EU TECHNICAL EXPERT GROUP ON
SUSTAINABLE FINANCE

Taxonomy Technical Report

June 2019

Disclaimer

This report represents the overall view of the members of the Technical Expert Group, and although it represents such a consensus, it may not necessarily, on all details, represent the individual views of member institutions or experts. The views reflected in this Report are the views of the experts only. This report does not reflect the views of the European Commission or it services.

About this document

This document sets out the results of the work to date undertaken by the Technical Expert Group on Sustainable Finance (hereafter, 'TEG') in relation to the development of an EU classification system for environmentally sustainable economic activities (hereafter 'Taxonomy'). It has six parts:

PART A	**Explanation of the Taxonomy approach**. This section sets out the role and importance of sustainable finance in Europe from a policy and investment perspective, the rationale for the development of an EU Taxonomy, the daft regulation and the mandate of the TEG.
PART B	**Methodology.** This explains the methodologies for developing technical screening criteria for climate change mitigation objectives, adaptation objectives and 'do no significant harm' to other environmental objectives in the legislative proposal.
PART C	**Taxonomy user and use case analysis.** This section provides practical guidance to potential users of the Taxonomy, including case studies.
PART D	**Economic impacts of the Taxonomy**. This section provides the TEG's analysis of the likely economic impacts of establishing an EU Taxonomy.
PART E	**Next steps for the Taxonomy**. This section elaborates on unresolved issues and potential ways forward for the Taxonomy and the technical work of the Platform on Sustainable Finance.
PART F	**Full list of technical screening criteria**. This annex sets out the sector- and economic activity-specific technical screening criteria and rationale for the TEG's analysis.

Contents

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PART A: Explanation of the Taxonomy approach

This section sets out the role and importance of sustainable finance in Europe from a policy and investment perspective, the rationale for the development of an EU Taxonomy, the draft regulation and the mandate of the TEG.

1. Context and rationale

1.1 An introduction - Why have an EU Taxonomy?

In committing to the SDGs and climate-related goals through the Paris Agreement, the EU and its Member States endorsed a direction for sustainable growth. These goals provide signals to corporations and investors about future economic trends, investment opportunities and risks, but it is only the alignment of public policies to the goals that will encourage capital markets to re-orient capital flows.

Through financing or investments and through the stewardship of investments, investors will influence the decisions taken by corporations and other entities. This chain of influence requires translation of policy goals into frameworks that the investors and managers of capital can respond to. The EU Taxonomy is one example of such a framework: a list of economic activities assessed and classified based on their contribution to EU sustainability related policy objectives.

The EU Taxonomy is an implementation tool that can enable capital markets to identify and respond to investment opportunities that contribute to environmental policy objectives. Decisions by investors to allocate capital or influence company activities will be making a substantial contribution to climate goals and to the related SDGs.

This report provides the basis for the EU Taxonomy. It presents a list of economic activities which can make a *substantial contribution* to climate change mitigation and criteria to *do no significant harm* to other environmental objectives. It also presents a framework for evaluating substantial contribution to climate change adaptation. The list of economic activities covered in this report is not exhaustive and additional activities should be added to the Taxonomy in future.

The Taxonomy proposed in this report is readily useful to investors, but the benefits of widespread use of the Taxonomy as a common language and reference point for markets, requires transparency by investors and companies alike. There is an important role for practical, disclosure-based regulation to help inform financial decision making and enable market participants to respond to the EU's goals for financing sustainable growth.

1.2 Background - The EU environment and climate action framework

Sustainable development and the protection and improvement of the quality of the environment are core values of the European Union (EU) and recognized by EU laws and treaties. The Treaty of the Functioning of the European Union (TFEU) requires all proposals by the Commission to include a high level of environmental protection.[11]

The EU's first Environment Action Programme was adopted in 1972. Successive programmes have resulted in over 50 directives, regulations and decisions on environmental protection covering air quality, waste management, water protection, chemical control, integrated pollution prevention and control and natural habitats protection

Many environmental policies have evolved into strategic programmes that recognise the need for mainstreaming environmental considerations into key 'driver' policy areas such as agriculture, transport, energy, industry, product policy and regional/structural development. The EU has been developing policies to limit air pollutants, including carbon emissions, and improve energy efficiency since the early 1990s. The EU has also played a leading role in the development of international climate and sustainable development policy, with a strong commitment to key international agreements such as the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention on Biological Diversity (UNCBD) and the United Nations Convention to Combat Desertification (UNCCD), Sustainable Development Goals (SDGs), the Paris Agreement on climate change, the Sendai Framework for Disaster Risk Reduction and the Kigali Amendment to the Montreal Protocol.

Private finance is critical to achieve many of these goals, but a significant investment gap remains. [12] Action is required to bridge the gap.

> '*A deep re-engineering of the financial system is necessary for investments to become more sustainable and for the system to promote truly sustainable development from an economic, social and environmental perspective. This implies finding ways to integrate sustainability into the EU's regulatory and financial policy framework and to mobilise and orient more private capital flows towards sustainable investments. The 17 Sustainable Development Goals (SDGs) identified in the UN 2030 Agenda for Sustainable Development provide a framework for directing such investments, which the EU is fully committed to implementing.*
>
> *Among other long-term sustainability challenges, managing climate change depends on making finance flows consistent with the long-term decarbonisation objectives and climate-resilient development. The Paris Agreement, which marked a watershed in global commitment to tackling climate change, put finance at the heart of this policy*.'
>
> ***Mid-Term Review of the Capital Markets Union***

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11 Article 11 states: 'Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development'. Article 114 furthermore requires the Commission to 'take as a base a high level of protection' concerning health, safety, environmental protection and consumer protection. Under Article 191, EU policy on the environment shall contribute to pursuit of the following objectives:

- preserving, protecting and improving the quality of the environment
- protecting human health
- prudent and rational utilisation of natural resources
- promoting measures at the international level to deal with regional or worldwide environmental problems, particularly combating climate change

12 This is discussed in Section 1.2.2 and in detail in Part D: Impact Assessment.

These goals are directly reflected in the environmental, social and economic policies of the EU. The importance of the SDGs and the Paris Agreement are specifically recognised in the 2017 update to the Capital Markets Union[13] (see call out box) and the 2018 Action Plan on Financing Sustainable Growth.[14]

On climate policy specifically, the EU has set targets for reducing its greenhouse gas (GHG) emissions progressively up to 2050, with specific milestones in 2020 and 2030. The EU is currently on track to meet the targets for 2020.[15] The European Council agreed on climate and energy targets for 2030 in 2014.[16] The renewables and energy efficiency targets were then revised upwards as part of the legislation adopted in 2018. The key targets for 2030 are: at least 40% cut in greenhouse gas emissions (based on 1990 levels); at least 32% share for renewable energy; at least 32.5% improvement in energy efficiency.[17]

In November 2018, the Commission presented its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050.[18] Reaching net-zero GHG emissions by 2050 (climate neutrality) is considered an appropriate EU contribution to limiting the global temperature increase to well below 2 degrees Celsius and pursuing efforts to limit the temperature increase to 1.5 degrees Celsius, in line with the Paris Agreement objectives. The EU aims to adopt and submit an ambitious strategy by early 2020 to the UNFCCC as requested under the Paris Agreement.[19]

In 2013, the European Commission adopted an EU strategy on adaptation to climate change. It aimed to enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change and make Europe more climate resilient. In 2015, the EU signed onto a new global goal on adaptation as part of the Paris Agreement, and works towards a wider and more interconnected policy agenda defined by the 17 UN Sustainable Development Goals.

Meeting EU environment and climate change objectives has required the comprehensive re-assessment of EU policies in related areas, including those related to the functioning of the European financial system.

1.3 The role of sustainable finance

Sustainable finance is a key element of EU policies, including those on Investment and Growth, Climate and Energy and Environment and the Capital Markets Union.[20] This reflects a growing awareness that sustainable economic development, employment and environmental goals such as clean air and a safe climate must be in alignment.

The EU is at the forefront of global financial system reforms that aim to incorporate sustainability, which now encompasses central bank market supervision and green finance policies in China, throughout ASEAN and in Latin America, among others (e.g. Morocco). This progress follows substantial investment in competency and ideas and a growing desire for sustainable finance.

13 https://ec.europa.eu/info/sites/info/files/communication-cmu-mid-term-review-june2017_en.pdf.
14 https://ec.europa.eu/info/publications/180308-action-plan-sustainable-growth_en.
15 https://ec.europa.eu/clima/policies/strategies/progress_en.
16 http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/en/pdf.
17 https://ec.europa.eu/clima/policies/strategies/2020_en.
18 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf.
19 https://ec.europa.eu/clima/policies/strategies/2050_en.
20 https://ec.europa.eu/commission/files/reflection-paper-towards-sustainable-europe_en.

1.3.1 High Level Expert Group

At the end of 2016, the European Commission appointed the High-Level Expert Group (HLEG) on Sustainable Finance with a mandate to recommend financial reforms on which to base the EU strategy on sustainable finance.[21] The group, composed of members and observers from banking, insurance, asset management, stock exchanges, financial industry associations, international institutions and civil society began work in January 2017 and delivered their final report in January 2018. The report includes eight key recommendations and several cross-cutting and sector-specific recommendations to align the financial system with sustainability goals.

The HLEG's first recommendation was to 'establish and maintain a common sustainability Taxonomy at the EU level':[22]

> *If Europe is to mobilise capital at scale for sustainable development, it needs a technically robust classification system to establish market clarity on what is 'sustainable'. This system would cover a wide range of activities, investments and assets that can be clearly linked to the Paris Agreement and the Sustainable Development Goals (SDGs).*
>
> *Such a 'sustainability Taxonomy' would identify under which conditions or criteria any given investment or financial product will contribute to the EU's sustainability objectives. The Taxonomy would enable market growth by re-orienting capital flows towards assets that contribute to sustainable development; by creating much needed comparability across standards, labels, products and jurisdictions; and by enabling market participants to invest in sustainability with greater confidence and ease.*

The HLEG proposed a detailed framework for the development of a future Taxonomy and presented a proposal for the climate change mitigation elements of this Taxonomy.[23]

1.3.2 Action Plan to finance sustainable growth

Building upon the HLEG's recommendations, on 8 March 2018 the EU Commission published its Action Plan: Financing Sustainable Growth,[24] stating the need for a deep rethink of the European financial framework. The Action Plan describes the EU strategy for sustainable finance and is part of the implementation plan of Article 2(1)(c) of the Paris Agreement, relating to the alignment of financial flows with global climate goals and the UN 2030 Agenda for Sustainable Development.

The European Commission proposal for a long-term decarbonisation strategy[25] estimates increased investment in Europe's energy system and infrastructure from the current 2% of GDP per annum to 2.8% of GDP to reach net-zero emissions, an additional €175 to 290 billion a year. This is consistent with the Intergovernmental Panel on Climate Change (IPCC) special report that estimated that of 2.5% of world GDP will be needed for the energy system between 2016 and 2035. To achieve this, private sector financial flows must be directed towards low emission investments.

The 10 initiatives set out in the Action Plan aim to:

- Reorient capital flows towards sustainable investment, in order to achieve sustainable and inclusive growth.

21 https://ec.europa.eu/info/sites/info/files/180131-sustainable-finance-final-report_en.pdf.

22 https://ec.europa.eu/info/publications/180131-sustainable-finance-report_en.

23 https://ec.europa.eu/info/sites/info/files/180131-sustainable-finance-final-report-annex-3_en.pdf.

24 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097.

25 A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. https://ec.europa.eu/clima/policies/strategies/2050_en

- Manage financial risks stemming from climate change, environmental degradation and social issues.
- Foster transparency and long-termism in financial and economic activity.

As highlighted in the Action Plan, achieving the goal of re-orienting capital flows towards sustainable investment should be underpinned by an EU classification system that provides a common language on what constitutes sustainable activities. Clarity is needed on the criteria an economic activity must meet to qualify as positively contributing to EU sustainability objectives.

Currently, there is no EU classification system for sustainable economic activities and the existing market-based practices are not necessarily aligned with EU environmental and sustainability policy objectives.

Economic transition to meet climate policy objectives

To avoid dangerous anthropogenic interference within the climate system, the Paris Agreement commits countries to limiting the global temperature increase to well below 2 degrees Celsius and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius. Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. The IPCC special report on the impacts of global warming above 1.5 degrees recognises that ambition over the next decade is critical for climate change mitigation and adaptation. The European Commission's long-term decarbonisation strategy proposes that Europe aim for carbon neutrality by 2050 as part of global efforts to reach these goals. The EU Adaptation Strategy aims to make Europe more climate resilient and enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change.

The transition to a net-zero emissions economy requires transitioning from high to low emitting activities. To achieve this, it is necessary to incentivise the growth of very low carbon and net-zero activities, while at the same time achieving substantial emissions reductions in other activities. There is a need to redirect capital to activities that can provide substantial emissions reductions and contribute to a transition to a net-zero economy, but which are not yet net-zero carbon. These activities can make a substantial contribution to climate change mitigation where the underlying activities do not undermine its objectives or result in lock-in to carbon intensive assets or processes.

Furthermore, several Member States are adopting national standards and financial product labels based on market-based classification systems. As a result, current industry and Member State-based initiatives might lead to market fragmentation which in turn can confuse investors, notably retail investors with sustainability preferences. Moreover, differences between national standards and labels could hamper cross-border sustainable investments. Finally, incoherence between classification systems or an absence of classification system might also create the risk of greenwashing,[26] which could undermine the confidence of investors and provide unfair competitive advantage to financial actors engaged in those practices.[27]

26 'Greenwashing' describes the practice of making misleading claims about the environmental benefits of a product or of a company's policies more generally.

27 See also the Impact Assessment accompanying the Proposal for a Regulation of the European Parliament and of the Council on the establishment of a framework to facilitate sustainable investment and Proposal for a Regulation of the European Parliament and of the Council on disclosures relating to sustainable investments and sustainability risks and amending Directive (EU) 2016/2341 and Proposal for a Regulation of the European Parliament and of the Council amending

To address the above risks and create a framework which promotes investors' confidence in sustainable investments, on 24 May 2018 the EU Commission tabled the proposal for a regulation on the establishment of a framework to facilitate sustainable investment (the so-called Taxonomy Regulation).

The Taxonomy forms part of the implementation of the Action Plan on Sustainable Finance. The Action Plan contains 10 actions, some of which have led to political agreements. In July 2018, the European Commission set up a technical expert group to assist it in developing:

- An EU classification system – the so-called Taxonomy – to determine whether an economic activity is environmentally sustainable;
- An EU Green Bond Standard;
- Benchmarks for low-carbon investment strategies; and
- Guidance to improve corporate disclosures of climate-related information.

This report summarises the recommendations by the TEG in relation to the Taxonomy. The TEG's recommendations on Taxonomy (and low-carbon benchmarks) will aid the Commission in the development of proposed future delegated acts.

Additional reports have been published by the TEG on other topic areas. The recommendations regarding corporate disclosure will inform updates to the non-binding guidelines underpinning the Non-Financial Reporting Directive.[28] The Green Bond Standard recommendations will inform a future voluntary EU Green Bond Standard.

1.3.3 Relevant legislative developments

The regulation on disclosures relating to sustainable investments and sustainability risks, which was formally adopted by the European Parliament and Council in April 2019, sets out requirements for financial market participants in relation to the disclosure of sustainability risks and impacts. Of particular relevance for the Taxonomy, it requires financial products targeting sustainability objectives to disclose:

- How the sustainability objectives are met and, if an index has been designated as a reference benchmark, whether and how it is consistent with the sustainability objectives.
- The extent to which sustainability objectives are attained, the overall sustainability-related impact of the financial product and, where an index has been designated as a reference benchmark, a comparison through sustainability indicators of the respective impacts of the financial product and a broad market index.
- A description of the sustainability objectives of the product and information on the methodologies used to assess, measure and monitor the sustainability objectives.

The Taxonomy is a tool that can inform investors in complying with this regulation.

The Taxonomy is also referenced in the draft InvestEU regulation as a framework to aid in monitoring the InvestEU fund's contribution to climate targets.[29]

Regulation (EU) 2016/1011 on low carbon benchmarks and positive carbon impact benchmarks, https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5524115_en#pe-2018-3333.

28 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017XC0705(01).

29 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A439%3AFIN

2. The Technical Expert Group

2.1 Mandate and work to date

The TEG was mandated by the European Commission to develop recommendations for technical screening criteria regarding economic activities that make a substantive contribution to climate change mitigation or adaptation, while avoiding significant harm to four further European Union environmental objectives: sustainable use and protection of water and marine resources, transition to a circular economy, waste prevention and recycling, pollution prevention control and protection of healthy ecosystems (environmental objectives 3-6).

The TEG has 35 members from civil society, academia, business and the finance sector, as well as 10 additional members and observers from EU and international public bodies. Members of the current TEG have been appointed as representatives of their organisations (type C members), as individuals appointed in a personal capacity (type A or B members) or as representatives of European entities (type E members). Members work through formal plenaries and subgroup meetings for each work stream.

The TEG was initially mandated to work until June 2019 with the possibility of extension until December 2019 to facilitate the transition to the longer-term governance of the Taxonomy.

The TEG included three other sub-working groups, including one to develop a Green Bonds Standard that would link to the Taxonomy, one on corporate sustainability and climate related disclosures, including disclosure guidelines in relation to the Taxonomy, and one on investment benchmarks.

Between July and December 2018, the TEG developed initial frameworks and methodologies, as well as some early technical screening criteria. In particular:

- A first sub-set of technical screening criteria for selected economic activities expected to make a substantial contribution to climate change mitigation objectives (referred to as ‘1st round mitigation activities’).
- Proposals for additional economic activities which can make a substantial contribution to climate change mitigation (referred to as ‘2nd round mitigation activities’).
- Early draft criteria to assess ‘significant harm’ across environmental objectives 3-6 for the above activities.
- A draft framework for activities expected to make a substantial contribution to climate change adaptation objectives.

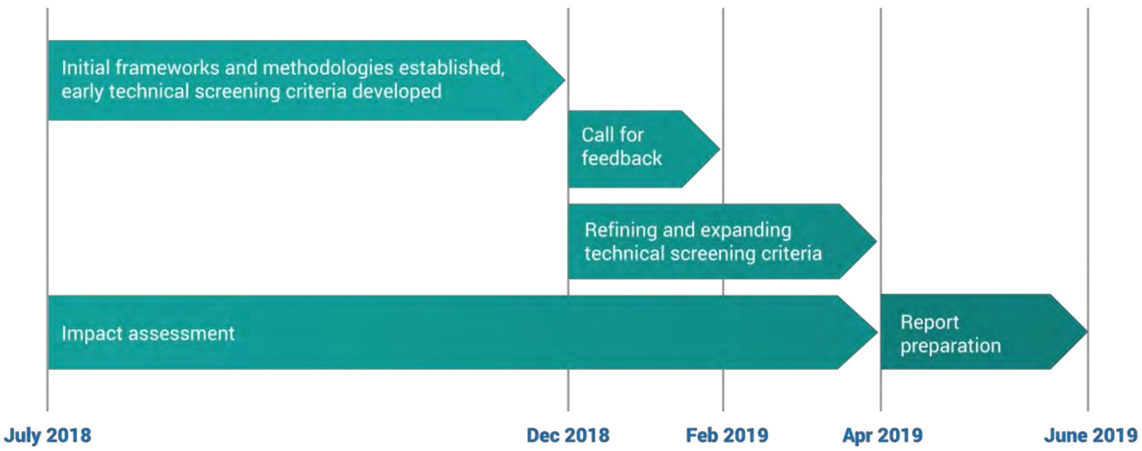

Figure 1 Timeline for taxonomy development (to June 2019)

In December 2018, the TEG issued a call for feedback[30] on the first phase of technical developments and established a process for Commission-hosted workshops to aid in further expansion of the technical screening criteria. The TEG also requested feedback on the usability of the Taxonomy.

The call for feedback closed on 22 February 2019. Over 1,200 technical comments on activity criteria from 244 respondents were received. The TEG has worked to understand the implications of the feedback received in terms of overarching methodologies, individual criteria and the long-term application and usability of the Taxonomy.

The TEG is grateful for the thoughtful and constructive responses received following the call for feedback. Comments on the individual technical screening criteria have been reviewed for each sector. Issues of usability are discussed in detail in Part C.

In order to develop technical screening criteria for the 2nd round economic activities selected for climate change mitigation, the TEG invited applications from academia, industry, civil society and policy organisations to provide additional expertise in the form of workshops. Over 250 applications were received and 160 additional experts were invited to participate. Technical workshops were hosted by the Commission on 26–27 March in Brussels to expand the technical screening criteria for climate change mitigation, adaptation and assessment of significant harm across objectives 3–6. The additional experts contributed substantively to the development of the Taxonomy criteria set by the TEG.

2.1.1 Extension to December 2019

This report details the recommendations of the TEG. However, the TEG has agreed to continue to support the Commission until the end of 2019 in preparation for the future development of a Taxonomy in law. This reflects the fact that, while the recommendations in this report provide the basis for an EU Taxonomy, further refinement of the criteria may be required after feedback from stakeholders. The TEG will use this time to:

- Refine and further develop some incomplete aspects of the proposed technical screening criteria for substantial contributions and avoidance of significant harm.
- Seek additional feedback on criteria that have not yet been subject to public consultation.
- Develop further guidance on implementation and use of the Taxonomy.

The TEG will not further expand the scope of the climate change mitigation activities covered under the Taxonomy in this phase, nor will it seek detailed feedback on screening criteria which have already been reviewed. Feedback received will be incorporated into a report submitted to the Commission in late 2019.

30 https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-Taxonomy-feedback-and-workshops_en.pdf.

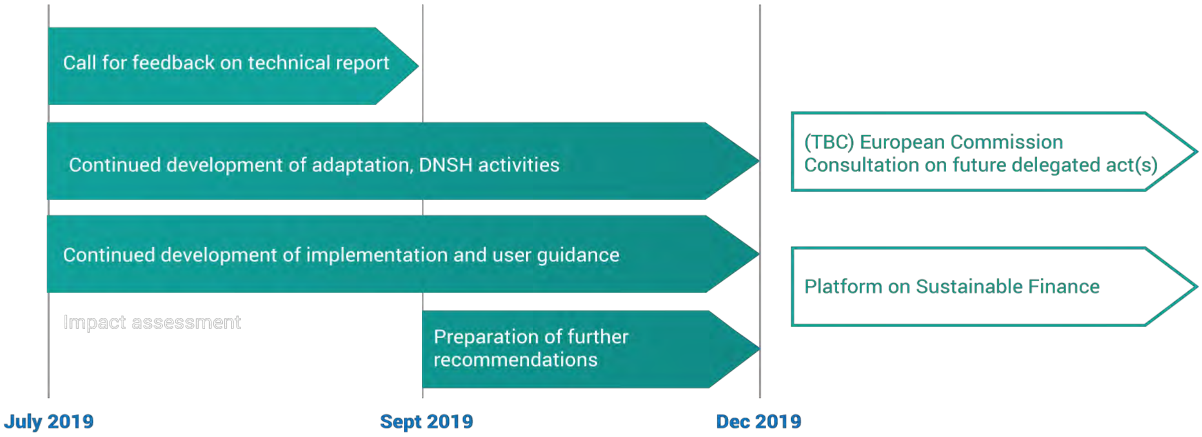

Figure 2 Timeline of the next phase of the Taxonomy development

The TEG's recommendations are designed to inform a proposed Delegated Act to implement the Taxonomy. Under the draft regulation, this would be developed by the European Commission and subject to full public consultation as required under standard procedures.

The proposed Taxonomy regulation also envisages a permanent Platform on Sustainable Finance to take on the role of the TEG in providing technical assistance and recommendations on technical screening criteria. Some technical screening criteria proposed by the TEG in this report will require periodic revisions; others require further development. The draft Taxonomy regulation also envisages a process for companies, investors and other stakeholders to submit suggestions to the Platform on Sustainable Finance for additional economic activities to be addressed and included in the Taxonomy. The implications of the TEG's work for the platform are discussed in Part E.

3. Principles for Taxonomy development

The mandate for the work undertaken by the TEG reflects the principles outlined in the 'Proposal for a regulation on the establishment of a framework to facilitate sustainable investment' (May 2018), as well as additional principles adopted by the TEG which follow as a necessary consequence of the technical work undertaken.

3.1 Principles enshrined in regulation

The regulation identifies six environmental objectives for the purposes of the Taxonomy (Article 5):

I. Climate change mitigation
II. Climate change adaptation
III. Sustainable use and protection of water and marine resources
IV. Transition to a circular economy, waste prevention and recycling
V. Pollution prevention and control
VI. Protection of healthy ecosystems

For an action to meet the definition of an 'environmentally sustainable economic activity' (Article 2) and thus be considered Taxonomy-eligible, it must:

1. Contribute substantially to one or more of the environmental objectives
2. Do no significant harm to any other environmental objective
3. Comply with minimum social safeguards (under the draft regulation, these are defined as ILO core labour conventions).
4. Comply with the technical screening criteria

The implication is that economic activities, even when making a substantial contribution to climate change mitigation and/or adaptation, will not be eligible for the Taxonomy if they cannot be performed in a way which avoids significant harm to other environmental objectives.

The proposed regulation (Article 16) will enable the Commission to establish technical screening criteria through a series of delegated acts, the first of which will cover economic activities generating a substantial contribution to climate change mitigation and adaptation. As such, the TEG has been mandated to focus and deliver a recommendation to the Commission on these activities and their technical criteria, including criteria for assessing 'significant harm' on objectives 3-6.

When developing these technical screening criteria, the regulation established the following requirements in Article 14.

Article 14

Article 14 text	**TEG response**
1. *The technical screening criteria adopted in accordance with Articles 6(2), 7(2), 8(2), 9(2), 10(2) and 11(2) shall:*	
a) *identify the most relevant potential contributions to the given environmental objective, considering not only the short-term but also the longer-term impacts of a specific economic activity*	**Climate change mitigation**: emissions levels and known mitigation opportunities were used to prioritise activities for inclusion in the Taxonomy. Long-term criteria were set for activities that could operate in a low carbon, zero carbon or net negative emissions way today. Short-term criteria, highly likely to be tightened over time, were set for activities that are currently transitioning to low carbon options.

	Adaptation: The criteria for substantial contribution to adaptation objectives are applicable to any sector. No prioritisation of activities was made for adaptation, recognising that adaptation in all sectors is important to build a climate resilient future. A sample of economic activities was used to test the approach. Development of the DNSH criteria is required to include adaptation activities in the Taxonomy. This work to be carried out in the TEG extension period.
2. *specify the minimum requirements that need to be met to avoid significant harm to any of the relevant environmental objectives;*	Minimum requirements are described in terms of performance standards or practices.
3. *be qualitative or quantitative, or both, and contain thresholds where possible;*	Qualitative and quantitative thresholds are used in the Technical Screening Criteria.
4. *where appropriate, build upon Union labelling and certification schemes, Union methodologies for assessing environmental footprint and Union statistical classification systems, and take into account any relevant existing Union legislation;*	Union regulations, methodologies and classification system are widely used in activity criteria. Where there are exceptions, the rationale is explained.
5. *be based on conclusive scientific evidence and take into account, where relevant, the precautionary principle enshrined in article 191 TFEU;*	All assessments were based on available scientific literature, international practice or evidence obtained by the TEG, either through existing market-based Taxonomy frameworks[31] or via evidence provided by additional experts and through the public 'call for feedback'.[32] Where evidence was not available, the precautionary principle was adopted.
6. *take into account the environmental impacts of the economic activity itself, as well as of the products and services provided by that economic activity, notably by considering their production, use and end-of-life;*	Technical work commenced with a full life cycle scope in mind. Limits on economic activity boundaries were introduced to enable the development of criteria that could be used in practice by the market. Limits were necessary when supply chain tracking processes were not established and/or where data regarding the environmental performance of upstream and end-of-life considerations was not available. Examples include forestry, transport and buildings. See the detailed notes in each section.
7. *take into account the nature and the scale of the economic activity;*	A selective process for climate change mitigation activities was based on emissions footprint, which

31 For example, the Climate Bonds Taxonomy, MDBs and IDFC common principles for climate change mitigation finance tracking and the SDG Taxonomy developed by PGGM and APG.
32 https://ec.europa.eu/info/publications/sustainable-finance-Taxonomy_en.

	incorporated consideration of the nature of economic activities. No re-prioritisation was made based on the scale of the economic activity. For adaptation, the screening criteria take into account the location- and context-specific vulnerability of an economic activity, the system the activity is in and its expected lifetime.
8. *take into account the potential impact on liquidity in the market, the risk of certain assets becoming stranded as a result of losing value due to the transition to a more sustainable economy, as well as the risk of creating inconsistent incentives;*	Economic impact assessment has been conducted at the macro level; this is in Part D.
9. *cover all relevant economic activities within a specific sector and ensure that those activities are treated equally if they contribute equally towards one or more environmental objectives, to avoid distorting competition in the market;*	Where possible, criteria have been set that apply equally to all activities within a sector. However, the broader environmental impacts of these activities can vary significantly, meaning that some individual economic activities within sectors require their own DNSH analysis for inclusion in the Taxonomy. As a result, even where substantial contribution criteria can be set for a broad sector (e.g. electricity generation), the DNSH assessment has been conducted at a more granular level.
10. *be set as to facilitate the verification of compliance with those criteria whenever possible.*	The TEG has intended to facilitate verification by proposing, wherever possible, screening criteria which are quantitative with thresholds or which reflect existing regulations with specific practice requirements.
2. The technical screening criteria referred to in paragraph 1 shall also include criteria for activities related to the clean energy transition, in particular energy efficiency and renewable energy, to the extent that those are substantially contributing to any of the environmental objectives.	Energy activities and energy efficiency activities are included and both short- and long-term criteria were set for these activities.
3. The technical screening criteria referred to in paragraph 1 shall also include criteria for activities related to the switch to clean or climate-neutral mobility, including through modal shift, efficiency measures and alternative fuels, to the extent that those are substantially contributing to any of the environmental objectives.	Mobility activities were included and both short- and long-term criteria were set.

3.2 Additional principles developed by TEG

The TEG developed additional principles to guide its decision-making approach, including:

Support ease of use	The TEG considered the users and uses of the Taxonomy in developing its recommendations, especially in relation to the Green Bonds Standard, but also in relation to data needs and future disclosure requirements to ensure the Taxonomy can support investment decisions. Part C of this paper details TEG considerations on usability.
Build a dynamic, flexible tool	The Taxonomy design includes quantitative criteria wherever possible so that solutions can be specified by the market and evolve over time. Criteria which should be tightened later have been signalled in advance to provide predictability to markets, while offering a clear review mechanism for the future Platform on Sustainable Finance.
Be inclusive of economic sectors	Economic sectors and activities that are not already low carbon have been included in the Taxonomy to provide an incentive for their substantial contribution to mitigation objectives.
Support transition from brown to green	By focussing on classifying economic activities and not investable entities, the Taxonomy can be used by any organisation to specify the proportion of its activities that substantially contribute to environmental objectives. Further, recognising that partial steps towards meeting activity criteria should also be encouraged, expenditure or investments as part of a plan to achieve an activity threshold are recognised as eligible under the Taxonomy.
Consider economic activities within an entire economic system	The TEG has considered the implications in Part B. The Further, technical Screening Criteria for substantial contribution to adaptation incorporates a system approach by ensuring that the activity is consistent with broader adaptation efforts and does not lead to increased risks for others or hamper adaptation elsewhere.

PART B: Methodology for developing the Taxonomy

This explains the methodologies for developing technical screening criteria for climate change mitigation objectives, adaptation objectives and 'do no significant harm' to other environmental objectives in the legislative proposal.

4. Sector framework

The Taxonomy aims to define which economic activities can be considered environmentally sustainable. Over time, it intends to be as comprehensive as possible and cover all relevant parts of the economy. As such, it is first necessary to establish a sector framework.

The NACE[33] industrial classification system of economic activities has been adopted by the TEG as it was established by EU law,[34] and is largely compatible with international and Member State frameworks. The TEG notes that NACE does not record stocks or flows of natural resources where they are not monetised, or broader efforts to account for these, such as the System of Integrated Environmental and Economic Accounting. It can neither capture activities which have been avoided, nor individual behavioural choices. Nonetheless, the NACE system has been selected as a starting point for Taxonomy development as it is comprehensive in its coverage of EU economic sectors, is used by EU institutions such as Eurostat and has already been implemented by some financial institutions.

In some areas, such as climate change adaptation, the sector framework cannot fully address location and context specific considerations, so these have been accounted for within the technical screening criteria. In other areas, NACE lacked sufficient granularity to enable the full evaluation of compliance with environmental objectives, and so has been supplemented by additional categories.

In the interim Taxonomy report,[35] the TEG acknowledged that some financial market participants use other classification systems, in particular the Global Industrial Classification System (GICS). The Taxonomy will define activities in a way that enables users unfamiliar with the NACE codes to understand them. The TEG believes that maps of NACE codes to GICS codes are readily available.

The TEG acknowledges that the existing sector frameworks used to classify economic activities can present challenges when assessing the systemic dimensions of mitigation and adaptation activities, such as cities, land use, transport or energy systems. This is discussed further in Section 5 Economic and environmental systems.

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33 *Nomenclature des Activités Économiques dans la Communauté Européenne* (NACE) is a European industry standard classification system.

34 Regulation (EC) No. 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No. 3037/90 as well as certain EC Regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

35 https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-Taxonomy-feedback-and-workshops_en.pdf.

5. Economic and environmental systems

The Taxonomy helps to define the universe of activities that will remain in a net-zero emissions economy in 2050 and beyond, and the types of activities that can support the transition to a low-emissions, climate-resilient economy. The nature, pace and priorities that facilitate this transition remain the remit of businesses, citizens and policymakers at the EU, Member State, region and city levels.

The way in which an electricity system is decarbonised may well differ across Europe depending on the characteristics of the available resources (e.g. wind or solar). For example, cities might choose not to prioritise low-emissions vehicles, instead targeting good public transport infrastructure to free up the road space for active modes of transport.

An economic activity cannot truly be considered sustainable independently from the wider system in which it operates. For example, the emissions reductions enabled by an electric vehicle depend a number of factors: charging from low-carbon electricity sources, not adding to congested traffic conditions and whether, at the end-of-life stage, the battery is reused or recycled in an environmentally sustainable way. Similarly, the well-being of people in cities does not just depend on the availability of low-emissions residential housing for example, but necessitates access to low-emissions transport options to ensure access to places of work and other vital services (shops, health facilities, etc.) or urban planning that lessens the need for vehicles.

To substantially contribute to environmental objectives, the critical aspects of a system must be decarbonised and made resilient. This can cover the resources used, the transformation processes undertaken and the infrastructure that underpins these systems.

In general, investors can finance individual companies or projects rather than systems. The Taxonomy development approach has therefore aimed to identify activities that make a substantial contribution on their own but also enable the overall transition of critical systems such as the energy, transport, urban, water and food systems. However, the nature of the transition in each country or region is influenced by the evolution of the entire system, including local strategies and policies. A Taxonomy-eligible activity may only contribute to an individual country or region's transition pathway when it is also coherent with the transition of the overall system of which the activity is a part.

It is thus important that investors account for overall systems and the local transition pathways for such systems. By choosing to finance activities that are the most coherent with the transition of the overall system in their specific context, investors can maximise the sustainability impact of their investments, as multiple individual activities reinforce each other and result in greater combined benefits.

As an example, economic activities relevant to urban water systems are shown in the below diagram. The TEG has developed screening criteria for several activities within each of these systems (see activities is Water and Agriculture sectors) in the Taxonomy.

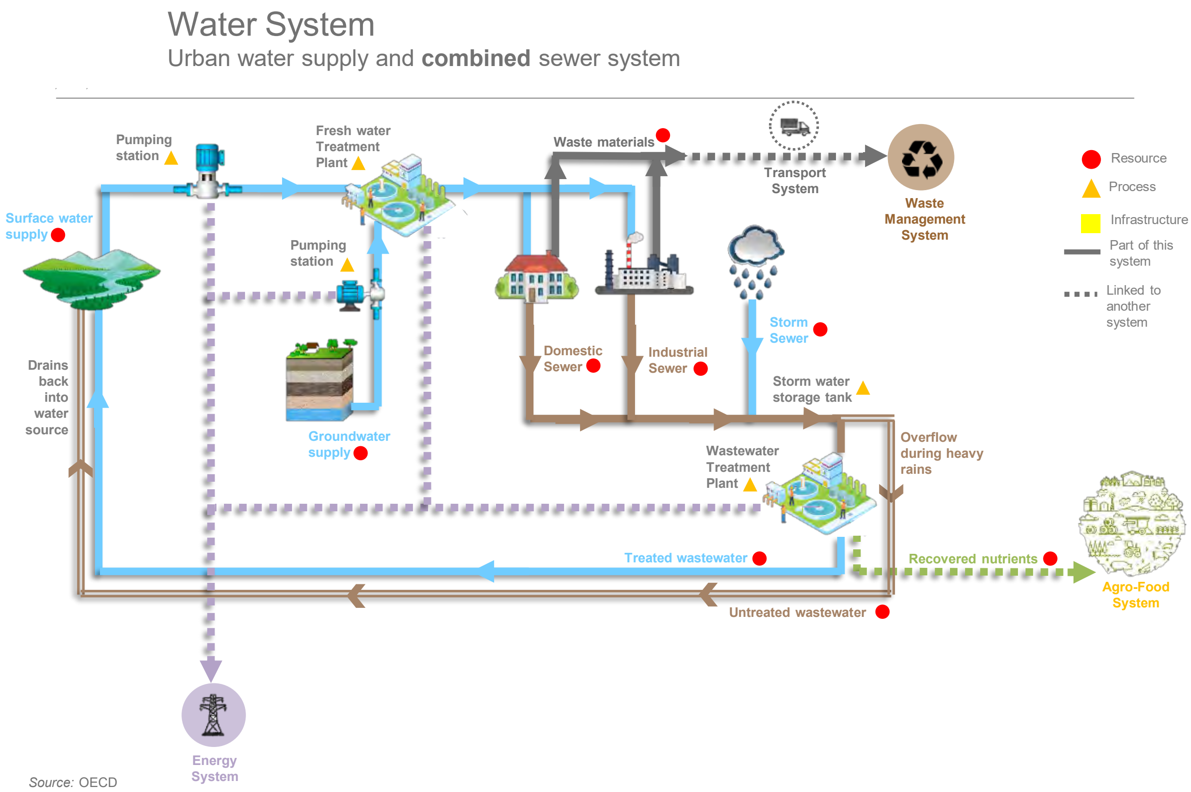


Figure 3 Economic activities relevant to urban water systems

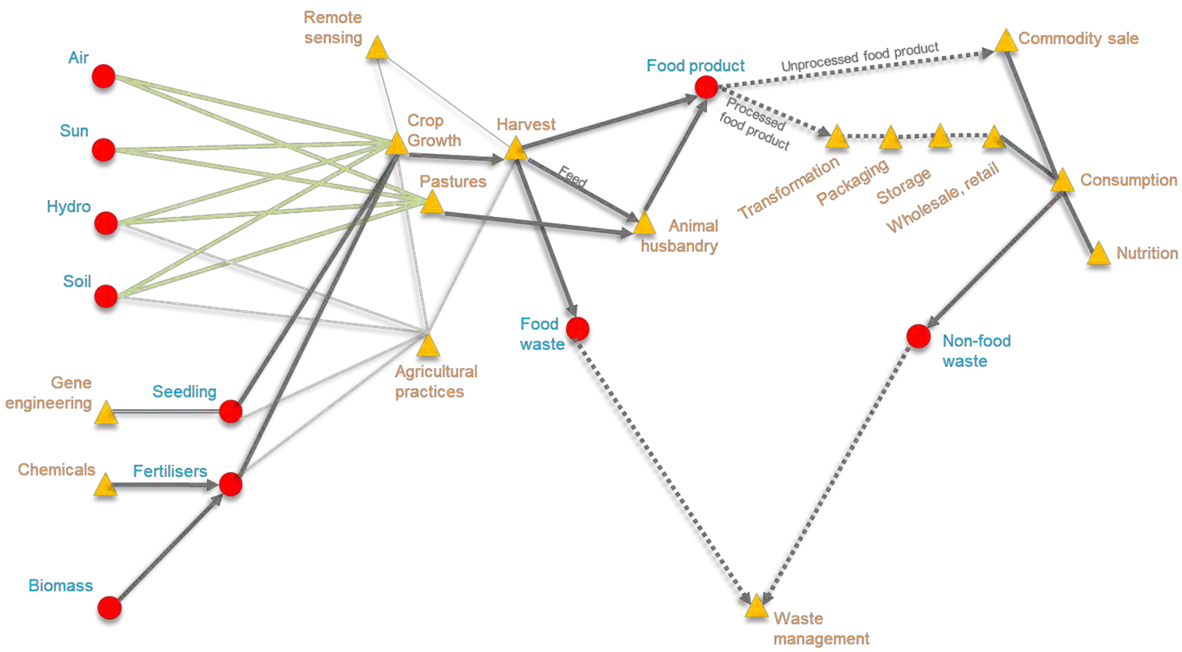


Figure 4 Economic activities relevant to agricultural systems

6. Climate change mitigation

6.1 Work process – conceptual approach

The TEG has developed the following process to assess economic activities (Shown in Figure 5).

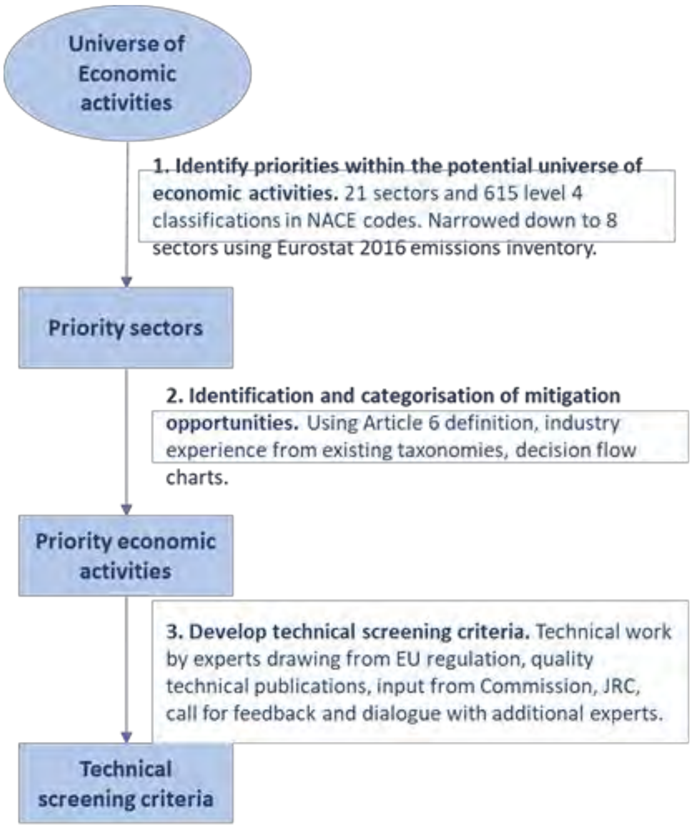


Figure 5 – Work process for technical screening criteria development

1. **Identify priorities within the potential universe of economic activities**. NACE codes 21 broad economic sectors, with four levels of sub-codes. At the fourth level, 615 classes of economic activity are identified. It was not possible to develop technical screening criteria for all economic classifications within the timeframe of the TEG. The TEG therefore identified priority sectors. See 6.2 Methodology for selecting sectors and economic activities.

2. **Identification of potential activities**. Within each sector, the TEG has identified activities with the potential to contribute substantially to climate change mitigation. These have been further categorised based on the type of contribution. See 0

3. Defining substantial contribution to climate change mitigation.

4. **Develop technical screening criteria.** For activities meeting the requirements, technical screening criteria have been developed. These have three components:

    a. **Principles**: The underlying rationale for how the activity will result in a substantial contribution and/or avoidance of significant harm to the environmental objective in question.
    b. **Metrics**: The method(s) by which the environmental performance of the economic activity will be measured, including defining the boundary for this measurement.
    c. **Thresholds**: Qualitative or quantitative conditions which must be met to enable the performance of the activity in a way that is considered environmentally sustainable.

6.2 Methodology for selecting sectors and economic activities

In line with the definition above, the methodology for selecting economic activities was based on two factors:

Consideration	Explanation
(1) High-emitting NACE macro sectors	Quantitative data on CO_2e emissions by NACE code in the EU. At the time of the analysis, the latest available data was from 2016.
(2) Enabling sectors	Where economic activities have the potential to enable substantial GHG emissions reductions in other sectors, these should also be included (assuming the life cycle emissions of the activity do not undermine mitigation objectives).

The TEG identified six macro-sectors for climate change mitigation based on GHG emissions. In addition, buildings were identified as a critical cross-cutting issue, given their 36% contribution to CO_2 emissions in the EU[36]. Buildings are covered in the 'construction' and 'real estate' NACE codes, but also have relevance to the emissions performance of almost all economic activities. Information and communications technologies was identified based on the potential to enable emissions reductions in other sectors. It was agreed that professional, scientific and technical activities would also be included when they are necessary for the fulfilment of an environmentally sustainable activity agreed to under the Taxonomy (e.g. energy audits that enable building renovation), but a full evaluation of this sector was not prioritised. Information and Communication Technologies were added in order to commence investigating sectors that may help to avoid greenhouse gas emissions.

The NACE macro-sectors covered by this phase of the TEG's work are therefore:

- Agriculture, forestry and fishing
- Manufacturing
- Electricity, gas, steam and air conditioning supply
- Water, sewerage, waste and remediation
- Transportation and storage
- Information and Communication Technologies (ICT)
- Buildings (Construction and real estate activities, with application to other sectors where appropriate)

36 See https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings. Note that emissions from buildings are considered across NACE codes. Emissions from domestic buildings are typically excluded from NACE codes as domestic occupation is not considered an economic activity. Nonetheless, activities to reduce emissions from the residential sector should be considered in the Taxonomy.

The TEG has identified priority activities within each sector. The title is drawn directly from the NACE classification system and may refer to activities that were not covered (e.g. the TEG has developed technical screening criteria for agriculture and forestry, but not fishing).

6.3 Defining substantial contribution to climate change mitigation

The proposed regulation establishes a framework for understanding substantial contributions to climate change mitigation objectives:

Article 6

1. *An economic activity shall be considered to contribute substantially to climate change mitigation where that activity substantially contributes to the stabilization of greenhouse gas concentrations in the atmosphere at a level which prevents dangerous anthropogenic interference with the climate system by avoiding or reducing greenhouse gas emissions or enhancing greenhouse gas removals through any of the following means, including through process or product innovation:*

   a) *generating, storing or using renewable energy or climate-neutral energy (including carbon-neutral energy), including through using innovative technology with a potential for significant future savings or through necessary reinforcement of the grid;*
   b) *improving energy efficiency;*
   c) *increasing clean or climate-neutral mobility;*
   d) *switching to use of renewable materials;*
   e) *increasing carbon capture and storage use;*
   f) *phasing out anthropogenic emissions of greenhouse gases, including from fossil fuels;*
   g) *establishing energy infrastructure required for enabling decarbonisation of energy systems;*
   h) *producing clean and efficient fuels from renewable or carbon-neutral sources.*

To avoid dangerous anthropogenic interference in the climate system, the Paris Agreement commits countries to limiting the global temperature increase to well below 2 degrees Celsius and pursue efforts to limit the temperature increase to 1.5 degrees Celsius. The European Commission's long-term decarbonisation strategy proposes that the EU aim for carbon neutrality by 2050 as part of global efforts to reach these goals, though not all EU Member States have endorsed this target. The TEG has also recognised carbon neutrality by 2050 as the desirable end-state.[37]

Economic activities may themselves be decarbonised, or they may enable decarbonisation in other sectors. Both activities are required. The TEG has therefore found it helpful to adopt the following concepts to consider economic activities, set screening criteria and identify the types of finance that could be considered Taxonomy eligible.

- **'Greening of' activities**: For these activities, the technical screening criteria focus on improving the environmental performance of the economic activity. Where the environmental performance of the activity is consistent with the technical screening criteria, its revenues or expenditures may be considered eligible within the Taxonomy.

- **'Greening by' activities**: These activities enable improved environmental performance in other sectors of the economy and are themselves performed to avert a substantial negative impact on the environment. These activities may not result in the target economic activity being brought in line with technical screening criteria. For example, the installation of a highly efficient boiler may not bring a building in line with the Taxonomy

37 The draft regulation defines greenhouse gases as those listed in Annex I to Regulation (EU) No. 525/2013 of the European Parliament and of the Council: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_20), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). It does not include certain short-lived climate pollutants (SLCPs): black carbon and tropospheric ozone.

renovation criteria. In this case, though the building manager could consider the boiler expenditure to be Taxonomy-eligible, the building itself would not be a Taxonomy-eligible asset. The company producing or installing the boiler could consider revenues associated with this economic activity Taxonomy-eligible.

The transition to a net-zero emissions economy requires a shift from high emitting activities or modes of production to low emitting activities or modes of production. To achieve this, it is necessary to incentivise the growth of zero carbon and sequestration activities.

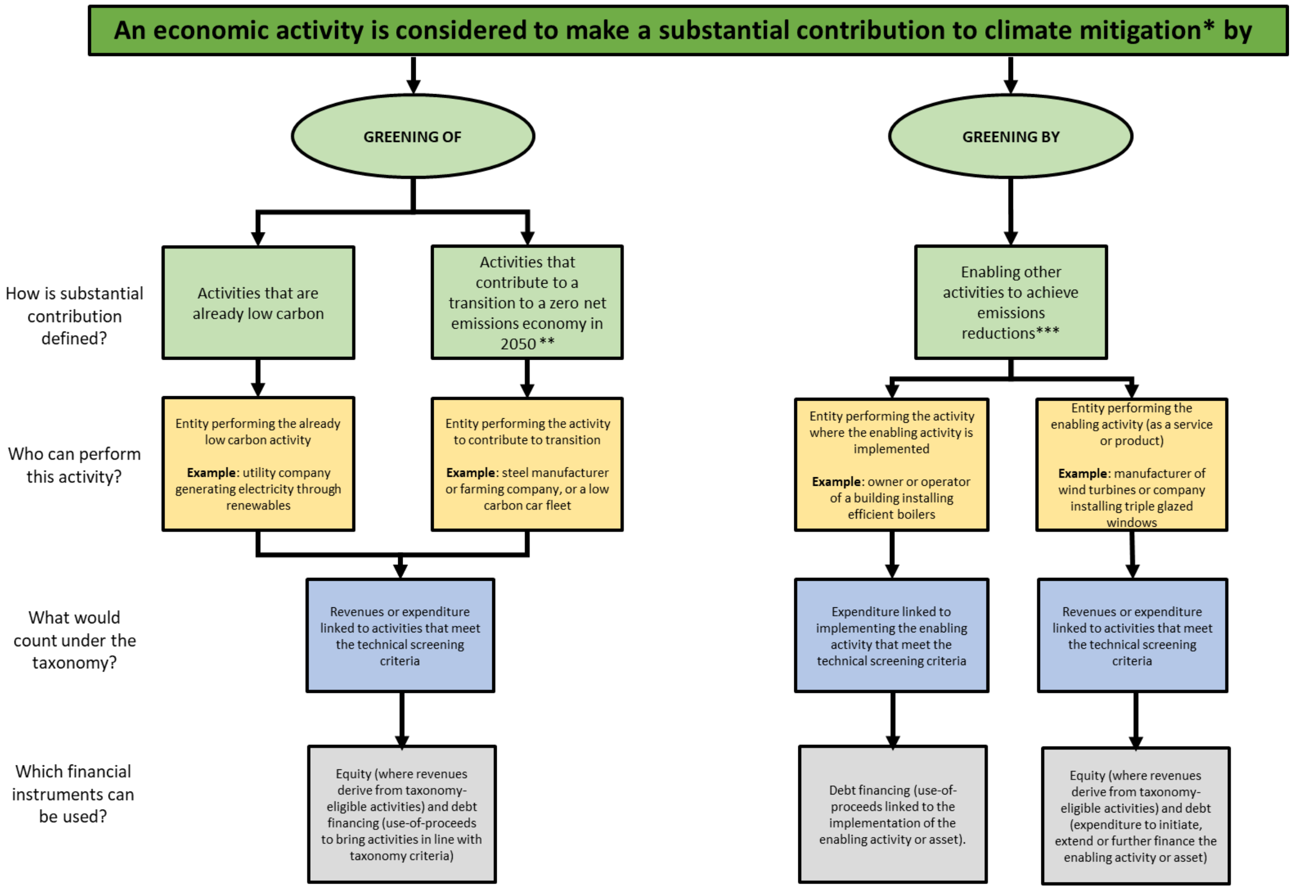
1) **Activities that are already low carbon** (i.e. activities associated with sequestration or very low and zero emissions). These activities require capital to increase their development and wider deployment. The technical screening criteria for these activities are likely to be stable and long-term. These are ‘green’ activities.

2) **Activities that contribute to a transition to a net-zero emissions economy in 2050 but are not currently close to a net-zero carbon emissions level**. These activities are critical to the economy but must significantly enhance their performance beyond the industry average, without lock-in to carbon intensive assets or processes. The technical screening criteria for these activities will be subject to regular revision, approaching zero over time. These are ‘greening of’ activities.

3) **Activities that enable low carbon performance or enable substantial emissions reductions**. These are ‘greening by’ activities.

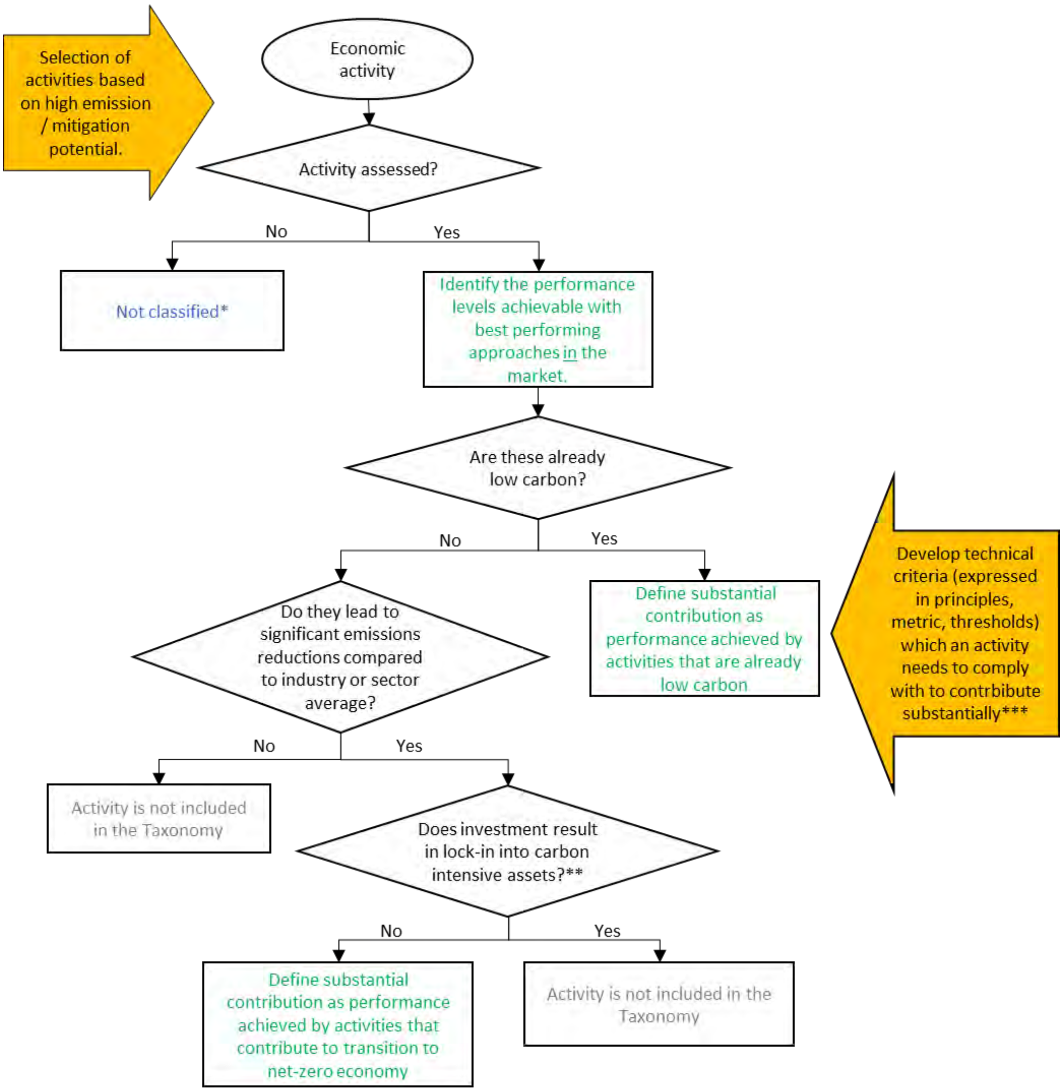
6.4 Eligibility of finance for activities contributing substantially to mitigation

The following table shows how to consider different types of investment and finance as Taxonomy eligible. See Section 6.3 above for further discussion on eligibility. Application of the Taxonomy is detailed in Part C.



* To be taxonomy eligible, activities must also avoid significant harm to other environmental objectives and comply with social safeguards
** Substantial contribution can also be achieved by modal shift within a sector
*** These enabling activities do not necessarily result in the other activity meeting its criteria for substantial contribution

Figure 6 – Decision tree to identify substantial contribution to mitigation objectives



* Activities that are not classified could be assessed (and included) at a later stage.

** Related to the lifetime of the asset.

*** In order to qualify as sustainable, the activity should also not significantly harm to other objectives

Figure 7 – Decision tree for the inclusion of economic activities in the EU Taxonomy

The transition to a low carbon economy will involve phase-out of some economic activities, such as unabated fossil fuel-based power generation[38]. While there may be some short-term advantages to reducing the environmental harm caused by these activities, the TEG considers that these cannot be considered to make a ‘substantial’ contribution to climate change mitigation. The EU Taxonomy should therefore exclude activities which would ultimately undermine climate change mitigation objectives if their operation was locked in for the long term. Including such activities in a sustainability-oriented Taxonomy would send inappropriate signals regarding their long-term contribution to climate objectives. Activities that were identified as failing this principle in the TEG work to date include renovations to transport facilities or buildings (including storage) that are dedicated to fossil fuels and may create lock in of these assets for fossil fuel purposes.

These approaches are summarised in Table 1 (including examples of types of criteria) and Figure 7 (decision tree for identifying and classifying climate change mitigation opportunities within a sector).

38 The Long-Term Climate Strategy includes the almost total decarbonisation of energy sector.

Economic activities which were not assessed by TEG should not be automatically considered to have poor climate change mitigation performance or potential. For example, they may be neutral. These activities are 'not classified' at this stage of the Taxonomy.

Table 1 – Approaches for identifying substantial contribution to mitigation objectives

Type of activity	Technical screening criteria	Examples
1. **Activities that are already low carbon**. Already compatible with a 2050 net zero carbon economy	Likely to be stable and long-term	• Zero emissions transport • Near to zero carbon electricity generation • Afforestation
2. **Activities that contribute to a transition to a zero net emissions economy in 2050** but are not currently operating at that level.	Likely to be subject to regular revision, tending towards zero emissions.	• Building renovation; • Electricity generation <100g CO_2/kWh • Cars <50g CO_2/km
3. **Activities that enable those above.**	Likely to be stable and long-term (if enabling activities that are already low carbon) or subject to regular revision tending to zero (if enabling activities that contribute to transition but are not yet operating at this level).	• Manufacture of wind turbines • Installing efficient boilers in buildings

6.5 Mitigation activities table

The following activities are included in the Taxonomy with criteria for substantial contributions to mitigation objectives. Full details of the technical screening criteria can be found in Part F of this document.

Table 2 – Selected macro-sectors and economic activities for climate change mitigation

NACE Macro-sector	Activities
Agriculture, forestry and fishing	Growing of perennial crops
	Growing of non-perennial crops
	Livestock production
	Afforestation
	Rehabilitation, Restoration
	Reforestation
	Existing forest management
Manufacturing	Manufacture of Low carbon technologies
	Manufacture of Cement
	Manufacture of Aluminium
	Manufacture of Iron and Steel
	Manufacture of Hydrogen
Manufacturing (cont…)	Manufacture of other inorganic basic chemicals
	Manufacture of other organic basic chemicals
	Manufacture of fertilizers and nitrogen compounds
	Manufacture of plastics in primary form
Electricity, gas, steam and air conditioning supply	Production of Electricity from Solar PV
	Production of Electricity from Concentrated Solar Power
	Production of Electricity from Wind Power
	Production of Electricity from Ocean Energy
	Production of Electricity from Hydropower
	Production of Electricity from Geothermal
	Production of Electricity from Gas Combustion
	Production of Electricity from Bioenergy
	Transmission and Distribution of Electricity
	Storage of Energy
	Manufacture of Biomass, Biogas or Biofuels
	Retrofit of Gas Transmission and Distribution Networks
	District Heating/Cooling Distribution
	Installation and operation of electric heat pumps
	Cogeneration of Heat/cool and Power from Concentrated Solar Power
	Cogeneration of Heat/Cool and Power from Geothermal Energy

	Cogeneration of Heat/Cool and Power from Gas Combustion Cogeneration of Heat/Cool and Power from Bioenergy Production of Heat/Cool from Concentrated Solar Power Production of Heat/Cool from Geothermal Production of Heat/Cool from Gas Combustion Production of Heat/Cool from Bioenergy Production of Heat/Cool using Waste Heat
Water, sewerage, waste and remediation **Water, sewerage, waste and remediation (cont…)**	Water collection, treatment and supply Centralized Wastewater treatment systems Anaerobic Digestion of Sewage sludge Separate collection and transport of non-hazardous waste in source-segregated fractions Anaerobic digestion of bio-waste Composting of bio-waste Material recovery from waste Landfill gas capture and energetic utilization Direct Air Capture of CO_2 Capture of Anthropogenic Emissions Transport of CO_2 Permanent Sequestration of captured CO_2
Transportation **and storage**	Passenger rail transport (inter-urban) Freight rail transport Public transport Infrastructure for low carbon transport Passenger cars and commercial vehicles Freight transport services by road Interurban scheduled road transport Inland passenger water transport Inland freight water transport Construction of water projects
ICT	Data processing, hosting and related activities Data-driven solutions for GHG emissions reductions
Construction and real estate activities	Construction of new buildings Renovation of existing buildings Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities Acquisition of buildings

7. Climate change adaptation

7.1 Work process – conceptual approach

The proposed approach for an adaptation taxonomy recognises that adaptation is context- and location-specific and requires the use of a process-based approach to determine if an activity contributes to adaptation and broader system's climate resilience. The following two-step process aims to demonstrate that an activity contributes to a substantial reduction of the negative effects of climate change:

a. Assessing the expected negative physical effects of climate change on the underlying economic activity that is the focus of resilience-building efforts, drawing on robust evidence and leveraging appropriate climate information;
b. Demonstrating how the economic activity will address the identified negative physical effects of climate change or will prevent an increase or shifting of these negative physical effects.

The assessment of the contribution of the activity will vary based on its scope (asset, corporate, sector or market), as well as spatial and temporal scale. Moreover, the proposed approach recognises that an adaptation activity may target an entity (e.g. a corporation or a city) and/or a market, sector, or region.

Activity-level adaptation aims at strengthening an asset or economic activity to withstand identified physical climate risks over its lifetime, such as considering sea-level rise in the design of a bridge. Systemic adaptation aims to reduce vulnerability and build resilience of a wider system, or systems, such as a community, ecosystem, or city.

7.1.1 Differences between climate change adaptation and mitigation

The context-specific nature of adaptation means that it is not possible to produce a stand-alone and exhaustive list of activities that could be viewed as contributing to adaptation under all circumstances. Instead of a list of adaptation activities, a set of guiding principles and screening criteria is used to assess the potential contribution of an economic activity to adapt to climate change and increase climate resilience. To aid users of the Taxonomy, the TEG has also developed an indicative framework for classification of climate-related hazards and a climate sensitivity matrix for specific economic activities.

There are fundamental differences between climate change adaptation activities and mitigation activities. For mitigation activities, a one-tonne reduction of CO_2 emissions has the same impact regardless of where the mitigation activity takes place. It is therefore possible to define lists of activities that are deemed to support climate change mitigation. Adaptation responds to physical risk that are mostly location and context specific. For example, there are in principles several engineering and non-engineering options available to a coastal city to respond to the risk resulting from increased sea level. Responses will vary according to where the city is located, its size, the institutional and financial capacity of the city administration to deal with climate risk, the technical and engineering expertise available, the priority of the city, the perception of the citizens, and other factors. The adaptation responses will benefit the city that adopt them and possibly systems that depend or interact with the city.

7.1.2 Type of technical screening criteria

The proposed approach is based on qualitative screening to identify activities that contribute to adaptation. Qualitative screening criteria allow for a structured process-based approach to determine if an economic activity contributes to adaptation. As measured baselines or accepted metrics for adaptation have not yet been developed, an established methodology for defining quantitative screening criteria for adaptation and defined adaptation targets at the national, sectoral, or subnational level do not exist. Even with the availability of methodologies, targets or baselines, quantitative

screening criteria could exclude small-scale activities that may deliver significant climate-resilience benefits in specific contexts.
The interaction of climate exposure, resources and socioeconomic characteristics related to a specific economic activity will determine the nature and scale of adaptation that would be appropriate.

7.1.3 Initial assessment of economic sectors

The TEG recognises that all sectors must become more climate resilient to achieve adaptation objectives. As a result, the adaptation approach is a set of guiding principles and qualitative screening criteria, which can be applied in any sector. However, to be eligible for the Taxonomy, an economic activity must also avoid significant harm to the five other environmental objectives. To enable evaluation of the broader environmental implications of an activity, an initial list of economic activities were considered from the following sectors:

- Agriculture, forestry and fishing;
- Electricity, gas, steam and air conditioning supply;
- Information and Communications Technology (ICT);
- Financial services and insurance;[39]
- Professional, scientific and technical activities; and
- Water supply, sewerage, waste management and remediation activities.

Economic activities were selected from these six sectors on the basis of the following characteristics:

- They are among the sectors most vulnerable to the negative effects of climate change in Europe;[40]
- They represent a large share of gross value added (GVA) and employment in Europe;[41] and
- They allow for testing of the adaptation taxonomy approach in natural resource-based sectors (agriculture and forestry, and water), asset-based sectors (electricity, gas, steam and air conditioning supply, and ICT), as well as service- based sectors (financial services and insurance, and professional, scientific and technical activities).

This initial assessment of economic activities does not represent a judgement on the vulnerability of other sectors to the negative effects of climate change or their contribution to climate change adaptation and resilience. Other sectors will be assessed over the extension period.

39 Within the financial services and insurance sector, only (re)insurance sector was considered recognising the different nature and role of the financial sector in applying the taxonomy compared to actors in the real economy. The (re)insurance sector was considered because the sector does not only contribute to transferring climate risks from a policyholder to an insurer but also plays an active role in incentivising physical climate risk reduction behaviour (for example some insurers offer premium discounts for homeowners who take steps to protect their houses from wildfires).

40 EEA Report No 15/2017, “Climate change adaptation and disaster risk reduction in Europe” (2017).

41 Based on EUROSTAT data available at https://ec.europa.eu/eurostat/news/themes-in-the-spotlight/gva-employment

7.2 Defining substantial contribution to climate change adaptation

The proposed regulation establishes a framework for understanding substantial contributions to climate change adaptation objectives. This definition is broadly consistent with that provided by the Intergovernmental Panel on Climate Change.[42]

Article 7

1. *An economic activity shall be considered to contribute substantially to climate change adaptation where that activity contributes substantially to reducing the negative effects of the current and expected future climate or preventing an increase or shifting of negative effects of climate change, through the following means:*
   a. *preventing or reducing the location- and context-specific negative effects of climate change, which shall be assessed and prioritised using available climate projections, on the economic activity;*
   b. *preventing or reducing the negative effects that climate change may pose to the natural and built environment within which the economic activity takes place, which shall be assessed and prioritised using available climate projections.*

The negative effects of climate change considered for the development of the taxonomy include both chronic or slow onset climate-related hazards (such as average temperature increase and sea level rise) and rapid or acute climate related hazards (such as extreme rainfall, storm surges, flooding, and heat waves).

In this report, material physical climate risk is the risk of (financial and non-financial) losses occurring due to performance failures, performance delays or incomplete performance of an economic activity resulting from climate-related hazards.

An economic activity makes a substantial contribution to adaptation objectives if:

- all material physical climate risks identified for the economic activity are reduced to the extent possible and on a best effort basis; and/or
- it reduces material physical climate risk in other economic activities.

Economic activities can contribute to adaptation objectives in two different ways:

1. Adaptation of an economic activity: an economic activity is made more climate resilient by integrating measures to reduce all material physical climate risks to the extent possible and on a best effort basis;
2. Adaptation by an economic activity: an economic activity contributes to adaptation of other economic activities to physical climate risks and must also be resilient to physical climate risks itself.

Conceptually, this is consistent with the approach taken when identifying activities which substantially contribute to climate change mitigation in terms of "greening of" and "greening by" (see 0

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42 The IPCC provides the following definition of adaptation in their 5th Assessment Report: 'The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects'. IPCC (2014), 'Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change', Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.), Cambridge University Press: Cambridge, UK and New York, NY, USA.

Defining substantial contribution to climate change mitigation).

The first set of economic activities contribute to adaptation by adopting measures that ensure that the economic activity can perform well under a changing climate. This contribution to adaptation usually occurs in economic activities that have a primary objective other than climate change adaptation. For example, a transmission line for the distribution of electricity to an urban area is made more climate resilient to the expected increase in temperature by installing conductors with operating limits at higher temperature thresholds.

Some economic activities can contribute to adaptation of other economic activities. For example, the construction of a flood protection system is performed to reduce the risk of flood for a facility or a city and the economic activities that take place in it. Similarly, the research, development and commercialisation of drought-resistant crop varieties will help ensure crop production yields despite increased risk of droughts.

Measures that support adaptation of and adaptation by economic activities are clearly linked and may overlap. However, the distinction between these two types of adaptation activities can guide different user types. Adaptation of an economic activity captures the measures required by actors to increase their own resilience, whilst adaptation by an economic activity captures the research, development, marketing, and installation of measures that will help other entities to adapt. For example, a water utility vulnerable to increased risk of floods may adopt early warning systems to reduce this risk (adaptation of an economic activity), whilst a small or medium-sized enterprise (SME) may develop the technology for flood early warning systems to support adaptation of other sectors (adaptation by an economic activity). This example is illustrated in Figure 8 below.

Taxonomy users	Economic activities	Types of adaptation
• Products & services	→ SME develops early warning systems for flood risk	→ Adaptation by an economic activity
• Corporate	→ Water utility deploys early warning system to reduce risk of flood	→ Adaptation of an economic activity

Examples of financial flows

→ Investors hold shares in SME developing products for adaptation
→ Banks loan money to utility to finance the deployment of early warning system
→ Investors holds shares in utility with more climate resilient operations

Figure 6 – Example of different types of adaptation activities and Taxonomy users

7.2.1 *Guiding principles for substantial contributions to climate change adaptation*

The TEG proposes the following guiding principles to identify an economic activity that substantially contributes to climate change adaptation:

Principle 1: The economic activity reduces all material physical climate risks to the extent possible and on a best effort basis.

- In the case of ‘adaptation of’ an economic activity, the activity integrates measures aimed at reducing all material physical climate risks identified through an assessment of risks posed by

both current weather variability and expected future climate change. The assessment should take into account chronic and acute climate-related hazards and associated physical climate risks across a range of scenarios, and account for uncertainty. It should consider geographic and temporal scales that are appropriate for the economic activity.
- In the case of ‘adaptation by’ an economic activity, the activity reduces material risks to other economic activities and/or addresses systemic barriers to adaptation, for example through a dedicated asset, technology, service or product, and itself integrates measures aimed at reducing material risks where applicable (e.g. in the case of a dedicated asset).

Principle 2: The economic activity does not adversely affect adaptation efforts by others.
- Activities should be consistent with adaptation needs in the applicable sector or region, considering opportunities to build resilience outside of the premises of a single activity. Adaptation activities should not hinder others, for example by encouraging unsustainable patterns of economic development or shifting impacts faced by others.

Principle 3: The economic activity has adaptation-related outcomes that can be defined and measured using adequate indicators.
- When possible, the outcomes of adaptation activities should be monitored and measured against defined indicators for adaptation results. If possible, updated assessments of physical climate risks should be undertaken at the appropriate frequency (e.g. every five or ten years) depending on the risks, the context and the availability of new information, technologies or approaches or policies and regulations.

7.3 Adaptation screening criteria

While the principles describe the foundations and qualities underpinning economic activities that contribute to climate change adaptation, the screening criteria are specific characteristics that can be used to determine whether an economic activity provides a substantial contribution to adaptation. These screening criteria vary between ‘adaptation by’ and ‘adaptation of’ activities.

7.3.1 Screening criteria for ‘adaptation of’ an economic activity

Table 3 - Screening criteria for 'adaptation of' an economic activity

Criterion	**Description**
A1: Reducing material physical climate risks	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: - considers both current weather variability and future climate change, including uncertainty; - is based on robust analysis of available climate data and projections across a range of future scenarios; - is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.

A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
A3: Monitoring adaptation results	The reduction of physical climate risks can be measured.
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.

7.3.2 Screening criteria for 'adaptation by' an economic activity

The table below describes the screening criteria for 'adaptation by' an economic activity.

Table 4 - Qualitative screening criteria for 'adaptation by' an economic activity

Criterion	Description
B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.
B1.1	The activity reduces or facilitates adaptation to the physical climate risks beyond the boundaries of the activity itself. This includes activities that: a) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or, b) Remove information, financial, technological and capacity barriers to adaptation by others.
B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.

7.4 Eligibility of finance for activities contributing substantially to adaptation

In the case of adaptation by an economic activity, the revenue and/or expenditure associated with the economic activity that meets the relevant screening criteria is considered as eligible.

Recognising the complexity associated with defining eligibility of finance in the case of adaptation of an economic activity, further work will be carried out in the TEG extension period.

7.5 Classification of climate-related hazards

The TEG has developed a classification of climate-related hazards. When developing the Taxonomy, the climate-related hazards considered are limited to the potential occurrence of a weather and climate-related natural physical event or trend[43].

[43] IPCC, 2014, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC,

The climate-related hazard classification comprises four major hazard groups, with hazards related to water, temperature, wind, and mass-movements. All groups include acute (extreme) and chronic (slow-onset) hazards, as adaptation must account for both rapid as well as gradual changes in the weather and climate to take the appropriate adaptation measures and avoid maladaptation.[44]

Table 5 - Classification of climate-related hazards

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Heat stress		Precipitation and/or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

This analysis focusses on the most important or significant hazards and is designed to guide the user to consider the most salient physical risks when mapping the sensitivities of a given sector.

All secondary hazards[45] resulting from climate-related hazards (including but not limited to chemical, biological, ecological and epidemiological hazards) are excluded. It is however advisable to assess the risk of such secondary hazards and consider measures to address them for each economic activity.

7.6 Sectoral sensitivity to climate hazards

The TEG has also developed an indicative climate sensitivity matrix for the six selected sectors. This matrix illustrates which climate-related hazards a NACE code tend to be sensitive, based on industry practice and sensitivity matrices used by development finance institutions. It can be used as a starting point but does not take the place of a climate risk assessment to identify context-specific physical climate risks and vulnerabilities of a specific activity before investing in adaptation, in line with Principle 1.

Geneva, Switzerland, 151 pp (https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf, last visit 02/04/2019).

44 There are clearly linkages with disaster risk reduction in the effort of reducing physical climate risks resulting from extreme climate-related hazards. Geophysical and technological hazards are outside the domain of adaptation to climate change.

45 As an example, new biological pests or increased prevalence of existing pests can result from changing temperatures. Forests and agriculture are typically sensitive to warmer (minimum) temperatures and, in this example, their effects on pests. In this case, the changing prevalence of pests is a secondary hazard against which adaptation measures may be needed.

7.7 Adaptation activities table

In addition to the principles and the screening criteria and the NACE code sensitivity matrix, the proposed adaptation lists includes a template for identifying adaptation activities. The template provides an example of the process a user would follow to identify actions that either adapt an economic activity or allow for adaptation by that activity. The full template can be found in Part F, and a completed example is in 0

Climate change adaptation worked example. The list of Adaptation activities assessed using the principles appears below.

NACE Macro sector	Activities
Agriculture, forestry and fishing	Growing of non-perennial crops Silviculture and other forestry activities
Electricity, gas, steam and air conditioning supply	Production of Electricity from Hydropower Transmission lines
Water, sewerage, waste and remediation	Sewage
ICT	Provision of specialised telecommunications applications for weather monitoring and forecast
Finance and Insurance **Professional, scientific and technical activities**	Non-life insurance Research and development (natural sciences and engineering) Engineering activities and related technical consultancy

8. Do no significant harm (DNSH)

Under the proposed Taxonomy regulation, economic activities making a substantial contribution to climate change mitigation or adaptation must be assessed to ensure they do not cause significant harm to all remaining environmental objectives. An activity contributing to climate change mitigation must avoid significant harm to climate change adaptation and the other four environmental objectives:

3. Sustainable use and protection of water and marine resources
4. Transition to a circular economy, waste prevention and recycling
5. Pollution prevention and control
6. Protection of healthy ecosystems

This assessment ensures that progress against some objectives are not made at the expense of others and recognises the reinforcing relationships between different environmental objectives. Future iterations of the Taxonomy are expected to integrate activities which make a substantive contribution to the above objectives.

8.1 DNSH to climate change adaptation (for other environmental objectives)

As discussed in Section 0, climate change adaptation, as defined in the draft regulation, is context and location specific. When considering how to avoid significant harm to climate change adaptation objectives, a modified and reduced version of the qualitative technical screening criteria is proposed:

Table 6 – Do no significant harm criteria for 'adaptation of' an economic activity

Criterion	Description
Criterion A1: Reducing material physical climate risks	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: - considers both current weather variability and future climate change, including uncertainty; - is based on robust analysis of available climate data and projections across a range of future scenarios; - is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.

8.2 DNSH to environmental objectives 3-6

In accordance with Article 14 of the Taxonomy proposal, the DNSH criteria aim to specify the minimum requirements to be met to avoid significant harm to environmental objectives relevant to each economic activity. Article 12 provides further details on what constitutes significant harm for each environmental objective:

Table 7 – Do no significant harm criteria for environmental objectives 3-6

Objective	Conditions for causing 'significant harm'
(3) Sustainable use and protection of water and marine resources	*The activity is detrimental to a significant extent to good status of Union waters, including freshwater, transitional waters and coastal waters, or to good environmental status of marine waters of the Union.*
(4) Transition to a circular economy, waste prevention and recycling	*The activity leads to significant inefficiencies in the use of materials in one or more stages of the life-cycle of products, including in terms of durability, reparability, upgradability, reusability or recyclability of products; or where that activity leads to a significant increase in the generation, incineration or disposal of waste.*
(5) Pollution prevention and control	*The activity has relative high emissions to air, water and land compared to a level of environmental performance that is based on BAT principles.*
(6) Protection of healthy ecosystems	*The activity is detrimental to a significant extent to the good condition of ecosystems.*

The technical screening criteria proposed by the TEG contain quantitative thresholds where possible. Where this is not possible, the criteria are qualitative, describing an action or set of actions to be demonstrated which avoid significant harm.

The baseline scenario for the economic activities is compliance with relevant EU environmental legislation. To this end, the criteria take into account existing EU legislation. The call for additional expertise to inform the TEG and the process described below enabled the establishment of criteria based on available scientific evidence. Where evidence was not conclusive, the precautionary principle enshrined in article 191 TFEU was taken into account, as required in Article 14 of the draft regulation.

To the extent possible, the screening criteria, whether qualitative or quantitative, were selected to facilitate the verification of compliance. In many instances, the proposed criteria are expressed in terms of compliance with relevant EU legislation and/or associated reference information, such as the best available techniques (BAT) reference documents (also known as 'BREFs').[46]

The technical screening criteria (TSC) process

Figure 9 presents an overview of the process for development of DNSH technical screening criteria against activities expected to make a substantial contribution to climate change mitigation. For each activity, the scope was reviewed to identify life cycle aspects and activity boundaries. Where linkages with other activities occurred (i.e. where life cycle aspects overlapped with other activities), this has been referenced in the analysis.

46 The BREF list of reference documents have been drawn (or are planned to be drawn) as part of the exchange of information carried out in the framework of Article 13(1) of the Industrial Emissions Directive (IED, 2010/75/EU) and other policy/legislative instruments. BREF are available at http://eippcb.jrc.ec.europa.eu/reference/.

1. **Initial screen for activities which could cause significant harm to each environmental objective.** This analysis was carried out within the scope defined for the economic activity as identified for substantial contribution to climate change mitigation objectives. In this analysis, TEG members and additional experts have considered all material life cycle stages of the performance of the economic activity within the scope of the mitigation screening criteria.

2. **Life cycle thinking.** A life cycle approach was adopted to establish the technical screening criteria for DNSH in accordance with Article 14.1(f) of the Taxonomy proposal.47 This approach provided a robust way to avoid errors such as considering sustainable any economic activity that may have negative effects during its upstream or downstream stages. Questions asked and resolved included:
   a. what would generate significant harm during the life cycle of the activity?

   AND

   b. can this risk be addressed by complying with EU legislation and best practices, international standards or guidelines?

3. **Sectoral activities with high mitigation potential not included in the Taxonomy.** Where 'significant harm' to one or more environmental objectives by the activity cannot be avoided through TEG requirements, the activity was not included in the Taxonomy. Material issues whereby an activity is considered unsuitable for inclusion in the Taxonomy may include but are not limited to: lack of empirical data for reasonable evaluation of DNSH (in line with the precautionary approach), lock-in and intergenerational risks.

4. **Evaluate and document key findings from relevant research and technical publications.** Authoritative publications were reviewed to gain a comprehensive understanding of potential environmental exposures, and to identify material exposures for further consideration which may not be captured in existing EU legislation, BEMP, BAT and BREF.

5. **EU environmental acquis**. Protection of the environmental objectives relating to water resources, circular economy, pollution prevention and the control and protection of ecosystems is advanced at the EU level with associated methodologies and thresholds, as contained in the existing body of EU environmental law (i.e. the environmental acquis).[48] Existing EU legal requirements apply across the Taxonomy. Therefore, for an activity to be included, it must at minimum comply with EU legal requirements, as well as national legal requirements and requirements relating to the environmental permits needed for its operation. EU legal requirements were considered as minimum requirements and were in general not repeated in the DNSH evaluation. When an environmental impact was considered significant, the relevant EU legal requirements (including BREF) and/or national requirements were included in the DNSH criteria, unless more specific requirements were deemed necessary to avoid significant harm.

6. **Global Context.** The Taxonomy can potentially be used outside of the EU. The technical screening criteria for DNSH therefore aim to be applicable worldwide, where feasible.

7. **Splitting DNSH criteria.** The scope of activities taken into consideration for DNSH mirrors the mitigation scope of activities. However, for a small number of activities two or three differing sets of DNSH criteria were deemed necessary. As an example, within the manufacturing

47 Article 14.1(f) states: The technical screening criteria adopted in accordance with Articles 6(2), 7(2), 8(2), 9(2), 10(2) and 11(2) shall take into account the environmental impacts of the economic activity itself, as well as of the products and services provided by that economic activity, notably by considering their production, use and end-of-life.
48 Access to EU environmental legislative and policy summaries is available at https://eur-lex.europa.eu/browse/summaries.html.

macro-sector, NACE code 20.13: Manufacture of other inorganic basic chemicals, there is one set of mitigation criteria and three sets of DNSH criteria divided into soda ash, carbon black and chlorine.

8. **Selection of technical screening criteria.** The 'do no significant harm' evaluation focussed only on the most significant aspects of concern and developed threshold screening criteria where:
   a. avoiding significant harm requires criteria that differ from EU legislation
   b. alignment with international standards, laws, conventions and the global SDGs was considered necessary
   c. issues were identified as most significant in a global context, even if resolved at the European level
   d. special care was needed to address local geographical/physical, climatological and/or hydrological conditions
   e. other sectoral specific aspects concerning one or more of the DNSH objectives, as detailed in the rationale, were found

* Activities that are not classified could be assessed (and included) at a later stage.
** Related to the lifetime of the asset.
*** In order to qualify as sustainable, the activity should not significantly harm other objectives and meet the minimum social safeguards.

Figure 7 – Do no significant harm decision tree

9. Climate change mitigation worked example

Criteria for economic activities are provided in tables that specify the relevant NACE code, sector description, substantial contribution criteria, rationale for the criteria and 'do no significant harm' assessment. An example activity table for mitigation – manufacture of iron and steel – is provided below. The full list of economic activities for mitigation, including their criteria, are provided in Part F.

Sector classification and activity	
Macro-Sector	C – Manufacturing
NACE Level	3 and 4
Code	C24.1: Manufacture of basic iron and steel and of ferro-alloys C24.2: Manufacture of tubes, pipes, hollow profiles and related fittings, of steel C24.3: Manufacture of other products of first processing of steel C24.5.1: Casting of iron C24.5.2: Casting of steel
Description	Manufacture of iron and steel
Mitigation criteria	
Principle	Manufacturing of iron and steel at the level of performance achieved by best performing plants is considered to make a substantial contribution to climate change mitigation. Additionally, secondary production of steel (i.e. using scrap steel) is considered eligible due to significantly lower emissions than primary steel production.
Metric	GHG emissions (tCO2e) / t product GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks.
Threshold	Manufacturing of iron and steel is eligible if the GHG emissions (calculated according to the methodology used for EU-ETS benchmarks) associated to the production processes are lower than the values of the related EU-ETS benchmarks. As of June 2019, the EU-ETS benchmarks values for iron and steel manufacturing are: • Hot metal = 1.328 tCO2e/t product • Sintered ore = 0.171 tCO2e/t product • Iron casting = 0.325 tCO2e/t product • Electric Arc Furnace (EAF) high alloy steel = 0.352 tCO2e/t product • Electric Arc Furnace (EAF) carbon steel = 0.283 tCO2e/t product Additionally, all production of steel in EAF using at least 90% of scrap steel is considered eligible.
Rationale	
The ETS benchmarks are the selected thresholds because of their reliability and the 5-year future update plan. Additionally, they are the only consistent data set available today. The "Achievable Reference Performance" specific emissions values, as defined in the standard EN 19694-2:2016, are considered to be accessible to any operator under normal operating conditions	

and therefore such specific emission values are less strict than the proposed EU ETS benchmarks. Therefore, the EU ETS benchmarks have been selected because they provide an ambitious threshold under which the steel and iron making industry should strive to operate in the short-term. However, given that the EU ETS benchmarks are for specific steps of production, the TEG recommends that the Sustainable Finance Platform analyses the possibility to define a threshold for the overall integrated steel plant using the methodology set in the standard EN 19694-2:2016. In the long-term, the steel and iron making industry should aim at implementing breakthrough technologies (characterised by ultra-low CO_2 emissions). Some of these technologies have already been demonstrated at the pilot or at industrial scale. Once these technologies become commercially available, the proposed thresholds will need to be revised in order to reflect the more ambitious specific emission values achievable. These technologies include: • blast furnace top gas recycling with carbon capture and storage; • direct smelting reduction processes • direct reduction with natural gas for production of DRI combined with EAF steelmaking; • hydrogen steelmaking in shaft furnaces using H_2 produced via water electrolysis (e.g. using renewable electricity sources); • direct electrolysis of iron ore; • advanced EAF steelmaking with scrap pre-heating and oxy-fuel combustion. This activity focuses on the greening of iron and steel manufacturing due to its high contribution to global GHG emissions. The potential of greening by products made of iron and steel can be addressed through other activities such as “manufacture of other low carbon technologies” where according to the criteria given for this activity, the manufacturer can prove the overall environmental benefits over the whole life.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from iron and steel production is associated with: • emissions to air from coke-making and smelting operations, especially particulate matter (dust), oxides of nitrogen, sulphur dioxide, carbon monoxide, chlorides, fluorides, volatile organic compounds, polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-dioxins/furans, and heavy metals; • emissions to water of hydrocarbons and suspended solids; • water consumption for quenching and cooling operations in water stressed areas; • the potential to impact local ecosystems and biodiversity due to the polluting emissions (if not properly mitigated) and due to the large land footprint of the operations and associated ancillary activities; and • wastes and byproducts from the coking and smelting operations including blast furnace slag, tar and benzole.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios;

	- is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: - The activity does not lead to increased climate risks for others or hamper adaptation elsewhere The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Appropriate measures are in place to minimise and manage waste and material use in accordance with BREF for iron and steel production.
(5) Pollution	Ensure emissions to water and air are within the BAT-AEL ranges set in the BREF for iron and steel production (e.g. for pH, total suspended solids (TSS), chemical oxygen demand (COD), chromium (total) and heavy metals, for sulphur dioxide - SO2, nitrogen oxide - NOx, particulate matter, polychlorinated dibenzo-dioxins/furans, mercury (Hg), hydrogen chloride (HCL) and hydrogen fluoride (HF).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, particularly UNESCO World Heritage and Key Biodiversity Areas (KBAs) have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter – in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: - a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; - all necessary mitigation measures are in place to reduce the impacts on species and habitats; and - a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

10. Climate change adaptation worked example

An example activity table for adaptation – transmission lines– is provided below. The full list of example economic activities for adaptation, including their criteria, are provided in Part F.

Sector classification and activity	
Macro-Sector	Electricity, gas, steam and air conditioning supply
NACE Level	4
Code	NACE code: 35.12 CPA codes: 35.12
Description	This class includes the operation of transmission systems that convey the electricity from the generation facility to the distribution system. Improving the resilience of electricity transmission also increases the resilience of operations that depend on electricity.
Adaptation criteria	
These criteria relate to **adaptation of** an economic activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Screening criterion A1. Reducing material physical climate risk	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
Criterion A3: Monitoring	The reduction of physical climate risks can be measured.

adaptation results	
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Further guidance

Typical sensitivities

The table below illustrates the typical sensitivities of this activity to climate-related hazards. Relevant climate-related hazard will be location and context specific and should be identified through a climate risk assessment as indicated in screening criteria A1.

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Changing temperature • Heat stress • Temperature variability • Permafrost thawing	• Heat wave • Cold wave/frost • Wildfire	• Changing wind patterns	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns and types • Sea level rise	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Coastal erosion • Soil erosion • Solifluction	• Avalanche • Landslide • Subsidence

Legend: typically sensitive; typically non sensitive.

Examples of adaptation measures

The table below provides examples of adaptation measures that can be adopted to reduce risks resulting from specific hazards for illustrative purpose only. Relevant climate-related hazards and required adaptation measures will be location and context specific and will be identified through the application of the qualitative screening criteria described above.

Temperature-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing temperature (increase)	Reduced thermal rating (i.e. the maximum current allowed at a given temperature), causing lines to sag to dangerous levels	Increasing the height of poles supporting power lines Installing conductors with hotter operating limits Using 'low-sag' conductors	Reduction of efficiency losses during period of temperature > design temperature
Temperature-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Heat waves	Overheating of lines and transformers causing them to trip off	Integrate higher temperatures into design calculation for maximum temperature/rating	System Average Interruption Duration Index and/or

	Electricity disruptions due to grid overload during higher peak energy demands	Increase system capacity by adding external coolers to transformers Increase system capacity by increasing height of the poles or otherwise increasing tension on the line to reduce snag	System Average Interruption Frequency Index after adaptation compared to before adaptations
Wind-related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing Wind Speeds	Downed transmission lines or gradual weakening of infrastructure leading to more frequent repairs	Adjust wind loading standards Reroute power lines away from sensitive objects or move them underground	Reduced repair costs
Wind-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Hurricanes/typhoons	Downed or damaged transmission lines, substations or poles due to wind and rain, leading to disruptions Debris or trees damaging lines or poles causing short circuit	Adjust wind loading standards Reroute power lines away from sensitive objects or move underground Improve hurricane forecasting Redefine technical standards so that grid operators are required to build in resilience	Reduced repair costs or decreased number of downed power lines during storms
Winter Storm	Potential for ice build-up disrupting transmissions	Improve forecasting of ice storms' impact on overhead lines and transmission circuits Improve forecasting of winter storms Enhance design standards to withstand larger ice loading	Accuracy of impact projection and of storm forecasting Reduced transmission disruptions during winter storms
Water-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Water Stress	Potential for energy supply disruptions from sources that rely on hydropower Potential for overheating of generation equipment that relies on water for cooling, which could lead	Incorporate rainfall projections and drought forecasting into reservoir management strategies Explore alternative water sources such as water banks, water supply contracts,	Reservoir levels maintained above a critical level throughout the dry season

	to transmission disruptions	groundwater wells, processed waste water	
Water-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Flash flooding	Inundation and potential damage to pipelines, towers, substations, or infrastructure	Relocate assets into areas that are not located in flood plains Waterproof pipelines, substations, etc. Incorporate submergible transformers, switches, pumps Seal manhole covers	Proportion of critical assets waterproofed and located outside of flood plains Reduced repair costs have flood events
Solid mass related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Soil Erosion	Electricity poles or pipelines made unstable	Replant any disturbed soil around asset	Reduced costs of restabilising poles or pipelines
Solid mass-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Landslide	Toppled electricity poles Buried pipelines or other transmission infrastructure, making them harder to reach in case of repairs	Relocate electricity poles away from areas prone to landslide Plant vegetation on empty hillsides above critical infrastructure	Proportion of electricity poles located in areas prone to landslide Reduced repair costs

PART C: Taxonomy user and use case analysis

This section provides practical guidance to potential users of the Taxonomy and includes case studies. It includes a description of usability feedback received.

11. Users of the Taxonomy

Feedback on the usability of the Taxonomy

During the call for feedback between December 2018 and February 2019, 205 responses were received on the usability of the Taxonomy. The six usability questions asked about the following:

- If the Taxonomy would clearly indicate what economic activities should be considered environmentally sustainable
- Potential challenges to implementing the Taxonomy
- Compliance with future disclosure obligations
- Suitability of the Taxonomy for investment decision making
- The resources required to use the Taxonomy
- Suggested improvements to the Taxonomy

Please refer to the December 2019 Taxonomy pack for feedback and workshop invitations for full details on the questions asked. Responses related to four key themes:

The design of the Taxonomy

A critical issue was if, and how, the Taxonomy should consider 'transition' activities and recognise providers of environmental solutions. This is discussed in 0

Defining substantial contribution to climate change mitigation.

Some comments reinforced aspects of the draft regulation and mandate of the TEG (See PART A:2 The Technical Expert Group) such as alignment with existing market taxonomies, creating a dynamic framework, ensuring technology neutrality, global applicability and thresholds based on authoritative research.

Potential economic implications of a Taxonomy

Feedback received covered intentional and unintentional economic and financial consequences of creating a Taxonomy. Some aspects of the feedback received, such as the applicability of the Taxonomy to capital requirements, fall outside of the scope of the TEG. All other issues raised are covered in the Impact Assessment (PART D: Economic impacts of the Taxonomy).

Data quality and availability

Respondents raised concerns that companies do not currently provide the necessary information to enable investors to disclose their Taxonomy obligations, and that provision of this data in future will be a particular barrier for smaller and non-European companies. For project and corporate financing, data was felt to be more readily available. Respondents also raised questions regarding data verification and accuracy, and whether proxies or estimated data would be accepted. This is discussed in more detail in the following section.

Implementation challenges

Respondents commented that the Taxonomy should have well-defined activity boundaries, aligned with existing classification systems where possible. This feedback has been considered extensively by the TEG when drafting the technical screening criteria in this report. Respondents also noted short-term costs (such as developing monitoring and reporting process, training and education) and long-term benefits (reducing costs associated with developing in-house taxonomies, fostering trust in 'green' products).

Users identified two concerns with the 'DNSH' criteria: how investors should check compliance, and how they could be applied to large portfolios. Some of these aspects are covered in the user section below, but further guidance on implementation will be provided by the TEG during the extension period.

11.1 Defining the users

The proposed Taxonomy regulation envisages two main mandatory users of the Taxonomy:

1. Member States or the EU when adopting measures or setting requirements on market actors in respect to financial products or corporate bonds that are marketed as environmentally sustainable.

2. Financial market participants offering financial products as environmentally sustainable investments or as investments having similar characteristics.

The Taxonomy may have additional uses. The Taxonomy is proposed as providing a basis for establishing the environmental characteristics of green bonds using the proposed EU Green Bond Standard. It is also referenced in the draft InvestEU regulation as a framework to aid in monitoring the InvestEU fund's contribution to climate targets.[49] In this analysis, the TEG principally focuses on uses of the Taxonomy by financial market participants.

[49] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A439%3AFIN

The definition applied of 'financial market participant' and 'financial product' refers to those stipulated in the EU Regulation regarding disclosure of sustainability risks and sustainable investments, adopted in April 2019.

Under this definition, 'financial market participants' comprise any of the following:

1. An insurance undertaking which makes available an insurance-based investment product (IBIP)[50]
2. An alternative investment fund manager (AIFM)
3. An investment firm which provides portfolio management
4. An institution for occupational retirement provision (IORP) or a provider of a pension product
5. A manager of a qualifying venture capital fund[51]
6. A manager of a qualifying social entrepreneurship fund[52]
7. A UCITS[53] management company

'Financial products' may mean:

1. Portfolio management
2. UCITS funds
3. Alternative investment funds[54]
4. Insurance-based Investment Products (IBIP)[55]
5. Pension products
6. Pension schemes[56]

The proposed Taxonomy regulation would create obligations for equity and bond investment products marketed as being environmentally sustainable or having similar characteristics. Investments in private equity, real estate funds and private-securitised loans could also be subject to the regulation if the resulting funds are marketed as green. The TEG has considered the above when examining the implementation of the Taxonomy but concentrated on the implementation for equity and bond funds given their share of existing finance markets. At the beginning of 2017, bond assets accounted for 41% of investment portfolios managed by asset managers, equity assets for 31%, while money market and cash equivalents represented 7% of total assets. We also note that the Taxonomy may be used on a voluntary basis by other financial actors, such as banks, for the purpose of project finance, or companies when issuing debt (or when reporting on their green revenues, capital expenditures (CAPEX), assets or activities).

In the table below, the TEG provides some examples of financial products for which the Taxonomy could be used as guidance to identify activities that meet the environmental criteria. Those highlighted in the *Disclosure Obligations* column would be subject to the future Taxonomy regulation according to

50 An insurance undertaking authorised in accordance with Article 18 of Directive 2009/138/EC.

51 Registered in accordance with Article 14 of the European Venture Funds regulation (EuVECA, EU 345/2013).

52 Registered in accordance with Article 15 of the European Social Entrepreneurship Funds regulation (EuSEF, EU 346/2013).

53 Undertakings for Collective Investment in Transferable Securities.

54 'AIF' means an AIF as defined in Article 4(1)(a) of Directive 2011/61/EU.

55 'IBIP' means either of the following:

(i) an insurance-based investment product as defined in Article 4(2) of Regulation (EU) No 1286/2014 the European Parliament and of the Council

(ii) an insurance product, made available to a professional investor, which offers a maturity or surrender value and where that maturity or surrender value is wholly or partially exposed, directly or indirectly, to market fluctuations

56 'Pension scheme' means a pension scheme as defined in Article 6(2) of Directive (EU) 2016/2341.

the Commission’s legislative proposal. The rest relate to products and investments that fall outside of the scope of the proposal.

Uses and users of the Taxonomy		
	Disclosure obligations	**Optional additional uses**
Asset Management	• UCITS funds: o equity funds; o exchange-traded funds (ETFs); o bond funds • Alternative Investment Funds (AIFs): o fund of funds; o real estate funds; o private equity or SME loan funds; o venture capital funds; o infrastructure funds; • Portfolio management.	
Insurance	• Insurance-based investment products (IBIP)	• Insurance
Corporate & Investment Banking	• Securitisation funds[57] • Venture capital and private equity funds • Indices funds • Portfolio management	• Securitisation • Venture capital and private equity • Indices • Project finance and corporate financing
Retail banking		• Mortgages • Commercial building loans • Car loans • Home equity loans

Figure 8 Users and uses of the Taxonomy

Securitisations, indices, venture capital or private equity conducted by investment banks do not fall under the scope of the regulation. The investment banks would not have to report on how they relate to the Taxonomy. However, the funds that replicate the indices, aggregate or package the green securitisations or private equity investments which are sold as AIFs, UCITS, EUVECA funds or EU SEF would be subject to the regulation.

International investors can also use the Taxonomy in their local markets, treating the criteria as a benchmark with which to compare local activities to high environmental standards, appropriately informing investment decisions.

Besides financiers, other actors could use the Taxonomy to help them identify and communicate about sustainable investment opportunities, for example corporations and local authorities could use the Taxonomy to help in investment or strategy decisions or corporate reporting.

[57] Securitisations, indices, venture capital or private equity conducted by investment banks do not fall under the scope of the regulation. They would not have to report on how they relate to the Taxonomy. However, the funds that replicate the indices, aggregate or package the green securitisations or private equity investments which are sold as AIFs, UCITS, EUVECA funds or EU SEF would have to disclose the extent to which they use the taxonomy.

11.2 Obligations for Taxonomy users

Under the proposed regulation, financial market participants, when offering financial products as environmentally sustainable investments, or as investments having similar characteristics, will be required to disclose (Article 4.2):

> *[…] information on how and to what extent the criteria for environmentally sustainable economic activities set out in Article 3 are used to determine the environmental sustainability of the investment. Where financial market participants consider that an economic activity which does not comply with the technical screening criteria set out in accordance with this regulation or for which those technical screening criteria have not been established yet, should be considered environmentally sustainable, they may inform the Commission.*

The European Commission would be empowered to develop delegated acts to further specify the information required to comply with this requirement. The Taxonomy should enable investors to identify:

1. The percentage of holdings pertaining to companies carrying out environmentally sustainable economic activities.
2. The share of the investment funding environmentally sustainable economic activities as a percentage of all economic activities.

The envisaged obligation in the Taxonomy regulation lies with the provider of the financial product within scope of the regulation. For example, an asset manager that creates a fund aggregating asset-backed securities (ABS), backed by financial assets such as green mortgages or forest bonds developed by an investment bank. The fund is then sold as a green alternative investment fund to asset owners. It is for the asset manager to disclose the extent to which the ABS relates to the Taxonomy. While the investment bank holds no legal responsibility, it is likely that the asset manager would ask for the information. The same principle applies to funds that replicate green indices, subsequent sellers of the financial product would rely on information furnished by the product provider and relate to all investments marketed as environmentally sustainable.

12. Implementation matters

The obligation on financial market participants is limited to reporting accurately how financial products marketed as sustainable relate to the Taxonomy. Their duty would be to provide an explanation of their strategy for ensuring the environmental sustainability of their investments. However, they are not obliged to invest in Taxonomy-eligible activities.

Increasingly investors want to demonstrate that they are "sustainable" and they want to be able to report on their positive contributions towards a low-carbon and environmentally sustainable economy. Some investors have made explicit commitments to increase their share of those investments at firm-level. These investors could use the Taxonomy as the guidance and the basis for such claims. Likewise, those that wish to report on their investments on "environmentally sustainable" assets or activities as part of their transparency commitments, or simply on the share they represent in a non-marketed fund.

Financial market participants would need to understand how to account for an investment in an economic activity classified as 'Taxonomy eligible'. Different approaches would be needed for equity or debt instruments. This section sets out the general process for investors to follow and includes asset class specific examples to illustrate the differences.

12.1 General implementation approach

The application of the EU Taxonomy follows emerging market practices by helping users to identify the sustainability of a financial product. The difference that the Taxonomy will make is that it provides unified underlying definitions of what is 'green' across green financial products, leading to more accountability and transparency. This in turn provides reassurances to investors – retail and institutional alike – that the underlying assets are contributing to one or more environmental objectives.

12.1.1 Five step approach

The implementation of the Taxonomy would require financial actors (that might delegate it to their data providers or other third parties) to conduct a five-step check process. An example of how this applies to investments in companies follows:

1. Identify the activities conducted by the company or issuer or those covered by the financial product (e.g. projects, use of proceeds) that could be eligible.
2. For each potentially eligible activity, verify whether the company or issuer meets the relevant screening criteria, e.g. electricity generation <100g CO_2/kWh.
3. Verify that the DNSH criteria are being met by the issuer. Investors using the Taxonomy would most likely use a due diligence like process for reviewing the performance of underlying investees and would rely on the legal disclosures of eligibility from those investees.
4. Conduct due diligence to avoid any violation to the social minimum safeguards stipulated in the Taxonomy regulation Article 13.
5. Calculate alignment of investments with the Taxonomy and prepare disclosures at the investment product level.

The objective of this process is to identify the proportion of the underlying assets that are eligible under the Taxonomy criteria. If an activity is eligible, the investor could determine the percentage of revenues or expenditures per investment.

The overall percentage of Taxonomy alignment will be determined by the portfolio asset value invested in Taxonomy-eligible activities.
That percentage could be calculated as the weighted sum of the percentage of revenues generated by Taxonomy-eligible activities per company in the fund, in the case of equities or corporate bonds. For

loans or project financing, the percentage will be determined by the expenditures made in those activities.

A portfolio must invest a minimum percentage of total assets in green or climate-related activities in order to obtain any of the existing green labels (e.g. French Label for the Energy and Ecological Transition, the LuxFLAG Environment, Green Bond or the LuxFLAG Climate Finance) in Europe. It is important to note that the Taxonomy regulation does not establish a standard or label, and hence there are no minimum thresholds for the share of sustainable activities at company or at portfolio-level under the proposed Taxonomy regulation. The future voluntary Ecolabel for financial products, currently under development, is expected to establish thresholds at holding and/or portfolio level.

12.1.2 Differences with current practice

In order to disclose investments in Taxonomy-eligible activities, investors should examine the economic activities conducted by an investee. This may require new types of reported data, at a level below the aggregate company performance (e.g. on greenhouse gas emissions). Initially this might require financial actors to update and/or slightly modify their databases and some internal processes. For successful implementation throughout financial markets and integration into the workflow of capital allocators, the nomenclature and codification must be incorporated into the data, operational and reporting systems.

The development of screening criteria and thresholds has also been designed to include activities that make a substantial contribution to mitigation objectives but are not low carbon today. These activities are sometimes disregarded as sustainable investments given the complexity of assessing their 'greenness'. The Taxonomy will provide a wider investment universe than is currently available under traditional 'green' investment criteria. An example is the inclusion of activities such as the manufacturing of iron or steel. The Taxonomy screening criteria also enable the measurement of positive environmental impact over time. Further, investors can use the Taxonomy when engaging companies over their environmental performance.

12.1.3 Implementing step 3 DNSH

Any breach to the DNSH criteria disqualifies an activity as environmentally sustainable. It is down to those entities conducting the activity to comply with DNSH criteria if they want the activity to be Taxonomy-eligible. However, if the financial actor finds that one or more DNSH criterion were not observed, the activity would not qualify as environmentally sustainable and the financial actor would have to reconsider their product disclosures accordingly.

The TEG believes that investors using the Taxonomy would use a due diligence-like process for reviewing the performance of underlying investments. Due diligence generally involves:

1) Identifying actual and potential adverse impacts
2) Preventing or mitigating adverse impacts
3) Accounting for how adverse impacts are addressed by
   i. tracking performance
   ii. communicating results[58]

A process of this nature would be needed as the Taxonomy regulation does not include a verification obligation on the investor. Investors who use ESG risk management processes in their portfolios commonly use this type of due diligence process.

58 OECD (2017), Responsible business conduct for institutional investors: Key considerations for due diligence under the OECD Guidelines for Multinational Enterprises.

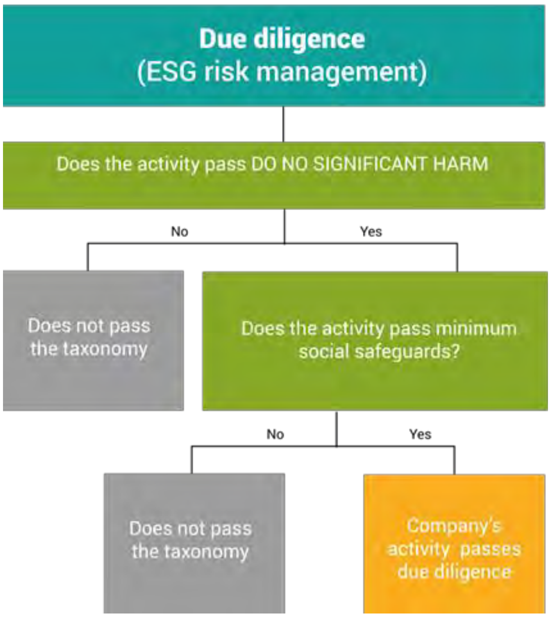

Figure 9 Due diligence process for assessing company's DNSH activities

As shown in the illustration, the introduction of the DNSH assessment adds to a thorough due diligence. While many investors conduct risk management assessments, few fully integrate the principle of 'do no significant harm' in a systematic way. Even a fund manager with a dedicated team with significant environmental expertise will struggle to identify and define in a precise way the potential adverse impacts of a company's activities, and how their management of these impacts should be assessed. This is where the Taxonomy can assist. The Taxonomy educates investors on scientifically assessed key potential adverse impacts and provides clear guidance on how and when they should be managed. The DNSH, therefore, acts as a guide for investors conducting environmental due diligence.

For example, when assessing an equity or debt investment in a company whose sole activity is the operation of generation facilities that produce electricity from wind power, investors can classify the entire investment as part of the Taxonomy. Investors should still, however, perform a DNSH analysis to ensure that the wind operations and production chain do not undermine environmental objectives.

With a rise in offshore wind power, investors should confirm that underwater noise in the construction phase complies with local thresholds to minimally impact local species. As wind turbines are largely made from carbon and glass fibres, investors should consider the percentage of recyclable materials used and the handling of such materials. Finally, investors should consider how companies minimise impacts on other ecosystems such as flight, bird habitats and visual impacts.

12.1.4 Implementing step 4: social risk management

The regulation introduces minimum social standards for all Taxonomy-eligible activities. The current proposal is that economic activities should be carried out in a way that aligns with the International Labour Organisation (ILO) core labour conventions (see box).

The violation of labour rights could be considered a material social risk and therefore is normally systematically included in Environmental, Social and Governance (ESG) risk assessment. Investors apply a risk-based approach for identifying real and potential violations of labour rights, including where they operate and the state of the rule of law, sector or activity, and verifying whether breaches have occurred, or any allegations have been made.

This in line with standardised ESG investment practice and is unlikely to bring large changes to the way in which responsible investors conduct social risk management.

In general, investors (or their data providers) will examine the investee's:

- Labour policies and governance, and whether these include compliance with all eight conventions;
- Labour management systems;
- Key performance Indicators such as health and safety track records, gender mobility or gender pay gap;
- Audits of sites and/or suppliers or subcontractors; and
- Whether they have the right monitoring, reporting and remedy procedures in place.

Minimum social safeguards

The minimum safeguards referred to in Article 3(c) of the Taxonomy legislative proposal (ref) shall be procedures implemented by the undertaking that is carrying out an economic activity to ensure that the principles and rights set out in the eight fundamental conventions identified in the International Labour Organisation's declaration on Fundamental Rights and Principles at Work, namely: the right not to be subjected to forced labour, the freedom of association, workers' right to organise, the right to collective bargaining, equal remuneration for men and women workers for work of equal value, non-discrimination in opportunity and treatment with respect to employment and occupation, as well as the right not to be subjected to child labour are observed.

12.2 Differences by asset classes

Although there are five general steps to follow, the ability of a financial actor to access the necessary data depends on:

1. The type of financial product. For example, project financing allows for greater detailed information to be shared, while large equity funds may provide less information on each underlying company;
2. The number of activities performed by the investee. that is, the identification of the relevant Taxonomy activities and the percentage of a company's activities that meet the screening criteria;
3. The accessibility and quality of investee disclosures; and
4. The relationship with the investee entity or issuer (e.g. corporate financing vs. equity investment, the percentage of ownership or the type of engagement the actor has with a company).

We have chosen three types of investments as case studies to show how the Taxonomy should be applied and how financial actors should report on it in practice. These are:

- Equity portfolios;
- Green bond funds; and
- Private equity funds.

The TEG has developed a further two case studies on possible voluntary uses of the Taxonomy. These are:

- Green loans; and
- Project finance.

12.3 Case Studies

12.3.1 Equity portfolio

An equity portfolio is a compilation of selected equity investments: money invested in a company by purchasing shares of that company in the stock market. The shares represent ownership in the company, which then uses the capital to generate revenues.

When applying the Taxonomy to an equity portfolio, the investor should follow the five-step process described above. The main challenge an equity investor might face is to identify the percentage of revenues or turnover derived from Taxonomy-eligible activities and, in some cases, to verify the technical criteria for those activities. Equity investors may need to contact companies to corroborate their calculations.

Technically the assessment of 'significant harm' only applies at an economic activity level. For around 70% of DNSH criteria, compliance with the Taxonomy can be demonstrated through compliance with EU environmental legislation. This can be assessed at a company or site-level.

Investors may also rely on existing environmental due diligence processes, where these are consistent with the technical screening criteria described in Section 12.1.3. Environmental due diligence in equity investment generally involves analysing:

- The materiality of environmental risks and impacts on the business and the environment;
- The appropriateness and implementation of the company's environmental management; system (EMS) and whether or not it fully covers the material environmental issues identified
- The company's performance through key performance indicators (KPIs);
- The company's monitoring and reporting mechanisms;
- The company's auditing or verification systems, including remedy mechanisms.

The DNSH descriptions equip equity investors with a comprehensive manual of which potential adverse impacts they need to consider when investing in a particular activity, and how to assess whether or not these impacts are being properly managed. In this respect, the DNSH facilitates investors' environmental risk management or due diligence processes.

12.3.2 Green Bond Fund

The Taxonomy can be applied to bonds whose proceeds (or a significant amount) are invested in qualifying environmentally beneficial economic activities. The greenness of a given bond may be calculated by the percentage or amount of proceeds that go to Taxonomy-eligible assets. *An example green bond fund allocation assessed by EU environmental standards is shown in Figure 12 to demonstrate how Taxonomy eligible investment reporting could be illustrated.*

Issuers of green bonds provide per-issuance reports on intended allocation and are expected to provide a post-allocation confirmation report. Best practice in post-issuance reporting includes an update on the allocation of proceeds and environmental and social impact data. In future issuers would disclose the disbursement or expenditure for eligible projects and the percentage they represent of the total. The annual report to investors would include the aggregate flow of funds allocated to Taxonomy-eligible projects. Issuers may choose to provide further information, such as project-by-project detail, if they feel it would appeal to investors.

In 2018, two-thirds of issuers provided post-issuance 'use of proceeds' reporting. Furthermore, 93% of bonds, where issuers committed to reporting at issuance, did in fact report. Another 33% of bonds where there was no commitment also reported.

During the same year, almost 50% of issuers reported on both ‘use of proceeds’ and impact. [59] There is little consistency in the market when reporting on the environmental impact of green bonds although an often-used benchmark is greenhouse gas emissions reductions.

In future, issuers are encouraged to disclose performance of Taxonomy-related activities relative to the screening criteria (e.g. carbon intensities). Environmental impact reporting should depict how the issuer manages DNSH, including performance data, when the Taxonomy requires specific performance levels in this area. Finally, issuers should report on social minimum safeguards, that is, if and how they comply with ILO conventions.

A green bond standard is being developed at the EU level. Under the recommendations from the TEG in regard to the EU Green Bond Standard (EU GBS), to qualify 100% of the bond will need to be Taxonomy-aligned. Verifiers will assure that the Green Bond Framework of the issuer takes necessary account of the conditions for the planned use of funds being Taxonomy-eligible and EU GBS aligned, and the allocation reports and impact reports will be issued annually until full allocation. Allocation reports will be verified at least once at the final allocation. Verification of allocation reporting further confirms alignment with the original taxonomy- aligned use of funds as defined in the Green Bond Framework. In any case, the verifiers will ensure that the bond complies with the Taxonomy criteria. The EU Green Bond Standard will reassure investors, as compliance will be verified externally against a clear Taxonomy aligned benchmark.

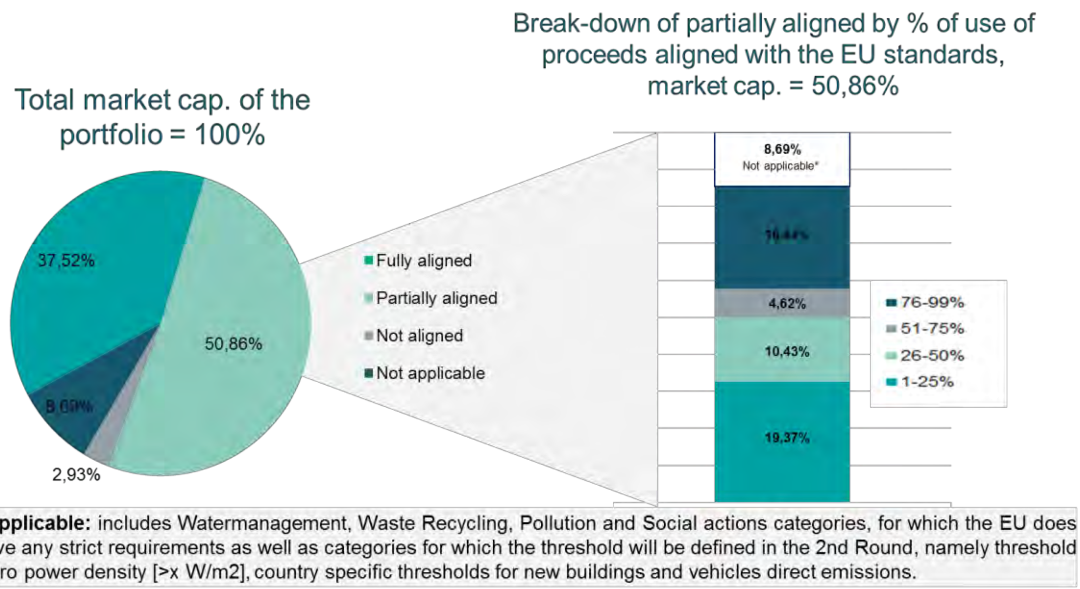

Figure 10 Example of bond fund portfolio alignment with select EU environmental standards.

12.3.3 Case study: private equity investments

In private equity (and infrastructure) investments, an investor takes a direct stake in one or more unlisted companies. Private equity investments can be focused on a specific sector like infrastructure or real estate but can also be more diversified. The influence of the investor on the company depends generally on the percentage of the equity that the investor owns as well as the strategy of the fund. The larger the stake, the larger the influence of the investor. Private equity investments are often

[59] Climate Bonds Initiative (March 2019), Post-issuance reporting in the green bond market available at www.climatebonds.net/files/reports/cbi_post-issuance-reporting_032019_web.pdf

bundled in funds that cover a specific sector or theme. These funds are available to institutional investors who may not have direct influence on the investee company.

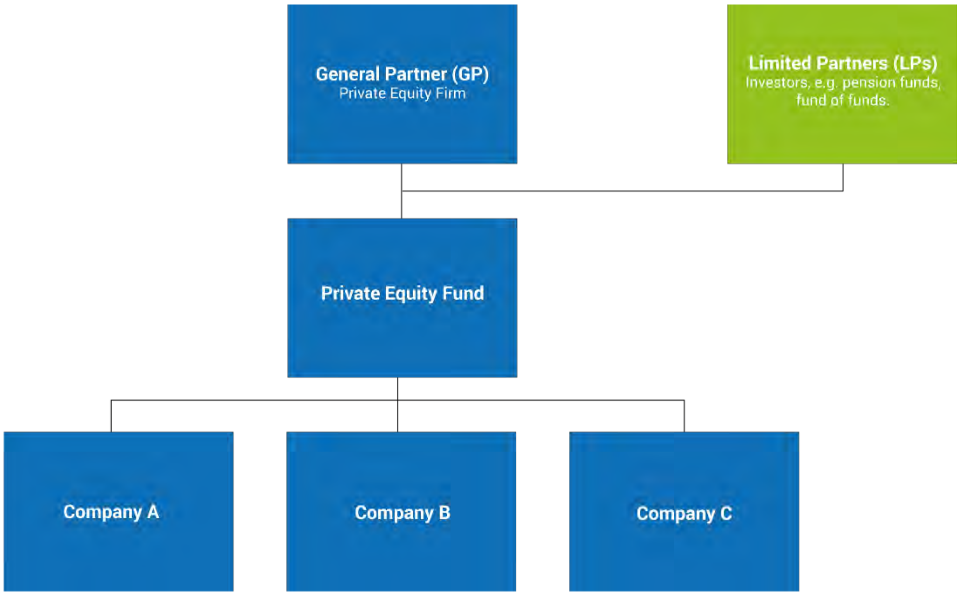

Figure 11 - Schematic of a generic private equity fund

A private equity fund established as a limited partnership generally covers a limited number of activities. Investors such as pension funds or other institutional investors can take ownership within a fund as limited partners. Because the fund is invested directly, it should be relatively easy to identify which activities are potentially Taxonomy-eligible. However, the technical data needed to screen compliance with the thresholds for transitional activities, such as CO_2 emissions, will be harder to obtain. Private companies' disclosures on sustainability-related data are rarely standardised and depend on whether, and the extent to which, investors have requested such information. As a result, data on sustainability in private equity investments remains scattered, complicating the accessibility of data for steps 2, 3 and 4. For investors acting as limited partners, data is even harder to obtain and, in most cases, must be specifically requested from fund managers.

To standardise the disclosure of ESG-related information by private real estate and infrastructure companies, there are organisations such as GRESB that have developed frameworks for standardised ESG reporting focused on private companies. In some cases the Taxonomy aligns with these frameworks and can play an important role in streamlining what type of data, and for which activities, companies in the environmental private equity space should prioritise collecting and reporting to fund managers.

12.3.4 Voluntary use of Taxonomy for green loans

According to the text of the Commission's proposal for a regulation on Taxonomy, banks are not included in the 'financial market participants' definition. There would be no obligation to use the Taxonomy unless portfolio management services are provided. However, banks may choose to adopt the Taxonomy framework on a voluntary basis if they see benefits to harmonisation and standardisation.

Commercial banks can play different roles in the financial markets. On the asset side, banks can be 'investors', acting as a lender of loans to finance the sustainable activities of their customers. On the liabilities side, banks can be 'issuers' of green bonds to raise capital for funding purposes. Furthermore, banks can also play 'services providers' and 'intermediaries', supporting and advising their clients.

The potential voluntary adoption of the Taxonomy by banks could enlarge the perimeter of the Taxonomy with relevant effects in terms of:

- Larger amount of capital channelled to sustainable activities through bank loans
- More effective and faster ability to meet sustainability targets
- Increased transparency of the financial market with lower greenwashing risk
- Improved ability for banks to meet the sustainable preferences of their customers and other stakeholders

In particular, the role of the banks could be very relevant to support and meet the financing needs of mid-sized corporations and small and medium-sized enterprises (SMEs) which have more difficulties accessing capital markets to finance their sustainable investments when compared to large corporations and listed companies.

There are even more potential roles for large international banking groups which usually act across different financial sectors with several products and services: commercial banking (bank loans), investment banking (equity, bonds and project financing), wealth management (asset management, pension funds, etc.) and financial services (advisory and payments). Considering the different activities performed by the banks and the underlying varied financial products, it is evident that there could be a large positive impact from the voluntary adoption of the Taxonomy by the banking sector.

To properly assess the sustainable content of the activities underlying their loans, banks would need to adapt their existing processes to the new definitions of the Taxonomy. Bank customers should provide the required information (activities classifications, criteria, metrics and thresholds), while banks would need to enhance their operational systems and procedures to collect and manage these information flows.

The overall process will also require some time and more than marginal investments in terms of upgrading the origination processes, IT systems and staff training. All of the information mentioned above could also be used by banks for disclosure purposes and for enhancements of risk management practices that include climate and environmental risks.

12.3.5 Voluntary use of the Taxonomy for project finance

Project finance is the funding of long-term infrastructure, industrial projects and public services using a non-recourse or limited recourse financial structure. The debt and equity used to finance a project is paid back from the cash flow generated. Project financing is a loan structure that relies primarily on the project's cash flow for repayment, with the project's assets, rights and interests held as secondary collateral.

Generally speaking, a project includes a limited number of activities and a direct relationship between debt and equity providers and the project management company. Therefore, the identification of the eligible activities for the Taxonomy is expected to be relatively straightforward. Projects will often entail specific activities, such as the building of a wind park or infrastructure assets. However, in practice, projects could also involve components that can comply with the Taxonomy and components that cannot, for example, in the case of the refurbishment of current infrastructure or real estate.

For this reason, a project financier should, in line with the equities strategy, take a granular approach to analysing the projects compliance with the Taxonomy. The Taxonomy-eligible part of the lending can be counted as ‘green’. This is in line with the current methodology applied by multilateral development banks (MDBs). As with equities, there is no minimum for the percentage of green activities to be counted per project.

To implement a granular approach, the recording system of the project must be credible on the metrics and thresholds required by the Taxonomy. Ideally the contribution to Taxonomy-related objectives should be clarified in the pre-appraisal stage of a project to give clarity to the investor right away and enable alignment of the recording system if necessary. In intermediated lending the Taxonomy objective, climate change mitigation or climate change adaptation, should be contractually earmarked for the activities as identified in the Taxonomy.

13. Data: availability analysis and results

From an investment perspective, the main usability issue related to the EU Taxonomy is whether the data needed to match a security or a project to a Taxonomy-related activity is available, reliable and complete, and at what cost.

To assess whether an economic activity is carried out in compliance with the Taxonomy, three types of information are needed:

1. Revenue or turnover[60] breakdown by Taxonomy-related activities, or expenditure allocation to each Taxonomy-related activity.
2. Performance against the technical screening criteria, or environmental management data where this is an acceptable proxy for compliance with the technical screening criteria including the DNSH criteria.
3. Management data on social issues including labour rights policies, management systems, audits and reporting.

13.1 Revenue breakdown by Taxonomy-related activities

The main challenge the application of the Taxonomy faces is that very few companies break out information on green revenues in line with any recognised framework.

Many data providers collect information or estimate companies' exposure to green activities. For example, analysis based on FTSE Russell Green Revenues data model on more than 14,000 global listed companies – 2,771 of which from Europe – shows that around 3,086 have exposure to green economy sectors, but only 28% of these companies actually disclose information on the share of their turnover deriving from green product and services. As such the data is augmented by estimated green revenue percentages with maximum and minimum possible ranges for companies which don't disclose.

Further, although most listed companies report revenue information broken down by activity or business line, this reporting (which is part of financial filings or annual reports) is not standardised and is not always easily accessible.

For example, MSCI Europe Index members report revenue by geographic region and product segment. However, there is significant variance between reporting classifications. Fewer than 30% of companies use the same geographic categories and there is an even wider variance in product line reporting.[61]

Encouraging companies to report revenue in line with NACE codes could greatly improve the consistency within industries. However, the implications of this adjustment for companies have not yet been assessed. Meanwhile, investors, or their research providers, will have to identify companies' activities that respond to NACE-classified activities.

13.2 Environmental data

13.2.1 Technical criteria performance

To fully identify whether an economic activity is Taxonomy-eligible, an investor must identify what proportion of the economic activities being carried out by a company or project meet the technical screening criteria.

60 Note that revenues and turnover could be considered synonymous as they relate to 'sales' of a given company.

61 For example, within the 10 companies of the NACE division name 'Manufacture of coke and refined petroleum products' there are 10 different revenue breakdowns. Among the three 'Air transport' companies there are three different revenue breakdowns and among the seven 'Mining of metal ores' companies there were seven different revenue breakdowns.

Information related to the environmental performance of Taxonomy-relevant economic activity is not always available in the financial filings (accounts or annual reports) published by companies. This type of information can be provided in sustainability reports or through ESG assessments carried out by ESG ratings providers.

Carbon intensity metrics
One of the most common metrics used as technical criteria for the Taxonomy is carbon intensity: the amount of CO_2 emissions equivalent per unit of electricity generated or per unit of output. While all companies participating in the EU ETS have been submitting information about their verified emissions, carbon intensities are not always easily accessible.

Carbon reporting is one of the most increasingly common metrics disclosed by companies in developed and emerging markets. This is partly due to rising carbon regulations, and partly as a result of investor and stakeholder pressure. There has been significant progress and today over 5,000 companies around the world, for example, report their emissions to CDP. However, emissions reporting is mostly restricted to scope 1 and 2.[62]

Nevertheless, approximately 80% of the emissions – scope 1 and 2 – from the 13,500 largest companies in the world, are estimated or re-worked before being used to calculate the carbon footprint of equity and bond portfolios because either the data is not reported or fully reported or it is not made available in a manner that can be processed and analysed. [63] Only 12% of companies disclose scope 1 and 2 for all operations in a standardised satisfactory manner, with an extra 8% in a sufficiently workable way.[64]

13.2.2 Do no significant harm (DNSH) environmental management data
While DNSH performance can be more easily assessed in Europe using the EU criteria, in other jurisdictions the 'matching' requirement to verify DNSH criteria implies that providers of capital will have to run their own due diligence processes, as explained in section 12.1. The TEG recognises that lower levels of environmental disclosure may make this more challenging.

Disclosure on climate-related and environmental metrics varies significantly from company to company. A study conducted on 105 European companies that examines how these companies disclose against the EU Non-Financial Reporting Directive (NFRD) proves that, despite the new directive, there is no standardisation or homogenisation on corporate environmental disclosures. For example, climate change reporting in the European energy sector can be summarised as follows:

- 63% Policy describes key issues and targets
- 53% Risk description is specific
- 68% Effects on company's business and strategy
- 47% Effects on financial planning
- 26% Below 2°C scenario
- 21% Information on short and long-term horizons

Despite almost universal reporting on issues such as water use, pollution and waste, certain important aspects are considered only by a few companies. These aspects include, for example, pollution from transportation, which is mentioned by 21% of companies, or water consumption and risks in water scarcity and borderline areas, which are reflected in 24% of companies' reports.

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62 See http://www.carbone4.com/wp-content/uploads/2016/09/CARBONE4-carbon-reporting-by-companies-around-the-world-EN.pdf.

63 BNPP AM database from Trucost

64 BNPP AM database from Trucost.

These figures compare to 74% and 70% of energy and health care companies that report on water use. Similarly, where companies identify risks to biodiversity connected to their business, they typically do not report concrete impacts or their management.

Bloomberg terminals, for example, have binary fields (yes/no types of data) such as 'biodiversity policy', flagging whether a company has implemented any initiatives to ensure the protection of biodiversity, as well as fields for climate change policies. These fields then link to the actual policies reported by companies, but they are not analysed. Of the MSCI Europe sample of 440 companies, 24% had a biodiversity policy, 37% had a climate change policy and 40% had an environmental supply chain policy indicating that they have implemented initiatives to reduce the environmental footprint of their supply chain.

While any breach to the DNSH criteria disqualifies an activity as environmentally sustainable, financial actor's duties are limited to conduct a DNSH assessment with the tools at hand and, if a breach is found, not to count the activity as Taxonomy-eligible. In the face of poor levels of disclosure, and in order to enhance their DNSH due diligence, investors might opt to ask companies or issuers directly for the information.

13.2.3 Labour rights policies, management systems, audits and reporting

Financial actors are confronted with a similar situation when conducting labour standards due diligence as described above (see section 12.1.4.).

Most large companies in Europe disclose a series of indicators related to their workforce. However, reporting is inconsistent and varies significantly between companies. Out of 100 European large companies, 92% provide information on the number of employees, 81% on overall gender balance, 79% on anti-discrimination policies and 80% on health and safety[65].

Fewer companies disclose more detailed information on the effects of their policies (36% report on improvements resulting from their anti-discrimination policies), and very few include outsourced workers in their perspective (1%-25% depending on specific issue) or provide country-by-country information on region-sensitive issues such equal opportunities (6%) and freedom of association (10%)[66].

Over 90% of companies express in their reports a commitment to respect human rights and over 70% endeavour to ensure the protection of human rights even in their supply chains[67]. As in other areas, a majority of companies, however, do not provide any information that would allow a stakeholder to understand how this commitment is put into practice. Only 36% describe their human rights due diligence system, 26% provide a clear statement of salient issues and 10% offer examples or indicators to demonstrate effective management of those issues[68].

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65 The Alliance for Corporate Transparency Project (2019), 2018 Research Report: The state of corporate sustainability disclosure under the EU Non-Financial Reporting Directive. See http://www.allianceforcorporatetransparency.org/assets/2018_Research_Report_Alliance_Corporate_Transparency-66d0af6a05f153119e7cffe6df2f11b094affe9aaf4b13ae14db04e395c54a84.pdf. In 2018, the project assessed over 105 companies from the sectors of energy & resource extraction, information and communication technologies, and health care to provide early reflections on the implementation of the NFR Directive in practice. The scope of 105 companies includes some of the biggest companies by market capitalisation as well as other companies from the lower tier falling under the scope of the NFR Directive. The initial sample of companies included larger sets of over 20 companies from Spain, France and the UK and smaller controlling samples from Germany, the Nordic region (Denmark, Finland, Sweden) and Central and Eastern Europe (Poland, Czech Republic, Slovenia).
66 Idem.
67 Idem.
68 Idem.

Market participants can play a role to ensure social minimum safeguards are respected by conducting due diligence as described above. They can also significantly improve performance by engaging companies on areas where they perform poorly and through requesting performance data.

Improving the supply of company data: Non-binding guidelines

Company reporting does not typically include information on their involvement in activities that would be categorised under the Taxonomy. To address this, the climate-related disclosures guidelines, that are based on proposals from the TEG and supplement the existing guidelines under the Non-Financial Reporting Directive (NFRD), will specifically encourage companies to provide their turnover broken down according to the Taxonomy's classification. The guidelines also recommend that companies disclose their CAPEX investments and/or expenditures OPEX for assets or processes that support products or services associated with Taxonomy activities[69]. This forward-looking indicator will help investors to better assess companies' future performance and identify those that will have a competitive advantage in an environment of ever-stricter carbon regulation.

Companies have an interest in reporting their Taxonomy-eligible activities. For companies and other issuers, the taxonomy provides a unique chance to showcase what they do and attract new investors. Companies will nevertheless feel investor pressure. Many investors will leverage their power as shareholders to encourage the companies they invest in to disclose the necessary information. But full implementation of the Taxonomy cannot be achieved without improved reporting from companies, coupled with better use of other data sources.

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69 Technical Expert Group on Sustainable Finance (January 2019, Report on Climate=related Disclosures; European Commission, Directorate-General for Financial Stability, Financial Services and Capital Markets Union https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190110-sustainable-finance-teg-report-climate-related-disclosures_en.pdf

14. Role of companies

For the Taxonomy to be successfully implemented by financial firms, companies must begin to provide transparency around their Taxonomy-aligned activities through reporting in widely distributed, publicly available documents.

14.1 Advantages of reporting to facilitate the implementation of the Taxonomy

14.1.1 High level guidance on reporting in line with the Taxonomy

Financial actors are increasingly interested in investing in sustainable products, with the amount of assets under management that are linked to sustainability performance growing year after year.[70] Investors, though, depend on companies to honour their commitments. They need access to meaningful, comparable and quality information about companies' activities and their performance in sustainability, such as how they manage environmental risks. This growth in investor demand shall translate into cheaper and better access to capital for green and greening activities. What is more, investors interested in sustainable investments are more likely to be focused on long-term investment horizons and less likely to pressure companies for rapid, short-term growth.

As regulation under the action plan moves forward, demand for sustainable investments will grow. Those companies that wish to benefit from this growth in demand are likely to put in place specific voluntary disclosures to show how their business activities align with the Taxonomy.

Equity – Publicly listed companies

Under current market practices, as experienced by TEG members, a company may be considered to be making a contribution to environmental objectives when its turnover in environmental-related activities corresponds to a minimum percentage of total turnover (this varies and may for example be between 20% and 50%). Investors today use either an internal taxonomy or a recognised classification system such as the FTSE Environmental Markets Classification or CBI Taxonomy to assign a percentage of a company's turnover to specific Taxonomy-linked activities.

Reporting revenues and investments by activity allows for a more in-depth understanding of business risks and opportunities related to climate change, social impacts and future regulation. Most European companies report revenue information broken down by activity or business line. Companies within the same industry often label activities differently and categorisation is at the discretion of the companies. This does not allow investors to understand their exposure to activities that may be included in the Taxonomy and would make it difficult for them to comply with any proposed regulation on financial reporting.

While the Taxonomy would not impose regulations on companies to change reporting practices, a clear structure for what investors need gives companies guidance on how to report revenue information. In addition, large listed companies reporting in accordance with the Non-Financial Reporting Directive (NFRD) must disclose their development, performance, position and impact related to environment (including climate change). Using the Taxonomy as tool for clarifying the reporting company's performance and impact, for example which today are often relative, related to climate change would not only strengthen reporting and compliance with the NFRD but also offer improved comparability.

In practice companies are encouraged to specify the percentage of revenues, turnover or the percentage of investment in CAPEX and/or operating expenses (OPEX) associated with Taxonomy-eligible activities in reference to climate-related disclosures.

70 The Global Sustainable Investment Review shows a growth in sustainably managed assets. See http://www.gsi-alliance.org/wp-content/uploads/2019/03/GSIR_Review2018.3.28.pdf (page 8).

Companies are also encouraged to disclose how their Taxonomy-eligible activities perform in terms of the criteria set for each type of activity (e.g. carbon intensity). In this respect, investors will benefit from access to how different companies' activities contribute to their emissions profile.

Example
A company that is active in the aluminium production business has set up a new facility that produces aluminium and meets the thresholds set out in the EU Taxonomy. In the annual report, the company separates out the revenues that can be attributed to the low-carbon plant, and clearly sign posts the corresponding CAPEX as part of its asset and liabilities. In the sustainability report, the company specifies how the new plant meets the Taxonomy criteria and provides details regarding the 'do no significant harm' assessment.

Corporate debt – Publicly listed and privately held companies
When issuing bonds and loans, issuers can have access to better borrowing conditions if investors believe that a bond or loan can contribute to the decarbonisation of their loan book or their investment portfolios[71]. Likewise, those bonds or loans aimed at improving a company or entity's environmental footprint, including expanding their Taxonomy-related activities, might benefit from preferential treatment of investors[72]. To validate their green credentials, issuers need to provide the necessary data to investors. Issuers should report their objectives in relation to the technical criteria set in the Taxonomy (ex-ante), and how they have performed against them as part of their impact report (ex-post).

For example: An automotive company issues a green bond that provides the capital necessary to develop a longer lasting electric vehicle battery as well as financing for purchasers of electric vehicles. The delineation of funds to both activities is defined in the bond's use of proceeds and continued reporting throughout the life of the bond is conducted in line with the GBS. Thus, transparency in line with the Taxonomy remains relevant in secondary markets.

In the case of corporate loans and private debt, where reporting may not be publicly available, debt issuers should aim to maintain the same standards of reporting.

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[71] BCG report (A New BCG Analysis of 300+ Companies Finds Businesses That Perform Well in Environmental, Social, and Governance Areas Can Improve Their Valuations and Margins) and University of Groningen, 2017, Greenhouse Gas Emissions Intensity and the Cost of Capital (For every unit increase in GHG emissions intensity, we find that the cost of equity increases by 15 basis points) Climate Bonds Initiative H2 2018 pricing report found that EUR green bonds achieve larger book cover, and slightly lower spread compression than vanilla equivalents on average, 28 days after pricing, green bonds had, on average, tightened by more than matched indices.

[72] UQ Business School, The University of Queensland, 2014, The impact of a firm's carbon risk profile on the cost of debt capital: Evidence from 78 Australian firms & their 255 firm-year observations (one standard deviation increase in the carbon risk measure mapping into a 73 basis point increase in the cost of debt for these firms) and Summary of sustainability linked loans in the market and their preferential loan treatments, from environmental finance.

15. Role of data providers

Data providers play an important role by standardising information from different sources and jurisdictions to provide financial institutions with comparable global datasets for capital allocation decisions.

Company-reported information is extracted from financial filings, annual reports, integrated reports, sustainability reports and company websites, then harmonised and standardised for investors, lenders and insurers to analyse and compare. Some data providers have developed their own questionnaires to guide companies towards meaningful and comparable reporting. This same data is then pulled through to trading systems, portfolio management tools, risk management systems and reporting done by financial institutions. Where reported information is missing (e.g. only 50% of the largest listed companies globally disclose carbon emissions), modelled information (e.g. carbon models) fills the gaps through estimated data points and industry comparisons.

Today some data providers such as Bloomberg and Thomson Reuters have developed services that provide information on listed companies' revenues based on business activities. These activities can then be classified as having environmental utility, green investments or exposure to green activities such as percent of sustainable products or investments in green CAPEX. Examples include the FTSE Russell Green Revenue Data Model, CDP and Carbon Delta. In the absence of a universally accepted Taxonomy, service providers have developed their own data models or taxonomies, which are mostly based on 'high-confidence' or 'low-carbon' sectors.

For the Taxonomy to be used successfully throughout financial markets and integrated into the workflow of capital allocators, the proprietary data models used by data providers need to be updated to capture mitigation thresholds where applicable for high-confidence or low-carbon sectors and must be widened to cover all additional sectors included in the Taxonomy. In addition, the data models have to capture the DNSH screening, which does not refer to an economic sector but to how a specific business carries out its economic activities. This process can require significant resource allocation, business planning and development time so data providers might require time to provide investors with the data they need to comply with future Taxonomy regulations.

While some investors rely on direct contact with companies for information on the companies' business activities and related revenues, for large institutional investors that make up the majority of financial transactions, data providers are relied upon for critical information.

As companies begin to report in line with the Taxonomy's classifications, data providers must be prepared to capture this data and relay it through financial research, operations and reporting systems.

Access to this information through data providers will not only allow investors to integrate company-reported information into their investment, trading, compliance and reporting operations, but it will also help companies understand how their reported information is being seen and used and how they are reporting in comparison to peers.

CDP Case Study

CDP asks companies directly for detailed information that cannot (or not easily) be found in corporate reports. They ask companies for the share of total revenues from low-carbon products or products that enable a third party to avoid GHG emissions as detailed below.

Response options

Please complete the following table. You are able to add rows by using the "Add Row" button at the bottom of the table.

Level of aggregation	Description of product/ Group of products	Are these low-carbon product(s) or do they enable avoided emissions?	Taxonomy, project, or methodology used to classify product(s) as low-carbon or to calculate avoided emissions	% revenue from low-carbon product(s) in the reporting year	Comment
Select from: • Product • Group of products • Company-wide	Text field [maximum 2,400 characters]	Select from: • Low-carbon product • Avoided emissions • Low-carbon product and avoided emissions	Select from: • Low-Carbon Investment (LCI) Registry Taxonomy • Climate Bonds Taxonomy • Addressing the Avoided Emissions Challenge-Chemicals sector • Evaluating the carbon reducing impacts of ICT • Other, please specify	Numerical field [enter a number from 0-100 using a maximum of 2 decimal places and no commas]	Text field [maxim characters]

Source: CDP Source: CDP Climate Change 2019 Questionnaire

In this case, companies are asked to select from a menu the Taxonomy they are using to report, and to provide a thorough description of the product or group of products they believe should qualify as low-carbon.

There is a clear incentive for data providers to adapt their questionnaires and systems to provide investors with the information they need to implement the Taxonomy. The most streamlined way to accomplish this, short of mandating it for companies themselves would be for data providers to use the Taxonomy criteria to build systems that would show what reporting is needed. Companies could have a Taxonomy profile and then it would be clear which companies are reporting in line with the Taxonomy and which are not. This would ideally prompt those that still report according to their own designated activity categories to begin reporting in line with the Taxonomy to fill out their profiles for investors to use. Companies that chose not to report in line with the Taxonomy may be penalised by investors as their Taxonomy-aligned revenue will have to be estimated or disregarded. The TEG will further examine Taxonomy usability, including data provision, in the mandate extension period.

PART D: Economic impacts of the Taxonomy

This section provides the TEG's analysis of the likely economic impacts of establishing an EU Taxonomy.

16. Expected impacts of the Taxonomy

16.1 Coverage of the Taxonomy and financial quantitative impact assessment

16.1.1 Coverage of the Taxonomy

The economic activities considered in this analysis have been selected based on their importance for climate change mitigation. Data availability means that only limited analysis has been conducted for climate change adaptation and the broader environmental objectives set by the Taxonomy.

While there is no comprehensive picture of financial exposure to climate change or investment needs for adaptation, climate-related hazards are already causing substantial economic damage.[73] The total reported economic losses caused by weather and climate-related extremes in the EU over the 1980-2017 period amounted to over €453 billion[74]. These estimates include the financial value of damage to assets and recovery costs, and do not include indirect and cascading losses.

Through references to NACE, the Taxonomy can broadly indicate the economic branches or industries where climate change mitigation technologies are being implemented or climate change mitigation actions are supposed to be taken and financed. The breakdown of NACE can be used to explain the relevance of the Taxonomy in terms of current GDP and employment in the specific activities/sectors it covers.

The macro-economic sectors analysed by the Taxonomy were selected based on quantitative data on GHG emissions in the EU. Sectors with a high potential to enable substantial GHG emissions reductions in other sectors have also been included. The TEG analysed a total of six macro-sectors for climate change mitigation based on GHG emissions as well as one enabling sector.[75] In total the activities in the selected sectors represent 93.2% of GHG emissions by NACE code.[76]

73 European Environment Agency, 2019.

74 UN Office for Disaster Risk Reduction/E3G, 2019.

75 In addition, professional services were considered where they were integral to the performance of a climate change mitigation activity, such as energy audits in buildings renovation.

76 https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-Taxonomy-feedback-and-workshops_en.pdf.

Table 8 GHG emissions for sectors considered in the TEG taxonomy, EU-28, 2017

NACE macro-sector	**GHG** (Tonne)	**Share of GHG (% of GHG from all NACE Macro-sectors)**
A – Agriculture, forestry and fishing	520,860,082.54	14.7%
B – Mining and quarrying	79,624,366.67	2.3%
C – Manufacturing	846,420,845.95	23.9%
D – Electricity, gas, steam and air conditioning supply	1,072,529,498.49	30.3%
E – Water supply, sewerage, waste management and remediation activities	163,285,205.41	4.6%
F – Construction	60,058,074.32	1.7%
H –Transportation and storage	535,602,112.51	15.2%
J – Information and communication	10,396,008.51	0.3%
L – Real estate activities	6,246,240.47	0.2%
Total A-F, H, J, L	3,295,022,434.87	93.2%

Furthermore, the economic activities in the selected sectors also cover a significant proportion of GDP and total employment at the EU 28 level.

Table 9 Share of gross value added and employment for sectors considered in the TEG taxonomy, EU-28, 2017 (Value added gross) and 2016 (Employment)[77]

NACE Macro-sector	**Gross value added (2017)**	**Employment (2016)**
A – Agriculture, forestry and fishing	1.7%	4.5%
B – Mining and quarrying	0.5%	0.3%
C – Manufacturing	16.4%	13.8%
D – Electricity, gas, steam and air conditioning supply	1.8%	0.5%
E – Water supply, sewerage, waste management and remediation activities	0.9%	0.7%
F – Construction	5.4%	6.3%
H –Transportation and storage	4.9%	5%
J – Information and communication	5%	2.9%
L – Real estate activities	*11.2%*	1.1%
Total of previous	47.8%	35.2%

The Eurostat macro-economic statistics do not provide for sufficient granularity at the economy activity level. For the first group of economic activities of interest to the TEG, climate change mitigation ‘supporting’ economic activities, the environmental goods and services sector (EGSS) dataset, developed by Eurostat, could be considered as a proxy.

[77] Source: Eurostat (online data code: nama_10_a64)

The EGSS database covers the environmental products and activities defined in the EGSS operational list[78]. The operational list does not indicate the percentage of correspondence between the NACE code and the environmental activity, given that only a certain percentage of the identified NACE category may be actually considered eligible within the Taxonomy and that the share is country specific.

There are important differences in the scope of economic activities covered by EGSS and the TEG-developed Taxonomy (e.g. TEG's Taxonomy includes railway transport whilst EGSS does not consider these economic activities environmental). The EGSS on the other hand covers activities relating to the two broad environmental purposes, environmental protection and resource management, broken down by detailed purposes, so that some further mapping with other TEG environmental objectives might be necessary in this context to ensure the comparability with the TEG's scope of work (climate change mitigation). Moreover, the EGSS has been developed exclusively for statistical purposes and does not set any thresholds on GHG emissions or other environmental pressures or impacts for activities considered 'environmental'.

The EGSS database is currently composed of three different datasets: EGSS1 (Employment in the environmental goods and services[79] sector); EGSS2 (Production, value added[80] and exports in the environmental goods and services sector); and EGSS3 (Production, value added and employment by industry groups in the environmental goods and services sector). While EGSS1 and 2 include country-level data and EU aggregates (the latter estimated) for employment and the value added respectively, EGSS3 contains data on both indicators, based on estimations for the European level.

Apart from activities in the mining, quarrying and manufacturing sector, both value-added and employment related to activities in the environmental goods and services sectors have followed an upwards trend over past years (see graphs below).

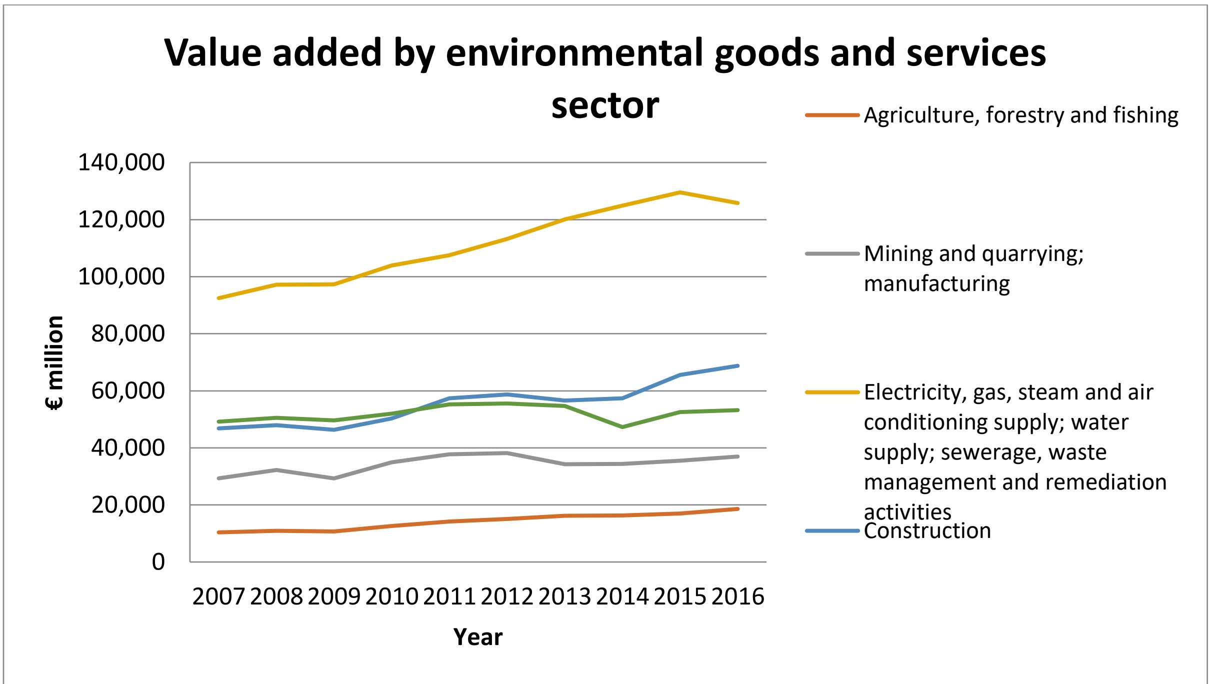

Figure 12 – Value added by environmental goods and services sector in the EU[81]

78 See list in the following link: ttps://ec.europa.eu/eurostat/documents/1798247/6191549/EGSS+list+of+env+products.xlsx
79 Only goods and services that have been produced for environmental purposes are included in the scope of the EGSS.
80 Contribution towards GDP.
81 Eurostat (online data code: env_ac_egss3)

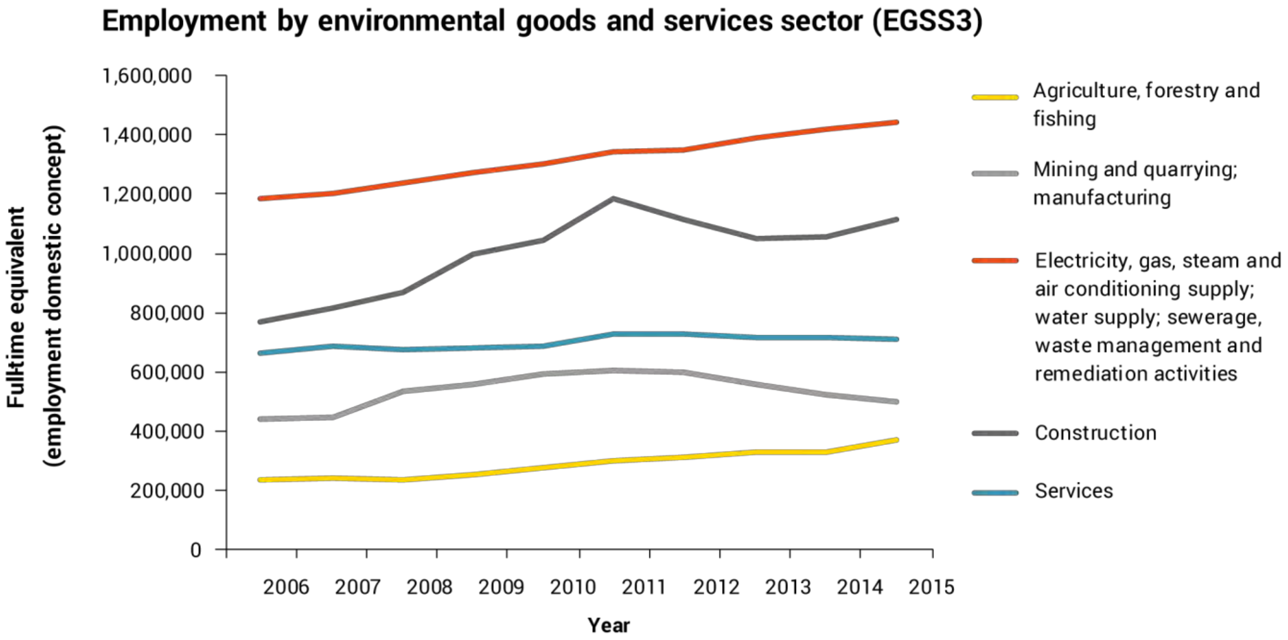

Figure 13 Employment by environmental goods and services sector in the EU[82]

The TEG mandate includes an assessment of the impacts of the Taxonomy, also covering the financial dimension. This task follows from one of the broader objectives of the Taxonomy, which is to redirect financial flows to make them consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. In this section, an impact assessment based on financial market data is developed[83].

The analysis first provides an overview of existing estimates of additional investment needs, which is taken as a benchmark. Then, confidential data on financial exposures of all institutional sectors in Europe are used to assess where European capital markets stand with respect to sustainable financial investment. This is the baseline scenario as it is argued that no major changes could be expected in the absence of an EU Taxonomy. Finally, the impact assessment develops alternative scenarios, compatible with different levels of uptake of the Taxonomy.

16.1.2 Overview of available estimates of additional investment needs

This section takes stock of available estimates of the investment needs in the EU and globally, necessary to achieve targets associated with the low-carbon transition and other sustainability objectives. It starts from the reports specifically related to the EU2030 targets and the scenarios developed by the EC. It then provides an overview of reports on global estimates carried out by international agencies. It finally compares with results from the academic literature.

Studies based on EU 2030 Targets and EC scenarios

In order to estimate to financial impact of the EU Taxonomy, the analysis considers the set of relevant scenarios previously elaborated by the EC in assessing the progress towards the EU 2020 and EU 2030 targets for climate and energy. The Reference Scenario 2016[84] (E3MLab and IIASA 2016), abbreviated as Ref2016 in the following, represents the *baseline scenario*. The set of EUCO

82 Eurostat (online data code: env_ac_egss3)

83 For details, see Alessi, L., Battiston, S., Melo, A.S., & Roncoroni, A. (2019), "The Eu Sustainability Taxonomy: a Financial Impact Assessment", European Commission Joint Research Centre Technical Report, forthcoming.

84 The scenario is described in detail in E3MLab and IIASA 2016, “Technical report on Member State results of the EUCO policy scenarios”, https://ec.europa.eu/energy/sites/ener/files/documents/20170125_-_technical_report_on_euco_scenarios_primes_corrected.pdf

scenarios[85] (EC 2016 SWD (2016) 405 and EC 2016 SWD (2016) 418; Capros et al. 2018) consider policies of varying stringency towards the 2030 targets. A review was done of the results of a series of reports that analyse the above scenarios focusing on the same set of economic sectors, i.e. utility (electricity generation and grid), industry, transport and buildings. This allows to compare investments needs in the EUCO scenarios relative to the Ref2016. Note however, that these sectors are not defined in terms of the Eurostat NACE codes and thus some additional work and assumptions are needed in order to map them to other relevant sector classifications discussed later on. Table 10 summarizes the targets and scenarios that are relevant to this section[86].

Table 10 EU Targets, Reference scenario and EUCO scenarios

Targets	Scenario
EU 2020 Targets • GHG emission reduction: 20%; • Renewable energy share (RES): 20%; • Energy efficiency improvements: 20%.	**Ref2016**: takes into account policies until 2015, it assumes that 2020 targets are achieved. Beyond 2020, no additional RES targets are set, no additional policy support is modelled. The EU 2030 targets are not achieved.
EU 2030 Targets • GHG emission reduction: 40%; • Renewable energy share: 27%; • Energy efficiency improvements: 27%.	**EUCO27, EUCO30, EUCO+33, EUCO+35, EUCO+40:** A set of scenarios of increasing stringency that achieve the EU 2030 targets, with different margins and pathways. The scenarios assume a range of policies including: revised EU ETS; policies facilitating renewables energy targets in the electricity, heating & cooling and transport sectors; energy efficiency policies in the buildings sector via e.g. increasing the rate of renovation, facilitating access to capital for investment in thermal renovation of buildings; ecodesign standards banning the least efficient technologies.
EU 2050 Targets • GHG emission reduction: at least 80%; • Renewable energy share: at least 80% in electricity; • Energy efficiency improvements: no quantitative target.	

The **EU Reference Scenario 2016** is elaborated and analysed in E3M-Lab and IIASA (2016)[87]. It takes into account the EU policies adopted until 2015 and assumes that the EU2020 targets are achieved. It assumes that beyond 2020 no targets are set for Renewable Energy Sources (RES) and that no additional relevant policy is implemented.[88] The report estimates the investment needs in the sectors mentioned earlier.
In the analysis, the level of investment taking place in the Ref2016 scenario (see Table a.2) does not allow to achieve the EU 2030 targets.

85 The EUCO scenarios were elaborated in the EC Impact Assessments of the EU2030 framework conducted in 2016, see EU Commission 2016, SWD (2016) 405 and 418. EU Commission 2016, SWD(2016) 405 final, "COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27/EU on Energy Efficiency"
https://ec.europa.eu/energy/sites/ener/files/documents/1_en_impact_assessment_part1_v4_0.pdf
EU Commission 2016, SWD(2016) 418 final, "COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)"
https://ec.europa.eu/energy/sites/ener/files/documents/1_en_impact_assessment_part1_v4_418.pdf
86 EU 2050 Targets are provided for completeness, though not used in the scenarios.
87 E3M-Lab and IIASA (2016). "EU Reference Scenario 2016 Energy, transport and GHG emissions Trends to 2050".
https://ec.europa.eu/energy/sites/ener/files/documents/20160713 draft_publication_REF2016_v13.pdf
88 Notice that, the Ref2016 scenario "does not predict how the EU energy, transport and climate landscape will actually change in the future. It provides a model-derived simulation of one of its possible future states given certain conditions. In particular, it assumes that the legally binding GHG and RES targets for 2020 will be achieved and that the policies agreed at EU and Member State level until December 2014 will be implemented".

The **Impact Assessments EC 2016 SWD (2016) 405[89] and EC 2016 SWD (2016) 418[90]** analyse the EUCO scenarios and the Ref2016 scenario in terms of investment needs in the sectors considered. The two reports focus on the aspects of renewable energy and energy efficiency, respectively. They elaborate a set of scenarios, named as EUCO27, EUCO30, EUCO+33, EUCO+35, EUCO+40, which achieve the EU 2030 targets with different margins and along different pathways, by means of policies of varying stringency. The scenarios assume a range of policies including: revised EU ETS; policies facilitating renewables energy targets in the electricity, heating & cooling and transport sectors; energy efficiency policies in the buildings sector via e.g. increasing the rate of renovation, facilitating access to capital for investment in thermal renovation of buildings; ecodesign standards banning the least efficient technologies. The evolution of the economic sectors is modelled by means of computable partial-equilibrium model PRIMES (Capros et al. 2018). Table 11 reports the investment needs estimated in EC 2016 SWD (2016) 405 across the scenarios. The investment gap of each EUCO scenario is computed relative to Ref2016. The investment gap in the EUCO30 relative to Ref2016 amounts to €177 billion.

Table 11 Investment needs across sector and scenarios reported from EC 2016 SWD (2016) 405, Table 22 p. 66

	Investment needs (€ bn)					
Sector	Ref2016	EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
Electricity grid	34	39	36	34	31	26
Gap to Ref2016		5	2	0	-3	-8
Power generation	33	42	42	40	37	36
Gap to Ref2016		9	9	7	4	3
Industry	15	17	19	24	29	51
Gap to Ref2016		2	4	9	14	36
Transport	705	731	736	729	733	740
Gap to Ref2016		26	31	24	28	35
Buildings - tertiary	23	40	68	119	157	257
Gap to Ref2016		7	45	96	134	234
Buildings - households	127	168	214	286	337	455
Gap to Ref2016		41	87	159	210	328
Total	**938**	**1037**	**1115**	**1232**	**1324**	**1565**

89 EU Commission 2016, SWD(2016) 405 final, "COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27/EU on Energy Efficiency"
https://ec.europa.eu/energy/sites/ener/files/documents/1_en_impact_assessment_part1_v4_0.pdf
90 EU Commission 2016, SWD(2016) 418 final, "COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)"
https://ec.europa.eu/energy/sites/ener/files/documents/1_en_impact_assessment_part1_v4_418.pdf

Total gap to Ref2016		**99**	**177**	**294**	**386**	**627**

The study **“Assessing the state-of-play of climate finance tracking in Europe” (2017) by Trinomics, commissioned by the European Environment Agency (EEA)[91],** carries out an analysis on the state of information at 2017 regarding estimated investment needs at the EU level and for selected member states. It further conducts a survey of availability and accessibility of climate finance relevant data at a country level for 39 EEA member states[92], to assess investment needs until 2030.

The report **“Restoring EU competitiveness” (2016) by the European Investment Bank (EIB)[93]** does not consider the EU 2030 climate targets explicitly but it analyses the challenges of the low-carbon transition from the point of view of competitiveness. In practice, this report combines the EC estimates of investment needs with own elaborations, focusing on sectors that are critical to Europe’s competitiveness. In particular, it provides estimates of investment needs and the investment gap for the water and waste sector (see Table 12).

Table 12 Estimates of sectoral investments gap for the EU by the EIB.

Sector	Technology	Current (€ bn)	Investment needs (€ bn)	Gap (€ bn)	
Transport	Modernizing urban transport to meet global benchmarks	40	80	40	**80**
	Ensuring sufficient capacity in interurban transport	40	80	40	
Water & waste	Water security, including flood risk management	2	15	13	**90**
	Compliance rehabilitation of Europe’s water infrastructure	30	75	45	
	Enhancing waste management/materials recovery	3	8	5	
	Additional needs for resilient and efficient urban infrastructure	13	40	27	
Energy	Upgrading energy networks (gas and electricity)	47	64	18	**100**
	Energy efficiency in buildings and industry	42	112	70	
	Power generation, including renewables	41	53	12	
	Total	258	527	**270**	

The **“Action Plan: Financing Sustainable Growth” (2018) by the European Commission[94]** discusses the key challenges for the sustainability transition, as well as the main milestones of the EC agenda. It combines the previous estimates conducted by the EC for the investment needs to achieve the 2030 targets with the EIB estimates for the investment needs to restore competitiveness (for the water and waste sector). As shown in Table 12, to reach energy and climate goals, an additional funding of €180 billion per year is needed with respect to the current level of investments (i.e. the Ref2016 benchmark, see above). When considering the water and waste sector as a well, the investment gap rises to €270 billion.

91 Trinomics 2017, “Assessing the state-of-play of climate finance tracking in Europe - Final Report“. https://trinomics.eu/wp-content/uploads/2017/07/State-of-play-of-European-climate-finance-tracking-published-6-July-2017.pdf

92 These include 28 EU Member States, together with Iceland, Liechtenstein, Norway, Switzerland, Turkey, Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo, Montenegro and Serbia.

93 European Investment Bank (2018). “Restoring EU competitiveness 2016 updated version” https://www.eib.org/attachments/efs/restoring_eu_competitiveness_en.pdf

94 EU Commission (2018). “Action Plan: Financing Sustainable Growth” https://ec.europa.eu/info/publications/180308-action-plan-sustainable-growth_en

More in detail, current annual investments in the transport sector amount to €80 billion and additional €80 billion are needed to meet the targets. As for the water and waste sector, current investments amount to €48 billion per year and additional €90 billion are needed. For the energy sector, €130 billion are currently invested each year, while additional investment needs are estimated at €100 billion per year.

Studies based on IEA and IRENA scenarios

In the report **"Perspectives For The Energy Transition: Investment Needs For A Low-carbon Energy System" (2017) by the International Energy Agency and International Renewable Energy Agency (IEA and IRENA)**[95] joined forces to shed light on how the energy sector should develop, at the global level, in order to achieve the objective set out in the Paris Agreement.

The table below provides an overview of the targets, scenarios and models considered by IEA and IRENA.

Table 13 Overview of targets, scenarios and models considered by IEA and IRENA

<table>
<tr><th>Target</th><th></th><th>Scenarios and models</th></tr>
<tr><td rowspan="2">Limiting the global mean temperature rise to well below 2°C with a probability of 66%.

Between 2015 and 2100, the CO_2 budget estimation amounts to 880 Gt.</td><td>IRENA</td><td>• Renewable Energy Roadmap (REmap) energy mixes complemented with the E3ME, a global macro-econometric model model that covers the global economy.
• It represents a techno-economic assessment of energy system developments on a country level, for all G20 countries.
• Two scenarios: The Reference Case (also called the baseline or business-as-usual), and The REmap Case (also called the decarbonisation case) an accelerated renewables case based on decarbonisation targets.</td></tr>
<tr><td>IEA</td><td>• The model consists of three main modules: final energy consumption (residential, services, agriculture, industry, transport and non-energy use); energy transformation (including power generation and heat, refinery and other transformation); and energy supply.
• Detailed sector-by-sector and region-by-region projections for the World Energy Outlook (WEO) scenarios.</td></tr>
</table>

As summarized in Table 14, for the power generation, transport, buildings and industry (including heating and cooling) sectors the IEA estimates the investment gap to be $1.7 trillion yearly until 2050, which is obtained as the difference between the $3.5 trillion required and the $1.8 trillion invested in 2015. In the same report, the International Renewable Energy Agency estimates the same overall investment needs until 2050, i.e. $116 trillion, which indeed corresponds to a yearly investment of $3.5 trillion over 33 years. However, the IEA estimates the investment gap to be lower, at $0.900 trillion per year, i.e. $29 trillion in total. According to updated estimates by IRENA, reported in its **"Global Energy Transformation" (2018)**[96], the investment needs increased by $4 trillion to $120 trillion, but the investment gap decreased by $2 trillion to $27 trillion overall by 2050.

95 IEA and IRENA (2016). "Perspectives for the energy transition: Investment needs for a low-carbon energy system" https://www.irena.org/publications/2017/Mar/Perspectives-for-the-energy-transition-Investment-needs-for-a-low-carbon-energy-system

96 IRENA (2018). "Global Energy Transformation: A Roadmap to 2050 (2018 edition)" https://www.irena.org/publications/2018/Apr/Global-Energy-Transition-A-Roadmap-to-2050

Table 14 - Estimates of current investment and investment needs at the global level by IEA and IRENA

	Current investment ($ tn)	**Investment needs ($ tn)**	**Investment gap ($ tn)**
IEA	1.8	3.5	1.7
IRENA (2017)	2.6	3.5	0.9
IRENA (2018)	3.0	3.6	0.8

Academic Studies

Turning to academic studies, while many works study the economic implications of reaching the 2030 EU climate targets, only some discuss investment needs and gaps. For instance, **Duscha et al. (2016)**[97] assess if RES are able to positively contribute to the three objectives of European energy policy: combating climate change, improving security of supply and resulting in economic benefits (i.e., job creation and economic growth). **Pfeiffer et al. (2016)**[98] review the global stock of infrastructure which, if operated to the end of its economic life, implies a global mean temperature increase of at least 2°C. The three contributions summarized below discuss investment needs across climate policy scenarios.

Capros et al. (2018)[99] leverages on the PRIMES energy systems to present a set of scenarios that have been used to contribute to the Impact Assessment work by the European Commission in 2016. While the impact assessment studies mainly use two policy scenarios, named EUCO27 and EUCO30, this scientific paper illustrates a systematic analysis across the six different climate policy scenarios described before. The scenarios have been defined starting from a set of climate targets for 2030 and beyond: reducing GHG emissions, increasing energy efficiency, and increasing the penetration of renewable energy sources in the energy system. The results show that the yearly investment gap to 2050 spans between €180 billion (in the EUCO30 scenario) and €240 billion (in the EUCO+40 scenario).

McCollum et al. (2018)[100] computes the investment needs across different climate policy scenarios by implementing a variety of Integrated Assessment Models. To do so, the authors compare the cost of the low carbon transition following three different greenhouse gas emission pathways, namely Nationally Determined Contributions, 1.5°C and 2°C. Further analyses based on the supplementary information to the paper and averaging across models, yield an annual gap in low-carbon investments in the European Union equal to $20 billion, $147 billion and $96 billion to achieve the Nationally Determined Contributions, 1.5 °C and 2°C targets, respectively.

Finally, the cost of the transition to a low-carbon energy can also be estimated based on a simple but coherent methodology, which: i) assumes constant shares of renewable energy in each country, and ii) leverages on country and technology specific levelized cost of electricity (LCOE) to assess the cost of converting electricity production to renewable energy. Applying this methodology on data from Bloomberg New Energy Finance yields and estimate of the investment needs for each European

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97 Duscha, V., Fougeyrollas, A., Nathani, C., Pfaff, M., Ragwitz, M., Resch, G., Schade, W., Breitschopf, B., & Walz, R. (2016). Renewable energy deployment in Europe up to 2030 and the aim of a triple dividend. Energy Policy, 95, 314-323.

98 Pfeiffer, A., Millar, R., Hepburn, C., & Beinhocker, E. (2016). The '2 C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy. Applied Energy, 179, 1395-1408.

99 Capros, P., Kannavou, M., Evangelopoulou, S., Petropoulos, A., Siskos, P., Tasios, N., Zazias, G. & DeVita, Alessia (2018). Outlook of the EU energy system up to 2050: The case of scenarios prepared for European Commission's "clean energy for all Europeans" package using the PRIMES model. Energy strategy reviews, 22, 255-263.

100 McCollum, D. L., Zhou, W., Bertram, C., De Boer, H. S., Bosetti, V., Busch, S., Després, J., Drouet, L., Emmerling, J., Faz, M., Fricko, O., Fujimori, S., Gidden, M., Harmsen, M., Huppmnann, D., Iyer, G., Krey, V., Kriegler, E., Nicolar, C., Pachauri, S., Parkinson, S., Poblete-Cazenave, M., Rafaj, P., Rao, N., Rozenberg, J., Schmitz, A., Schoepp, W., Van Vuuren, D. & Riahi, K. (2018). Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals. Nature Energy, 3(7), 589.

country. Based on these results, investment needs for the low-carbon transition are estimated between €125 billion and €225 billion for the EU as a whole.

16.1.3 Financial markets in Europe and sustainable finance: the status quo

Against the estimates of additional investment needs described above, in this section we investigate where EU capital markets stand today in terms of funding environmentally sustainable economic activities. While 70% of debt financing for EU non-financial corporations (NFC) is currently provided by banks, developing deeper capital markets is one of the priorities for the EU. Hence, capital markets will arguably play an important role in financing the carbon transition.

The detailed analysis presented in this section can be regarded as a baseline scenario for EU financial markets in the absence of an EU Taxonomy.[101] Indeed, it could be argued that in this case, financial markets would not look dissimilar from today in a sustainable finance perspective. In this respect, this scenario is similar in spirit to the Ref2016 scenario described in the previous section.

Data

Our analysis is based on confidential security-by-security databases, namely the Eurosystem's Centralised Securities Database (CSDB), which contains information on the issuer side, and the Securities Holding Statistics Database - Sector module (SHS), which contains information on the holder side. We focus on debt and equity securities identified by International Securities Identification Number (ISIN) and issued by non-financial corporations (NFCs, according to the ESA2010 classification) resident in the EU.[102] For each ISIN, the dataset comprises information on the issuer, notably including its NACE code, as well as information on the institutional sector of holders. For the electricity generation, primary energy and automotive sectors, we have cross-checked the NACE code associated to the security based on data obtained from annual reports, and from the Paris Agreement Capital Transition Assessment (PACTA) project. Finally, one of our proposed approaches to estimating the share of financial investment associated with green activities is based on the FTSE Russell Green Revenues data.

European Financial Markets and Climate Policy Relevant Sectors

The EU taxonomy builds on the NACE code classification, recognizing that in several cases a more granular classification by technology is required in order to identify economic activities that can be considered sustainable. The scientific literature has pointed out that in order to assess the relevance of economic activities for with respect to climate mitigation, it is useful to consider NACE codes at the most granular level (NACE 4 digits) and to group them accordingly to the classification of Climate Policy Relevant Sectors (CPRS), developed in Battiston et al. (2017).[103] Recently, this classification has been used in the ECB Financial Stability Review.[104]

Figures 16 and 17 show the breakdown of market capitalization and outstanding bond amount, respectively, of EU issuers by NACE code (1 digit)[105] and by CPRS (level 1). The figures illustrate how the CPRS classification is complementary to the NACE codes and covering all the NACE macro-sectors included in the EU Taxonomy (A-F, H, J and L). For instance, some activities that pertain to the value chain of the transportation sector are classified in terms of NACE codes under C-Manufacturing. Regrouping the activities by CPRS allows gauging the investment more directly in relation to the climate mitigation domains. Another added value of using CPRS is that, while the sectors in the EUCO scenarios (see previous section) are not defined in terms of NACE codes, they are broadly comparable with CPRS. Hence, in the next section the CPRS classification will allow bridging between the estimation of the investment gap conducted by the EC in previous exercises and the current investments in the EU financial markets.

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101 In this analysis, the EU composition excludes Croatia, Sweden, Romania and the UK, - i.e. the countries for which detailed security-by-security holding information is not available.

102 The SHS covers holdings of investors residing in the euro area and non-resident investors' holdings of euro area securities that are deposited with a euro area custodian. In addition, the analysis presented in this report also utilizes detailed information about issuance and holdings of securities by non-euro area EU countries such as Bulgaria, the Czech Republic, Denmark, Hungary, and Poland.

103 Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. Nature Climate Change, 7(4), 283.

104 https://www.ecb.europa.eu/pub/financial-stability/fsr/special/html/ecb.fsrart201905_1~47cf778cc1.en.html#toc4

105 NACE codes belonging to main sections from A to M are shown.

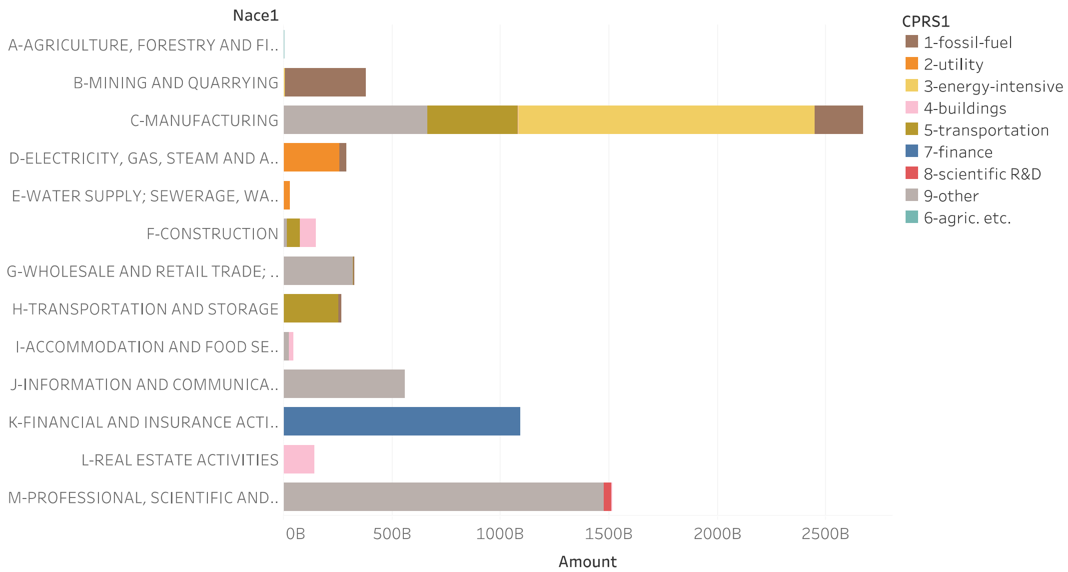


Figure 14 Breakdown of market capitalization by NACE (1 digit) and CPRS (level 1)

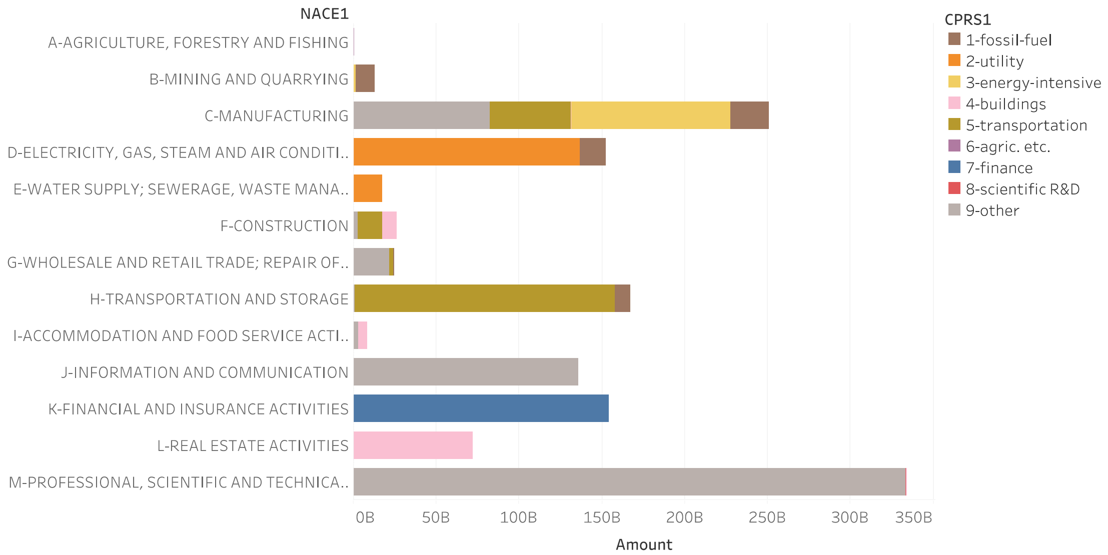


Figure 15 Breakdown of outstanding bond amount by NACE (1 digit) and CPRS (level 1)

In 2018, the total market capitalization of equity shares and outstanding amount of bonds issued by EU NFCs classified into the first six climate-policy relevant sectors (i.e. fossil-fuel, utility, energy-intensive, buildings, transportation and agriculture) is around €2864 billion and €456 billion, respectively.[106] In percentage terms, financial investments directed to firms classified into CPRS correspond to 37% of outstanding shares and 33% of outstanding bonds as reported in the table below.

[106] CPRS are based on the NACE classification, where a firm is classified into the one NACE sector associated with its main activity. However, firms may be active into various businesses; hence one needs firm-level data for a more precise assessment of the share of investment that is directed to CPRS. Still, in the absence of segregation requirements, there is no certainty on how firms use their funding.

Table 14 market capitalisation

Year 2018	Equity (€ bn)	Bonds (€ bn)
Values of securities issued by NFCs in CPRS sectors	2864	456
Values of securities issued by NFCs in all sectors	7786	1397

Figures 18 and 19 provide a more detailed breakdown of financial investments by showing the finer classification of CPRS level 1 and level 2 over time.

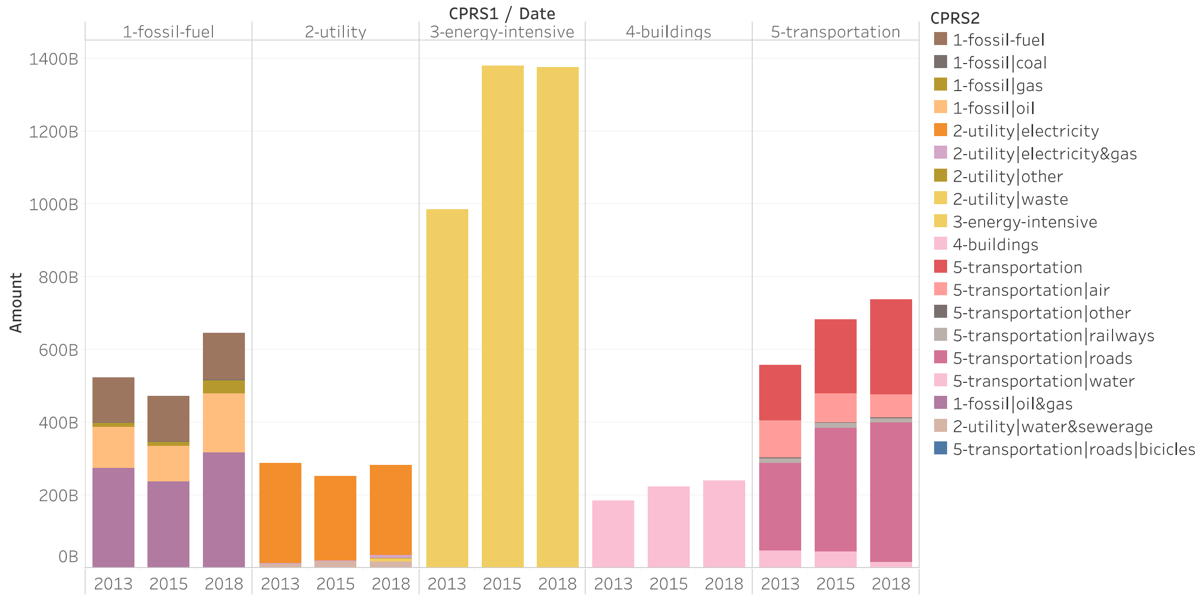


Figure 16 Breakdown of market capitalization by CPRS (level 1 and 2) over time

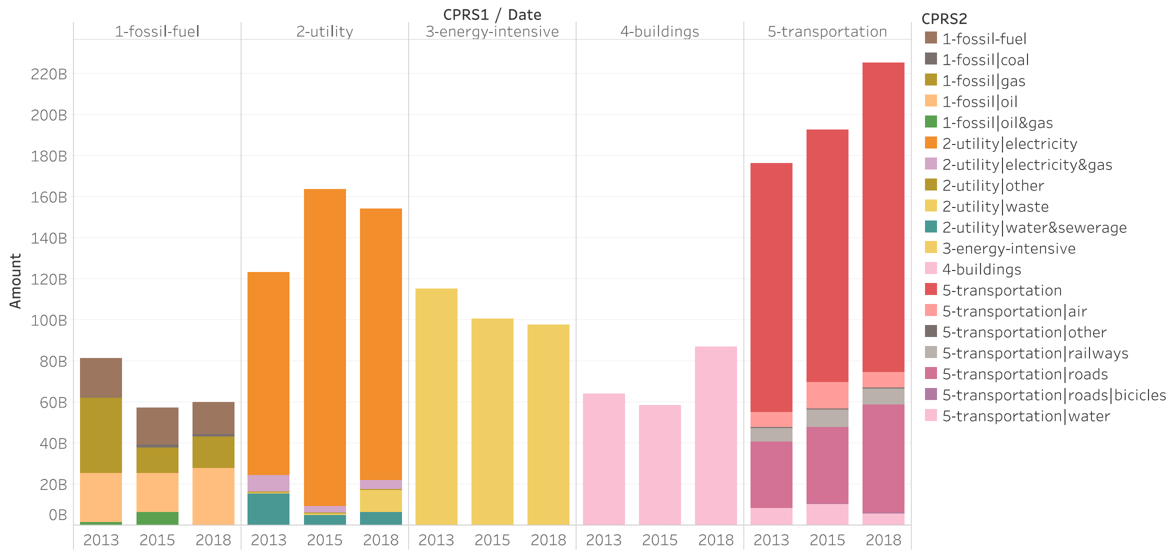


Figure 17 Breakdown of outstanding bond amount by CPRS (level 1 and 2) over time

Turning to holders, Figures 23 and 24 show the exposures (in billion and percentage) on the balance sheet of selected institutional sectors, towards NFCs active in the main CPRS sectors (i.e. fossil fuels, utility, energy-intensive activities, buildings and transport). Institutional sectors are defined following the ESA 2010 classification, namely households, NFCs, government, financial corporations, and rest of the world. From 2013 to 2018, securities holdings of institutional sectors have increased across the board. Against this background, investment into companies active in the main CPRS, including fossil fuels, has remained broadly stable in percentage terms.

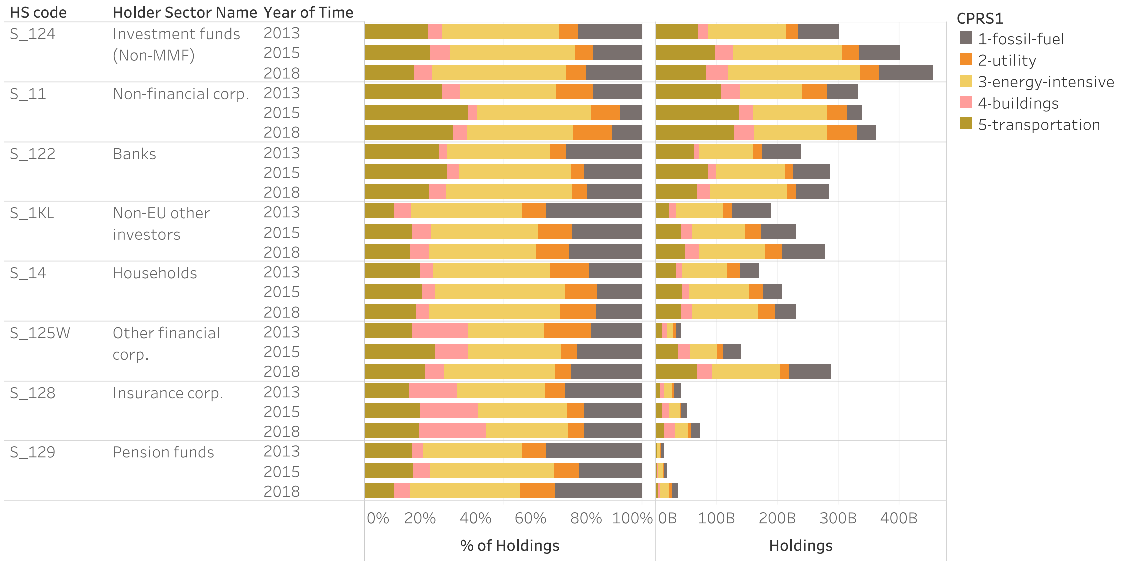


Figure 18 - Breakdown of exposures by institutional sector and CPRS (level 1) through equities

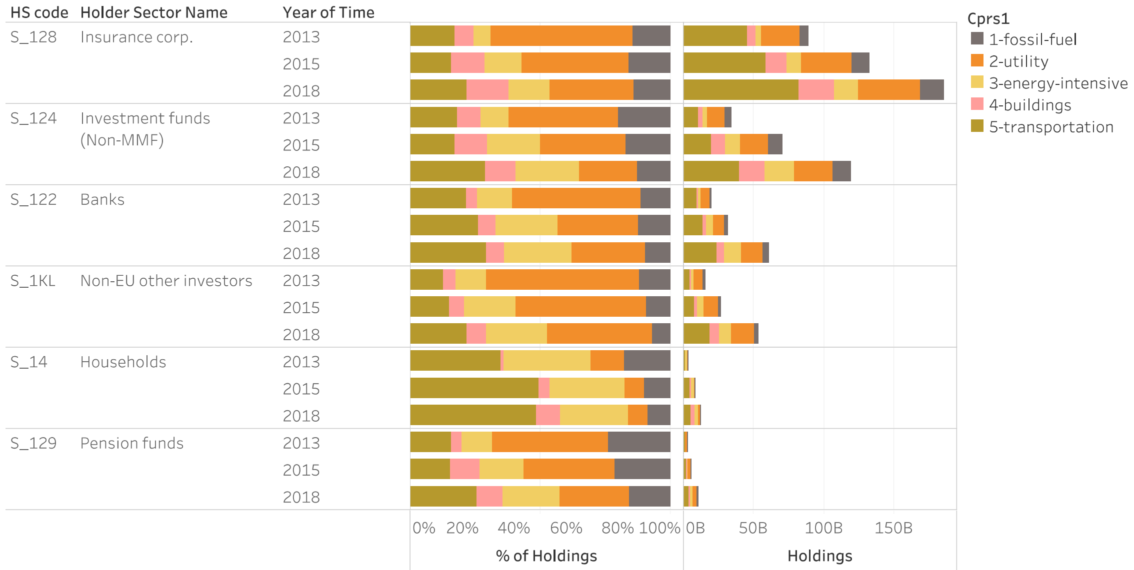


Figure 19 - Breakdown of exposures by institutional sector and CPRS (level 1) through bonds

The exposures of the institutional sectors aggregated across all CPRS in 2018 are reported in Tables 15 and 16 for equity and bonds, respectively. Investment funds and non-financial corporations are the top holders of CPRS sectors in the equity market. Across institutional sectors the relative exposure to CPRS ranges between about 30% and 45%. In the bond market, insurance and Investment funds are the top holders of CPRS sectors. Across institutional sectors the relative exposure to CPRS ranges between about 35% and 50%.

Table 15 - Aggregate exposures of institutional sectors in CPRS sectors through equity holdings in 2018.

Holder Sector	CPRS	Total (€ bn)
Investment funds (Non-MMF)	41.0%	1120
Non-financial corporations	30.5%	1031
Banks	36.4%	780
Non-EU other investors	41.2%	678
Other financial corporations	45.6%	645
Households	42.1%	558
Insurance corporations	40.9%	176
Pension funds	43.1%	85

Table 16 - Aggregate exposures of institutional sectors in CPRS sectors through bond holdings in 2018.

Holder Sector	CPRS	Total (€ bn)
Insurance corporations	47.7%	321
Investment funds (Non-MMF)	36.8%	295
Non-EU other investors	38.4%	137
Banks	40.5%	136
Money market funds (MMF)	44.2%	34
Households	36.5%	33
Pension funds	39.0%	23

Estimated investments in EU Taxonomy eligible activities

Measuring the share of market investment funding environmentally sustainable economic activities is not trivial because firms typically engage in multiple activities (Thomae et al. 2018).[107] In particular, only some activities may be Taxonomy-eligible. Hence, we estimate the financial market share which could be EU Taxonomy-eligible at the aggregate level. This approach involves the following steps:

- As a proxy of the EU Taxonomy thresholds, we use the EU-ETS (Emission Trading System) benchmarks for the activities for which these are available. The ETS benchmark is defined as the average of the first decile of the installations, ranked by emission efficiency.[108] This means that in each of the 52 sectors considered in the EU-ETS, on average, only 5% of the installations pass the EU-ETS benchmark.
- Further, in addition to the GHG intensity criteria, an activity has also to pass the DNSH criteria in order to qualify for the taxonomy. The combined application of the ETS benchmark and the DNSH criteria results in a smaller set of qualifying activities with respect to those that pass the benchmark. However, given that the actual Taxonomy thresholds might be looser than the corresponding ETS benchmarks, we assume that the combined effect results in the top 5% of the installations being EU Taxonomy eligible.
- Assuming that installations' GHG emission efficiency is not correlated with size[109], we obtain an approximation for the sustainable financial market share as the 5% of the total market capitalization or outstanding bond amount in relevant sectors.[110]

[107] Thomae Jakob, Dupré Stan and Hayne Michael, 2018, A Taxonomy of Climate Accounting Principles for Financial Portfolios, Sustainability 2018, 10, 328; doi:10.3390/su10020328

[108] https://www.emissions-euets.com/product-benchmarks

[109] One can expect that efficiency is correlated inversely with age of the installation. Whether there is a correlation between age and efficiency is unclear at this stage.

110 Notice that for the sector utility – electricity generation, for the activities that use renewable energy source there is no threshold (except for Hydropower). The same applies to railways (passenger and freight).

- For consistency, a threshold of 5% is also applied for those sectors covered by the EU Taxonomy for which no ETS benchmark is available.

16.1.4 Best outcome scenarios

The assessment of the implications of the Taxonomy for EU financial markets builds on the available estimates of additional investment needs, on the one hand, and on the estimates of market funding currently financing environmentally sustainable activities, on the other hand. These have been provided in the first and second sections, respectively. To reflect different levels of uptake of a Taxonomy providing increased transparency for financial markets, various best outcome scenarios are considered. These correspond to achieving the EU2030 targets, under the various EUCO27 – EUCO+40 scenarios described in Section a. In other words, this section presents estimates of what the impact would be for financial markets under each of these scenarios, assuming that the Taxonomy would contribute to achieve the targets. These estimates correspond to an upper bound for the impact of the Taxonomy, which coincides with the best outcome, where climate and energy targets are met, under the various scenarios.

The sustainable investment gap described in Section a. can be regarded as a form of additional CAPEX which firms could finance in various ways, including by raising money on the market. Although the relation between capital expenditures and financial investments is not straightforward, and the existing literature does not provide standard ways to relate them, this section provides insights on how the investment gap could be financed by various financial instruments.

CAPEX has an impact on firms' future profitability and can be a driver of increased market value of firms. CAPEX can be funded by firms with the issuance of new equity or via retained earnings, for example. However, no aggregate data are available to obtain a precise estimate of the CAPEX share that is funded via these sources. Therefore, the following calculations only consider the issuance of bonds and the granting of loans as funding sources for new sustainable investments. Hence, the estimates can be interpreted as an upper bound for the impact on the fixed-income market and bank loan exposure, as part of the estimated increase outstanding amounts will in fact be replaced by equity or internally generated means. A second assumption relates to the relative importance of bonds and loans as funding sources, by sector. This is assumed to be constant over time and equal to the observed funding mix in 2018 (in the following, "assumption of constant funding mix"). This appears as a reasonable assumption, as the funding mix does tend to remain broadly stable over time, though exhibiting striking differences across sectors.

The details of the estimation and the interpretation of the results shown in Table 17 are provided below.

Investment gap vs Ref2016.

- For each sector and scenario, the investment gap vs Ref2016 (in billions of euro) represents the difference in investment needs in each of the EUCO scenarios with respect to the Ref2016 scenario. As explained in the previous section, the Ref2016 is similar in spirit to the status quo, i.e. a business-as-usual scenario. The figures are based on those shown in Table 12. Interestingly, for the utility sector the investment gap turns negative under the most stringent scenarios. At the same time, the investment gap in buildings represents the higher share of the investment gap in all scenarios compared to other sectors, and close to 90% under EUCO+40.
- For each sector and scenario, the investment gap vs Ref2016 (percentage) represents the relative increase of investment needs with respect to the Ref2016 scenario. In the EUCO30 scenario, the values span from 4.4% in the transport sector to 88% in the buildings sector. Larger values of this indicator imply that the gap represents a larger share of the average annual investment level in the reference scenario.

Investment gap compared to outstanding bond and loan amounts.

- In a given sector, the ratio "gap / total bonds and loans" is defined as the investment gap divided by the total value of outstanding of bonds issued by firms in the sector and loans granted to firms in the sector. This number represents the percentage increase in bond issuance and bank loans that would be needed in order to finance the investment gap.

- In the EUCO30, the values of this ratio across sectors read 2.8%, 0.54%, 5.3% and 7.0%, for the utility, energy-intensive, transport and buildings sectors, respectively. Under the assumption of constant funding mix, these percentages correspond to the projected growth rates for the outstanding bond and loan amounts, associated to the respective sectors. Based on these growth rates, values in billions of euro are provided below.

Investment gap funded by bonds
- We define as "share of bonds" in a given sector the amount of bonds divided by the sum of bonds and loans invested in the sector. The quantity "investment gap funded by bonds" is defined as the product of the investment gap and the share of bonds, and it is measured in billion Euros.
- This quantity can be interpreted as the portion of the investment gap that would be financed through the issuance of new bonds under the assumption of empirical funding mix.
- In the EUCO30 scenario, the values we obtain across sectors read €4.7, €0.59, €12 and €6.1 billion, for the sectors utility, energy-intensive, transport and buildings, respectively.
- Notice also that not all of the additional bonds, even if they would be targeted at financing sustainable activities, would necessarily be issued under the EU Green Bond standard. Hence, the values of the investment gap funded by bonds represents an upper bound for the estimated impact of the Taxonomy on the issuance of Green Bonds under the EUCO scenarios.
- Overall, in the EUCO30 scenario, the total amount of additional bonds needed to fill the investment gap across sectors sum up to €23 billion, ranging up to €42 billion in the EUCO+40 scenario.

Investment gap funded by loans
- We define as "share of loans" in a given sector the amount of loans divided by the sum of bonds and loans invested in the sector. The quantity "investment gap funded by loans" is defined as the product of the investment gap and the share of loans, and it is measured in billion Euros.
- This quantity can be interpreted as the portion of the investment gap that would be financed through the granting of new loans under the assumption of empirical funding mix.
- In the EUCO30 scenario, the values we obtain across sectors read €6.3, €3.4, €19 and €126 billion, for the sectors utility, energy-intensive, transport and buildings, respectively.
- In the case of the buildings sector, the value tends to be significantly larger than in the other sectors across scenarios. This result can be explained by the fact that much of the investment gap described by the EUCO scenarios refers to energy efficiency improvements in residential and commercial buildings belonging to households and small firms, who typically do not issue bonds but finance their investments through loans.[111]
- Loans would play a key role in the transition of the transport sector as well. Indeed, part of the investments needed for this sector under the EUCO30 scenario refer, on the one hand, to improvements in the energy efficiency of vehicles, as well as the electrification of the vehicle fleet. These investments pertain to the CAPEX of automotive companies, many of which issue corporate bonds. On the other hand, another part of the investment gap relates to infrastructures and policies to facilitate adoption of electric vehicles, which pertain to local authorities, households and small firms, which do not issue bonds and which are finance through loans.
- Overall, in EUCO30 scenario, the total amount of loans across sectors sum up to €155 billion, ranging up to €586 billion in the EUCO+40 scenario.

16.1.5 Concluding remarks
The financial impact assessment presented in this section assumes that the EU Taxonomy would help redirecting financial resources towards sustainable economic activities and contribute to fill the investment gap in the relevant sectors. In the best case, the EU Taxonomy would help reaching the targets.

The estimated impact on financial markets of filling the investment gap varies across sectors and scenarios. In general, however, the increased financial investments towards relevant sectors appear to be within reach, at least under the least stringent scenarios (EUCO27 and EUCO30), compared to the current size of the corporate bond market and outstanding loans to NFCs.
Even in the most stringent scenario (EUCO+40), estimates show that the (green) bond and loan issuance would increase by around 4.9% in the energy-intensive sector and by 6.0% in the transport

[111] The focus is on non-financial corporations, hence "green mortgages" are excluded from the calculations.

sector. This also means that filling the gap is compatible with a modest increase of the leverage of relevant sectors and with a reasonable increase of the exposure of institutional investors, via bond holdings and loans, to firms in the relevant sectors.

At the same time, focussing on the bond market, the increased annual financing needs under all scenarios are close to the outstanding bond amounts currently financing sustainable activities in the energy-intensive, buildings and transportation sectors. In particular, it is estimated that less than €1 billion additional bond financing would be needed annually in the energy intensive sector under the EUCO27-30 scenarios, while the outstanding bond amount currently financing EU Taxonomy-eligible activities in this sector is also estimated at around €1 billion. This figure increases to around €10-12 billion for the transport sector, where bond financing needs under the least stringent scenarios are estimated at €10 billion. For the utilities sector, where €10 billion bonds are estimated financing Taxonomy-eligible activities, increased bond financing needs amount to €6 billion in the EUCO27 scenario.

Table 17 Investment Gap and EU Financial Markets. Estimated breakdown of investment gap financing across CPRS sectors and EUCO scenarios

Sector (CPRS)		Scenarios				
		EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
Utility	Investment gap vs Ref2016 (€ bn)	14	11	7	1	-5
	Investment gap vs Ref2016 (%)	21	16	10	1.5	-7.5
	Ratio gap/total bonds and loans (%)	3.5	2.8	1.8	0.3	-1.3
	Gap funded by bonds (€ bn)	6.0	4.7	3.0	0.4	-2.1
	Gap funded by loans (€ bn)	8.0	6.3	4.0	0.6	-2.9
Energy Intensive	Investment gap vs Ref2016 (€ bn)	2	4	9	14	36
	Investment gap vs Ref2016 (%)	13	27	60	93	240
	Ratio gap/total bonds and loans (%)	0.27	0.54	1.2	1.9	4.9
	Gap funded by bonds (€ bn)	0.29	0.59	1.32	2.06	5.3
	Gap funded by loans (€ bn)	1.7	3.4	7.7	11.9	31
Transport	Investment gap vs Ref2016 (€ bn)	26	31	24	28	35
	Investment gap vs Ref2016 (%)	3.7	4.4	3.4	4.0	5.0
	Ratio gap/total bonds and loans (%)	4.4	5.3	4.1	4.8	6.0
	Gap funded by bonds (€ bn)	10	12	9	11	13
	Gap funded by loans (€ bn) *	16	19	15	17	22
Buildings	Investment gap vs Ref2016 (€ bn)	48	132	255	344	562
	Investment gap vs Ref2016 (%)	32	88	170	229	375
	Ratio gap/total bonds and loans (%)	2	7	13	17	28
	Gap funded by bonds (€ bn)	2.2	6.1	12	16	26
	Gap funded by loans (€ bn)	46	126	243	328	536
	Total investment gap (**€** bn)	90	178	295	387	628
	Total gap funded by bonds (€ bn)	18	23	25	29	42
	Total gap funded by loans (€ bn)	72	155	270	358	586

* The amount of loans granted by euro area banks to the transportation and storage sector (H) and information and communication sector (J) are only available at an aggregate level. Thus, the denominator in the ratio gap/bank loans for the transport sector refers to the total amount of the loans granted to the two sectors combined (H+J).

16.2 Qualitative analysis of the transmission channels of the Taxonomy

16.2.1 Current situation of the market and baseline scenario

The situation is currently characterized by the coexistence of several private and public taxonomies with different approaches, scopes and objectives. The lack of a harmonized EU taxonomy might pose several risks, summarized in the following table.

Table 18 Risks due to the absence of a European taxonomy

Risks	Description	Consequences
	Several Member States have already or intend to have a	

Fragmentation of practices and standards	national taxonomy framework for sustainable investments, with diverging scopes, mandatory characters and links with international initiatives, depending on their national context. Other MS do not have any taxonomy. In the same way, several market-led and market-driven classifications, national, regional or global coexist.	⇨ Divergent classifications are a source of confusion for investors, especially in retail. ⇨ Fragmentation of classification may discourage cross-border sustainable investments, due to the lack of clarity and comparability of standards. ⇨ Divergent classifications increase the cost of entry for firms and investors (high search costs). They may become more reluctant to enter this market given the uncertainties.
Absence of regulation regarding the definition of sustainable activities	The lack of a unified approach might increase the risk of greenwashing and reduce the accountability of classification providers.	⇨ Loss of confidence of retail investors who could be discouraged to invest in green assets. Potentially reduced investment in sustainable development. ⇨ Unfair competitive advantage for companies/investors that benefit from a 'green' label with few constraints.
Lack of awareness, information and clarity	Currently, green products are not always identified and when they are, the information/definition might not be sufficiently understandable. A clear identification of green assets would increase the adequacy of products selling.	⇨ Inexplicit assets characteristics would limit the ability of retail investors to show a preference for green assets. ⇨ A commonly agreed framework would increase investors' confidence in green market integrity.

Without any regulatory intervention, substantial evolution of the state of play is not foreseen, maintaining these risk factors (no widely agreed classification would emerge) and hampering a much-needed increase in the level of sustainable investments. These factors motivated the Commission's proposal for a regulation on the establishment of a framework to facilitate sustainable investment. The EU Taxonomy is assessed against the previous baseline scenario.

16.3 Cost and benefit analysis for relevant stakeholders

The Taxonomy will generate positive externalities, albeit its implementation could increase costs for individual firms

Table 15 – Cost and benefit analysis for relevant stakeholders

Organisation	Benefits	Costs
Financial market participants, in particular banks and insurers	• The Taxonomy will be a common tool available to all green finance actors to identify sustainable assets. Therefore, the costs associated with developing and updating their own classification will be reduced. It would particularly benefit financial institutions that have not yet developed their own approach. • The Taxonomy will be used as a basis for other legislation to provide more transparency, such as the disclosure framework, the suitability test and possibly a revision of prudential requirements or a Green Bond Standard and/or European labels (e.g. Ecolabel). The same tool will be used for different purposes. • The activity-level approach followed by the Taxonomy can also help investors to mainstream sustainability into their investments. It can facilitate the discussion with finance firms to foster the integration of sustainability factors. • A reduced fragmentation and more clarity on definitions can limit the risk of greenwashing and the reputation and liability risks to which green investors are exposed. It would also ensure a level playing field. • By being the first to implement a commonly agreed Taxonomy, first movers will benefit from increased competitiveness.	• The phase-in to the Taxonomy might lead to increased cost as investors and financial actors will have to develop adequate tools (especially in IT and internal processes), obtain information (or contract a third party to provide the necessary data) and train their staff: o A cost increase is expected in order to enhance the IT systems supporting the collection and aggregation of data. o The use of the Taxonomy will require qualified professional advisers or in-house specialists, generating higher costs (particularly for project financing and debt products; for funds it might be as simple as getting a third party to do it for them). • It will be particularly challenging as very few companies are used to providing the necessary information, especially for SME or emerging markets (see below). For project and corporate financing accessing the necessary data might be easier.
Corporations and investees	• The Taxonomy will be the common tool used in several regulatory frameworks, such as the disclosure framework for environmentally sustainable investments and finance. • If the Taxonomy increases the interest of investors in sustainable products, it will encourage firms to incorporate sustainability concerns	• As for financial institutions, it might be costly for companies to correctly assess whether activities are in line with the Taxonomy (data quality and availability). Internal processes and procedures should be upgraded to support the adoption of the Taxonomy across the whole investment process: data collection,

	into their strategy. By identifying its green activities, a firm can diversify its investor base. Further, it provides a clear path for companies on how to transition (e.g. set up targets). • A better identification of firms' green assets can be used as a metric in a long-term business strategy or for marketing purposes.	monitoring and reporting. These costs might be difficult to bear, especially for SMEs and non-European companies, and lead some companies to prefer not to identify their assets. The structure of the Taxonomy (NACE code activity level) renders it difficult to link companies' revenues to activities and thresholds (metrics) where applicable. Bigger companies which benefit from economies of scale might be privileged. Those that believe they do not meet the criteria might be discouraged. • However, it should be noted that the Taxonomy aims to reflect existing EU standards and legal commitments in the area of the environment and climate change, thus limiting new compliance costs for those market players already subjected to the relevant rules. • Companies conducting the activities covered in the Taxonomy might benefit from more interest and investments than those outside of the scope (particularly for 'neutral sectors'). Green activities help companies limit risk from a climate perspective, but there is no definitive evidence that green activities are less risky than others from a non-environmental perspective. However, the possibility of unintended consequences (bubble or market distortion) due to increased investments in companies that meet Taxonomy criteria seems rather limited.
Retail consumers	• Reduced information asymmetries: the increased transparency of assets and an easier access to green products will raise awareness among retail investors and limit search costs. • The Taxonomy will increase certainty and confidence of retail investors as the framework is shared by all investors and will have the 'approval stamp' of the EU.	• The effectivity of the identified benefits will depend on the appropriation of disclosure by financial institutions, since retail investors do not have the resources to assess compliance with the Taxonomy.

	• Increased competition: retail investors will be able to compare financial products more easily against one another through the use of the Ecolabel and/or standards that will follow, effective tools for distinguishing financial products.	
Regulators and supervisors	• Basis for further policy action: regulators and supervisors could leverage the Taxonomy to implement new green investment frameworks at a lower cost and as a reference for establishing policies that encourage green investments/financing by private as well as public actors. It should be the reference to monitor capital flows towards green investments, to set up targets, etc.	• Regulators and supervisors who have already developed their own taxonomy might need to adapt their system.

- **Cross-cutting issues**

First of all, given the massive negative impacts associated with climate change,[112] the promotion of sustainable investments to fill the investment gap provides substantial positive externalities for our society compared to the current situation.

<u>Table 16 – List of substantial positive externalities of a European Taxonomy on Society</u>

Geographical distribution	When designing the Taxonomy, the TEG has focused on sustainable economic activity and its contribution to a net-zero 2050 economy. National energy mixes for instance have not been taken into consideration. However, the DNSH section might integrate some considerations on geography as the environmental impact of an investment might differ according to where it is implemented.
Social impact of divestment and/or reorienting capital flows from some activities to others	The impact of the Taxonomy on social issues is hard to assess but seems rather limited, given that it is a soft law tool designed to help investors more easily identify green assets. Negative social impacts might arise if a specific company decides to adapt its activities to fall into the remits of the Taxonomy and thus cause workforce adjustments or the need to develop new skillsets. The potential for job creation in green industries should also be considered (as of 2017, 4.2 million Europeans were employed in 'green jobs'[113]). However, the most significant impact comes from the transition rather than from the Taxonomy per se, as it could lead to structural changes in the economy.[114]
Impact on the environment	By increasing transparency for green investments, the Taxonomy should increase capital flow financing environmentally and climate-friendly activities. However, several activities identified in the Taxonomy could have an impact on the environment (such as hydropower on

112 IPCC (2018).
113 See https://ec.europa.eu/environment/efe/themes/economics-strategy-and-information/jobs-green-future_en.
114 JRC, 'EU coal regions: opportunities and challenges', investigates the impact of this transition on the regions most affected by the decline of coal'. https://ec.europa.eu/jrc/en/news/eu-coal-regions-opportunities-and-challenges-ahead.

	biodiversity). These impacts should be captured and mitigated by the DNSH and identified by financial actors when conducting due diligence.
Impact on the economy as a whole	The Taxonomy is a tool to identify the activities aligned with net zero emissions economy by 2050. Its purpose is to generate more investments and redirect investments to sectors with substantial positive externalities. In addition, the activities should be less affected by the possible economic consequences of the transition to a low-carbon economy. Although these investments are less risky from a climate perspective and will benefit from the transition, they should not be automatically considered as less exposed to other financial risks in the absence of definitive evidence.
Risk of generating financial disruptions: green bubbles, disorderly correction of current market distortions, stranded assets and asset liquidity	By increasing transparency, the Taxonomy might raise interest for certain investments in green assets (and certain actions and technologies) and reduce interest in others. Intuitively, an increased demand for green products might generate a decorrelation between asset valuation and its fundamental value. Such a green bubble might have adverse consequences for the financing of sustainable projects in the long term and for the market from a financial stability point of view. However, it is important to highlight that the Taxonomy proposal is incorporated in the broader framework of EU climate strategy, which aims to generate more opportunities related to a low-carbon economy and therefore generate more sustainable activities that fulfil demand. On the contrary, the activities which are not considered sustainable might be considered less attractive by investors. However, the risk of creating stranded assets (e.g. assets which might be subject to a price depreciation resulting from the implementation of climate policies, prior to the end of their economic life, and to the attached investment) does not result from the Taxonomy, but rather from the implementation of climate policies (especially in the case of a disorderly transition) and the lack of long-term perspectives from the investors. Overall, the Taxonomy might signal activities which are less exposed to transition risks a and therefore it can help preserving long-term financial stability.
Risk of creating inconsistent incentives	The design of a sustainable Taxonomy might initiate some distortions resulting from inconsistent incentives, such as a difference of treatment between two activities with a similar contribution to mitigation or providing incentives to over-invest in an activity that allows achieving some objectives but damages others. Inconsistent incentives might also result from the interaction with other regulatory framework, such as a contradiction between the Taxonomy and certain public policies (if, for instance, the Taxonomy is not updated fast enough). To prevent such a situation, several firewalls have been developed: • First, to tackle the risk of incorporating in the Taxonomy activities which have other negative environmental consequences, following the EC proposal the TEG has paid specific attention to assessing that the activity does not significantly harm other environmental purposes (see Section 2.1.). Second, to ensure the proper incorporation of the most recent regulations and consideration of future regulations, the TEG has interacted with EC-relevant DGs

	(energy, climate, environment, etc.) and Member States have been regularly informed by the Commission through a dedicated expert group.
Impact on competition within a given sector and across sectors	The integration of an activity into the Taxonomy is based on its contribution to mitigating GHG emissions, without causing significant harm to several other environmental objectives. Therefore, within a sector, activities have been treated equally from this perspective. However, given time constraints, the TEG has chosen to focus on eight sectors with a significant interest in the transition. This is the reason why the EC proposal suggested creating a Platform on Sustainable Finance that will be in charge of further developing the Taxonomy.

During its discussions, the TEG has identified and tried to address several risks. For the time being, classifications are mainly used for the bond market. The TEG is, however, paying attention to ensure that the Taxonomy can be used for all types of financial products.

To ensure the broadest usability of the Taxonomy possible, the TEG had to arbitrate between granularity and flexibility as well as between complexity and clarity. A very granular Taxonomy, which uses precise metrics and thresholds, is expected to provide clarity and to minimise the risk of greenwashing. Nevertheless, there is a risk that requirements that are too granular and stringent lower the willingness of stakeholders to take up the Taxonomy, due mainly to the costs to access the necessary data and adapting their internal processes. On the other hand, more flexibility in the definition of screening criteria may facilitate the use of the Taxonomy but increase significantly the risk of divergent interpretations and greenwashing.

Another challenge regarding the definition of the screening criteria is setting the adequate level of thresholds. Setting too low or too high thresholds, which do not reflect best market practices, would undermine the Taxonomy's ultimate goal of redirecting financial flows towards sustainable investments. Consequently, the selection of the Taxonomy's thresholds has been carefully considered, based on existing standards and consultation processes with experts in the relevant sectors.

The Taxonomy will apply globally, but in the majority of cases, avoidance of 'significant harm' against environmental objectives 3-6 is based on EU legislative requirements. The TEG has accounted for this geographic challenge by drawing out the material thresholds embedded within the EU law, rather than referencing legal text directly.

The qualitative impacts identified above may vary significantly, depending on several factors. The impact of the Taxonomy would increase if other incentives and/or regulations refer to the Taxonomy as a standard for the definition of what should be considered as 'green'. For instance, the creation of an Ecolabel for funds and financial products would widely contribute to the adoption of the Taxonomy. As lined out in the Commission's Action Plan 'the Commission will explore the use of the EU Ecolabel framework for certain financial products, to be applied once the EU sustainability Taxonomy is adopted'. Referring to the Taxonomy, the Ecolabel would considerably increase its visibility. This is also true for other standards, for example national labels, that will have to align with the Taxonomy.

Furthermore, according to the Commission's action plan[115], 'building on the development of the EU sustainability Taxonomy, the Commission will assess whether more appropriate capital requirements [for example in form of a 'green supporting factor'] could be adopted to better reflect the risk of sustainable assets held by banks and insurance companies. […] For instance, in its calibration, the

[115] See Communication from the Commission Action Plan: Financing Sustainable Growth: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0097&from=EN

Commission will consider all the available evidence (*emphasis added*) on the link between energy efficiency savings and mortgage loan performance'.

Initiatives and research on other measures, such as the EU GBS also have planned interaction with the Taxonomy. Its impact thus not only depends on the Taxonomy itself, but also on its 'environment'.

The Commission's legislative proposals on sustainable finance also include propositions to amend existing European Directives (MiFID II and IDD) in order for them to include 'ESG considerations into the investment and advisory process in a consistent manner across sectors'.[116] As an example, the Commission proposes amending the Delegated Regulation (EU) 2017/565 by referring to the Taxonomy for a definition of 'environmentally sustainable investment'. These amendments also propose the creation of 'a mandatory requirement to take into account ESG preferences in the advisory process (both in the customer profiling and product selection)'.[117]

The impact of the Taxonomy would be further increased if the ESAs can use the Taxonomy for climate scenario analysis and, at a later stage, climate stress testing.[118] By defining sustainable investments the Taxonomy can indeed facilitate the task of building bottom-up climate scenarios, activity by activity.

Furthermore, the use of the Taxonomy in disclosure and ESG analysis would further increase its visibility. On 7 March 2019, the European Parliament and EU Member States reached a political agreement for new rules on disclosure requirements related to sustainable investments and sustainability risks for the financial services sector.[119] Building on three main pillars, the elimination of greenwashing; regulatory neutrality; and the establishment of a level playing field, this new regulation is part of the same legislative package as the Taxonomy. The services of the European Commission will soon publish a fitness check of the EU framework for public reporting by companies, including non-financial reporting. It is possible that the next European Commission may decide to propose an update of the Accounting Directive (2013/34/EU), as amended by the Non-Financial Reporting Directive (2014/95/EU). The usability of the Taxonomy would benefit from an increasing number of 'companies disclosing adequate sustainability-related information'.[120]

The usability of the Taxonomy will also depend on the ability to solve current data issues. Solving these problems (including data availability, consistency, accessibility, reliability and disclosure) will require a broad appropriation of the Taxonomy by the private sector and capacity building at a European as well as an international level, especially for SMEs and non-sustainable investors. Before the Taxonomy will be fully implemented there will in any case be a transition or phase-in period in practice, given the current lack of data.

Lastly, the future dynamism and adaptability of the Taxonomy will also depend on the Platform on Sustainable Finance, which will help to promote data transparency and technology transfer as well as to propose policy improvement.

116 https://ec.europa.eu/info/law/better-regulation/initiative/1185/publication/237241/attachment/090166e5baeab2bd_en.
117 https://ec.europa.eu/info/law/better-regulation/initiative/1185/publication/237222/attachment/090166e5baeabd08_en.
118 https://ec.europa.eu/info/law/better-regulation/initiative/1185/publication/238025/attachment/090166e5baea4e23_en.
119 http://europa.eu/rapid/press-release_IP-19-1571_en.htm
120 https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2019-non-financial-reporting-guidelines-consultation-document_en.pdf

16.4 Conclusions

The taxonomy identifies economic activities substantially contributing to climate change objectives within selected sectors representing 93.2% of GHG emissions as well as a significant proportion of GDP and total employment at the EU level.

The impact assessment of the taxonomy builds upon the existing estimates regarding the investments needs to achieve targets associated with the low carbon transition and other sustainability objectives. The analysis takes into consideration the current significant exposures of institutional investors to climate policy relevant sectors in the equity and bond markets.

The estimated impact on financial markets of filling the investment gap varies across sectors and scenarios. In general, however, the increased financial investments towards relevant sectors appear to be within reach, at least under the least stringent scenarios, compared to the current size of the corporate bond market and outstanding loans to non-financial corporations. Even in the most stringent scenario, estimates show that the (green) bond and loan issuance would increase by around 4.9% in the energy-intensive sector and by 6.0% in the transport sector. This also means that filling the gap is compatible with a modest increase of the leverage of relevant sectors and with a reasonable increase of the exposure of institutional investors, via bond holdings and loans, to firms in the relevant sectors.

The taxonomy is expected to bring benefits to financial markets participants, in particular banks and insurers, by facilitating the identification of sustainable assets and consequently the integration of sustainability factors in their investment decisions. The taxonomy is also expected to encourage the incorporation of sustainability concerns by corporations and investees into their strategy, providing an opportunity to diversify its investor base and more certainty on the transition path. The main costs derived from the implementation of the taxonomy relate to the collection and management of data needed to assess the compliance with the defined screening criteria.

Retail consumers will benefit from the increased transparency, easier access to green products (with reduced risk of greenwashing) and better comparability. Finally, regulators and supervisors could leverage the taxonomy to implement new green investment frameworks at a lower cost. The actual impacts may vary significantly depending on several factors, the adoption of related regulatory actions (e.g. mandatory integration of ESG considerations into the investment and advisory process) and the level of appropriation of the taxonomy by the private sector, at the same time depending on its usability and dynamism.

PART E: Next steps for the Taxonomy

This section elaborates potential ways forward for the Taxonomy and the technical work of the Platform on Sustainable Finance.

17. The extension of the TEG and development after TEG

17.1 TEG extension

As discussed in section 2.1, this report details the recommendations of the TEG. However, the TEG has agreed to continue to support the Commission until the end of 2019 in preparation for the future development of a Taxonomy. This reflects the fact that, while the recommendations in this report provide the basis for an EU Taxonomy, further refinement of the criteria may be required after feedback from stakeholders. The TEG will use this time to:

- Refine and further develop some incomplete aspects of the proposed technical screening criteria for substantial contributions and avoidance of significant harm.
- Seek additional feedback on criteria that have not yet been subject to public consultation.
- Develop further guidance on implementation and use of the Taxonomy.

The TEG will not further expand the scope of the climate change mitigation activities covered under the Taxonomy in this phase, nor will it seek detailed feedback on screening criteria which have already been reviewed. Feedback received will be incorporated into a report submitted to the Commission in late 2019.

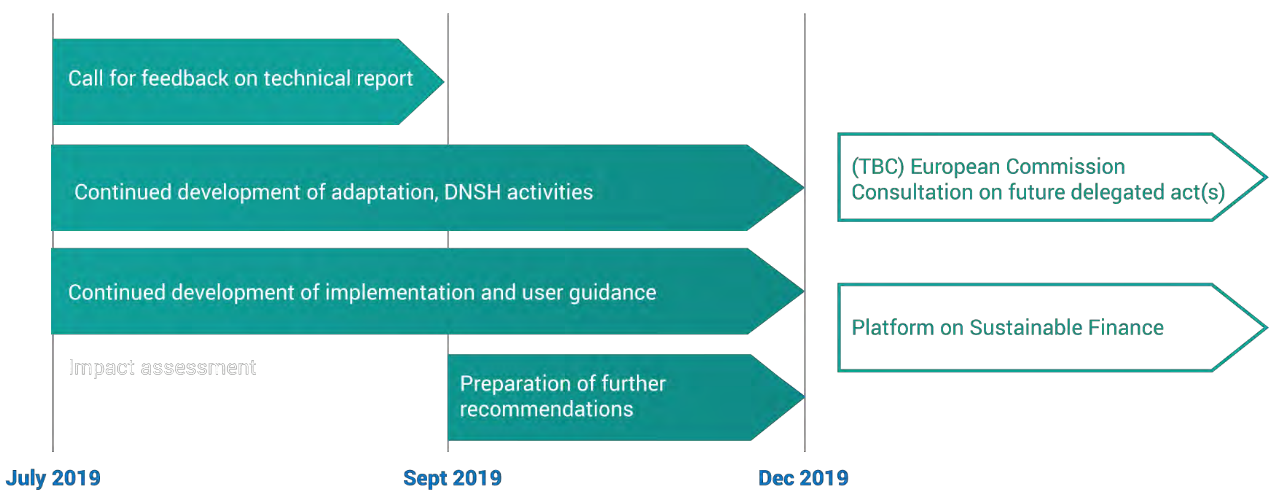


Figure 20 Timeline of the next phase of the Taxonomy development

These recommendations are designed to inform a proposed Delegated Act to implement the Taxonomy. Under the draft regulation, this would be developed by the European Commission and subject to full public consultation as required under standard procedures.

The proposed Taxonomy regulation also envisages a permanent Platform on Sustainable Finance to take on the role of the TEG in providing technical assistance and recommendations on technical screening criteria.

Some technical screening criteria proposed by the TEG in this report will require periodic revisions; others require further development. The implications of the TEG's work for the platform are discussed below.

17.2 Ongoing development beyond the TEG

The recommendations in this report, including the economic activities and screening criteria, are designed to inform future legislation to implement the Taxonomy. Under the proposed Taxonomy regulation, the European Commission would be empowered to adopt delegated acts to further develop the Taxonomy and these would be subject to consultation as required under standard procedures.

The proposed Taxonomy regulation also envisages a permanent *Platform on Sustainable Finance* to take on the role of the TEG in providing technical assistance and recommendations on technical screening criteria. Article 15 of the proposed regulation sets out the proposed membership, comprising of representatives from the private sector, individual experts and representatives of the European Environment Agency, the European Supervisory Authorities, the European Investment Bank and the European Investment Fund.

Some technical screening criteria proposed by the TEG in this report will require periodic revision, and others may require further development beyond the terms of the extension of the TEG. The Platform would advise on the progressive development and update of the Taxonomy, including identifying additional activities for future inclusion and aiding the Commission in contextualising and interpreting stakeholder feedback. In addition, the platform is envisaged to provide ongoing advice on the impacts of the Taxonomy criteria and monitoring capital flows towards sustainable finance objectives.

In developing the Taxonomy methodologies and technical screening criteria, the TEG has developed greater understanding of the structures and competencies required to undertake this kind of work. The TEG has also benefitted from and is grateful for the learnings from many of the Members who have participated in similar processes previously. We present these learnings as inputs to the development of the proposed Platform on Sustainable Finance. The TEG's comments focus on resourcing, activities and operational considerations.

Resourcing

Since June 2018, the TEG has developed technical screening criteria for 67 activities expected to contribute to climate change mitigation and technical screening criteria for adaptation.

From January – May 2019, the TEG benefitted from the insights of upwards of 150 additional experts, as well as expert staff within the organisations or agencies of TEG members. This indicates the scale of the technical challenge, as well as the breadth of expertise required. When establishing the Platform, resourcing is required that is commensurate to the scale of the technical challenge.

When selecting members or models for resourcing the Platform, the TEG considers that the following competencies are needed:

- Within the platform:
    a. Expertise in translating science into practical guidance sets for finance and industry;
    b. An appreciation of interactions between technological and environmental systems and the inter-dependencies among different activities and actions;
    c. An understanding of economy and financial systems and the interactions between them, and how systems transitions can be supported by the Taxonomy;
    d. Expertise in climate, environmental and financial policy on EU and national level;
    e. Expertise in different sectors and relevant technological developments;
    f. Expertise in sustainable finance, sustainability, corporate analysis and ESG-related products;
    g. Should the Taxonomy be extended to social objectives in future, relevant expertise would be needed.

- In addition, the Platform should have the ability to commission or source additional studies to aid in decision-making where specific expertise is required such as:
    a. Expertise in climate change mitigation and adaptation, sustainable use and protection of water and marine resources, air and soil, circular economy, waste prevention and recycling, pollution prevention and control and protection of healthy ecosystems, their nexus and interactions;
    b. Expertise of a scientific and technical nature at activity and sectoral level.

Tasks

In addition to the roles proposed in the regulation (technical development, extension and enhancement of the Taxonomy), the TEG considers additional activities are necessary:

- The Platform should build on the current TEG recommendations - this includes agreeing to the scope of the next phase of the Taxonomy encompassing those “greening by” and “greening of” activities currently not addressed due to limited time as well as identifying additional activities;
- Immediate oversight during transition period. Uptake of the EU Taxonomy will require a transition in market awareness, understanding and availability of data. During this period, the Platform should observe the uptake of the Taxonomy through periodic market surveys and direct feedback from industry and the financial sector). Dialogue with Member States in particular, including feedback on uptake of the Taxonomy, is felt to be critical to build trust in the process and enhance usability and implementation;
- Regular outreach and communication to the intended users of the Taxonomy to promote understanding of its use, including transparency on progress of Taxonomy implementation, addressing each of the points above;
- Consideration of and if necessary, activities to develop the Taxonomy in a way that allows market participants to scale up and automate the identification of sustainable activities of companies or other issuers – from a classification system and technology perspective.
- Periodic revision of existing screening criteria and activities in the Taxonomy. Some screening criteria have been proposed with a specific review date in mind, based on expected market, research or regulatory developments. Further thought will need to be given regarding the review process and timing;

Operations

On operational aspects of the platform, TEG makes the following recommendations:

- The governance, composition and resourcing model of the Platform should be clear to external observers and stakeholders including transparency on the ongoing proceedings, as well as the results of deliberations. Community support for outcomes will be enhanced by an appreciation of the nature of work involved;
- The Platform should be able to make impartial, independent judgements relating to the ongoing development and maintenance of the Taxonomy. While the development of screening criteria is reliant to some extent on legislative and regulatory developments, in order to meet stated policy objectives, it is important that the Platform should be able to recommend technical screening criteria which may at times exceed existing legislative requirements;
- Consistent with the approach taken in the TEG’s Taxonomy report and call for feedback, the TEG recommends clearly distinguishing between technical development of screening criteria (which should be impartial and science-based) and consultation with expected users of the Taxonomy (financial market participants, companies and other issuers). A useful means to do this could be to have Independent Expert Groups convened to develop thresholds around an area of investigation, and separate (to avoid conflict of interest issues) User Representative Groups to comment on draft thresholds. The interaction between the two groups would allow refinement of thresholds before a public outreach phase;
- The Platform should ensure an appropriate balance between public and private sector actors, large and small- and medium-sized actors.

PART F: Technical screening criteria

This annex sets out the sector and economic activity-specific technical screening criteria and rationale for the TEG's analysis.

18. List of activities with technical screening criteria

18.1 Summary: climate change mitigation

Technical screening criteria for a substantial contribution to climate change mitigation have been developed for the following activities:

NACE Macro-sector	Activities
Agriculture, forestry and fishing	Growing of perennial crops Growing of non-perennial crops Livestock production Afforestation Rehabilitation, Restoration Reforestation Existing forest management
Manufacturing	Manufacture of Low carbon technologies Manufacture of Cement Manufacture of Aluminium Manufacture of Iron and Steel Manufacture of Hydrogen Manufacture of other inorganic basic chemicals Manufacture of other organic basic chemicals Manufacture of fertilizers and nitrogen compounds Manufacture of plastics in primary form
Electricity, gas, steam and air conditioning supply	Production of Electricity from Solar PV Production of Electricity from Concentrated Solar Power Production of Electricity from Wind Power Production of Electricity from Ocean Energy Production of Electricity from Hydropower Production of Electricity from Geothermal Production of Electricity from Gas Combustion Production of Electricity from Bioenergy Transmission and Distribution of Electricity
Electricity, gas, steam and air	Storage of Energy Manufacture of Biomass, Biogas or Biofuels

conditioning supply cont…	Retrofit of Gas Transmission and Distribution Networks District Heating/Cooling Distribution Installation and operation of electric heat pumps Cogeneration of Heat/cool and Power from Concentrated Solar Power Cogeneration of Heat/Cool and Power from Geothermal Energy Cogeneration of Heat/Cool and Power from Gas Combustion Cogeneration of Heat/Cool and Power from Bioenergy Production of Heat/Cool from Concentrated Solar Power Production of Heat/Cool from Geothermal Production of Heat/Cool from Gas Combustion Production of Heat/Cool from Bioenergy Production of Heat/Cool using Waste Heat
Water, sewerage, waste and remediation	Water collection, treatment and supply Centralized Wastewater treatment systems Anaerobic Digestion of Sewage sludge Separate collection and transport of non-hazardous waste in source-segregated fractions Anaerobic digestion of bio-waste Composting of bio-waste Material recovery from waste Landfill gas capture and energetic utilization Direct Air Capture of CO_2 Capture of Anthropogenic Emissions Transport of CO_2 Permanent Sequestration of captured CO_2
Transportation **and storage** **Transportation** **and storage cont…**	Passenger rail transport (inter-urban) Freight rail transport Public transport Infrastructure for low carbon transport Passenger cars and commercial vehicles Freight transport services by road Interurban scheduled road transport Inland passenger water transport Inland freight water transport Construction of water projects
ICT	Data processing, hosting and related activities Data-driven solutions for GHG emissions reductions

Construction and real estate activities	Construction of new buildings Renovation of existing buildings Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities Acquisition of buildings

18.2 Summary: climate change adaptation

There are no sector specific screening criteria for adaptation. Instead, the qualitative screening criteria for adaptation activities can be applied to all economic activities. The template provides information fields for on:

- how the economic activity contributes to adaptation
- the climate sensitivity of the activity to climate-related hazards
- the screening criteria
- illustrative examples of adaptation measures relevant to the economic activity (adaptation of an economic activity)
- how the economic activity can contribute to the adaptation of other activities (adaptation by an economic activities)
- compliance with the criteria developed by the do no significant harm criteria, and
- some of the relevant information sources.

A sample of adaptation activity templates have been developed to provide examples of the process a user would follow to identify adaptation activities.

NACE Macro sector	Activities
Agriculture, forestry and fishing	Growing of non-perennial crops Silviculture and other forestry activities
Electricity, gas, steam and air conditioning supply	Production of Electricity from Hydropower Transmission lines
Water, sewerage, waste and remediation	Sewage
ICT	Provision of specialised telecommunications applications for weather monitoring and forecast
Finance and Insurance **Professional, scientific and technical activities**	Non-life insurance Research and development (natural sciences and engineering) Engineering activities and related technical consultancy

Detailed activities: climate change mitigation

19. Agriculture

Why agriculture is addressed in the Taxonomy

Agriculture is the management of plants and animals to produce food, feed, fibre, fuel and other products. As a sector, it plays a central role in climate change, sustainable development and food security.
It is projected that by 2050 the global population will increase to 10 billion, resulting in a 50% increase in the demand for food. However, even at present, the food supply chain contributes 19-29% of global greenhouse gas (GHG) emissions, the majority of which, for most supply chains, occurs at the farm level (80-90%). This alone presents opportunities for significant climate change mitigation. However, agriculture differs from other sectors when considering climate change mitigation as it can act as both a source and a sink for GHG emissions. Soil carbon and biomass (trees, shrubs and grasslands) are also relevant as major pools of carbon. For this reason, agriculture has the potential to be a net positive sector from an emissions perspective. At the same time, agricultural productivity is simultaneously vulnerable to climate change (including, but not limited to, heat stress, drought, flooding, changes in seasonality and extreme weather events) and central to supporting adaptation and resilience through its provision of ecosystem services and income for billions of households worldwide.

Subjects covered

The following economic activities are explicitly addressed in the Taxonomy:

- Growing of non-perennials: including cereals, rice, leguminous crops and oil seeds, vegetables, melons, roots and tubers, sugar cane and fibre crops;
- Growing of perennials: including grapes, tropical and sub-tropical fruits, citrus fruits, stone fruits, other tree and bush fruits and nuts, oleaginous fruits, beverage crops, spices, aromatics and drug and pharmaceutical crops;
- Animal production: including dairy and other cattle and buffaloes, sheep, goats, pigs and poultry and the management of their waste (manure) and related grassland or pasture.

In addition, mixed farming, where combinations of the above activities are carried out on a farm, can be addressed via the application of the relevant thresholds and criteria from these same three activities.

Setting criteria and thresholds

As noted above, agriculture can act as both a source and a sink for GHG emissions. However, it may not be possible to reach net positive emissions in every instance of agricultural activity or on every farm, particularly those that specialise in nature and/or have low carbon stocking capacity. Therefore, the Taxonomy does not require the demonstration of net positive emissions at the activity or farm level, but instead requires that the following three criteria must all be met for agricultural activities to be recognised as delivering substantial contributions to mitigation:

1. Reduced emissions from ongoing land and animal management.
2. Increased removals of carbon from the atmosphere and storage in above- and below-ground biomass through ongoing land and animal management, up to the limit of saturation levels.
3. The agricultural activity is not being carried out on land that was previously deemed to be 'of high carbon stock'.

The lack of deep GHG reporting datasets from which to establish best performance benchmarks, coupled with the lack of emissions budgets or sequestration targets for the agricultural sector at either the EU or global level, meant it was not possible to set robust absolute GHG thresholds for either criteria 1 or 2. Furthermore, given the high degree of heterogeneity across the agricultural sector (in terms of production system, crop or livestock type, farm size, environmental and biophysical conditions, etc.), it was felt to be inappropriate to do so.

However, requiring a relative GHG improvement compared to an ‘own-farm counterfactual’ is workable within this context of high heterogeneity. For criteria 1, emissions reductions targets as a percentage of that counterfactual have been established using studies of the emissions reductions needed across the agricultural sector as whole over time. For criteria 2, recognising that carbon stocking potential is highly variable across different land parcels, but that carbon sequestration represents a large mitigation potential available to the agriculture sector, a simpler requirement has been set – simply that carbon stocks are increased over a 20-year period – which recognises that preventing ongoing carbon losses and increasing sequestration is viable to make a substantial contribution in this case. It is noted, however, that the studies on emissions reduction paths are limited in number and therefore the criteria would benefit from greater clarity on the precise transition needed in the agriculture sector to contribute to a net-zero economy in 2050.

In addition, recognising that relative GHG improvement targets are a fairly blunt instrument and require farm level GHG accounting, which is not yet widespread, an additional, alternative approach is proposed. Namely, demonstration of the deployment of a specified bundle of land and, if appropriate, animal management practices across the production area. From a review of the scientific literature, these practices have been selected because they deliver substantial mitigation with relatively high certainty across a range of biophysical and farming conditions. They should therefore be widely applicable and provide a more directly communicable approach to farmers, although this would benefit from testing with key stakeholders globally, including small- and large-scale farmers. The Platform on Sustainable Finance should regularly review this list of practices to integrate new advances in scientific knowledge. It would also be advantageous to work with existing standards and certification schemes to determine whether or how such schemes could be used as proxy indicators for compliance with these bundles of practices.

To maximise usability, it is left open to the user whether they demonstrate i) emissions reductions and increased sequestration or, alternatively, ii) the deployment of the specified bundle of practices. However, whichever approach is taken, three yearly audits are required to demonstrate ongoing compliance with the criteria and thresholds. This is to address the multi-year timeframes over which emissions reductions and carbon stocking can occur and acknowledges the risks to the permanence of carbon stocks.

It is noted that agriculture has the potential to supply materials to a variety of sectors, but these will primarily be addressed in the Taxonomy through the energy and manufacturing sectors (e.g. crops for bioenergy or crops for food respectively). No different treatment is proposed in the agricultural criteria depending on the ultimate use of the crops produced. This is for the pragmatic reason that many agricultural producers do not know in which supply chains their products will end up.

Impact of these proposals[121]
There are 10.5 million farms in the EU, using 173 million hectares (ha) of land for agricultural production (about 39% of the EU's total land area). One quarter (25.1%) of these farms are specialist livestock farms and just over half (52.5%) are specialist crop farms.

Most of these farms are small in nature, with two-thirds less than 5 ha in size. But the largest 3.3% of them (those over 100 ha in size) manage just over half (52.7%) of all farmland.

Agriculture contributed 1.2% to the EU's GDP in 2017, even without considering its importance as the key building block for the downstream food and beverages processing industry. It employs 9.7 million people, just over 4% of the working population, but these statistics vary significantly by country. In Romania, for example, nearly a quarter of the working population work in agriculture, and numbers are also high in Bulgaria, Greece and Poland.

The agricultural sector in the EU invested EUR 57.2 billion in 2017.

Next steps
Within and across these economic activities, the following are not (yet) addressed in this round of Taxonomy criteria, but all provide significant opportunities for emissions reductions across the agricultural sector as a whole:

- Taking land completely out of agricultural production for the purposes of restoring or re-establishing natural habitats, particularly peatland and other carbon rich landscapes. Such movements and impacts would merit additional consideration by the platform.
- Switching from higher emitting activities to lower emitting activities. For example, reducing cattle numbers and increasing legume production as an alternative source of protein, with a corresponding consumption switch between agricultural commodities. At this time, while livestock production, and in particular ruminant livestock production (beef, lamb and dairy), is a significant source of emissions in the agriculture sector, it is included in the Taxonomy due to the significant short-term mitigation potential associated with reducing emissions intensity in livestock management. However, it is noted that for absolute emissions from agriculture to continue decreasing beyond a certain point and to move towards net-zero targets by mid-century, reduced emissions intensity will need to be coupled as soon as possible with commensurate changes in consumption patterns and overall reduced per-capita consumption of livestock products, especially beef, lamb and dairy products.

  This implies both societal changes in terms of changing diets and reducing food waste, as well as structural transformations in the agricultural sector. Significant and coordinated policy efforts will be required to manage both consumer behavioural changes and to incentivise and manage structural change in the agri-food supply chain. Future Taxonomy updates should, however, whether high rates of meat consumption are compatible with a zero-carbon economy.
- More granular actions that deliver significant mitigation, but not at a sufficient level to be recognised as making a substantial contribution to climate mitigation for any of the three economic activities listed above. These measures or actions might include addressing energy or resource efficiency or land management through:

[121] All data relates to 2016, unless otherwise stated. Source: Eurostat - Agriculture, Forestry & Fisheries Statistics - 2018 edition, https://ec.europa.eu/eurostat/documents/3217494/9455154/KSFK-18-001-EN-N.pdf/a9ddd7db-c40c-48c9-8ed5-a8a90f4faa3f.

- Subsets of the bundle of management practices described below
- Irrigation modernisation/refurbishments (sometimes mitigation, sometimes adaptation)
- Upgrades to water pumping and distribution systems
- Use of renewable energy in greenhouses
- Replacement/upgrades of agricultural machinery
- Installation or upgrade of storage facilities

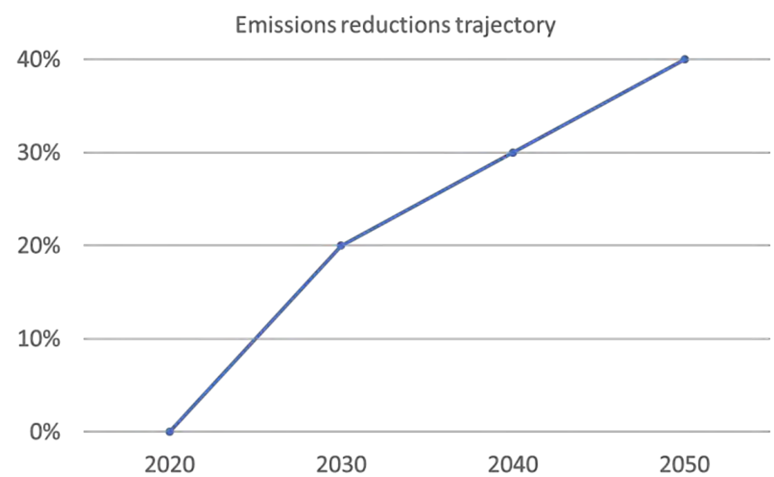
The platform is asked to consider how these and any other additional actions which deliver significant mitigation might be identified and evaluated, and how these can be incorporated into the Taxonomy. This includes determining a rule set to define what counts as significant mitigation from individual actions, which may be consistent with similar rule sets across other economic activities, or common across agricultural activities only, or specific to individual agricultural activities.

In addition, livestock production comprises a broad range of practices, including intensive and landless operations (“factory farms”), which can have particular challenges regarding environmental impacts beyond GHG emissions. The TEG did not have sufficient resources to analyse the evidence in depth in order to allow for a differentiated treatment of extensive and intensive forms of livestock production from a DNSH angle. Based on the above, the TEG recommends the Platform to re-assess the inclusion of livestock production in the taxonomy.

In addition, the TEG recognises that there are also considerations in relation to animal welfare, but these are not covered by the taxonomy framework.

19.1 Growing of perennial crops

Sector classification and activity	
Macro-Sector	A - Agriculture, forestry and fishing
NACE Level	3
Code	A1.2
Description	Growing of perennial crops
Mitigation criteria	
Principles	Both of the principles set out here must be fulfilled: 1. Demonstrate substantial avoidance or reduction of GHG emissions from production and related practices; and 2. Maintain existing sinks and increase sequestration (up to saturation point) in above- and below-ground carbon stocks.
Criteria	Criterion relating to Principle 1: **1) Avoid or reduce GHG emissions (including those from inputs used on the farm) through the application of appropriate management practices.** Criterion relating to Principle 2: **2) Maintain and increase existing carbon stocks for a period equal to or greater than 20 years through the application of appropriate management practices.** Criterion relating to both Principles: **3) No conversion of high carbon stock land which has this status in or before January 2008 to perennial crop production.** *a) wetlands, namely land that is covered with or saturated by water permanently or for a significant part of the year;* *b) continuously forested areas, namely land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds in situ;* *c) land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 %, or trees able to reach those thresholds in situ;* *d) peatland in January 2008, unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil.* *e) highly biodiverse grassland spanning more than one hectare that is:* *i) natural, namely grassland that would remain grassland in the absence of human intervention and that maintains the natural species composition and ecological characteristics and processes; or* *ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and that is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority.*
Metric	**Metrics for Criterion 1**

	- Area over which essential management practices* are deployed on the farm (%) OR - % reduction in GHG emissions (gCO2e) over a specified period, compared to emissions at the start of that period **Metric for Criterion 2** - Area over which appropriate management practices* are deployed on the farm (%) OR - Increasing carbon stock (tC/ha) over a specified period **Metric for Criterion 3** - n/a – presence absence N.B. This metric is simply the presence or absence of land use change taking place from those categories listed in the criterion to perennial crop production. ** These essential management practices are described in the table below. All essential practices will need to be deployed, except where particular practices can be demonstrated to be not applicable to that site.*
Threshold	**Thresholds for Criterion 1** - The essential management practices are deployed consistently over the applicable perennial crop production area each year Or - Reduction in GHG emissions (gCO2e) in line with the following trajectory 

	For example, over the 10 year period of 2020-2030, a 20% reduction in GHG emissions would be required. Over the 20 year period of 2020-2040, a 30% reduction in GHG emissions would be required. N.B. In the case of *force majeure*: emissions resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not affect the application of these requirements or result in non-compliance with these criteria. **Threshold for Criterion 2** - The essential management practices are deployed consistently over the applicable perennial crop area each year or - Above and below ground carbon stocks (tC/ha) to be increased progressively over a minimum 20-year period* * Noting the following exception: For soils specifically, where saturation levels have been reached, no further increase in carbon content is expected. In this case, existing levels should be maintained **Threshold for Criterion 3** - Presence or absence Supporting notes: - To demonstrate compliance with the essential management practices criteria, it will be necessary to establish a farm sustainability management plan which describes the management practices being deployed - taking into account crop husbandry requirements, farm pedo-climatic conditions - and their coverage on the farm. - To demonstrate compliance with the quantitative GHG thresholds it will be necessary to establish a Carbon stock and GHG emission baseline for the farm. It will be against such baseline data that emission reductions of Carbon increases can be measured. A carbon audit is necessary in order to also assess where action is needed, and this must be accompanied by a carbon management plan to set out the management practices that will deliver the GHG emissions reduction/ carbon sequestration. This carbon management plan is part of the broader farm sustainability plan. Emissions, sinks and management practices are all to be audited at 3-year intervals to confirm ongoing compliance with these requirements.
Rationale	

Opportunities for substantial mitigation and contributions to a net zero carbon economy

An overarching goal of the Taxonomy is to enable the screening of economic activities to determine whether or when they do or do not deliver substantial mitigation, consistent with the underlying goal of a net zero carbon economy by 2050.

In the context of agriculture, Net-Zero is a means to ensure that even where GHG emissions cannot be reduced to zero, they can be compensated for through increased removals (through carbon sequestration) on farmed land. The discussion about the scale at which net-zero should (and could) be met solely in agriculture remains open. It may not be possible to reach net-zero emissions on an individual farm holding in all cases, particularly where they are specialist in nature. In other cases, it may be more feasible. At the aggregate level, it may be that some countries with concentrated production systems and small land areas, would struggle to reach net-zero emissions within the agriculture sector alone and within country. This raises the question as to the extent to which a given farm, or aggregation of farms, could reach net-zero and the extent to which these farms could appropriate negative emissions (sequestration) from other farms or other sectors.

Furthermore, one opportunity for emissions reductions in the agriculture sector as a whole is to switch from higher emitting activities to lower emitting activities (for example, by reducing cattle numbers and increasing legume production as an alternative source of protein), with a corresponding consumption switch between agricultural commodities. These criteria and thresholds, which focus specifically on emissions within the perennial crop production activity, cannot address this type of mitigation action.

The criteria and thresholds proposed therefore focus on ensuring that emissions are substantially reduced and removals substantially increased at the economic activity (NACE code) level.

There is significant potential to reduce emissions, maintain carbon sinks, and increase sequestration through good practices in perennial cropland management. Each of these needs to be addressed in order to ensure that agriculture as a whole delivers substantial mitigation and contributes its part to a net zero carbon economy. Doing so will ensure each instance of perennial cropland management maximises its contribution – this rationale drove the principles set out above.

Approach taken to setting thresholds for this economic activity

There continues to be a relative paucity of information and data to set absolute thresholds (e.g. gCO_2e/ ha or gCO2e/ unit of production) for agriculture that represent low carbon agriculture. Even if such information existed at the aggregate level, translating this to appropriate thresholds for implementation would remain challenging given the heterogeneity across farms and farming practice.

However, setting relative GHG thresholds (i.e. % change in gCO2e) is possible, where these can be made relative to a counterfactual on the same farm or project. Whilst this provides some quantitative means of assessing mitigation performance, it is a relatively blunt mechanism as it does not take into account emissions reductions which might previously have been achieved and if the farm is already delivering significant mitigation. Therefore, is is harder for a farm that already performs relatively well to deliver an additional X% reduction in emissions than it is for a form that currently performs relatively poorly. Furthermore, to determine compliance with such a GHG threshold, GHG accounting at farm level is necessary. However, this is not yet mainstream, despite the existence of a range of tools and approaches.

The proposals, therefore, allow for a different approach, namely the demonstration of the deployment of specific bundles of management practices, which that are recognised as essential to delivering low carbon production in agriculture. This more qualitative approach is relatively simple to monitor, and there are existing mechanisms to do so, such as under the CAP. It also provides a more directly communicable approach to farmers and land managers who will implement such practices on the ground. As this approach is applicable for those who have already established such practices as well as those that will additional investment finance to do so, it also allows for the recognition of farms (and associated assets and equity) that are already high performers in terms of a low GHG footprint. As such, it avoids the problems associated with the relative GHG threshold as described above.

Emission contributions from agriculture arise primarily from three sources: enteric fermentation (42.9%; 0.186 GtCO2e); management of agricultural soils (38%; 0.165 GtCO2e); and manure management (15.4%; 0.067 GtCO2e) (2014 figures). Mitigation potential therefore predominantly involves reductions in non-CO2 emissions as these form the majority of agriculture emissions in the EU, with CO2 from on-farm energy use being a minor component (covering only 0.13% of total EU28+ISL agriculture emissions in 2014). The largest share of the EU's agricultural non-CO2 GHG emissions comes from the more potent nitrous oxide (N2O) and methane (CH_4). Nitrous oxide accounts for 58% of non-CO_2 emissions from agriculture (largely from fertiliser application and exposed soils, as well as grazing animals), with methane accounting for the remaining 42% (largely from livestock and rice cultivation).

In respect of perennial cropland production, key sources of emissions are emissions associated with soil management and the application of fertilisers, and avoided emissions embedded in crop waste.

Metrics and thresholds for this economic activity

On management practices that deliver substantial mitigation

Rationale for the selection of practices: Scientific literature identifies a wide range of possible mitigation practices available in the agricultural sector to address the different emissions and opportunities for sequestration in perennial cropland management.

For the purpose of establishing criteria and thresholds which identify when the economic activity of perennial cropland delivers substantial mitigation, individual management practices were identified for which: 1) there is sufficient existing scientific knowledge and consensus on the mitigation effects and interactions with other environmental and food security objectives; and 2) the scale, certainty and consistency of mitigation effects is sufficiently demonstrated (for example, Smith et al. 2008[122], Paustian et al. 2016[123], Kay et al. 2019[124]).

[122] Smith, P. et al. (2008), "Greenhouse gas mitigation in agriculture", Philosophical Transactions of the Royal Society B, Vol. 363, Issue 1495, The Royal Society, London, 789-813.

[123] Paustian K, Lehmann J, Ogle S, ReayD, RobertsonGP and Smith P 2016 "Climate-smart soils", Nature 532 49–57

[124] Kay et al. (2019). "Agroforestry creates carbon sinks whilst enhancing the environment in agricultural landscapes in Europe", Land Use Policy 83 581-593.

These management practices have been demonstrated to improve soil health and soil productivity so as to secure agricultural yields and thus reduce the emission intensity of crop production – outcomes critical for the delivery of substantial mitigation - and/ or reduce the carbon intensity of agriculture, and also do not risk leakage effects. They also do not risk negative ancillary effects nor are in conflict with legislation in the EU. These practices deliver substantial mitigation with relatively high certainty across a range of biophysical and farming conditions.

Scientific literature provides insights on mitigation potential on categories of individual practices and also indicates that it is the combination of practices which are applied over large areas that leads to substantial mitigation, i.e. an approach is required where all feasible mitigation practices which are environmentally sustainable should be pursued (Paustian et al. 2016). The literature, however, provides limited guidance on how to translate sectoral or activity-based mitigation potential into individual farm-level mitigation potential, i.e. what combination of practices should be applied together as a minimum at farm level in different conditions to deliver substantial mitigation. Therefore, TEG expert input was used to determine the minimum combination of practices which should be applied together for perennial cropland management to deliver substantial mitigation at farm level.

The table below indicates the management practices selected as the bundle of essential practices that, deployed collectively, should deliver substantial mitigation at farm level. It is noted that given heterogeneity of farms, deployment of the same bundle of practices may result in different emissions impacts farm to farm, but overall it is expected that deployment of this bundle will deliver substantial mitigation in the majority of cases.

The applicable area for management practices relates to where those practices could and should be deployed on a farm in order to meet their objectives. For example, buffer strips designed to prevent soil erosion and run-off are to be placed next to water courses and ditches, etc. Therefore, some practices may only be deployed on a small area of the farm where they add value.

On GHG emission reduction thresholds

Substantial, in the context of substantial mitigation, falls on a spectrum of mitigation potential from net - negative (where removals exceed emissions), net-zero (where removals balance with emissions) to varying degrees of emission reductions. With no EU or global baseline target for emission reductions from the agriculture sector as a whole or perennial crop production specifically the degree to which emission reductions and removals should be required becomes a question of ambition and need. It is also noted that the Taxonomy has a global reach, and thus any level of 'substantial' should be consistent in the global context.

A review by Wollenberg *et al,* 2016[125] suggests a total mitigation need from agriculture from between 0.9 – 1.4 $GtCO_2e$ (in 2030) to meet the 2 °C target, 1 $GtCO_2e$ (in 2030). This was selected as an approximate target. These figures relate primarily to non-CO_2 emissions and are "an annualized", not cumulative, goal. The target assumes an allowable emissions budget of 6.15–7.78 GtCO2e yr-1 for agriculture in 2030. The goal represents an 11–18% reduction relative to the scenarios' respective 2030 business as usual baselines"[126]. As these figures represent non-CO_2 emissions they implicitly do not recognise the role of potential carbon sequestration and its contribution to global mitigation goals. As such a GHG emissions reduction threshold of 20% over the 10 year period from 2020 to 2030 has

[125] Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F. N., ... Campbell, B. M. (2016). Reducing emissions from agriculture to meet the 2°C target. Global Change Biology, 22, 3859–3864. doi:10.1111/gcb.13340

[126] idem

been proposed as 'significant contribution' in the context of the Taxonomy. This is supported by work from Frank et al (2018)[127], and The IPCC's fourth assessment report (Smith et al, 2007)[128].

In terms of establishing a declining emissions trajectory for agriculture, the work by Wollenberg et al (2016) calculates emission reduction needs based on a trajectory of emissions from 2010 through to 2100. The emissions curve (level of emissions over time) increases and decreases at different points, relative to existing efforts, projected changes in external factors, etc. The average reduction figure needed over this whole timeframe is 28% emission reductions compared to the baseline. As we move towards 2040 and 2050 the level of emission reductions needed increases, and this implications for any threshold set beyond the 2030 timeframe. The reduction figure in 2050 would be larger (approximately a doubling). Although in the study the level of emission reductions needed is not linear between the years, for simplicity a linear reduction is drawn between the two pegs of 20% reduction by 2030 and 40% reduction by 2050 as a linear trajectory of emission reductions also simplifies implementation and communication.

The study determined these reductions against a business as usual scenario for agriculture. However, establishing a BaU counterfactual level of emissions for each project or farm could limit implementation effectiveness, as the BaU emissions would need to be calculated assuming the mitigation action was not in place. For simplicity, the proposed approach is therefore to simplify the requirement to compare emissions at the start of period with those achieved in 10 years-time and assess this against the target reduction.

The threshold metric for emissions reduction is gCO2e, and not an emissions intensity metric such as gCO2e/ unit of production, as this enables the Taxonomy to be applied by those reducing emissions intensity (e.g. through energy or resource efficiency) while also requiring them to reduce emissions overall – the overall goal.

On setting Carbon stock thresholds

Setting a universal (or global) absolute threshold (in terms of tC/ ha) for carbon stocks is not a viable option given the variability of carbon sequestration and stocking potential – which is very context specific. Those with low carbon stock potential will not be able to deliver substantial sequestration in line with a universal, absolute threshold. Even setting an absolute threshold linked to local conditions (based on maximum carbon stocking potential at that site) is not possible as at present is it is impractical to test and estimate the maximum sequestration potential (i.e. saturation point) of a specific area. Such calculations currently use default values based on soil type, and therefore are not truly context specific.

Furthermore, even defining a specific % of carbon increase required is more challenging than setting the relative threshold for reducing emissions. *Reducing* emissions is always proportional to the level of emissions at a given point, therefore a 20% reduction over 10 years for example can be expected to

[127] Stefan Frank et al, Agricultural non-CO2 emission reduction potential in the context of the 1.5 °C target, Nature Climate Change (2018). DOI: 10.1038/s41558-018-0358-8

[128] Smith, P. et al. (2007), "Agriculture", in Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, New York.

deliver a 'substantial' contribution from an underperforming farm (resulting in high overall emission reductions). However, the premise is different when looking to *increase* sequestration on agricultural land as there is relatively little evidence and few studies that suggest what level of Carbon stock increase would be needed on agricultural land in a 1.5 or 2°C climate stabilisation target scenario, as this is relative to the level of emissions from that same land (if one is pursuing a net-zero approach) or the level of carbon sequestration needed to offset other sectors of the economy. It is however, recognised that C sequestration represents the largest mitigation potential available to the agriculture sector at global scale, while emission savings of non-CO2 emissions may be more important in the EU with a prevailing intensive production system. Smith et al (2007) estimate that 89% of the technical potential of emission reductions in the sector to 2030 and 2050 lies in soil carbon sequestration, i.e.in reducing **net** CO_2 emissions from farming practices and management, including cropland management, grazing land management, restoration of cultivated organic soils and restoration of degraded lands.

The proposal is therefore to require evidence of a positive direction of travel in terms of increasing carbon stocks, specifically, the progressive increase of carbon stocks over a 20-year period. A 20 year period for C stock saturation maintenance is proposed in line with the IPCC 20 year soil C saturation period;

On no conversion of high carbon stock land

A cut-off date of 2008 for no conversion of high carbon stock land is chosen to be consistent with the operation of the Renewable Energy Directive sustainability criteria relative to these land types. This provides a link with existing sustainability schemes through which compliance could be demonstrated for this criterion.

On demonstrating compliance with these criteria and thresholds

3-year compliance checking is proposed to ensure progress is being made and mitigation is being delivered in practice, and also to reduce the burden necessary on operators. This compliance checking is required for management practice checking, C stock change and GHG reductions.

To prepare the farm sustainability management plan a carbon calculator can be used, or the plan can also be prepared using other nutrient decision-support tools. Advisory support will likely be required in the process of preparing the plan.

Recommendations to the Platform

A large number of carbon audit tools are available at present, although there is variation in the coverage and robustness of these tools. A recent review[129] conducted in Scotland identified three tools deemed technically very suitable for farm-level carbon audits in the Scottish context, enabling sufficient robustness, comprehensiveness and clarity of documentation: Cool Farm Tool[130], Scottish AgRE

[129] Leinonen, I., , V.Eory, M. MacLeod, A.Sykes, K. Glenk and R. Rees (2019). "Comparative analysis of farm-based carbon audits." Report for ClimateXChange Scotland. https://www.climatexchange.org.uk/media/3584/farm-based-carbon-audits-final.pdf

[130] http://www.coolfarmtool.org

Calculator[131,] and JRC Carbon calculator[132]. At least the Cool Farm Tool and JRC Carbon Calculator are also more broadly applicable in the EU. The future Sustainability Platform should provide guidance on appropriate tools for demonstrating compliance. Further development of the existing tools is expected to address capacity building and compliance checking needs associated with a transition to low-carbon farming.

As currently proposed, the Criteria and thresholds apply equally to, and do not distinguish between, smaller and large scale farms. This seems appropriate in terms of seeking to address emissions reductions and sequestration in farms of all sizes to maximise aggregate impact, recognising that small farms can be some of the most inefficient and emitting, and large firms can be some of the most efficient per unit of output, and vice versa. However, the Platform is asked to consider whether differences should be made in terms of the requirements to demonstrate compliance, recognising the higher transaction cost impacts for smaller scale farmers.

More broadly, the Platform is requested to consider whether and which existing sustainability standards or certification schemes could be used as proxy indicators for compliance with these criteria and thresholds, subject to meeting the same performance outcomes. This includes engaging to align those standards or certification schemes if needed. The adoption of such proxy indicators would help substantially in the cost-effective demonstration of compliance with these criteria and thresholds.

It is envisaged that these criteria and thresholds have global applicability, based on input from TEG members and expert advisers with global expertise and experience. However, additional global consultation will be needed to confirm the appropriateness of these proposals for perennial crop production around the world.

As noted above, there is potential for significant emissions reductions and increased sequestration by taking land completely out of production for the purposes of restoring or re-establishing natural habitats, particularly peatland and other carbon rich landscapes. Such movements and impacts are not captured here, but would merit additional consideration by the Platform.
Lastly, the Platform should regularly review the list of essential practices to integrate new advances in the scientific practices.

Future development - Incorporation of mitigation actions: The proposals above are intended to screen the activity of perennial cropland production to determine when that activity can be deemed to be delivering substantial mitigation. The proposals do not capture more granular measures and actions that deliver significant mitigation, but not at a level sufficient for the activity as a whole to be recognised as making a substantial contribution to climate mitigation.

These measures or actions might include energy or resource efficiency or land management through:

- Subsets of the bundle of management practices described below
- Replacement/ upgrades of agricultural machinery
- Irrigation modernisation/ refurbishments (sometimes mitigation, sometimes adaptation)
- Upgrades to water pumping and distribution systems

131 http://www.agrecalc.com/

132 https://solagro.com/images/imagesCK/files/publications/2016/Farm_Tool_Calculator_Carbon.pdf

- Installation or establishment of storage facilities

The Platform is asked to consider how mitigation actions which deliver significant mitigation might be identified and evaluated, and how these can be incorporated into the Taxonomy. This includes 1) determining a rule set to determining what counts as significant mitigation from individual actions, which may be consistent with similar rule sets across other economic activities, or common across agricultural activities only, or specific to perennial cropland management.

Do no significant harm assessment

Key environmental aspects to be considered for investments in *growing of perennial crops* span across all other five objectives and are summarized as follows:

- ability of farming systems to adapt to a changing climate;
- impact on water quantity, water quality and water ecosystems;
- impacts on air quality;
- inefficiencies in the production system including nutrient management;
- pollutant and nutrient run-off and leaching;
- impacts on habitats and species, e.g. through conversion of areas, intensification of existing arable land, and invasive alien species.

Note that areas of environmental risk are highly geographically variable. Guidance should be sought from the relevant competent national or regional authority to identify areas or issues of importance and relevance within the area or project concerned.

DNSH Objective	**Thresholds and Metrics**
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.

<table>
<tr><td>(3) Sustainable use and protection of water and marine resources</td><td>• Activities should not lead to a decrease in water availability in catchments where this is a concern and should be in line with keeping with the objective of good quantitative status as defined in table 2.1.2 in Annex V to (the Water Framework) Directive 2000/60/EC[133];
• Activities should not lead to a decrease in water quality within a catchment, and should be in keeping with the objective of good chemical and ecological status as defined in (the Water Framework) Directive 2000/60/EC.</td></tr>
<tr><td>(4) Circular economy and waste prevention and recycling</td><td>• Activities should minimise waste or losses from the production or harvesting of crops, in line with good agricultural practice;
• Activities should minimise raw material use per unit of output, including energy[134].
• Activities should minimise the loss of nutrients from the production system.</td></tr>
<tr><td>(5) Pollution prevention and control</td><td>• Activities ensure that nutrients (fertilisers) and plant protection products (e.g. pesticides and herbicides) are targeted in their application and are delivered at appropriate levels and with appropriate techniques to prevent water and air pollution and the loss of excess nutrients and pesticide drift.</td></tr>
<tr><td>(6) Healthy Ecosystems</td><td>• Activities ensure the protection of soils, particularly over winter, to prevent erosion and run-off into water courses/bodies and to maintain soil organic matter.
• Activities do not lead to the conversion, fragmentation or unsustainable intensification of high-nature-value farmland, wetlands, forests, or other areas of high-biodiversity value[135].
• Activities should not:
  o result in a decrease in the diversity or abundance of species and habitats of conservation importance or concern;
  o contravene existing management plans or conservation objectives.
• Where activities involve the production of novel non-native or invasive alien species, their cultivation should be subject to an initial risk assessment and on-going monitoring in order to ensure that sufficient safeguards are in place to prevent escape to the environment.</td></tr>
<tr><td colspan="2">References
Potential proxies or schemes to demonstrate compliance with some elements:
• (EU only) CAP cross compliance where beneficiaries are in receipt of support under the CAP. Specifically Good Agricultural and Environmental Condition (GAEC). Different GAECs would be relevant, in particular:
  o GAEC 1, 2, 4, 5, 6, 7 for adaptation;</td></tr>
</table>

[133] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[134] The criterion refers to “unit of output” to allow for production efficiency increases where raw material use may not decline

[135] Areas of high-biodiversity-value can be defined as set out in Article 29(3) of the Directive EU(2018)2001

o GAEC 1, 2, 4, 5, 7 for water resources; o GAEC 1, 3, 4, 5 for pollution o GAEC 1 to 7 for healthy ecosystems. • (EU only) Pillar 1 greening requirements aim at ensuring a broad contribution to environmental objectives. Specifically, requirements linked to the maintenance of permanent grassland, designation of environmentally sensitive permanent grasslands and Ecological Focus Areas (EFAs) under which at least 5% of the arable land on farms with more than 15 hectares of arable land should be managed as an EFA. EFAs can include landscape features, agroforestry, areas with short rotation coppice with no use of mineral fertilizer and/or plant protection products, afforested areas that receive or have received support from EAFRD in 2007-2013 or 2014-2020. Member States can choose which of the EFA greening measures to offer to farmers. • (Global) Round Table on Sustainable Soy (http://www.responsiblesoy.org/wpdm-package/rtrs-standard-responsible-soy-production-v3-1/?lang=en) – which includes some criteria for the production of soy – particularly principle 4 and 5 covering the environment and good agricultural practice. • UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia: https://www.unece.org/index.php?id=41358 • National Emission Ceilings Directive (EU) 2016/2284 (notably Annex III, part 2), and the related provisions in the National Air Pollution Control Programme, established by each Member State under this Directive.

Management category	Management practice	GHG ↓	C-Seq ↑
Crop choice and rotation *(to increase carbon sequestration in soil, reduce fertilizer need, and N20 emissions)*	Sowing of cover/catch crops using at least a 6 species cover crop including 1 legume and reducing bare soil to the point of having a living plant coverage index of at least 75% at farm level per year.	√	√
Soil tillage and management *(in order to prevent soil erosion and carbon losses from soils)*	Reduced (shallow plough to 25cm no more than once every three years) and/or zero tillage with adjusted weed and disease control	√	√
	Prevent soil compaction (frequency and timing of field operations should be planned to avoid traffic on wet soil; tillage operation should be avoided or strongly reduced on wet soils; stock density should be reduced to avoid compaction, especially on wet soils).	√	
	Management of carbon-rich soils • Avoiding row crops • Maintaining a shallower water table – peat	√	

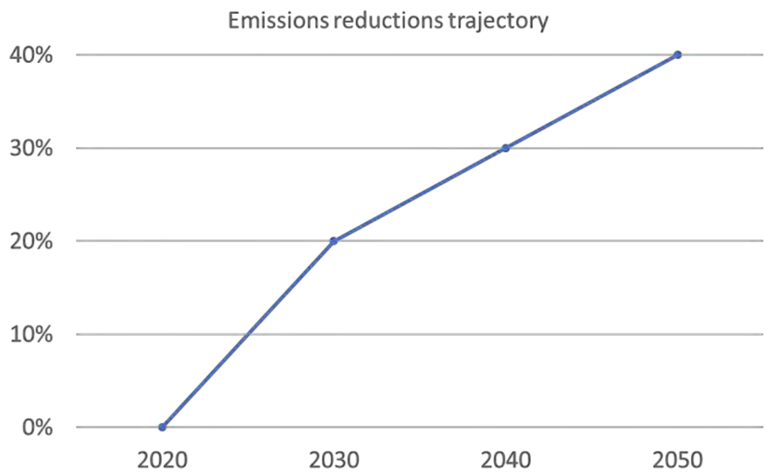
Management category	Management practice	GHG ↓	C-Seq ↑
	• Maintaining a shallower water table - arable		
Nutrient management *(in order to reduce N20 emissions)*	Nutrient management plan to optimize fertilization and improve nitrogen use efficiency. The plan should be based on soil testing, estimating of crops nutrient requirements, recording of nutrient applications, considering field characteristics and soil type, estimating soil nitrogen supply, and where applicable analysis of manure nutrient content prior to application. In addition, it is required that a low emission N-application technology is used (e.g. slurry injection, incorporating manure in the soil within 2 hours of spreading) and fertilizer spreaders which have low coefficient of variation (synthetic fertilizer and farmyard manure (e.g. placing N in the soil via injection), combined with calibration of spreaders.	√	√
Structural elements with mitigation benefit *(in order to increase C sequestration)*	Plant hedges and/or buffer strips and/or individual trees		√
	Conversion of low productivity land (e.g. along field edges) into woodland to increase C sequestration and protect against soil erosion		√
Waste management	Minimize post-harvest loss	√	

19.2 Growing of non-perennial crops

Sector classification and activity	
Macro-Sector	A - Agriculture, forestry and fishing
NACE Level	3
Code	A1.1
Description	Growing of non-perennial crops
Mitigation criteria	
Principles	Both of the principles set out here must be fulfilled: 1. Demonstrate substantial avoidance or reduction of GHG emissions from production and related practices; and 2. Maintain existing sinks and increase sequestration (up to saturation point) in above- and below-ground carbon stocks.
Criteria	Criterion relating to Principle 1: **1) Avoid or reduce GHG emissions (including those from inputs used on the farm) through the application of appropriate management practices.** Criterion relating to Principle 2: **2) Maintain and increase existing carbon stocks for a period equal to or greater than 20 years through the application of appropriate management practices.** Criterion relating to both Principles: **3) No conversion of high carbon stock land which has this status in or before January 2008 to non-perennial crop production.** *a) wetlands, namely land that is covered with or saturated by water permanently or for a significant part of the year;* *b) continuously forested areas, namely land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds in situ;* *c) land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 %, or trees able to reach those thresholds in situ;* *d) peatland in January 2008, unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil.* *e) highly biodiverse grassland spanning more than one hectare that is:* *i) natural, namely grassland that would remain grassland in the absence of human intervention and that maintains the natural species composition and ecological characteristics and processes; or* *ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and that is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority.*
Metric	**Metrics for Criterion 1**

	- Area over which essential management practices* are deployed on the farm (%) OR - % reduction in GHG emissions (gCO2e) for the area of non-perennial production, over a specified period, compared to emissions at the start of that period **Metric for Criterion 2** - Area over which appropriate management practices* are deployed on the farm (%) OR - Increasing carbon stock (tC/ha) over a specified period **Metric for Criterion 3** - n/a – presence absence N.B. This metric is simply the presence or absence of land use change taking place from those categories listed in the criterion to non-perennial crop production. ** These essential management practices are described in the table below. All essential practices will need to be deployed, except where particular practices can be demonstrated to be not applicable to that site.*
Threshold	**Thresholds for Criterion 1** - The essential management practices are deployed consistently over the applicable non-perennial crop production area each year or

Reduction in GHG emissions (gCO2e) for the area of non-perennial production, in line with the following trajectory:



For example, over the 10 year period of 2020-2030, a 20% reduction in GHG emissions would be required. Over the 20 year period of 2020-2040, a 30% reduction in GHG emissions would be required.

N.B.

In the case of *force majeure*: emissions resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not affect the application of these requirements or result in non-compliance with these criteria.

Threshold for Criterion 2

- The essential management practices are deployed consistently over the applicable non-perennial crop area each year

or

- Above and below ground carbon stocks (tC/ha) to be increased progressively over a minimum 20-year period*

* Noting the following exception: For soils specifically, where saturation levels have been reached, no further increase in carbon content is expected. In this case, existing levels should be maintained

Threshold for Criterion 3

- Presence or absence

	Supporting notes: - To demonstrate compliance with the essential management practices criteria, it will be necessary to establish a farm sustainability management plan which describes the management practices being deployed - taking into account crop husbandry requirements, farm pedo-climatic conditions - and their coverage on the farm. - To demonstrate compliance with the quantitative GHG thresholds it will be necessary to establish a carbon stock and GHG emission baseline for the farm. It will be against such baseline data that emission reductions of carbon increases can be measured. A carbon audit is necessary in order to also assess where action is needed, and must be accompanied by a carbon management plan to set out the management practices that will deliver the GHG emissions reduction/ carbon sequestration. This carbon management plan is part of the broader farm sustainability plan. Emissions, sinks and management practices are all to be audited at 3-year intervals to confirm ongoing compliance with these requirements.

Rationale

Opportunities for substantial mitigation and contributions to a net zero carbon economy

An overarching goal of the Taxonomy is to enable the screening of economic activities to determine whether or when they do or do not deliver substantial mitigation, consistent with the overarching goal of a net zero carbon economy by 2050.

In the context of agriculture, Net-Zero is a means to ensure that even where GHG emissions cannot be reduced to zero, they can be compensated for through increased removals (through carbon sequestration) on farmed land. The discussion about the scale at which net-zero should (and could) be met solely in agriculture remains open. It may not be possible to reach net-zero emissions on an individual farm holding in all cases, particularly where they are specialist in nature. In other cases, it may be more feasible. At the aggregate level, it may be that some countries with concentrated production systems and small land areas, would struggle to reach net-zero emissions within the agriculture sector alone and within country. This raises the question as to the extent to which a given farm, or aggregation of farms, could reach net-zero and the extent to which these farms could appropriate negative emissions (sequestration) from other farms or other sectors. Furthermore, one opportunity for emissions reductions in the agriculture sector as a whole is to switch from higher emitting activities to lower emitting activities (for example, by moving from conventional production using artificial fertiliser to organic farming), with a corresponding consumption switch between agricultural commodities. These criteria and thresholds, which focus specifically on emissions within the non-perennial crop production activity, cannot address this type of mitigation potential.

The criteria and thresholds proposed therefore focus on ensuring that emissions are substantially reduced and removals substantially increased at the economic activity (NACE code) level.

There is significant potential to reduce emissions, maintain carbon sinks, and increase sequestration through good practices in non-perennial cropland management. Each of these needs to be addressed in order to ensure that agriculture as a whole delivers substantial mitigation and contributes its part to a net-zero carbon economy. Doing so will ensure each instance of non-perennial cropland management maximises its contribution – this rationale drove the principles set out above.

Approach taken to setting thresholds for this economic activity

There continues to be a relative paucity of information and data to set absolute thresholds (e.g. gCO_2e/ ha or gCO2e/ unit of production) for agriculture that represent low carbon agriculture. Even if such information existed at the aggregate level, translating this to appropriate thresholds for implementation, would remain challenging given the heterogeneity across farms and farming practice implementation.

However, setting relative GHG thresholds (i.e. % change in gCO2e/ ha or % change in gCO2e/unit of production) is possible, where these can be made relative to a counterfactual on the same farm or project. Whilst this provides some quantitative means of assessing mitigation performance, it is a relatively blunt mechanism as it does not take into account emissions reductions which might previously have been achieved and if the farm is already delivering significant mitigation. Furthermore, to determine compliance with such a GHG threshold, GHG accounting at the farm level is necessary. However, this is not yet mainstream, despite the existence of a range of tools and approaches.

The proposals, therefore, allow for a different approach, namely the demonstration of the deployment of specific bundles of management practices, which are recognised as essential to delivering low carbon production in agriculture. This more qualitative approach is relatively simple to monitor, and there are existing mechanisms to do so, such as under the CAP. It also provides a more directly communicable approach to farmers and land managers who will implement such practices on the ground. As this approach is applicable for those who have already established such practices as well as those that will require additional investment finance to do so, it also allows for the recognition of farms (and associated assets and equity) that are already high performers in terms of a low GHG footprint. As such, this approach avoids the problems associated with the relative GHG threshold as described above.

Emission contributions from agriculture arise primarily from three sources: enteric fermentation (42.9%; 0.186 GtCO2e); management of agricultural soils (38%; 0.165 GtCO2e); and manure management (15.4%; 0.067 GtCO2e) (2014 figures). Mitigation potential therefore predominantly involves reductions in non-CO2 emissions as these form the majority of agriculture emissions in the EU, with CO2 from on-farm energy use being a minor component (covering only 0.13% of total EU28+ISL agriculture emissions in 2014). The largest share of the EU's agricultural non-CO2 GHG emissions comes from the more potent nitrous oxide (N2O) and methane (CH_4). Nitrous oxide accounts for 58% of non-CO_2 emissions from agriculture (largely from fertiliser application and exposed soils, as well as grazing animals), with methane accounting for the remaining 42% (largely from livestock and rice cultivation).

In respect of non-perennial cropland production, key sources of emissions are emissions associated with soil management and the application of fertilisers, methane emissions from rice cultivation, and avoided emissions embedded in crop waste.

Metrics and thresholds for this economic activity

On management practices that deliver substantial mitigation

Rationale for the selection of practices: Scientific literature identifies a wide range of possible management practices available in the agricultural sector to address the different emissions and opportunities for sequestration in non-perennial cropland management. For the purpose of establishing criteria and thresholds which identify when the economic activity of non-perennial cropland delivers substantial mitigation, individual management practices were identified for which: 1) there is sufficient existing scientific knowledge and consensus on the mitigation effects and interactions with other environmental and food security objectives; and 2) the scale, certainty and consistency of mitigation effects is sufficiently demonstrated (for example, Smith et al. 2008[136], Paustian et al. 2016[137], Kay et al. 2019[138]).

These management practices have been demonstrated to improve soil health and soil productivity so as to secure agricultural yields and thus reduce the emission intensity of crop production – outcomes critical for the delivery of substantial mitigation. The selected practices include reducing the carbon intensity of agriculture, and also do not risk leakage effects. They also do not risk negative ancillary effects nor are in conflict with legislation in the EU. These practices deliver substantial mitigation with relatively high certainty across a range of biophysical and farming conditions.

Scientific literature provides insights on mitigation potential on categories of individual practices and also indicates that it is the combination of practices which are applied over large areas that leads to substantial mitigation, i.e. an approach is required where all feasible mitigation practices which are environmentally sustainable should be pursued (Paustian et al. 2016). The literature, however, provides limited guidance on how to translate sectoral or activity-based mitigation potential into individual farm-level mitigation potential, i.e. what combination of practices should be applied together as a minimum at farm level in different conditions to deliver substantial mitigation. Therefore, TEG expert input was used to determine the minimum combination of practices which should be applied together for non-perennial cropland management to deliver substantial mitigation at farm level.

The table below indicates the management practices selected as the bundle of essential practices that, deployed collectively, should deliver substantial mitigation at farm level. It is noted that given heterogeneity of farms, deployment of the same bundle of practices may result in different emissions impacts farm to farm, but overall it is expected that deployment of this bundle will deliver substantial mitigation in the majority of cases.

The applicable area for management practices relates to where those practices could and should be deployed on a farm in order to meet their objectives. For example, buffer strips designed to prevent soil erosion and run-off are to be placed next to water courses and ditches, etc. Therefore, some practices may only be deployed on a small area of the farm where they add value.

[136] Smith, P. et al. (2008), “Greenhouse gas mitigation in agriculture”, Philosophical Transactions of the Royal Society B, Vol. 363, Issue 1495, The Royal Society, London, 789-813.

[137] Paustian K, Lehmann J, Ogle S, ReayD, RobertsonGP and Smith P 2016 "Climate-smart soils", Nature 532 49–57

[138] Kay et al. (2019). "Agroforestry creates carbon sinks whilst enhancing the environment in agricultural landscapes in Europe", Land Use Policy 83 581-593.

On GHG emission reduction thresholds

Substantial, in the context of substantial mitigation, falls on a spectrum of mitigation potential from net - negative (where removals exceed emissions), net-zero (where removals balance with emissions) to varying degrees of emission reductions. With no EU or global baseline target for emission reductions from the agriculture sector as a whole or non-perennial crop production specifically, the degree to which emission reductions and removals should be required becomes a question of ambition and need. It is also noted that the Taxonomy has a global reach, and thus any level of 'substantial' should be consistent in the global context.

A review by Wollenberg *et al,* 2016[139] suggests a total mitigation need from agriculture from between 0.9 – 1.4 $GtCO_2e$ (in 2030) to meet the 2 °C target, 1 $GtCO_2e$ (in 2030). This was selected as an approximate target. These figures relate primarily to non-CO_2 emissions and are "an annualized", not cumulative, goal. The target assumes an allowable emissions budget of 6.15–7.78 GtCO2e yr-1 for agriculture in 2030. The goal represents an 11–18% reduction relative to the scenarios' respective 2030 business as usual baselines"[140]. As these figures represent non-CO_2 emissions they implicitly do not recognise the role of potential carbon sequestration and its contribution to global mitigation goals. As such a GHG emissions reduction threshold of 20% over the 10 year period from 2020 to 2030 has been proposed as 'significant contribution' in the context of the Taxonomy. This is supported by work from Frank et al (2018)[141], and The IPCC's fourth assessment report (Smith et al, 2007)[142].

In terms of establishing a declining emissions trajectory for agriculture, the work by Wollenberg et al (2016) calculates emission reduction needs based on a trajectory of emissions from 2010 through to 2100. The emissions curve (level of emissions over time) increases and decreases at different points, relative to existing efforts, projected changes in external factors, etc. The average reduction figure needed over this whole timeframe is 28% emission reductions compared to the baseline. As we move towards 2040 and 2050 the level of emission reductions needed increases, and this implications for any threshold set beyond the 2030 timeframe. The reduction figure in 2050 would be larger (approximately a doubling). Although in the study the level of emission reductions needed is not linear between the years, for simplicity a linear reduction is drawn between the two pegs of 20% reduction by 2030 and 40% reduction by 2050 as a linear trajectory of emission reductions also simplifies implementation and communication.

The study determined these reductions against a business as usual (BaU) scenario for agriculture. However, establishing a BaU counterfactual level of emissions for each project or farm could limit implementation effectiveness, as the BaU emissions would need to be calculated assuming the mitigation action was not in place. For simplicity, the proposed approach is therefore to simplify the requirement to compare emissions at the start of period with those achieved over the period and assess this against the target reduction for that period.

[139] Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F. N., ... Campbell, B. M. (2016). Reducing emissions from agriculture to meet the 2°C target. Global Change Biology, 22, 3859–3864. doi:10.1111/gcb.13340

[140] idem

[141] Stefan Frank et al, Agricultural non-CO2 emission reduction potential in the context of the 1.5 °C target, Nature Climate Change (2018). DOI: 10.1038/s41558-018-0358-8

[142] Smith, P. et al. (2007), "Agriculture", in Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, New York.

The threshold metric is gCO2e, and not an intensity metric such as gCO2e/ unit of production, as this enables the Taxonomy to be applied by both those reducing emission intensity (e.g. through efficiency) while also requiring them to reduce emissions overall – the overall goal.

On setting Carbon stock thresholds

Setting a universal (or global) absolute threshold (in terms of tC/ ha) for carbon stocks is not a viable option given the variability of carbon sequestration and stocking potential – which is very context specific. Those with low carbon stock potential will not be able to deliver substantial sequestration in line with a universal, absolute threshold. Even setting an absolute threshold linked to local conditions (based on maximum carbon stocking potential at that site) is not possible as at present is it is impractical to test and estimate the maximum sequestration potential (i.e. saturation point) of a specific area. Such calculations currently use default values based on soil type, and therefore are not truly context specific.

Furthermore, even defining a specific % of carbon increase required is more challenging than setting the relative threshold for reducing emissions. *Reducing* emissions is always proportional to the level of emissions at a given point, therefore a 20% reduction can be expected to deliver a 'substantial' contribution from an underperforming farm (resulting in high overall emission reductions). However, the premise is different when looking to *increase* sequestration on agricultural land as there is relatively little evidence and few studies that suggest what level of Carbon stock increase would be needed on agricultural land in a 1.5 or 2°C climate stabilisation target scenario, as this is relative to the level of emissions from that same land (if one is pursuing a net-zero approach) or the level of carbon sequestration needed to offset other sectors of the economy. It is however, recognised that C sequestration represents the largest mitigation potential available to the agriculture sector at global scale, while emission savings of non-CO2 emissions may be more important in the EU with a prevailing intensive production system. Smith et al (2007) estimate that 89% of the technical potential of emission reductions in the sector to 2030 and 2050 lies in soil carbon sequestration, i.e.in reducing **net** CO_2 emissions from farming practices and management, including cropland management, grazing land management, restoration of cultivated organic soils and restoration of degraded lands.

The proposal is therefore to require evidence of a positive direction of travel in terms of increasing carbon stocks, specifically, the progressive increase of carbon stocks over a 20-year period. A 20 year period for C stock saturation maintenance is proposed in line with the IPCC 20 year soil C saturation period.

On no conversion of high carbon stock land

A cut-off date of 2008 for no conversion of high carbon stock land is chosen to be consistent with the operation of the Renewable Energy Directive sustainability criteria relative to these land types. This provides a link with existing sustainability schemes through which compliance could be demonstrated for this criterion.

On demonstrating compliance with these criteria and thresholds

3-year compliance checking is proposed to ensure progress is being made and mitigation is being delivered in practice, and also to reduce the burden necessary on operators. This compliance checking is required for management practice checking, C stock change and GHG reductions.

To prepare the farm sustainability management plan a carbon calculator can be used, or the plan can also be prepared using other nutrient decision-support tools. Advisory support will likely be required in the process of preparing the plan.

Recommendations to the Platform

A large number of carbon audit tools are available at present, although there is variation in the coverage and robustness of these tools. A recent review[143] conducted in Scotland identified three tools deemed technically very suitable for farm-level carbon audits in the Scottish context, enabling sufficient robustness, comprehensiveness and clarity of documentation: Cool Farm Tool[144], Scottish AgRE Calculator[145], and JRC Carbon calculator[146]. At least the Cool Farm Tool and JRC Carbon Calculator are also more broadly applicable in the EU. The future Sustainability Platform should provide guidance on appropriate tools for demonstrating compliance. Further development of the existing tools is expected to address capacity building and compliance checking needs associated with a transition to low-carbon farming.

As currently proposed, the criteria and thresholds apply equally to, and do not distinguish between, smaller and large scale farms. This seems appropriate in terms of seeking to address emissions reductions and sequestration in farms of all sizes to maximise aggregate impact, recognising that small farms can be some of the most inefficient and emitting, and large firms can be some of the most efficient per unit of output, and vice versa. However, the Platform is asked to consider whether differences should be made in terms of the requirements to demonstrate compliance, recognising the higher transaction cost impacts for smaller scale farmers. If so, this could be enabled through group certification (as is the case with renewable energy certification).

More broadly, the Platform is requested to consider whether and which existing sustainability standards or certification schemes could be used as proxy indicators for compliance with these criteria and thresholds, subject to meeting the same performance outcomes. This includes engaging to align those standards or certification schemes if needed. The adoption of such proxy indicators would help substantially in the cost-effective demonstration of compliance with these criteria and thresholds.

It is envisaged that these criteria and thresholds have global applicability, based on input from TEG members and expert advisers with global expertise and experience. They also include elements of non-perennial crop production not common in the EU but with important mitigation potential globally (e.g. practices for rice management). However, additional global consultation will be needed to confirm the appropriateness of these proposals for non-perennial crop production around the world.

143 Leinonen, I., , V.Eory, M. MacLeod, A.Sykes, K. Glenk and R. Rees (2019). "Comparative analysis of farm-based carbon audits." Report for ClimateXChange Scotland. https://www.climatexchange.org.uk/media/3584/farm-based-carbon-audits-final.pdf

144 http://www.coolfarmtool.org

145 http://www.agrecalc.com/

146 https://solagro.com/images/imagesCK/files/publications/2016/Farm_Tool_Calculator_Carbon.pdf

As noted above, there is potential for significant emissions reductions and increased sequestration by the agricultural sector, by moving from higher emitting activities to lower emitting activities within the agricultural sector itself, or by taking land completely out of agricultural production for the purposes of restoring or re-establishing natural habitats, particularly peatland and other carbon rich landscapes. Such movements and impacts are not captured here, but would merit additional consideration by the Platform.

Lastly, the Platform should regularly review the list of essential practices to integrate new advances in the scientific knowledge.

Future development – incorporation of mitigation actions

The proposals above are intended to screen the activity of non-perennial cropland production to determine when that activity can be deemed to be delivering substantial mitigation. The proposals do not capture more granular actions that deliver significant mitigation, but not at a level sufficient for the activity as a whole to be recognised as making a substantial contribution to climate mitigation.

These measures or actions might include addressing energy or resource efficiency or land management through e.g.

- Subsets of the bundle of management practices described below
- Irrigation modernisation/ refurbishments (sometimes mitigation, sometimes adaptation)
- Upgrades to water pumping and distribution systems
- Use of renewable energy in greenhouses
- Replacement/ upgrades of agricultural machinery
- Installation or establishment or upgrade of storage facilities

The Platform is asked to consider how these and any other additional actions which deliver significant mitigation might be identified and evaluated, and how these can be incorporated into the Taxonomy. This includes 1) determining a rule set to determining what counts as significant mitigation from individual actions, which may be consistent with similar rule sets across other economic activities, or common across agricultural activities only, or specific to non-perennial cropland management.

Do no significant harm assessment

Key environmental aspects to be considered for investments in *growing of non-perennial crops* span across all other five objectives and are summarized as follows:

- ability of farming systems to adapt to a changing climate;
- impact on water quantity, water quality and water ecosystems;
- impacts on air quality;
- inefficiencies in the production system including nutrient management;
- pollutant and nutrient run-off and leaching;

<table>
<tr><td colspan="2">• impacts on habitats and species, e.g. through conversion of areas, intensification of existing arable land, and invasive alien species.

Note that areas of environmental risk are highly geographically variable. Guidance should be sought from the relevant competent national or regional authority to identify areas or issues of importance and relevance within the area or project concerned.</td></tr>
<tr><td>**DNSH Objective**</td><td>**Thresholds and Metrics**</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Sustainable use and protection of water and marine resources</td><td>• Activities should not lead to a decrease in water availability in catchments where this is a concern and should be *in line with keeping with the objective of good quantitative status as defined in table 2.1.2 in Annex V to (the Water Framework) Directive 2000/60/EC*[147]*;*
• Activities should not lead to a critical decrease in water quality within a catchment, and should be *in keeping with the objective of good chemical and ecological status as defined in (the Water Framework) Directive 2000/60/EC.*</td></tr>
<tr><td>(4) Circular economy and waste prevention and recycling</td><td>• Activities should minimise waste or losses from the production or harvesting of crops, in line with good agricultural practice;
• Activities should minimise raw material use per unit of output, including energy[148].</td></tr>
</table>

[147] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[148] The criterion refers to “unit of output” to allow for production efficiency increases where raw material use may not decline

	• Activities should minimise the loss of nutrients from the production system.
(5) Pollution prevention and control	• Activities ensure that nutrients (fertilisers) and plant protection products (e.g. pesticides and herbicides) are targeted in their application and are delivered at appropriate levels and with appropriate techniques to prevent water and air pollution and the loss of excess nutrients and pesticide drift.
(6) Healthy Ecosystems	• Activities ensure the protection of soils, particularly over winter, to prevent erosion and run-off into water courses/bodies and to maintain soil organic matter. • Activities do not lead to the conversion, fragmentation or unsustainable intensification of high-nature-value farmland, wetlands, forests, or other areas of high-biodiversity value[149]. • Activities should not: o result in a decrease in the diversity or abundance of species and habitats of conservation importance or concern; o contravene existing management plans or conservation objectives. • Where activities involve the production of novel non-native or invasive alien species, their cultivation should be subject to an initial risk assessment and on-going monitoring in order to ensure that sufficient safeguards are in place to prevent escape to the environment.

Management category	Management practice	GHG ↓	C-Seq ↑
Crop choice and rotation ***(to increase carbon sequestration in soil, reduce fertilizer need, and N20 emissions)***	At least a 5 crop rotation, including at least one legume, where a multi-species cover crop between cash crops counts for 1	√	√
	Sowing of cover/catch crops using at least a 6 species cover crop including 1 legume and reducing bare soil to the point of having a living plant coverage index of at least 75% at farm level per year.	√	√
Soil tillage and management ***(in order to prevent soil erosion and carbon losses from soils, and maintain soil health and agricultural productivity)***	Avoiding deep ploughing on carbon-rich soils	√	
	Prevent soil compaction (frequency and timing of field operations should be planned to avoid traffic on wet soil; tillage operation should be avoided or strongly reduced on wet soils; stock density should be reduced to avoid compaction, especially on wet soils; controlled traffic planning can be used). For best long-term results,	√	

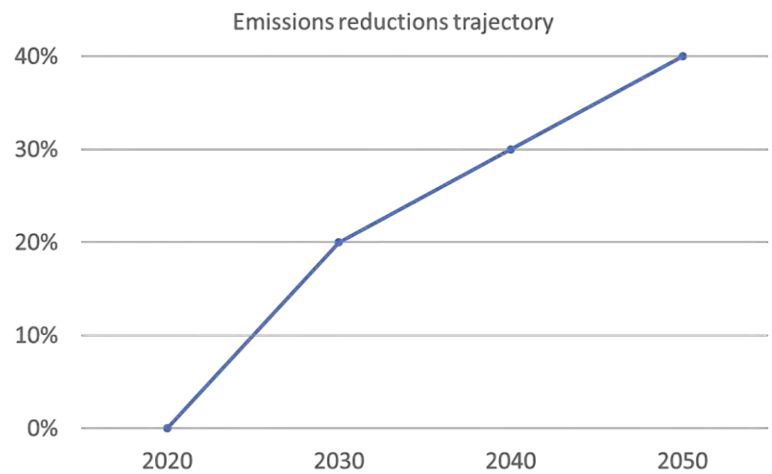
[149] Areas of high-biodiversity-value can be defined as set out in Article 29(3) of the Directive EU(2018)2001

Management category	**Management practice**	**GHG ↓**	**C-Seq ↑**
	drainage assessment and improvements needed to be carried out regularly).		
	Management of carbon-rich soils • Avoiding row crops and tubers • Maintaining a shallower water table – peat • Maintaining a shallower water table - arable	√	
	Land drainage (regularly check and maintain drainage where it has been installed to avoid water-logging and compaction which in turn reduces emissions)	√	
Nutrient management ***(in order to reduce N20 emissions)***	Nutrient management plan to optimize fertilization and improve nitrogen use efficiency. The plan should be based on soil testing, estimating of crops nutrient requirements, recording of nutrient applications, considering field characteristics and soil type, estimating soil nitrogen supply, and where applicable analysis of manure nutrient content prior to application. In addition, it is required that a low emission N-application technology is used (e.g. slurry injection, incorporating manure in the soil within 2 hours of spreading) and fertilizer spreaders which have low coefficient of variation (synthetic fertilizer and farmyard manure (e.g. placing N in the soil via injection), combined with calibration of spreaders.	√	√
Paddy Rice management	Shallow flooding	√	
	Mid-season drying event	√	
	Off-season straw	√	
Structural elements with mitigation potential ***(in order to increase C sequestration)***	Plant hedges and/or buffer strips and/or individual trees		√
	Conversion of low productivity land (e.g. along field edges) into woodland to increase C sequestration and protect against soil erosion		√
Waste management	Minimize post-harvest loss	√	

19.3 Livestock production

Sector classification and activity	
Macro-Sector	A - Agriculture, forestry and fishing
NACE Level	3
Code	A1.4
Description	Livestock production
Mitigation criteria	
Principles	1. Demonstrate substantial avoidance or reduction of GHG emissions from livestock production (including animal management, storage and processing of manure and slurry, and management of permanent grasslands) 2. Maintain existing sinks and increase sequestration (up to saturation point) of carbon in permanent grassland. Where livestock production does not include permanent grassland, only principle 1 applies. ***Permanent grassland*** *is land used to grow grasses or other herbaceous forage, either naturally (self-seeded including 'rough grazing') or through cultivation (sown), and which is more than five years old.*
Criteria	Criterion relating to Principle 1 **1) Avoid or reduce GHG emissions (including those from inputs used on the farm) through the application of appropriate management practices.** Criterion relating to Principle 2 **2) Maintain and increase existing carbon stocks for a period equal to or greater than 20 years through the application of appropriate management practices.** Criterion relating to both Principles **3) No conversion of high carbon stock land which has this status in or before January 2008 to livestock production.** a) *wetlands, namely land that is covered with or saturated by water permanently or for a significant part of the year;* b) *continuously forested areas, namely land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds in situ;* c) *land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 %, or trees able to reach those thresholds in situ;* d) *peatland in January 2008, unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil.* e) *highly biodiverse grassland spanning more than one hectare that is:*

	i) natural, namely grassland that would remain grassland in the absence of human intervention and that maintains the natural species composition and ecological characteristics and processes; or *ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and that is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority.*
Metric	**Metrics for Criterion 1** - Proportion of the livestock operation for which mitigation practices* are deployed (%)' OR - % reduction in GHG emissions (gCO2e) over a specified period, compared to emissions at the start of that period **Metric for Criterion 2** - Area over which appropriate management practices* are deployed on the farm (%) OR - Increasing carbon stock (tC/ha) over a specified period **Metric for Criterion 3** - n/a – presence absence *N.B. This metric is simply the presence or absence of land use change taking place from those categories listed in the criterion to livestock production.* * These essential management practices are described in the table below. *All essential practices will need to be deployed, except where particular practices can be demonstrated to be not applicable to that site.*
Threshold	**Thresholds for Criterion 1** - The essential management practices are deployed consistently over the applicable livestock operation each year or - Reduction in GHG emissions (gCO2e) in line with the following trajectory



For example, over the 10 year period of 2020-2030, a 20% reduction in GHG emissions would be required. Over the 20 year period of 2020-2040, a 30% reduction in GHG emissions would be required.

N.B.

In the case of *force majeure*: emissions resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not affect the application of the Taxonomy or result in non-compliance with the Taxonomy criteria.

Threshold for Criterion 2

- The essential management practices are consistently deployed over the applicable permanent grassland area each year

or

- Above and below ground carbon stocks shall increase progressively over a 20-year period*

* Noting the following exception: For soils specifically, where saturation levels have been reached, no further increase in carbon content is expected. In this case, existing levels should be maintained

Threshold for Criterion 3

- Presence or absence

	Supporting notes: - To demonstrate compliance with the essential management practices criteria, it will be necessary to establish a farm sustainability management plan which describes the management practices being deployed and their coverage on the farm. - To demonstrate compliance with the quantitative GHG thresholds it will be necessary to establish a Carbon stock and GHG emission baseline for the farm. It will be against such baseline data that emission reductions of Carbon increases can be measured. A carbon audit is necessary in order to also assess where action is needed, and this must be accompanied by a carbon management plan to set out the management practices that will deliver the GHG emissions reduction/ carbon sequestration. This carbon management plan is part of the broader farm sustainability plan. Emissions, sinks and management practices are all to be audited at 3-year intervals to confirm ongoing compliance with these requirements.

Rationale

Opportunities for substantial mitigation and contributions to a net zero carbon economy

An overarching goal of the Taxonomy is to enable the screening of economic activities to determine whether or when they do or do not deliver substantial mitigation, consistent with the underlying goal of a net zero carbon economy by 2050.

In the context of agriculture, Net-Zero is a means to ensure that even where GHG emissions cannot be reduced to zero, they can be compensated for through increased removals (through carbon sequestration) on farmed land. The discussion about the scale at which net-zero should (and could) be met solely in agriculture remains open. It may not be possible to reach net-zero emissions on an individual farm holding in all cases, particularly where they are specialist in nature. In other cases, it may be more feasible. At the aggregate level, it may be that some countries with concentrated production systems and small land areas, would struggle to reach net-zero emissions within the agriculture sector alone and within country. This raises the question as to the extent to which a given farm, or aggregation of farms, could reach net-zero and the extent to which these farms could appropriate negative emissions (sequestration) from other farms or other sectors.

The criteria proposed in the Taxonomy do not attempt to address this question directly and instead focus on ensuring that emissions are reduced and that removals increase at the economic activity (NACE code) level.

While livestock production, and in particular ruminant livestock production (beef, lamb, dairy), is a significant source of emissions in the agriculture sector it is included in the Taxonomy due to the significant short-term mitigation potential associated with reducing emissions intensity in livestock management, and in particular long-lived greenhouse gases (N20, CO2), through good practices on the farm. In the short term, emission reductions associated with improved nitrogen use efficiency and manure management are substantial, with overall positive impacts on farm level economics. Each of these needs to be addressed in order to ensure that agriculture as a whole delivers substantial mitigation and contributes its part to a net zero carbon economy. Doing so ensures each instance of livestock management maximises its contribution – this rationale drove the principles set out above.

However, it is important to note that for absolute emissions from agriculture to continue decreasing beyond a certain point and to move towards net-zero targets by mid-century, reduced emissions intensity will need to be coupled as soon as possible with commensurate changes in consumption patterns and overall reduced per-capita consumption of livestock products, especially beef, lamb and dairy products. This implies both societal changes in terms of changing diets and reducing food waste, as well as structural transformations in the agricultural sector. Significant and coordinated policy efforts will be required to manage both behavioural changes on the side of consumers and to incentivise and manage structural change in the agri-food supply chain At this point, the Taxonomy cannot address such shifts, but can only point to significant short-term potential associated with efficiency gains. Future Taxonomy updates should, however, consider these aspects.

Approach taken to setting thresholds for livestock production

There continues to be a relative paucity of information and data to set absolute thresholds (e.g. gCO_2e/ ha or gCO2e/ unit of production) for agriculture that represent low carbon agriculture. Even if such information existed at the aggregate level, translating this to appropriate thresholds would remain challenging given the heterogeneity across farms and farming practice implementation.

However, setting relative GHG thresholds (i.e. % change in gCO2e/ ha or % change in gCO2e/unit of production) is possible, where these can be made relative to a counterfactual on the same farm or project. Whilst this provides some quantitative means of assessing mitigation performance, it is a relatively blunt mechanism as it does not take into account emissions reductions which might previously have been achieved and farm is already delivering significant mitigation. Therefore, is is harder for a farm that already performs relatively well to deliver an additional X% reduction in emissions than it is for a form that currently performs relatively poorly. Furthermore, to determine compliance with such a GHG threshold, GHG accounting at farm level is necessary. But this is not yet mainstream, despite the existence of a range of tools and approaches.

The proposals, therefore, allow for a different approach, namely the demonstration of the deployment of specific bundles of management practices, practices that are recognised as essential to delivering low carbon production in different types of agriculture. This qualitative approach is relatively simple to monitor, and there are existing mechanisms to do so, such as under the CAP. It also provides a more directly communicable approach to farmers and land managers who will implement such practices on the ground. As this approach is applicable for those who have already established such practices as well as those that will additional investment finance to do so, it also allows for the recognition of farms (and associated assets and equity) that are already high performers in terms of a low GHG footprint, so avoids the problems associated with the relative GHG threshold as described above.

Emission contributions from agriculture arise primarily from three sources: enteric fermentation (42.9%; 0.186 GtCO2e); management of agricultural soils (38%; 0.165 GtCO2e); and manure management (15.4%; 0.067 GtCO2e). And they are predominantly from reductions in non-CO2 emissions as these form the majority of agriculture emissions in the EU, with CO2 from on-farm energy use being a minor component (covering only 0.13% of total EU28+ISL agriculture emissions in 2014). The largest share of the EU's agricultural non-CO2 GHG emissions comes from the more potent nitrous oxide (N2O) and methane (CH_4). Nitrous oxide accounts for 58% of non-CO_2 emissions from agriculture (largely from fertiliser application and exposed soils, as well as grazing animals), with methane accounting for the remaining 42% (largely from livestock and rice cultivation).

In relation to livestock management, mitigation potential derives from improved animal health planning, lower-emission feeding strategies, and reducing emissions from manure management and waste treatment (Buckley et al. 2015[150], Chadwick et al 2011[151], Miselbrook et al 2014[152]).

Metrics and thresholds ***On management practices that deliver substantial mitigation***

Rationale for the selection of practices: Scientific literature identifies a wide range of possible mitigation activities available in livestock production to address the different emissions and opportunities for sequestration.

[150] Buckley, C., Howley, P. and Jordan, P. (2015) The role of differing farming motivations on the adoption of nutrient management practices pp. 152-162.

[151] Chadwick, D., Sommer, S., Thorman, R., Fangueiro, D., Cardenas, L., Amon, B. and Misselbrook, T. (2011) Manure management: Implications for greenhouse gas emissions. Animal Feed Science and Technology 166-67, 514-531.

[152] Misselbrook, T. H., Cardenas, L. M., Camp, V., Thorman, R. E., Williams, J. R., Rollett, A. J. and Chambers, B. J. (2014) An assessment of nitrification inhibitors to reduce nitrous oxide emissions from UK agriculture. Environmental Research Letters 9, 115006.

For the purpose of the Taxonomy, individual management practices were identified for which: 1) there is sufficient existing scientific knowledge and consensus on the mitigation effects and interactions with other environmental and food security objectives; and 2) the scale, certainty and consistency of mitigation effects is sufficiently demonstrated (for example, Smith et al. 2008[153], Paustian et al. 2016[154], Kay et al. 2019[155]).

The identified practices include activities that reduce the carbon intensity of agriculture and do not risk leakage effects, and also do not risk negative ancillary effects or are in conflict with legislation in the EU. These practices deliver substantial mitigation with relatively high certainty across a range of biophysical and farming conditions.

Scientific literature provides insights on mitigation potential on categories or individual practices and also indicates that it is the combination of practices which are applied over large areas that leads to substantial mitigation, i.e. an approach is required where all feasible mitigation practices which are environmentally sustainable should be pursued (Paustian et al. 2016). The literature, however, provides limited guidance on how to translate sectoral or activity-based mitigation potential into individual farm-level mitigation potential, i.e. what combination of practices should be applied together as a minimum at farm level in different conditions to deliver substantial mitigation. Therefore, TEG expert input was used to determine the minimum combination of practices which should be applied together for each NACE activity code to deliver substantial mitigation at farm level.

The table below indicates the management practices selected as the bundle of essential practices that, deployed collectively, should deliver substantial mitigation from livestock production at farm level. It is noted that given heterogeneity of farms, deployment of the same bundle of practices may result in different emissions impacts farm to farm, but overall it is expected that deployment of this bundle will deliver substantial mitigation in the majority of cases.

The applicable area for management practices relates to where those practices could and should be deployed on a farm in order to meet their objectives. For example, buffer strips designed to prevent soil erosion and run-off are to be placed next to water courses and ditches, etc. Therefore, some practices may only be deployed on a small area of the farm where they add value.

On GHG emission reduction thresholds

Substantial, in the context of substantial mitigation, falls on a spectrum of mitigation potential from net - negative (where removals exceed emissions), net-zero (where removals balance with emissions) to varying degrees of emission reductions. With no EU or global baseline target for emission reductions from the agriculture sector as a whole or non-perennial crop production specifically the degree to which emission reductions and removals should be required becomes a question of ambition and need. It is also noted that the Taxonomy has a global reach, and thus any level of ‘substantial’ should be consistent in the global context.

[153] Smith, P. et al. (2008), “Greenhouse gas mitigation in agriculture”, Philosophical Transactions of the Royal Society B, Vol. 363, Issue 1495, The Royal Society, London, 789-813.

[154] Paustian K, Lehmann J, Ogle S, ReayD, RobertsonGP and Smith P 2016 "Climate-smart soils", Nature 532 49–57

[155] Kay et al. (2019). "Agroforestry creates carbon sinks whilst enhancing the environment in agricultural landscapes in Europe", Land Use Policy 83 581-593.

A review by Wollenberg *et al,* 2016[156] suggests a total mitigation need from agriculture from between 0.9 – 1.4 $GtCO_2e$ (in 2030) to meet the 2 °C target, 1 $GtCO_2e$ (in 2030). This was selected as an approximate target. These figures relate primarily to non-CO_2 emissions and are "an annualized", not cumulative, goal. The target assumes an allowable emissions budget of 6.15–7.78 GtCO2e yr-1 for agriculture in 2030. The goal represents an 11–18% reduction relative to the scenarios' respective 2030 business as usual baselines"[157]. As these figures represent non-CO_2 emissions they implicitly do not recognise the role of potential carbon sequestration and its contribution to global mitigation goals. As such a GHG emissions reduction threshold of 20% over the 10 year period from 2020 to 2030 has been proposed as 'significant contribution' in the context of the Taxonomy. This is supported by work from Frank et al (2018)[158], and The IPCC's fourth assessment report (Smith et al, 2007)[159].

In terms of establishing a declining emissions trajectory for agriculture, the work by Wollenberg et al (2016) calculates emission reduction needs based on a trajectory of emissions from 2010 through to 2100. The emissions curve (level of emissions over time) increases and decreases at different points, relative to existing efforts, projected changes in external factors, etc. The average reduction figure needed over this whole timeframe is 28% emission reductions compared to the baseline. As we move towards 2040 and 2050 the level of emission reductions needed increases, and this implications for any threshold set beyond the 2030 timeframe. The reduction figure in 2050 would be larger (approximately a doubling). Although in the study the level of emission reductions needed is not linear between the years, for simplicity a linear reduction is drawn between the two pegs of 20% reduction by 2030 and 40% reduction by 2050 as a linear trajectory of emission reductions also simplifies implementation and communication.

The study determined these reductions against a business as usual scenario for agriculture. However, establishing a BaU counterfactual level of emissions for each project or farm could limit implementation effectiveness, as the BaU emissions would need to be calculated assuming the mitigation action was not in place. For simplicity, the proposed approach is therefore to simplify the requirement to compare emissions at the start of period with those achieved over the specified period and assess this against the target reduction.

The threshold metric is gCO2e, and not an emissions intensity metric such as gCO2e/ unit of production, as this enables the Taxonomy to be applied by those reducing emissions intensity (e.g. through efficiency improvements) while also requiring them to reduce emissions overall – the overall goal.

On setting Carbon stock thresholds

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[156] Wollenberg, E., Richards, M., Smith, P., Havlík, P., Obersteiner, M., Tubiello, F. N., ... Campbell, B. M. (2016). Reducing emissions from agriculture to meet the 2°C target. Global Change Biology, 22, 3859–3864. doi:10.1111/gcb.13340

[157] idem

[158] Stefan Frank et al, Agricultural non-CO2 emission reduction potential in the context of the 1.5 °C target, Nature Climate Change (2018). DOI: 10.1038/s41558-018-0358-8

[159] Smith, P. et al. (2007), "Agriculture", in Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, New York.

Setting a universal (or global) absolute threshold (in terms of tC/ ha) for carbon stocks is not a viable option given the variability of carbon sequestration and stocking potential – which is very context specific. Those with low carbon stock potential will not be able to deliver substantial sequestration in line with a universal, absolute threshold. Even setting an absolute threshold linked to local conditions (based on maximum carbon stocking potential at that site) is not possible as at present is it is impractical to test and estimate the maximum sequestration potential (i.e. saturation point) of a specific area. Such calculations currently use default values based on soil type, and therefore are not truly context specific.

Furthermore, even defining a specific % of carbon increase required is more challenging than setting the relative threshold for reducing emissions. *Reducing* emissions is always proportional to the level of emissions at a given point, therefore a 20% reduction can be expected to deliver a 'substantial' contribution from an underperforming farm (resulting in high overall emission reductions). However, the premise is different when looking to *increase* sequestration on agricultural land as there is relatively little evidence and few studies that suggest what level of Carbon stock increase would be needed on agricultural land in a 1.5 or 2°C climate stabilisation target scenario, as this is relative to the level of emissions from that same land (if one is pursuing a net-zero approach) or the level of carbon sequestration needed to offset other sectors of the economy. It is however, recognised that C sequestration represents the largest mitigation potential available to the agriculture sector at global scale, while emission savings of non-CO2 emissions may be more important in the EU with a prevailing intensive production system. Smith et al (2007) estimate that 89% of the technical potential of emission reductions in the sector to 2030 and 2050 lies in soil carbon sequestration, i.e.in reducing **net** CO_2 emissions from farming practices and management, including cropland management, grazing land management, restoration of cultivated organic soils and restoration of degraded lands.

The proposal therefore is to require evidence of a positive direction of travel in terms of increasing carbon stocks, specifically, the progressive increase of carbon stocks (confirmed at 3-year intervals) over a [20]-year period.

On no conversion of high carbon stock land

A cut-off date of 2008 for no conversion of high carbon stock land is chosen to be consistent with the operation of the Renewable Energy Directive sustainability criteria relative to these land types. This provides a link with existing sustainability schemes through which compliance could be demonstrated for this criterion.

On demonstrating compliance with these criteria and thresholds

3-year compliance checking is proposed to ensure progress is being made and mitigation is being delivered in practice, and also to reduce the burden necessary on operators. This compliance checking is required for management practice checking, C stock change and GHG reductions.

To prepare the farm sustainability management plan a carbon calculator can be used, or the plan can also be prepared using other nutrient decision-support tools. Advisory support will likely be required in the process of preparing the plan.

Moreover, farm sustainability planning enables farmers to take a holistic approach to optimize mitigation potential from various activities undertaken on the farm and prevent emissions swapping.

Recommendations to the Platform

Livestock production comprises a broad range of practices, including intensive and landless operations ("factory farms"), which can have particular challenges regarding environmental impacts. The TEG did not have sufficient resources to analysis the evidence in depth in order to allow for a differentiated treatment of extensive and intensive forms of livestock production from a DNSH angle. The TEG also raised questions about whether high rates of meat consumption are compatible with a zero-carbon economy. In addition, there are also issues in relation to animal welfare that the TEG has concerns about but that are not covered by the taxonomy framework. Based on the above, the TEG recommends the Platform to re-assess the inclusion of livestock production in the taxonomy.

A large number of carbon audit tools are available at present, although there is variation in the coverage and robustness of these tools. A recent review[160] conducted in Scotland identified three tools deemed technically very suitable for farm-level carbon audits in the Scottish context, enabling sufficient robustness, comprehensiveness and clarity of documentation: Cool Farm Tool[161], Scottish AgRE Calculator[162,] and JRC Carbon calculator[163]. At least the Cool Farm Tool and JRC Carbon Calculator are also more broadly applicable in the EU. The future Sustainability Platform should provide guidance on appropriate tools for demonstrating compliance. Further development of the existing tools is expected to address capacity building and compliance checking needs associated with a transition to low-carbon farming.

As currently proposed, the Criteria and thresholds apply equally to, and do not distinguish between, smaller and large scale farms. This seems appropriate in terms of seeking to address emissions reductions and sequestration in farms of all sizes to maximise aggregate impact, recognising that small farms can be some of the most inefficient and emitting, and large firms can be some of the most efficient per unit of output. But the Platform is asked to consider whether differences should be made in terms of the requirements to demonstrate compliance, recognising the higher transaction cost impacts for smaller scale farmers.

More broadly, the Platform is requested to consider whether and which existing sustainability standards or certification schemes could be used as proxy indicators for compliance with these criteria and thresholds, subject to meeting the same performance outcomes. This includes engaging to align those standards or certification schemes if needed. The adoption of such proxy indicators would help substantially in the cost-effective demonstration of compliance with these criteria and thresholds.

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160 Leinonen, I., , V.Eory, M. MacLeod, A.Sykes, K. Glenk and R. Rees (2019). "Comparative analysis of farm-based carbon audits." Report for ClimateXChange Scotland. https://www.climatexchange.org.uk/media/3584/farm-based-carbon-audits-final.pdf

161 http://www.coolfarmtool.org

162 http://www.agrecalc.com/

163 https://solagro.com/images/imagesCK/files/publications/2016/Farm_Tool_Calculator_Carbon.pdf

It is envisaged that these criteria and thresholds have global applicability, based on input from TEG members and expert advisers with global expertise and experience. They also include elements of non-perennial crop production not common in the EU but with important mitigation potential globally (e.g. practices for rice management). However, additional global consultation will be needed to confirm the appropriateness of these proposals for non-perennial crop production around the world.

As noted above, there is potential for significant emissions reductions and increased sequestration by the agricultural sector, by moving from higher emitting activities to lower emitting activities within the agricultural sector itself, or by taking land completely out of agricultural production for the purposes of restoring or re-establishing natural habitats, particularly peatland and other carbon rich landscapes. Such movements and impacts are not captured here, but would merit additional consideration by the Platform.

Lastly, the Platform should regularly review the list of essential practices to integrate new advances in the scientific knowledge.

Future development - Incorporation of mitigation actions:

The proposals above are intended to screen the activity of non-perennial cropland production to determine when that activity can be deemed to be delivering substantial mitigation. The proposals do not capture more granular measures and actions that deliver significant mitigation, but not at a level sufficient for the activity as a whole to be recognised as making a substantial contribution to climate mitigation.

These measures or actions might include:

- Subsets of the bundle of management practices described below
- Replacement/ upgrades of agricultural machinery
- Biogas to manage manure[164]
- Installation or establishment of storage facilities or refrigeration facilities

The Platform is asked to consider how mitigation actions which deliver significant mitigation might be identified and evaluated, and how these can be incorporated into the Taxonomy. This includes 1) determining a rule set to determining what counts as significant mitigation from individual actions, which may be consistent with similar rule sets across other economic activities, or common across agricultural activities only, or specific to non-perennial cropland management.

Do no significant harm assessment

The activity *livestock production* captures a distinct set of sub-activities that would include intensive and extensive forms of livestock rearing, as well as the management of permanent grassland. These

[164] Treatment of animal waste in anaerobic biogas digesters (provided that purpose-grown crops are not used as feedstock, sufficient storage is available for digesters to avoid negative impact on the environment, and digesters are not located in areas where additional application of digestate would result in nutrient overload) can also provide an important mitigation option. This measure can provide locally important mitigation potential, when combined with solid-liquid separation (Grossi et al 2019) and should be considered where possible.

<table>
<tr><td colspan="2">come with different key environmental aspects that need to be considered for investments in this sector, summarised as follows:
• ability of farming systems to adapt to a changing climate;
• impact on water quantity, water quality and water ecosystems, incl. waste water treatment from intensive rearing;
• manure treatment;
• Emissions of pollutants (such as methane, ammonia, dust, odour, noise) to air, water and soil, in particular in the case of intensive rearing;
• impact on habitats and species.
To note that areas of environmental risk are highly geographically variable. Guidance should be sought from the relevant competent national or regional authority to identify areas or issues of importance and relevance within the area or project concerned.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Sustainable use and protection of water and marine resources</td><td>• Activities should not lead to a decrease in water availability in catchments where this is a concern and should be in keeping with the objective of good quantitative status as defined in table 2.1.2 in Annex V to (the Water Framework) Directive 2000/60/EC[165];
• Activities should not lead to a decrease in water quality within a catchment, and should be in keeping with the objective of good chemical and ecological status as defined in (the Water Framework) Directive 2000/60/EC;</td></tr>
</table>

[165] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

	• Activities should be in compliance with the provisions set out under the Nitrates Directive 91/676/EEC[166]. [This means that livestock density should not exceed 1,7LU/ha.]
(4) Circular economy and waste prevention and recycling	• Activities should minimise primary raw material use per unit of output, including energy[167]. • Activities should minimise the loss of nutrients from the production system.
(5) Pollution prevention and control	• Activities ensure that nutrients (fertilisers) and plant protection products (e.g. pesticides and herbicides) are targeted in their application and are delivered at appropriate levels to prevent water and air pollution and the loss of excess nutrients through leaching, volatilisation or oxidisation. • Ensure emissions to air, water and soil are within the BATAEL ranges / are prevented or reduced by using a combination of BAT techniques as set out in the BREF for the Intensive Rearing of Poultry or Pigs[168], and by using similar emission reducing techniques for dairy farming; • Ensure that mitigation and emission reduction techniques for feeding and housing of livestock and for manure storage and processing are applied, as recommended in the UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia; • Where manure is applied to the land, activities should comply with the limit of 170kg nitrogen application per hectare per year, or alternatively, the derogated threshold where one has been set in that member state[169].
(6) Healthy Ecosystems	• Activities ensure the protection of soils, particularly over winter, to prevent erosion and run-off into water courses/bodies and to maintain soil organic matter. • Activities do not lead to the conversion, fragmentation or unsustainable intensification of high-nature-value farmland, wetland, forests or other areas of high-biodiversity value[170]. • Activities should not:

[166] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources

[167] The criterion refers to “unit of output” to allow for production efficiency increases where raw material use may not decline.

[168] http://eippcb.jrc.ec.europa.eu/reference/irpp.html

[169] This threshold derives from the provisions set out under the Nitrates Directive 91/676/EC [Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources]. In practice the threshold of 170kg/ha/year has been implemented by Member States by setting limits on livestock density between 1.7 - 2.0 livestock units / ha. Livestock unit is a reference unit which facilitates the aggregation of livestock from various species and age as per convention, via the use of specific coefficients established on the basis of the nutritional or feed requirement of each type of animal (see, for example,https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Livestock_unit_(LSU))

[170] Areas of high-biodiversity-value can be defined as set out in Article 29(3) of the Directive EU(2018)2001

	o result in a decrease in the diversity or abundance of species and habitats of conservation importance or concern; o contravene existing management plans or conservation objectives; o lead to overgrazing other forms of degradation of grasslands.

Management category	Management practice	GHG ↓	C-Seq ↑
Animal Health Planning	Better health planning and management (develop a health management plan, improve hygiene & supervision at parturition, improve maternal nutrition in late gestation to increase offspring survival, improve fertility management, semen selection for improving both methane and ammonia emission efficiency).	√	
Animal Feeding	Feed additives: certain compounds, such as dietary fats, nitrate, 3-NOP, can reduce enteric CH_4 emissions of ruminants. They need to be administered by mixed into the feed, and the dosage needs to be set accurately in order to avoid some potential negative health effects on the livestock. It is usually not feasible to apply these for the periods when the livestock is grazing.	√	
	Precision and multi-phase feeding techniques, where the nutrient requirements of groups of animals (or individual animals) are targeted in feed formulation. This can reduce nitrogen excretion and subsequent N_2O emissions from manure, and also increase feed efficiency in general (reducing the feed related upstream emissions). Close monitoring of animals (e.g. regular weighting) coupled with feed mixers and automated feeding systems are required for the more precise technology, while lower precision can still be achieved by separating animal groups by growth status for feeding and grazing.	√	
Manure Management	Cooling of liquid manure. CH_4 emissions from liquid manure increase with temperature. The slurry can be stored at a lower (ambient) temperature by using animal houses where the manure is collected in an outside pit rather than in the house. Note: Bundle all manure storage measures with low emission spreading	√	
	Covering slurry and farm-yard manure reduces gaseous losses of ammonia (and related indirect N_2O) and also CH_4 emissions. The covers act as a physical barrier between the air and the slurry/manure, reducing diffusion. The presence of a slurry cover increases the ammonium concentration of the slurry and hence its nutrient value (and potentially subsequent ammonia and N_2O losses from spreading). There are a wide choice of technological solutions from	√	

	short lifetime plastic film covers to retrofitted or purpose built rigid covers.		
	Separating solids from slurry: via mechanical or chemical ways the liquid part (rich in N) of the slurry (and also digestate from AD) can be separated from the solid part (rich in phosphorous and volatile solids). Storing them separately can reduce CH_4 and N_2O emissions (though can increase NH_3 emissions). Separation also reduces the transportation cost of the phosphorous-rich solid fraction, helping to relieve phosphorous over-application problems in areas with high livestock density.	√	
	Composting and applying solid manure	√	√
	Slurry acidification is achieved by adding strong acids to the slurry to achieve a pH of 4.5-6.8 – this reduces CH_4 and NH_3 emissions considerably. There are three main types of technology based on the stage at which the acid is added to the slurry: in the livestock house, in the storage tank, or before field application. The slurry tank and the spreading equipment needs to be designed to withstand the acidic liquid, and precautions particularly while handling the strong acids are needed to minimize the risk of accidents. A better monitoring of the storage is also advisable to reduce the risk of slurry spillage to a minimum.	√	
	Apply low-emission application technology for slurry and manure	√	√
Permanent grassland management	Pasture renovation (when productivity declines, reseed the pasture)	√	√
	Remove animals from very wet fields to reduce compaction	√	
	No ploughing of permanent grassland	√	√

20. Forestry

Why forestry is included in the Taxonomy
The Taxonomy defines forest as per the UN Food and Agriculture Organization.[171]

Forests cover about 30% of global landmass and absorb roughly 2 billion tons of carbon dioxide each year.[172] Forests regulate ecosystems, protect biodiversity, play an integral part in the carbon cycle, support livelihoods and can help drive sustainable growth. EU forests participate already in more than 20% of the global forest carbon sink, and yet an increase in carbon sequestration from forests is essential to the achievement of a net-zero target by 2050 in Europe and globally.[173]

The role of forests in the global greenhouse gas balance can be enhanced through the implementation of cost-effective mitigation options for forestry including afforestation, sustainable forest management, rehabilitation of degraded forests, reforestation and through the reduction of deforestation across the globe.[174,175]

The Taxonomy recognizes the carbon capture potential of forests through long-lived wood products[176], and acknowledges that using harvested wood products (HWP) to substitute more greenhouse gas intensive materials and fossil fuels can under certain circumstances have climate mitigation benefits through the reduction of fossil greenhouse gas emissions from other sectors (e.g. wood-based raw materials and products, bioenergy and construction). Overall the Taxonomy supports the principles put forward in the EU Forestry Strategy, advancing both the benefits of sustainable forest management and the multifunctional role of forests.[177]

In Europe alone, more wildfires have been recorded in the first four months of 2019 than in the whole of 2018[178] and deforestation remains the second-leading cause of climate change, after the burning of fossil fuels.[179] The United Nations Framework Convention on Climate Change (UNFCCC) estimates that an additional USD 14 billion in financial flows will be required to address climate impacts in agriculture, forestry and fisheries globally in 2030.[180] That includes the implementation of mitigation projects, but also ensuring the resilience of forests to climatic changes, the pro-active protection of forest ecosystems, biodiversity, habitats and soil, as well as the sustainable provision of raw material for the forestry industry.

171 FAO FRA 2020.
172 http://www.fao.org/state-of-forests/en/.
173 European Forest Institute.
174 IPCC, 2014.
175 While the forest Taxonomy focuses on enhancing the mitigation potential of forestry activities, it reinforces the importance of reducing deforestation globally, and reiterates the importance of the international guiding principles against deforestation provided by the UNREDD.
176 It is estimated that EU forests have a climate change mitigation effect equivalent to 13% of EU CO2 emissions, including forest sinks and wood products storage, excluding substitution effects. See https://www.efi.int/sites/default/files/files/publication-bank/2018/efi_fstp_2_2015.pdf.
177 https://ec.europa.eu/agriculture/forest/strategy_en.
178 EC Joint Research Center's European Forest Fire Information System, 2019.
179 www.fao.org/state-of-forests/en/.
180 https://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/adaptation.pdf.

Subjects covered

The scope of the Taxonomy emphasizes carbon storage in forest ecosystems through forest management activities that apply up to the forest gate.

The selected activities represent interventions at different stages of a forest's economic life cycle and have been scoped under the NACE code A2 - Forestry and logging. They include:

- Afforestation
- Reforestation
- Restoration/rehabilitation
- Existing forest management

The transfer from 'afforestation' or 'reforestation' criteria to the criteria set for 'existing forest management' follows the EU LULUCF accounting rule of 20 years.

Logging, or forest harvesting (thinning, final felling, etc.), is considered an integral part of the cycle of forest management. Logging activities shall meet the criteria set for forest activities in order to be eligible under the Taxonomy. Whenever forest management is supported/carried out by subcontractors, the same criteria apply to them according to the activity that the services support. That includes investing in inventory management, planning, certification, reporting and monitoring, pest control and forest fire prevention and management.

Criteria and thresholds

Selected criteria build on EU legislation (e.g. the Renewable Energy Directive and its recast, EU LULUCF, EU Nature Directives, EU FLEGT, EU Timber Regulation, etc.), national forest legislation, international standards and best practices and international processes, such as Forest Europe. The Taxonomy recognizes that, although the EU has a variety of forest-related policies, the Treaty on the Functioning of the European Union makes no reference to a common EU forest policy, and that the responsibility for forests lies with the Member States within a defined framework of established ownership rights, which include a long history of long-term planning in national and regional regulations.

The Taxonomy sets out the following three cumulative qualitative and quantitative mitigation criteria to be implemented, which shall result in substantial greenhouse gases sequestration and soil and biodiversity maintenance and/or improvement:

1. Compliance with Sustainable Forest Management (SFM) requirements;

   SFM is defined as 'the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems'.[181] The SFM requirements set in the Taxonomy apply internationally, provided they can be informed using forest certification via independent third-party schemes that are regularly audited. This shall allow

[181] https://foresteurope.org/wp-content/uploads/2016/10/MC_lisbon_resolutionL2_with_annexes.pdf#page=18.

investors and forest management companies to verify compliance with the criteria in Europe and globally.[182]

2. The establishment of a GHG balance baseline for above-ground carbon pools, based on growth-yield curves;
3. The demonstration of permanence and steady progress with respect to the other two criteria shall be reported through a forest management plan (or equivalent) at 5-year intervals, to be subsequently reviewed by an independent third-party certifier and/or competent authorities. Carbon stocks shall increase above the carbon baseline over a period of 20 years for afforestation and reforestation projects and shall increase over the economic lifetime for the management of existing forests and restoration projects.

Progress in the forest carbon inventory and evolution of the forest increment is required relative to a self-established baseline, over the economic life cycle of the forest, which reflects and adapts to the industry's levels of maturity, climate conditions, location features and market structures. Measurement and reporting recognize approaches adopted in the EU LULUCF regulation and the recast of the Renewable Energy Directive allowing for, where relevant, integrated landscape management practices beyond single forest stands.[183]

Impact of these proposals

About 430,000 enterprises are active in wood-based industries across the EU, representing 20% of EU manufacturing enterprises and 7.5% of the gross value-added of the manufacturing industry in Europe.[184] The wood industry provides around 3.5 million jobs in the EU.[185]

Forests vary from small family holdings to state forests or to large estates owned by companies. Forest owners and managers with similar forest characteristics, under similar climate conditions and jurisdictions, are expected to be equally impacted.

Forestry operations that are FSC and PEFC certified are likely to meet the SFM and Do No Significant Harm criteria of the forest Taxonomy. This equates to 61.5% of total productive forests in the EU.[186] Globally, it is estimated that about 20% of productive forests used for multiple purposes are certified by FSC and PEFC.[187] Other forestry projects (i.e. non-certified) may also meet the criteria, but it is not possible to estimate this part of the market with certainty.

Progress and performance in relation to above-ground GHG sequestration is measured relative to the self-assessed baseline, therefore any forest owner/manager is being given the opportunity to progress in accordance with its specific constrains and maturity level. It is unclear what proportion of the market already meets this requirement.

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182 FSC/PEFC estimate that about 54% of forests globally are productive and/or used for multiple purposes, of which 20% are certified by FSC and PEFC. See Data about Share Forest Certification (FSC+PEFC) in Forest Management, John Hontelez, FSC International, 30 April 2019.

183 Denier, L., Scherr, S., Shames, S., Chatterton, P., Hovani, L., Stam, N. 2015. The Little Sustainable Landscapes Book. Global Canopy Programme, Oxford, UK.

184 In 2017. https://ec.europa.eu/eurostat/statistics-explained/index.php/Wood_products_-_production_and_trade

185 https://ec.europa.eu/info/events/forestry-conference-2019-apr-25_en

186 Eurostat, 2017, and Data about Share Forest Certification (FSC+PEFC) in Forest Management, John Hontelez, FSC International, 30 April 2019.

187 Data about Share Forest Certification (FSC+PEFC) in Forest Management, John Hontelez, FSC International, 30 April 2019.

From a reporting perspective the Taxonomy builds on EU legislation and national frameworks. The Taxonomy allows for performance-related information to either be reported and disclosed by the forest owner/forest management company directly, or through existing, integrated reporting mechanisms in place at the level of the jurisdiction. The Taxonomy recognizes the importance of landscape approaches in how the forest carbon inventory and evolution of the forest sink increment is managed. Due to the inclusion of forests as a competence of Member States, certain forest owners/manager might already be required to produce a forest management plan and report SFM practices and carbon performance on an annual basis.
Overall it is estimated that best performers might already be able to comply with the Taxonomy criteria, while others will need more time.

Next steps
The following issues are not fully addressed in this round of forest Taxonomy criteria. However, they may provide additional mitigation opportunity and should therefore merit additional consideration by the Platform on Sustainable Finance:

- The forest Taxonomy sets out criteria and thresholds for forest management activities that apply up to the forest gate. No different criteria are proposed depending on the ultimate use of the timber produced. This is for the pragmatic reason that many forest managers and owners do not know in which supply chains their products will end up. In principle however, the Taxonomy recognizes the holistic mitigation potential of forests and wood beyond the forest gate (e.g. substitution effect). At present climate benefits beyond the forest gate are expected to primarily be captured through the construction/building, energy and manufacturing sectors. The platform should improve the holistic consideration of forests' mitigation potential across their entire value chains, and across all sectors of the economy.
- The current proposal does not capture or address all possible sources of emissions taking place in the forest during the lifetime of a forest project or activity (e.g. fuel use by machinery). The platform should further explore broadening the current criteria to account for individual improvements to be eligible as individual investments towards meeting the overall forest activity criteria, i.e. the substantial mitigation objective.
- GHG measurement is required for above-ground carbon sequestration on the basis that below-ground carbon is technically more challenging to assess and measure overtime. Instead, below-ground carbon shall be maintained and/or increased through the application of management practices, reflected through cumulative Sustainable Forest Management and Do No Significant Harm requirements. The platform is advised to further explore below-ground carbon measurements and review existing impact assessment methodologies that might complement the current threshold for below-ground carbon measurements.
- It is estimated that selected criteria and thresholds are applicable internationally based on input from TEG members and expert advisers with global expertise, provided they can be informed by applying forest certification using independent third-party schemes that are regularly audited. It is recommended that the platform further develop guidance, including a mapping of the Taxonomy criteria and thresholds, with existing internationally-used forest certification schemes. This will support investors and forest management companies with the Taxonomy. In addition, global consultation will be needed to confirm the appropriateness of these proposals around the world.
- The platform should further explore potential end-user issues for investors and financial institutions, including potential challenges that may arise in relation to associating capital expenditures or revenues that can be tagged or screened through the current criteria set for forest management/land use activities.

20.1 Afforestation

Sector classification and activity	
Macro-Sector	A - Agriculture, forest and silviculture
NACE Level	2
Code	A2
Description	**Afforestation** Afforestation is defined as the establishment of forest through planting and/or deliberate seeding on land that, until then, was under a different land use, implies a transformation of land use from non-forest to forest[188].
Mitigation criteria	
Principle	Afforestation shall increase carbon sinks of above and below ground carbon overall compared to a counterfactual with no conversion to forest. All the Criteria are additive and shall apply together: • Apply the following Sustainable Forest Management (SFM) requirements: o Identify and apply forest management practices that increase existing carbon stocks from above and below ground carbon overall, while maintaining or improving the soil quality, and biodiversity; o Maintain or improve the long-term capacity of the forest to deliver multiple services (e.g. ecosystem services, timber production); o Do not convert high carbon stock land (i.e. primary forest, peatlands, wetlands, and grasslands) which has this status on or before January 2008; o Carry out harvesting activities in compliance with national laws; o Regenerate harvested forests. • Establish a baseline GHG balance of carbon pools at the beginning of the afforestation/reforestation activity; • Demonstrate continued compliance with the Sustainable Forest Management requirements and increase of carbon sinks from above-ground carbon over time, supported by and disclosed through a forest management plan (or equivalent) at 5-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.
Metric	• Sustainable Forest Management (SFM) requirements as described above. • GHG balance baseline[189] is calculated for above-ground carbon pools, based on growth-yield curves for species per m3/year/ha, carbon convertible.

[188] Source: FAO, Global Forest Resources Assessment, 2020

[189] Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas

Threshold	• Continued compliance with the Sustainable Forest Management (SFM) requirements is demonstrated and disclosed at 5-year intervals through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3). • Carbon stocks shall increase above carbon baseline over a period of 20 years[190]. Changes in carbon stocks should be disclosed based on growth yield curves in 5 years intervals through a forest management plan (or equivalent[191]) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3)[192].

Rationale

The Taxonomy acknowledges a definitional change from 'afforestation' and 'reforestation' to 'existing forest management' according to the LULUCF Regulations 20-year accounting rule as per Art. 5(3).

Forestry can deliver substantial greenhouse gas (GHG) emission mitigation and protect the carbon storage through sequestration of carbon during tree growth. Carbon is fixed above ground and below ground in the vegetation, soil, litter, dead wood, that are derived from the forest in line with the lifetime of these products.

Afforestation and reforestation activities can deliver substantial mitigation through:

- An increase in the forest capacity to sequestrate carbon from above ground and below ground carbon pools;
- Maintenance and/or increase of the soil quality, soil carbon and biodiversity.

The approach taken to determine metrics and thresholds rely on cumulative criteria:

1. **Sustainable Forest Management (SFM) requirements** that ensure the maintenance and/or increase of carbon sinks of above and below ground carbon through management practices.

- SFM requirements use EU legislation as minimum baseline, align with and build on the Climate Bonds Initiative's Forestry criteria, the EU Renewable Energy Directive and its recast (RED II), and the Forest Europe general guidelines for sustainable forest management.
- An Annex to the Forest mitigation Taxonomy provides an indication of recommended forest management practices that maintain and/or increase carbon stores or carbon sinks of above

Inventories, it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide

190 20 years aligns with the measurement of carbon and under LULUCF regulation land that was afforested moves from category "afforestation" to "forest land" after 20 years

191 Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

192 This threshold should apply considering the following force majeure clause: underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not result in non-compliance with the Taxonomy criteria.

and below ground carbon. These are non-exhaustive examples of types of practices that can be considered for all the relevant carbon pools in the forest.

- SFM requirements include a no conversion land requirement to preserve high carbon land areas that is consistent with the RED II, which defines 2008 as a base year for land use change. This base year has also been adopted by several global certification schemes (e.g. ISCC and RSPO RED).
- Harvesting activities must be carried out in compliance with national laws, shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable.
- Regeneration of forests after harvesting is covered under EU legislation and has been included as a requirement to ensure regeneration is taken into consideration for forest activities outside the EU.
- SFM requirements should be considered in combination with the Do No Significant Harm criteria.
- They can be informed by applying forest certification using independent third-party schemes that are regularly audited.

2. **GHG measurement of sequestration in carbon pools** identified in LULUCF regulation Annex I section B.

- The forest Taxonomy acknowledges that setting a universal absolute threshold for carbon stocks is not a viable option given the variability of carbon sequestration is very context specific. The Taxonomy therefore requires evidence of a positive direction of travel in terms of maintaining and/or increasing carbon stocks, specifically, the progressive increase of above ground carbon stocks.
- Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines), it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.
- Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

3. **Demonstration of permanence and performance.** Demonstration of permanence and steady progress with respect to Criteria 1 and 2 is reported through a forest management plan (or equivalent) at 5-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.

- In order for forests to achieve their full climate mitigation potential, it is essential the Taxonomy accounts for both a continuum of management practices, and the demonstration that the carbon stocks increment includes the impact from living, aboveground biomass, specifically in the case of afforestation and reforestation projects. SFM requirements are essential to guarantee the maintenance in carbon sequestration from belowground biomass, dead organic matter or soils: increase in carbon sequestration from below ground carbon pools is not included due to the high uncertainty in measuring it.

- Sequestration levels shall be calculated on an average annual basis, reported at a minimum every 5 year, and performance shall be demonstrated after 20 years of the afforestation/reforestation project, which aligns with the measurement of carbon and under LULUCF regulation land that was afforested moves from category “afforestation” to “forest land” after 20 years. A 20-year period for maintaining carbon sinks and activities also follows the IPCC time frame of 20 years to saturation for soil carbon.
- Information might either be reported and disclosed by the forest owner/forest management company directly, or through existing, integrated reporting mechanisms in place at the level of the jurisdiction: the forest Taxonomy recognizes the importance of landscape approaches in how the forest carbon inventory and evolution of the forest sink increment is managed: it recognizes approaches described in the LULUCF regulation and RED II. Absence of landscape management access will in turn require disclosure at the single forest stand.

Do no significant harm assessment

Key environmental aspects span across all other five objectives and are summarized as follows:

- ability of forests to adapt to a changing climate;
- impact on water resources as well as on water quality;
- pollution to water, air, and soil, and risks associated from the use of pesticides and fertilizer;
- impacts on biodiversity and ecosystems from intensification and conversion of land of high ecological value to forests and illegal logging.

The DNSH criteria below should be considered in combination with the SFM requirements of the forest mitigation Taxonomy (criterion 1). The criteria can be informed by applying forest certification using independent third-party schemes that are regularly audited. Compliance shall be reported through a forest management plan (or equivalent) as per criterion 3 of the forest mitigation Taxonomy.

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.

(3) Water	• Identify, disclose and address any water-related risks (e.g. in relation to quality of discharges into watercourses, wetlands and quantitative impacts of water use on groundwater and surface water bodies).
(4) Circular Economy	
(5) Pollution	• Minimise the use of pesticides and favour alternative approaches or techniques, such as non-chemical alternatives to pesticides, in line with the Directive 2009/128/EC on the sustainable use of pesticides. With exception of occasions that this is needed to control pest and diseases outbreaks. Adapt the use of fertilizers to what is needed to prevent leeching of nutrients to waters. • Take well documented and verifiable measures to avoid the use of active ingredients that are listed in the Stockholm Convention, the Rotterdam Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, or that are listed as classification Ia or Ib in the WHO recommended Classification of Pesticides by Hazard; • Prevent pollution of water and soil in the forest concerned and undertake clean up measures when it does happen. • Chose trees and vegetation with low emissions of biogenic ozone precursors.
(6) Ecosystems	• Take measures to ensure sustained or improved conservation status at the landscape level[193] • In designated conservation areas, actions should be demonstrated to be in line with the conservation objectives for those areas. • No conversion of habitats specifically sensitive to biodiversity loss or of high conservation value such as grasslands and any high carbon stock area (e.g. peat lands and wetlands), and areas set aside for the restoration of such habitats • Develop a forest management plan (or equivalent) that includes provisions for zoning conservation areas, and for maintaining biodiversity[194] • Evaluate the ecosystem service provision with the aim to not decrease the amount and quality of ecosystem services provided. • Forests are monitored and protected to prevent illegal logging, in compliance with national laws

[193] Landscape management level may be used to emphasize that the goal to preserve conservation status for different species is at a scale above the single forest stand.

[194] This criterion should be considered in combination with criterion 3 of the mitigation criteria to disclose through a forest management plan (or equivalent).

20.2 Rehabilitation, Restoration

Sector classification and activity	
Macro-Sector	A - Agriculture, forest and silviculture
NACE Level	2
Code	A2
Description	**Restoration & Rehabilitation** The Taxonomy defines rehabilitation/restoration as any intentional activity that initiates or accelerates the recovery of an ecosystem from a degraded state[195].
Mitigation criteria	
Principle	Restoration & Rehabilitation shall maintain and/or increase carbon sinks of above and below ground carbon. *All the Criteria are additive and shall apply together:* • Apply the following Sustainable Forest Management (SFM)[196] requirements: o Identify and apply forest management practices that increase and/or maintain existing carbon stocks from above and below ground carbon overall, while maintaining or improving the soil quality, and biodiversity; o Maintain or improve the long-term capacity of the forest to deliver multiple services (e.g. ecosystem services, timber production); o Land must not have been converted from high carbon stock land (i.e. primary forest, peatlands, wetlands, and grasslands) which has this status in or before January 2008; o Carry out harvesting activities in compliance with national laws; o Regenerate harvested forests. • Establish a baseline GHG balance of carbon pools[197] at the beginning of the forest management/restoration activity; • Demonstrate continued compliance[198] with the Sustainable Forest Management requirements and increase and/or maintenance of carbon

[195] Source: FAO, Unasylva, Forest and landscape restoration (referencing the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES).

[196] SFM requirements align with EU legislation and can be informed by applying forest certification using independent third-party schemes that are regularly audited. The SFM requirements should be considered in combination with the Do No Significant Harm criteria.

[197] GHG measurement shall at least account for above ground carbon at the start of the forest activity and overtime, where below ground carbon is recognized to be technically more challenging to assess and measure overtime.

[198] Information might either be disclosed by the forest owner/forest management company directly, and/or submitted to competent authorities through existing, integrated/landscape reporting mechanisms in place at the level of the jurisdiction (e.g. national registries).

	sinks from above-ground carbon over time, supported by and disclosed through a forest management plan (or equivalent[199]) at 5 to 10-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.
Metric	• Sustainable Forest Management (SFM) requirements as described above; • GHG balance baseline[200] is calculated for above-ground carbon pools, based on growth-yield curves for species per m3/year/ha, carbon convertible.
Threshold	• Continued compliance with the Sustainable Forest Management (SFM) requirements is demonstrated and continuously disclosed at 5-year intervals through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3). • Carbon stocks shall increase above carbon baseline over the economic lifetime[201] of the forest. Changes in carbon stocks should be disclosed based on growth yield curves in 5 to maximum 10 years intervals[202] through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3)[203].
Rationale	
A substantial portion of forestry activities will fall under the bracket of existing forest management. Therefore, it is proposed that existing forest management is recognized in the Taxonomy, provided it can demonstrate maintenance of high carbon stocks in multiple pools and overall improvement in the forest carbon sink. Forestry can deliver substantial greenhouse gas (GHG) emission mitigation and protect the carbon storage through sequestration of carbon during tree growth. Carbon is fixed above ground and below	

[199] Landscape management level may be used to emphasize that the goal to perform is at a scale above the single forest stand: the Taxonomy recognizes landscape management approaches such as defined by LULUCF regulation and RED II in how the forest carbon inventory and evolution of the forest sink increment is manage. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

[200] Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.

[201] The economic lifetime is generally aligned with the time of harvesting, meaning that harvesting is accounted for when calculating the average annual carbon sequestration.

[202] A description of above ground carbon state of play is required every 5 to maximum 10 years to ensure steady and overall progress is aimed for and achieved. That aligns with management cycles time horizons performed in the European Union as well as National Forest Inventories.

[203] This threshold should apply considering the following force majeure clause: underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not result in non-compliance with the Taxonomy criteria.

ground in the vegetation, soil, litter, dead wood, that are derived from the forest in line with the lifetime of these products.

The management of existing forests and forest rehabilitation activities can deliver substantial mitigation through:

- An increase in the forest capacity to sequestrate carbon from above ground and below ground carbon pools;
- Maintenance and/or increase of the soil quality, soil carbon and biodiversity.

The approach taken to determine metrics and thresholds rely on cumulative criteria:

- **Sustainable Forest Management (SFM) requirements** that ensure the maintenance and/or increase of carbon sinks of above and below ground carbon through management practices.
    - SFM requirements use EU legislation as minimum baseline, align with and build on the Climate Bonds Initiative's Forestry criteria, the EU Renewable Energy Directive and its recast (RED II), and the Forest Europe general guidelines for sustainable forest management.
    - An Annex to the Forest mitigation Taxonomy provides an indication of recommended forest management practices that maintain and/or increase carbon stores or carbon sinks of above and below ground carbon. These are non-exhaustive examples of types of practices that can be considered for all the relevant carbon pools in the forest.
    - SFM requirements include a no conversion land requirement to preserve high carbon land areas that is consistent with the RED II, which defines 2008 as a base year for land use change. This base year has also been adopted by several global certification schemes (e.g. ISCC and RSPO RED).
    - Harvesting activities must be carried out in compliance with national laws, shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable.
    - Regeneration of forests after harvesting is covered under EU legislation and has been included as a requirement to ensure regeneration is taken into consideration for forest activities outside the EU.
    - SFM requirements should be considered in combination with the Do No Significant Harm criteria.
    - They can be informed by applying forest certification using independent third-party schemes that are regularly audited.
- **GHG measurement of sequestration in carbon pools** identified in LULUCF regulation Annex I section B.
    - The forest Taxonomy acknowledges that setting a universal absolute threshold for carbon stocks is not a viable option given the variability of carbon sequestration is very context specific. The Taxonomy therefore requires evidence of a positive direction of travel in terms of maintaining and/or increasing carbon stocks, specifically, the progressive increase of above ground carbon stocks.
    - Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield

curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines), it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.

  - Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

- **Demonstration of permanence and performance.** Demonstration of permanence and steady progress with respect to Criteria 1 and 2 is reported through a forest management plan (or equivalent) at 5 to 10-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.
  - In order for forests to achieve their full climate mitigation potential, it is essential the Taxonomy accounts for both a continuum of management practices, and the demonstration that the carbon stocks increment includes the impact from living, aboveground biomass. SFM requirements are essential to guarantee the maintenance in carbon sequestration from belowground biomass, dead organic matter or soils: increase in carbon sequestration from below ground carbon pools is not included due to the high uncertainty in measuring it.
  - Sequestration levels shall be calculated on an average annual basis over the full economic lifetime and not only the project lifetime. Taking an average over this time-period is important as biomass growth and carbon sequestration is not linear for forest growth due to changing growth rates as the forest matures, impact of thinning and harvesting, other management interventions, and natural conditions. The economic lifetime is generally aligned with the time of harvesting, meaning that harvesting is accounted for when calculating the average annual carbon sequestration.
  - A description of state of play is required every 5 to maximum 10 years to ensure steady and overall progress is aimed for and achieved. That aligns with management cycles time horizons performed in the EU as well as National Forest Inventories, performed on a 10-year basis.
  - Information might either be reported and disclosed by the forest owner/forest management company directly, or through existing, integrated reporting mechanisms in place at the level of the jurisdiction: the forest Taxonomy recognizes the importance of landscape approaches in how the forest carbon inventory and evolution of the forest sink increment is managed: it recognizes approaches described in the LULUCF regulation and RED II. Absence of landscape management access will in turn require disclosure at the single forest stand.
  - Considering the impact of climate conditions and changing environments the Taxonomy includes a clause for force majeure that states that underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds - and will not result in non-compliance with the Taxonomy criteria.

<table>
<tr><td colspan="2"></td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">Key environmental aspects span across all other five objectives and are summarized as follows:
ability of forests to adapt to a changing climate;
impact on water resources as well as on water quality;
pollution to water, air, and soil, and risks associated from the use of pesticides and fertilizer;
impacts on biodiversity and ecosystems from intensification and conversion of land of high ecological value to forests and illegal logging.
The DNSH criteria below should be considered in combination with the SFM requirements of the forest mitigation Taxonomy (criterion 1). The criteria can be informed by applying forest certification using independent third-party schemes that are regularly audited. Compliance shall be reported through a forest management plan (or equivalent) as per criterion 3 of the forest mitigation Taxonomy.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td>Identify, disclose, and address any water-related risks (e.g. in relation to quality of discharges into watercourses, wetlands and quantitative impacts of water use on groundwater and surface water bodies).</td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td>Minimise the use of pesticides and favour alternative approaches or techniques, such as non-chemical alternatives to pesticides, in line with the Directive 2009/128/EC on the sustainable use of pesticides. With exception of occasions that this is needed to control pest and diseases outbreaks. Adapt the use of fertilizers to what is needed to prevent leeching of nutrients to waters.</td></tr>
</table>

	• Take well documented and verifiable measures to avoid the use of active ingredients that are listed in the Stockholm Convention, the Rotterdam Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, or that are listed as classification Ia or Ib in the WHO recommended Classification of Pesticides by Hazard; • Prevent pollution of water and soil in the forest concerned and undertake clean up measures when it does happen.
(6) Ecosystems	• Take measures to ensure sustained or improved conservation status at the landscape level[204] • In designated conservation areas, actions should be demonstrated to be in line with the conservation objectives for those areas. • No conversion of habitats specifically sensitive to biodiversity loss or of high conservation value such as grasslands and any high carbon stock area (e.g. peat lands and wetlands), and areas set aside for the restoration of such habitats • Develop a forest management plan (or equivalent) that includes provisions for zoning conservation areas, and for maintaining biodiversity[205] • Evaluate the ecosystem service provision with the aim to not decrease the amount and quality of ecosystem services provided. • Forests are monitored and protected to prevent illegal logging, in compliance with national laws

[204] Landscape management level may be used to emphasize that the goal to preserve conservation status for different species is at a scale above the single forest stand.

[205] This criterion should be considered in combination with criterion 3 of the mitigation criteria to disclose through a forest management plan (or equivalent).

20.3 Reforestation

Sector classification and activity	
Macro-Sector	A - Agriculture, forest and silviculture
NACE Level	2
Code	A2
Description	**Reforestation** Reforestation is defined as re-establishment of forest through planting and/or deliberate seeding on land classified as forest. It implies no change of land use, includes planting/seeding of temporarily unstocked forest areas as well as planting/seeding of areas with forest cover. It includes coppice from trees that were originally planted or seeded. It excludes natural regeneration of forest[206]. *In the context of the Taxonomy, the category 'reforestation' applies in cases following extreme events (wind throws, fires etc.), and not as part of normal, legally binding obligation to reforest after harvesting.*
Mitigation criteria	

Principle	Reforestation shall increase overall carbon sinks of above and below ground carbon.
	
	All the Criteria are additive and shall apply together:
	
	• Apply the following Sustainable Forest Management (SFM) requirements:
	  o Identify and apply forest management practices that increase existing carbon stocks from above and below ground carbon overall, while maintaining or improving the soil quality, and biodiversity;
	  o Maintain or improve the long-term capacity of the forest to deliver multiple services (e.g. ecosystem services, timber production);
	  o Do not convert high carbon stock land (i.e. primary forest, peatlands, wetlands, and grasslands) which has this status on or before January 2008;
	  o Carry out harvesting activities in compliance with national laws;
	  o Regenerate harvested forests.
	• Establish a baseline GHG balance of carbon pools at the beginning of the afforestation/reforestation activity;
	• Demonstrate continued compliance with the Sustainable Forest Management requirements and increase of carbon sinks from above-ground carbon over time, supported by and disclosed through a forest management plan (or equivalent) at 5-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.

[206] Source: FAO, Global Forest Resources Assessment, 2020.

Metric	• Sustainable Forest Management (SFM) requirements as described above. • GHG balance baseline[207] is calculated for above-ground carbon pools, based on growth-yield curves for species per m3/year/ha, carbon convertible.
Threshold	• Continued compliance with the Sustainable Forest Management (SFM) requirements is demonstrated and disclosed at 5-year intervals through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3). • Carbon stocks shall increase above carbon baseline over a period of 20 years[208]. Changes in carbon stocks should be disclosed based on growth yield curves in 5 years intervals through a forest management plan (or equivalent[209]) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3)[210].

Rationale

The Taxonomy acknowledges a definitional change from 'afforestation' and 'reforestation' to 'existing forest management' according to the LULUCF Regulations 20-year accounting rule as per Art. 5(3).

Forestry can deliver substantial greenhouse gas (GHG) emission mitigation and protect the carbon storage through sequestration of carbon during tree growth. Carbon is fixed above ground and below ground in the vegetation, soil, litter, dead wood, that are derived from the forest in line with the lifetime of these products.

Afforestation and reforestation activities can deliver substantial mitigation through:

- An increase in the forest capacity to sequestrate carbon from above ground and below ground carbon pools;
- Maintenance and/or increase of the soil quality, soil carbon and biodiversity.

The approach taken to determine metrics and thresholds rely on cumulative criteria:

[207] Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide

[208] 20 years aligns with the measurement of carbon and under LULUCF regulation land that was afforested moves from category "afforestation" to "forest land" after 20 years

[209] Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

[210] This threshold should apply considering the following force majeure clause: underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not result in non-compliance with the Taxonomy criteria.

4. **Sustainable Forest Management (SFM) requirements** that ensure the maintenance and/or increase of carbon sinks of above and below ground carbon through management practices.

- SFM requirements use EU legislation as minimum baseline, align with and build on the Climate Bonds Initiative's Forestry criteria, the EU Renewable Energy Directive and its recast (RED II), and the Forest Europe general guidelines for sustainable forest management.
- An Annex to the Forest mitigation Taxonomy provides an indication of recommended forest management practices that maintain and/or increase carbon stores or carbon sinks of above and below ground carbon. These are non-exhaustive examples of types of practices that can be considered for all the relevant carbon pools in the forest.
- SFM requirements include a no conversion land requirement to preserve high carbon land areas that is consistent with the RED II, which defines 2008 as a base year for land use change. This base year has also been adopted by several global certification schemes (e.g. ISCC and RSPO RED).
- Harvesting activities must be carried out in compliance with national laws, shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable.
- Regeneration of forests after harvesting is covered under EU legislation and has been included as a requirement to ensure regeneration is taken into consideration for forest activities outside the EU.
- SFM requirements should be considered in combination with the Do No Significant Harm criteria.
- They can be informed by applying forest certification using independent third-party schemes that are regularly audited.

5. **GHG measurement of sequestration in carbon pools** identified in LULUCF regulation Annex I section B.

- The forest Taxonomy acknowledges that setting a universal absolute threshold for carbon stocks is not a viable option given the variability of carbon sequestration is very context specific. The Taxonomy therefore requires evidence of a positive direction of travel in terms of maintaining and/or increasing carbon stocks, specifically, the progressive increase of above ground carbon stocks.
- Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines), it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.
- Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

6. **Demonstration of permanence and performance.** Demonstration of permanence and steady progress with respect to Criteria 1 and 2 is reported through a forest management plan (or equivalent) at 5-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities. • In order for forests to achieve their full climate mitigation potential, it is essential the Taxonomy accounts for both a continuum of management practices, and the demonstration that the carbon stocks increment includes the impact from living, aboveground biomass, specifically in the case of afforestation and reforestation projects. SFM requirements are essential to guarantee the maintenance in carbon sequestration from belowground biomass, dead organic matter or soils: increase in carbon sequestration from below ground carbon pools is not included due to the high uncertainty in measuring it. • Sequestration levels shall be calculated on an average annual basis, reported at a minimum every 5 year, and pperformance shall be demonstrated after 20 years of the afforestation/reforestation project, which aligns with the measurement of carbon and under LULUCF regulation land that was afforested moves from category “afforestation” to “forest land” after 20 years. A 20-year period for maintaining carbon sinks and activities also follows the IPCC time frame of 20 years to saturation for soil carbon. • Information might either be reported and disclosed by the forest owner/forest management company directly, or through existing, integrated reporting mechanisms in place at the level of the jurisdiction: the forest Taxonomy recognizes the importance of landscape approaches in how the forest carbon inventory and evolution of the forest sink increment is managed: it recognizes approaches described in the LULUCF regulation and RED II. Absence of landscape management access will in turn require disclosure at the single forest stand.	
Do no significant harm assessment	
Key environmental aspects span across all other five objectives and are summarized as follows: • ability of forests to adapt to a changing climate; • impact on water resources as well as on water quality; • pollution to water, air, and soil, and risks associated from the use of pesticides and fertilizer; • impacts on biodiversity and ecosystems from intensification and conversion of land of high ecological value to forests and illegal logging. The DNSH criteria below should be considered in combination with the SFM requirements of the forest mitigation Taxonomy (criterion 1). The criteria can be informed by applying forest certification using independent third-party schemes that are regularly audited. Compliance shall be reported through a forest management plan (or equivalent) as per criterion 3 of the forest mitigation Taxonomy.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty;

	• is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	• Identify, disclose, and address any water-related risks (e.g. in relation to quality of discharges into watercourses, wetlands and quantitative impacts of water use on groundwater and surface water bodies).
(4) Circular Economy	
(5) Pollution	• Minimise the use of pesticides and favour alternative approaches or techniques, such as non-chemical alternatives to pesticides, in line with the Directive 2009/128/EC on the sustainable use of pesticides. With exception of occasions that this is needed to control pest and diseases outbreaks. Adapt the use of fertilizers to what is needed to prevent leeching of nutrients to waters. • Take well documented and verifiable measures to avoid the use of active ingredients that are listed in the Stockholm Convention, the Rotterdam Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, or that are listed as classification Ia or Ib in the WHO recommended Classification of Pesticides by Hazard; • Prevent pollution of water and soil in the forest concerned and undertake clean up measures when it does happen.
(6) Ecosystems	• Take measures to ensure sustained or improved conservation status at the landscape level[211] • In designated conservation areas, actions should be demonstrated to be in line with the conservation objectives for those areas. • No conversion of habitats specifically sensitive to biodiversity loss or of high conservation value such as grasslands and any high carbon stock area (e.g. peat lands and wetlands), and areas set aside for the restoration of such habitats • Develop a forest management plan (or equivalent) that includes provisions for zoning conservation areas, and for maintaining biodiversity[212]

[211] Landscape management level may be used to emphasize that the goal to preserve conservation status for different species is at a scale above the single forest stand.

[212] This criterion should be considered in combination with criterion 3 of the mitigation criteria to disclose through a forest management plan (or equivalent).

	• Evaluate the ecosystem service provision with the aim to not decrease the amount and quality of ecosystem services provided. • Forests are monitored and protected to prevent illegal logging, in compliance with national laws

20.4 Existing forest management

Sector classification and activity	
Macro-Sector	A - Agriculture, forest and silviculture
NACE Level	2
Code	A2
Description	**Existing Forest Management** The Taxonomy defines forest as per FAO FRA 2020.
Mitigation criteria	
Principle	Existing forest management shall maintain and/or increase carbon sinks of above and below ground carbon. *All the Criteria are additive and shall apply together:* • Apply the following Sustainable Forest Management (SFM)[213] requirements: o Identify and apply forest management practices that increase and/or maintain existing carbon stocks from above and below ground carbon overall, while maintaining or improving the soil quality, and biodiversity; o Maintain or improve the long-term capacity of the forest to deliver multiple services (e.g. ecosystem services, timber production); o Land must not have been converted from high carbon stock land (i.e. primary forest, peatlands, wetlands, and grasslands) which has this status in or before January 2008; o Carry out harvesting activities in compliance with national laws; o Regenerate harvested forests. • Establish a baseline GHG balance of carbon pools[214] at the beginning of the forest management/restoration activity; • Demonstrate continued compliance[215] with the Sustainable Forest Management requirements and increase and/or maintenance of carbon sinks from above-ground carbon over time, supported by and

[213] SFM requirements align with EU legislation and can be informed by applying forest certification using independent third-party schemes that are regularly audited. The SFM requirements should be considered in combination with the Do No Significant Harm criteria.

[214] GHG measurement shall at least account for above ground carbon at the start of the forest activity and overtime, where below ground carbon is recognized to be technically more challenging to assess and measure overtime.

[215] Information might either be disclosed by the forest owner/forest management company directly, and/or submitted to competent authorities through existing, integrated/landscape reporting mechanisms in place at the level of the jurisdiction (e.g. national registries).

	disclosed through a forest management plan (or equivalent[216]) at 5 to 10-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.
Metric	• Sustainable Forest Management (SFM) requirements as described above; • GHG balance baseline[217] is calculated for above-ground carbon pools, based on growth-yield curves for species per m3/year/ha, carbon convertible.
Threshold	• Continued compliance with the Sustainable Forest Management (SFM) requirements is demonstrated and continuously disclosed at 5-year intervals through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3). • Carbon stocks shall increase above carbon baseline over the economic lifetime[218] of the forest. Changes in carbon stocks should be disclosed based on growth yield curves in 5 to maximum 10 years intervals[219] through a forest management plan (or equivalent) that shall be reviewed by an independent third-party certifier and/or competent authorities (as described in Criteria 3)[220].

Rationale

A substantial portion of forestry activities will fall under the bracket of existing forest management. Therefore, it is proposed that existing forest management is recognized in the Taxonomy, provided it can demonstrate maintenance of high carbon stocks in multiple pools and overall improvement in the forest carbon sink.

Forestry can deliver substantial greenhouse gas (GHG) emission mitigation and protect the carbon storage through sequestration of carbon during tree growth. Carbon is fixed above ground and below

[216] Landscape management level may be used to emphasize that the goal to perform is at a scale above the single forest stand: the Taxonomy recognizes landscape management approaches such as defined by LULUCF regulation and RED II in how the forest carbon inventory and evolution of the forest sink increment is manage. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

[217] Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.

[218] The economic lifetime is generally aligned with the time of harvesting, meaning that harvesting is accounted for when calculating the average annual carbon sequestration.

[219] A description of above ground carbon state of play is required every 5 to maximum 10 years to ensure steady and overall progress is aimed for and achieved. That aligns with management cycles time horizons performed in the European Union as well as National Forest Inventories.

[220] This threshold should apply considering the following force majeure clause: underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds and will not result in non-compliance with the Taxonomy criteria.

ground in the vegetation, soil, litter, dead wood, that are derived from the forest in line with the lifetime of these products.

The management of existing forests and forest rehabilitation activities can deliver substantial mitigation through:

- An increase in the forest capacity to sequestrate carbon from above ground and below ground carbon pools;
- Maintenance and/or increase of the soil quality, soil carbon and biodiversity.

The approach taken to determine metrics and thresholds rely on cumulative criteria:

- **Sustainable Forest Management (SFM) requirements** that ensure the maintenance and/or increase of carbon sinks of above and below ground carbon through management practices.
    - SFM requirements use EU legislation as minimum baseline, align with and build on the Climate Bonds Initiative's Forestry criteria, the EU Renewable Energy Directive and its recast (RED II), and the Forest Europe general guidelines for sustainable forest management.
    - An Annex to the Forest mitigation Taxonomy provides an indication of recommended forest management practices that maintain and/or increase carbon stores or carbon sinks of above and below ground carbon. These are non-exhaustive examples of types of practices that can be considered for all the relevant carbon pools in the forest.
    - SFM requirements include a no conversion land requirement to preserve high carbon land areas that is consistent with the RED II, which defines 2008 as a base year for land use change. This base year has also been adopted by several global certification schemes (e.g. ISCC and RSPO RED).
    - Harvesting activities must be carried out in compliance with national laws, shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable.
    - Regeneration of forests after harvesting is covered under EU legislation and has been included as a requirement to ensure regeneration is taken into consideration for forest activities outside the EU.
    - SFM requirements should be considered in combination with the Do No Significant Harm criteria.
    - They can be informed by applying forest certification using independent third-party schemes that are regularly audited.
- **GHG measurement of sequestration in carbon pools** identified in LULUCF regulation Annex I section B.
    - The forest Taxonomy acknowledges that setting a universal absolute threshold for carbon stocks is not a viable option given the variability of carbon sequestration is very context specific. The Taxonomy therefore requires evidence of a positive direction of travel in terms of maintaining and/or increasing carbon stocks, specifically, the progressive increase of above ground carbon stocks.
    - Calculating the GHG balance baseline requires knowledge of the area, the species and number of trees (in case of planting). The increment based on the growth-yield

curves gives the approximate number of how many m3/year/ha is available for increment. The methodology is consistent with the approach in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines), it recommends recalculation of the amount of carbon sequestered; 1 ton of biomass representing approximately 0,5 ton of carbon. Further one ton of carbon equals 44/12 = 3.67 tons of carbon dioxide.

  - Landscape management level may be used to emphasize that the goal may be to perform at a scale above the single forest stand. Absence of landscape management access will in turn require disclosure at the single forest stand. The Forest Taxonomy leaves to forest owners and companies to explain, document on which level they report.

- **Demonstration of permanence and performance.** Demonstration of permanence and steady progress with respect to Criteria 1 and 2 is reported through a forest management plan (or equivalent) at 5 to 10-year intervals, that shall be reviewed by an independent third-party certifier and/or competent authorities.
  - In order for forests to achieve their full climate mitigation potential, it is essential the Taxonomy accounts for both a continuum of management practices, and the demonstration that the carbon stocks increment includes the impact from living, aboveground biomass. SFM requirements are essential to guarantee the maintenance in carbon sequestration from belowground biomass, dead organic matter or soils: increase in carbon sequestration from below ground carbon pools is not included due to the high uncertainty in measuring it.
  - Sequestration levels shall be calculated on an average annual basis over the full economic lifetime and not only the project lifetime. Taking an average over this time-period is important as biomass growth and carbon sequestration is not linear for forest growth due to changing growth rates as the forest matures, impact of thinning and harvesting, other management interventions, and natural conditions. The economic lifetime is generally aligned with the time of harvesting, meaning that harvesting is accounted for when calculating the average annual carbon sequestration.
  - A description of state of play is required every 5 to maximum 10 years to ensure steady and overall progress is aimed for and achieved. That aligns with management cycles time horizons performed in the EU as well as National Forest Inventories, performed on a 10-year basis.
  - Information might either be reported and disclosed by the forest owner/forest management company directly, or through existing, integrated reporting mechanisms in place at the level of the jurisdiction: the forest Taxonomy recognizes the importance of landscape approaches in how the forest carbon inventory and evolution of the forest sink increment is managed: it recognizes approaches described in the LULUCF regulation and RED II. Absence of landscape management access will in turn require disclosure at the single forest stand.
  - Considering the impact of climate conditions and changing environments the Taxonomy includes a clause for force majeure that states that underperformance resulting from natural disturbance can be excluded from impacting on the achievement of the thresholds - and will not result in non-compliance with the Taxonomy criteria.

Do no significant harm assessment

<table>
<tr><td colspan="2">Key environmental aspects span across all other five objectives and are summarized as follows:

ability of forests to adapt to a changing climate;
impact on water resources as well as on water quality;
pollution to water, air, and soil, and risks associated from the use of pesticides and fertilizer;
impacts on biodiversity and ecosystems from intensification and conversion of land of high ecological value to forests and illegal logging.

The DNSH criteria below should be considered in combination with the SFM requirements of the forest mitigation Taxonomy (criterion 1). The criteria can be informed by applying forest certification using independent third-party schemes that are regularly audited. Compliance shall be reported through a forest management plan (or equivalent) as per criterion 3 of the forest mitigation Taxonomy.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:

considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.

A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:

The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.
</td></tr>
<tr><td>(3) Water</td><td>Identify, disclose and address any water-related risks (e.g. in relation to quality of discharges into watercourses, wetlands and quantitative impacts of water use on groundwater and surface water bodies).</td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td>Minimise the use of pesticides and favour alternative approaches or techniques, such as non-chemical alternatives to pesticides, in line with the Directive 2009/128/EC on the sustainable use of pesticides. With exception of occasions that this is needed to control pest and diseases outbreaks. Adapt the use of fertilizers to what is needed to prevent leeching of nutrients to waters.
Take well documented and verifiable measures to avoid the use of active ingredients that are listed in the Stockholm Convention, the Rotterdam</td></tr>
</table>

	Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, or that are listed as classification Ia or Ib in the WHO recommended Classification of Pesticides by Hazard; • Prevent pollution of water and soil in the forest concerned and undertake clean up measures when it does happen.
(6) Ecosystems	• Take measures to ensure sustained or improved conservation status at the landscape level[221] • In designated conservation areas, actions should be demonstrated to be in line with the conservation objectives for those areas. • No conversion of habitats specifically sensitive to biodiversity loss or of high conservation value such as grasslands and any high carbon stock area (e.g. peat lands and wetlands), and areas set aside for the restoration of such habitats • Develop a forest management plan (or equivalent) that includes provisions for zoning conservation areas, and for maintaining biodiversity[222] • Evaluate the ecosystem service provision with the aim to not decrease the amount and quality of ecosystem services provided. • Forests are monitored and protected to prevent illegal logging, in compliance with national laws

[221] Landscape management level may be used to emphasize that the goal to preserve conservation status for different species is at a scale above the single forest stand.
[222] This criterion should be considered in combination with criterion 3 of the mitigation criteria to disclose through a forest management plan (or equivalent).

21. Manufacturing

Why manufacturing is included in the Taxonomy
Manufacturing is the second largest contributor to CO_2e emissions but is also be able to produce the products and technologies that can contribute to GHG emissions reductions in other sectors of the economy and is thus a fundamental part of the low-carbon economy.

The manufacturing section of the Taxonomy therefore includes both the manufacturing of low-carbon technologies as well as energy intensive and hard-to-abate manufacturing sectors. It aims to give support to those economic activities that are low in carbon emissions and first movers who are engaging in a transformational shift.

Subjects covered
The economic activities covered in this first Taxonomy development include both 'greening of' and 'greening by' activities. 'Greening of' activities include: the manufacturing of aluminium (NACE 24.42); the manufacturing of iron and steel (NACE 24.1, 24.2, 24.3); the manufacturing of cement (NACE 23.51); and the manufacturing of chemicals (NACE 20.13, 20.14, 20.15, 20.16). These sectors account for a high share of industrial GHG emissions and offer large potential for GHG emissions reductions.

'Greening by' activities include: the manufacturing of products, key components, equipment and machinery that are essential to a number of key renewable energy technologies (geothermal power, hydropower, concentrated solar power (CSP), solar photovoltaic (PV) technology, wind energy and ocean energy); the manufacturing of low-carbon transport vehicles, fleets and vessels; the manufacturing of energy efficiency equipment for buildings and other low-carbon technologies that result in substantial GHG emission reductions in further sectors of the economy (including private households).

Due to the nature of manufacturing, and in order to undertake a proper systemic value chain approach in the Taxonomy, close linkages have been made with the energy, transport, agriculture and building sectors. Where possible, circularity considerations (in so far as they affect GHG emissions) and a broader value chain approach have been taken into account.

Setting criteria and thresholds
For 'greening by' activities, the criteria identify a number of defined products, components, equipment and technologies that qualify. For these, no criteria on the GHG emissions from manufacturing are given because the benefits these lead to are considered to outweigh their emissions. This uncomprehensive list is complemented by additional criteria that allow any other product, component, equipment or technology to be considered eligible if the overall benefits in terms of GHG emissions reductions are proven by life cycle carbon footprinting.

For 'greening of' activities, the criteria focus instead on reducing the GHG emissions caused by manufacturing activities up to the levels of performance achieved by best performers. The criteria cover in general both scope 1 and 2.

These activities are considered to make a substantial contribution to climate change mitigation if the specific thresholds set for each activity are reached (e.g. producing cement with GHG emissions lower than 0.498 tCO_2e/t of cement). The EU ETS benchmarks have been the main reference for setting such thresholds, as they correspond to the level of performance achieved by the 10% best installations in the EU.

Additionally, the Taxonomy also supports the transition of economic activities in these high emitting sectors towards reaching the defined thresholds. It recognises expenditures in energy efficiency measures, process improvements and all other mitigation measures in these sectors as eligible if the measures support closing the gap between the current level of efficiency and the level considered 'substantially contributing to mitigation objectives' as defined by the thresholds. This has two implications for users of the Taxonomy:

1. For private finance users of the Taxonomy, where revenues from Taxonomy eligible activities count, such as equities (the share of a corporation would be considered eligible based on the share of revenues from Taxonomy-eligible activities): only manufacturing activities complying with the activity threshold would be considered eligible.
2. For the uses of the Taxonomy where expenditures in Taxonomy-eligible measures count (such as for financing projects, green mortgages, the use of proceeds from green bonds or simply counting how much a corporation has invested in climate mitigation): all the investments needed to reach the activity threshold would be considered eligible. This means that measures are eligible once they are implemented entirely and the threshold is reached, as well as if the individual investments in different measures are implemented over a defined time span (e.g. 5 or 10 years) as part of a multi-annual investment plan aimed at meeting the threshold that must be verified by a third party. The TEG suggests that further consideration will need to be taken by the platform on the usability of such an approach by small and medium-sized enterprises as well as the possible use of a similar approach for those sectors not currently covered in the manufacturing section of the Taxonomy.

Whilst many manufacturing activities are not currently covered in the Taxonomy and therefore cannot be recognized as green within, it is not assumed that all omitted activities are non-green or brown. Due to limited time, the TEG has focused its attention on those economic activities likely to play the biggest role in leading Europe down a low-carbon pathway to meet its Paris Agreement and 2050 climate neutrality goals. Therefore, the first round of sectors included in the manufacturing section of the Taxonomy are either those energy intensive and hard-to-abate sectors that emit the most greenhouse gas emissions or those enabling manufacturing sectors that are clearly necessary for Europe's low-carbon economic transformation. This means that other manufacturing sectors (including other energy-intensive sectors) are not currently included even if they are significant in their impact.

In the manufacturing sector, certain processes are difficult to reduce to very low carbon levels, particularly in the metals, minerals and chemical sectors. In those cases, switching to renewable energy sources and energy efficient measures are not feasible options and very low carbon levels may only be achieved by either implementing an alternative manufacturing process, like switching to the production of alternative products, or due to the introduction of carbon capture and storage (CCS) technologies, which are addressed in another section of the Taxonomy. Additionally, if CCS enables an economic activity in the manufacturing sector to meet its screening criteria, the installation of CCS technology can be considered Taxonomy eligible once the screening criteria has been met. This also applies to overall economic activity. Carbon Capture and Utilisation (CCU), where the captured CO_2 is utilized as a feed stock (e.g. for a chemical process), may also qualify, if substantial mitigation impacts can be demonstrated by reducing emissions towards meeting the activity criteria (e.g. the use of CO_2 for enhanced oil extraction would not qualify).

The thresholds set for the 'greening of' manufacturing sectors are predominantly tied to EU ETS benchmarks. That means that the thresholds reflect the average performance of the 10% most efficient installations in a particular sector. EU ETS benchmarks have been selected because they are the most robust benchmarks that currently exist and data calculated according to the boundaries set are readily available for all installations within the EU that are part of the EU ETS scheme. Although not necessarily readily available for non-EU installations, these can also be calculated univocally. Additionally, the EU ETS benchmarks are periodically updated, meaning that the thresholds that refer to them will not be static over time but automatically continue to represent the performance of the 10% best performing plants.

The TEG recognizes that there are disadvantages to using the EU ETS benchmarks. The benchmarks are based on EU historic trends rather than global data. Moreover, EU ETS benchmarks do not consider the full lifecycle of a process or product but are focused on scope 1 and/or scope 2 GHG emissions. Therefore, EU ETS benchmarks do not directly support recycling or improvement in upstream emissions. The TEG has actively looked for equally robust data sources, acknowledging the limitations of the EU ETS benchmarks. However, better data sources were not identified. In a number of sectors, the requirement to limit GHG emissions to the level set in the EU ETS benchmarks has been complemented by other thresholds (e.g. on the energy efficiency and carbon intensity of the electricity used) or by alternative qualitative criteria (e.g. making production of recycled aluminium eligible).

Within the 'greening by' activities, resource efficiency is also considered because it contributes to meeting the criterion of proving substantial emissions reductions through lifecycle carbon footprinting.

The TEG recommends that the Platform on Sustainable Finance undertake deeper analysis to explore how to further support resource efficiency measures that can lead to significant GHG emissions reductions, since it is a critical aspect of the Paris Agreement objectives. In addition, the TEG recommends that the future platform consider establishing screening criteria and thresholds on the basis of alternative data sources with a broader scope in terms of overall production processes and/or life cycle emissions than the EU ETS benchmarks when better data is identified.

Next steps and recommendations

The TEG recognizes that the scope of the manufacturing section of the Taxonomy should be extended to cover many more sectors. Care must continue to be taken to review the context in which the Taxonomy is applied to ensure that it does not identify activities as green which have perverse incentives or a negative impact on other environmental objectives. From a manufacturing perspective, the TEG recommends that in the next round the future platform consider building on the work undertaken to establish thresholds for other manufacturing sectors that include at least in the near-term:

- Other manufacturing sectors: e.g. glass manufacturing, paper and pulp manufacturing, including those that have complex, multiple and varied products and processes. The TEG originally intended to address all excepted manufacturing sectors under a 'general manufacturing' category. However, after deliberation it was not possible to establish meaningful screening criteria that would be usable across the diverse sectors considered. The TEG recommends that the future platform address these manufacturing sectors, prioritising those with the highest emissions by identifying those processes that contribute the most significant portion of emissions (e.g. steam generation in the paper and pulp sector) and establishing thresholds for these specific processes. Further analysis for light manufacturing sectors may also need to be considered by the platform as these sectors grow in impact. For these, the platform could either try to develop individual activity criteria for each (where feasible) or identify key improvement measures applicable across a number of these sectors and classify them as individual 'greening by' activities.

- Mining: this is an important sector both in terms of avoiding bottlenecks in the deployment of low-carbon technologies by providing the critical materials needed for low-carbon technologies, as well as the value chain link with energy-intensive manufacturing sectors. It is recommended that further work is undertaken to include this sector. The TEG recommends that the platform analyse the role the sector plays in terms of enhancing availability of the critical materials needed for current and future technologies to create a climate neutral, circular and resource efficient economy, while sourcing raw materials in a sustainable and responsible way, with a view to consider the 'greening by' potential of the sector. However, the extractive industry can also be considered a 'greening of' activity: minimising its impacts could make a significant contribution to climate change mitigation. The TEG was not able to complete work for this sector due to time constraints and the complexity of the issues.

Additionally, there is room to expand the list of 'greening by' activities over time. The TEG recommends that in future the platform consider:

- Inclusion of the manufacturing of charging points for electric vehicles.
- Inclusion of the manufacturing of electrolysis equipment and related key components, based on the potential of hydrogen use (produced through electrolysis, based on renewable energy or an even grid) to play a major role in the decarbonisation of several industrial sectors.
- How and under what conditions to include carbon capture and utilisation (CCU) technologies in different manufacturing sectors, as well as the manufacturing of such equipment.

The Taxonomy thresholds must also be updated, with the phasing out of some included activities until specific points in time, as well adaptation to the latest technological developments and innovation.

With regard to both data availability and value chain depth, it is recommended that further care be taken by the platform to address two issues: first, the possibility of looking at data complementary to the ETS benchmarks; and secondly to ensure that a more complete value chain analysis is undertaken, which will include resource efficiency, in order to match current legislative discussions around circularity and critical materials-use, including responsible sourcing.

21.1 Manufacture of Low carbon technologies

Sector classification and activity	
Macro-Sector	C - Manufacturing
NACE Level	
Code	No specific NACE code
Description	**Manufacture of low carbon technologies** • Manufacturing of products, key components, and machinery that are essential for eligible renewable energy technologies • Manufacture of eligible low carbon transport vehicles, fleets and vessels. • Manufacture of eligible energy efficiency equipment for buildings • Manufacture of other low carbon technologies that result in substantial GHG emission reductions in other sectors of the economy (including private households)
Mitigation criteria	
Principle	The manufacture of low carbon technologies that result in substantial GHG emission reductions in other sectors of the economy (including private households) is eligible.
Metric	1. **Manufacture of products, key components and machinery that are essential for eligible renewable energy technologies (Geothermal Power, Hydropower, Concentrated Solar Power (CSP), Solar Photovoltaic (PV), Wind energy, Ocean energy)** 2. **Manufacture of vehicles, fleets and vessels meeting the following criteria is eligible:** Passenger cars, light commercial and Category L vehicles: • Until 2025: vehicles with tailpipe emission intensity of max 50 g CO_2/km (WLTP). This also includes zero tailpipe emission vehicles (e.g. electric, hydrogen). • From 2026 onwards: only vehicles with emission intensity of 0g CO_2/km (WLTP). Heavy Duty Vehicles: N2 and N3 vehicles, as defined by REGULATION (EU) 2018/858: • Zero direct emission heavy-duty vehicles that emits less than 1g CO2/kWh (or 1g CO2/km for certain N2 vehicles); • low-emission heavy-duty vehicles with specific direct CO_2 emissions of less than 50% of the reference CO_2 emissions of all vehicles in the same sub-group (Heavy Duty CO_2 Regulation - Procedure 2018/0143(COD)). Rail Fleets: • Zero direct emissions trains Urban, suburban and interurban passenger land transport fleets

	• Zero direct emissions land transport fleets (e.g. light rail transit, metro, tram, trolleybus, bus and rail) Water transport • Zero direct emissions waterborne vessels. **3. Manufacture of the following products (with thresholds where appropriate) for energy efficient equipment for buildings and their key components is eligible:** • Installation of Building Management Systems (BMS) • High efficiency windows (U-value better than 0.7 W/m^2K) • High efficiency doors (U-value better than 1.2 W/m^2K) • Insulation products with low thermal conductivity (lambda lower or equal to 0.045 W/mK), external cladding with U-value lower than 0.5 W/m^2K and roofing systems with U-value lower than 0.3 W/m^2K) • Hot water fittings (e.g. taps, showers) that are rated in the top class (dark green) of the European Water Label Scheme (http://www.europeanwaterlabel.eu/) • Household appliances (e.g. washing machines, dishwashers) rated in the top available class according to the EU Energy Label for each type of appliance • High efficiency lighting appliances rated in the highest energy efficiency class that is significantly populated in the energy efficiency label (or higher classes) according to EU energy labelling regulations • Presence and daylight controls for lighting systems • Highly efficient space heating and domestic hot water systems rated in the highest energy efficiency class significantly populated in the energy efficiency label (or higher classes) according to EU energy labelling regulations • Highly efficient cooling and ventilation systems rated in the highest energy efficiency class significantly populated in the energy efficiency label or higher classes according to EU energy labelling regulations • Heat pumps compliant with the criteria for heat pumps given in the energy section of the taxonomy • Façade and roofing elements with a solar shading or solar control function, including those that support the growing of vegetation • Energy-efficient building automation and control systems for commercial buildings as defined according to the EN 15232 standard. • Zoned thermostats and devices for the smart monitoring of the main electricity loads for residential buildings, and sensoring equipment, e.g. motion control.

	Products for heat metering and thermostatic controls for individual homes connected to district heating systems and individual flats connected to central heating systems serving a whole building. 4**. The manufacture of low carbon technologies that result in substantial GHG emission reductions in other sectors of the economy (including private households) is eligible if they demonstrate substantial higher net GHG emission reductions compared to the best performing alternative technology/ product/ solution available on the market on the basis of a recognised/standardised cradle-to-cradle carbon footprint assessment (e.g. ISO 14067, 14040, EPD or PEF) validated by a third party.**
Threshold	No threshold applies, unless otherwise specified in the metrics.
Rationale	
The list of specific eligible technologies is coherent with the eligible activities in other sections of the Taxonomy, namely energy, transport and buildings. However, in some cases, the list is less broad than the eligible activities in the corresponding section of the Taxonomy due to limited resources to explore in this phase the implications for use in other sectors of the same products, components, equipment and infrastructure. Further analysis is required to ensure no perverse incentives occur. For transport the manufacture is focused on the production of complete low carbon or zero carbon vehicles, fleets or vessels so that either revenue from sales of eligible vehicles or expenditure on investments in manufacturing capacity specifically relating to eligible vehicles can be identified.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the manufacture of low carbon technologies is associated with: • the (potential) use of toxic substances and generation of toxic wastes (both at the manufacturing stage as well as at other stages of the product/equipment lifecycle); and • the potential for polluting emissions to air, water and soil from the manufacturing process. Depending on the product/equipment being manufactured, there may, also be issues with respect to the embodied carbon and the demand for certain metals and materials (e.g. rare earth metals) which are in limited supply and may have significant environmental impact issues associated with the mining phase.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty;

	• is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	Embodied carbon emissions should represent less than 50% of the total carbon emissions saved by the use of the energy efficient equipment. Carbon emissions and savings at the end-of-life stage are not included in the assessment for this criteria (too uncertain).
(5) Pollution	Compliance with the REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Regulation (1272/2008/EC) and the RoHS (Restriction of Hazardous Substances) Regulation (2002/95/EC) or the equivalent for equipment manufactured and used outside the EU (n.b.: equipment manufactured outside of the EU but imported into the EU must comply with the REACH and RoHS Regulations).
(6) Ecosystems	

21.2 Manufacture of Cement

Sector classification and activity	
Macro-Sector	C - Manufacturing
NACE Level	4
Code	C23.5.1
Description	Manufacture of cement
Mitigation criteria	
Principle	The manufacturing of cement is associated with significant CO_2 emissions. Minimising process emissions through energy efficiency improvements and switch to alternative fuels, promoting the reduction of the clinker to cement ration and the use of alternative clinkers and binders can contribute to the mitigation objective.
Metric	(A) Specific emissions (tCO2e/t of clinker) (B) Specific emissions (tCO2e/t of cement or alternative binder) GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks.
Threshold	Thresholds for cement Clinker (A) are only applicable to cement clinker plants that are not producing finished cement (no cement mills). All other plants need to meet the thresholds for cement (B)..For production of alternative binders only threshold (B) need to be met. (A) Cement clinker: Specific emissions (calculated according to the methodology used for EU-ETS benchmarks) associated to the clinker production processes are lower than the value of the related EU-ETS benchmark. As of June 2019, the EU-ETS benchmark value for cement clinker manufacturing is: 0,766 tCO2e/t of clinker[223] (B) Cement: Specific emissions associated to the clinker and cement production processes are lower than: 0.498 tCO2e/t of cement[224]
Rationale	
Cement production is responsible for more than 70% of the emissions under C.23 and concrete is the most significant application for the use of cement. Cement is the main constituent of concrete. The	

[223] Based on the EU ETS benchmark for grey cement clinker (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0278&from=EN). The threshold for cement clinker needs to be revised every time that there is an update in the EU ETS benchmark value for grey cement clinker.

[224] Threshold was derived taking into account the threshold for cement clinker and the threshold for clinker to cement ratio. It excludes emissions from electricity use that is mainly required for finish grinding, raw materials grinding and the exhaust fans (kiln/raw mill and cement mill).

content of cement in the concrete and total GHG emissions can vary significantly based on the specifications of the application that concrete will be used for. For this reason, concrete (Concrete - NACE C.23.6) is not covered by the sustainable Taxonomy.

Cement manufacture includes three main stages:

1. Raw materials preparation;
2. Clinker production;
3. Grinding of clinker with other components such as gypsum, fly ash, ground granulated blast furnace slag (GGBFS) and fine limestone to produce the finished cement.

Typically, 30-40% of direct CO_2 emissions comes from the combustion of fuels; the remaining 60-70% comes from the chemical reactions involved in converting limestone to calcium oxide[225].

Reducing the emissions from the manufacturing process of cement can therefore positively contribute to the mitigation objective.

The absolute performance approach has been proposed in order to identify the maximum acceptable carbon intensity that the activity should comply with in order to be able to substantially contribute to the mitigation objective.

ETS product benchmarks have been selected as one of the thresholds for cement clinker production. They reflect the average performance of the 10% most efficient installations in a sector.

Within cement manufacture, the following activities were taken into account:

1. Process emissions: Emissions from the calcination process for the production of cement clinker
2. Fuel emissions: Energy required for the calcination process during the clinker production

The cement production facilities that meet the identified threshold are expected to achieve thermal energy intensity in the range of 2.9 – 3,4 GJ/t clinker.

Threshold calculations:

- Cement clinker: Specific emissions: 0,766 tCO_2e/t of clinker (EU-ETS)
- Clinker to cement ratio: 0.65[226]
- Specific emissions: 0.766x0.65 = 0.498 tCO_2e/t of cement (or alternative binder)

<u>Electricity: Indirect emissions from the use of electricity during the clinker and cement production</u>

The main users of electricity in cement plants are the mills (grinding of cement, milling of raw materials) and the exhaust fans (kiln/raw mill and cement mill, which together account for more than 80% of the electrical energy usage. The electricity demand in cement plants ranges from 90 to 150 kWh/t cement[227].

A global average electric energy demand for cement manufacturing of 104 kWh/t cement was reported by Cement Sustainability Initiative (CSI) for the years 2012 to 2014[228]. The CSI data cover more than 900 plants worldwide, and all technologies and clinker and cement types. The variations in the data are

[225] https://webstore.iea.org/technology-roadmap-low-carbon-transition-in-the-cement-industry

[226] As weighted average for the total production of the facility. Global average in 2014 was 0.65. EU around 0.75, and projected to 0.65 in 2030

[227] https://webstore.iea.org/technology-roadmap-low-carbon-transition-in-the-cement-industry

[228] https://docs.wbcsd.org/2017/06/CSI_ECRA_Technology_Papers_2017.pdf

significant: The 10% best in class show figures of 85 kWh/t cement and below, while the 90% percentile amounted to 129 kWh/t cement.

Taking into account that the decarbonisation of the cement sector will run in parallel with the decarbonisation of the energy sector, it is expected that the electricity required for cement manufacture in the near future will come from renewable sources and thus a specific threshold for specific electricity consumption is not proposed. Based on the above mentioned information and sources, it is expected that the best in class plants have specific electricity consumption of 85 KWh/ t cement.

- **Improving energy efficiency**: Thermal energy intensity of clinker and the electric intensity of cement can be reduced by deploying existing state-of-the-art technologies in new cement plants and retrofitting existing facilities to improve energy performance levels when economically viable.
- **Switching to alternative fuels**: The carbon intensity of cement clinker can be reduced significantly by the use of biomass and waste materials as fuels in cement kilns. The clinker-burning process offers good conditions for using different types of waste materials replacing parts of the consumption of carbon-intensive fossil fuels. A wide range of different types of wastes can be used as fuels but as these can replace primary fuel in cement kilns, a consistent waste quality is essential (e.g. adequate calorific value, metal, halogen and ash content).
- **Reducing the clinker to cement ratio**: Increasing the use of blended materials and the market deployment of blended cements is very important for the decarbonisation of the sector and alignment with a low carbon pathway. This requires substitution of cement clinker by mineral additives such as fly ash, silica fume or blast-furnace slag. The amount of clinker substitute that can be blended in the cement depends on the type of substitute and the type of cement produced. Some mineral additives, e.g. GBFS, allow for substitution levels of over 70 per cent. Revision of the cement and concrete standards, building codes and public procurement regulations would be required in order to allow more widespread use of blended cements with very high substitution of clinker (e.g. >60%) while ensuring product reliability and durability at final application.
- **Alternative clinkers and binders**: Alternative clinker formulations (e.g. belite, CSA, BCSA, CACS, MOMS) and alternative binders (e.g. alkali-activated binders) could offer potential opportunities for CO2 emissions reductions by using different mixes of raw materials or alternatives compared to Portland cement. Their commercial availability and applicability differ widely. Further efforts are required to support the demonstration, testing and earlier stage research for alternative clinkers and binders and to develop standards to facilitate market deployment. The specification of the benchmark based on ton of binder will allow investments in these types of novel alternative binders to be considered for eligibility under the EU Sustainable Taxonomy.
- **Renewable energy generation and use**: In the production of cement, the use of electricity from renewable energy sources could be also explored as a measure to reduce the electric intensity of the final cement product. This can be achieved through different strategies including implementing renewable-based captive power generation, power purchase agreements that ensure electricity imports are provided from renewable sources or demand-side response strategies that enable a flexible electricity demand (e.g. a flexible operating strategy of grinding plants throughout the day). Various renewable-based options are available for cement manufacturers including wind power, solar photovoltaic power, solar thermal power and small hydropower generation. Potential deployment of these technologies in cement plants is highly dependent on local conditions.

Transportation emissions: The emissions from transportation are excluded as these represent only a small percentage of the total emissions of cement manufacture. **Additional information:** European Commission, Report. Competitiveness of the European Cement and Lime Sectors, December 2017 https://ec.europa.eu/growth/content/competitiveness-european-cement-and-lime-sectors_en Provisions to determine the benchmarks in the period from 2021 to 2025 and for the period from 2026 to 2030 are included in Art. 10a, paragraphs 2(a) and 2(c) of the Directive 2003/87/EC. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20180408&qid=1547917622180&from=EN	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from cement manufacturing is associated with: - Polluting emissions to air associated to the consumption of fossil fuels and calcinations reaction in the cement kiln; - Water consumption at production facilities located in water-stressed areas; - Potential for soil and groundwater contamination associated with the handling and storage of (hazardous) wastes used as fuel substitute ('secondary' fuels) in the cement production process;	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: - considers both current weather variability and future climate change, including uncertainty; - is based on robust analysis of available climate data and projections across a range of future scenarios; - is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: - The activity does not lead to increased climate risks for others or hamper adaptation elsewhere

	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Cement manufacturing plants accept alternative fuels such as SRF originating from waste, as well as secondary raw materials such as recycled concrete aggregates (RCA). For cement production sites using hazardous wastes as alternative fuels, ensure a waste management plan that meets EU standards (or equivalent for plants operated in non-EU countries) exists and is implemented.
(5) Pollution	Ensure emissions to air and water are within the BAT-AEL ranges set in the BREF for the Production of Cement, Lime and Magnesium Oxide[1] Ensure implementation of a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, particularly UNESCO World Heritage and Key Biodiversity Areas (KBAs), have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and a robust, appropriately

	designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.3 Manufacture of Aluminium

Sector classification and activity	
Macro-Sector	C – Manufacturing
NACE Level	4
Code	C24.4.2
Description	Manufacture of aluminium
Mitigation criteria	
Principle	The manufacturing of aluminium is a highly energy intensive process. The CO2 emissions related to the production of aluminium are primarily scope 2 emissions (i.e. from the generation of the electricity used). Aluminium manufacturing is eligible if relying on low carbon electricity and reduced direct emissions. Additionally, all aluminium recycling is eligible due to significantly lower emissions than primary production.
Metric	• Direct emissions: GHG emissions per unit of production: ***tCO2e/t aluminium (Direct emissions)*** • Energy Efficiency for the electrolysis: ***MWh/t primary aluminium production*** • Average GHG emissions associated to the electricity production per unit of electricity used: ***gCO2e/kWh (Indirect emissions)***
Threshold	Manufacture of primary aluminium is eligible if the three following criteria are met: 1. Direct emission for primary aluminium production is at or below the value of the related EU-ETS benchmark. As of June 2019, the EU-ETS benchmarks values for aluminium manufacturing is **1.514 tCO2e/t**. Direct emissions are to be calculated according to the methodology used for EU-ETS benchmarks) 2. Electricity consumption for electrolysis is at or below: **15.29 MWh/t** (as of June 2019, European average emission factor according to International Aluminium Institute, 2017, to be updated annually)[229] 3. Average carbon intensity of the electricity that is used for primary aluminium production (electrolysis) is at or below: **100 g CO2e/kWh** (Taxonomy threshold for electricity production, subject to periodical update). Manufacture of secondary aluminium (i.e. production of aluminium from recycled aluminium) is eligible. No additional mitigation criteria need to be met.
Rationale	

[229] http://www.world-aluminium.org/statistics/primary-aluminium-smelting-power-consumption/#data

- Emissions related to the production of aluminium are primarily related to the use of electricity.
- Electricity costs contribute to over 50% of the production costs. Consequently, there is a strong incentive for the aluminium industry to aim for improving energy efficiency.
- The key action for aluminium production to make a substantial contribution to climate change mitigation is to increase its share of use of low carbon electricity.

4. Aluminium production facilities can become dominant players on local electricity markets and the availability of low carbon electricity may be a limiting factor. Therefore, aa manufacturer could either directly produce its own low carbon electricity or purchase low carbon electricity or renewable energy certificates. It should be possible to verify the average carbon intensity of the electricity on the basis of a prevailing PPA (Power Purchase Agreement).

- It is acknowledged that aluminium production facilities may play an important role in stabilizing electricity grids by active management of electricity demand. This may result in substantial mitigation contributions, e.g. by limiting the need for electricity storage facilities. However, given the lack of available metrics to quantify these impacts, these benefits are not taken into account at this stage.
- It is acknowledged that aluminium will play a role in a low carbon economy, in particular enabling light weight products and electrification (including transmission wires). Such applications could also be considered eligible under the activity "Manufacture of other low carbon technologies" provided they can demonstrate substantial emissions reductions according to the criteria for that activity.
- All aluminium recycling is considered to make a substantial contribution to climate change mitigation because of its association with much lower emissions than primary production.

The emissions covered are:

- Scope 1: all direct emissions related to the production (the process's direct emissions and the emissions due to fuel use for on-site energy production).
- Scope 2: Electricity consumption for electrolysis process and related emissions from the generation of the electricity used.

Information sources:

- ASI Performance standard, version 2, December 2017, https://aluminium-stewardship.org/asi-standards/asi-performance-standard/
- CO2 benchmark as defined for free allocation of Emission allowances under the ETS: 1.514 allowances/ton Al
- International Aluminium institute: http://www.world-aluminium.org/statistics/primary-aluminium-smelting-energy-intensity/

Do no significant harm assessment

The main potential significant harm to other environmental objectives from the manufacture of aluminium is associated with:

- the potential for significant air emission impacts: perfluorocarbons, fluoride gases, polycyclic aromatic hydrocarbons (PAHs), and particulate matter (e.g. unused cryolite). Hydrogen fluorides can be toxic to vegetation;
- the toxic, corrosive and reactive nature of waste generated by the used linings (cathodes) from the electrolytic cells (known as spent pot lining (SPL)). Dissolved fluorides and cyanides from the SPL material can create significant environmental impacts including groundwater contamination and pollution of local watercourses;

• the ability (or lacking thereof) of aluminium manufacturing plants to incorporate aluminium scrap (including scrap from their own manufacturing processes) in the production process; and • the potential to impact ecosystems as a result of the land footprint of the site and from polluting emissions to air.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	Measures are in place to minimise and manage waste (including hazardous waste) and material use in accordance with the BREF for the Non-Ferrous Metals Industries. In order to avoid risks to circular economy, aluminium manufacturing plants need to be able to process aluminium scrap.
(5) Pollution	Emissions to air (e.g. sulphur dioxide - SO_2, nitrogen oxide - NOx, particulate matter, Total Organic Carbon (TOC), dioxins, , mercury (Hg), hydrogen chloride (HCL), hydrogen fluoride (HF), Total Fluoride, and (PFCs) polyfluorinated hydrocarbons (PFCs)) are within the BAT-AEL ranges set in the BREF for the Non-Ferrous Metals Industries. [230] A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other

[230] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.174.01.0032.01.ENG

	equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO Word Heritage and Key Biodiversity Areas (KBAs), have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018); • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.4 Manufacture of Iron and Steel

Sector classification and activity	
Macro-Sector	C – Manufacturing
NACE Level	3 and 4
Code	C24.1: Manufacture of basic iron and steel and of ferro-alloys C24.2: Manufacture of tubes, pipes, hollow profiles and related fittings, of steel C24.3: Manufacture of other products of first processing of steel C24.5.1: Casting of iron C24.5.2: Casting of steel
Description	Manufacture of iron and steel
Mitigation criteria	
Principle	Manufacturing of iron and steel at the level of performance achieved by best performing plants is considered to make a substantial contribution to climate change mitigation. Additionally, secondary production of steel (i.e. using scrap steel) is considered eligible due to significantly lower emissions than primary steel production.
Metric	GHG emissions (tCO2e) / t product GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks.
Threshold	Manufacturing of iron and steel is eligible if the GHG emissions (calculated according to the methodology used for EU-ETS benchmarks) associated to the production processes are lower than the values of the related EU-ETS benchmarks. As of June 2019, the EU-ETS benchmarks values for iron and steel manufacturing are: • Hot metal = 1.328 tCO2e/t product • Sintered ore = 0.171 tCO2e/t product • Iron casting = 0.325 tCO2e/t product • Electric Arc Furnace (EAF) high alloy steel = 0.352 tCO2e/t product • Electric Arc Furnace (EAF) carbon steel = 0.283 tCO2e/t product Additionally, all production of steel in EAF using at least 90% of scrap steel is considered eligible.
Rationale	
The ETS benchmarks are the selected thresholds because of their reliability and the 5-year future update plan. Additionally, they are the only consistent data set available today. The "Achievable Reference Performance" specific emissions values, as defined in the standard EN 19694-2:2016, are considered to be accessible to any operator under normal operating conditions and	

therefore such specific emission values are less strict than the proposed EU ETS benchmarks. Therefore, the EU ETS benchmarks have been selected because they provide an ambitious threshold under which the steel and iron making industry should strive to operate in the short-term. However, given that the EU ETS benchmarks are for specific steps of production, the TEG recommends that the Sustainable Finance Platform analyses the possibility to define a threshold for the overall integrated steel plant using the methodology set in the standard EN 19694-2:2016.

In the long-term, the steel and iron making industry should aim at implementing breakthrough technologies (characterised by ultra-low CO_2 emissions). Some of these technologies have already been demonstrated at the pilot or at industrial scale. Once these technologies become commercially available, the proposed thresholds will need to be revised in order to reflect the more ambitious specific emission values achievable. These technologies include:

- blast furnace top gas recycling with carbon capture and storage;
- direct smelting reduction processes
- direct reduction with natural gas for production of DRI combined with EAF steelmaking;
- hydrogen steelmaking in shaft furnaces using H_2 produced via water electrolysis (e.g. using renewable electricity sources);
- direct electrolysis of iron ore;
- advanced EAF steelmaking with scrap pre-heating and oxy-fuel combustion.

This activity focuses on the greening of iron and steel manufacturing due to its high contribution to global GHG emissions. The potential of greening by products made of iron and steel can be addressed through other activities such as "manufacture of other low carbon technologies" where according to the criteria given for this activity, the manufacturer can prove the overall environmental benefits over the whole life.

Do no significant harm assessment

The main potential significant harm to other environmental objectives from iron and steel production is associated with:

- emissions to air from coke-making and smelting operations, especially particulate matter (dust), oxides of nitrogen, sulphur dioxide, carbon monoxide, chlorides, fluorides, volatile organic compounds, polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-dioxins/furans, and heavy metals;
- emissions to water of hydrocarbons and suspended solids;
- water consumption for quenching and cooling operations in water stressed areas;
- the potential to impact local ecosystems and biodiversity due to the polluting emissions (if not properly mitigated) and due to the large land footprint of the operations and associated ancillary activities; and
- wastes and byproducts from the coking and smelting operations including blast furnace slag, tar and benzole.

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty;

	- is based on robust analysis of available climate data and projections across a range of future scenarios; - is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: - The activity does not lead to increased climate risks for others or hamper adaptation elsewhere The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Appropriate measures are in place to minimise and manage waste and material use in accordance with BREF for iron and steel production..
(5) Pollution	Ensure emissions to water and air are within the BAT-AEL ranges set in the BREF for iron and steel production (e.g. for pH, total suspended solids (TSS), chemical oxygen demand (COD), chromium (total) and heavy metals, for sulphur dioxide - SO2, nitrogen oxide - NOx, particulate matter, polychlorinated dibenzo-dioxins/furans, mercury (Hg), hydrogen chloride (HCL) and hydrogen fluoride (HF).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, particularly UNESCO World Heritage and Key Biodiversity Areas (KBAs) have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;

	• all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.5 Manufacture of Hydrogen

Sector classification and activity	
Macro-Sector	C - Manufacturing
NACE Level	4
Code	C20.1.1
Description	Manufacture of hydrogen (CPA: 20.11.11.50)
Mitigation criteria	
Principle	The manufacturing of hydrogen is a highly carbon-intensive activity within the chemical industry[231]. Therefore, reducing the emissions from the manufacturing activity itself can positively contribute to the mitigation objectives.
Metric	• Emission factor: GHG emissions per unit of production: tCO2e/t Hydrogen • Performance for electricity use: MWh/t Hydrogen • Emissions factor, GHG emissions per unit of production for the electricity used: gCO2e/kWh The boundaries for assessing Scope 1 emissions are defined in the ETS benchmark decision. The boundaries for thresholds related to electricity production and use (scope 2 emissions) are assessed in line with the GHG protocol guidelines.
Threshold	The following thresholds need to be met: • Direct CO2 emissions from manufacturing of hydrogen: 0.95 tCO2e/t Hydrogen • Electricity use for hydrogen produced by electrolysis is at or lower than 50 MWh/t Hydrogen [232] • Average carbon intensity of the electricity produced that is used for hydrogen manufacturing is at or below 100 gCO2e/kWh (Taxonomy threshold for electricity production, subject to periodical update).
Rationale	
Currently, almost 96% of industrially-produced hydrogen is manufactured via steam reforming using fossil fuels: 48% (natural gas), 30% (liquid hydrocarbon) and 18% (coal). Steam reforming is a mature	

[231] Energy efficiency and JRC emissions, Perspective scenarios for the chemical and petrochemical industry, JRC (2017), page 12. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf. Accounting for approximately 9% of the emissions from the chemical sector. Please note that emissions from the production of methanol and synthesis gas are included in the 9% share.

[232] pag 52 of report published by DECHEMA and commissioned by CEFIC https://dechema.de/dechema_media/Downloads/Positionspapiere/Technology_study_Low_carbon_energy_and_feedstock_for_the_European_chemical_industry-p-20002750.pdf

process, associated with high CO2 emissions and incompatible with the EU Strategy for long-term EU greenhouse gas emissions reductions. Minimizing the emissions from hydrogen manufacturing, by promoting low carbon emission production processes can positively contribute to the mitigation objective. The selected metrics are (1) emission factors, in terms of GHG emissions per unit of production and in terms of electricity consumed as well and (2) an energy efficiency threshold for electricity consumption.. The thresholds cover both direct and indirect emissions, to ensure that the most effective abatement techniques are being incentivized, while avoiding inconsistent incentives, which might promote manufacturing processes which reduce direct emissions, but which are associated with extremely high indirect emissions.[233] The thresholds reflect the performance of electrolysis with low carbon energy as defined in the electricity generation activities, and could also be achieved with CCS.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the manufacture of hydrogen is, in practical terms, inseparable from the potential for significant harm created by the hydrocarbon refining activity more generally and is associated with: • polluting emissions to air (in the case of hydrogen production via electrolysis, there is an indirect environmental impact associated with the generation of electricity); • water used for cooling might lead to local resource depletion, dependent of the local scarcity of water resources; and • the generation of wastes (e.g. spent catalysts and byproducts of the various physical and chemical treatment processes used in purifying the hydrogen produced via hydrocarbon processing).	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means:

233 The production of hydrogen trough electrolysis using low carbon electricity will be the preferable process in the decarbonized future. See page 64 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf
See also : page 22, http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf
page 73, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf
page 354 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

	• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Where the operations are situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented
(4) Circular Economy	Where manufacture of hydrogen takes place within the context of an oil and gas refining installation, ensure appropriate measures are in place to minimize and manage waste and material use in accordance with the BAT conclusions of the BREF for the Refining of Mineral Oil and Gas. Waste and by-products from the manufacturing process should be treated according to the waste hierarchy and ideally recycled in the same process (closed-loop).
(5) Pollution	Ensure that emissions to air are within the BAT-AEL ranges set in the BREFs for the Refining of Mineral Oil and Gas and for the chemical industry (e.g. the BREF for Large Volume Inorganic Chemicals - Ammonia, Acids and Fertilisers). A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, particularly UNESCO World Heritage and Key Biodiversity Areas (KBAs) have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;

	• all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.6 Manufacture of other inorganic basic chemicals

Sector classification and activity	
Macro-Sector	C – Manufacturing
NACE Level	4
Code	C20.1.3
Description	• Manufacture of carbon black • Manufacture of disodium carbonate (soda ash) • Manufacture of chlorine CPA codes: • Carbon black: 20.13.21.30 • Disodium carbonate (soda ash): 20.13.43.10 • Chlorine: 20.13.21.11
Mitigation criteria	
Principle	Reducing the emissions from the manufacturing of carbon black and soda ash and improving energy efficiency and switching to low carbon electricity[234] in the manufacturing of chlorine can positively contribute to the climate change mitigation objective.
Metric	For carbon black and soda ash: • GHG emissions (tCO2e)/t product • GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks. For the manufacturing of chlorine: • Electricity use: MWh/t Chlorine (alternating current at 'X' kA/m^2) • Carbon intensity of the electricity that is used for chlorine manufacturing: gCO2e/kWh
Threshold	Manufacturing of carbon black and soda ash are eligible if the GHG emissions (calculated according to the methodology used for EU-ETS benchmarks) associated to the production processes are lower than the values of the related EU-ETS benchmarks. As of June 2019, the EU-ETS benchmarks values are: • For carbon black: 1,954 tCO2e/t • For soda ash: 0,843 tCO2e/t Manufacturing of chlorine is eligible if the two following thresholds are met:

[234] See page 40 https://dechema.de/dechema_media/Downloads/Positionspapiere/Technology_study_Low_carbon_energy_and_feedstock_for_the_European_chemical_industry-p-20002750.pdf

	• Electricity use for chlorine manufacturing is at or lower than 2.75 MWh/t Chlorine (electrolysis and chlorine treatment, threshold subject to periodical update) [235] • Average carbon intensity of the electricity that is used for chlorine manufacturing is at or below 100 gCO2e/kWh (Taxonomy threshold for electricity production, subject to periodical update).

Rationale

The manufacturing process of carbon black accounts for approximately 3.4% of the GHG emissions from the chemical sector, while the manufacturing of soda ash accounts for 1.5% of the emissions.[236]

The manufacturing process of chlorine is extremely energy-intensive, with chlor-alkali process accounting for 17% of total electrical consumption of the European chemical and petrochemical industry.[237]

Reducing the manufacturing emissions for carbon black and soda ash and improving energy efficiency in the manufacturing of chlorine can positively contribute to the mitigation objective.

The absolute performance approach has been proposed in order to identify the maximum acceptable carbon intensities of the manufacturing processes of carbon black and soda ash that the activities should comply with in order to be able to substantially contribute to the mitigation objective.

For the manufacturing of chlorine, a process that uses electricity to fuel the electrolysis process, the absolute performance approach has been proposed in order to identify the energy intensity threshold. In addition to complying with the energy efficiency threshold, the process shall be based on low carbon electricity.

ETS product benchmarks have been selected as thresholds for the manufacturing of carbon black and soda ash. They reflect the average performance of the 10% most efficient installations in a sector.

Emissions covered:

- Scope 1: All direct emissions related to the production (the process direct emissions and the emissions due to fuel use for energy production).
- Note on the electricity:
  According to the methodology to calculate ETS benchmarks, emissions from electricity are considered where direct emissions and indirect emissions from electricity are to a certain level interchangeable (as is the case for carbon black but not for soda ash).[238]

For chlorine, the value corresponding to an efficient level of electricity consumption was selected as the threshold given that the main source of energy used for the production of chlorine is electricity and by improving the energy efficiency of the process, as well as using low carbon electricity sources, the activity can substantially contribute to the climate change mitigation objective.

https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2012:387:0005:0013:EN:PDF

https://epub.wupperinst.org/frontdoor/deliver/index/docId/6478/file/6478_Lechtenboehmer.pdf

EU average data reported in a CEPS desk study. (CEPS, Ares(2014) 174266-27/01/2014)

235 https://www.eurochlor.org/wp-content/uploads/2019/04/12-electrolysis_production_costs.pdf

236 Page 14 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf

237 page 11 http://eippcb.jrc.ec.europa.eu/reference/BREF/CAK_BREF_102014.pdf

238 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0278&from=EN

https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd9_sector_specific_guidance_en.pdf

BREF: http://eippcb.jrc.ec.europa.eu/reference/BREF/lvic-s_bref_0907.pdf http://eippcb.jrc.ec.europa.eu/reference/BREF/CAK_BREF_102014.pdf Provisions to determine the benchmarks in the period from 2021 to 2025 and for the period from 2026 to 2030 are included in Art. 10a, paragraphs 2(a) and 2(c) of the Directive 2003/87/EC. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20180408&qid=1547917622180&from=EN

The DNSH assessment is split across the three chemicals:

- Manufacture of carbon black
- Manufacture of disodium carbonate (soda ash)
- Manufacture of chlorine

Do no significant harm assessment	
Manufacture of carbon black The main potential significant harm to other environmental objectives from the manufacture of carbon black is associated with: • polluting emissions to air, especially volatile organic compounds (VOC) and dust;. • the use of water in water stressed areas for cooling purposes; and • the generation of wastes.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant),

	ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous manufacturing wastes, are managed in line with the Waste Treatment BREF and the requirements set out in BREF LVIC- S (Large Volumes Inorganic Chemicals- Solids and others Industry).
(5) Pollution	Ensure polluting emissions to air are within BAT-AEL ranges set in the BREF LVIC- S (Large Volumes Inorganic Chemicals- Solids and others Industry).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, particularly UNESCO World Heritage sites and Key Biodiversity Areas (KBAs), have been implemented.

<table>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2"><u>Manufacture of disodium carbonate (soda ash)</u>
The main potential significant harm to other environmental objectives from the manufacture of soda ash is associated with:
• the generation of process effluents (e.g. calcium chloride in aqueous solution), by products and wastes with the potential to pollute groundwater and surface water bodies as well as soils;
• polluting air emissions;
• the use of water in water scarce areas for cooling purposes; and
• impacts on ecosystems and biodiversity from the disposal of wastes and by-products (primarily calcium carbonate, gypsum, sodium chloride and calcium chloride, although there can be trace amounts of toxic materials such as mercury, cadmium, arsenic and zinc depending on the source of the raw materials (e.g. limestone) for the production process) which create ‘waste beds’.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.</td></tr>
</table>

	A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous wastes, are managed in line with the BREF for Waste Treatment and the requirements set out in BREF LVIC- S (Large Volumes Inorganic Chemicals- Solids and others Industry).
(5) Pollution	Ensure polluting emissions to air and water are within BAT-AEL ranges set in the BREF LVIC- S (Large Volumes Inorganic Chemicals- Solids and others Industry).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage and Key Biodiversity Areas (KBAs), have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

Do no significant harm assessment	
Manufacture of chlorine The main potential significant harm to other environmental objectives from the manufacture of chlorine is associated with: • polluting emissions to air (e.g. chlorine); • process water effluents which can contain oxidizing agents (e.g. chlorine) • the use of water in water stressed areas; and • the generation of wastes.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous process wastes, are managed in line with the Waste Treatment BREF and the requirements set out in the BREF for the Production of Chlor-Alkali.
(5) Pollution	Ensure polluting emissions to air and water are within the BAT-AEL ranges set in the BREF for the Production of Chlor-Alkali.
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and

	operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage Key Biodiversity Areas (KBAs) have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.7 Manufacture of other organic basic chemicals

Sector classification and activity	
Macro-Sector	C - Manufacturing
NACE Level	4
Code	C20.1.4
Description	Manufacture of: • **High volume chemicals:** o acetylene: 20.14.11.90[239] o ethylene: 20.14.11.30 o propylene: 20.14.11.40 o butadiene: 20.14.11.60 o hydrogen: 20.11.11.50 • **Aromatics:** o Mixed alkylbenzenes, mixed alkylnaphthalenes other than HS 2707 or 2902: 20.59.56.70 o Cyclohexane: 20.14.12.13 o Benzene: 20.14.12.23 o Toluene: 20.14.12.25 o o-Xylene: 20.14.12.43 o p-Xylene: 20.14.12.45 o m-Xylene and mixed xylene isomers: 20.14.12.47 o Ethylbenzene: 20.14.12.60 o Cumene: 20.14.12.70 o Biphenyl, terphenyls, vinyltoluenes, other cyclic hydrocarbons excluding cyclanes, cyclenes, cycloterpenes, benzene, toluene, xylenes, styrene, ethylbenzene, cumene,naphthalene, anthracene: 20.14.12.90 o Benzol (benzene), toluol (toluene) and xylol (xylenes) l: 20.14.73.20 o Naphthalene and other aromatic hydrocarbon mixtures (excluding benzole, toluole, xylole): 20.14.73.40 • **Vinyl chloride**: 20.14.13.71 • **Styrene**: 20.14.12.50 • **Ethylene oxide**: 20.14.63.73 • **Monoethylene glycol**: 20.14.23.10 • **Adipic acid:** 20.14.33.85 • **Organic chemicals,** which fall under the following CPA codes:

[239] CPA code

	- industrial monocarboxylic fatty acids; acid oils from refining (20.14.31) - Saturated acyclic monocarboxylic acids and their derivatives (20.14.32) - Unsaturated monocarboxylic, cyclanic, cyclenic or cycloterpenic acyclic polycarboxylic acids and their derivatives (20.14.33) - Aromatic polycarboxylic and carboxylic acids with additional oxygen functions; and their derivatives, except salicylic acid and its salts (20.14.34)
Mitigation criteria	
Principle	The manufacturing of organic chemicals is associated with significant CO2 emissions. Minimizing process emissions and promoting the manufacturing of organic chemicals with renewable feedstock can contribute to the mitigation objective.
Metric	For the manufacturing of all chemicals covered in this activity except the manufacture of the following CPA product categories: 20.14.31, 20.14.32, 20.14.33, 20.14.34; the selected metric is: • Emission factor: GHG emissions per unit of production (tCO2e/t) GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks. For the manufacturing of the organic chemicals falling under the codes: • 20.14.31 • 20.14.32 • 20.14.33 • 20.14.34 the following criterion shall apply: • the manufacturing of the organic chemicals shall be wholly or partially based on renewable feedstock and, • the carbon footprint shall be substantially lower compared to the carbon footprint of the same chemical manufactured from fossil fuel feedstock. The carbon footprint shall be calculated in accordance with ISO 14067:2018 and validated by a third party. For the purpose of applying these criteria, renewable feedstock refers to biomass, industrial bio-waste or municipal bio-waste. **Additional criteria the activity needs to comply with:** **If feedstock is biomass (excluding industrial and municipal bio-waste):** – a full traceability of sourcing through the corresponding chain of custody management system needs to be in place and its effectiveness proven through the corresponding certification systems;

	– any forest biomass used in the process shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable; – any forest biomass used in the process is committed to forest certification using independent third-party schemes that are regularly audited in the forest areas. Forest management and chain of custody practices in sourcing areas that are not yet certified, must be aligned (roadmap to certification) with the same certification standards; – forest biomass coming from irrigated forest plantations shall not be used; – any biomass produced within the EU used in the process must be subject to a transparent, credible chain of custody and comply with biomass sustainability criteria as defined in the cross compliance conditionalities of the Common Agricultural Policy and as defined in the Common Fisheries Policy; – biomass used shall comply with a recognised voluntary sustainability certification scheme, for example, those established by the EC in the frame of article 26 of Directive 2009/28/EC and any of its amending directives (RED + and RED2+, as applicable) for biomass and biofuels. – biomass shall not come from agricultural land that has been the subject of land use change from forest or pasture since 1994. The above-mentioned certification schemes shall provide a robust chain of custody audit system for the feedstock; – products derived from new, greenfield oil palm tree plantations are excluded from the scope; – particular case of forest biomass certification: small-scale palm oil cultivators operating in existing forest plantations should be able to be included in the certification system and ensure that they receive their fair share of profits. **If feedstock is industrial bio-waste (incl. waste from the food or feed industries) or municipal bio-waste:** – any solid bio-waste used in the manufacturing process shall originate from source-segregated and separately collected (non-hazardous) waste streams, i.e. shall not be separated from mixed residual waste; – the bio-waste used in the process shall be consistent with the waste regulatory framework and the national/regional/local waste management plans, in particular with the proximity principle. Where municipal bio-waste is used as a feedstock, the project shall be complementary to and not compete with existing municipal bio-waste management infrastructure. If the manufacturing processes for any of the organic chemicals for which the ETS benchmarks are used as thresholds is based on renewable feedstock, then the criteria for the renewable feedstock also apply.
Threshold	ETS product benchmarks **only** for the manufacturing of all chemicals covered in this activity except the manufacturing of the following CPA product categories: 20.14.31, 20.14.32, 20.14.33, 20.14.34:

	a) For HVC: 0,702 tCO_2e/t b) For aromatics: 0,0295 tCO_2e/t[240] c) For vinyl chloride: 0,204 tCO_2e/t d) For styrene: 0,527 tCO_2e/t e) For ethylene oxide/ethylene glycols: 0,512 tCO_2e/t g) For adipic acid 2,79 (allowances/t).

Rationale

For the manufacturing of all chemicals in this activity except CPA codes 20.14.31, 20.14.32, 20.14.33, 20.14.34:

The manufacturing of high value chemicals, aromatics, ethylene chloride, vinyl chloride, ethylbenzene, styrene, ethylene oxide, mono ethylene glycol and methanol accounts for more than 35% of the emissions from the chemical sector.[241]

Steam cracking is the main industrial process for manufacturing high value chemicals, but is also the most energy intensive one in the chemical industry and responsible for 25% of the GHG emissions from the chemical industry.[242]

Reducing the emissions from the manufacturing process of organic chemicals can therefore positively contribute to the mitigation objective.

The absolute performance approach has been proposed in order to identify the maximum acceptable carbon intensity that the activity should comply with in order to be able to substantially contribute to the mitigation objective.

ETS product benchmarks have been selected as thresholds. They reflect the average performance of the 10% most efficient installations in a sector.

Emissions covered:

- Scope 1: All direct emissions related to the production (the process direct emissions and the emissions due to fuel use for energy production).
- Note on electricity:
  According to the methodology to calculate ETS benchmarks, emissions from electricity are considered where direct emissions and indirect emissions from electricity are to a certain level interchangeable.

The thresholds have been aligned with the work undertaken in the respective forestry subgroup. The following principles have been applied where biomass use is relevant:

- All Sustainable Forestry Management requirements have EU legislation as minimum baseline. The Forest Taxonomy includes this overarching principle' Carry out harvesting activities in compliance with national laws ' and refers to EU Timber Regulation (EU/995/2010) and FLEGT.
- The Taxonomy doesn't include forest plantations – because of the mitigation focus. We do recognize the international guiding principles against deforestation provided by UN REDD, as an overarching principle.

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0278&from=EN

[240] Unit of production: CO2 weighted tonne

[241] Page 14 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf

[242] Page 14 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf

https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd9_sector_specific_guidance_en.pdf **BREF:** https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/best-available-techniques-bat-reference-document-production-large-volume-organic-chemicals Provisions to determine the benchmarks in the period from 2021 to 2025 and for the period from 2026 to 2030 are included in Art. 10a, paragraphs 2(a) and 2(c) of the Directive 2003/87/EC. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20180408&qid=1547917622180&from=EN **For the manufacturing of chemicals under CPA codes 20.14.31, 20.14.32, 20.14.33, 20.14.34:** Art. 6 of the Commission's proposed regulation on a framework to facilitate sustainable investment includes *"switching to use of renewable materials"* to provide a substantial contribution to climate change mitigation. The innovative bio-based chemical sector may contribute to that objective. Therefore, additional criteria have been specified to identify the conditions under which the manufacturing process of organic chemicals - when based on renewable feedstock, such as biomass - can substantially contribute to the mitigation objective. "Bio-based chemicals are defined as chemical products that are wholly or partly derived from materials of biological origin (for example biomasses, feedstock, but also plants, algae, crops, trees, marine organisms and biological waste). Given their expected limited environmental footprint in comparison to their traditional counterparts, bio-based chemicals have recently emerged on EU markets as valid, environmentally friendly alternatives to standard chemicals".[243]	
Do no significant harm assessment	
The main potential significant harm to the environment from the production of other organic chemicals is associated with: • polluting emissions to air and water from the production process; • vulnerable ecosystems might be damaged by the construction and/or operation of the production facilities; • the use of water resources for production purposes (e.g. cooling water) in water stressed areas; and • the generation of hazardous wastes.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios;

[243] https://ec.europa.eu/jrc/en/science-update/future-bio-based-chemicals-eu-bioeconomy

	• is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous wastes, are managed in line with the BREF for Waste Treatment[244].
(5) Pollution	Ensure polluting emissions to air, soil and water are within BAT-AEL ranges as set out in the following BREF documents (as applicable): • BREF document LVOC (Large Volume Organic Chemicals) [245] • BREF document CWW (for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector)[246] • BREF document EFS (Emissions From Storage)[247] • BREF document REF (Refining of Mineral Oil and Gas) [248] • BREF document WT (Waste Treatment) (referenced above) • BREF document WI (Waste Incineration) [249] A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance

[244] Best Available Techniques (BAT) Reference Document for Waste Treatment available at http://eippcb.jrc.ec.europa.eu/reference/BREF/WT/JRC113018_WT_Bref.pdf

[245] Best Available Techniques (BAT) Reference Document for the Production of Large Volume Organic Chemicals, available at http://eippcb.jrc.ec.europa.eu/reference/BREF/lvic-s_bref_0907.pdf

[246] Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector, available at http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf (pp. 539-557)

[247] Reference Document on Best Available Techniques on Emissions from Storage July 2006, available at http://eippcb.jrc.ec.europa.eu/reference/BREF/esb_bref_0706.pdf (pp. 257-277)

[248] Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas, available at http://eippcb.jrc.ec.europa.eu/reference/BREF/REF_BREF_2015.pdf

[249] Best Available Techniques (BAT) Reference Document for Waste Incineration available at http://eippcb.jrc.ec.europa.eu/reference/BREF/WI/WI_BREF_FD_Black_Watermark.pdf

	Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage and Key Biodiversity Areas (KBAs), have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.8 Manufacture of fertilizers and nitrogen compounds

Sector classification and activity	
Macro-Sector	C - Manufacturing
NACE Level	4
Code	C20.1.5
Description	Manufacture of: • Anhydrous ammonia (CPA: 20.15.10.75) • Nitric acid (CPA:20.15.10.50)
Mitigation criteria	
Principle	The manufacturing of ammonia and nitric acid is highly carbon-intensive. Therefore, reducing the emissions from the manufacturing activity itself can positively contribute to the mitigation objective.
Metric	Metric for nitric acid manufacturing: • Emission factor: tCO_2e/t Nitric acid. GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks. Metric for ammonia manufacturing: • Scope 1 emissions: tCO_2/t Ammonia • Combined CO_2 emissions (scope 1 emissions and scope 2 emissions from electricity consumed): tCO_2/t Ammonia. For the calculation of the emissions from the manufacturing process of ammonia, both the steps: production of the intermediate product hydrogen and synthesis of the ammonia are considered. Scope 1 emissions include both emissions. GHG emissions must be calculated according to the methodology used for EU-ETS benchmarks.
Threshold	Manufacturing of nitric acid is eligible if the GHG emissions (calculated according to the methodology used for EU-ETS benchmarks) associated to the production processes are lower than the values of the related EU-ETS benchmarks. As of June 2019, the EU-ETS benchmarks values for the manufacturing of nitric acid are: • ETS benchmark: 0.302 tCO_2e/t[250] Manufacturing of ammonia is eligible if the two following thresholds are met: • Scope 1 emissions lower than 1 tCO_2/tAmmonia and • Combined CO_2 emissions (scope 1 emissions and scope 2 emissions, from electricity consumed) lower than 1,3 tCO_2/tAmmonia. •

[250] See page 100 on the GWP used for the benchmark value: https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd9_sector_specific_guidance_en.pdf

Rationale
The manufacturing of ammonia and nitric acid accounts for approximately 23% of emissions coming from the chemical sector.[251] Reducing emissions from the manufacturing processes can positively contribute to the mitigation objective. The ammonia sector is expected to substantially contribute to GHG emissions reduction, notably by using hydrogen produced from electrolysis.[252][253][254] During the manufacturing process of nitric acid, the main type of GHG generated is nitrous oxide and by applying the available technologies it is possible to achieve more than 80% of emission reductions.[255] The selected metric for nitric acid is the emission factor, in terms of XX GHG emissions per unit of production. The absolute performance approach has been proposed in order to identify the maximum acceptable carbon intensity of the manufacturing process that the activity should comply with in order to be able to substantially contribute to the mitigation objective. The selected threshold for nitric acid is the ETS product benchmark. ETS product benchmarks reflect the average performance of the 10% most efficient installations in a sector. https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd9_sector_specific_guidance_en.pdf https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0278&from=EN http://eippcb.jrc.ec.europa.eu/reference/BREF/lvic_aaf.pdf Provisions to determine the benchmarks in the period from 2021 to 2025 and for the period from 2026 to 2030 are included in Art. 10a, paragraphs 2(a) and 2(c) of the Directive 2003/87/EC. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20180408&qid=1547917622180&from=EN
Do no significant harm assessment
The main potential significant harm to the environment from the production of nitric acid or ammonia production is associated with: • polluting emissions to air (especially nitrogen oxides (NOx), and ammonia (NH3)) from the production process; • Vulnerable ecosystems might be damaged by the construction and/or operation of the production facilities. • the use of water resources for production purposes (especially for cooling processes) in water stressed areas; and • the generation of hazardous wastes (e.g. spent catalyst material).

[251] Energy efficiency and JRC emissions, Perspective scenarios for the chemical and petrochemical industry, JRC (2017), page 12. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf .

[252] Page 56, https://dechema.de/dechema_media/Downloads/Positionspapiere/Technology_study_Low_carbon_energy_and_feedstock_for_the_European_chemical_industry-p-20002750.pdf

[253] The production of hydrogen trough electrolysis using low carbon electricity will be the preferable process in the decarbonized future. Page 64 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

[254] In FORECAST, ammonia is assumed to be produced trough electrolysis with low carbon free electricity. See page 353 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

[255] Page 39, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105767/kj-na-28471-enn.pdf

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous wastes, are managed in line with the BREF for Waste Treatment.
(5) Pollution	Ensure polluting emissions to air (e.g. nitrogen oxides (NOx), and ammonia (NH_3)) and water are within BAT-AEL ranges set in the BREF LVIC-AAF (Large Volume Inorganic Chemicals - Ammonia, Acids and Fertilisers), the BREF CWW (Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector) and the BREF EFS (Emissions from Storage). A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage and Bey Biodiversity Areas (KBAs), have been implemented.

	For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

21.9 Manufacture of plastics in primary form

Sector classification and activity	
Macro-Sector	C – Manufacturing
NACE Level	4
Code	C20.1.6
Description	Manufacture of plastics in primary form
Mitigation criteria	
Principle	The manufacturing of plastics is associated with significant life cycle CO2 emissions. Materials recirculation and manufacture of polymers with renewable feedstock can contribute to reduce CO2 emissions from the plastic sector.
Metric	Manufacture of plastics in primary form shall comply with at least one of the following three criteria and when relevant with the additional criteria, reported below: 1) The plastics in primary form shall be manufactured by mechanical recycling. 2) The plastics in primary form shall be manufactured by chemical recycling. When applying criterion 2, the carbon footprint of the plastics in primary form, manufactured by chemical recycling, shall be lower when compared to the carbon footprint of the plastics in primary form manufactured with fossil fuel feedstock. The carbon footprint shall be calculated in accordance with ISO 14067:2018 and validated by a third party. 3) Manufacture of plastics in primary form shall be wholly or partially derived from renewable feedstock and the carbon footprint of the plastics in primary form, manufactured wholly or partially from renewable feedstock shall be lower when compared to the carbon footprint of the plastics in primary form manufactured with fossil fuel feedstock. The carbon footprint shall be calculated in accordance with ISO 14067:2018 and validated by a third party. For the purpose of applying criterion 3, renewable feedstock refers to biomass, industrial bio-waste or municipal bio-waste. **<u>Additional criteria the activity needs to comply with:</u>** **If feedstock is biomass (excluding industrial and municipal bio-waste):** – a full traceability of sourcing through the corresponding chain of custody management system needs to be in place and its effectiveness proven through the corresponding certification systems; – any forest biomass used in the process shall comply with EU Timber Regulation (EU/995/2010) and the EU Forest Law Enforcement Governance and Trade (FLEGT), where applicable; – any forest biomass used in the process is committed any forest biomass used in the process is committed to forest certification using independent third-party schemes that are regularly audited in the forest areas. Forest management and chain of custody practices in sourcing areas that are not

	yet certified, must be aligned (roadmap to certification) with the same certification standards; – forest biomass coming from irrigated forest plantations shall not be used; – any biomass produced within the EU used in the process must be subject to a transparent, credible chain of custody and comply with biomass sustainability criteria as defined in the cross compliance conditionalities of the Common Agricultural Policy and as defined in the Common Fisheries Policy; – biomass used shall comply with a recognised voluntary sustainability certification scheme, for example, those established by the EC in the frame of article 26 of Directive 2009/28/EC and any of its amending directives (RED + and RED2+, as applicable) for biomass and biofuels. – biomass shall not come from agricultural land that has been the subject of land use change from forest or pasture since 1994. The above-mentioned certification schemes shall provide a robust chain of custody audit system for the feedstock; – products derived from new, greenfield oil palm tree plantation are excluded from the scope; – particular case of forest biomass certification: small-scale palm oil cultivators operating in existing forest plantations should be able to be included in the certification system and ensure that they receive their fair share of profits. **If feedstock is industrial bio-waste (incl. waste from the food or feed industries) or municipal bio-waste:** – any solid bio-waste used in the manufacturing process shall originate from source segregated and separately collected (non-hazardous) waste streams, i.e. shall not be separated from mixed residual waste; – the bio-waste used in the process shall be consistent with the waste regulatory framework and the national/regional/local waste management plans, in particular with the proximity principle. Where municipal bio-waste is used as a feedstock, the project shall be complementary to and not compete with existing municipal bio-waste management infrastructure;
Threshold	No threshold applied.
Rationale	
Plastics production has been sharply growing over the last years and emissions from the plastics sector are expected to increase, not only because consumption is expected to increase – and so also the emissions from the manufacturing process - but also because plastics release CO2 when incinerated. In order to reduce CO2 emissions from the plastics sector it is therefore important to promote materials recirculation and manufacture of polymers with renewable feedstock. The criteria for the manufacturing of plastics from renewable feedstock are based on Eligibility Criteria for funding projects under the Circular Bioeconomy Investment Platform[256]. The CBIP is part of the framework of InnovFin – EU Finance for Innovators, a joint initiative launched by the European	

[256] TA2018061 R0 INN Title: Circular Bioeconomy Investment Platform (CBIP) – The Appendix 2 to the terms of reference of the tender includes the "Eligibility Criteria" for the CBIP. Among those, #10 is about "Feedstock and project sustainability criteria".

Investment Bank Group (EIB and EIF) in cooperation with the European Commission under Horizon 2020.[257]

By selecting the above criteria, the purpose is also to contribute to the EU's Bioeconomy Strategy, which aims to accelerate the deployment of a sustainable European bioeconomy so as to maximise its contribution to the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), as well as the Paris Agreement.[258]

Moreover, the manufacturing of plastics with recyclates from the recycling processes can significantly reduce the life cycle emissions of the plastics, by decreasing:

- the emissions from the manufacturing process of plastics and
- the embedded CO2 emissions.

Note on the link between manufacturing activity under NACE code 20.16 and code 22.2.

The manufacturing of plastics in primary form is covered by NACE code 20.16 and the definition of "primary form" includes: liquids and pastes, blocks or irregular shape, lumps, powders (including molding powders), granules, flakes and similar bulk forms.[259] The manufacturing of plastic products falls under the NACE code 22.2.

When setting the criteria for activity 22.2, for the purpose of objective 4 under Article 5 of the *Regulation on the establishment of a framework to facilitate sustainable investment] (24.5.2018, COM(2018) 353 final, 2018/0178 (COD)* [260]*,* the pursuing of which can also positively contribute to objective 1, it is recommended that the criteria for activity 22.2 take into account the criteria established for activity 20.16.

It follows that the criteria for activity 22.2 should aim to promote:

- the manufacture of plastic products which are substantially based on recycled plastics in line with the EU strategy for plastics,[261] to minimize the production of virgin plastics, and

the manufacture of plastic products which are based on plastics in primary form, which are wholly or partially derived from renewable feedstock.

Do no significant harm assessment

The main potential significant harm to the environment from the production of plastics in primary form is associated with:

- polluting emissions to air and water from the production process;
- vulnerable ecosystems might be damaged by the construction and/or operation of the production facilities;
- the use of water resources for production purposes (e.g. cooling water) in water stressed areas); and
- the generation of hazardous wastes.

[257] https://etendering.ted.europa.eu/cft/cft-documents.html?cftId=4096

[258] https://ec.europa.eu/jrc/en/science-update/future-bio-based-chemicals-eu-bioeconomy
https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy

[259] https://www.gov.uk/guidance/classifying-plastics

[260] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018PC0353

[261] http://ec.europa.eu/environment/waste/plastic_waste.htm

The production of polymers includes a lot of synthesis, hence, in order to allow a clear demarcation and in order to NOT go beyond the limits of this sector 20.16 it has to be acknowledged that precursors are covered under C.20.11, C.20.13, C.20.14; C.20.15.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For operations situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented.
(4) Circular Economy	Wastes and by-products, especially hazardous wastes, are managed in line with the BREF for Waste Treatment[262]. A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent).
(5) Pollution	Ensure polluting emissions to air, soil and water are within BAT-AEL ranges as set out in BREF POL (Polymers)[263].
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks) – whichever is stricter - in the case of sites/operations in non-EU countries) for the

[262] Best Available Techniques (BAT) Reference Document for Waste Treatment available at http://eippcb.jrc.ec.europa.eu/reference/BREF/WT/JRC113018_WT_Bref.pdf

[263] The production of PVC is described in the Polymer (POL) BREF which was developed under the IPPC directive: http://eippcb.jrc.ec.europa.eu/reference/BREF/pol_bref_0807.pdf
Best available techniques are identified for PVC production on page v/vi and pages 266-268 of the POL BREF. Current consumption and emission levels are provided on page 101-104 of the POL BREF

	site/operation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage and Key Biodiversity Areas (KBAs), have been implemented. For sites/operations located in or near to biodiversity-sensitive areas (including the Natura 2000 network of protected areas as well as other protected areas), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Biodiversity Strategy (COM (2011) 244), the Birds (2009/147/EC) and Habitats (92/43/EEC) Directives (or other equivalent national provisions or international standards (e.g. IFC Performance Standard 6) – whichever is stricter - in case of sites/operations in non-EU countries) based on the conservation objectives of the protected area. For such sites/operations, ensure that: • a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; • all necessary mitigation measures are in place to reduce the impacts on species and habitats; and • a robust, appropriately designed and long-term biodiversity monitoring and evaluation programme exists and is implemented.

22. Electricity, gas, steam and air conditioning supply

Why electricity generation is included in the Taxonomy

Electricity generation is responsible for over a quarter of EU greenhouse gas emissions.[264] Ambitious emissions reductions in this sector are vital to decarbonisation. The Taxonomy work on electricity has attempted to recognise this finding with suitably ambitious requirements within a model of supporting a transition to the EU's emission reduction goals.

Subjects covered; criteria and thresholds

An overarching, technology-agnostic emissions threshold of 100g CO_2e / KWh is proposed for electricity generation. This threshold will be reduced every five years in line with a trajectory to net-zero CO2e in 2050.

For electricity generation we have generally required using an ISO 14044-compliant Life Cycle Emissions (LEC) analysis to prove eligibility – that is that the life cycle impacts for producing one KWh of electricity are below the declining threshold of 100gCO2e.

Some technologies, such as solar, wind and existing hydropower (in the EU), are exempt from the requirement for LCEs on the basis of the existing research base on the issue. Exemptions are subject to regular review in accordance with the declining threshold.

However, with electricity generation from natural gas, where the risk of fugitive emissions across the gas supply chain is seen as high, there is a requirement to provide a full life cycle assessment of fugitive emissions on ongoing basis. This assessment should include actual physical measurements, i.e. methane leakage measurements across gas extraction, transport and storage systems. Electricity generation from other gaseous fuels (such as hydrogen or renewable gases) would be eligible under the Taxonomy, subject to meeting the declining emissions threshold.

(Guidance around LCE methodologies, based on ISO 14025, ISO 14044 and ISO 14067, will be published in November 2019, along with final recommendations to the European Commission.)
For activities which go beyond 2050, it must be technically feasible to reach zero emissions. Implications include:

- Coal-fired power: unabated coal-fired power generation will not meet the required threshold. Coal-fired power with carbon capture and sequestration *may* qualify in the short-term, but new coal plants generally have lifetime of 40 years or longer. Under the requirement to reach zero emissions in 2050, coal with CCS would need to demonstrate that it will be able to do this.
- Natural gas-fired power: unabated natural gas-fired power generation is not expected to meet the required threshold. Gas-fired power with carbon capture and sequestration may qualify. However, this will be subject to the requirement that fugitive emissions across the gas supply chain need to be measured rather than estimated.

A further series of sector-specific thresholds have been articulated, which define the circumstances under which an energy sector activity provides a substantial contribution to climate change mitigation.

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[264] Greenhouse gas emissions by economic activity according to the NACE classification EU-28, 2016. Eurostat (env_ac_ainah_r2) https://ec.europa.eu/eurostat/statistics-explained/index.php/Climate_change_-_driving_forces#Total_emissions.2C_main_breakdowns_by_source_and_general_drivers.

The TEG has also developed criteria for other economic activities across the energy sector including:

- Transmission and distribution of electricity
- Storage of energy
- Retrofit of gas transmission and distribution networks
- The manufacture of biofuels and biogas
- The operation of district heating and cooling networks
- Installation and operation of heat pumps
- The cogeneration of heating/cooling and power
- The production of heating/cooling

Outlook

Energy criteria in the EU Taxonomy will require further refinement and development to ensure topicality and market coherence. This will encompass:

- Adjustments to thresholds: energy thresholds should be revisited regularly in order to reflect state of the art research and progress on decarbonisation efforts. Particularly, the emission threshold for electricity generation should be reduced every five years.
- Inclusion of new technologies: technological progress could allow for market entry in the near future. Technologies with a sufficiently high technology readiness level (TRL) could be added to the Taxonomy (e.g. nuclear fusion).
- Development of further metrics: as energy markets decarbonise and deployment patterns of certain technologies change, some activities (e.g. storage of electricity) might require the development of further metrics.
- TEG also recognises that the use of biomass for energy requires trade-off decisions relative to other potential uses and across mitigation activities, but also for do no significant harm dimensions. For these reasons, the TEG recognises that possible production and use of bioenergy will require further consideration as the Taxonomy is developed and based on technical feedback in the outreach period.

Market impact

The TEG has worked to adopt a technology-neutral approach that can ensure rapid decarbonisation within the electricity sector. Adherence to the declining emissions intensity threshold is technically feasible for virtually any energy generation technology. However, it does imply that unabated fossil fuel combustion, namely coal and natural gas, will be ineligible under the Taxonomy.

Next steps and recommendations

The TEG recognizes that the scope of the Taxonomy could be extended to cover more sectors. Care must continue to be taken to review the context in which the Taxonomy is applied to ensure that the Taxonomy does not identify activities as sustainable which have perverse incentives or a negative impact on other environmental objectives.

From an energy production perspective, the TEG recommends that the future platform consider revising downwards the emissions intensity threshold in line with a net-zero economy.

TEG deliberations on nuclear energy

The TEG assessed nuclear energy as part of its review on energy generation activities. Nuclear energy generation has near to zero greenhouse gas emissions in the energy generation phase and can be a contributor to climate mitigation objectives. Consideration of nuclear energy by the TEG from a climate mitigation perspective was therefore warranted.

The proposed Taxonomy regulation and thus TEG's methodology for including activities in the Taxonomy explicitly includes two equally important aspects, Substantial Contribution to one environmental objective and Do No Significant Harm (DNSH) to the other environmental objectives. In making its recommendations, the TEG used evidence and expert opinion from others, but ultimately was mandated to make recommendations about the inclusion of economic activities and screening criteria in the Taxonomy.

Evidence on the potential substantial contribution of nuclear energy to climate mitigation objectives was extensive and clear. The potential role of nuclear energy in low carbon energy supply is well documented[265],[266].

On potential significant harm to other environmental objectives, including circular economy and waste management, biodiversity, water systems and pollution, the evidence about nuclear energy is complex and more difficult to evaluate in a taxonomy context. Evidence often addresses different aspects of the risks and management practices associated with nuclear energy. Scientific, peer-reviewed evidence of the risk of significant harm to pollution and biodiversity objectives arising from the nuclear value chain was received and considered by the TEG [267],[268],[269] . Evidence regarding advanced risk management procedures and regulations to limit harm to environmental objectives was also received. This included evidence of multiple engineered safeguards, designed to reduce the risks. Despite this evidence, there are still empirical data gaps on key DNSH issues.

For example, regarding the long-term management of High-Level Waste (HLW), there is an international consensus that a safe, long-term technical solution is needed to solve the present unsustainable situation. A combination of temporary storage plus permanent disposal in geological formation is the most promising, with some countries are leading the way in implementing those solutions. Yet nowhere in the world has a viable, safe and long-term underground repository been established[270],[271]. It was therefore

265 IPCC, 2014: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA;

266 International Atomic Energy Agency, Climate Change and Nuclear Power 2018, IAEA, Vienna (2018);

267 NEA Issue Brief: An analysis of principal nuclear issues No. 3, January 1989. The disposal of high-level radioactive waste. https://www.oecd-nea.org/brief/brief-03.html , more recently: Preservation of Records, Knowledge and Memory (RK&M) Across Generations: Developing a Key Information File for a Radioactive Waste Repository, OECD 2019 NEA No. 7377;

268 Verbruggen A., Laes, E. Lemmens, S., Assessment of the actual sustainability of nuclear fission power, renewable and Sustainable Energy Reviews 32(2014)16–28;

269 Tierney Kieran M., Graham K.P. Muira, Gordon T. Cook, Johanna J. Heymans, Gillian MacKinnona, John A. Howeb, Sheng Xua, Andrew Brownlowc, Nicholas J. Davisonc, Mariel ten Doeschatec, Rob Deavilled, Nuclear reprocessing-related radiocarbon (14C) uptake into UK marine mammals, Marine Pollution Bulletin 124 (2017) 43–50;

270 World Nuclear Waste Report (WNWR), Focus Europe, 7 December 2018, available on: https://rebecca-harms.de/files/1/4/14p1u61xrvc0/attc_RiBS6hfU8CMhUiD1.pdf;

271 Blue Ribbon Commission (BRC) on America's Nuclear Future, Report to the Secretary of Energy, January 2012.

infeasible for the TEG to undertake a robust DNSH assessment as no permanent, operational disposal site for HLW exists yet from which long-term empirical, in-situ data and evidence to inform such an evaluation for nuclear energy.

Given these limitations, it was not possible for TEG, nor its members, to conclude that the nuclear energy value chain does not cause significant harm to other environmental objectives on the time scales in question. The TEG has not therefore recommended the inclusion of nuclear energy in the Taxonomy at this stage. Further, the TEG recommends that more extensive technical work is undertaken on the DNSH aspects of nuclear energy in future and by a group with in-depth technical expertise on nuclear life cycle technologies and the existing and potential environmental impacts across all objectives.

22.1 Production of Electricity from Solar PV

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.1.1
Description	**Construction and operation of electricity generation facilities that produce electricity from Solar Photovoltaic**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold. However: • Solar PV is exempt from performing a LCE o This exemption is subject to regular review in accordance with the declining threshold
Threshold	**Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions Production of electricity from Solar PV is eligible. This is subject to regular review in accordance with the declining threshold.
Rationale	
An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the installation and operation of photovoltaic (PV) panels relate to: • The PV installation siting: impacts on ecosystems and biodiversity if built in a designated conservation area or other areas with important ecosystem and biodiversity value. • The impacts from the production and end-of-life management of the PV systems and its component/materials: potentially significant environmental impacts are associated with the sourcing/production of materials and components of PV systems (see '**Manufacture of Low Carbon Technologies'** for DNSH criteria)	

<table>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.

The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.

The economic activity must not adversely affect adaptation efforts of others. This means:
The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td>Ensure PV panels and associated components have been designed and manufactured for high durability, easy dismantling, refurbishment, and recycling (see ‘Manufacture of Renewable Energy Equipment’ for DNSH criteria).
Ensure the reparability of the solar photovoltaic (PV) installation or plant thanks to accessibility and exchangeability of the components, e.g. capacitors or boards in inverters, or the bypass diodes in the module junction boxes.
Ensure that field inspection and monitoring tools have been implemented to prevent the occurrence of system failures and for the early detection of faults.
Ensure modules and inverter components have been selected that have undergone accelerated life testing to demonstrate durability and low degradation for their expected lifespan in the field (e.g. 15 years for inverters, 25 years for modules)</td></tr>
<tr><td>(5) Pollution</td><td></td></tr>
<tr><td>(6) Ecosystems</td><td>PV installation (except rooftop PVs) must not be sited on protected natural areas, such as land designated as Natura 2000, or equivalent outside the EU as defined by UNESCO and / or the International Union for Conservation of Nature (IUCN) under the following categories:
Category Ia: Strict Nature Reserve
Category Ib: Wilderness Area
Category II: National Park
PV installation must not be sited on arable or greenfield land of recognised high biodiversity/eco-system value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List and / or the IUCN Red List.</td></tr>
</table>

22.2 Production of Electricity from Concentrated Solar Power

<table>
<tr><th colspan="2">Sector classification and activity</th></tr>
<tr><td>Macro-Sector</td><td>D - Electricity, Gas, Steam and Air Conditioning Supply</td></tr>
<tr><td>NACE Level</td><td>4</td></tr>
<tr><td>Code</td><td>D.35.1.1</td></tr>
<tr><td>Description</td><td>Construction and operation of electricity generation facilities that produce electricity from Concentrated Solar Power</td></tr>
<tr><th colspan="2">Mitigation criteria</th></tr>
<tr><td>Principle</td><td>Support a transition to a net-zero emissions economy
Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy
Ensure that economic activities meet best practice standards
Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target
Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds</td></tr>
<tr><td>Metric</td><td>Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold. However:
Concentrated Solar Power is exempt from performing a LCE
This exemption is subject to regular review in accordance with the declining threshold
Cogeneration of Heat and Power is covered under Construction and operation of a facility used for cogeneration of heat/cooling and Power threshold

Generation of heat/cool is covered under the Generation of heat/cool threshold</td></tr>
<tr><td>Threshold</td><td>Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.
This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory
Assets and activities must meet the threshold at the point in time when taxonomy approval is sought
For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Production of electricity from Concentrated Solar Power is eligible. This is subject to regular review in accordance with the declining threshold.</td></tr>
<tr><th colspan="2">Rationale</th></tr>
<tr><td colspan="2">An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.</td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">The main potential significant harm to other environmental objectives from CSP is associated with:
the construction of the installation and the substantial land-take associated with the installation
impacts to birdlife from the high temperatures generated by the plant</td></tr>
</table>

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For CSP technologies that require water and are located in water stressed areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other analogous national provisions or international standards – whichever is stricter - in the case of sites/operations in non-EU countries)done to recognised standards, has been completed for the CSP and the area of inundation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.3 Production of Electricity from Wind Power

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.1.1
Description	**Construction and operation of electricity generation facilities that produce electricity from Wind Power**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold. However: • Wind Power is exempt from performing a LCE o This exemption is subject to regular review in accordance with the declining threshold
Threshold	**Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.	
Do no significant harm assessment	
In spite of the crucial contribution of wind energy to mitigating climate change, there may be conflicts arising between its deployment and nature conservation at a local level. The main environmental exposures to be considered as a Do No Significant Harm (DNSH) criteria, in the most stringent sense, include: • Underwater noise created in the installation of bottom-fixed offshore wind turbines; • The composite waste generated from both on- and offshore wind turbine blades at the end of their lifetime; • The pollution that could result from maintenance activities by using fossil fuels for transportation (marine and road transport) • The possible disturbance, displacement or collision of birds and bats by the construction and operation of wind farms	

The possible visual impacts created by landscape change in the installation of wind turbines[272].	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Consider and minimise underwater noise generated in the construction phase during the installation of bottom-fixed offshore wind turbine foundations which may have impact on mammal species in the area. Thresholds: Comply with national threshold for underwater noise. Apply relevant mitigation measures to be decided on a case by case basis.
(4) Circular Economy	Consider and minimise the amount of composite waste from wind turbine blades at their end of life (carbon and glass fibers). Metric: % recyclable materials of wind turbines at the end of their life.
(5) Pollution	
(6) Ecosystems	Consider and minimise the following impacts - Collision risk of birds and bats with wind turbines rotor blades or associated infrastructures such as overhead cables; - Disturbance & displacement effects of birds that may result in habitat loss or degradation. - Visual impacts – as part of the EIA a visualisation of the impact of the wind farm on the landscape is prepared for projects planned within a range visible from the coast or visible to nearby communities (e.g. by computer simulation or photomontage).

[272] Selected references:

- Directive 2011/92/EU as amended
- Council Directive 92/43/EEC
- Directive 2009/147/EC
- Guidance Document: "Wind energy developments and Natura 2000" : http://ec.europa.eu/environment/nature/natura2000/management/docs/Wind_farms.pdf

	Metrics - Ensure that an Environmental Impact Assessment (EIA), done to recognised standards (e.g.EIA Directive 2011/92/EU), has been completed - Follow the procedure for Appropriate Assessment as laid down in the Directive 2009/147/EC "Birds Directive" and Council Directive 92/43/EEC known as the Habitats Directive.

22.4 Production of Electricity from Ocean Energy

<table>
<tr><th colspan="2">Sector classification and activity</th></tr>
<tr><td>Macro-Sector</td><td>D - Electricity, Gas, Steam and Air Conditioning Supply</td></tr>
<tr><td>NACE Level</td><td>4</td></tr>
<tr><td>Code</td><td>D.35.1.1</td></tr>
<tr><td>Description</td><td>Construction and operation of electricity generation facilities that produce electricity from Ocean Energy</td></tr>
<tr><th colspan="2">Mitigation criteria</th></tr>
<tr><td>Principle</td><td>• Support a transition to a net-zero emissions economy
• Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy
• Ensure that economic activities meet best practice standards
• Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target
• Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds</td></tr>
<tr><td>Metric</td><td>Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold. However:
• Ocean Energy is exempt from performing a LCE
    o This exemption is subject to regular review in accordance with the declining threshold

Combined Heat and Power is covered under Construction and operation of a facility used for cogeneration of heat/cooling and Power threshold</td></tr>
<tr><td>Threshold</td><td>Facilities operating at life cycle emissions lower than 100gCO$_2$e/kWh, declining to 0gCO$_2$e/kWh by 2050, are eligible.
• This threshold will be reduced every 5 years in line with a net-zero CO$_2$e in 2050 trajectory
• Assets and activities must meet the threshold at the point in time when taxonomy approval is sought
• For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions</td></tr>
<tr><th colspan="2">Rationale</th></tr>
<tr><td colspan="2">An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.</td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">The main potential significant harm to other environmental objectives from ocean energy is associated with:
- Construction, deployment, operation and maintenance of ocean energy installations can impact on marine ecosystems and biodiversity
- Pollution from lubricants and anti-fouling paints and emissions from maintenance and inspection vessels</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.</td></tr>
</table>

<table>
<tr><td></td><td>The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td>Measures in place to minimise toxicity of anti-fouling paint and biocides as regulated in the Biocidal Products Regulation: (EU) 528/2012 ,which implements (in the EU) the International Convention on the Control of Harmful Anti-fouling Systems on Ships, which was adopted on 5 October 2001</td></tr>
<tr><td>(6) Ecosystems</td><td>Ensure an Environmental Impact Assessment (EIA) has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other analogous national provisions or international standards – whichever is stricter - in the case of sites/operations in non-EU countries) and all measures are implemented to identify, evaluate, and mitigate any potential negative impacts on the marine environment and marine life.
For projects in protected sites, UNESCO World Heritage and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).</td></tr>
</table>

22.5 Production of Electricity from Hydropower

<table>
<tr><th colspan="2">Sector classification and activity</th></tr>
<tr><td>Macro-Sector</td><td>D - Electricity, Gas, Steam and Air Conditioning Supply</td></tr>
<tr><td>NACE Level</td><td>4</td></tr>
<tr><td>Code</td><td>D.35.1.1</td></tr>
<tr><td>Description</td><td>Construction and operation of electricity generation facilities that produce electricity from Hydropower</td></tr>
<tr><th colspan="2">Mitigation criteria</th></tr>
<tr><td>Principle</td><td>• Support a transition to a net-zero emissions economy
• Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy
• Ensure that economic activities meet best practice standards
• Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target
• Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds</td></tr>
<tr><td>Metric</td><td>Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold.

A full LCE shall be applied, using project specific-data where relevant, and shall be subjected to review, however:
• Existing hydropower facilities within the EU are exempt from performing a LCE
    o This exemption is subject to regular review in accordance with the declining threshold

Investments which improve the capacity of a hydropower facility, without enlarging any reservoirs are eligible</td></tr>
<tr><td>Threshold</td><td>Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.
• This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory
• Assets and activities must meet the threshold at the point in time when taxonomy approval is sought
• For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions</td></tr>
<tr><th colspan="2">Rationale</th></tr>
<tr><td colspan="2">An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.</td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">The main environmental impacts associated with hydropower installations are:
- Emissions to water and generation of waste during construction;
- Impacts on biodiversity associated with habitat destruction, changes to hydrological and hydrogeological regimes, water chemistry, and interference with species migration pathways as a result of the establishment of the installation and its operation;</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.</td></tr>
</table>

	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Construction Phase impacts: Ensure that the river catchment assessment (conducted in consultation with local stakeholders), in accordance with EU Water Directive[1], shows no significant adverse impacts on upstream and downstream quantitative and qualitative water resources and uses. Implementation of catchment management plan (with relevant stakeholders) to minimise and mitigate impacts identified in the assessment. General impacts: Operation of the hydro power plant must adhere to the principles of the UNECE Convention on the Protection and Use of Transboundary, Watercourses and International Lakes
(4) Circular Economy	Minimise construction-related waste and ensure appropriate recycling/treatment for waste generated. Thresholds applied should be those indicated in regulations such as European Directives 2018/850, 2018/851, 2018/852
(5) Pollution	Maintain the quality of the waters at baseline concentrations and to a quality that protects and supports fish life, aquatic habitats and recreational uses. Parameters and acceptable limits/ranges and necessary sampling and measuring frequency are contained in EU Directive 2006/44/EC and should be observed. These address the Quality of Freshwaters needing Protection or Improvement in order to support fish life and relevant parameters contained in the WFD[273] surface water chemical monitoring and chemical monitoring of sediment and biota
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other analogous national provisions or international standards – whichever is stricter - in the case of sites/operations in non-EU countries), has been completed for the hydro electricity production and the area of inundation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including

[273] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

	protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018). No risk of invasive and non-native species introduction is demonstrated.

22.6 Production of Electricity from Geothermal

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.1.1
Description	**Construction and operation of electricity generation facilities that produce electricity from Geothermal**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold A full LCE shall be applied, using project specific-data where relevant, and shall be subjected to review, however: • Existing Geothermal facilities within the EU are exempt from performing a LCE o This exemption is subject to regular review in accordance with the declining threshold Combined Heat and Power is covered under Construction and operation of a facility used for cogeneration of heat/cooling and Power threshold
Threshold	**Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from Production of electric energy from high-enthalpy geothermal system is associated with: • Non-condensable geothermal gases with specific environmental threats, such as H_2S, CO_2, and CH_4, are often released from flash-steam and dry-steam power plants. Binary plants ideally represent closed systems and no steam is emitted. • Possible emissions to surface and underground water	

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[274] Thermal anomalies associated with the discharge of waste heat should not exceed 3°K for groundwater environments or 1.5°K for surface water environments, respectively.
(4) Circular Economy	
(5) Pollution	Discharges to water bodies should comply with individual license conditions for specific operations, where applicable, and/or national threshold values in line with the EU regulatory framework (e.g., EU Water Framework Directive[1] and Daughter Directives); Emissions to groundwater environments shall be below: 7.5 ug/l As, 7.5 ug/l Pb, 75 ug/l Zn, 150 ug/l Al, 750 ug/l B, 3.75 ug/l Cd, 700 ug/l Ba, 5ug/l Sb, 200 ug/l Fe and for surface water environments to 20 ug/l As, 40 ug/l Zn, 7.2 ug/l Pb.

[274] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

	Emissions to air: the operations of high-enthalpy geothermal energy systems should ensure that adequate abatement systems are in place to comply with existing EU Air Quality Legislation and BAT[275]; including but not limited to <1 μg/Nm³ Hg;
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for Production of electric energy from high-enthalpy geothermal system and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

[275] JRC. Best Available Techniques (BAT) Reference Document for Large Combustion Plants. JRC107769 / EUR 28836 EN. ISBN 978-92-79-74303-0. 2017

22.7 Production of Electricity from Gas Combustion

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.1.1
Description	**Construction and operation of electricity generation facilities that produce electricity from Gas Combustion (not exclusive to natural gas)**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Any electricity generation technology can be included in the taxonomy if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of electricity are below the declining threshold A full LCE shall be applied, using project specific-data where relevant, and shall be subjected to review Combined Heat and Power is covered under Construction and operation of a facility used for cogeneration of heat/cooling and Power threshold
Threshold	**Facilities operating at life cycle emissions lower than 100gCO_2e/kWh, declining to 0gCO_2e/kWh by 2050, are eligible.** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050.	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and recycling criteria, the NOx and CO emissions control in line with BREF indicators and the avoidance of direct impacts on sensitive ecosystems, species or habitats.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[276] and Bathing Waters Directive [277]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[278]
(5) Pollution	Ensure emissions to *air* of NOx and CO and emission to *water* are within the BATAEL ranges set in the BREF for the Large Combustion Plants[1] and Medium Combustions Plants Directive[279].
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from gas turbine and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

[276] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[277] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[278] Thierry Lecomte, José Félix Ferrería de la Fuente, Frederik Neuwahl, Michele Canova, Antoine Pinasseau, Ivan Jankov, Thomas Brinkmann, Serge Roudier, Luis Delgado Sancho; Best Available Techniques (BAT) Reference Document for Large Combustion Plants; EUR 28836 EN; doi:10.2760/949 http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

[279] Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plants

22.8 Production of Electricity from Bioenergy

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.1.1
Description	**Construction and operation of electricity generation facilities that produce electricity from Bioenergy**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Production of electricity from biofuels shall be assessed in relation to the relative fossil fuel comparator set out in RED II. This is applicable to feedstock where a minor share is bio-waste and sewage sludge (combined), (otherwise, see corresponding activities on Anaerobic Digestion of bio-waste and sewage sludge treatment).
Threshold	**Facilities operating at less than 85% of GHG emissions in relation to the relative fossil fuel comparator set out in RED II increasing to 100% by 2050, are eligible** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions Biofuels used in electricity production must be eligible under “Manufacture of Biomass, Biogas or Biofuels”.
Rationale	
An over-arching, technology-agnostic emissions threshold of 100g CO2e / KWh is proposed for the electricity generation. This threshold will be reduced every 5 years in line with a trajectory to net-zero CO2e in 2050. A GHG emission reduction of 85% in relation to the relative fossil fuel comparator set out in RED II is roughly equivalent to the 100g CO2e / KWh threshold.	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and recycling criteria, the SO2, NOx dust and other emissions control in line with BREF/ Medium Combustions Plants Directive and the avoidance of direct impacts on sensitive ecosystems, species or habitats.	

Intelligent pathways for cascading use are environmentally superior and preferable to single use.[280]. For biomass feedstocks refer to Forestry Criteria and/or Crop criteria.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[281] and Bathing Waters Directive [282]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[283]. These requirements apply for installations with a total rated thermal input of 50 MW or more. Promote the establishment of closed waste cycles.
(5) Pollution	Do not transport feedstocks over long distances. Thresholds: Limit the emissions to values within the ranges given in the newest version of the following documents depending on the size of the installation: o BREF document on Large Combustion Plants [2], chapter 10.2.2 (BAT conclusions for the combustion of solid biomass and/or peat; SO2, NOx, dust, CO, Mercury, HCl, HF thresholds). These thresholds apply for

[280] UBA (2017) Fehrenbach, et. al. BIOMASS CASCADES Increasing resource efficiency by cascading use of biomass — from theory to practice, TEXTE 53/2017, https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-06-13_texte_53-2017_biokaskaden_summary.pdf

[281] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[282] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[283] http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

	installations with a total rated thermal input of 50 MW or more, only when this activity takes place in combustion plants with a total rated thermal input of 50 MW or more. For the purpose of calculating the total rated thermal input of a combination of combustion plants referred to in paragraphs 1and 2, individual combustion plants with a rated thermal input below 15 MW shall not be considered. o Medium Combustions Plants Directive [3]. These thresholds apply for combustion plants with a rated thermal input equal to or greater than 1 MW and less than 50 MW (‘medium combustion plants’), and for a combination formed by new medium combustion plants pursuant to Article 4 of this directive, including a combination where the total rated thermal input is equal to or greater than 50 MW, unless the combination forms a combustion plant covered the BREF document on Large Combustion Plants (see above). The following thresholds apply: o In general: of Annex II ($SO2$, NOx and dust thresholds) o For plants in zones or parts of zones not complying with the air quality limit values laid down in EU Directive 2008/50/EC[284]: Recommended values which are to be published by the European Commission (DG ENV) pursuant to Article 6, paragraph 10. Metrics: Emissions in mg/Nm³ (for biomass in large combustion plants: SO2, NOx, dust, CO, Mercury, HCl, HF; for biomass and for liquid biofuels in medium combustion plants: SO2, NOx, dust, for biogas in medium combustion plants: SO2, NOx)
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from biomass and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

[284] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02008L0050-20150918

22.9 Transmission and Distribution of Electricity

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.12, D.35.13
Description	Construction and operation of transmission lines that transport the electricity on the extra high-voltage and high-voltage interconnected system with a view to its delivery to final customers or to distributors Construction and operation of distribution systems that transport electricity on high-voltage, medium-voltage and low-voltage distribution systems with a view to its delivery to customers
Mitigation criteria	
Principle	• Support the integration of renewable energy into the power grid • Lead to significant GHG emissions reductions, from fuel switching or merit order optimisation, as a direct result of the investment • Decreases direct emissions from T&D infrastructure

Metric	**All transmission and distribution infrastructure in systems which are on a trajectory to full decarbonisation are eligible, except for infrastructure that:**
	• Is dedicated to directly connecting, or expanding existing direct connection to production plants that are more CO_2 intensive than 100 gCO_2e/kWh measured on a LCE basis
	
	The following T&D grid infrastructure-related activities are eligible, irrespective of whether the system is on a pathway to full decarbonisation:
	• Direct connection of low carbon electricity generation below the threshold of 100 gCO_2e/kWh declining to 0g CO_2e/kWh in 2050 measured on a LCE basis
	• EV charging stations and electric infrastructure for public transport
	• Installation of T&D transformers that comply with the Tier 2 (2021) requirements from Regulation 548/2014 on the ecodesign of small, medium and large power transformers and, for medium power transformers 50 Hz with highest voltage for equipment not exceeding 36 kV, with AAA0 level requirements on no-load losses set out in standard EN 50588-1.
	• Equipment where the main objective is an increase of the generation or use of renewable electricity generation
	• Equipment to increase the controllability and observability of the electrical power system and enable the development and integration of renewable energy sources, this includes:
	  o Sensors and measurement tools (including meteorological sensors for forecasting renewable production)
	  o Communication and control (including advanced software and control rooms, automation of substations or feeders, and voltage control capabilities to adapt to more decentralised renewable infeed)
	• Equipment to carry information to users for remotely acting on consumption
	• Equipment to allow for exchange of renewable electricity between users

Threshold	Covered under Metric.

Rationale	
Increasing access to electricity throughout Europe will support its decarbonisation by enabling more consumers to transition from carbon-intensive energy supply, while increasing the utilisation of renewable energy. As Europe continues to fulfil its decarbonisation objectives, there will be fewer and fewer investments in transmission and distribution which are not climate aligned. Under this logic, we propose that virtually all investments in electricity transmission and distribution infrastructure should be considered climate-aligned under the EU Taxonomy. This includes investments to electric grid infrastructure which improve the overall systems architecture. Naturally, there are a variety of exceptions to this rule and this is reflected within the criteria. Additional Notes: • A system is deemed to be on a trajectory to full decarbonisation if the weighted emissions factor of incremental new generation in the system is below the threshold value of 100 gCO_2e/kWh, on a five-year rolling average basis • For investments covering multiple systems, the generation-weighted average emissions across all concerned systems are used • A direct connection or expansion of an existing direct connection to production plants includes infrastructure that is indispensable to carry the associated electricity from the power generating facility to the network • A connection or connection expansion for new load is eligible only if it allows Demand Side Management	
Do no significant harm assessment	
The impacts of transmission and distribution lines are a function of the spatial alignment of the grid, the structures and conductors required for various voltages, the extent to which pre-existing corridors are used, and how the transmission and distribution lines are operated and maintained. The most common environmental impacts of transmission and distribution of electricity lines are associated with ecosystems and land use, thus are most closely associated with protection of healthy ecosystems. In the cases of underground offshore electricity lines, water and marine resources may be impacted.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.

(3) Water	Underground power lines: Avoid routings with heavy impact on marine and terrestrial ecosystems (proven by an ESIA) and follow the principles of IFC General EHS Guidelines for construction site activities follow.
(4) Circular Economy	Avoid breaking current or future Circular Economy strategies and regulations during construction, operation and decommission phases of electricity transmission assets. • Qualitative requirements: • Implement eco-design strategies. Minimize waste generation.
(5) Pollution	Overground high voltage lines: • For construction site activities follow the principles of IFC General EHS Guideline. Do not use PCBs Polyclorinated Biphenyls.
(6) Ecosystems	Ensure an Environmental Impact Assessment, done to recognized standards and appropriate requirements has been completed for the transmission or distribution line and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, ensure that a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018) Underground power lines: Avoid routings with heavy impact on marine and terrestrial ecosystems (proven by an ESIA), UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), and follow the principles of IFC General EHS Guidelines for construction site activities.

22.10 Storage of Energy

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	
Code	No NACE Code
Description	**Construction and operation** of facilities that store electricity and/or renewable energy, and return it at a later time, in the form of electricity or other energy vectors • This does not include Demand Side Management (load shedding and load shifting)
Mitigation criteria	
Principle	• Power grid stabilisation: making best use of excess renewable energy • The effective utilisation of peak generation renewable energy
Metric	**All investments in electricity storage are eligible under the Taxonomy, except:** • Any storage technology which uses hydrocarbons as a medium of storage is not eligible under the Taxonomy. **Hydrogen:** • Infrastructure to store taxonomy-eligible hydrogen (see Manufacture of hydrogen (CPA: 20.11.11.50)) is included
Threshold	
Rationale	
Electricity storage can support the integration of renewable energy systems into electricity transmission and distribution. It can balance centralized and distributed electricity generation, while also contributing to energy security. It will supplement demand response and flexible generation, and complement grid development. It can also contribute to the decarbonisation of other economic sectors and support the integration of higher shares of variable renewable energy (variable RES) in transport, buildings, or industry. At current levels of storage capacity available in European markets, all additional storage capacity should be beneficial to the EU climate change mitigation objectives.	
Do no significant harm assessment	
The energy storage activities differ considerably in their physical, chemical and biological bases and forms, which result in divergent environmental impacts in each case.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.

	A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	Avoid breaking current or future Circular Economy strategies and regulations during construction, operation and decommission phases of electricity transmission assets. **Qualitative requirements:** • Implement eco-design strategies. • Minimize waste generation.
(5) Pollution	
(6) Ecosystems	Ensure an Environmental Impact Assessment, done to recognized standards and appropriate requirements has been completed for the transmission or distribution line and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).
• European Directive 2018/849 on end-of-life vehicles, batteries and accumulators and waste batteries and accumulators, and waste electrical and electronic equipment. • Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators • European Directive 2018/850 on landfill of waste. • European Directive 2018/851 on waste. European Directive 2018/852 on packaging and packaging waste	

22.11 Manufacture of Biomass, Biogas or Biofuels

Sector classification and activity	
Macro-Sector	Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.21
Description	Manufacture of Biomass, Biogas or Biofuels
Mitigation criteria	
Principle	• • Reduce the risk of indirect land use impact (iLUC) • Manufacture of all biomass, biogas or bio-fuels should deliver robust climate benefits compared to fossil fuels
Metric	
Threshold	Production of biomass, biogas and biofuels is eligible if produced from the advanced bioenergy feedstock listed in Annex IX of Directive (EU) 2018/2001. Only production of advanced biofuels as per Art2(34), and certified low-ILUC fuels, in line with the requirements of RED II, is eligible. If primary forest-related feedstock (item (o) of Annex IX, Part A of Directive (EU) 2018/2001) is used, it must be produced in economic activities fulfilling the Afforestation & Reforestation, and/or Rehabilitation & Existing Forest Management criteria. If crop feedstock is used, it must be produced in economic activities fulfilling the Growing of Perennial Crops or the Growing of Non-perennial Crops criteria.
Rationale	
The manufacture of Biomass, Biogas and Biofuel has the potential to be a key mitigation technology but, if done poorly, can have no net positive impact or even a negative impact. The manufacture of biomass, biogas and biofuels can have adverse environmental impacts. Thus, the eligibility criteria are based on existing EU regulation but seek to advance the agenda by setting a higher threshold on the required GHG emissions savings outlined in RED II.	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfilment of the applicable waste and recycling criteria, and the avoidance of direct impacts on sensitive ecosystems, species or habitats. For biomass feedstocks refer to Forestry Criteria and/or Crop criteria.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:

	• considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[285] and Bathing Waters Directive [286]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented. Criteria on the potential water impacts of the feedstock to be developed.
(4) Circular Economy	For biogas production: The resulting digestate meets the requirements for fertilising materials in Proposed Regulation COM (2016) 157 or national rules on fertilisers/soil improvers for agricultural use. For other types of bioenergy: criteria to be developed.
(5) Pollution	• For biogas production: apply a gas-tight cover on the digestate storage. For other types of bioenergy: criteria to be developed.
(6) Ecosystems	Production of biomass, biogas and biofuels using primary forest-related feedstock (item (o) of Annex IX, Part A of Directive (EU) 2018/2001) must use feedstock that was produced fulfilling the DNSH criteria given under the Afforestation & Reforestation, and/or Rehabilitation & Existing Forest Management activities. Production of biomass, biogas and biofuels using crop feedstock must use feedstock that was produced fulfilling the DNSH criteria given under the Growing of Perennial Crops or Growing of Non-perennial Crops activities. Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the plant producing biomass, biogas and liquid biofuels (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an

[285] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[286] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

	appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.12 Retrofit of Gas Transmission and Distribution Networks

Sector classification and activity	
Macro-Sector	Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D35.21 H49.50
Description	Retrofit of gas networks for the distribution of gaseous fuels through a system of mains. Retrofit of gas networks for long-distance transportation of gases by pipelines
Mitigation criteria	
Principle	Significant GHG emissions reductions by reducing leakage and increasing the volume of hydrogen and other low-carbon gases used in the gas system
Metric	**Retrofit of gas transmission and distribution networks whose main purpose is the integration of hydrogen and other low-carbon gases is eligible:** • Any gas transmission or distribution network investment which enables the network to increase the blend of hydrogen in the gas system is eligible • The repair of existing gas pipelines for the reduction of methane leakage is eligible if the pipelines are hydrogen-ready Retrofit of gas networks whose main purpose is the integration of captured CO_2 is eligible, if the operation of the pipeline meets the criteria outlined for the transportation of captured CO_2 Gas network expansion is not eligible
Threshold	
Rationale	
Electrification of the energy sector will not be sufficient to fulfil the EU's net-zero by 2050 target. Molecule-based energy will continue to have a role to play in the future energy supply. This is particularly pertinent to supporting the uptake of hydrogen, the simplest of elements but one with an enormous capacity to decarbonise the electricity, transport and manufacturing sectors.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from retrofit and operation of existing gas distribution and supply networks that allow for the use of hydrogen system is associated with: • Construction phase of the network: all aspects have to be considered that are usually connected with construction like terrestrial habitat alteration, loss of valuable ecosystems, land consumption, overburden disposal, negative impacts on biodiversity, emissions of particles and NOx, noise and hazardous materials. For larger projects an ESIA should be done. Operation phase: Leakages should be kept at a minimum. Underground networks can have an impact on ground water systems and on local ecosystems.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	The activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[287] A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent). For construction site activities follow the principles of IFC General EHS Guideline.
(4) Circular Economy	Ensure appropriate measures are in place to minimize and manage waste and material use in construction and decommission phases. Thresholds applied should be those indicated in regulations such as European Directives 2018/850, 2018/851, 2018/852 and BREF document[288]
(5) Pollution	A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent); Fans, compressors, pumps, whatever kind of equipment is covered by Ecodesign and used should be as efficient as possible to reduce emissions in the generation of the required electricity.
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for retrofit and operation of existing gas distribution and supply networks that allow for the use of hydrogen system and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs) ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with

[287] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[288] Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage July 2006

	the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018). The routing should be as short as possible and not pass through vulnerable local ecosystems.

22.13 District Heating/Cooling Distribution

Sector classification and activity	
Macro-Sector	Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	District Heating/Cooling Distribution
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards, including use of best available climate-friendly refrigerant • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	**Construction and operation of pipelines and associated infrastructure for distributing heating and cooling is eligible**, if the system meets the definition of efficient district heat/cool systems in the EU Energy Efficiency Directive.
Threshold	The EU Energy Efficiency Directive defines "efficient district heating and cooling" as a district heating or cooling system using at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat.
Rationale	
Providing energy services in a low-carbon manner, particularly for heating and cooling distribution will require investments in newer and more efficient delivery models. The Taxonomy criteria on District Heating and Cooling Networks provide guidance that seeks to foster the market as a whole and ultimately lower the emissions intensity of the energy services that society needs.	
Do no significant harm assessment	
Key environmental aspects to be considered for the investments in Distribution of District Level Heating and Cooling are summarised as follow: For the **construction** of the mains, the potential significant harms to the environmental objectives are constituted by the typical potential harms connected to construction of facilities in general. This includes *inter alia,* terrestrial habitat alteration, loss of valuable ecosystem, land consumption, overburden disposal, negative effects on biodiversity, emissions of particles and NOx, noise and hazardous materials. For the **operation** of the district heating networks, potential significant impacts are considered low. They relate mainly to the potential impact of underground district heating networks on drinking water/ground water systems and local ecosystems through corrosion products from corrosion of the distribution system elements and applied water additives that may be non-biodegradable[289].	

[289] Selected references for this analysis:

- IFC General EHS Guideline – Environment, April 30,2007
- IFC's Environmental and Social Performance Standards, 2012
- Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For the operation of the district heating and cooling networks consider the emissions of corrosion products due to the corrosion of the mains as well as applied water additives and heir reactants to water and marine resources. For construction site activities related to construction of the mains, ensure that the principles of IFC General EHS Guideline – Environment are followed.
(4) Circular Economy	Avoid that the construction, operation and decommission of the district heating system activities undermine the relevant Circular Economy, waste prevention and recycling strategies and regulations.
(5) Pollution	Consider the emissions of corrosion products due to corrosion of the distribution systems, bacteria, applied water additives and their reactants. Fans, compressors, pumps, whatever kind of equipment is covered by Ecodesign and used should be as efficient as possible to reduce emissions in the generation of the required electricity.
(6) Ecosystems	Follow the principles of IFC Performance Standard 6 Biodiversity. Ensure that the distribution system routing is as short as possible and does not pass through vulnerable local ecosystems including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs).

- Directive (EU) 2018/850 on landfill waste,
- Directive (EU) 2018/851 on waste,
- Directive (EU) 2018/851 on packaging and packaging waste

22.14 Installation and operation of Electric Heat Pumps

Sector classification and activity	
Macro-Sector	Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	Installation and operation of electric heat pumps
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Installation and operation of electric heat pumps is eligible, subject to GWP threshold and Seasonal Coefficient of Performance threshold
Threshold	• Refrigerant threshold: GWP <10 • Seasonal Coefficient of Performance threshold: above 3.33
Rationale	
Providing energy services in a low-carbon manner, particularly for heating and cooling distribution will require investments in newer and more efficient delivery models. Heat pumps are an energy efficient heating/cooling method. Heat pumps will play an important role in the European Union’s decarbonisation efforts. The Taxonomy criteria on the Installation and Operation of Heat Pumps, provide guidance that seeks to foster the market as a hole and ultimately lower the emissions intensity of the energy services that society needs. The Seasonal Coefficient of Performance (SCOP) is an average measurement showing the effectiveness of heat pumps on an annual basis. The SCOP threshold of 3.33 is consistently used as a benchmark throughout the Taxonomy.	
Do no significant harm assessment	
This assessment has not yet been completed for this activity.	
(2) Adaptation	
(3) Water	
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	

22.15 Cogeneration of Heat/cool and Power from Concentrated Solar Power

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.11 D.35.30
Description	Construction and operation of a facility used for cogeneration of heat/cooling and power from Concentrated Solar Power
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • If a CHP plant produces electricity and heat, it must apply a weighted heat and power threshold, based on the relative production of heat and power.
Metric	Any combined heat and power generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the facility is operating at less than the weighted cogeneration threshold. • Concentrated Solar Power is exempt from performing a LCE o This exemption is subject to regular review in accordance with the declining threshold Generation of Heat/cool is covered under the Generation of Heat/cool threshold
Threshold	All cogeneration of Heat/cool and Power from Concentrated Solar Power is eligible
Rationale	
Efficient and low-emissions cogeneration of heating/cooling and power will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th). Production of heat/cool using waste heat as defined by the EU Energy Efficiency Directive	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from CSP is associated with: • the construction of the installation and the substantial land-take associated with the installation • impacts to birdlife from the high temperatures generated by the plant	
(2) Adaptation	A1: Reducing material physical climate risks.

	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For CSP technologies that require water and are located in water stressed areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other analogous national provisions or international standards – whichever is stricter - in the case of sites/operations in non-EU countries)done to recognised standards, has been completed for the CSP and the area of inundation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.16 Cogeneration of Heat/cool and Power from Geothermal Energy

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.11 D.35.30
Description	Construction and operation of a facility used for Construction and operation of a facility used for cogeneration of heat/cooling and power from Geothermal Energy
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • If a CHP plant produces electricity and heat, it must apply a weighted heat and power threshold, based on the relative production of heat and power.
Metric	Any combined heat and power generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the facility is operating at less than the weighted cogeneration threshold.
Threshold	The Weighted Cogeneration Threshold is calculated from the relative production of heat and power, and based on the declining power generation threshold of 100 gCO_2e/kWh(e), and a notional heat threshold of 30 gCO_2e/kWh(th) • Weighted CHP Threshold: (30 * P(th) + 100 * P(e)) / (P(th)+ P(e)) CO_2e/kWh(th+e) This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory The threshold must be met at the point in time when taxonomy approval is sought for the first time For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
Efficient and low-emissions cogeneration of heating/cooling and power will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. Production of heat/cool using waste heat as defined by the EU Energy Efficiency Directive	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from Production of CHP from high-enthalpy geothermal system is associated with:	

• Non-condensable geothermal gases with specific environmental threats, such as H2S, CO2, and CH4, are often released from flash-steam and dry-steam power plants. Binary plants ideally represent closed systems and no steam is emitted. • Possible emissions to surface and underground water	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[290] Thermal anomalies associated with the discharge of waste heat should not exceed 3°K for groundwater environments or 1.5°K for surface water environments, respectively.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use
(5) Pollution	Discharges to water bodies should comply with individual license conditions for specific operations, where applicable, and/or national threshold values in line with the EU regulatory framework (e.g., EU Water Framework Directive[1] and Daughter Directives); Emissions to groundwater environments shall be below: 7.5 ug/l As, 7.5 ug/l Pb, 75 ug/l Zn, 150 ug/l Al, 750 ug/l B, 3.75 ug/l Cd, 700 ug/l Ba, 5ug/l Sb,

[290] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

	200 ug/l Fe and for surface water environments to 20 ug/l As, 40 ug/l Zn, 7.2 ug/l Pb. Emissions to air: the operations of high-enthalpy geothermal energy systems should ensure that adequate abatement systems are in place to comply with existing EU Air Quality Legislation and BAT[291]; including but not limited to <1 μg/Nm^3 Hg;
(6) Ecosystems	E Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for Production of CHP from high-enthalpy geothermal system and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

[291] JRC. Best Available Techniques (BAT) Reference Document for Large Combustion Plants. JRC107769 / EUR 28836 EN. ISBN 978-92-79-74303-0. 2017

22.17 Cogeneration of Heat/cool and Power from Gas Combustion

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.11 D.35.30
Description	Construction and operation of a facility used for cogeneration of heat/cooling and power from Gas Combustion (**not exclusive to natural gas)**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • If a CHP plant produces electricity and heat, it must apply a weighted heat and power threshold, based on the relative production of heat and power.
Metric	Any combined heat and power generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the facility is operating at less than the weighted cogeneration threshold.
Threshold	The Weighted Cogeneration Threshold is calculated from the relative production of heat and power, and based on the declining power generation threshold of 100 gCO_2e/kWh(e), and a notional heat threshold of 30 gCO_2e/kWh(th) • Weighted CHP Threshold: (30 * P(th) + 100 * P(e)) / (P(th)+ P(e)) CO_2e/kWh(th+e) This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory The threshold must be met at the point in time when taxonomy approval is sought for the first time For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
Efficient and low-emissions cogeneration of heating/cooling and power will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and	

recycling criteria, the NOx and CO emissions control in line with BREF indicators and the avoidance of direct impacts on sensitive ecosystems, species or habitats.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[292] and Bathing Waters Directive [293]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[294]
(5) Pollution	Ensure emissions to *air* of NOx and CO and emission to *water* are within the BATAEL ranges set in the BREF for the Large Combustion Plants[1] and Medium Combustions Plants Directive[295].
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from gas turbine and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been

[292] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[293] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[294] Thierry Lecomte, José Félix Ferrería de la Fuente, Frederik Neuwahl, Michele Canova, Antoine Pinasseau, Ivan Jankov, Thomas Brinkmann, Serge Roudier, Luis Delgado Sancho; Best Available Techniques (BAT) Reference Document for Large Combustion Plants; EUR 28836 EN; doi:10.2760/949 http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

[295] Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plants

	implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs) ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.18 Cogeneration of Heat/cool and Power from Bioenergy

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.11 D.35.30
Description	Construction and operation of a facility used for cogeneration of heat/cooling and power from Bioenergy
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • If a CHP plant produces electricity and heat, it must apply a weighted heat and power threshold, based on the relative production of heat and power.
Metric	Any combined heat and power generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the facility is operating at less than the weighted cogeneration threshold.
Threshold	The Weighted Cogeneration Threshold is calculated from the relative production of heat and power, and based on the declining power generation threshold of 100 gCO_2e/kWh(e), and a notional heat threshold of 30 gCO_2e/kWh(th) • Weighted CHP Threshold: (30 * P(th) + 100 * P(e)) / (P(th)+ P(e)) CO_2e/kWh(th+e) This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory The threshold must be met at the point in time when taxonomy approval is sought for the first time For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
Efficient and low-emissions cogeneration of heating/cooling and power will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and	

recycling criteria, the SO2, NOx dust and other emissions control in line with BREF/ Medium Combustions Plants Directive and the avoidance of direct impacts on sensitive ecosystems, species or habitats. Biomass-based electricity should be eligible only if produced through the following technologies: Biomass, Biogas or Biofuels. For biomass feedstocks refer to Forestry Criteria and/or Crop criteria.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[296] and Bathing Waters Directive [297]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[298]. These requirements apply for installations with a total rated thermal input of 50 MW or more. Promote the establishment of closed waste cycles.
(5) Pollution	Do not transport feedstocks over long distances. Thresholds: Limit the emissions to values within the ranges given in the newest version of the following documents depending on the size of the installation:

[296] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[297] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[298] http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

	o BREF document on Large Combustion Plants [2], chapter 10.2.2 (BAT conclusions for the combustion of solid biomass and/or peat; SO2, NOx, dust, CO, Mercury, HCl, HF thresholds). These thresholds apply for installations with a total rated thermal input of 50 MW or more, only when this activity takes place in combustion plants with a total rated thermal input of 50 MW or more. For the purpose of calculating the total rated thermal input of a combination of combustion plants referred to in paragraphs 1and 2, individual combustion plants with a rated thermal input below 15 MW shall not be considered. o Medium Combustions Plants Directive [3]. These thresholds apply for combustion plants with a rated thermal input equal to or greater than 1 MW and less than 50 MW ('medium combustion plants'), and for a combination formed by new medium combustion plants pursuant to Article 4 of this directive, including a combination where the total rated thermal input is equal to or greater than 50 MW, unless the combination forms a combustion plant covered the BREF document on Large Combustion Plants (see above). The following thresholds apply: o In general: of Annex II (SO2, NOx and dust thresholds) o For plants in zones or parts of zones not complying with the air quality limit values laid down in EU Directive 2008/50/EC[299]: Recommended values which are to be published by the EuropeanCommission (DG ENV) pursuant to Article 6, paragraph 10. Metrics: Emissions in mg/Nm³ (for biomass in large combustion plants: SO2, NOx, dust, CO, Mercury, HCl, HF; for biomass and for liquid biofuels in medium combustion plants: SO2, NOx, dust, for biogas in medium combustion plants: SO2, NOx)
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from biomass and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs) ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

[299] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02008L0050-20150918

22.19 Production of Heat/cool from Concentrated Solar Power

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	Production of Heat/cool from Concentrated Solar Power
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
Metric	Any heat/cool generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of heat/cool are below the declining threshold. Concentrated Solar Power is exempt from performing an LCE • This exemption is subject to regular review in accordance with the declining threshold Cogeneration of Heat and Power is covered under Construction and operation of a facility used for cogeneration of heat/cooling and Power threshold
Threshold	Production of Heat/cool from Concentrated Solar Power is always eligible. This is subject to regular review in accordance with the declining threshold
Rationale	
Efficient and low-emissions production of heating and cooling will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from CSP is associated with: • the construction of the installation and the substantial land-take associated with the installation • impacts to birdlife from the high temperatures generated by the plant	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and

	non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For CSP technologies that require water and are located in water stressed areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), has been completed in accordance with the EU Directives on Environmental Impact Assessment (2014/52/EU) and Strategic Environmental Assessment (2001/42/EC) (or other analogous national provisions or international standards – whichever is stricter - in the case of sites/operations in non-EU countries)done to recognised standards, has been completed for the CSP and the area of inundation (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.20 Production of Heat/cool from Geothermal

<table>
<tr><th colspan="2">Sector classification and activity</th></tr>
<tr><td>Macro-Sector</td><td>D - Electricity, Gas, Steam and Air Conditioning Supply</td></tr>
<tr><td>NACE Level</td><td>4</td></tr>
<tr><td>Code</td><td>D.35.30</td></tr>
<tr><td>Description</td><td>Production of heating and cooling from Geothermal Energy</td></tr>
<tr><th colspan="2">Mitigation criteria</th></tr>
<tr><td>Principle</td><td>• Support a transition to a net-zero emissions economy
• Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy
• Ensure that economic activities meet best practice standards
• Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target
• Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds
• Based on Electric Heat Pumps as best available technology to determine the threshold</td></tr>
<tr><td>Metric</td><td>Any heating or cooling generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of thermal energy are below the declining threshold</td></tr>
<tr><td>Threshold</td><td>Facilities operating at less than 30g CO_2e/kWh (th), declining to 0g CO_2e/kWh (th) by 2050, are eligible
• This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory
• Assets and activities must meet the threshold at the point in time when taxonomy approval is sought
• For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions</td></tr>
<tr><th colspan="2">Rationale</th></tr>
<tr><td colspan="2">Efficient and low-emissions production of heating and cooling will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling.

We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).</td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">This assessment has not yet been completed for this activity.</td></tr>
<tr><td>(2) Adaptation</td><td></td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td></td></tr>
</table>

(6) Ecosystems	

22.21 Production of Heat/cool from Gas Combustion

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	Production of heating and cooling from Gas Combustion (**not exclusive to natural gas)**
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • Based on Electric Heat Pumps as best available technology to determine the threshold
Metric	Any heating or cooling generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of thermal energy are below the declining threshold
Threshold	**Facilities operating at less than 30g CO_2e/kWh (th), declining to 0g CO_2e/kWh (th) by 2050, are eligible** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought • For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
Efficient and low-emissions production of heating and cooling will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and recycling criteria, the NOx and CO emissions control in line with BREF indicators and the avoidance of direct impacts on sensitive ecosystems, species or habitats.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[300] and Bathing Waters Directive [301]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[302]
(5) Pollution	Ensure emissions to *air* of NOx and CO and emission to *water* are within the BATAEL ranges set in the BREF for the Large Combustion Plants[1] and Medium Combustions Plants Directive[303].
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from gas turbine and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6:

[300] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[301] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[302] Thierry Lecomte, José Félix Ferrería de la Fuente, Frederik Neuwahl, Michele Canova, Antoine Pinasseau, Ivan Jankov, Thomas Brinkmann, Serge Roudier, Luis Delgado Sancho; Best Available Techniques (BAT) Reference Document for Large Combustion Plants; EUR 28836 EN; doi:10.2760/949 http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

[303] Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plants

	Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.22 Production of Heat/cool from Bioenergy

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	Production of heating and cooling from Bioenergy
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • Based on Electric Heat Pumps as best available technology to determine the threshold
Metric	Any heating or cooling generation technology is eligible if it can be demonstrated, using an ISO 14044-compliant Life Cycle of Emissions (LCE) assessment, that the life cycle impacts for producing 1 kWh of thermal energy are below the declining threshold
Threshold	**Facilities operating at less than 30g CO_2e/kWh (th), declining to 0g CO_2e/kWh (th) by 2050, are eligible** • This threshold will be reduced every 5 years in line with a net-zero CO_2e in 2050 trajectory • Assets and activities must meet the threshold at the point in time when taxonomy approval is sought For activities which go beyond 2050, it must be technically feasible to reach net-zero emissions
Rationale	
Efficient and low-emissions production of heating and cooling will be required if Europe is to meet its net-zero by 2050 target. A power-to-heat ratio has been adopted to draw an equivalence between the declining emissions intensity threshold set on the production of electricity and that which applies to production of heating/cooling. We assume operation of a heat pump with a seasonal coefficient of performance (SCOP) of 3.33 in an electricity system aligned with the threshold in D.35.11, which results in an effective heat threshold of 30g CO2e/kWh (th).	
Do no significant harm assessment	
The key environmental aspects to be taken into account when investing in this activity are the impact on local water (consumption and sewage), the fulfillment of the applicable waste and recycling criteria, the SO2, NOx dust BAP and other emissions control in line with BREF/ Medium Combustions Plants Directive and the avoidance of direct impacts on sensitive ecosystems, species or habitats. Biomass-based electricity should be eligible only if produced through the following technologies: Biomass, Biogas or Biofuels. For biomass feedstocks refer to Forestry Criteria and/or Crop criteria.	

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[304] and Bathing Waters Directive [305]. For operations situated in water scarce areas, ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, have been developed and implemented.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in accordance with BREF for Large Combustion Plants[306]. These requirements apply for installations with a total rated thermal input of 50 MW or more. Promote the establishment of closed waste cycles.
(5) Pollution	Do not transport feedstocks over long distances. Thresholds: Limit the emissions to values within the ranges given in the newest version of the following documents depending on the size of the installation: o BREF document on Large Combustion Plants [2], chapter 10.2.2 (BAT conclusions for the combustion of solid biomass and/or peat; SO2, NOx, dust, CO, Mercury, HCl, HF thresholds). These thresholds apply for installations with a total rated thermal input of 50 MW or more, only when this activity takes place in combustion plants with a total rated thermal input of 50 MW or more. For the purpose of calculating the total rated thermal input of a combination of combustion plants referred to in paragraphs 1and 2, individual combustion plants with a rated thermal input below 15 MW shall not be considered.

[304] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[305] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

[306] http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC_107769_LCPBref_2017.pdf

	o Medium Combustions Plants Directive [3]. These thresholds apply for combustion plants with a rated thermal input equal to or greater than 1 MW and less than 50 MW ('medium combustion plants'), and for a combination formed by new medium combustion plants pursuant to Article 4 of this directive, including a combination where the total rated thermal input is equal to or greater than 50 MW, unless the combination forms a combustion plant covered the BREF document on Large Combustion Plants (see above). The following thresholds apply: o In general: of Annex II (SO2, NOx and dust thresholds) o For plants in zones or parts of zones not complying with the air quality limit values laid down by the WHO, notably for PM and BAP: Recommended values which are to be published by the European Commission (DG ENV) pursuant to Article 6, paragraph 10 of the MCP Directive, or stricter measures in line with Article 18 of the Industrial Emissions Directive. Metrics: Emissions in mg/Nm³ (for biomass in large combustion plants: SO2, NOx, dust, CO, Mercury, HCl, HF; for biomass and for liquid biofuels in medium combustion plants: SO2, NOx, dust, for biogas in medium combustion plants: SO2, NOx)
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the combined production of heat and electric energy from biomass and site (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

22.23 Production of Heat/cool using Waste Heat

Sector classification and activity	
Macro-Sector	D - Electricity, Gas, Steam and Air Conditioning Supply
NACE Level	4
Code	D.35.30
Description	Production of heating and cooling using Waste Heat
Mitigation criteria	
Principle	• Support a transition to a net-zero emissions economy • Avoidance of lock-in to technologies which do not support the transition to a net-zero emissions economy • Ensure that economic activities meet best practice standards • Ensure equal comparability within an economic activity with regards to achieving net-zero emissions economy target • Where necessary, incorporating technology-specific considerations into secondary metrics and thresholds • Based on Electric Heat Pumps as best available technology to determine the threshold
Metric	
Threshold	**All recovery of waste heat is eligible**
Rationale	
The operation of waste heat infrastructure is eligible because the emissions from the underlying economic activity would be generated with or without the waste heat recovery system. Hence the waste heat recovery system would not increase operational emissions.	
Do no significant harm assessment	
This assessment has not yet been completed for this activity.	
(2) Adaptation	
(3) Water	
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	

23. Water, Sewerage, Waste and Remediation

Why is water, sewerage, waste and remediation included in the Taxonomy

The sub-sector Water, Sewerage, Waste and Remediation (WSWR) covering NACE-Codes E36 to E39 contributes to a rather small share of the EU's total greenhouse gas emissions – water with 0.2% and sewerage, waste, remediation with 4.4% in 2016. However, advanced solid waste management has a great potential to trigger greenhouse gas emission reductions in other sectors of the economy through waste prevention, separate waste collection, waste reuse and recycling.

What is covered

In the waste sector, a systems approach describing the climate mitigation effects of an integrated package of closely interrelated and combined environmentally sustainable activities would have its merits. As, however, the scope of the Taxonomy subgroup was to define stand-alone activities, the chosen climate mitigation principles, metrics and thresholds were formulated in a way to allow for the assessment of singular activities without consideration of their linkages in a complex waste management system (respectively, waste hierarchy).

The TEG and the experts involved assessed the nine NACE codes for WSWR and identified nine economic activities that offer a substantial contribution for climate mitigation:

- E36.0.0 Water collection, treatment and supply: 1. Water collection, treatment and supply
- E37.0.0 Sewerage: 2. Centralized wastewater treatment systems; 3. Anaerobic digestion of sewage sludge
- E38.1.1 Collection of non-hazardous waste: 4. Separate collection and transport of non-hazardous waste in source segregated fractions
- E38.1.2 Collection of hazardous waste: -
- E3821 Treatment and disposal of non-hazardous waste: 5. Anaerobic digestion of bio-waste; 6. Composting of bio-waste
- E38.2.2 Treatment and disposal of hazardous waste: -
- E38.3.1 Dismantling of wrecks: -
- E38.3.2 Recovery of sorted materials: 7. Material recovery from waste
- E39.0.0 Remediation activities: 8. Landfill gas capture and energetic utilization; 9 Carbon Capture and Storage

For two NACE Codes within the WSWR sector ('E38.1.2 collection of hazardous waste' and 'E38.2.2 treatment and disposal of hazardous waste'), no economic activity with relevant climate mitigation benefits has been identified due to the lack of available information. 'E38.3.1 dismantling of wrecks' was reprioritized mainly because the dismantling of wrecks (automobiles, televisions and computers, ships, etc.) involves major risks for the environment but not for the climate.

On waste incineration with energy recovery (waste-to-energy, WtE) experts' opinions differed on whether this would be an appropriate environmentally sustainable activity offering a substantial contribution to climate mitigation. On the one hand, there were arguments against the inclusion of WtE. These highlighted the large portion of waste currently incinerated that could be recycled, the reliance of some individual Member States on the incineration of municipal waste, and the risk that further increasing capacities risk overcapacity and could result in lock-in effects. This would in turn discourage more reuse and recycling, options higher in the waste hierarchy. On the other hand, it was emphasized that WtE has a role to play even in an increasingly circular economy as not all residual waste can be reused or recycled (as acknowledged by the EC in its Communication COM(2017)34 on 'the role of waste-to-energy in the circular economy', Section 5). The Commission interprets the Taxonomy proposal in such a way that WtE is outside its scope for climate change mitigation as it causes harm to the environmental objectives of a circular economy: waste prevention and recycling, as per Article 9(1)(i) and Article 12(d) of the EU draft Taxonomy regulation. Thus, WtE was not included in the Taxonomy for climate change mitigation. However, several experts wished to bring this matter for further discussion and consideration to the Commission.

Setting criteria and thresholds

An important characteristic of subsector WSWR is that for the identified activities – with one exception – the climate mitigation effect is at the heart of the corresponding business model, for example the energetic utilization of bio-gas gained through the anaerobic digestion of sewage sludge and bio-waste, or the material recovery from waste for reuse by other sectors. This constellation focuses the choice of climate mitigation criteria on qualitative metrics, securing the execution of the activities/businesses themselves and rendering obsolete climate mitigation thresholds.

Only in 'water collection, treatment and supply' is the core business a different issue, namely water supply, and the climate mitigation effect is the result of a more efficient design of the production process (e.g. by raising pump efficiency or reducing leakages). Consequently, concrete quantitative thresholds were defined only for this activity, with a first option describing an ambitious level of high energy efficiency in the water collection, treatment and supply system, and with a second, more transitional option setting thresholds for the substantial improvement of the system's energy efficiency.

Impact of these proposals

The activities do not impose major additional implementation costs on the stakeholders because (as explained) for most of them the climate activity is the heart of the correspondent business model itself. Considering 'water collection, treatment and supply', the cost savings, along with the implementation of the measures necessary to reach certain thresholds, have to be taken into account.

There should be no systematic distortive effect of the activities on the companies in the sector. The overall sectoral impact will depend on the state of the water, wastewater and waste management in each Member State in terms of i.e. regional coverage of different management technologies. Outside of the EU the impact could be even greater if the state of the sector in an individual country or region is below that of the EU.

Clear additional beneficial environmental effects can be assumed for i.e. water, circular economy and pollution. Employment effects should be positive, and further beneficial economic impacts are induced through increased investments and the demand for consumer goods.

Why carbon capture and sequestration (CCS) is included in the Taxonomy

Carbon capture and sequestration (CCS) is a key technology for the decarbonisation of Europe. It is included in all pathways presented by the European Commission in its Long-Term Strategic Vision document and is relied upon heavily in three-out-of-four scenarios outlined by the IPCC in the Special Report on 1.5 Degrees.

A typical CCS chain consists of three main stages: capture, transport and storage. CO_2 transport and storage are established and proven processes, with decades of operation and well-established regulation here in Europe.

The Technical Expert Group has developed criteria to define the eligibility of facilities used to capture carbon dioxide directly from the atmosphere and, separately, to capture carbon dioxide directly from anthropogenic activities.

CCS can be eligible in any sector/activity if it enables that primary activity to operate in compliance with the threshold - for example, steel, cement or electricity production.

Capture

CCS facilitates the direct mitigation of both fossil and process emissions in many industrial sectors including steel, cement and chemicals. Time is a crucial factor: the later options for deep decarbonisation in an industry arise, the more costly they become, and the more likely the need for greater carbon dioxide removal (CDR) in the future. 2050 is only one investment cycle away for many industries. Thus, decisions need to be made today.

In addition to renewable energies, energy storage and demand-side management, CCS on dispatchable generation allows all aspects of the electricity supply system to be deeply decarbonised.[307] CCS provides a backstop to the unabated operation of flexible electricity generation plants that are required to guarantee the operation and supply of year-round electricity. This is especially true in more isolated grids with a high penetration of seasonally variable renewables (e.g. onshore and offshore wind) where the reliable operation of electricity networks requires on-demand electricity generation.

The availability of CCS means that no remaining segment of the electricity supply system will be capable of emitting CO_2 to the atmosphere.

Whilst some CO_2 capture technologies can incur an 'energy penalty' of 10-15%, others do not. For example, the Allam cycle being developed by Net Power on natural gas combustion for power generation does not incur an energy penalty, as supercritical CO_2 is integrated fully into the power cycle as a coolant. This significantly reduces both energy and water demand. It is therefore inaccurate to say that CCS is a highly energy-intensive technology.

Transport and Storage

The transport and storage of CO_2 should be considered essential to the infrastructure of a modern, sustainable society. It can aid electricity grid expansion, the integration of renewables and the deep decarbonisation of energy intensive industries; support and enable CO_2 removal; and help stimulate a green hydrogen market. Without CO_2 transport and storage infrastructure, Europe will not achieve its climate objectives.

Chemically, CO_2 bonds with surrounding minerals after injection (gradual re-fossilisation), making CO_2 storage sites safer as time progresses. The IPCC estimates that over 99.9% of CO_2 will remain underground. The EU has provided clear and extensive assessment and monitoring requirements through the 2009 CO_2 Storage Directive. CO_2 has already been safely stored in geological formations in Europe for over 20 years.

[307] https://pubs.rsc.org/en/content/articlelanding/2016/ee/c6ee01120a#!divAbstract.

Through decade-long CO_2 injection experiences in North America, and the monitoring of CO_2 storage in Europe, the safe final disposal of CO_2 both on- and offshore has already been established. Selected sources on risk and safety of CO_2 storage can be found in the footnotes.[308,309,310,311,312,313,314,315,316,317]

Next steps

The Platform on Sustainable Finance to come will have to review two activities: By 2025, the threshold in Option 2 of 'water collection, treatment and supply' will have to be assessed for adjustment as the standards in the water supply sector and the technologies develop over time. Further, by 2025 the platform should analyse whether for 'landfill gas capture and energetic utilization' the intended incentive to close existing landfills has materialized.

The experts identified further activities which could have been analysed with respect to their suitability for the Taxonomy. However, constrained by limited manpower, these activities had to be reprioritized by the TEG. Future matters for the platform might include: the cascading uses of biowaste (i.e. production of biochemicals from biowaste substituting production from fossil sources) are still in their infancy but could gain in importance in the future; the 'dismantling of wrecks', a similar enabling activity for material recovery and recycling as waste collection, could be analysed in more detail; the separate management of rain water (e.g. through local infiltration or separate sewers) or use of biofilters in old landfills (which get rid of the methane through micro-organisms) are further possible candidates for a climate mitigation activity to be developed by the platform; and, finally, the 'collection of hazardous waste' and 'treatment and disposal of hazardous waste' could be analysed and addressed by the platform if more information becomes available.

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[309] Benson, S. M. et al. (2002), Lessons Learned from Natural and Industrial Analogues for Storage of Carbon Dioxide in Deep Geological Formations. Berkeley, CA, Lawrence Berkeley National Laboratory.

[310] Busch, A. et. Al. (2010), The Significance of Caprock Sealing Integrity for CO_2 Storage, SPE International Conference on CO_2 Capture, Storage, and Utilization, 10-12 November, New Orleans, Louisiana, USA.

[311] Duncan, I. J., Wang, H. (2014), 'Estimating the likelihood of pipeline failure in CO_2 transmission pipelines: New insights on risks of carbon capture and storage', International Journal of Greenhouse Gas Control 21: 49-60.

[312] European Union (2009), On the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, Official Journal of the European Union.

[313] IEA (2007), Remediation of Leakage from CO_2 Storage Reservoirs, IEA Greenhouse Gas R&D Programme.

[314] IPCC (2005), IPCC Special Report on Carbon Dioxide Capture and Storage, Cambridge University Press, Cambridge, UK and New York, NY, USA.

[315] Liebscher, A., Münch, U., Eds. (2015), Geological Storage of CO_2 – Long Term Security Aspects, Springer.

[316] Phuoc Pham, L. H., Rusli, R., Keong, L. K. (2016), Consequence Study of CO_2 Leakage from Ocean Storage Procedia Engineering, 148: 1081-1088.

[317] Wilson, E. J., T. L. Johnson, et al. (2003), 'Regulating the ultimate sink: Managing the risks of geologic CO_2 storage', Environmental Science & Technology 37(16): 3476-3483.

23.1 Water collection, treatment and supply

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E36.0.0
Description	**"Water collection, treatment and supply"** Water collection, treatment and supply with high energy efficiency of the system.
Mitigation criteria	
Principle	Substantial contribution to GHG emissions savings through low specific energy consumption in the water collection, treatment and supply system. By 2025 the Sustainable Finance Platform should assess the feasibility of Option 2, in particular with regard to the intended incentive for substantial energy efficiency improvements in water supply systems.
Metric	The front-to-end water collection, treatment and supply system is eligible provided that: • it's performance in terms of energy consumption per cubic meter of final water supply is high or substantially improved.
Threshold	Option 1: The front-to-end water supply system has a high degree of energy efficiency characterized by: • an average energy consumption of the system (including abstraction, treatment and distribution) of 0.5 kwh per cubic meter billed/unbilled authorized water supply or less.[318] Option 2: The energy efficiency of the front-to-end water supply system is increased substantially: • by decreasing the average energy consumption of the system by at least 20% (including abstraction, treatment and distribution; measured in kwh per cubic meter billed/unbilled authorized water supply); or • by closing the gap between the actual leakage of the water supply network and a given target value of low leakage by at least 20%. The unit of measurement is the Infrastructure Leakage Index (ILI)[319], the target value of low leakage is an ILI of 1.5.
Rationale	
The water supply sector is a wide and varied sector with very different performance conditions depending on the water source, the necessary treatment, the topography of the supplied area, the	

[318] Value of 0.5 according to the European benchmarking. https://www.waterbenchmark.org/documents/Public-documents.

[319] The Infrastructure Leakage Index (ILI) is calculated as current annual real losses (CARL) / unavoidable annual real losses (UARL). See Canfora P., Antonopoulos I. S., Dri M., Gaudillat P., Schönberger H. (2019), "Best Environmental Management Practice for the Public Administration Sector". JRC Science for Policy Report EUR 29705 EN.

length of the network etc. For the purpose of the Taxonomy, “ILI” and “kwh/m3 supplied” were chosen as parameters in order to measure the efficiency of a water supply system. An average energy consumption of a water supply system of 0.5 kwh per cubic meter billed/unbilled authorized water supply indicates a high performing system in terms of energy consumption. Several energy efficiency measures can reduce directly the energy consumption in a water supply system, enabling significant reductions of GHG emissions, these are inter alia: • to use more efficient sources in substitution of others more GHG demanding (e.g. surface sources instead groundwater sources, by means of water harvesting), • more efficient pumping systems, • frequency variators, • digitalization and automation. An ILI of 1.5 represents a very efficient performance of the network with regards water losses. ILI incorporates in its definition the length of the supply network, which makes it the most objective parameter. Water losses management (reduction of the ILI) reduces indirectly the energy consumption in the whole water supply system thus enabling significant reductions of GHG emissions from the water supply system. Water loss management measures consist inter alia of: • active leakage control, • pressure management, • speed and quality of repairs, • infrastructure and assets management (including maintenance), • metering, • monitoring and reporting, • digitalization and automation. Compliance with relevant EU and national law as well as consistency with national, regional or local water management strategies and plans is part of the approving process.	
Do no significant harm assessment	
Potential harm linked to water collection treatment and supply is related to water abstraction.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means:

	• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For water abstraction situated in areas of water stress (ratio between naturally incoming and extracted water, UNEP endorsed AWARE methodology, ISO compliant), ensure that water use/conservation management plans, developed in consultation with relevant (local) stakeholders, exist and are implemented
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	Protect groundwater hydrology and aquatic ecological status of surface waters in line with national and local permitting requirements.

23.2 Centralized Wastewater treatment systems

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E37.0.0
Description	**"Centralized wastewater treatment systems"** Centralized wastewater systems (including collection and treatment), substituting untreated wastewater discharge or treatment systems causing high GHG emissions (e.g. onsite sanitation, anaerobic lagoons).
Mitigation criteria	
Principle	Net GHG emission reduction through centralization of wastewater treatment thus substituting or avoiding decentralized sanitation systems with higher GHG emissions.
Metric	Construction or extension of centralized wastewater systems including collection (sewer network) and treatment is eligible, provided that: • the new wastewater treatment substitutes the untreated discharge of wastewater to the water bodies or more GHG emission intensive wastewater treatment systems.
Threshold	No threshold applies.
Rationale	
This activity considers collection and waste water treatment line in wastewater treatment plants. The sludge treatment is included in another Taxonomy activity. From common practice (see 2006 IPCC Guidelines for National Greenhouse Gas inventories) it is known that any level of treatment (primary, secondary, or tertiary) achieves significant reductions of GHG emissions when compared with the emissions of the discharge of untreated wastewater in the water bodies or other on-site sanitation systems (such as septic tanks, anaerobic lagoons etc.). Compliance with relevant EU and national law as well as consistency with national, regional or local wastewater management strategies and plans is part of the approving process.	
Do no significant harm assessment	
Potential harm linked to centralised wastewater treatment is related to: • emissions to water from wastewater treatment • Combined sewer overflow in case of heavy rainfall • Sewage sludge treatment	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:

	• considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	
(5) Pollution	• Ensure emissions to water are within the ranges set in the Urban Waste Water Treatment Directive. • Implement appropriate measure to avoid and mitigate combined sewer overflow in case of heavy rainfall, such as Nature-based solutions, separate rainwater collection systems, retention tanks and / or treatment of the first flush. • Ensure sewage sludge is managed/used (e.g, incineration, anaerobic digestion, land application) according to relevant national/EU legislation.
(6) Ecosystems	

23.3 Anaerobic Digestion of Sewage sludge

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E37.0.0
Description	**“Anaerobic Digestion of Sewage sludge”** Treatment of sewage sludge in wastewater treatment plants or in other installation with the resulting production and energetic utilization of biogas.
Mitigation criteria	
Principle	Net GHG emission reduction from sewage sludge treatment through the capture and energetic utilization (electricity/heat generation or biofuel production) of the generated biogas.
Metric	Anaerobic digestion of sewage sludge treatment is eligible provided that (cumulative): • methane leakage from biogas production is controlled by a monitoring system; • the captured biogas is used for electricity/heat generation or biofuel production.
Threshold	No threshold applies.
Rationale	
Sewage sludge is a by-product of waste-water treatment, with organic and inorganic content. The organic content of the sludge is subject of decomposition which might occur under controlled circumstances (in sludge treatment installations) or under un-controlled circumstances in the final disposal, with significant GHG emissions (mainly methane). Anaerobic Digestion (AD) and in some cases aerobic digestion are examples of sludge treatments. In AD microorganisms decompose the organic matter of the sludge (in the absence of oxygen) and produce methane-rich biogas. The climate mitigation effect is dual: (i) The biogas is a source of energy which is transformed into heat, electricity or fuel, replacing fossil fuels in electricity / heat generation and consequently avoiding GHG emissions to air (CO2, N2O, etc.)[320]; (ii) the sludge is turned into a recyclable product (e.g. as fertilizer substituting synthetic fertilizers). Sludge treatment is in many cases centralized in wastewater treatment plants (WWTP), which treat the sludge and produce energy from sludge produced in the WWTP or outside the plant. Methane leakage may offset the climate mitigation benefits and therefore needs to be avoided. A monitoring system allows the detection of leakages; it is in the interest of the operator to fix detected leakages in order to minimize economic losses.	

[320] Joint Research Center, 2015: Best Environmental Management Practice for the Public Administration Sector, Section 11.3 (Anaerobic Digestion of Sludge).

Compliance with relevant EU and national law as well as consistency with national, regional or local wastewater management strategies and plans is part of the approving process.	
Do no significant harm assessment	
Sewerage sludge treatment for the production of biogas may lead to emissions of pollutants that have significant impacts on human respiratory systems and on ecosystems through acidification and/or eutrophication, in particular ammonia emissions from the sludge storage as well as emissions resulting from the subsequent use of biogas such as sulphur dioxide, nitrous oxide and particulates. When the resulting digestate is used as fertiliser / soil improver, there is a risk of soil pollution because of contaminants contained in the digestate. Additionally, there could be impacts on the local ecosystems where the sewerage sludge treatment is carried out.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	
(5) Pollution	• Emissions to air and water are within the BAT-AELs ranges set for anaerobic treatment of waste in the BREF for waste treatment • Emissions to air (e.g. SOx, NOx, and particulate) after combustion of biogas are controlled, abated (when needed) and within the limits set by national/EU legislation. • If the resulting digestate is used as fertiliser / soil improver, it must meet the national rules on fertilisers/soil improvers for agricultural use
(6) Ecosystems	

23.4 Separate collection and transport of non-hazardous waste in source segregated fractions

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E38.1.1
Description	**“Separate collection and transport of non-hazardous waste in source segregated fractions”** Separate collection and transport of non-hazardous waste in single or comingled fractions aimed at preparing for reuse and/or recycling.
Mitigation criteria	
Principle	Net GHG emission reduction enabled through separate collection and transport of non-hazardous waste for subsequent substitution of virgin materials thus avoiding higher emissions from the alternative use of virgin materials (energy consumption for extraction, transport and production).
Metric	Separate collection and transport of non-hazardous waste is eligible provided that: • source segregated waste (in single or co-mingled fractions) is separately collected with the aim of preparing for reuse and/or recycling.
Threshold	No threshold applies.
Rationale	
Separate waste collection is a precondition for advanced recycling of materials. The climate mitigation net benefits of material recovery are proven by pertinent studies [321] Collection and transport of waste includes i.e. bins, containers, vehicles, ancillary technological equipment and IT systems, reverse vending machines, services useful to separate waste collection (i.e. information campaigns, activities of waste advisers) as well as related temporary storage and transfer facilities. Compliance with relevant EU and national law as well as consistency with national, regional or local waste management strategies and plans is part of the approving process.	

[321] German Federal Environmental Agency (UBA), 2015: The Climate Change Mitigation Potential of Waste Management, sections 4.2.4 and 11.1 (Recovering dry recyclables, specific emission factors). https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_56_2015_the_climate_change_mitigation_potential_of_the_waste_sector.pdf.
Eunomia, 2015: The Potential Contribution of Waste Management to a Low Carbon Economy, section 3.2 (Quantifying the Impacts per Ton of Waste). https://www.eunomia.co.uk/reports-tools/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/.
Joint Research Center, 2018: Best Environmental Management Practice for the Waste Management Sector, section 1.4.6 (Material recycling). http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBEMP.pdf.
United Nations Environmental Programme / Division of Technology, Industry and Economics International Environmental Technology Centre: Waste and Climate Change: Global trends and strategy framework; Osaka/Shiga / Japan 2010; www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange.

<table>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">Potential harm linked to the collection of non-hazardous waste in source segregated fractions is related to:
Emissions of collection vehicles
Risk of mixing source segregated waste fractions in waste storage and transfer facilities</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.

The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.

The economic activity must not adversely affect adaptation efforts of others. This means:
The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td>Avoid mixing source segregated waste fractions in waste storage and transfer facilities</td></tr>
<tr><td>(5) Pollution</td><td>If waste collection is carried out by trucks, vehicles must be at least Euro V.</td></tr>
<tr><td>(6) Ecosystems</td><td></td></tr>
</table>

23.5 Anaerobic digestion of bio-waste

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E38.2.1
Description	**"Anaerobic digestion of bio-waste[322]"** Treatment of separately collected bio-waste through anaerobic digestion with the resulting production and energetic utilization of biogas and production of digestate for use as fertilizer/soil improver[323], possibly after composting or any other treatment.
Mitigation criteria	
Principle	Net GHG emission reduction through avoidance of GHG emissions compared to alternative options for bio-waste management, through controlled production and energetic utilization (electricity/heat generation or biofuel production) of biogas, and through production of digestate that can be used – possibly after composting or any other treatment – as fertiliser/soil improver displacing synthetic fertilisers.
Metric	Anaerobic digestion of bio-waste is eligible provided that (cumulative): • the bio-waste is collected separately; • methane leakage from biogas production is controlled by a monitoring system; • the produced biogas is used for electricity/heat generation or biofuel production; • the digestate produced is used as fertiliser/soil improver – possibly after composting or any other treatment; • the major share of material for anaerobic digestion is bio-waste. In case of co-digestion, other biodegradable wastes such as solid or liquid manure and other agricultural residues may be added, whereas energy crops and other non-waste feedstock are excluded.
Threshold	No threshold applies.
Rationale	
Anaerobic digestion (AD) is a process by which microorganisms decompose biodegradable material in the absence of oxygen. As part of an integrated waste management system, AD is a valid route	

[322] For definition of bio-waste refer to Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Article 1(3)(b)). It comprises biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants.

[323] For definition of fertilising products refer to ANNEX I of Proposed Regulation COM (2016) 157 laying down rules on the making available on the market of EU fertilising products, amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003.

to divert biodegradable waste from landfilling and thus reduce the uncontrolled emissions of landfill gas, in particular methane. The AD process produces methane-rich biogas under controlled conditions, and a sludge-like or liquid residue, termed 'digestate'. The biogas can be used to drive a gas engine with connected generator to generate electricity and/or heat or can be incinerated to produce heat or can be further processed into bio-methane to be used as a fuel. The digestate is typically used on farmland as organic fertilizer, directly or after a composting step. The use of digestate instead of synthetic fertilizers derived from by-products of the petroleum industry saves energy and reduces the consumption of fossil fuels.[324] Where there is no immediate use on farmland, the digestate can be dewatered and 'cured' by composting to stabilise the material which can be stored for longer time and used as an organic fertiliser or soil improver. Overall, AD exhibits the best environmental performance for the treatment of separately collected biodegradable waste, where both the biogas and the digestate can be utilized (in particular when the digestate is composted). For AD to be technically viable, appropriate feedstock must be secured in sufficiently large quantities (a rule of thumb is > 20.000 tpa for a commercial scale plant). Besides bio-wastes, other biodegradable wastes[325] such as solid or liquid manure and other agricultural residues may be added to the feedstock and co-digested to improve the stability of the AD process and increase biogas yields. The co-digestion of energy crops and other non-waste feedstock is excluded from this activity (see separate EU-Taxonomy Activity "Production of Electricity" under NACE Code D35.1.1 / Bioenergy [name and code to be confirmed]). Bio-wastes with high ligneous content (such as in green garden waste) are typically not directly degradable by AD. Where such bio-waste fraction is significant, it should be collected separately and treated by composting (see separate EU Taxonomy Activity "Composting of bio-waste" under NACE Code 38.2.1). Methane leakage may offset the climate mitigation benefits and therefore needs to be avoided. A monitoring system allows the detection of leakages; it is in the interest of the operator to fix detected leakages in order to minimize economic losses. Compliance with relevant EU and national law as well as consistency with national, regional or local waste management strategies and plans is part of the approving process.	
Do no significant harm assessment	
The operation of an anaerobic digestion (AD) plant may lead to emissions of pollutants that have significant impacts on human respiratory systems and on ecosystems through acidification and/or eutrophication. The most relevant emissions are ammonia emissions from the digestate storage as well as emissions resulting from the subsequent use of biogas, such as sulphur dioxide, nitrous oxide and particulates. The use of the resulting digestate as fertiliser / soil improver may also result in soil pollution due to contaminants in the digestate.	
(2) Adaptation	A1: Reducing material physical climate risks.

[324] Joint Research Center, 2018: Best Environmental Management Practice for the Waste Management Sector, sections 1.4.4 (Organic waste recycling). http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBEMP.pdf

[325] For the definition of "wastes" refer to the EU Waste Framework Directive (Directive 2008/98/EC) and Commission Decision of December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

<table>
<tr><td></td><td>The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others:
The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td>Emissions to air and water are within the BAT-AELs ranges set for anaerobic treatment of waste in the BREF for waste treatment
Emissions to air (e.g. SOx, NOx, and particulate) after combustion of biogas are controlled, abated (when needed) and within the limits set by national/EU legislation.
The resulting digestate meets the requirements for fertilising materials in Proposed Regulation COM (2016) 157 or national rules on fertilisers/soil improvers for agricultural use.</td></tr>
<tr><td>(6) Ecosystems</td><td></td></tr>
</table>

23.6 Composting of bio-waste

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E38.2.1
Description	**"Composting of bio-waste[326]"** Treatment of separately collected bio-waste through composting (aerobic digestion) with the resulting production of compost for use as fertilizer/soil improver[327].
Mitigation criteria	
Principle	Net GHG emission reduction, through avoidance of GHG emissions compared to alternative options for bio-waste management and from the production of compost that can be used as fertiliser/soil improver displacing synthetic fertilisers and eventually peat (e.g. in horticulture).
Metric	Composting of bio-waste is eligible provided that (cumulative): • the bio-waste is collected separately; • anaerobic digestion is not a technically viable alternative; • the compost produced is used as fertiliser/soil improver.
Threshold	No threshold applies.
Rationale	
Composting describes the process by which microorganisms decompose biodegradable waste in the presence of oxygen, which is why it is sometimes also referred to as "aerobic digestion". As part of an integrated waste management system, composting is a valid route to divert biodegradable waste from landfilling and thus reduce the uncontrolled emissions of landfill gas, in particular methane. Composting makes organic matter more resilient to further degradation. The end product is compost which can be used as a natural fertilizer or soil improver in agriculture, horticulture and hobby gardening (provided it is of a sufficient quality). The use of compost instead of synthetic fertilizers – e.g. derived from by-products of the petroleum industry – saves energy and reduces the consumption of fossil fuels. Other climate mitigation effects of compost use include the long-term carbon capture in soils.[328] Overall, anaerobic digestion (AD) exhibits the better environmental performance for the treatment of municipal bio-waste (above all when digestate gets post-composted), where both the biogas and the digestate can be utilized. Thus, where technically viable AD should be given preference to composting. At commercial scale, this could be presumed where appropriate feedstock (putrescible wastes with high humidity) is secured in stable quantities > 20.000 tpa (as a rule of thumb).	

[326] For definition of bio-waste refer to Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Article 1(3)(b)).

[327] For definition of fertilising products refer to ANNEX I of Proposed Regulation COM (2016) 157 laying down rules on the making available on the market of EU fertilising products, amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003.

[328] Joint Research Center, 2018: Best Environmental Management Practice for the Waste Management Sector, sections 1.4.4 (Organic waste recycling) http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBEMP.pdf

However, depending on i.a. the properties of the waste, the amount of waste to treat, and the distance of transport composting can be a technically viable alternative to AD. Bio-wastes with high ligneous content (such as in green garden waste) are typically not directly degradable by AD and therefore better suited for composting (unless the garden waste fraction is insignificant and economically unfeasible to collect separately). Compliance with relevant EU and national law as well as consistency with national, regional or local waste management strategies and plans is part of the approving process.	
Do no significant harm assessment	
The operation of a composting plant may lead to emissions of pollutants that have significant impacts on human respiratory systems and on ecosystems through acidification and/or eutrophication. The use of the resulting compost as fertiliser / soil improver may also result in soil pollution due to contaminants in the compost.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	
(5) Pollution	• In case of composting plants treating over 50 t/day, emissions to air and water are within the BAT-AELs ranges set for aerobic treatment of waste in the BREF for waste treatment • The site has a system in place that prevents leachate reaching groundwater • The resulting compost meets the requirements for fertilising materials in Proposed Regulation COM (2016) 157 or national rules on fertilisers/soil improvers for agricultural use
(6) Ecosystems	

23.7 Material recovery from waste

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E38.3.2
Description	**“Material recovery from waste”** Sorting and processing of separately collected waste streams into secondary raw materials usually involving a mechanical transformation process.
Mitigation criteria	
Principle	Net GHG emission reduction enabled through sorting and processing of separately collected waste streams for subsequent substitution of virgin materials thus avoiding higher emissions from the alternative use of virgin materials (energy consumption for extraction, transport and production).
Metric	Material recovery from separately collected waste is eligible provided that: • it produces secondary raw materials suitable for substitution of virgin materials in production processes.
Threshold	No threshold applies.
Rationale	
The climate mitigation net benefits of material recovery are proven by pertinent studies.[329] Compliance with relevant EU and national law as well as consistency with national, regional or local waste management strategies and plans is part of the approving process.	
Do no significant harm assessment	
Potential harm linked to the recovery of sorted materials is related to: • emissions to air, soil and water from the process • unjustified diversion from the waste hierarchy	
(2) Adaptation	A1: Reducing material physical climate risks.

[329] German Federal Environmental Agency (UBA), 2015: The Climate Change Mitigation Potential of Waste Management, sections 4.2.4 and 11.1 (Recovering dry recyclables, specific emission factors). https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_56_2015_the_climate_change_mitigation_potential_of_the_waste_sector.pdf.
Eunomia, 2015: The Potential Contribution of Waste Management to a Low Carbon Economy, section 3.2 (Quantifying the Impacts per Ton of Waste). https://www.eunomia.co.uk/reports-tools/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/.
Joint Research Center, 2018: Best Environmental Management Practice for the Waste Management Sector, section 1.4.6 (Material recycling). http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBEMP.pdf.
United Nations Environmental Programme / Division of Technology, Industry and Economics International Environmental Technology Centre: Waste and Climate Change: Global trends and strategy framework; Osaka/Shiga / Japan 2010; www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange.

	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	The major share of the processed separately collected waste is converted into secondary raw materials.
(5) Pollution	Ensure the secondary raw materials obtained do not contain substances of very high concern, as defined by the REACH Regulation .
(6) Ecosystems	

23.8 Landfill gas capture and energetic utilization

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E39.0.0
Description	**“Landfill gas capture and energetic utilization”** New installation and subsequent operation of a landfill gas capture and energetic utilization system (or extension and/ or retrofitting of an existing system) in permanently closed old landfills.
Mitigation criteria	
Principle	Net GHG emission reduction through the capture and energetic utilization (for electricity/heat generation or biofuel production) of landfill gas. By 2025 the Sustainable Finance Platform should assess the feasibility of the principle, in particular with regard to the intended incentive to close landfills.
Metric	Collection and utilization of landfill gas is eligible provided that (cumulative): • the landfill has not been opened after [date of entry into force of Taxonomy]; • the landfill (or landfill cell) where the system is installed (or extended and / or retrofitted) is permanently closed; • the captured landfill gas is utilized for electricity/heat generation or biofuel production. • leakage from landfill gas capture is controlled by a monitoring system;
Threshold	No threshold applies.
Rationale	
The activity is generally carried out as part of or complementary to the closure and remediation of old landfills. The landfill gas collection and its energetic utilization contributes to climate change mitigation (i) by reducing methane emissions to the atmosphere emanating from biodegradable waste previously deposited in the landfill body and (ii) by displacing the use of fossil fuels for electricity/heat generation or fuel production. It is expected that the inclusion of this activity in the Taxonomy under the climate change mitigation objective will generally incentivize the closure of old landfills. Landfill gas leakage may offset the climate mitigation benefits and therefore needs to be avoided. A monitoring system allows the detection of leakages; it is in the interest of the operator to fix detected leakages in order to minimize economic losses. Compliance with relevant EU and national law as well as consistency with national, regional or local waste management strategies and plans is part of the approving process.	
Do no significant harm assessment	
Potential harm linked this activity is related to the emissions resulting from the energetic utilization of landfill gas, such as sulphur dioxide, nitrous oxide and particulates	

<table>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
considers both current weather variability and future climate change, including uncertainty;
is based on robust analysis of available climate data and projections across a range of future scenarios;
is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td></td></tr>
<tr><td>(5) Pollution</td><td>The permanently closed old landfills and dumpsites, where the landfill gas capture system is installed, are compliant with the provisions on general requirements and control and monitoring procedures specified in the Council Directive 99/31/EC.
Emissions to air (e.g. SOx, NOx, and particulate) after combustion of biogas are controlled, abated (when needed) and within the limits set by national/EU legislation.
Filters to capture particulate matter are installed to avoid that particulates are dispersed into the atmosphere after combustion.</td></tr>
<tr><td>(6) Ecosystems</td><td></td></tr>
</table>

23.9 Direct Air Capture of CO_2

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E39.0.0
Description	Direct Air Capture of CO_2
Mitigation criteria	
Principle	• The activity provides substantial contribution to achieving net-zero GHG emissions target by 2050 • The activity reduces net GHG emissions from economic activities and GHG concentrations in the atmosphere • The activity leads to significant emissions reductions compared to BAU • Ensure there is sufficient storage and sequestration capacity available to meet the rate of capture of CO_2 • Emissions captured from Direct Air Capture cannot be attributed towards meeting the threshold of another economic activity in the Taxonomy.
Metric	All investments in direct capture of CO_2 from the atmosphere to lower global atmospheric CO2 concentration levels are eligible
Threshold	All investments in direct capture of CO_2 from the atmosphere to lower global atmospheric CO_2 concentration levels are eligible
Rationale	
The TEG Energy Group recommends that the following ISO standards are incorporated into this Taxonomy threshold when made publicly available: • ISO/CD 27919-2 - Carbon dioxide capture -- Part 2: Evaluation procedure to assure and maintain stable performance of past-combustion CO_2 capture plant integrated with a power plant • ISO/CD 27920 - Carbon dioxide capture, transportation and geological storage (CCS) -- Quantification and Verification • ISO/DTR 27921 - Carbon dioxide capture, transport and storage -- CO_2 stream composition • ISO/AWI TS 27924 - Lifecycle risk management for integrated CCS projects	
Do no significant harm assessment	
This assessment has not yet been completed for this activity.	
(2) Adaptation	
(3) Water	
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	

23.10 Capture of Anthropogenic Emissions

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E39.0.0
Description	Capture of anthropogenic CO_2 emissions
Mitigation criteria	
Principle	• The activity provides substantial contribution to achieving net-zero GHG emissions target by 2050 • The activity reduces net GHG emissions from economic activities and GHG concentrations in the atmosphere • The activity leads to significant emissions reductions compared to BAU • Ensure there is sufficient storage and sequestration capacity available to meet the rate of capture of CO_2e
Metric	**Capture of anthropogenic emissions is eligible with the Taxonomy** if: • it enables the economic activity to operate under its respective threshold and • It shows that the captured CO_2 will be offloaded to a Taxonomy eligible CO_2 transportation operation and permanent sequestration facility
Threshold	**Capture of anthropogenic emissions is eligible with the Taxonomy** if: • it enables the economic activity to operate under its respective threshold and • It shows that the captured CO_2 will be offloaded to a Taxonomy eligible CO_2 transportation operation and permanent sequestration facility
Rationale	
Emissions captured from Direct Air Capture cannot be attributed towards meeting the threshold of another economic activity in the Taxonomy **The TEG Energy Group recommends that the following ISO standards are incorporated into this Taxonomy threshold when made publicly available:** • ISO/CD 27919-2 - Carbon dioxide capture -- Part 2: Evaluation procedure to assure and maintain stable performance of past-combustion CO_2 capture plant integrated with a power plant • ISO/CD 27920 - Carbon dioxide capture, transportation and geological storage (CCS) -- Quantification and Verification • ISO/DTR 27921 - Carbon dioxide capture, transport and storage -- CO_2 stream composition • ISO/AWI TS 27924 - Lifecycle risk management for integrated CCS projects	
Do no significant harm assessment	
The main environmental impacts associated with Capture of Anthropogenic Emissions are due to chemicals/technologies used to capture carbon.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Follow all the requirements of EU Directive 2009/31/EC and in particular: • Minimize additional abstraction requirements of the capture plant in order to avoid reductions in the river water flow. • Avoid water contamination by discharges from earthworks and accidental spillage, wastewater discharges etc. • Protect groundwater hydrology and aquatic ecology through the construction, the physical presence of the capture plant, and in the event of leaks and spills.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in construction and decommission phases. Thresholds applied should be those indicated in regulations such as European Directives 2018/850, 2018/851, 2018/852 and BREF document[330] Select solvents based on environmental impact criteria and conducting full chemical risk assessments. Avoid hazardous waste from the amine solvent. Limit for nitrosamine concentration is 0.1 ppt.
(5) Pollution	A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent); Follow all the requirements of EU Directive 2009/31/EC and in particular: • Select solvents based on environmental impact criteria and conducting full chemical risk assessments. • Prevent release during operation by implementing permanent leakage detection systems. • Avoid loss of ammonia. • Minimize the formation of secondary aerosol and the production of tropospheric ozone.

[330] Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage July 2006

	Fans, compressors, pumps, whatever kind of equipment is covered by Ecodesign and used for CCS and CO2 transport should be as efficient as possible to reduce emissions in the generation of the required electricity.
(6) Ecosystems	Follow all the requirements of EU Directive 2009/31/EC and in particular: • Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems, in particular UNESCO World Heritage Sites and Key Biodiversity Areas (KBAs), have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

23.11 Transport of CO_2

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E39.0.0
Description	Transport of captured CO_2
Mitigation criteria	
Principle	• The activity provides substantial contribution to achieving net-zero GHG emissions target by 2050 • The activity reduces net GHG emissions from economic activities and GHG concentrations in the atmosphere • The activity leads to significant emissions reductions compared to BAU • Ensure there is sufficient storage and sequestration capacity available to meet the rate of capture of CO_2e
Metric	**Transport of captured CO2 is eligible subject to Threshold.**
Threshold	Leakage/tonne of CO_2 transported from head of the pipeline to injection point is <0.5%, and all the CO_2 is delivered to a taxonomy-eligible permanent sequestration site. Only pipelines which lead directly to an eligible permanent sequestration site are eligible.
Rationale	
The TEG Energy Group recommends that the following ISO standards are incorporated into this Taxonomy threshold when made publicly available: • ISO/CD 27919-2 - Carbon dioxide capture -- Part 2: Evaluation procedure to assure and maintain stable performance of past-combustion CO_2 capture plant integrated with a power plant • ISO/CD 27920 - Carbon dioxide capture, transportation and geological storage (CCS) -- Quantification and Verification • ISO/DTR 27921 - Carbon dioxide capture, transport and storage -- CO_2 stream composition • ISO/AWI TS 27924 - Lifecycle risk management for integrated CCS projects	
Do no significant harm assessment	
The main environmental impacts associated with transport of CO2 are due to: • Construction phase of the transport network: all aspects have to be considered that are usually connected with construction, like terrestrial habitat alteration, loss of valuable ecosystems, land consumption, overburden disposal, negative impacts on biodiversity, emissions of particles and NOx, noise and hazardous materials. An ESIA should be done. • Operation phase: Leakages should be kept at a minimum. Underground networks can have an impact on ground water systems and on local ecosystems.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Avoid water contamination by discharges from pipeline testing, earthworks and accidental spillage, wastewater discharges etc. Activity should minimize risks related to local water quality and/or local water consumption during construction, operation and decommission phases of the activity, fulfilling the requirements of the Water Framework Directive[331]. A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent). For construction site activities follow the principles of IFC General EHS Guideline.
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in construction and decommission phases. Thresholds applied should be those indicated in regulations such as European Directives 2018/850, 2018/851, 2018/852 and BREF document[332].
(5) Pollution	A minimum requirement is the implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent); Prevent release during operation by implementing permanent leakage detection systems. Fans, compressors, pumps, whatever kind of equipment is covered by Ecodesign and used for CCS and CO2 transport should be as efficient as possible to reduce emissions in the generation of the required electricity.
(6) Ecosystems	Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed for the Transportation of CO2 system (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries)

[331] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

[332] Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage July 2006

	based on the conservation objectives of the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018). The routing should be as short as possible and not pass through vulnerable local ecosystems.

23.12 Permanent Sequestration of captured CO_2

Sector classification and activity	
Macro-Sector	E - Water supply; sewerage; waste management and remediation activities
NACE Level	4
Code	E39.0.0
Description	Permanent Sequestration of captured CO_2
Mitigation criteria	
Principle	• The activity provides substantial contribution to achieving net-zero GHG emissions target by 2050 • The activity reduces net GHG emissions from economic activities and GHG concentrations in the atmosphere • The activity leads to significant emissions reductions compared to BAU • Ensure there is sufficient storage and sequestration capacity available to meet the rate of capture of CO_2e
Metric	**Operation of a permanent CO2 storage facility is eligible** if the facility complies with ISO 27914:2017 for geological storage of CO_2.
Threshold	**Operation of a permanent CO2 storage facility is eligible** if the facility complies with ISO 27914:2017 for geological storage of CO_2.
Rationale	
The TEG Energy Group recommends that the following ISO standards are incorporated into this Taxonomy threshold when made publicly available: • ISO/CD 27919-2 - Carbon dioxide capture -- Part 2: Evaluation procedure to assure and maintain stable performance of past-combustion CO_2 capture plant integrated with a power plant • ISO/CD 27920 - Carbon dioxide capture, transportation and geological storage (CCS) -- Quantification and Verification • ISO/DTR 27921 - Carbon dioxide capture, transport and storage -- CO_2 stream composition ISO/AWI TS 27924 - Lifecycle risk management for integrated CCS projects	
Do no significant harm assessment	
The main environmental impacts associated with Sequestration of CO2 are due to: • the risk of leakage • The long-term impermeability of the reservoirs, central issues regarding the monitoring and the interrelation of carbon with physical, chemical and geological conditions in the reservoir is still a debated argument, however the safety of CO2 storage may be assured with the implementation of specific rules and requirements.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios;

	• is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Follow all the requirements of EU Directive 2009/31/EC and in particular: • Avoid water contamination by discharges from pipeline testing, earthworks and accidental spillage, wastewater discharges etc. • Protect groundwater hydrology and aquatic ecology through the construction, the physical presence of the storage plant, and in the event of leaks and spills. • Proof impermeability of the storage site during operation or post closure in order to keep groundwater safe from acidification, which could also lead to leaching of trace metals from surrounding matrix. • Do no pollute groundwater on contact while injecting CO2 into the storage formation that leads to the displacement of brines. • Proof impossibility of water acidification. Monitor storage sites throughout operation and post closure
(4) Circular Economy	Ensure appropriate measure are in place to minimize and manage waste and material use in construction and decommission phases. Thresholds applied should be those indicated in regulations such as European Directives 2018/850, 2018/851, 2018/852 and BREF document[333].
(5) Pollution	Follow all the requirements of EU Directive 2009/31/EC and in particular: • The implementation and adherence to a recognised environmental management system (ISO 14001, EMAS, or equivalent); • Prevent release during operation by implementing permanent leakage detection systems. The maximum tolerable CO2 flow should guarantee that no significant deterioration of the soil and its functions will happen. The thresholds should be developed in order to meet the physical, geological, chemical, biological Fans, compressors, pumps, whatever kind of equipment is covered by Ecodesign and used for CCS and CO2 transport should be as efficient as possible to reduce emissions in the generation of the required electricity.
(6) Ecosystems	Follow all the requirements of EU Directive 2009/31/EC and in particular: Ensure an Environmental Impact Assessment (EIA), done to recognised standards, has been completed (including ancillary services, e.g. transport infrastructure and operations, waste disposal facilities, etc.) and any required mitigation measures for protecting biodiversity/eco-systems have been implemented. For sites in or near biodiversity sensitive areas, including protected areas, ensure that an appropriate assessment has been conducted in compliance with the provisions of the EU Habitats and Birds Directives (or other analogous provisions in case of non-EU countries) based on the conservation objectives of

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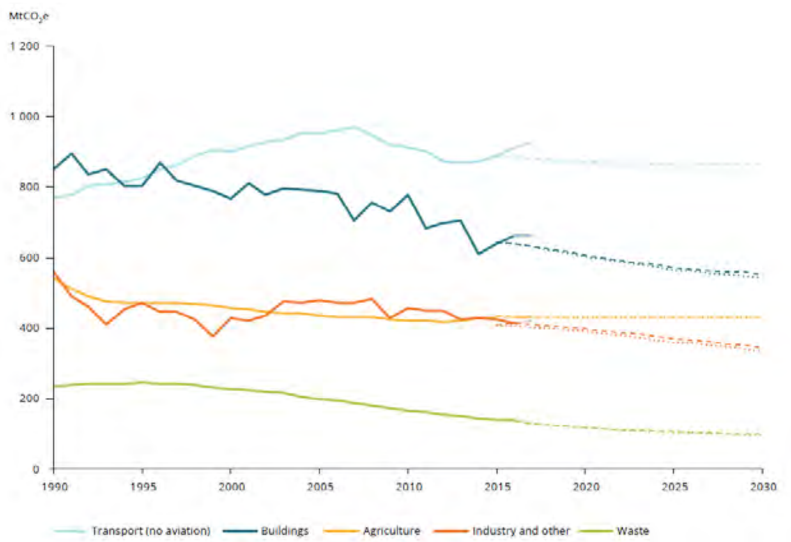
	the protected area. For such sites, ensure a site-level biodiversity management plan exists and is implemented in alignment with the IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2018).

24. Transportation

Why transport is included in the Taxonomy

Transport operations consume one-third of all energy in the EU. The bulk of this energy comes from oil. This means that transport is responsible for a large share of the EU's greenhouse gas emissions and is a major contributor to climate change. While most other economic sectors, such as industry, have reduced their emissions since 1990, those from transport have risen (see Figure 1). Preliminary estimates from EU Member States show that GHG emissions from transport were 28% above 1990 levels in 2017.[334] They now account for more than one quarter of the EU's total greenhouse gas emissions. This presents a major challenge in addressing transport sector emissions to ensure that the EU's emission reduction target is met. Although vehicle efficiency improvements have had a mitigating effect on GHG emissions, growing transport demand[335] and a sluggish share of low-carbon solutions have outweighed it.

Figure 1: GHG emission trends and projections under the scope of the Effort Sharing Decision



Source: EEA, Trends and Projections in Europe 2018

Within the transport sector, road transport is the dominant emissions source, accounting for more than two-thirds (72.1%[336]) of transport-related greenhouse gas emissions. Passenger cars and vans are responsible for the bulk of these emissions, the rest resulting from trucks and buses. Road transport is followed by shipping and aviation as the second and third largest sources of GHG emissions from transport.

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[334] https://www.eea.europa.eu/themes/transport/term/term-briefing-2018.

[335] Passenger and freight transport demand: https://www.eea.europa.eu/data-and-maps/indicators/passenger-and-freight-transport-demand/assessment.

[336] Greenhouse gas emissions from transport: https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-11.

The transport sector represents about 30% of additional annual investment needs for sustainable development in the Union.[337]

Subjects covered

To make a substantial contribution to climate mitigation, the activities and technical screening criteria (hereafter 'criteria') included in the Taxonomy need to focus on the main emissions sources from the transport sector. Reducing the GHG emissions from road transport is therefore key. For road vehicles there is a well-developed legislative framework in the EU that includes mandatory emissions testing. This system is most mature for cars and vans. It has recently evolved significantly for trucks, and buses are set to follow.

Rail and inland waterways are also important emissions sources covered by the Taxonomy. Compared to road and air, they can provide modal shift benefits. However, EU legislation provides less direct orientation regarding these modes of transport.

While public transport and the infrastructure for low-carbon transport in themselves are smaller sources of GHG emissions, they are vital to achieve systemic change towards more sustainable mobility and are therefore also included in the Taxonomy.

Linkages between the transport sector and other economic activities in the Taxonomy

The transport section of the climate mitigation Taxonomy deals primarily with 'greening of' operations of vehicle/vessel fleets and the associated enabling infrastructure. There are several principal climate mitigation options for the 'greening of' the transport sector including:

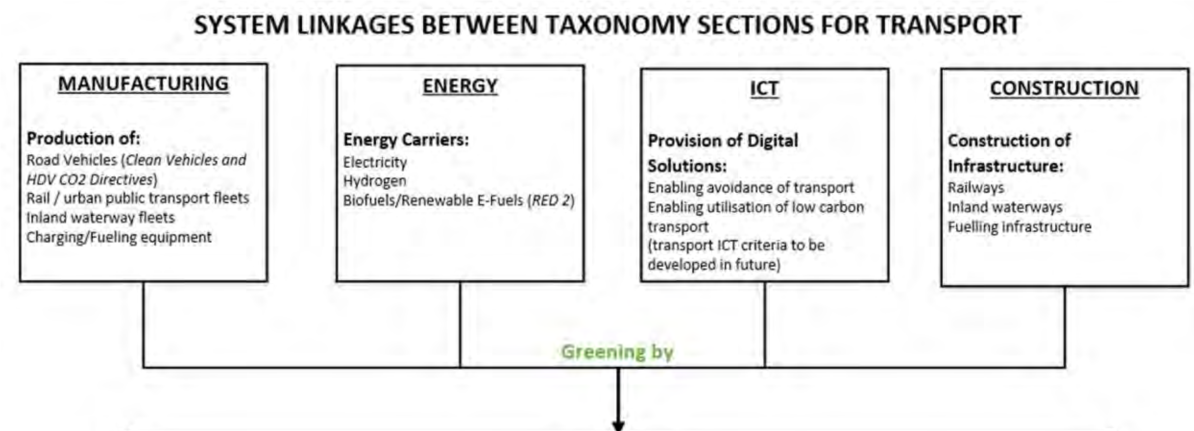
- Increasing the number of low- and zero emission vehicles
- Improving vehicle efficiency and infrastructure
- Substituting fossil fuels with alternative and net-zero carbon fuels
- Improving efficiency of the overall transport/mobility system[338] (see Figure 1 below)

Climate mitigation in the transport sections of the Taxonomy is linked to supporting activities elsewhere. These are so called 'greening by' activities and include:

- Production of low- and zero emission vehicles in line with requirements outlined in EU legislation (included in the manufacturing section of the Taxonomy)
- Low-carbon and net-zero energy carriers and fuels for the transport sector (included in the energy section)
- Digital solutions (included in the ICT section)
- Construction of enabling infrastructure (included in the transport section and highlighted below for clarity: see Figure 1)

[337] Proposal for a Regulation of the European Parliament and of the Council on the Establishment of a Framework to Facilitate Sustainable Investment (COM (2018) 353 final).

[338] '"A Clean Planet for All". A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy'. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf.



TRANSPORT

Greening of Transport Operations (Fleets and Associated Infrastructure)

Mitigation Option	Reference Section in EC Long Term Strategy	Taxonomy Approach
Low- and zero emission vehicles, vehicle efficiency and infrastructure	4.4.1.1	- Eligibility of zero direct emissions fleets and low carbon fleets *(reference to CV and HDV CO2 Directives for criteria on road vehicles)*
The use of alternative and net-zero carbon fuels	4.4.1.2	- Eligibility of fleets exclusively using bio and renewable e-fuels in certain modes *(reference to RED 2 for criteria on fuels)*
Improving the efficiency of the transport system	4.4.1.3	- Encouraging modal shift through consistent threshold approach across modes (a greater proportion of rail, public transport and inland waterway operations are eligible because of lower carbon intensity therefore facilitating investment in these modes) - ICT solutions (not currently included)

Figure 2: Linkages between transport and other Taxonomy sections

Setting criteria and thresholds

The general Taxonomy approach for the transport section is outlined in Figure 1 and was inspired by the long-term strategic options for decarbonisation of the transport sector as per the Commission's long-term strategic vision 'A Clean Planet for All'.[339] The associated criteria proposed can therefore be grouped into three categories below, as identified in the Long Term Strategy.[340] Criteria developed for fleet efficiency and fuel substitution have been designed to be discrete. There is no intention on the part of the TEG to undermine the approach in existing regulations covering these different aspects.

Efficient, low- and zero direct emissions fleets

This category requires that operated vehicles become more efficient over time by linking eligibility to emissions performance below a certain threshold set to ensure substantially reduced emissions.

[339] '"A Clean Planet for All". A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy'. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf.

[340] The criteria developed is set with an EU focus, due to its links to EU legislation and the European context in general. It is acknowledged that for other regions the criteria proposed may not be applicable in defining substantial contributions to climate change mitigation.

Thresholds are based on performance metrics (vehicle km, passenger km or tonne km). They are mode specific and are linked to available testing methods. They require efficiency improvements without being technology prescriptive, so long as the benefits of relevant technologies can be demonstrated.

The operation of vehicles with zero tailpipe emissions, or close to zero tailpipe emissions, is automatically eligible in the proposed criteria. Vehicle/vessel electrification is the main category in this context. This approach is also motivated by ETS inclusion and the ongoing decarbonisation of the EU power sector.

Fuel substitution to net-zero carbon fuels

The operation of vehicle fleets where fossil fuels are substituted with low- or net-zero carbon fuels such as advanced bio- and synthetic fuels can make a substantial contribution to CO_2 net emissions savings in the transport sector.[341,342,343,344] The criteria for producing these fuels are set elsewhere in the Taxonomy. The transport section outlines criteria for their use in fleets.

In the activity technical criteria below, the TEG considers a role for biofuels in four activities where commercialisation of zero tailpipe emissions vehicles or vessels is limited to date and where the operating conditions for the vehicles or vessels may slow the implementation of zero emissions alternatives, including Freight transport services by road; Interurban scheduled road transport services of passengers; Inland passenger water transport; Inland freight water transport.

The proposed criteria limit their eligibility for use in certain modes and for dedicated fleets, where it is understood that these fuels and the finance needed to support a shift can have a greater role to play from a climate mitigation perspective through the substitution of fossil fuels. TEG notes that it's important to ensure that biofuels are solely used to realise the maximum benefits of fuel substitution. As such, the criteria proposed also require a strict monitoring regime to ensure that these particular fuels are used.

As an example of how this might work in practice, a road freight transport operator may seek to operate a new or existing fleet of trucks solely using an eligible fuel (e.g. advanced fuel). To meet the Taxonomy criteria, the operator would need to demonstrate through ongoing verification that the fleet was solely using biofuels as specified in the criteria. A financier may be able to claim its investment (e.g. in a new fleet) was Taxonomy eligible through a contractual agreement with an operator to solely use biofuels, also establishing a verification system to enable ongoing monitoring.

Improving the efficiency of the transport system - modal shift

An important contribution to meeting GHG targets and reducing environmental pressures from the transport sector could come from a modal shift from aviation and road transport to rail and non-motorised passenger transport, as well as from road to rail and waterborne freight transport. However, 'modal shift' is not included as a distinct economic activity with associated criteria in the proposed Taxonomy due to

[341] The CO2 emissions from the use of biofuels are not counted in the total GHG emissions from the transport sector in EU's official GHG inventory under the UNFCCC. Without fuel substitution - the CO2 emissions from the transport sector would have been substantially higher.
(Annual European Union greenhouse gas inventory 1990-2017 and inventory report 2019, EEA, 2019).

[342] '"A Clean Planet for All". A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy'. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf.

[343] IPPC (2014), AR5 Climate Change 2014: Mitigation of Climate Change.

[344] OECD/IEA (2017), The Future of Trucks - Implications for energy and the environment.

the complexities of capturing it in a robust, unambiguous manner within the given Taxonomy architecture. Instead, the proposed Taxonomy acknowledges the potential carbon savings from a modal shift and therefore sets similar thresholds across modes, which indirectly promotes modal shifts (e.g. a greater proportion of fleets in lower carbon modes are Taxonomy eligible, facilitating investment in these activities). The relative emissions performance of modes will change over time as technologies evolve and uptake increases, therefore the approach taken within the Taxonomy should be reviewed in the future.

Next steps and recommendations

At this stage, there are other activities in the transport sector that have not been addressed, but which need consideration as part of further work on the Taxonomy.

These include:

- Maritime shipping
- Aviation
- ICT for transport

Maritime shipping has been considered by the TEG. Whilst it was evident that zero direct emissions fleets should be eligible as for other modes, criteria will also need to be established for short sea shipping where modal shift benefits can be achieved. Furthermore, it will be also important to consider approaches to maritime shipping based on the efficiency of transport fleets. Discussions in this area were not concluded during the timeframe of the TEG and should be continued in further work on the Taxonomy. Aviation was not considered within the scope of the work of the TEG, but should be addressed in the future considering the significance of emissions from the sector. In addition, ICT transport specific solutions and transport demand management can be important measures for enabling mitigation that have not been included at this stage, but warrant further study.

For a number of criteria, a review period is recommended as detailed in the tables that follow.

24.1 Passenger rail transport (interurban)

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.1.0
Description	**Passenger Rail Transport (Interurban)**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction
Metric	CO_2e emissions per passenger kilometre (gCO_2e/pkm)
Threshold	• Zero direct emissions trains are eligible. • Other trains are eligible if direct emissions (TTW) are below 50 gCO_2e/pkm until 2025 (non-eligible thereafter)
Rationale	
Zero direct emissions rail (e.g. electric, hydrogen) is eligible because: • With the present energy mix, the overall emissions associated with zero direct emissions rail transport (i.e. electric or hydrogen) are among the lowest compared with other transport modes. • The generation of the energy carriers used by zero direct emissions transport is assumed to become low or zero carbon in the near future The threshold of 50 gCO_2e/pkm until 2025 ensures that the carbon intensity remains similar to criteria for eligible road vehicles with low occupation factor (50 gCO_2/vkm) and significantly lower than emissions for an average car in the current vehicle stock (290 gCO2/vkm[345]). The current average for EU diesel rail is 70-90 gCO2/pkm[346], so the threshold is stringent enough to screen out most of the rail systems based on diesel operating in Europe as the load factor would need to be higher than 60% to reach eligibility. However, it would still enable certain hybrid systems of high efficiency to be eligible.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the operation of rail transport activities are attributed to air pollution, noise and vibration pollution, and some potential for water contamination. Direct emissions of air pollutants are not an issue of concern in the case of electrified rail, but only where (very efficient) diesel or hybrid engines would meet the CO2e-threshold defined to ensure substantial mitigation of GHG emissions.	
(2) Adaptation	A1: Reducing material physical climate risks.

[345] The factor represents urban operational emissions for the current average car in the vehicle stock (weighting the share of diesel, petrol, LPG, CNG, hybrid in the fleet). It does not represent emissions of new vehicles. Source: COPERT data for different vehicle types and COPERT data for annual utilization, to obtain 3.35 MJ/vkm. 88.87 gCO2/MJ.

[346] Source: UIC data for average diesel rail emissions in 2016 in Europe per pkm. It does not represent emissions per seat-km (capacity) but actual emissions per passenger-km, thus taking into account not only the technological component but also the operational efficiency of the system. Average load factor for diesel rail in EU is 24% or 24 passengers-km per 100 seats-km offered (source UIC 2010)

	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Ensure that draining from the tracks is not released into water bodies, for example, by constructing basins for drainage water that lead to a water treatment plant before released into water bodies.
(4) Circular Economy	Ensure end-of-life management for the rolling stock, e.g. reuse and recycle of parts like batteries, in compliance with EU and national legislation on hazardous waste generation, management and treatment.
(5) Pollution	• Engines for the propulsion of railway locomotives (RLL) and engines for the propulsion of railcars (RLR) must comply with latest applicable standards (currently stage V) of Non-Road Mobile Machinery Regulation . • Minimise noise and vibrations of rolling stock, thresholds in line with Regulation 1304/2014 Noise TSI : o Electric locomotives <84dB at 80km/h & <99 at 250 km/h; o Diesel locomotives <85 at 80km/h; o Electric multiple units <80dB at 80km/h & <95 at 250 km/h; o Diesel Multiple Units <81dB at 80km/h & <96 at 250 km/h; o Coaches <79dB at 80km/h; o Wagons <83dB at 80km/h
(6) Ecosystems	

24.2 Freight rail transport

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.2.0
Description	**Freight Rail Transport**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction
Metric	CO_2e emissions per tonne- kilometre (gCO_2e/tkm)
Threshold	• Zero direct emissions trains (e.g. electric, hydrogen) are eligible. • Other trains are eligible if direct emissions per tkm are 50% lower than average reference CO2 emissions of HDVs as defined for the Heavy Duty CO2 Regulation, to be reviewed in 2025. • Rail that is dedicated to the transport of fossil fuels or fossil fuels blended with alternative fuels is not eligible even if meeting the criteria above.
Rationale	
The carbon intensity of freight rail, even if diesel, is in most cases significantly lower than road freight transport, rail freight transport at least meeting the threshold proposed in the road transport HDV criteria is eligible. Average direct emissions for diesel rail is in the range of 18-40 gCO2e/tkm[347] compared 80-100gCO2e/tkm for road freight[348]. Emissions intensity can vary significantly depending on the type of cargo transported. This criterion should be reviewed in 2025. Transport of fossil fuels is considered to have potential negative impacts on climate change and therefore is excluded. A percentage of fossil fuels transported was considered as a threshold, but following feedback from experts, it is considered difficult to implement a % threshold because for example it is not easily known, particularly ex-ante, how locomotives will be used.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the operation of rail transport activities are attributed to air pollution, noise and vibration pollution, and some potential for water contamination. Direct emissions of air pollutants are not an issue of concern in the case of electrified rail, but only where (very efficient) diesel or hybrid engines would meet the CO2e-threshold defined to ensure substantial mitigation of GHG emissions.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best

[347] IFEU et al, 2018. Ecological Transport Information Tool for Worldwide Transports Methodology and Data Update 2018, Berne - Hannover - Heidelberg: IFEU, INFRAS, IVE, based on data from ECOTRANSIT

[348] Consumption factors per km for different HDV segments are based on COPERT. The average load per vehicle type is based the load capacity of the vehicles and an average utilization factors based on STREAM Freight (2016) and the capacity values are deduced from HBEFA data for empty and full vehicles.

	effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Ensure that draining from the tracks is not released into water bodies, for example, by constructing basins for drainage water that lead to a water treatment plant before released into water bodies.
(4) Circular Economy	Ensure end-of-life management for the rolling stock, e.g. reuse and recycle of parts like batteries, in compliance with EU and national legislation on hazardous waste generation, management and treatment.
(5) Pollution	• Engines for the propulsion of railway locomotives (RLL) and engines for the propulsion of railcars (RLR) must comply with latest applicable standards (currently stage V) of Non-Road Mobile Machinery Regulation . • Minimise noise and vibrations of rolling stock, thresholds in line with Regulation 1304/2014 Noise TSI : o Electric locomotives <84dB at 80km/h & <99 at 250 km/h; o Diesel locomotives <85 at 80km/h; o Electric multiple units <80dB at 80km/h & <95 at 250 km/h; o Diesel Multiple Units <81dB at 80km/h & <96 at 250 km/h; o Coaches <79dB at 80km/h; o Wagons <83dB at 80km/h
(6) Ecosystems	

24.3 Public transport

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.3.1
Description	**Urban and suburban passenger land transport (public transport)**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction
Metric	CO_2e emissions per passenger- kilometre (gCO_2e/pkm).
Threshold	• Zero direct emissions land transport activities (e.g. light rail transit, metro, tram, trolleybus, bus and rail) are eligible. • Other fleets are eligible if direct emissions are below 50 gCO_2e/pkm until 2025 (non-eligible thereafter)
Rationale	
The threshold of 50 gCO_2e/pkm until 2025 ensures that the carbon intensity remains similar to criteria for eligible road vehicles with low occupation factor (50 gCO_2/vkm) and significantly lower than the average car (290 gCO2/vkm[349]). The current average emissions intensity for a bus in the EU is 70-90 gCO2e/pkm[350] with load factors of around 10 passengers per bus, with the variation dependent on a number of considerations such as public service obligations, type of service, etc. As per current average technology, a hybrid bus would require at least 16 passenger average occupation factor, and diesel more than 20 passengers to be eligible. This threshold is therefore stringent while it provides some flexibility to recognize highly efficient systems and advanced hybrid technology. Diesel and petrol cars still represent the immense majority of the road fleet in all countries and the penetration of electric vehicles will materialize at a yet unknown pace. In the meanwhile, a lack of investment in public transport fleet renewal can lead to behavioural changes, such as modal shift to private car that would be significantly more difficult to revert in the future[351].	

[349] The factor represents urban operational emissions for the current average car in the vehicle stock (weighting the share of diesel, petrol, LPG, CNG, hybrid in the fleet). It does not represent emissions of new vehicles. Source: COPERT data for different vehicle types and COPERT data for annual utilization, to obtain 3.35 MJ/vkm. 88.87 gCO2/MJ

[350] The consumption factors per veh-km are based on Copert. The average consumption factor is made up of a ratio between urban, rural and motorway which is typical for an urban bus according to the Copert data: 12.18 MJ/km. The EU average (km weighted) occupation of a standard bus is 8.9 persons (STREAM 2016). does not represent emissions per seat-km (capacity) but actual emissions per passenger-km, thus taking into account not only the technological component but also the operational efficiency of the system.

[351] In 2015, 1,2% of all new cars and 0,5% of vans sold in the Europe was electric. In total, electric vehicles represent 1 in 700 cars in Europe (0,15%) (EEA, 2016). A further uptake is expected in the next decades.

There are various projections for the global EV stock in 2030, ranging between 60 and 200 million EVs, which would be between 4 and 14%. Worldwide (Bloomberg, 2018). Other sources indicate 125 million EVs, around 9% of global stock in 2030 (CNBC, 2018).

<table>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
<tr><td colspan="2">The main potential significant harm to other environmental objectives from the operation of urban and suburban passenger land transport (public transport) are summarised as follows:
• Direct emissions to air[352] from the exhaust gases of internal combustion engine: nitrogen oxides (NOx), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), carbon monoxide (CO), particulate matter (PM) and particle number, and from tyre abrasion and brakes friction and noise emissions[353];
• Waste generation (hazardous and non-hazardous) during maintenance and end-of-life of the vehicle or rolling stock.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td>• Regarding end-of-life management of vehicles or rolling stock, compliance with EU and national legislation on hazardous waste generation, management and treatment.
• Compliance with Directive 2000/53/EC ("End-of-life of vehicles Directive")</td></tr>
</table>

In Europe, EC estimates between 20 and 70 million passenger cars in Europe by 2030. Projections on the quantity of vehicles indicate 200 million passenger cars in Europe in 2030 (PWC, 2018). This would mean that in 2030 in Europe between 10 and 35% of cars are electric.

[352] ELV Directive 2000/53/EC (http://ec.europa.eu/environment/waste/elv/index.htm); Promotion of clean and energy-efficient road transport vehicles Directive (http://www.europarl.europa.eu/doceo/document/TA-8-2019-0427_EN.html?redirect), EU GPP criteria for road transport (http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm) and (https://ec.europa.eu/growth/sectors/automotive/environment-protection/noise-reduction_en)

[353] Indirect emissions to air from the production of fuels and energy carriers are a further impact, however, one that is out of the control of vehicles manufacturers and operators.

(5) Pollution	• Buses must comply with a real driving emission (RDE) performance which is in line with Euro VIE limit values for NOx and particulate number (PN); • Railcars, locomotives must comply with latest applicable standards (*currently stage 5*) of Non-Road Mobile Machinery Regulation[354]. • Where applicable, tyres must comply with the (revised) Tyre labelling regulation[355]. It includes noise labelling requirements but not requirements on tyre abrasion. However, the proposal of revision envisages a test method to be developed: *A suitable testing method to measure tyre abrasion is not currently available. Therefore, the Commission should mandate the development of such a method, taking into full consideration of all state-of-the-art internationally developed or proposed standards or regulations, with a view to establishing a suitable testing method as soon as possible.* • Where applicable, tyres must comply with the noise requirements set by Regulation (EC) No 661/2009 on type-approval requirements for the general safety of motor vehicles[356]. • Vehicles must comply with Regulation (EU) No 540/2014[357] on the sound level of motor vehicles and of replacement silencing systems. • Minimise noise and vibrations of rolling stock by applying thresholds on pass-by noise in dB in line with Regulation 1304/2014 Noise TSI[358]: o Electric locomotives <84dB at 80km/h & <99 at 250 km/h; o Diesel locomotives <85 at 80km/h; o Electric multiple units <80dB at 80km/h & <95 at 250 km/h; o Diesel Multiple Units <81dB at 80km/h & <96 at 250 km/h; o Coaches <79dB at 80km/h; o Wagons <83dB at 80km/h
(6) Ecosystems	

[354] Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery, amending Regulations (EU) No 1024/2012 and (EU) No 167/2013, and amending and repealing Directive 97/68/EC.
[355] Revision of the Tyre labelling regulation, https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3509962_en
[356] Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor
[357] Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems
[358] Technical Specifications for Interoperability (TSIs, Regulation 1304/2014, also known as TSI NOI)

24.4 Infrastructure for low carbon transport

Sector classification and activity	
Macro-Sector	F - Construction
NACE Level	4
Code	F42.1.1, F42.1.2, F42.1.3
Description	**Infrastructure for low carbon transport – land transport** including NACE categories: • Construction of roads and motorways • Construction of railways and underground railways • Construction of bridges and tunnels
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction.
Metric	CO_2e emissions per passenger-kilometre, per tonne-kilometre, or per kilometre (gCO_2e/pkm, gCO_2e/tkm or gCO_2e/km).
Threshold	The construction and operation of transport infrastructure is eligible in the following cases: 1. Infrastructure that is required for zero direct emissions transport (e.g. electric charging points, hydrogen fuelling stations or electric highways). 2. Infrastructure and equipment for active mobility (walking and cycling) 3. Infrastructure that is predominantly used for low-carbon transport if the fleet that uses the infrastructure meets the thresholds for direct emissions as defined in the relevant activity (the biofuels criteria does not apply here as it is not possible to monitor). 4. Non-electrified rail infrastructure with an existing plan for electrification or use of alternatively powered trains. For all cases: • Only infrastructure that is fundamental to the operation of the transport service is eligible. • Infrastructure that is dedicated to the transport of fossil fuels or blended fossil fuels is not eligible
Rationale	
The construction and operation of infrastructure for low carbon land transport is considered eligible because this is considered a key enabling factor for improving the uptake of the transport activities that are considered eligible under the rest of the land transport section of the Taxonomy. Criteria 3. above would accommodate all electric rail lines and non-electrified lines with battery powered and hydrogen trains operating. However even if non-electrified there might be a case for renewal of rail infrastructure in order to ensure continuity of the service while alternative powered trains (hydrogen, battery) are deployed in the future years, hence the inclusion of criteria 4 above. There is no significant risk of lock-in in those cases where the fleet is due for renewal. It is acknowledged that embedded carbon emissions in infrastructure projects (e.g. upstream emissions from manufacture of construction materials) may be significant in certain circumstances.	

The level of uncertainty around data in this respect makes it challenging at this time to incorporate this consideration within thresholds for infrastructure. However, this element should be considered for ongoing work on the Taxonomy. Transport of fossil fuels is considered to have potential negative impacts on climate change and therefore is excluded.	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from infrastructure activities are attributed to noise and vibration pollution, water contamination, waste generation and impacts on biodiversity (habitat and wildlife) and land use, specifically: • Contamination of water during construction and unsustainable use of water during construction and operations • Unsustainable use of resources during constructions, e.g. generation of high amount of waste, no recycling/reuse of construction waste • Noise pollution can be relevant for both rolling stock and railway infrastructure as noise can be generated by both rolling stock and poor conditions of rail tracks.[359] • Construction of infrastructure can cause significant harm when taking place in protected areas or areas of high biodiversity values outside protected areas. • Infrastructure can cause fragmentation and degradation of the natural and urban landscape due to the "barrier" effects of the infrastructure and can involve risks of wildlife accidents caused by collisions. Railway infrastructure (in particular tunnels) can cause change and degradation of hydromorphological conditions of water bodies and therefore have impacts on aquatic ecosystems.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	Ensure that no harmful substances are released into water to avoid water contamination, during operation, renewal, upgrade and new construction of

[359] http://www.diva-portal.org/smash/get/diva2:675304/FULLTEXT02

	infrastructure, in accordance with the environmental objectives of Directive 2000/60/EC[28], Art. 4(1).
(4) Circular Economy	• Re-use parts and use recycled material during the renewal, upgrade and construction of infrastructure. • At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list) generated on the construction site must be prepared for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials. This can be achieved by executing the construction works in line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[360].
(5) Pollution	• Minimise noise and vibrations from use of infrastructure by introducing open trenches/ wall barriers/ other measures. • Minimise noise, dust, emissions pollution during construction / maintenance works.
(6) Ecosystems	• Projects likely to affect designated protected areas, or areas of high nature and biodiversity value and vulnerability including UNESCO World Heritage and Key Biodiversity Areas (KBAs) may be implemented only if the Environmental Impact Assessment and the appropriate assessment conducted in compliance with the provisions of the EU Habitats[361] and Birds[362] Directives (or other analogous provisions in case of non-EU countries) have concluded that the infrastructure will not adversely affect the integrity of the site, and all necessary mitigation measures are in place to reduce the impacts on species and habitats. Possible mitigation measures could be: a) measures to reduce fragmentation and ensure the connectivity of habitats (e.g. tunnels and viaducts, under-or above-ground wildlife crossings), b) minimisation of collision risks through and barriers/fences for wildlife, c) avoid works during critical periods of species such as mating, reproductive, breeding or migration periods.

[360] EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

[361] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

[362] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

24.5 Passenger cars and commercial vehicles

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	
Code	
Description	**Passenger cars, light commercial vehicles and category L vehicles**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction.
Metric	CO_2 emissions per vehicle kilometre (gCO_2/km).
Threshold	For passenger cars and light commercial vehicles: • Zero tailpipe emission vehicles (incl. hydrogen, fuel cell, electric). These are automatically eligible. • Vehicles with tailpipe emission intensity of max 50 g CO_2/km (WLTP) are eligible until 2025. • From 2026 onwards only vehicles with emission intensity of 0g CO_2/km (WLTP) are eligible. For category L vehicles: Zero tailpipe emission vehicles (incl. hydrogen, fuel cell, electric).
Rationale	
This activity includes operation of vehicles classified as M1, N1, as defined by Regulation (EU) 2018/858, and of vehicles classified as category L (2- and 3-wheel vehicles and quadricycles) as defined in Regulation (EU) No 168/2013. Zero direct emission vehicles and vehicles with low and reducing emission intensities contribute substantially to climate mitigation and are aligned with Article 6. 1. (c) increasing clean or climate-neutral mobility, and Article 6. 1. (f) phasing out anthropogenic emissions of greenhouse gases, including from fossil fuels, Zero direct emissions vehicles (e.g. electric, hydrogen) are eligible because: - the generation of the energy carriers used by zero direct emissions transport is assumed to become low or zero carbon in the near future (for instance, in the scenario called EUCO 3038 that meets the EU targets in the clean energy package, 70% of electricity in the EU is generated from decarbonized sources in 2030). Point of reference for thresholds: Clean Vehicles Directive (CVD): The revised Directive includes ambitious and binding procurement targets for each EU member state using harmonized definition what a clean-vehicle is. The notion of clean-vehicle is principally aligned with aim of the Taxonomy and the proposed Art 6.1.c (above). The transition element is also built into the CVD. The relevant definitions for light duty vehicles are aligned with the post-2020 CO_2 Regulation for cars and vans. Taken together, these two pieces of EU legislation reflect the latest thinking on ambitious and sufficiently mature performance metrics. The potential for synergies is significant when the	

Taxonomy is aligned to the legislative thresholds for clean vehicles. It will reduce market uncertainty in terms of what are green vehicles to manufacture and operate- both from the demand and supply side. Procedure 2017/0291(COD) – Clean Vehicles Directive https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?lang=&reference=2017/0291(COD) https://eur-lex.europa.eu/procedure/EN/2017_291?uri=PROCEDURE:2017_291 Life-cycle and well-to-wheel considerations for thresholds is pending on the feasibility to develop and agree a common Union methodology: The Clean Vehicles Directive acknowledges that life-cycle and well-to-wheel emission are to be addressed at a later point in time (recital 31): The possible reflection of life cycle CO2 emissions and of well-to-wheel CO2 emissions of vehicles for the period after 2030 should be considered taking into account relevant provisions of Union law for their calculation at that point in time. By 31 December 2027, the Commission should review the implementation of Directive 2009/33/EC. In its review the Commission should also assess, inter alia, the possibility of aligning this Clean Vehicles Directive to any methodology for counting life-cycle CO2 emissions and well-to-wheel CO2 emissions developed in the context of EU vehicle CO2 emission performance standards. The new CO2 Regulation for cars and vans (EU) 2019/631 mandates in Art. 7 (10) that: The Commission shall no later than 2023 evaluate the possibility of developing a common Union methodology for the assessment and the consistent data reporting of the full life-cycle CO2 emissions of light duty vehicles that are placed on the Union market. The Commission shall transmit that evaluation, including where appropriate proposals for follow-up measures, such as legislative proposals, to the European Parliament and the Council.
Do no significant harm assessment
Key environmental aspects to be considered for investments on passenger cars and light commercial vehicles are the following: • Direct emissions to air from the exhaust gases of internal combustion engine: nitrogen oxides (NOx), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), carbon monoxide (CO), particulate matter (PM) and particle number, and from tyre abrasion and brakes friction and noise emissions • Indirect emissions to air from the production of fuels and energy carriers. However, this is out of the control of vehicles manufacturers and operators. • Waste generation (hazardous and non-hazardous) during maintenance and end-of-life of the vehicle. The manufacture of vehicles, particularly batteries, is part of the scope of the sub-group "Manufacture of low carbon transport vehicles, equipment and infrastructure"

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:

	• considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	• Compliance with EU and national legislation on hazardous waste generation, management and treatment. • Compliance with Directive 2000/53/EC ("End-of-life of vehicles Directive")
(5) Pollution	• Vehicles must comply with a Real driving emission (RDE)[363] performance which is at the most equal to 0.8 times the Euro 6 limit values[364] for NOx and PN • Tyres must comply with the (revised) Tyre labelling regulation[365]. It includes noise labelling requirements but not requirements on tyre abrasion. However, the proposal of revision envisages a test method to be developed: *A suitable testing method to measure tyre abrasion is not currently available. Therefore, the Commission should mandate the development of such a method, taking into full consideration all state-of-the-art internationally developed or proposed standards or regulations, with a view to establishing a suitable testing method as soon as possible.* • Tyres must comply with the noise requirements set by Regulation (EC) No 661/2009 on type-approval requirements for the general safety of motor vehicles[366]. • Vehicles must comply with Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems[367].

[363] Declared maximum Real driving emission (RDE) values of particles (PN) in #/km and nitrogen oxides (NOx) in mg/km as reported in point 48.2 of the Certificate of Conformity, as described in Annex IX of Directive 2007/46/EC for both complete and urban RDE trips.

[364] The applicable emission limit found in Annex I of Regulation (EC) 715/2007, or its successors

[365] Revision of the Tyre labelling regulation, https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3509962_en

[366] Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor

[367] Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems

(6) Ecosystems	

24.6 Freight transport services by road

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.4.1
Description	**Freight transport services by road**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction.
Metric	CO_2 emissions per vehicle kilometre (gCO2/km) or gCO2/KWh.
Threshold	• Zero direct emission heavy-duty vehicles that emits less than 1g CO2/kWh (or 1g CO2/km for certain N2 vehicles) are automatically eligible; • Low-emission heavy-duty vehicles with specific direct CO2 emissions of less than 50% of the reference CO2 emissions of all vehicles in the same sub-group are eligible. • Dedicated vehicles solely using advanced biofuels or renewable liquid and gaseous transport fuels of non-biological origin as defined in Art. 2 (34) and Art. 2 (36) as well as certified low-ILUC biofuels in line with Directive (EU) 2018/2001), guaranteed either by technological design or ongoing monitoring and verification. In addition, for an investment in new vehicles to be eligible, the transport operator must demonstrate that investment in more fuel-efficient alternative vehicles is not economically viable. Eligibility should be reviewed in 2025. • Fleets of vehicles dedicated to transport fossil fuels or fossil fuels blended with alternative fuels are not eligible.
Rationale	
This activity includes operation of vehicles classified as N2 and N3 vehicles, as defined by REGULATION (EU) 2018/858 Zero direct emission vehicles and vehicles with low and reducing emission intensities contribute substantially to climate mitigation and are aligned with Article 6. 1. (c) increasing clean or climate-neutral mobility, and Article 6. 1. (f) phasing out anthropogenic emissions of greenhouse gases, including from fossil fuels Zero direct emissions vehicles (e.g. electric, hydrogen) is eligible because: - the generation of the energy carriers used by zero direct emissions transport is assumed to become low or zero carbon in the near future (for instance, in the scenario called EUCO 3038 that meets the EU targets in the clean energy package, 70% of electricity in the EU is generated from decarbonised sources in 2030). Key reference point for thresholds: Heavy Duty CO_2 Regulation Procedure 2018/0143(COD) https://oeilm.secure.europarl.europa.eu/oeil-mobile/fiche-procedure/2018/0143(COD) https://eur-lex.europa.eu/procedure/EN/2018_143?uri=PROCEDURE:2018_143	

-zero emission heavy-duty vehicle means a heavy-duty vehicle without an internal combustion engine, or with an internal combustion engine that emits less than 1g CO_2/kWh (or 1g CO_2/km for certain N2 vehicles) -Low-emission heavy-duty vehicle means a heavy-duty vehicle, which is not a zero emission heavy-duty vehicle, with specific CO_2 emissions of half of the reference CO_2 emissions of all vehicles in the sub-group to which the heavy-duty vehicle belongs. The reference CO_2 emissions shall be based on the monitoring data reported pursuant to Regulation (EU) 2018/956 for the period from 1 July 2019 to 30 June 2020. Life-cycle and well-to-wheel considerations for thresholds is pending on the feasibility to develop and agree a common Union methodology: Heavy Duty CO_2 Regulation Recital (42)[368]: It is important to assess the full life-cycle emissions from heavy-duty vehicles at EU level. To this end the Commission should no later than 2023 evaluate the possibility of developing a common Union methodology for the assessment and the consistent data reporting of the full life-cycle CO2 emissions of heavy-duty vehicles that are placed on the Union market. The Commission should adopt follow-up measures, including, where appropriate, legislative proposals. By contrast to light duty vehicles, the electrification of trucks is currently limited to small demonstration fleets. Especially for heavy trucks for regional and long-haul operations, fuel substitution to advanced biofuels and renewable synthetic fuels are considered a relevant mitigation option in the medium term[369].	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the operation of freight road transport are summarised as follows: • Direct emissions to air from the exhaust gases of internal combustion engine: nitrogen oxides (NOx), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), carbon monoxide (CO), particulate matter (PM) and particle number, and from tyre abrasion and brakes friction and noise emissions . • Waste generation (hazardous and non-hazardous) during maintenance and end-of-life of the vehicle.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation.

368 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=consil:ST_8444_2019_INIT

369 https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

	The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	• Compliance with EU and national legislation on hazardous waste generation, management and treatment. • Compliance with Directive 2000/53/EC ("End-of-life of vehicles Directive")
(5) Pollution	• Vehicles must comply with a real driving emission (RDE) performance which is in line with Euro VIE limit values for NOx and PM. • Tyres must comply with the (revised) Tyre labelling regulation[370]. It includes noise labelling requirements but not requirements on tyre abrasion. However, the proposal of revision envisages a test method to be developed: *A suitable testing method to measure tyre abrasion is not currently available. Therefore, the Commission should mandate the development of such a method, taking into full consideration all state-of-the-art internationally developed or proposed standards or regulations, with a view to establishing a suitable testing method as soon as possible.* • Tyres must comply with the noise requirements set by Regulation (EC) No 661/2009 on type-approval requirements for the general safety of motor vehicles[371]. • Vehicles must comply with Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems[372].
(6) Ecosystems	

[370] Revision of the Tyre labelling regulation, https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3509962_en

[371] Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor

[372] Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems

24.7 Interurban scheduled road transport

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H49.3.9
Description	**Interurban scheduled road transport services of passengers**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction
Metric	CO_2e emissions per passenger- kilometre (gCO_2e/pkm).
Threshold	• Zero tailpipe emission vehicles (incl. hydrogen, fuel cell, electric) are automatically eligible. • Dedicated vehicles solely using advanced biofuels or renewable liquid and gaseous transport fuels of non-biological origin as defined in Art. 2 (34) and Art. 2 (36) as well as certified low-ILUC biofuels in line with Directive (EU) 2018/2001), guaranteed either by technological design or ongoing monitoring and verification. In addition, for an investment in new vehicles to be eligible, the transport operator must demonstrate that investment in more fuel efficient alternative vehicles is not economically viable. Eligibility should be reviewed in 2025. • Other vehicles are eligible if direct emissions are below 50 gCO_2e
Rationale	
The threshold of 50 gCO_2e/pkm until 2025 ensures that the carbon intensity remains similar to criteria for eligible road vehicles with low occupation factor (50 gCO_2/vkm) and significantly lower than average diesel car (290 gCO2/vkm[373]). Unlike urban buses, zero tailpipe emission vehicle technologies are not commercially available, therefore the threshold should be reviewed in or prior to 2025, rather than specifying now that only zero direct emissions will be eligible at that point, to analyze the modal shift comparison with cars in interurban transport, and technology developments in the sector. With no commercial availability of zero tailpipe emission vehicles for this activity, fuel substitution to advanced biofuels and renewable synthetic fuels are considered a relevant mitigation option for some transport modes in the medium term as identified in the EC Long term strategy[374]: “for those transport modes where the deployment of zero emission vehicles is unfeasible due to energy density requirements or technology costs, carbon neutral fuels (i.e. advanced biofuels and biomethane, as well as e-fuels) can be deployed for use in conventional vehicle engines”.	
Do no significant harm assessment	

[373] The factor represents urban operational emissions for the current average car in the vehicle stock (weighting the share of diesel, petrol, LPG, CNG, hybrid in the fleet). It does not represent emissions of new vehicles. Source: COPERT data for different vehicle types and COPERT data for annual utilization, to obtain 3.35 MJ/vkm. 88.87 gCO2/MJ.

[374] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

<table>
<tr><td colspan="2">The main potential significant harm to other environmental objectives from the operation of interurban scheduled road transport services of passengers are summarized as follows:
• Direct emissions to air from the exhaust gases of internal combustion engine[375]: nitrogen oxides (NOx), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), carbon monoxide (CO), particulate matter (PM) and particle number, and from tyre abrasion and brakes friction and noise emissions[376].
• Waste generation[377] (hazardous and non-hazardous) during maintenance and end-of-life of the vehicle.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.

The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.

A2: Supporting system adaptation.

The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td></td></tr>
<tr><td>(4) Circular Economy</td><td>• Compliance with EU and national legislation on hazardous waste generation, management and treatment.
• Compliance with Directive 2000/53/EC ("End-of-life of vehicles Directive")</td></tr>
<tr><td>(5) Pollution</td><td>• Buses must comply with a real driving emission (RDE) performance which is in line with Euro VIE limit values for NOx and PN;
• Tyres must comply with the (revised) Tyre labelling regulation. It includes noise labelling requirements but not requirements on tyre</td></tr>
</table>

[375] 375 Promotion of clean and energy-efficient road transport vehicles Directive (http://www.europarl.europa.eu/doceo/document/TA-8-2019-0427_EN.html?redirect), EU GPP criteria for road transport (http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

[376] Indirect emissions to air from the production of fuels and energy carriers are a further impact, however, one that is out of the control of vehicles manufacturers and operators.

[377] EU Waste legislation: Directive 2008/98/EC, Decision 2000/532/EC (http://ec.europa.eu/environment/waste/hazardous_index.htm), ELV Directive 2000/53/EC (http://ec.europa.eu/environment/waste/elv/index.htm)

	abrasion. However, the proposal of revision envisages a test method to be developed: A suitable testing method to measure tyre abrasion is not currently available. Therefore, the Commission should mandate the development of such a method, taking into full consideration all state-of-the-art internationally developed or proposed standards or regulations, with a view to establishing a suitable testing method as soon as possible. • Tyres must comply with the noise requirements set by Regulation (EC) No 661/2009 on type-approval requirements for the general safety of motor vehicles. • Vehicles must comply with Regulation (EU) No 540/2014 on the sound level of motor vehicles and of replacement silencing systems.
(6) Ecosystems	

24.8 Inland passenger water transport

Sector classification and activity	
Macro-Sector	H – Transport and storage
NACE Level	4
Code	H50.3.0
Description	**Inland passenger water transport**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction
Metric	CO_2e emissions per passenger kilometre (gCO_2e/pkm)
Threshold	- Zero direct emissions inland waterway vessels are eligible. - Dedicated vessels solely using advanced biofuels or renewable liquid and gaseous transport fuels of non-biological origin as defined in Art. 2 (34) and Art. 2 (36) as well as certified low-ILUC biofuels in line with Directive (EU) 2018/2001), guaranteed either by technological design or ongoing monitoring and verification. In addition, for an investment in new vehicles to be eligible, the transport operator must demonstrate that investment in more fuel-efficient alternative vehicles is not economically viable. Eligibility should be reviewed in 2025. - Other Inland waterways vessels are eligible if direct emissions are below 50 gCO_2e/pkm. Eligibility should be reviewed in 2025.
Rationale	
The threshold of 50gCO2e/pkm relates to the thresholds set for road passenger vehicles and passenger rail. If inland passenger water transport operations can at least match the thresholds of those modes, it is deemed to be making a substantial contribution as it offers significantly lower emissions than average car emissions. The threshold should be reviewed in or prior to 2025, rather than specifying now that only zero direct emissions will be eligible at that point, to analyse the modal shift comparison with cars, and technology developments in the sector. With limited availability of zero tailpipe emission fleets for this activity, fuel substitution to advanced biofuels and renewable synthetic fuels are considered a relevant mitigation option for some transport modes in the medium term as identified in the EC Long term strategy[378]	
Do no significant harm assessment	
The main potential significant harm to other environmental objectives from the operation of inland passenger and freight water transport are summarised as follows: • Direct emissions to air of carbon oxide (CO), hydrocarbons (HC), nitrogen oxides (NOx), and particulate matter (PM), as well as noise emissions379. • Waste generation (hazardous and non-hazardous) during maintenance and end-of-life of the vessel.	

[378] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

[379] Indirect emissions to air from the production of fuels and energy carriers are a further impact, however, one that is out of the control of vehicles manufacturers and operators.

• Direct and indirect emission of pollutants in water.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For any activity that leads to direct or indirect emission of pollutants into water, ensure that it is in accordance with the environmental objectives of Directive 2000/60/EC[380], Art. 4(1).
(4) Circular Economy	• Compliance with EU and national legislation on hazardous waste generation, management and treatment[381]. Compliance with Regulation 1257/2013[382] ("Ship recycling Regulation")
(5) Pollution	Vessels must comply with latest applicable standards (currently stage V) of Non-Road Mobile Machinery Regulation[383] (including vessels meeting stage V without type-approved solutions such as through after-treatment).
(6) Ecosystems	

[380] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[381] EU Waste legislation: Directive 2008/98/EC, Decision 2000/532/EC, http://ec.europa.eu/environment/waste/hazardous_index.htm

[382] Regulation (EU) No 1257/2013 of the European Parliament and of the Council of 20 November 2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC

[383] Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery, amending Regulations (EU) No 1024/2012 and (EU) No 167/2013, and amending and repealing Directive 97/68/EC.

24.9 Inland freight water transport

Sector classification and activity	
Macro-Sector	H - Transport and storage
NACE Level	4
Code	H50.4.0
Description	**Inland freight water transport**
Mitigation criteria	
Principle	Demonstrate substantial GHG emission reduction.
Metric	CO_2e emissions per passenger kilometre (gCO_2e/tkm).
Threshold	• Zero direct emissions inland waterways vessels are eligible. • Dedicated vessels solely using advanced biofuels or renewable liquid and gaseous transport fuels of non-biological origin as defined in Art. 2 (34) and Art. 2 (36) as well as certified low-ILUC biofuels in line with Directive (EU) 2018/2001), guaranteed either by technological design or ongoing monitoring and verification. In addition, for an investment in new vehicles to be eligible, the transport operator must demonstrate that investment in more fuel-efficient alternative vehicles is not economically viable. Eligibility should be reviewed in 2025. • Other inland waterway vessels are eligible if direct emissions per tkm are 50% lower than the average reference value defined for HDVs (Heavy Duty CO_2 Regulation). Eligibility should be reviewed in 2025. • Vessels that are dedicated to the transport of fossil fuels or any blended fossil fuels are not eligible even if meeting the criteria above
Rationale	
The threshold of 50% of the HDV reference value relates to the thresholds set for road freight vehicles and freight rail. If inland freight water transport operations can at least match the thresholds of those modes, it is deemed to be making a substantial contribution as it is significantly lower emissions than average road freight emissions. The threshold should be reviewed in or prior to 2025, rather than specifying now that only zero direct emissions will be eligible at that point, to analyze the modal shift comparison with cars, and technology developments in the sector. Transport of fossil fuels is considered to have potential negative impacts on climate change and therefore is excluded. With limited availability of zero tailpipe emission fleets for this activity, fuel substitution to advanced biofuels and renewable synthetic fuels are considered a relevant mitigation option for some transport modes in the medium term. The EC Long term strategy[384].	
Do no significant harm assessment	

[384] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

<table>
<tr><td colspan="2">The main potential significant harm to other environmental objectives from the operation of inland passenger and freight water transport are summarised as follows:
• Direct emissions to air of carbon oxide (CO), hydrocarbons (HC), nitrogen oxides (NOx), and particulate matter (PM), as well as noise emissions[385].
• Waste generation (hazardous and non-hazardous) during maintenance and end-of-life of the vessel.
• Direct and indirect emission of pollutants in water.</td></tr>
<tr><td>(2) Adaptation</td><td>A1: Reducing material physical climate risks.
The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:
• considers both current weather variability and future climate change, including uncertainty;
• is based on robust analysis of available climate data and projections across a range of future scenarios;
• is consistent with the expected lifetime of the activity.
A2: Supporting system adaptation.
The economic activity must not adversely affect adaptation efforts of others. This means:
• The activity does not lead to increased climate risks for others or hamper adaptation elsewhere
• The activity is consistent with sectoral, regional, and/or national adaptation efforts.</td></tr>
<tr><td>(3) Water</td><td>• For any activity that leads to direct or indirect emission of pollutants into water, ensure that it is in accordance with the environmental objectives of Directive 2000/60/EC386, Art. 4(1).</td></tr>
<tr><td>(4) Circular Economy</td><td>• Compliance with EU and national legislation on hazardous waste generation, management and treatment387.
• Compliance with Regulation 1257/2013388 ("Ship recycling Regulation")</td></tr>
</table>

[385] Indirect emissions to air from the production of fuels and energy carriers are a further impact, however, one that is out of the control of vehicles manufacturers and operators.

[386] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[387] EU Waste legislation: Directive 2008/98/EC, Decision 2000/532/EC, http://ec.europa.eu/environment/waste/hazardous_index.htm

[388] Regulation (EU) No 1257/2013 of the European Parliament and of the Council of 20 November 2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC

(5) Pollution	• Vessels must comply with latest applicable standards (currently stage V) of Non-Road Mobile Machinery Regulation389 (including vessels meeting stage V without type-approved solutions such as through after-treatment).
(6) Ecosystems	

[389] Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery, amending Regulations (EU) No 1024/2012 and (EU) No 167/2013, and amending and repealing Directive 97/68/EC.

24.10 Construction of water projects

<table>
<tr><th colspan="2">Sector classification and activity</th></tr>
<tr><td>Macro-Sector</td><td>F - Construction</td></tr>
<tr><td>NACE Level</td><td>4</td></tr>
<tr><td>Code</td><td>F42.9.1</td></tr>
<tr><td>Description</td><td>Infrastructure for low carbon transport - water including the following category:
• Construction of water projects</td></tr>
<tr><th colspan="2">Mitigation criteria</th></tr>
<tr><td>Principle</td><td>Demonstrate substantial GHG emission reduction.</td></tr>
<tr><td>Metric</td><td>CO_2e emissions per passenger-kilometre or per tonne-kilometre (gCO_2e/pkm or gCO_2e/tkm).</td></tr>
<tr><td>Threshold</td><td>The construction and operation of transport infrastructure is eligible in the following cases:
1. Infrastructure that is required for zero direct emissions water transport (e.g. batteries or hydrogen fuelling facilities) is eligible
2. Infrastructure dedicated to supporting the renewable energy sector
3. Infrastructure that is predominantly used for low-carbon transport is eligible if the fleet that uses the infrastructure meets the thresholds for direct emissions as defined in the relevant activity (the biofuels criteria does not apply here as it is not possible to monitor)
For all cases:
• Only infrastructure that is fundamental to the operation of the transport service is eligible.
• Infrastructure that is dedicated to the transport of fossil fuels or blended fossil fuels is not eligible</td></tr>
<tr><th colspan="2">Rationale</th></tr>
<tr><td colspan="2">The construction and operation of infrastructure for low carbon water transport is considered eligible because this is considered a key enabling factor for improving the uptake of the activities considered eligible under the rest of the water transport section of the Taxonomy.
Criteria 2 is a supply chain activity for renewable energy. It includes for example port facilities dedicated to supporting the offshore wind power sector.
It is acknowledged that embedded carbon emissions in infrastructure projects (e.g. upstream emissions from manufacture of construction materials) can be significant. The level of uncertainty around data in this respect makes it challenging at this time to incorporate this consideration within thresholds for infrastructure. However, this element should be considered for ongoing work on the Taxonomy.
Transport of fossil fuels is considered to have potential negative impacts on climate change and therefore is excluded.</td></tr>
<tr><th colspan="2">Do no significant harm assessment</th></tr>
</table>

The main potential significant harm to other environmental objectives from water infrastructure activities are attributed to the alteration of hydromorphology due to dredging, maintenance activities and construction of new infrastructures and waterways, as well as impact on biodiversity and ecosystems from such activities.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	For any activity that leads to direct or indirect emission of pollutants into water, ensure that it is in accordance with the environmental objectives of Directive 2000/60/EC[32], Art. 4(1)..
(4) Circular Economy	Re-use parts and use recycled material during the renewal, upgrade and construction of water projects. At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list) generated on the construction site must be prepared for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials. This can be achieved by executing the construction works in line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[390].
(5) Pollution	Minimise noise, vibration, dust, pollutant emissions during construction / maintenance works.
(6) Ecosystems	Projects likely to affect designated protected areas, or areas of high nature and biodiversity value and vulnerability including UNESCO World Heritage and Key Biodiversity Areas (KBAs) may be implemented only if the Environmental Impact Assessment and the appropriate assessment conducted in compliance with the

[390] EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

	provisions of the EU Habitats[391] and Birds[392] Directives (or other analogous provisions in case of non-EU countries) have concluded that the infrastructure will not adversely affect the integrity of the site, and all necessary mitigation measures are in place to reduce the impacts on species and habitats.

[391] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

[392] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

25. Information and communication

Why information and communication (ICT) is included in the Taxonomy

Analysis by the European Commission's Joint Research Centre (JRC) on the EU ICT sector[393], based on 2015 data, assesses that its value added amounted to 581 billion euros. It employed 5.8 million people, spent 30 billion euros on research and development (R&D), and represented 3.9% of the EU value added, 2.5% of total employment, and 15.7% of total R&D. The ICT service sector in particular represented 3.6% of GDP. In general, the ICT sector in 2015 was more dynamic than the whole EU economy, as value added increased 5.2%, employment 1.8% and R&D 2.9%.

However, based on the estimates published by the 'European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector'[394] ICT currently accounts for 8-10% of European electricity consumption and up to 4% of its carbon emissions.

Subjects covered

The analysis carried out here focuses on NACE sector J, Information and Communication, which does not include electronics manufacturing. The TEG has analysed the sector from two angles:

1. Mitigation potential associated with high-emitting ICT sectors ('greening of'): data centres, telecommunication networks, and software;
2. Enabling potential of digitalisation solutions ('greening by'): data-driven solutions for GHG emissions reductions and context-specific digitalisation solutions for resource efficiency.

Setting criteria and thresholds

Data centres

The JRC has estimated the total annual energy consumption of data centres in Western Europe as 56 TWh (or 2% of the total electricity consumption) per year. In 2012, this was projected to increase to 104 TWh (or 4%) per year by 2020. The extensive consumption of energy is due to the need for the permanent storage of data (24-hour availability, back-up generators, etc.) and the need to cool the servers and other equipment to maintain optimal operating temperatures.[395]

Considering this economic activity's dependence on electricity, in a long-term scenario of decarbonized but limited energy from the grid, the sector mitigation potential has been identified in high standards of energy efficiency rather than low carbon footprints.

Given the complexity of data centres, which encompass hardware, software, heating and cooling systems, monitoring and back-up energy systems, to name only a few components, and the trade-offs that are present in the industry between energy efficiency and reliability and security, the TEG has opted for a comprehensive approach. It set as a 'threshold' for significant contribution to mitigation data centre compliance with the most advanced standard of energy efficiency available for this sector, the ' 'Best

[393] JRC (2018), 2018 PREDICT Key Facts Report, available at http://publications.jrc.ec.europa.eu/repository/bitstream/JRC112019/jrc112019_2018_predict_key_facts_report.pdf

[394] https://ictfootprint.eu/en/about/ict-carbon-footprint/ict-carbon-footprint.

[395] JRC (2016), Best Environmental Management Practice in the Telecommunications and ICT Services Sector, available at http://susproc.jrc.ec.europa.eu/activities/emas/documents/TelecomICT_BEMP_BackgroundReport.pdf.

Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency' (JRC), updated every year by the Commission to account for technological advances.[396]

Data-driven solutions for GHG reductions

Despite their almost negligible contribution to the economy, data-driven solutions for data collection, transmission and modelling of GHG emissions reduction information plays an important enabling role. Given the nature of the activity, no thresholds are necessary.

Next steps

Further work was performed by the TEG in the following areas but not completed. This work should be resolved as soon as possible by the TEG or the future Platform on Sustainable Finance.

Telecommunications networks

The IEA[397] estimates that networks consume slightly less energy (e.g. 185 TWh in 2015) than data centres (e.g. 194 TWh in 2014) globally, and posits high uncertainty for energy consumption trajectories for networks, with scenarios varying between a growth of 70% or a decline of 15% by 2021 depending on trends in energy efficiency.

To ensure a significant contribution to climate change mitigation, the TEG has considered setting a threshold in terms of energy efficiency for each type of network, based on environmental and energy efficiency standards as set by the European Telecommunications Standards Institute (ETSI)[398], which fully take into account the complexity and diversity of telecommunications networks. The recommended threshold would be set at the top 10%, meaning that only the networks belonging to the top decile in their category for energy efficiency would qualify as Taxonomy-eligible.

Software

The energy efficiency of software and programming languages is an emerging area of research which is starting to gain the attention of academics.[399] The TEG recommends that the Commission develop a code of conduct (similar to the one published for data centres) to ensure that best practices are identified and standards adopted by the software industry.

Context-specific digitalisation solutions for resource efficiency

Defined as development and/or use of integrated systems (e.g. the combination of software and hardware, or software applications that minimize resource consumption in other sectors of the economy), these digitalisation solutions are essential to ensure that other sectors of the economy (agriculture,

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[396] The 2019 version is available at https://e3p.jrc.ec.europa.eu/publications/2019-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency.

[397] IEA (2017), Digitalization & Energy, available at http://www.iea.org/digital/.

[398] See for examples *Operational Energy Efficiency for Users (OEU); Technical Global KPIs for Fixed Access Networks* (ETSI), available at https://www.etsi.org/deliver/etsi_gs/OEU/001_099/012/01.01.01_60/gs_OEU012v010101p.pdf; or the ETSI ES 203 228 V1.2.1 (2017-04): Environmental Engineering (EE); Assessment of mobile network energy efficiency (ETSI), available at https://www.etsi.org/deliver/etsi_es/203200_203299/203228/01.02.01_60/es_203228v010201p.pdf.

[399] See for examples Pereira et al. (2017), 'Energy efficiency across programming languages', available at http://greenlab.di.uminho.pt/wp-content/uploads/2017/09/paperSLE.pdf.

energy, transport, buildings, etc.) meet the eligibility criteria set for other sectors' inclusion in the EU Taxonomy.

Examples include:

- Transport: Electric vehicle smart charging to manage EV charging stations and leverage the extra storage capacity connected to the grid.
- Agriculture: Precision agriculture digital solutions allow, for example, for the right amount of water for irrigation or fertiliser use.
- Energy: Innovative grid equipment (e.g. short circuit breakers) ensure security in grids with growing decentralised renewable production.

25.1 Data processing, hosting and related activities

Sector classification and activity	
Macro-Sector	J – Information and communication
NACE Level	4
Code	J63.1.1
Description	Storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of diversity of data through data centres Data centres include the following equipment: • ICT equipment and services; • cooling; • data centre power equipment; • data centre building; • monitoring systems:
Mitigation criteria	
Principle	Data centres implementing a comprehensive set of energy efficiency practices are considered to make a substantial contribution to climate change mitigation
Metric	Implementation of the practices described in the most recent "Best Practice Guidelines for the European Code of Conduct for Data Centre Energy Efficiency " (JRC)
Threshold	The data centre complies with the European Code of Conduct for Data Centre Energy Efficiency
Rationale	
Rationale for energy efficiency versus emission reduction as mitigation principle: low or zero emissions can be achieved by sourcing electricity from renewable sources, from the grid or on site. Given the mounting competition for renewable energy, an expected greening of the energy system, and the exponential projected growth of electricity consumption deriving from the digitalisation of the economy, inclusion in the Taxonomy will only depend on energy efficiency. Reference standard: *2019 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency* (JRC) available at https://e3p.jrc.ec.europa.eu/publications/2019-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency This EU code of conduct is also the basis for the CEN/CENELEC documents CLC TR50600-99-1 and CLC TR50600-99-2 (on data centre energy efficiency and data centre environmental sustainability respectively).	
Do no significant harm assessment	
This assessment has not yet been completed for the ICT sector.	
(2) Adaptation	
(3) Water	

(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	

25.2 Data-driven solutions for GHG emissions reductions

Sector classification and activity	
Macro-Sector	J – Information and communication
NACE Level	2 and 4
Code	J61, J62, J63.1.1
Description	Development and/or use of ICT solutions that are exclusively aimed at collecting, transmitting, storing data and at its modelling and use when these activities are aimed at the provision of data and analytics for decision making (by the public and private sector) enabling GHG emission reductions.
Mitigation criteria	
Principle	Data-driven solutions for GHG emission reductions are considered to make a substantial contribution to climate change mitigation because of the emissions reductions they enable
Metric	
Threshold	
Rationale	
• The option to adopt a threshold for multi-purpose solutions (eg. "50% of activity has to be applied to climate change") has been considered but turned down not to incur behavioural issues (related to the lack of control over the use of the data and analytics by the end user) • The mix of NACE codes (telecommunication, software and data processing) is necessary to keep the category open to solutions that will emerge in the future • Exclusive use of data for climate change mitigation purposes is deemed sufficient to prove significant mitigation contribution and avoid application of thresholds. • Example: Advanced weather forecasting models tailored to integrating more renewables in electricity generation. Digital technologies, such as machine-learning algorithms, when applied to weather and power plant output data, can increase the accuracy of renewable forecasts to up to 94%, from around 88% across the industry	
Do no significant harm assessment	
This assessment has not yet been completed for the ICT sector.	
(2) Adaptation	
(3) Water	
(4) Circular Economy	
(5) Pollution	
(6) Ecosystems	

26. Construction, Real estate activities

26.1.1 Why construction and real estate are addressed in the Taxonomy

In the EU, buildings are effectively the largest energy consuming sector, responsible for around 40% of energy consumption and 36% of carbon emissions.[400] Three-quarters of the European building stock is considered inefficient, but renovation rates remain very low, around 1% per year. Annual rates of new construction resulting in buildings with higher performance levels differ across EU Member States but are generally estimated to be around 1-2%, clearly inadequate to set the whole sector on a zero-emissions pathway.[401]

Given that building emissions are heavily dependent on the carbon intensity of the grid, the TEG acknowledges that it is necessary to look at both energy demand and GHG emissions as metrics to evaluate a building's performance. However, feedback received through consultation with financial institutions and developers has shown that, in practice, the majority are not ready to use GHG emissions metrics to assess the performance of their activities and assets. Against this background, the TEG has decided to adopt a transitional approach based on the initial decision to use energy metrics, which will be extended to include GHG emissions once sufficient data for the latter is available.

The TEG acknowledges that sector emissions are not only caused throughout a building's operational phase but that significant emissions are generated during the extraction, manufacture and transport of building materials, as well as during the construction process and through the end-of-life demolition process. Due to current whole life cycle GHG emissions data constraints, the TEG chose to focus on the operational phase. However, the TEG strongly recommends the establishment of additional GHG emissions thresholds once more robust data becomes available.

Subjects covered

The TEG has focused on four individual economic activities, enabling the Taxonomy to establish mitigation criteria that are consistent with and relevant to a large group of real estate market participants and can maximise investment flows to mitigation actions within the building sector. Consistency of the criteria across the four activities should be maintained once absolute thresholds are established.

Economic activities

1. Construction of new buildings: This activity covers real estate development and enables accounting project capital expenditures of construction clients and the equity/revenues of developers and construction companies as eligible under the Taxonomy.
2. Renovation of existing buildings: This activity includes both relative improvements (30% against baselines) and comprehensive interventions on buildings and enables accounting project capital expenditure of renovation clients (including renovation costs unrelated to energy efficiency measures) and the equity/revenues of renovation companies as eligible under the Taxonomy.
3. Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities: This activity covers a) single technical interventions, enabling the accounting of project capital expenditure of clients (including only costs related to the eligible measures) and the equity/revenues of installation companies; and b) services functional to building performance improvement, enabling the accounting of project capital expenditure of clients and the equity/revenues of companies offering such services as eligible under the Taxonomy.

[400] https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings.

[401] https://ec.europa.eu/energy/en/eu-buildings-database.

4. Acquisition and ownership of buildings: This activity covers the purchase of buildings, building ownership and improvement from an asset perspective and enables accounting project capital expenditure (related to the acquisition) and the revenues/equity of the owner as eligible under the Taxonomy. This activity covers portfolios and real estate trusts.

The criteria established for building acquisitions follow the same rationales as the construction of new buildings and the renovation of existing ones. Future iterations of the Taxonomy should maintain this alignment within building-related activities and the associated level of ambition by updating the criteria for building acquisitions in accordance with the changes that will be introduced in the criteria for new construction and renovation.

Setting criteria and thresholds

As a principle, the TEG agreed that the Taxonomy should recognise energy- and resource-efficient and low-GHG emission buildings as eligible under the mitigation criteria, considering as a minimum benchmark the top performing 15% of the stock as representative of the best level of energy and resource efficiency that can be achieved in a local context. To reflect the level of ambition for the Taxonomy, this percentage will subsequently be tightened to set the sector on a net-zero carbon trajectory by 2050.

The TEG has faced several challenges setting criteria for the buildings sector:

1. The lack of consistent data across countries for benchmarking building stock performance and for setting suitable thresholds for the ‘best in class’ top performing layer of the stock.
2. The inherent difficulty of creating a level playing field across countries with different climates and degrees of market readiness.
3. Barriers to the establishment of transitional thresholds that will work across Member States, cognisant of varying levels of ambition and rigor regarding the implementation of NZEBs and EPCs.
4. The need to find a compromise between ambition and the desire to build upon already existing ‘green’ financing instruments.
5. The current inability of significant parts of the market to operate with GHG emission metrics.

Against this background, for the time being the TEG chose to adopt existing EU policy instruments as proxies for thresholds and metrics. It recommends reviewing these thresholds as soon as possible and undertaking work to establish suitable absolute thresholds for each EU Member State as soon as possible.

Considering the practical implications in demonstrating Taxonomy eligibility, DNSH criteria have been established to ensure minimum safeguards across the building life cycle by adopting EU and international standards.

Market coverage

With the exception of buildings related to fossil fuel activities, the Taxonomy does not exclude any building or renovation type, and therefore covers virtually the whole market for construction and real estate activities. This does not mean that every activity will be eligible, only that any participant in the market can be eligible. In its current formulation, the Taxonomy criteria will impact EU Member States differently and the share of the market eligible under the Taxonomy criteria will vary from location to location due to the varying levels of ambition underlying NZEB requirements and EPC ratings. In practice, this means that during the transitional period, meeting the eligibility criteria would be easier for some Member States. However, once absolute thresholds are identified through benchmarking the performance

of the top 15% of each national building stock, a more consistent level of ambition can be established across all Member States.
Outside the EU, the share of the market that could be eligible will also vary from country to country. Countries with ambitious building regulations that are accepted as Taxonomy-eligible will more easily be able to make large shares of their market eligible.
However, the 30% improvement rule relative to baseline performance will not only facilitate immediate functionality of the Taxonomy outside the EU, it will also make a significant part of renovation activities eligible, even in countries where national building regulations may not be ambitious enough. In addition, outside the EU, the share of the market that could be eligible will also depend on the local proliferation of Taxonomy-eligible sustainability certification schemes.

Impact of these proposals

Market introduction of the Taxonomy will have both beneficial and adverse effects on the sector. By enabling owners and developers to access dedicated 'green' financial instruments, the Taxonomy will stimulate much needed investment in construction and the acquisition of new efficient buildings as well as the renovation of buildings with lower levels of performance. Market participants who do not upgrade their practices in line with the Taxonomy criteria may lose their competitive edge and ability to brand their economic activities and products as 'green'. The TEG acknowledges the risk of creating stranded assets, but it feels that sufficient safeguards have been included in the criteria to adequately manage this possibility.

In terms of implementation costs, the Taxonomy will affect market participants differently. The Taxonomy eligibility of new construction, renovation and acquisitions can result in additional costs in comparison to business-as-usual practices. Market participants may incur further costs due to the process required to demonstrate eligibility with the Taxonomy thresholds, especially when the latter are based on several technical parameters. However, during the transitional period, several Taxonomy requirements will be de facto requirements in EU Member States and will therefore not induce additional costs. Once absolute thresholds are established by benchmarking the top 15% of the local stock in terms of energy and GHG emissions performance, ancillary costs associated with achieving and demonstrating eligibility may increase.

Overall, considering the importance of ensuring high standards in new construction and the renovation of existing buildings, the impact of implementation costs can be considered proportionate to the goals of the Taxonomy, especially as the successful implementation of the Taxonomy will have significant positive environmental and social impacts. Requiring high standards for new buildings and improving the performance of existing ones will reduce energy bills and improve indoor air quality and thermal comfort, positively impacting occupants' health and available income. Requiring high standards for new construction and renovations will likely stimulate the demand for sustainability professionals and service providers and skilled construction workers, thus providing employment opportunities. The eligibility of individual measures and installation of on-site renewables will also boost the market for low-carbon technologies.

Next steps

The main steps for the future shall be:

- Development of the absolute thresholds for primary operational energy, followed by operational GHG emissions and then eventually embodied GHG emissions.
- Development of additional criteria for the inclusion of operational management of buildings.

26.2 Construction of new buildings

Sector classification and activity	
Macro-Sector	F – Construction
NACE Level	2
Code	F41, F43
Description	**Construction of new buildings**. This relates primarily to activities under NACE codes 'F41.1 - Development of building projects' and "F41.2 - Construction of residential and non-residential buildings", but includes also activities under NACE code "F43 - Specialised construction activities"
Mitigation criteria	
Principle	Construction of energy and resource efficient and low-GHG emission new buildings can make a substantial contribution to climate change mitigation by reducing GHG emissions from the operational and construction phase of the building lifecycle and this should be measured by appropriate indicators of primary energy and GHG emissions both in the operational phase and along the lifecycle (including embodied emissions). The Taxonomy takes a transitional approach by relying on requirements set in current EU policies but with an intention to develop and start using, as soon as possible, absolute thresholds for energy and carbon performance. These thresholds will be based on ambitious performance benchmarks set by building type. It will be ensured that the criteria are always at least as ambitious, as a minimum, as the level of performance of the top 15% of the local building stock and projected to progressively decline to net zero energy and GHG emissions by 2050.
Metric	There is no single specific metrics defined, as the thresholds rely on requirements set in the national regulation and building codes for NZEB transposing the EPBD in each Member State. The calculation methodology for the measurement of floor area (m^2) shall be disclosed with clear definition of what is within boundary.[402]
Threshold	A new building is eligible when it meets national requirements for NZEB and has a level of energy performance equivalent to the EPC rating of B (or above).[403] The appropriateness of such thresholds will be subject to review after publication of a DG ENER study in the autumn of 2019 and further work on the development of absolute thresholds.

402 For measurement of floor area, see International Property Measurement Standards (IPMS): https://ipmsc.org/

403 Where EPC rating B is not defined (e.g. in the case of Poland, Malta and the Belgian region of Flanders), acceptable thresholds for operational energy should be established. The ENEV 2014 equivalent to residential EPC B for Germany is as follows: 50 to 75 kWh/(m2·a). The range for residential EPC B rating in the Belgian region of Flanders is considered 100 to 200 kWh/(m2·a). The range for single family houses EPC B in Poland is considered 60 to 120 kWh/(m2·a). Where thresholds for EPC ratings are not defined, the only requirement to be eligible is the NZEB performance.

	To avoid lock-in and undermining of the climate mitigation objective, the construction of new buildings for the purpose of occupation by fossil fuel extraction, transporting transport of fossil fuels or manufacturing of fossil fuels activities (either for actual extraction, transporting, manufacturing and/or administrative purpose)[404] are excluded. **Eligibility of alternative schemes acting as proxies** If an alternative scheme, such as a commercial sustainability certification scheme or a similar national regulation or requirement in countries outside EU proves the respective scheme meets the performance criteria set in the Taxonomy in a defined location, eligibility for the alternative scheme is accepted as a means to prove eligibility for the Taxonomy criteria.

Rationale

Principle

The principle reflects the fundamental Taxonomy aim of identifying economic activities which contribute substantially to climate change mitigation. The construction sector is responsible for significant GHG emissions, although a large share of these emissions occurs during the operational phase of the product (i.e. the building) and can be considered to fall within Scope 3 from the perspective of construction activities[405]. To minimise future operational emissions, new buildings must be designed to ensure the lowest possible energy demand. For this reason, only new buildings designed to achieve the highest performance, taking into account local climate and market conditions, are eligible for the Taxonomy.

Metric

There is no single specific metrics defined, as the thresholds rely on requirements set in the applicable regulation and building codes transposing the EPBD in each Member State. These requirements are based on the calculated operational primary energy demand as a metric for the assessment of building performance, but the TEG makes a strong recommendation to plan for inclusion of GHG emissions performance in alignment with future EU policies. Therefore, the Taxonomy will consider as eligible the top performing new buildings defined on the basis of, (i) initially, their calculated operational primary energy performance, (ii) after a transitional period, also their GHG emissions performance during the use phase, and later (iii) their GHG emissions performance over the whole life cycle (i.e. including embodied GHG emissions).

Feedback received from TEG members and through consultation with stakeholders has shown that large parts of the construction and financial sectors are not ready to use GHG emissions as building performance metric straightaway due to the lack of available data and shared methodologies for data collection.

There is, however, strong consensus around the need for the sector to move towards operational GHG emissions and eventually, lifecycle operational GHG emissions (including embodied GHG emissions) to align assessment methods with the rest of the Taxonomy and climate change reporting practice.

Against this background, the TEG recommends that the following metrics are considered:

[404] Activities belonging to the following NACE codes: B5.1 - Mining of hard coal; B6 - Extraction of crude petroleum and natural gas; B9.1 - Support activities for petroleum and natural gas extraction; C19 - Manufacture of coke and refined petroleum products

[405] As defined by the GHG Protocol's corporate value chain accounting & reporting standard (WRI and WBCSD, 2013)

- Operational primary energy metric: The annual net primary energy demand during the operational phase of the building life-cycle, i.e. “Phase B6” according to CEN T350, calculated ex-ante according to the national methodologies for asset design assessment as defined in EN 52000, expressed as kWh/m2 per year
- Operational GHG emissions metric: The annual net carbon-equivalent emission rate (Global Warming Potential – GWP100) arising from energy consumption during the operational phase of the building life-cycle, i.e. “Phase B6” according to CEN/TC350, calculated ex-ante for the building “as designed”, and expressed as kgCO2eq/m2 per year.
- Embodied GHG emissions metric: GHG emissions embodied into building materials during production, transportation and construction (modules A1-A5) and end of life (modules C1-C4 and D) according to CEN/TC350, expressed as kgCO2eq/m2.

The TEG is aware of the so-called “performance gap” between energy demand as calculated via building physics modelling and actual energy demand as measured via metering equipment, the latter being strongly influenced by operational management and user behaviour. However, the TEG chooses to base its assessment on calculated primary energy demand rather than measured final energy demand, because during the design and construction stages performance can be assessed only through building physics modelling.

Threshold

A single figure benchmarking the highest performance of new buildings cannot be established because performance levels are largely dependent on building type and climatic conditions. Although some datasets exist, substantial work is necessary to establish a detailed methodology, collect sufficient data and produce consistent figures to benchmark the highest performance of different building types across different locations.

Against this background, for the time being, the TEG chooses to rely on the existing EU policy framework based on EPC ratings and NZEB requirements to provide thresholds for eligibility. During the transitional period, the thresholds provided by EPC rating B and NZEB requirements provide an approximation of the top performing buildings within each EU Member State. However, the TEG is aware that both EPC and NZEB requirements are established differently across Member States, and do not necessarily represent comparable levels of ambition. Therefore, the TEG recommends that the thresholds are reviewed following publication of a dedicated DG ENER study in the second half of 2019 and, if necessary, revised to ensure they continue to represent, as a minimum, the performance of the top 15% performing buildings in the local stock as the main reference to represent “energy and resource efficient and low-GHG emissions buildings”. Absolute thresholds (for operational primary energy as well as operational and embodied GHG emissions metrics) should be set, as a minimum, at the level of performance corresponding to the top 15% of the local stock. For setting such absolute thresholds, it will be necessary to distinguish among building types (at least between residential and non-residential ones) and account for climatic differences. Once established, absolute thresholds for operational GHG emissions should be projected to decline over time and reach zero emissions by 2050, thus providing a dynamic target as well as a clear indication to the market.

Embodied GHG emissions

For highly-efficient new buildings, GHG emissions embodied in building materials and in construction and demolition processes - technically also referred to in standards as embodied GWP or carbon emissions - can represent a significant share of the total carbon emitted along the building lifecycle. However, a number of issues need to be addressed before a future iteration of the Taxonomy can include embodied GHG emissions in the criteria for building performance assessment and provide evidence-based thresholds for this metric. The use of the building bill of materials (kg) was considered as a proxy, but it was felt that it does not strongly enough correlate with embodied carbon or reflect possible choices for less GHG emission-intensive building materials. International standard methodologies to assess building lifecycle emissions exist, and the Level(s) initiative is working to define a shared methodology for EU Member States, but, as yet, there is only limited data that could be used to establish reliable benchmarks for different building typologies. Currently, Environmental Product Declarations (EPDs, regulated by EN 15804:2012+A1:2013) provide figures for GHG emissions embodied in building materials based on Life Cycle Analysis (LCA), and can be combined to produce whole building assessment. However, differences in assessment methods and output formats among EPD issuers pose a significant limitation to the reliability and usability of these certificates. As these issues will be progressively resolved (see also the Product Environmental Footprint being developed under the Single Market for Green Products Initiative), it is envisioned that the reliability and usability of these instruments will be greatly improved.

Against this background, the TEG recommends that for future iterations of the Taxonomy thresholds for embodied GHG emissions for different building typologies based on standardized LCA should be defined. The methodological reference for this work should be the standards developed by the CEN Technical Committee 350 “Sustainability of construction works” and the assessment framework Level(s). The CEN/TC350 suite of standards and the Level(s) framework could also provide the basis for refining the “do not significant harm” criteria in terms of additional environmental impact categories (CEN/TR 17005:2017) as well as social impact assessment (EN 16309:2014).

Eligibility of alternative schemes acting as proxies

Until absolute thresholds for GHG emissions performance are established, the EPC and NZEB thresholds are applicable only within EU Member States. Thus, it is necessary to provide an alternative path to eligibility for new constructions in locations outside the EU. Eligibility with the Taxonomy mitigation criteria can be confirmed through the application of alternative schemes. Such schemes, for example commercial sustainability schemes or national regulations and standards in countries outside the EU, can be used as alternative means to demonstrate eligibility with the Mitigation criteria set above, provided that they are considered a suitable proxy for the required performance and investor reporting/benchmarking schemes. For example, third-party “green building” certification schemes play a major role in meeting climate targets and represent a mechanism that market participants are familiar with. All schemes share the establishment and publication of verifiable criteria for defined sustainability indicators. The basis for this is qualitative and quantitative data that can be derived from the planning, development and operational phases of buildings. The certification body typically ensures external verification of that data.

The organisation responsible for the scheme will need to disclose their assessment methodology and propose a specific standard or certification level to be considered comparable to the mitigation criteria (i.e. approximating to NZEB performance levels, EPC performance levels or as a minimum to the level of performance of the top 15% of the local building stock). The Sustainable Finance Platform will be responsible for approving/rejecting the proposal put forward by the certification body.

The TEG recommends the introduction of an accreditation procedure that is open to all schemes (EU and non-EU based) and which will therefore create a level-playing field. The burden of proof of Taxonomy eligibility shall be on the certification bodies. They should thus have to demonstrate that their respective certification criteria fulfil the Taxonomy mitigation criteria for a defined location. The accreditation should be periodically reviewed to confirm that the certification criteria are still

Taxonomy-eligible. In the case of deviations or in the case of other significant reasons (e.g. absence of adequate quality control processes) the Taxonomy accreditation can be withdrawn. Linking existing schemes to the Taxonomy will enable spreading the use of the Taxonomy, building on established structures and quality assurance mechanisms. Furthermore, the link will have the additional benefit that the Taxonomy criteria will be firmly embedded within education and training among sector professionals who routinely work with the such schemes.	
Do no significant harm assessment	
The main potential significant harm to the other environmental objectives from the construction of new buildings are determined by: • The building siting: impacts on ecosystems if built on greenfield and especially if in a conservation area or high biodiversity value area; impacts on local air pollution and ecosystems if the building use entails large road transport demand. • The actual economic life span of the building and of its components/materials: the environmental impacts from producing the building materials and components can be minimised by increasing the building life span, adopting design solutions for adaptability and by maximising the future potential of building material reuse and recycling, adopting design solutions for ease of deconstruction as well as through careful selection of components/materials that prioritises recyclable materials and avoids hazardous substances.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	• In water scarce areas (i.e. where water availability is below 5000 m3/capita/year – see EEA water scarcity mapping) calculated water consumption of the new building during the use phase (expressed as litres/person per day) must be no more than below 80% of the average for other buildings of the same typology and functionality, i.e. residential or non-residential.

(4) Circular Economy	• At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list[406]) generated on the construction site must be prepared for re-use or sent for recycling or other material recovery, including backfilling operations that use waste to substitute other materials. This requirement is achieved by executing the construction works in line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[407]. • It is ensured that building components and materials do not contain asbestos nor substances of very high concern as identified on the basis of the REACH Regulation[408] which could present problems for recycling/reuse at end-of-life. • Verification of design solutions to ensure adaptability and ease of deconstruction is carried out with reference to the checklists provided in the European Commission's Level(s) framework[409] or using other semi-quantitative indices, scoring or calculator tools provided that they address the majority of the design aspects covered by Level(s).
(5) Pollution	All materials, including waste and reused materials, must be fit-for-purpose and ensure no significant adverse human health or environmental impacts.
(6) Ecosystems	• New buildings must not be built on protected natural areas, such as land designated as Natura 2000, UNESCO World Heritage and Key Biodiversity Areas (KBAs), or equivalent outside the EU as defined by UNESCO and / or the International Union for Conservation of Nature (IUCN) under the following categories: o Category Ia: Strict Nature Reserve o Category Ib: Wilderness Area o Category II: National Park • Buildings that are associated supporting infrastructure to the protected natural area, such as visitor centres, museums or technical facilities are exempted from this criterion. • New buildings must not be built on arable or greenfield land of recognised high biodiversity value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List and / or the IUCN Red List. • All virgin timber used in the new building for structures, cladding and finishes must be sourced from sustainably-managed forests as certified by third-party certification audits performed by accredited certification bodies, e.g. FSC/PECF standards or equivalent.

406 Commission Decision of 3 May 2000 replacing Decision 94/3/EC (2000/532/EC)

407 EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

408 Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

409 The checklists can be found in tables 2.2.2, 2.2.3 and 2.2.5 of the Level 3 common performance assessment guidance. Available at: http://susproc.jrc.ec.europa.eu/Efficient_Buildings/docs/170816_Levels_EU_framework_of_building_indicators.pdf

26.3 Renovation of existing buildings

Sector classification and activity	
Macro-Sector	F – Construction
NACE Level	2
Code	F41, F43
Description	**Renovation of existing buildings** (residential and non-residential). This relates to activities under NACE codes “F41.1 - Development of building projects, “F41.2 - Construction of residential and non-residential buildings” and “F43 - Specialised construction activities”.
Mitigation criteria	
Principle	Renovation of existing buildings makes a substantial contribution to climate change mitigation by reducing energy use and GHG emissions for the remaining operational phase of the buildings as well as by avoiding emissions that would occur through the construction of new buildings.
Metric	The thresholds rely on either the respective metrics set in the applicable building regulation and building codes for major renovations transposing the EPBD, or, in the case of relative improvements, on energy savings calculated in terms of net primary energy demand during the operational phase of the building life-cycle, i.e. “Phase B6” according to CEN T350, expressed as kWh/m^2 per year. The calculation methodology for the measurement of floor area (m^2) shall be disclosed with clear definition of what is within boundary.[410]
Threshold	A renovation is eligible when it meets either of the following criteria: a) The renovation is compliant with energy performance standards set in the applicable building regulations for major renovations transposing the Energy Performance of Buildings Directive (EPBD)’; or, b) The renovation achieves energy savings[411] of at least 30% in comparison to the baseline performance of the building before the renovation. The baseline performance and predicted improvement shall be based on a specialised building survey and be validated by an accredited energy auditor. To avoid lock-in and undermining of the climate mitigation objective, the renovation of buildings for the purpose of occupation by fossil fuel extraction, transporting transport of fossil fuels or manufacturing of fossil fuels activities (either for actual extraction, transporting, manufacturing and/or administrative purpose)[412] are excluded.

[410] For measurement of floor area, see International Property Measurement Standards (IPMS): https://ipmsc.org/

[411] Energy savings in terms of net primary energy demand during the operational phase of the building life-cycle, i.e. “Phase B6” according to CEN T350, expressed as kWh/m2 per year

[412] Activities belonging to the following NACE codes: B5.1 - Mining of hard coal; B6 - Extraction of crude petroleum and natural gas; B9.1 - Support activities for petroleum and natural gas extraction; C19 - Manufacture of coke and refined petroleum products

	Eligibility of alternative schemes acting as proxies If an alternative scheme, such as a commercial sustainability certification scheme or a similar national regulation or requirement in countries outside EU proves the respective scheme meets the performance criteria set in the Taxonomy in a defined location, eligible for the alternative scheme is accepted as a means to prove eligibility with the criteria.

Rationale

Principle

The principle reflects the fundamental Taxonomy aim of identifying economic activities that contribute substantially to climate change mitigation. Existing buildings are responsible for significant GHG emissions, which can be considered to fall within Scope 3 from the perspective of renovation activities. To minimise future operational emissions, existing buildings must be renovated to ensure lower energy demand and thus lower GHG emissions. Although a considerable increase in building renovation rates is needed to accomplish climate change targets, renovation rates in the EU remain very low (averaging around 1% per year) due to a number of technical and financial obstacles. The TEG acknowledges that the market for major renovation needs to be stimulated and that establishing criteria that are too strict may pose the risk of excluding large shares of this market and missing the opportunity to realise energy and GHG emissions savings.

Metric and threshold

The TEG chooses to allow any renovation complying with major renovation requirements in each Member State to be eligible. As these requirements are based on cost-optimal measures defined in the national regulation transposing the revised EPBD, they represent feasible levels of improvements within the local context, taking into consideration climate, building stock and market conditions. However, the TEG recognises that these requirements have been determined differently by each Member State, and therefore do not necessarily represent a consistent level of ambition across countries.

The TEG also chooses an alternative threshold based on delivering a relative improvement in energy performance. This threshold enables eligibility for the renovation of buildings to be pursued in locations outside EU Member States and for renovations in the EU where the intervention might not meet the requirements for major renovation but would still deliver at least 30% in energy savings calculated in terms of net primary energy demand. The 30% figure is based on consensus within the TEG around a minimum level of substantial contribution to mitigation and is aligned with existing "green" financing initiatives.[413]

With the possible exception of renovations involving structural components, GHG emissions embodied in renovation materials and works can be expected to be of a lesser significance when compared to the emissions saved by reducing operational energy consumption. Nevertheless, once future iterations of the Taxonomy extend the scope of the mitigation criteria to include embodied GHG emissions for the construction of new buildings, it should be considered whether such extension of the scope could be replicated also for renovations, at least to cover the most emissions-intensive materials such as steel and concrete.

Eligibility of alternative schemes acting as proxies

[413] See definition of an energy efficient mortgage as developed by the Energy Efficient Mortgage Initiative, available at: https://eemap.energyefficientmortgages.eu/eem-definition/

Until absolute thresholds for GHG emissions performance are established, the EPC and NZEB thresholds are applicable only within EU Member States. Thus, it is necessary to provide an alternative path to eligibility for renovations outside the EU. Eligibility for the Taxonomy mitigation criteria can be confirmed through the application of alternative schemes. Such schemes, for example commercial sustainability schemes or national regulations and standards in countries outside the EU, can be used as alternative means to demonstrate eligibility with the Mitigation criteria set above, provided that they are considered a suitable proxy for the required performance and investor reporting/benchmarking schemes. For example, third-party "green building" certification schemes play a major role in meeting climate targets and represent a mechanism that market participants are familiar with. All schemes share the establishment and publication of verifiable criteria for defined sustainability indicators. The basis for this is qualitative and quantitative data, that can be derived from the planning, development and operational phases of buildings. The certification body typically ensures external verification of that data. The agency responsible for the scheme will need to disclose their assessment methodology and propose a specific standard or certification level to be considered comparable to the mitigation criteria (i.e. approximating the performance of the top 15% of the local building stock). The Sustainable Finance Platform will be responsible for approving/rejecting the proposal put forward by the certification body. The TEG recommends the introduction of an accreditation procedure that is open to all schemes (EU and non-EU based) and which therefore will create a level-playing field. The burden of proof of Taxonomy eligibility shall be on the certification bodies. They should thus have to demonstrate that their respective certification criteria fulfil the Taxonomy mitigation criteria for a defined location. The accreditation should be periodically reviewed to confirm that the certification criteria are still Taxonomy-eligible. In the case of deviations or in the case of other significant reasons (e.g. absence of adequate quality control processes) the Taxonomy accreditation can be withdrawn. Linking existing schemes to the Taxonomy will enable spreading the use of the Taxonomy, building on established structures and quality assurance mechanisms. Furthermore, the link will have the additional benefit that the Taxonomy criteria will be firmly embedded within education and training among sector professionals who routinely work with the such schemes.	
Do no significant harm assessment	
The main potential significant harm to the other environmental objectives from the renovation of existing buildings are determined by: • The handling of building components that are likely to contain substances of concern (e.g. asbestos containing materials) and of any hazardous construction and demolition waste arising from the building renovation; Ensuring the future possibility of reusing and recycling building components and materials through careful selection of components/materials that prioritises recyclable materials and avoids hazardous substances.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics:

	• considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	In water scarce areas (i.e. where water availability is below 5000 m3/capita/year – see EEA water scarcity mapping) calculated water consumption of the new building during the use phase (expressed as litres/person per day) must be no more than 80% of the average for other buildings of the same typology and functionality, i.e. residential or non-residential.
(4) Circular Economy	• At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list[414]) generated on the construction site must be prepared for re-use or sent for recycling or other material recovery, including backfilling operations that use waste to substitute other materials. This requirement is achieved by executing the construction works in line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[415]. • It is ensured that building components and materials do not contain asbestos nor substances of very high concern as identified on the basis of the REACH Regulation[416] which could present problems for recycling/reuse at end-of-life
(5) Pollution	• All materials including waste reused material must be fit-for-purpose and ensure no significant adverse human health or environmental impacts. • Before starting the renovation work, a building survey must be carried out in accordance with national legislation by a competent specialist with training in asbestos surveying and in identification of other materials containing substances of concern. • Any stripping of lagging that contains or is likely to contain asbestos, breaking or mechanical drilling or screwing and/or removal of insulation board, tiles and other asbestos containing materials shall be carried out by appropriately trained personnel, with health monitoring before, during and after the works, in accordance with national legislation.

[414] Commission Decision of 3 May 2000 replacing Decision 94/3/EC (2000/532/EC)

[415] EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

[416] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

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<td>(6) Ecosystems</td>
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To be eligible, the building that is being renovated must not be located on protected natural areas, such as land designated as Natura 2000, or equivalent outside the EU as defined by UNESCO and / or the International Union for Conservation of Nature (IUCN) under the following categories:

Category Ia: Strict Nature Reserve
Category Ib: Wilderness Area
Category II: National Park
Buildings exempted from this criterion include associated supporting infrastructure, such as visitor centres, museums, technical facilities etc.
To be eligible, the building that is being renovated must not be located on arable or greenfield land of recognised high biodiversity value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List and / or the IUCN Red List.

To be eligible, all virgin timber used during the renovation for structures, cladding and finishes must be sourced from sustainably-managed forests, i.e. must be certified by third-party certification audits performed by accredited certification bodies, e.g. FSC/PECF standards or equivalent.
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26.4 Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities

Sector classification and activity	
Macro-Sector	F – Construction
NACE Level	2
Code	F41, F43
Description	**Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities**. This relates to activities under NACE codes "F41.2 - Construction of residential and non-residential buildings","F43 - Specialised construction activities", "M – Professional, scientific and technical activities".
Mitigation criteria	
Principle	Individual renovation measures and the installation of renewables on-site make a contribution to climate change mitigation by reducing GHG emissions for the remaining operational phase of the buildings. Professional, scientific and technical activities are a necessary support and validation mechanism for building renovation.
Metric	There are no defined metrics. In the case of individual building renovation measures, the thresholds rely on requirements set in the national regulation and building codes transposing the EPBD by each Member State.
Threshold	The following **on-site renewable energy installations** are eligible: • Installation of solar photovoltaic modules (and the ancillary technical equipment) • Installation of solar hot water panels (and the ancillary technical equipment) • Installation of ground-source heat pumps using a refrigerant with GWP<10, calculated following Annex IV of Regulation (EU) No 517/2014 (F-gas Regulation), (and the ancillary technical equipment) • Installation of wind turbines (and the ancillary technical equipment) • Installation of solar transpired collectors (and the ancillary technical equipment) • Installation of thermal or electric energy storage units (and the ancillary technical equipment) The following **individual building renovation measures** are eligible if compliant with the energy performance standards set for individual components and systems in the applicable building regulations transposing the Energy Performance Building Directive (EPBD): • Addition of insulation to the existing envelope components, such as external walls, roofs (including green roofs), lofts, basements and ground floors (including measures to ensure air-tightness, measures to reduce

	the effects of thermal bridges and scaffolding) and products for the application of the insulation to the building envelope (mechanical fixings, adhesive, etc.). • Replacement of existing windows with new energy efficient windows • Replacement of existing external doors with new energy efficient doors • Installation of façade and roofing elements with a solar shading or solar control function, including those that support the growing of vegetation. • Installation and updating of HVAC and domestic hot water systems, including equipment related to district heating service • Installation of efficient lighting appliances and systems • Installation of low-flow kitchen and sanitary water fittings • Installation of third-generation smart meters for electricity load monitoring • Installation of zoned thermostats, smart thermostat systems and sensoring equipment, e.g. motion and day light control • Installation of Building Management Systems (BMS) Accredited **professional, scientific and technical activities to support mitigation in building renovation**, for example provision of services such as energy audits to enable building renovation, are eligible.

Rationale

The TEG is including individual renovation measures, the installation of on-site renewables and professional, scientific and technical activities that support mitigation in building renovation as eligible under the Taxonomy. These activities are considered as an enabling mechanism. The installation of on-site renewables is automatically eligible. The requirements for individual renovation measures are based on cost-optimal measures defined in the applicable regulation transposing the revised EPBD. As such, they represent feasible levels of improvements within the local context, taking into consideration climate, building stock and market conditions. However, the TEG recognises that these requirements have been determined differently by each Member State, and therefore do not necessarily represent a consistent level of ambition across countries. The list of eligible measures will be updated by the Sustainable Finance Platform. Professional and technical services, such as energy audits, are included as eligible as they play a central role in supporting and validating building renovation efforts.

Do no significant harm assessment

The main potential significant harm to the other environmental objectives from the carrying out of individual renovation measures and installation of on-site renewables in relation to existing buildings are determined by:

- The handling of building components that are likely to contain substances of concern (e.g. asbestos containing materials) and of any hazardous construction and demolition waste arising from the building renovation;
- Ensuring the future possibility of reusing and recycling building component and materials through careful selection of components/materials that prioritises recyclable materials and avoids hazardous substances.

(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	
(4) Circular Economy	• At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list[417]) generated on the construction site must be prepared for re-use or sent for recycling or other material recovery, including backfilling operations that use waste to substitute other materials. This requirement is achieved by executing the construction works in line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[418]. • It is ensured that building components and materials do not contain asbestos nor substances of very high concern as identified on the basis of the REACH Regulation[419] which could present problems for recycling/reuse at end-of-life.
(5) Pollution	• Any stripping of lagging that contains or is likely to contain asbestos, breaking or mechanical drilling or screwing and/or removal of insulation board, tiles and other asbestos containing materials shall be preceded by a building survey carried out in accordance with national legislation by a competent specialist with training in asbestos surveying[420] and in identification of other materials containing substances of concern and

[417] Commission Decision of 3 May 2000 replacing Decision 94/3/EC (2000/532/EC)

[418] EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

[419] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

[420] ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys

	work shall be carried out by appropriately trained personnel, with health monitoring before, during and after the works in accordance with national legislation[421]. • Any stripping of lagging that contains or is likely to contain asbestos, breaking or mechanical drilling or screwing and/or removal of insulation board, tiles and other asbestos containing materials shall be carried out by appropriately trained personnel, with health monitoring before, during and after the works, in accordance with national legislation.
(6) Ecosystems	• To be eligible, all virgin timber used during the renovation for structures, cladding and finishes must be sourced from sustainably-managed forests, i.e. must be certified by third-party certification audits performed by accredited certification bodies, e.g. FSC/PECF standards or equivalent.

[421] ASTM D7201 – 06 Standard Practice for Sampling and Counting Airborne Fibers, Including Asbestos Fibers, in the Workplace, by Phase Contrast Microscopy (with an Option of Transmission

26.5 Acquisition of buildings

Sector classification and activity	
Macro-Sector	L – Real Estate activities
NACE Level	2
Code	L68
Description	**Acquisition of buildings** (residential and non-residential). This activity relates to NACE code L68 "Real estate activities".
Mitigation criteria	
Principle	The acquisition of energy and resource efficient and low-GHG emissions buildings instead of conventional, lower-performing ones can make a substantial contribution to climate change mitigation objectives by: a) creating demand for such buildings; this in turn will stimulate others to build and renovate buildings to a higher level of performance than they would have done otherwise. b) sending a clear signal to the market that the acquisition of such buildings against an ever more stringent legislative background and changing client preferences can help reduce future potential risk and value depreciation. In alignment with the criteria set for the construction of new buildings, the Taxonomy takes a transitional approach by relying on requirements set in current EU policies with a view to develop absolute thresholds for energy and GHG emissions performance. These thresholds will be based on performance benchmarks set, as a minimum, at the level of performance of the top 15% of the local building stock and are projected to progressively decline to net zero energy and GHG emissions by 2050.
Metric	The thresholds rely on either the respective metrics set in the applicable building regulation and building codes for major renovations transposing the EPBD, or, in the case of relative improvements, on energy savings calculated in terms of net primary energy demand during the operational phase of the building life-cycle, i.e. "Phase B6" according to CEN T350, expressed as kWh/m^2 per year. The calculation methodology for the measurement of floor area (m^2) shall be disclosed with clear definition of what is within boundary.[422]
Threshold	Until absolute thresholds are established, benchmarking the energy and GHG emissions performance of, as a minimum, the top 15% of the stock, a building acquisition is eligible under either of the following conditions:

[422] For measurement of floor area, see International Property Measurement Standards (IPMS): https://ipmsc.org/

	• Acquisition of a building issued with EPC rating B (or above)[423] [424];
	• Acquisition of any other building, provided that it is subsequently improved (within 3 years of purchase, either through one single improvement achieving the thresholds or through a series of improvements), achieving one of the following:
	  o savings in energy performance[425] of least 30% against the baseline; performance and predicted improvement shall be based on a specialised building survey and be validated by an accredited energy auditor;
	  o EPC rating B (or above)[426] [427];
	  o Energy performance standards set for major renovation in applicable building regulations transposing the EPBD;
	
	To avoid lock-in and undermining the climate mitigation objective, the construction of new buildings or the renovation of buildings for the purpose of occupation by fossil fuel extraction, transporting transport of fossil fuels or manufacturing of fossil fuels activities (either for actual extraction, transporting, manufacturing and/or administrative purpose)[428] are excluded.
	
	Eligibility of alternative schemes acting as proxies
	If an alternative scheme, such as a commercial sustainability certification scheme or a similar national regulation or requirement in countries outside EU proves the respective scheme meets the performance criteria set in the Taxonomy in a defined location, eligibility for the alternative scheme is accepted as a means to prove eligibility for the criteria.

Rationale	
The rationales sustaining the criteria established for building acquisition follow the same rationales employed to establish criteria for the construction of new buildings and the renovation of existing ones,	

[423] Where EPC rating B is not defined (e.g. in the case of Poland, Malta and the Belgian region of Flanders), acceptable thresholds for operational energy should be established. The ENEV 2014 equivalent to residential EPC B for Germany is as follows: 50 to 75 kWh/(m2·a). The range for residential EPC B rating in the Belgian region of Flanders is considered 100 to 200 kWh/(m2·a). Where thresholds for EPC ratings are not defined, the only requirement to be eligible is the NZEB performance for new buildings as defined in the applicable building code.

[424] Appropriateness of both NZEB and EPC rating B thresholds subject to review after publication of DG ENER study in the autumn of 2019.

[425] Energy savings in terms of net primary energy demand during the operational phase of the building life-cycle, i.e. "Phase B6" according to CEN T350, expressed as kWh/m2 per year

[426] Where such class is not defined (e.g. in the case of Poland, Malta and the Belgian region of Flanders), acceptable thresholds for operational energy should be established. The ENEV 2014 equivalent to EPC B for Germany is as follows: < 75 kWh/(m2·a).

[427] Appropriateness of both NZEB and EPC rating B thresholds subject to review after publication of DG ENER study in the autumn of 2019.

[428] Activities belonging to the following NACE codes: B5.1 - Mining of hard coal; B6 - Extraction of crude petroleum and natural gas; B9.1 - Support activities for petroleum and natural gas extraction; C19 - Manufacture of coke and refined petroleum products

as the TEG chooses to align the three sets of criteria to ensure consistency across the Taxonomy on what constitutes a "energy and resource efficient building". Future iterations of the Taxonomy should maintain this alignment within building-related activities by updating the criteria for building acquisition in accordance with the changes that will be introduced in the criteria for the new construction and renovation, e.g. the transition to operational GHG emissions as metric and the successive inclusion of embodied GHG emissions as well as future tightening of criteria.	
Do no significant harm assessment	
The main sources of potential harm to other environmental objectives for the acquisition and ownership of buildings relate to the management of the buildings including operation, maintenance and any renovation carried out. As a pre-requisite, at the time of the acquisition of a building, the future building owner is expected to assess as part of its due diligence procedure the overall environmental condition of the building and its surrounds, such as contaminated soil and groundwater beneath and surrounding the building, presence of any dangerous building materials and other chemical and biological risks. Any works which involve renovation or extension of the acquired building shall be carried out in accordance with the DNSH requirements for the activity 'Renovation of existing buildings (residential and non-residential)'.	
(2) Adaptation	A1: Reducing material physical climate risks. The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis. This means the activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment. The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity. A2: Supporting system adaptation. The economic activity must not adversely affect adaptation efforts of others. This means: • The activity does not lead to increased climate risks for others or hamper adaptation elsewhere • The activity is consistent with sectoral, regional, and/or national adaptation efforts.
(3) Water	In water scarce areas (i.e. where water availability is below 5000 m3/capita/year – see EEA water scarcity mapping) calculated water consumption of the new building during the use phase (expressed as litres/person per day) must be no more than below 80% of the average for other buildings of the same typology and functionality, i.e. residential or non-residential.
(4) Circular Economy	If the building acquisition is eligible under threshold (a), there are no requirements. If the building acquisition is eligible under threshold (b), the renovation needs to comply with the following criterion:

	At least 80% (by weight) of the waste generated on site must be prepared for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list[429]). This can be achieved by executing the construction works line with the good practice guidance laid down in the EU Construction and Demolition Waste Management Protocol[430] to ensure that waste produced during the construction phase of the renovation is adequately managed, recycled and / or re-used.
(5) Pollution	If the building acquisition is eligible under threshold (a), there are no further requirements. If the building acquisition is eligible under threshold (b), the renovation needs to comply with the following criterion: • All materials including waste reused material must be fit-for-purpose and ensure no significant adverse human health or environmental impacts. • Before starting the renovation work, a building survey must be carried out in accordance with national legislation by a competent specialist with training in asbestos surveying and in identification of other materials containing substances of concern. • Any stripping of lagging that contains or is likely to contain asbestos, breaking or mechanical drilling or screwing and/or removal of insulation board, tiles and other asbestos containing materials shall be carried out by appropriately trained personnel, with health monitoring before, during and after the works, in accordance with national legislation. • Assess and map all sewerage or combined sewer/ surface water drains and ensure all waste water discharges from the building are conveyed to the public sewer or an appropriate waste water treatment facility.
(6) Ecosystems	• Maintain existing vegetated surface and natural water management components (such as ponds and permeable surfaces) around the building, which can provide habitat for local fauna and flora. • To be eligible, the building that is being acquired must not be located on protected natural areas, such as land designated as Natura 2000, or equivalent outside the EU as defined by UNESCO and / or the International Union for Conservation of Nature (IUCN) under the following categories: Category Ia: Strict Nature Reserve Category Ib: Wilderness Area Category II: National Park Buildings exempted from this criterion include associated supporting infrastructure, such as visitor centres, museums, technical facilities etc. To be eligible, the building that is being acquired must not be located on arable or greenfield land of recognised high biodiversity value and land that serves as

[429] Commission Decision of 3 May 2000 replacing Decision 94/3/EC (2000/532/EC)

[430] EU Construction and Demolition Waste Protocol. Available at https://ec.europa.eu/growth/content/eu-construction-and-demolition-waste-protocol-0_en

	habitat of endangered species (flora and fauna) listed on the European Red List and / or the IUCN Red List.

Detailed activities: Climate change adaptation

As discussed in section 6, The TEG recognises that all sectors must become more climate resilient to achieve adaptation objectives. As a result, the adaptation approach is a set of guiding principles and qualitative screening criteria, which can be applied in any sector. However, to be eligible for the Taxonomy, an economic activity must also avoid significant harm to the five other environmental objectives. To enable evaluation of the broader environmental implications of an activity, an initial list of economic activities were considered from the following sectors:

- Agriculture, forestry and fishing
- Electricity, gas, steam and air conditioning supply
- Information and Communications Technology (ICT)
- Financial services and insurance[431]
- Professional, scientific and technical activities
- Water supply, sewerage, waste management and remediation activities

Economic activities were selected from these six sectors on the basis of the following characteristics:

- They are among the sectors most vulnerable to the negative effects of climate change in Europe;[432]
- They represent a large share of gross value added (GVA) and employment in Europe;[433] and
- They allow for testing of the adaptation taxonomy approach in natural resource-based sectors (agriculture and forestry, and water), asset-based sectors (electricity, gas, steam and air conditioning supply, and ICT), as well as service- based sectors (financial services and insurance, and professional, scientific and technical activities).

This initial assessment of economic activities does not represent a judgement on the vulnerability of other sectors to the negative effects of climate change or their contribution to climate change adaptation and resilience. Other sectors will be assessed over the extension period.

431 Within the financial services and insurance sector, only (re)insurance sector was considered recognising the different nature and role of the financial sector in applying the taxonomy compared to actors in the real economy. The (re)insurance sector was considered because the sector does not only contribute to transferring climate risks from a policyholder to an insurer but also plays an active role in incentivising physical climate risk reduction behaviour (for example some insurers offer premium discounts for homeowners who take steps to protect their houses from wildfires).

432 EEA Report No 15/2017, "Climate change adaptation and disaster risk reduction in Europe" (2017).

433 Based on EUROSTAT data available at https://ec.europa.eu/eurostat/news/themes-in-the-spotlight/gva-employment

27. Agriculture, Forestry and Fishing

27.1 Growing of non-perennial crops

Sector classification and activity	
Macro-Sector	Agriculture, Forestry and Fishing
NACE Level	2
Code	NACE code: 1.1 CPA codes: 1.1
Description	This group includes the growing of non-perennial crops, i.e. plants that do not last for more than two growing seasons. Included is the growing of these plants for the purpose of seed production. The growing of non-perennial crops, if done in an appropriate way, can reduce the risk of flash floods by enhancing infiltration and soil water retention.

Adaptation criteria	
These criteria relate to **adaptation of** an economic activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Screening criterion A1. Reducing material physical climate risk	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.

Criterion A3: Monitoring adaptation results	The reduction of physical climate risks can be measured.
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Further guidance

Typical sensitivities

The table below illustrates the typical sensitivities of the growing of non-perennial crops to climate-related hazards. Relevant climate-related hazard will be location and context specific and should be identified through a climate risk assessment as indicated in screening criterion A1.

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Changing temperature • Heat stress • Temperature variability • Permafrost thawing	• Heat wave • Cold wave/frost • Wildfire	• Changing wind patterns	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns and types • Sea level rise	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Coastal erosion • Soil erosion • Solifluction	• Avalanche • Landslide • Subsidence

Legend: typically sensitive; typically non sensitive.

Examples of adaptation measures

The table below provides examples of adaptation measures that can be adopted to reduce risks resulting from specific hazards for illustrative purpose only. Relevant climate-related hazards and required adaptation measures will be location and context specific and will be identified through the application of the qualitative screening criteria described above.

Temperature-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Temperature increase	Increase of specific plant diseases and insect infestations	Use of crops/varieties less susceptible to temperature-related diseases and pests	% cropping area with less susceptible crops/varieties

		Controlled agriculture (e.g. greenhouses, vertical farming, hydroponics) Use of integrated pest control measures (incl. chemical and biological measures) Use of multi-functional field margins (mffm) and (semi)natural vegetation (s)nv	% production from controlled agriculture % cropping area with integrated pest control measures % area with mffm and (s)nv within a defined region
Temperature-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Frost (outside “normal” periods)	Frost damage to susceptible crops	Use of crops/varieties less susceptible to frost Controlled agriculture (e.g. greenhouses, vertical farming, hydroponics) Use of irrigation (for some fruit crops)	% cropping area with less susceptible crops/ varieties % production from controlled agriculture % susceptible crop surface with irrigation
Water-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing precipitation patterns and types	Yield losses due to reduced water availability, particularly after planting	Use of irrigation Enhancement of soil water retention (e.g. through use of cover crops, organic fertilizers, minimum tillage)	% cropping area with irrigation % cropping area with enhanced soil water retention
Water-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Drought	Yield losses	Use of crops/varieties less susceptible to drought Use of irrigation Controlled agriculture (e.g. greenhouses, vertical farming, hydroponics) Enhancement of soil water retention (e.g. through use of cover crops, organic fertilizers, minimum tillage)	% cropping area with less susceptible crops/varieties. % cropping area with irrigation % production from controlled agriculture % cropping area with enhanced soil water retention

Flooding of fields due to extreme precipitation or river flooding	Yield losses	Use of crops/varieties less susceptible to flooding Improved land drainage Set-aside of land in flood plain areas	% cropping area with less susceptible crops/varieties. % cropping area with improved drainage % cropping area in flood plains
Solid mass related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Soil Erosion (due to intensive precipitation or wind)	Yield losses	Soil conservation measures (e.g. use of cover crops, minimum/no tillage, wind breaks) Use of perennial crops / pasture in highly erosion susceptible areas Set-aside of land in highly erosion susceptible areas	% cropping area with soil conservation measures % susceptible cropping area with perennial soil cover % susceptible cropping area set aside

27.2 Silviculture and other forestry activities

Sector classification and activity	
Macro-Sector	A: Agriculture, Forestry and Fishing
NACE Level	3
Code	NACE code: 2.1 CPA code: 2.1
Description	This class includes the growing of standing timber, planting, replanting, transplanting, thinning and conserving of forests and timber tracts, the growing of coppice, pulpwood and fire wood and the operation for forest tree nurseries which are dedicated to climate change adaptation. A forest is defined as a minimum area of land of 0.05-1.0 hectares with tree crown cover of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent of tree height of 2-5 meters are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest; source: FCCC/CP/2001/13/Add.1, decision 11/CP7 The activity itself can be made climate-resilient through different measures, such as: • Use of early warning systems or wildfire control measures (to reduce damages due to wildfires enhanced by heat waves); • Use of regeneration material (species and ecotypes) less sensitive to strong wind or timely management of seedling stand and timely thinning (to reduce damage to forest stands from increased wind); • Use of species and ecotypes less susceptible to drought or diversification of species and ecotypes (to minimise tree losses due to lack of water availability).

Adaptation criteria	
These criteria relate to **adaptation enabled by** this activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Criterion B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.

B1.1	The activity reduces or facilitates adaptation to physical climate risks beyond the boundaries of the activity itself. This includes activities that: a) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or, b) Remove information, financial, technological and capacity barriers to adaptation by others.
B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Example contributions

The table below provides examples of ways this activity can contribute to reduce physical climate risk of other economic activities.

Climate-related hazards	Associated physical climate risk	How does the activity contribute to reduce physical climate risks
Temperature-related (acute) – heat waves	Health impacts on (particularly elderly) people	Forests contribute to moderating extreme temperatures, particularly in densely populated areas
Wind-related (acute) – dust and sand storms	Damage to crops and assets; interruption of traffic	Silviculture and other forestry activities contribute to reducing surface wind velocities and protect the surface from being eroded
Water-related (acute) – flash floods	Damage to people, livestock and assets	Forests enhance infiltration and retain water, thus reducing surface runoff and flooding
Solid-mass related (chronic and acute) – soil erosion, coastal erosion, landslides	Soil degradation, damage to people, livestock and assets	Forests provide protection against soil erosion, coastal erosion and landslides

28. Electricity, gas, steam and air conditioning supply

28.1 Production of electricity – hydropower

Sector classification and activity	
Macro-Sector	Electricity, gas, steam and air conditioning supply
NACE Level	4
Code	NACE code: 35.11 [hydropower only] CPA codes: 35.11 [hydropower only]
Description	Production of electricity by hydropower. This class includes the generation of electricity using hydropower, covering both dam storage and run-over-river hydropower generation facilities Improving the climate resilience of hydropower electricity generation may improve the climate resilience of other sectors that rely on electricity, especially in countries where a high proportion of the electricity supply is generated by hydropower.
Adaptation criteria	
These criteria relate to **adaptation of** an economic activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Screening criterion A1. Reducing material physical climate risk	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.

A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
Criterion A3: Monitoring adaptation results	The reduction of physical climate risks can be measured.
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Further guidance

Typical sensitivities

The table below illustrates the typical sensitivities of hydropower to climate-related hazards. Relevant climate-related hazard will be location and context specific, and should be identified through a climate risk assessment as indicated in screening criteria A1.

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Not typically sensitive	• Not typically sensitive	• Not typically sensitive	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns • Hydrological variability	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Soil erosion • Sedimentation	• Avalanche • Landslide
typically non sensitive	typically non sensitive	typically non sensitive	typically sensitive	typically sensitive	typically sensitive	typically sensitive	typically sensitive

Legend: typically sensitive; typically non sensitive.

Examples of adaptation measures

The table below provides examples of adaptation measures that can be adopted to reduce risks resulting from specific hazards for illustrative purpose only. Relevant climate-related hazards and required adaptation measures will be location and context specific and will be identified through the application of the qualitative screening criteria described above.

Wind-related – acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Cyclones Hurricanes Typhoons	Physical damage to hydropower facilities (e.g. dams, turbine houses, switchyards,	Adoption of structural strengthening of hydropower facilities (e.g. dams, spillways turbine houses, switchyards, ancillary infrastructure, etc.)	Reduction in down-time due to acute “wind” events (days)

	ancillary infrastructure, etc.)		Reduction in annual damage due to acute "wind" events (EUR)
		Adoption of hydro-meteorological monitoring and forecasting equipment	As above
Water-related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing precipitation patterns Hydrological variability	Reduced water flows through turbines Increased variability of water flows through turbines	Adoption of turbines capable of operating at low and/or variable flow conditions	Increased electricity production (MWh)
		Adoption of increased dam storage capacity	As above
		Adoption of hydro-meteorological monitoring and forecasting equipment	As above
Water-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Droughts	Insufficient water flowing through turbines	Adoption of turbines capable of operating at low and/or variable flow conditions	Increased electricity production (MWh)
		Adoption of increased dam storage capacity	As above
		Adoption of hydro-meteorological monitoring and forecasting equipment	As above
Extreme precipitation events Floods GLOFs	Physical damage to hydropower facilities (e.g. dams, turbine houses, switchyards, ancillary infrastructure, etc.)	Adoption of structural strengthening of hydropower facilities (e.g. dams, spillways, turbine houses, switchyards, ancillary infrastructure, etc.)	Reduction in down-time due to acute "water" events (days) Reduction in annual damage due to acute "water" events (EUR)
		Adoption of hydro-meteorological monitoring and forecasting equipment	As above
Solid mass related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***

Soil Erosion	Loss of dam storage capacity	Adoption of sediment dredging and/or other sediment management measures	Increased dam storage capacity (km^3)
	Sediment damage to turbines	Adoption of sediment-resistant turbines	Reduction in annual damage caused by sediment (EUR)
Solid mass-related – acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Avalanche Landslide	Physical damage to hydropower facilities (e.g. dams, turbine houses, switchyards, ancillary infrastructure, etc.)	Adoption of structural strengthening of hydropower facilities (e.g. dams, spillways, turbine houses, switchyards, ancillary infrastructure, etc.)	Reduction in down-time due to acute “land mass” events (days) Reduction in annual damage due to acute “land mass” events (EUR)
		Adoption of early warning monitoring equipment	As above
		Adoption of emergency response systems and equipment	As above

28.2 Transmission lines

Sector classification and activity	
Macro-Sector	Electricity, gas, steam and air conditioning supply
NACE Level	4
Code	NACE code: 35.12 CPA codes: 35.12
Description	This class includes the operation of transmission systems that convey the electricity from the generation facility to the distribution system. Improving the resilience of electricity transmission also increases the resilience of operations that depend on electricity.
Adaptation criteria	
These criteria relate to **adaptation of** an economic activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Screening criterion A1. Reducing material physical climate risk	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty; • is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
Criterion A3: Monitoring	The reduction of physical climate risks can be measured.

adaptation results	
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Further guidance

Typical sensitivities

The table below illustrates the typical sensitivities of this activity to climate-related hazards. Relevant climate-related hazard will be location and context specific and should be identified through a climate risk assessment as indicated in screening criteria A1.

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Changing temperature • Heat stress • Temperature variability • Permafrost thawing	• Heat wave • Cold wave/frost • Wildfire	• Changing wind patterns	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns and types • Sea level rise	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Coastal erosion • Soil erosion • Solifluction	• Avalanche • Landslide • Subsidence

Legend: typically sensitive; typically non sensitive.

Examples of adaptation measures

The table below provides examples of adaptation measures that can be adopted to reduce risks resulting from specific hazards for illustrative purpose only. Relevant climate-related hazards and required adaptation measures will be location and context specific and will be identified through the application of the qualitative screening criteria described above.

Temperature-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing temperature (increase)	Reduced thermal rating (i.e. the maximum current allowed at a given temperature), causing lines to sag to dangerous levels	Increasing the height of poles supporting power lines Installing conductors with hotter operating limits Using 'low-sag' conductors	Reduction of efficiency losses during period of temperature > design temperature
Temperature-related - acute			

Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Heat waves	Overheating of lines and transformers causing them to trip off Electricity disruptions due to grid overload during higher peak energy demands	Integrate higher temperatures into design calculation for maximum temperature/rating Increase system capacity by adding external coolers to transformers Increase system capacity by increasing height of the poles or otherwise increasing tension on the line to reduce snag	System Average Interruption Duration Index and/or System Average Interruption Frequency Index after adaptation compared to before adaptations
Wind-related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Changing Wind Speeds	Downed transmission lines or gradual weakening of infrastructure leading to more frequent repairs	Adjust wind loading standards Reroute power lines away from sensitive objects or move them underground	Reduced repair costs
Wind-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Hurricanes/typhoons	Downed or damaged transmission lines, substations or poles due to wind and rain, leading to disruptions Debris or trees damaging lines or poles causing short circuit	Adjust wind loading standards Reroute power lines away from sensitive objects or move underground Improve hurricane forecasting Redefine technical standards so that grid operators are required to build in resilience	Reduced repair costs or decreased number of downed power lines during storms
Winter Storm	Potential for ice build-up disrupting transmissions	Improve forecasting of ice storms' impact on overhead lines and transmission circuits Improve forecasting of winter storms Enhance design standards to withstand larger ice loading	Accuracy of impact projection and of storm forecasting Reduced transmission disruptions during winter storms
Water-related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Water Stress	Potential for energy supply disruptions from sources that rely on hydropower	Incorporate rainfall projections and drought forecasting into reservoir management strategies	Reservoir levels maintained above a critical level

	Potential for overheating of generation equipment that relies on water for cooling, which could lead to transmission disruptions	Explore alternative water sources such as water banks, water supply contracts, groundwater wells, processed waste water	throughout the dry season
Water-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Flash flooding	Inundation and potential damage to pipelines, towers, substations, or infrastructure	Relocate assets into areas that are not located in flood plains Waterproof pipelines, substations, etc. Incorporate submergible transformers, switches, pumps Seal manhole covers	Proportion of critical assets waterproofed and located outside of flood plains Reduced repair costs have flood events
Solid mass related - chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Soil Erosion	Electricity poles or pipelines made unstable	Replant any disturbed soil around asset	Reduced costs of restabilising poles or pipelines
Solid mass-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Landslide	Toppled electricity poles Buried pipelines or other transmission infrastructure, making them harder to reach in case of repairs	Relocate electricity poles away from areas prone to landslide Plant vegetation on empty hillsides above critical infrastructure	Proportion of electricity poles located in areas prone to landslide Reduced repair costs

29. Water supply; sewerage; waste management and remediation activities

29.1 Sewerage

Sector classification and activity	
Macro-Sector	Water Supply; sewerage, waste management and remediation activities
NACE Level	2
Code	NACE code: 37 CPA codes: 37
Description	This class includes the operation of sewer systems or sewage treatment facilities that collect, treat, and dispose of sewage, and in particular: • operation of sewer systems or sewer treatment facilities • collection and transport of human or industrial wastewater from one or several users, as well as rain water by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.) • emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage; servicing of chemical toilets • treatment of wastewater (including human and industrial wastewater, water from swimming pools etc.) by means of physical, chemical and biological processes like dilution, screening, filtering, sedimentation etc. • maintenance and cleaning of sewers and drains, including sewer rodding This class excludes decontamination of surface water and groundwater at the place of pollution (see 39.00) and cleaning and deblocking of drainpipes in buildings (see 43.22). Improving the resilience of sewerage also increases the resilience of buildings and of the natural ecosystems from which the sewer system draws water and into which the system discharges its output.

Adaptation criteria	
These criteria relate to **adaptation of** an economic activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Screening criterion A1. Reducing material physical climate risk	The economic activity must reduce all material physical climate risks to the extent possible and on a best effort basis.
A1.1	The activity integrates physical and non-physical measures aimed at reducing - to the extent possible and on a best effort basis - all material risks that have been identified through a risk assessment.
A1.2	The above-mentioned assessment has the following characteristics: • considers both current weather variability and future climate change, including uncertainty;

	• is based on robust analysis of available climate data and projections across a range of future scenarios; • is consistent with the expected lifetime of the activity.
Criterion A2: Supporting system adaptation	The economic activity must not adversely affect adaptation efforts of others.
A2.1	The activity does not lead to increased climate risks for others or hamper adaptation elsewhere, for example, upstream flood defence causing increased risk downstream in a river basin.
A2.2	The activity is consistent with sectoral, regional, and/or national adaptation efforts.
Criterion A3: Monitoring adaptation results	The reduction of physical climate risks can be measured.
A3.1	Adaptation results can be monitored and measured against defined indicators. Recognising that risk evolves over time, updated assessments of physical climate risks should be undertaken at the appropriate frequency where possible.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Further guidance

Typical sensitivities

The table below illustrates the typical sensitivities of this activity to climate-related hazards. Relevant climate-related hazard will be location and context specific, and should be identified through a climate risk assessment as indicated in screening criteria A1.

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Changing temperature • Heat stress • Temperature variability • Permafrost thawing	• Heat wave • Cold wave/frost • Wildfire	• Changing wind patterns	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns and types • Sea level rise	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Coastal erosion • Soil erosion • Solifluction	• Avalanche • Landslide • Subsidence
typically non sensitive	typically sensitive	typically non sensitive	typically non sensitive	typically sensitive	typically sensitive	typically non sensitive	typically sensitive

Legend: typically sensitive; typically non sensitive.

Examples of adaptation measures

The table below provides examples of adaptation measures that can be adopted to reduce risks resulting from specific hazards for illustrative purpose only. Relevant climate-related hazards and required adaptation measures will be location and context specific and will be identified through the application of the qualitative screening criteria described above.

Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Temperature-related - chronic			
Temperature-related	Changes to the biological or physico-chemical internal processes of the sewer system can be a source of infectious diseases	Adjust water and wastewater management and treatment processes under NACE 37 – Sewerage	Reduced number of days of disrupted operation
	Exacerbated hygiene conditions causing outbreaks of infectious diseases (significantly higher risk in urban areas)	Preventive activities against infectious diseases Increasing the knowledge level of residents regarding sewerage water or contaminated water Building new medical institutions or healthcare centres around the target areas	Reduced number of infectious disease patients
Temperature-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***

Cold waves/frost	Source water freeze leading to insufficient water input for operations; ice build-up in process components and mechanical equipment lubricant freeze. These can lead either the mechanical equipment freezing before sludge freezes, with a risk of overflow; or to sludge freeze, leading to the temporary closing of operations to protect mechanical infrastructure (ie. frozen sludge in basins can damage treatment tanks, ruptured pipes etc.).	Building additional storage capacity, shortening retention duration, and covering tanks. Equipping mechanical equipment with warming/heating systems, such as lamps, hot air guns etc.	No excess overflow because of cold waves/frost Continued service during cold waves/frost
	Changes in physical, chemical and biological reactions.	Adjust water and wastewater management and treatment processes under NACE 37 – Sewerage	Reduced number of days of disrupted operation
Water-related – chronic			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Increase in the frequency and severity of droughts Reduction of surface water and groundwater levels Seasonal (and likely overall) reduction of river flows	Undermining sewer function and operations	Construction, extension or upgrading of: - Network connectivity infrastructure (to channel water and wastewater flows between plants) - NACE 42.2 Construction of utility projects - Distributed small-scale closed-loop systems - NACE 42.2 Construction of utility projects	No or limited reduction in the quantity of wastewater water treated in the occurrence of drought/reduced of water availability
Extreme precipitations and flooding	Excess existing capacity: overflow into and contamination of rivers and coastal	Construction, extension or upgrading of: - Increase pumping stations capacity - NACE 42.2	Total number or length of sewerage and drainage networks at risk from flooding

	areas; contamination of clean water infrastructure Damage to existing wastewater infrastructure (pipes, pumping stations, tanks, treatment plants)	Construction of utility projects - Upgrade and extend pipes (+ pipe replacement and dreding/insulation from flooding) - NACE 42.2 Construction of utility projects - Build additional storm tanks - NACE 42.2 Construction of utility projects - Upgrade the drainage networks - NACE 42.2 Construction of utility projects - Build flood protection for water treatment plants and pumping stations (elevate buildings; prioritize or re-locate to higher grounds or away from vulnerable costal zones) - Build permeable urban surfaces - NACE 42.11 Construction of roads and motorways	Reduced investment in repair of sewer networks damaged by precipitations, rainstorms and/or flooding Number of properties affected by sewer flooding Quantity of contaminated flow into drainage Quality of water in surrounding water bodies
	Exacerbated hygiene conditions causing outbreaks of infectious diseases (significantly higher risk in urban areas)	Preventive activities against infectious diseases – NACE 86 Human Health Activities Knowledge level of residents regarding sewerage water or contaminated water – NACE 85.5 Other Education Build new medical institutions or healthcare centres around the target areas – NACE 41 Construction of buildings	Reduced number of infectious disease patients during outbreaks following flooding Number of people reached by awareness campaign on hygiene
Water-related - acute			
Specific hazards	**Associated impacts**	***Illustrative examples of adaptation measures***	***Suggested performance metrics***
Flash flooding	Inundation and potential damage to treatment plant, piping, or infrastructure	Relocate assets into areas that are not located in flood plains Waterproof treatment plants Incorporate submergible transformers, switches, pumps	Proportion of critical assets waterproofed and located outside of flood plains Reduced repair costs have flood events

30. Information and communication

30.1 Provision of specialised telecommunications applications for weather monitoring and forecast

Sector classification and activity	
Macro-Sector	Information and Communications Technology (ICT)
NACE Level	3
Code	NACE code: 61.9 CPA codes: 61.9
Description	Other telecommunication activities: provision of specialised telecommunications applications for weather monitoring and forecast and early warnings (see example contribution): • provision of specialised telecommunications applications, such as satellite tracking, communications telemetry, and radar station operations • operation of satellite terminal stations and associated facilities operationally connected with one or more terrestrial communications systems and capable of transmitting telecommunications to or receiving telecommunications from satellite systems Satellite communications can support monitoring, forecast, early warning, and emergency communications through extreme weather events and enhance climate resilience of other economic activities.
Adaptation criteria	
These criteria relate to **adaptation enabled by** this activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Criterion B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.
B1.1	The activity reduces or facilitates adaptation to physical climate risks beyond the boundaries of the activity itself. This includes activities that: c) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or, d) Remove information, financial, technological and capacity barriers to adaptation by others.
B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.
Do no significant harm assessment	

This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.

Example contributions

The table below provides examples of ways this activity can contribute to reduce physical climate risk of other economic activities.

Climate-related hazards	Associated physical climate risk	How does the activity contribute to reduce physical climate risks
Temperature-related Wind-related Water related Solid mass-related	Damages and disruption to natural and built environment	The provision of specialised telecommunications applications for weather monitoring, forecast and early warning improves preparedness and response planning for small-scale and large-scale drought, floods, cyclones, storm surges, and other climate-related hazards, and reduce the risk of death, injury, asset loss and damage. By providing and delivering climate-related information to authorities and the general public, specialised telecommunications applications for weather monitoring, forecast and early warning empowers individuals, institutions and public and private organisations to adapt. These applications include: • nowcast, short, medium and extended range, forecast of drought, flood, tropical cyclone, wind storms, hot spells, cold spells, and other climate-related hazards; • public weather local forecast; • long range forecast; • early warnings related to climate-related hazards; • sea and coastal zone forecasts; and • customized sector-based forecasts.

31. Financial and insurance activities

31.1 Non-life insurance

Sector classification and activity	
Macro-Sector	Financial services and insurance
NACE Level	4
Code	NACE code: 65.12 CPA codes: 65.12.49
Description	Non-life insurance. Insurance against climate-related hazards such as: • Drought • Flood (Coastal, Fluvial, Pluvial, Groundwater) • Heavy Precipitation (Rain, Hail, Snow / Ice) • Cyclone, hurricane, typhoon • Storm, including blizzard, dust and sand storm • Glacial Lake Outburst • Tornado • Wildfire • Sea level rise • Avalanche • Landslide • Subsidence Insurance against climate-related hazards is an important element for climate change adaptation since it does not only support risk sharing but is also working throughout the risk management cycle (identify, analyse, plan, implement and evaluate) and the disaster management cycle (prevent and protect, prepare, respond and recover).
Adaptation criteria	
These criteria relate to **adaptation enabled by** this activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Criterion B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.
B1.1	The activity reduces or facilitates adaptation to physical climate risks beyond the boundaries of the activity itself. This includes activities that: a) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or, b) Remove information, financial, technological and capacity barriers to adaptation by others.

B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Example contributions

The table below provides examples of non-life insurance can contribute to reduce physical climate risk of other economic activities.

Climate-related hazards	Associated physical climate risk	How does the activity contribute to reduce physical climate risks
Temperature-related Wind-related Water related Solid mass-related	Damages and disruption to natural and built environment	Insurance against climate-related hazard contributes to reduce physical climate risk by:[434] • offering standard non-life insurance products against climate-related hazards; • offering multi-peril (yield) crop insurance against both annual yield variations in addition to extreme climate-related hazards; • incentivising adaptation behaviour, for example where insurers would offer premium discounts for homeowners who take steps to protect their houses from wildfires; • offering risk engineering expertise to their customers with proactive risk improvement action management programs or by sharing their expertise with new projects; • using insurers' data and knowledge in developing zoning and building code regulations, standards and construction requirements and local adaptation plans. Insurers often have good information on which areas are at high risk and which measures can lower risk. This information is often used in designing zoning, flood defences, building code regulations and prioritising related adaptation investments; • developing innovative risk transfer mechanisms as part of broader risk management solutions to help under-insured or uninsured communities to meet the

[434] Undertakings should follow specific requirements: i) be well capitalised (i.e. compliance with capital requirements, under Solvency II or equivalent regime); and (ii) demonstrate strong risk management (e.g. follow EIOPA's Technical Advice on integration of sustainability risks).

		challenges of a changing climate (for example the Caribbean Catastrophe Risk Insurance Facility or the African Risk Capacity); • requiring minimum building standards, or adherence to build-back-better principles, differentiated by risk level, as a standard element of insurance contracts; • developing online tools or early warning methods to allow people to detect risks to property from floods, storms and other climate related hazards; • helping improve natural catastrophe models for different climate-related hazards.

32. Professional, scientific and technical activities

32.1 Research and development (natural sciences and engineering)

Sector classification and activity	
Macro-Sector	Professional, scientific and technical activities
NACE Level	3
Code	NACE code: 72.1 CPA codes: 72.1
Description	This group comprises basic research, applied research, experimental development in natural sciences and engineering dedicated to adaptation to climate change. See example contributions for further examples.
Adaptation criteria	
These criteria relate to **adaptation enabled by** this activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Criterion B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.
B1.1	The activity reduces or facilitates adaptation to physical climate risks beyond the boundaries of the activity itself. This includes activities that: e) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or, f) Remove information, financial, technological and capacity barriers to adaptation by others.
B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Example contributions

The table below provides examples of ways this activity can contribute to reduce physical climate risk of other economic activities.

Climate-related hazards	**Associated physical climate risk**	**How does the activity contribute to reduce physical climate risks**
Temperature-related Wind-related Water related Solid mass-related	Damages and disruption to natural and built environment	Scientific research and experimental development on natural sciences and engineering dedicated to understand and model the climate system, and anticipate and manage physical climate risks lay foundations for adaptation in all economic activities. By providing data and information to, among others, assess how the climate may change, the potential impacts and vulnerabilities associated with these changes, it facilitates adaptation of vulnerable activities, products and services. Examples of activities include: • Development of climate models (e.g. high-resolution climate simulations / earth system modelling by HPC) and research for reducing uncertainty on climate change projections and impact assessments • Scientific research on the impacts of climate change and on resilience to the impacts of climate change on local, regional, global scales on natural and managed ecosystems (incl. model outputs as well as lab experiments, in-situ sampling, environmental observation and remote sensing) e.g. development of models for real-time visualisation of impacts • Scientific research on and development of adaptation technologies and solutions (incl. capacity building / introduction of pilot studies/ early warning systems etc.) • Scientific research on and development of methodologies for the evaluation of potential, effectiveness and efficiency of implemented adaptation solutions • Scientific research on and development of data processing methods, especially machine learning and statistics approaches, for solving environmental problems • Tailored training and targeted knowledge dissemination e.g. training of experts with interdisciplinary skills for tackling increasingly complex questions in environmental systems and resources management (e.g. PhD candidates, Post-docs)

32.2 Engineering activities and related technical consultancy dedicated to adaptation to climate change

Sector classification and activity	
Macro-Sector	Professional, scientific and technical activities
NACE Level	3
Code	NACE code: 71.12 CPA codes: 71.12
Description	Engineering activities and related technical consultancy dedicated to adaptation to climate change. This class includes: • engineering design (i.e. applying physical laws and principles of engineering in the design of machines, materials, instruments, structures, processes and systems) and consulting activities for: • machinery, industrial processes and industrial plant • projects involving civil engineering, hydraulic engineering, traffic engineering • water management projects • projects elaboration and realisation relative to electrical and electronic engineering, mining engineering, chemical engineering, mechanical, industrial and systems engineering, safety engineering • elaboration of projects using air conditioning, refrigeration, sanitary and pollution control engineering, acoustical engineering etc. • geophysical, geologic and seismic surveying • geodetic surveying activities: • land and boundary surveying activities • hydrologic surveying activities • subsurface surveying activities • cartographic and spatial information activities.
Adaptation criteria	
These criteria relate to **adaptation enabled by** this activity. To be eligible for the EU taxonomy, the economic activity must meet the following qualitative screening criteria:	
Criterion B1. Supporting adaptation of other economic activities	The economic activity contributes to adaptation of other activities and/or addresses systemic barriers to adaptation.
B1.1	The activity reduces or facilitates adaptation to physical climate risks beyond the boundaries of the activity itself. This includes activities that: a) Promote a new technology, product, practice or governance process or innovative uses of existing practices (including those related to natural infrastructure); or,

	b) Remove information, financial, technological and capacity barriers to adaptation by others.
B1.2	In the case of infrastructure-based activities, the economic activity must also meet the screening criteria A1, A2 and A3 for adaptation of an economic activity.
Do no significant harm assessment	
This assessment has not yet been completed for activities which substantially contribute to climate change adaptation.	

Example contributions

The table below provides examples of how engineering activities and related technical consultancy can contribute to reduce physical climate risk of other economic activities.

Climate-related hazards	Associated physical climate risk	How does the activity contribute to reduce physical climate risks
Temperature-related Wind-related Water related Solid mass-related	Damages and disruption to natural and built environment	Engineering activities associated with design, construction, retrofitting and reconstruction of infrastructure to enhance resilience to the climate-related hazards, through the implementation of the structural adaptation measures or ecosystem based approaches, contribute to the reduction of physical climate risk of other economic activities. Consulting and planning activities related to engineering activities that take into account climate-related hazards and enable adaptation of the built infrastructure (e.g. building codes; integrated management systems; delivering spatial information on changing risks and vulnerabilities due to CC) contribute to the reduction of physical climate risk of other economic activities