

Investment Package Manual for European Cities and Regions

VOLUME I

**EU Taxonomy applied to circular
bio-based activities**

www.hoopproject.eu



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List of Acronyms

Acronym	Description
AD	Anaerobic Digestion
BAT	Best Available Techniques
BREF	Best available techniques REference documents
CAPEX	CAPital EXpenditures
CPA	Classification of Products by Activity
DNSH	Do No Significant Harm
EC	European Commission
ESG	Environmental, Social and Governance
ETS	Emissions Trading System
EU	European Union
GHG	GreenHouse Gas
ISO	International Standard Organisation
KPI	Key Performance Indicator
NACE	<i>Nomenclature statistique des Activités économiques dans la Communauté européenne - statistical classification of economic activities in the European Community</i>
NBS	Nature-Based Solution
NFRD	Non-Financial Reporting Directive
OECD	Organisation for Economic Cooperation and Development
OFMSW	Organic Fraction of Municipal Solid Waste
OPEX	OPerational EXpenditures

Acronym	Description
PDA	Project Development Assistance
RRP	Recovery and Resilience Plan
SDG	Sustainable Development Goals
SFDR	Sustainable Finance Disclosure Regulation
SME	Small and Medium-sized Enterprises
TEG	Technical Expert Group
TRL	Technology Readiness Level
UN	United Nations
UWWS	Urban WasteWater Sludge

1. Executive summary

Circular bioeconomy needs to be deployed thanks to investments aligned with the green financing and funding to comply with requirements and goals from public policies and strategies toward a circular and carbon-neutral economy by 2050. Thanks to green finance, European cities, regions, their entrepreneurs and businesses will be able to accelerate their transition to a low-carbon, resilient and resource-efficient economy,

The Investment Package Manual was designed at first time as confidential for the HOOP project's pilot cities and regions, called Lighthouse, supporting them with knowledge and tools in their circularity journey. The HOOP project [October 2020 - September 2024] aims to unlock bio-based investments and deploy local bio economies in Europe through a systemic and cross-cutting approach. It will offer project development assistance to a group of 8 Lighthouse Cities and Regions to build the technical, economic, financial and legal expertise needed to develop concrete investments to valorise biowaste and wastewater, with the aim of obtaining safe and sustainable bio-based products.

The manual demonstrated a practical utility over time, being extensible and valuable resource for other EU Member States and their cities and regions. For this reason, the authors propose a public version that was developed to be disseminated among Cities and Regions of the HOOP Network and others across Europe and offers an overview on funding and financing schemes and opportunities at European, National and Regional levels.

The Investment Package Manual was developed on three-step approach and the public version distributed through 3 respective volumes. This Volume I presents the description of the EU Taxonomy concepts, methodology, objectives, technical screening criteria and DNSH ("do no significant harm") applied to economic activities linked to the circular bioeconomy technologies, processes, activities and bioproducts from biowaste and wastewater sludge feedstocks, and respective regulation package. These economic activities selected are related to the bio-based technologies and processes being invested in the HOOP project by the European Cities and Regions.

The second step (Volume II) guides the reader through the selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at European level. The third step (Volume III) presents a selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at National and Regional levels, under 8 European countries and regions case studies: Finland, Greece, Germany, Italy, Norway, Portugal, Spain and The Netherlands.

The Recovery and Resilience plans and Horizon Europe already included the DNSH principle from EU Taxonomy, i.e., no measure in the projects and investments should lead to significant harm to any of the 6 environmental objectives: climate change mitigation, climate change adaptation, circular economy, sustainable use and protection of water resources, pollution prevention and control, protection and restoration of biodiversity and ecosystems.

2. Introduction

The circular economy concept is gaining attention as the consumption and use of resources increases to serve a fast-growing population with rising standards of living. Circularity refers to the circular flow and efficient use and reuse of resources, materials and products. This new economic model represents sustainable green growth, moving from a consumption and disposal-based linear model to a system that extends the life of products and materials and minimises waste. The circular model has many environmental, climate, social and economic benefits [1].

The circular economy is backed strongly by the European Commission (EC) and other European Union (EU) institutions, as well as by a growing number of cities and countries across the EU, like HOOP demonstration territories, the so-called Lighthouse Cities and Regions. It is also attracting attention from the business community and public and private investors. The circular economy goes beyond resource efficiency and recycling. It provides the framework to develop new business models aimed at increasing the value, use and lifespan of materials, products and assets and designing out waste from production and consumption [1]. Inspired by these principles, the HOOP project is ongoing, and **this manual was developed for the European Cities and Regions, in order to provide them a green investment package of knowledge and opportunities to boost urban circular bioeconomy.**

2.1. The HOOP project [2]

The HOOP project, “Hub of circular cities bOOsting Platform to foster investments for the valorisation of urban biowaste and wastewater”, emerges to help unlock bio-based investments and deploy local bioeconomies in Europe through a systemic and cross-cutting approach. **The project offers Project Development Assistance (PDA), budgeted with EUR 5.78 million, to a group of 8 Lighthouse Cities and Regions** [2] with a variety of sizes, geographical distribution throughout Europe and different socio-economic context. In order to build the technical, economic, financial and legal expertise needed to develop concrete investments to valorise Organic Fraction of Municipal Solid Waste (OFMSW) and Urban Wastewater Sludge (UWWS), with the aim of obtaining safe and sustainable bio-based products. The urban bioeconomy concept of the HOOP project and its biowaste and wastewater cycle of material valorisation is illustrated through the **Figure 1**.

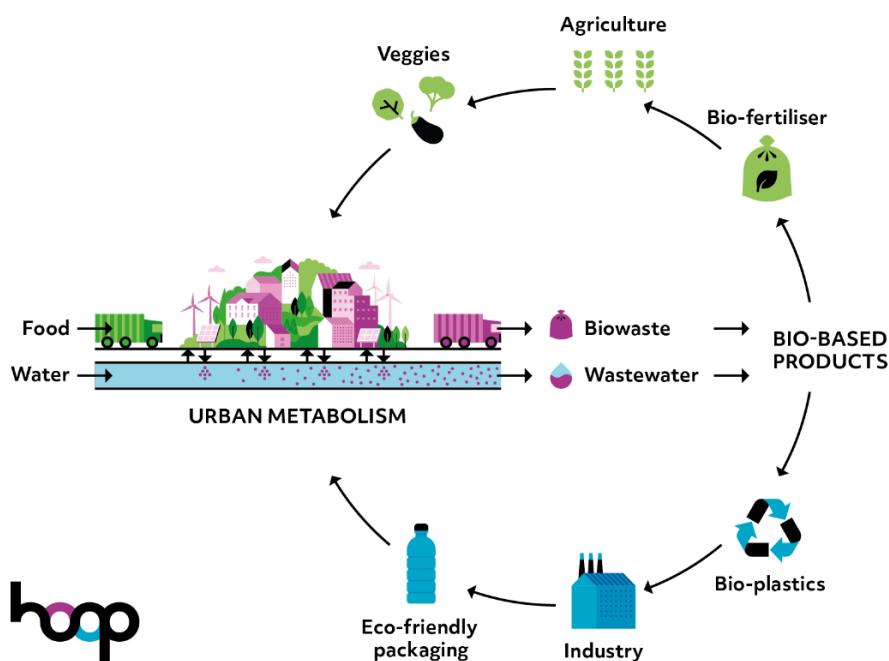


Figure 1 – Urban circular bioeconomy concept of the HOOP: biowaste and wastewater converted into innovative high-value bioproducts.

The report “State-of-the-art of technologies for the production of bioproducts from biowaste and wastewater” was presented in July 2021 and will be transformed in both a scientific review article and a series of *technology factsheets*. It provides a technical description and a multidisciplinary analysis of 17 technologies preselected by HOOP technological partners and on technology readiness levels (TRL) from 5 to 9. This document aimed to be an early tool for the identification of potential paths towards circular bioeconomy strategies for cities and regions.

Furthermore, HOOP will develop, from the bioprocesses and technologies selected by the Lighthouse Cities and Regions as BATs (best available techniques/technologies): **circular business models, technological and environmental assessments, innovative financial engineering & procurement, stakeholder engagement & mobilisation, and a replication strategy**.

The PDA will focus on a variety of projects within the cities and regions, with different investment volumes planned that are expected to be complemented by public and private investments. The HOOP project partners will create an understanding among investors on specific aspects of those processes (i.e., technical specifications, input and output materials/products, business cases, among others) as this is a prerequisite to be able to support the development of tools and the decision-making on financing solutions.

Besides Lighthouse Cities and Regions, the project impacts will be extended through the project's large **Network of Cities & Regions – a network that aims to include 100+ cities and regions to facilitate the exchange of knowledge and mutual learning** among European cities and regions that are willing to recover valuable resources from OFMSW and UWWS to make bio-based products – will ensure that the provided PDA mechanisms will reach beyond the HOOP demonstration territories and spread across all Europe. This Network

is led by HOOP partner ACR+, acronym of “association of cities and regions for sustainable resource management”.

By joining this Network, cities and regions gain information to innovative urban bioeconomy solutions and engage in activities relevant to their context and specific interests. Participants have direct exchanges with the 8 HOOP lighthouse cities and regions, sharing experiences and expertise.

The following resources and tools will be available for the HOOP Network of Cities & Regions by September 2022:

- ❖ The Urban Circular Bioeconomy Hub;
- ❖ Circularity Label;
- ❖ Knowledge exchange activities;
- ❖ Virtual Academy.

More information about HOOP project, resources, tools and the HOOP’s Network of Cities and Regions are available on its website [here](#) [2].

2.2. The Investment Package Manual

The investment package manual was designed at first time as confidential for the HOOP’s Lighthouse Cities and Regions, supporting them with knowledge and tools in their circularity journey. This manual demonstrated a practical utility over time, being extensible and valuable resource for other EU Member States and their cities and regions. For this reason, this current public version was developed to be disseminated into the HOOP’s Network of Cities and Regions, and other interested on it. Therefore, this manual aimed at the identification of funding and financing schemes and opportunities at European, National and Regional levels, available for the European Cities and Regions. Such investment package will be considered in the financial schemes and development of business models in further advanced tasks of HOOP project.

The Investment Package Manual was delivered in the end of January 2022 as confidential (extended) version, only available for the HOOP’s Lighthouse Cities and Regions and project partners. However, the present shorter version of the Manual was designed and divided in three volumes for public dissemination and training of Cities & Regions of the HOOP Network and others across Europe.

2.3. Objectives

The manual was developed to be a thorough still easy-to-consult resource. The methodology behind its development consists of a three-step approach illustrated below in **Figure 2** and reflected in this three-volume public version of the manual. The first step (**Volume I**) is the description of the EU Taxonomy concepts, methodology, objectives, technical screening criteria and DNSH assessment applied to economic activities linked to the circular bioeconomy technologies, processes, activities and bioproducts from biowaste and

wastewater feedstocks, and regulation package in this field. In the Volume I was also identified the economic activities and sectors related to the bio-based technologies and processes being invested in the HOOP project by the European Cities and Regions.

The second step (**Volume II**) was the selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at European level. The third step (**Volume III**) was the selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at National and Regional levels, under 8 European countries and regions case studies: Finland, Greece, Germany, Italy, Norway, Portugal, Spain and The Netherlands.

Several programmes establish both bioeconomy and bioenergy lines combined, e.g., some schemes only grant projects where circular bioeconomy activity also includes bioenergy production in order to decarbonise the organisations and economic activities. For this reason, all investment opportunities identified in this manual for the European Cities and Regions are focused on both activities.

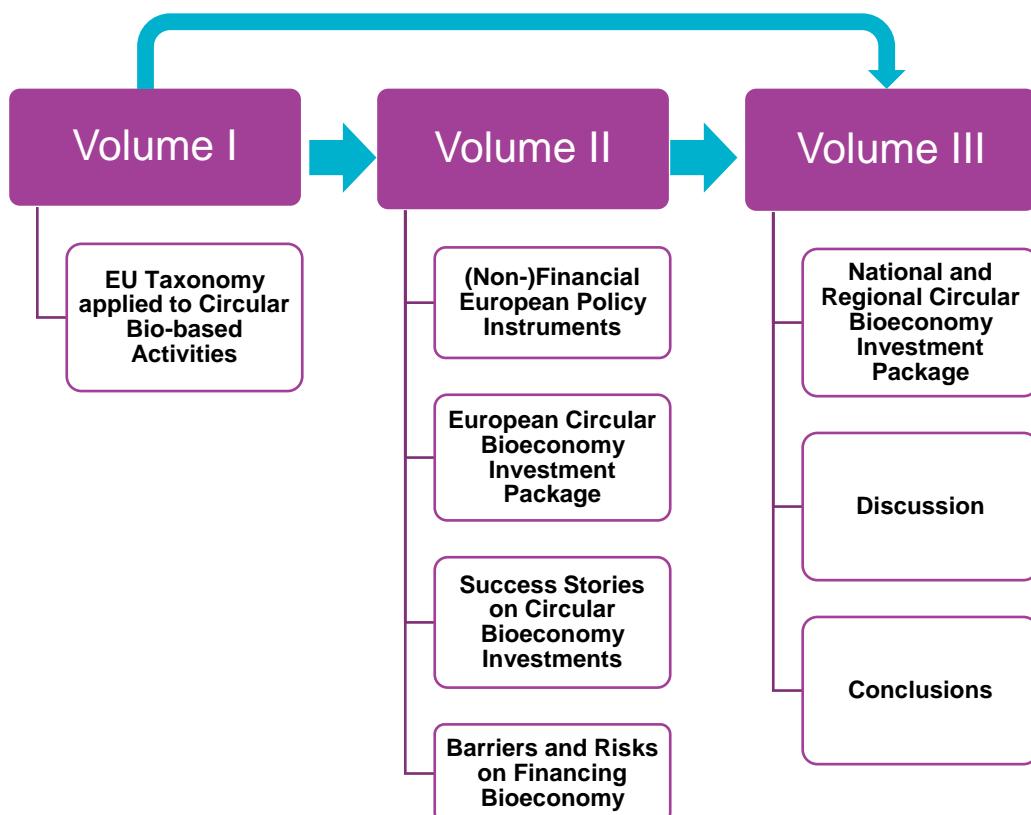


Figure 2 – Investment Package Manual’s contents distributed by each Volume.

More in detail, the content of the 3 volumes constituting the public version of Investment Package Manual for the European Cities and Regions is distributed as follows:

Volume I - EU Taxonomy applied to circular bio-based activities

- ❖ Provide a description of the concepts and methodology of the EU Taxonomy, as well as the regulation package and other issues related to its application;
- ❖ Identify the economic activities classified, namely macro-sector, NACE (statistical classification of economic activities in the European Community) levels and codes, in the EU Taxonomy linked to the circular bioeconomy technologies, processes, activities and bioproducts from biowaste and wastewater feedstocks.

Volume II - European investment package on circular bioeconomy for European Member States, Regions and Cities

- ❖ Select and characterise the financial and non-financial European policy instruments for policymakers, and European funding and financing instruments, schemes, sources, investors and tools on circular bioeconomy available for European Cities and Regions;
- ❖ Present some investment success stories on circular bioeconomy from urban biowaste and sewage sludge to inspire the European Cities and Regions.

Volume III - National and Regional investment package on circular bioeconomy for European Regions and Cities

- ❖ Identify some business models applied to circular bioeconomy projects and activities for cities and regions, as well as the circular bio-based characteristics applied to urban solid biowaste and wastewater sectors;
- ❖ Create an investment intake form on circular bioeconomy to be inserted on HOOP's website and used by the HOOP's Network of Cities & Regions in order to characterise the investment projects and provide PDA;
- ❖ Identify the national and regional funding schemes and initiatives on circular bioeconomy under 8 European countries and regions case studies;
- ❖ Provide complementary resources and tools supporting circular bioeconomy initiatives, financing services and funding available for European Cities and Regions.

3. EU Taxonomy applied to circular bio-based activities

Sustainable finance refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects [3].

Sustainable finance channels private investment into the transition to a climate-neutral, climate-resilient, resource-efficient and fair economy, as a complement to public money. Therefore, it has a key role to play in delivering on the policy objectives under the European Green Deal, as well as the EU's international commitments on climate and sustainability objectives. Sustainable finance will help ensure that investments support a resilient economy and a sustainable recovery from the impacts of the COVID-19 pandemic [3].

The EU Taxonomy is a tool of common classification for sustainable economic activities and was designed to reorient capital flows facilitating cross-border sustainable investment, while also helping in determining whether an economic activity qualifies as environmentally sustainable. The taxonomy establishes environmental objectives for climate mitigation, adaptation, protection of water and marine resources, protection of biodiversity and ecosystems, circular economy, and pollution prevention and control. As such, **the EU Taxonomy can be used by European Cities and Regions as a framework to assess their current position and track progress in terms of climate and sustainable investment towards climate action** [4].

In this context, the **European Cities and Regions are encouraged to be proactive with respect to alignment and compliance, but also to use the EU Taxonomy Regulation to assist them in guiding the transformation driven by more sustainable business and public practices**. In this **Volume I** was identified the bio-based economic activities related to the technologies and processes being invested in the HOOP project, as well as principles, concepts, methodologies and case studies related to the implementation of the EU Taxonomy.

3.1. EU Taxonomy as a tool of common classification for sustainable economic activities

The **EU Taxonomy is not a mandatory list of economic activities for investors to invest in**. Nor does it set mandatory requirements on environmental performance for companies or for financial products. Investors are free to choose what to invest in. However, it is expected that over time, the EU Taxonomy will be an enabler of change and encourage a transition towards sustainability [4].

The EU Taxonomy was introduced for the first time in 2018 from the EU's Action Plan on Financing Sustainable Growth [5] as a key action categorised in the strategic topic “reorienting capital flows towards a more sustainable economy”. It is defined as a common classification system for sustainable economic activities, being an

indispensable, detailed and clear tool to support investors, companies, policymakers, issuers and project promoters to foster the transition to a low-carbon, resilient and resource-efficient/circular economy in the cities and organisations. Hence, nowadays a taxonomy-aligned investment will be fundamental whether the city or other private or public organisation needs a funding and/or financing support.

In this way, the Taxonomy plays an important role to achieve European Green Deal objectives, UN's 2030 Agenda for Sustainable Development Goals, 2015 Paris Agreement on Climate Change and EU's climate and energy targets for 2030 and 2050 towards a hipocarbonic economy and society. According to the EU's Action Plan on Financing Sustainable Growth [5], EU Taxonomy will be an essential guidance for investors:

"Clear guidance on activities qualifying as contributing to climate change mitigation and adaptation, environmental and social objectives will help inform investors. It will provide detailed information on the relevant sectors and activities, based on screening criteria, thresholds and metrics. This is an essential step in supporting the flow of capital into sustainable sectors in need of financing. An EU taxonomy will be gradually integrated into EU legislation to provide more legal certainty." [5]

Thus, this Taxonomy establishes a list of environmentally sustainable economic activities and technical screening criteria for each activity, based on six environmental interlinked objectives as described in **Figure 3** [6]. The technical screening criteria for the climate change objectives are listed in delegated acts (subchapter 3.3), while the technical screening for the other environmental and social objectives have not been published until at this moment, being under development [6, 7].

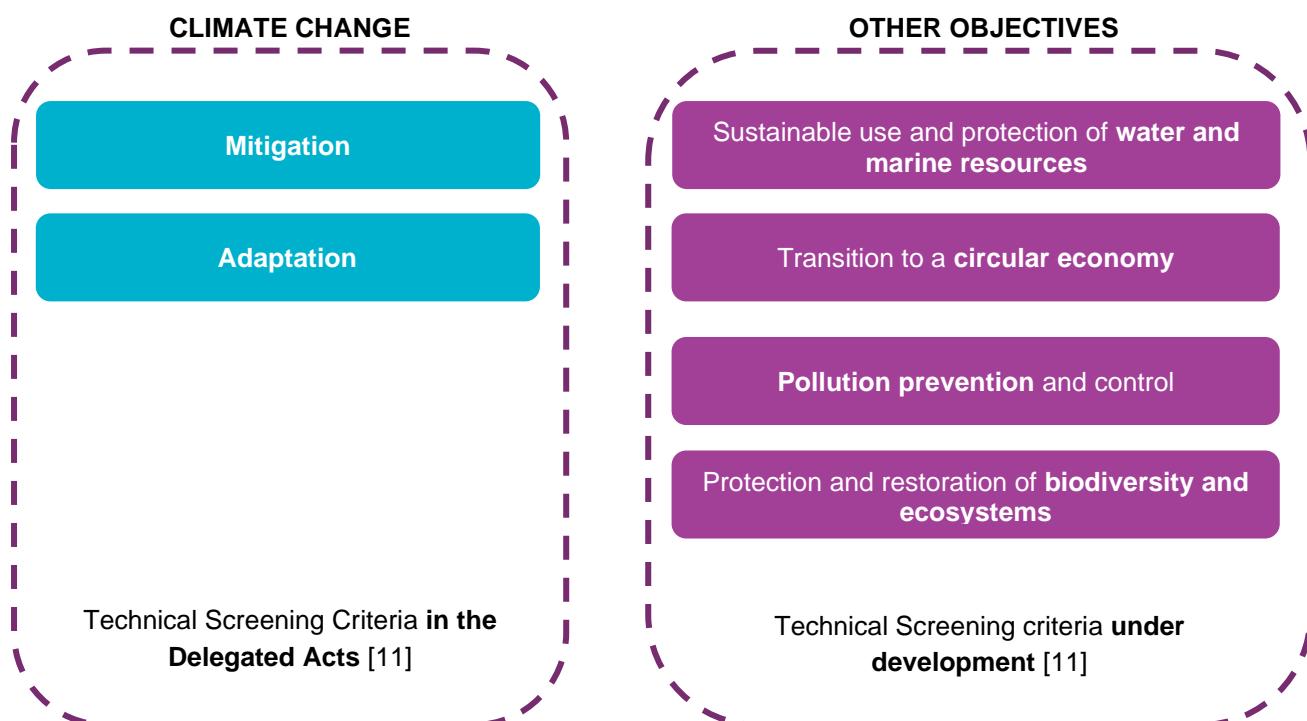


Figure 3 – EU's Taxonomy environmental objectives.

Applying the EU Taxonomy for climate tracking, or to other environmental objectives, depends on the financer (fund manager, bond issuer, project financier, government and other public bodies) **and the type of investment is being assessed** (project or asset, share portfolio or capital investment budget). Therefore, **an economic activity that can be a project or investment should meet the technical screening criteria [8]**.

The **four conditions that an economic activity has to meet to be recognised as Taxonomy-aligned [7, 8, 6, 4]** are described below and schematised in **Figure 4**:

- 1. Be taxonomy eligible:** the activity must be taxonomy eligible to contribute to environmental objectives. In other words, the activity needs to fit a NACE macro-sector category (subchapter **3.5.1**) identified as being most relevant to environmental objectives and complying with the technical screening criteria, established by the Commission through delegated acts, is mandatory.
- 2. Demonstrate taxonomy alignment:** the activity must demonstrate taxonomy alignment, which needs to make a **substantially contribute** to at least one of that 6 environmental objectives (**Figure 3**).
- 3. Do No Significant Harm (DNSH):** the activity needs to show it doesn't significant harm to any of the other five environmental objectives as defined in the Taxonomy Regulation.
- 4. Comply with minimum safeguards:** minimum social and governance safeguards are also set out in the Taxonomy Regulation.



Figure 4 – EU's Taxonomy requirements for economic activities.

To understand better the concepts discriminated previously, some of them are described in detail below.

► What is “substantial contribution”?

Substantial contribution to climate change mitigation, for example, means levels of performance that are aligned with climate neutrality and limiting the increase in temperature to 1.5 °C globally. For climate change adaptation this means the implementation of solutions to substantially reduce the most significant identified climate risks to a particular activity such as wildfires, storms or droughts. The Taxonomy Regulation calls such activities environmentally sustainable: but this does not mean that activities that do not meet those four conditions, listed above, are unsustainable [4].

Economic activities can make a substantial contribution through the specific means listed in Articles 10 to 15 of the Taxonomy Regulation [6]. Based on these provisions, the Delegated Act (**Table 11 – Annex 5**) contains a number of activities that can make a substantial contribution and defines criteria for those activities to qualify as

green under the EU Taxonomy [9]. The Technical Expert Group (TEG) considers that activities can make a substantial contribution when [7]:

- ❖ They have a low impact on the environment and have the potential to replace high impact activities (e.g., bioenergy and valorisation of urban biowaste);
- ❖ They reduce impact from other activities (e.g., wastewater activities);
- ❖ They make a positive environmental contribution (e.g., restoration and protection of soils).

The classification of the activities as **enabling or transitional** is defined in subchapter 3.4.

► What is “significant harm to environmental objectives”?

According to article 17 from Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 [6]:

1. (...) taking into account the life cycle of the products and services provided by an economic activity, including evidence from existing life-cycle assessments, that economic activity shall be considered to significantly harm:

- a)** climate change mitigation, where that activity leads to significant GHG emissions;
- b)** climate change adaptation, where that activity leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets;
- c)** the sustainable use and protection of water and marine resources, where that activity is detrimental to the good status or the good ecological potential of bodies of water and marine waters;
- d)** the **circular economy, including waste prevention and recycling**, where:
 - i)** that activity leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources such as non-renewable energy sources, raw materials, water and land at one or more stages of the life cycle of products, including in terms of durability, reparability, upgradability, reusability or recyclability of products;
 - ii)** that activity leads to a significant increase in the generation, incineration or disposal of waste, with the exception of the incineration of non-recyclable hazardous waste;
 - iii)** the long-term disposal of waste may cause significant and long-term harm to the environment.
- e)** pollution prevention and control, where that activity leads to a significant increase in the emissions of pollutants into air, water or land, as compared with the situation before the activity started;
- f)** the protection and restoration of biodiversity and ecosystems, where that activity is significantly detrimental to the good condition of ecosystems or to the conservation status of habitats and species.

- 2.** When assessing an economic activity against the criteria set out in previous number, both the environmental impact of the activity itself and the environmental impact of the products and services provided by that activity throughout their life cycle shall be taken into account, in particular by considering the production, use and end of life of those products and services.

► **What are “minimum safeguards”?**

According to article 18 from Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 [6]:

1. The minimum safeguards shall be procedures implemented by an undertaking that is carrying out an economic activity to ensure the alignment with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, including the principles and rights set out in the eight fundamental conventions identified in the Declaration of the International Labour Organisation on Fundamental Principles and Rights at Work and the International Bill of Human Rights.

2. When implementing the procedures referred to in previous number, undertakings shall adhere to the DNSH principle.

3.2. Check alignment with EU Taxonomy

The most important question that the investors (financial and non-financial entities) and public authorities commonly ask is:

How does an organisation/economic activity/investment report alignment with the Taxonomy?

To report degree of alignment with the taxonomy, the organisation/economic activity/investment should [10]:

- 1.** Screen the urban biowaste and wastewater activities from the cities and regions against activities in the taxonomy.
- 2.** Map relevant directives and standards referenced to in the technical screening criteria per activity.
- 3.** Interpret the collected material to understand meaning. Extract the measures, indicators and thresholds referenced in the criteria and standards. Collect data from the project/activity/investment in order to assess the compliance with these established criteria/indicators.
- 4.** Create a framework for assessing the activities against the technical screening criteria.
- 5.** Conduct the assessment and reporting.

While 5) should be conducted continuously or at least on an annual basis, 1-4) should be conducted when required, i.e., whenever there are updates to either the taxonomy or the directives and standards in the references [10].

In summary, **the Taxonomy will play an important role in the future investments, funding requirements and financing lending in the European Union**. The projects, investments and economic activities need to ensure that are compliant with the EU's 2030 targets and 2050 net-zero emissions trajectories for climate change and other European and international regulations for circular economy, pollution prevention, biodiversity and ecosystems, water and marine resources. Non-compliant projects in eligible sectors (subchapter 3.4) are at risk of having their activities and investments curtailed by future climate regulation and taxonomy updates [8].

The technical screening criteria are only currently defined for 2 out of 6 objectives, those referred to climate change (mitigation and adaptation). The screening criteria for the other 4 non-climate environmental objectives, including circular economy, will be defined in the short-term by EC. Therefore, the projects may experience more difficulties to align with the taxonomy in the future and more restrictions in terms of investment requirements.

Thus, the construction and operation of the complying asset should not also significantly harm the water, waste, pollution prevention and biodiversity objectives through DNSH assessment (subchapter 3.5). **In several municipal and regional public projects** and private investments, **the environmental harm is covered and evaluated in an Environmental Impact Assessment study** while pre-condition to get an operating license to perform the project or investment, and is required by mainstream funders in legal due diligence processes [8]. The next subchapters help to evaluate and achieve each step described before to check alignment with the EU Taxonomy.

3.3. EU Taxonomy regulation and delegated acts package

In December 2019, the European Council and the European Parliament reached political agreement on the text of the Taxonomy Regulation. On 15 April 2020, the European Council adopted, at first reading, the proposed Taxonomy Regulation and published the adopted text. On 22 June 2020, the Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment (Taxonomy Regulation), and amending Regulation (EU) 2019/2088, was published in the Official Journal. Regulation 2020/852 also amends Regulation 2019/2088 on sustainability-related disclosures in the financial services sector [6, 11].

The EU Regulation 2020/852 entered into force on 12 July 2020 and the dates that the rules apply are:

- ❖ 17 July 2020 - see Art. 27.1
- ❖ 1 January 2022: partial application - see Art. 27.2(a)
- ❖ 1 January 2023: partial application - see Art. 27.2(b)

The Taxonomy Regulation imposes three key obligations, according to article 2 from Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 [6]:

- ❖ On Member States and at EU level to apply the Taxonomy when regulating how environmentally financial products or corporate bonds are made available;
- ❖ On "financial market participants" to make statements about alignment of investments with the Taxonomy when making available financial products;

- On large public-interest entities to include information, in the non-financial disclosure part of their financial statements, about how their activities align with the Taxonomy.

The European Commission is establishing the actual list of environmentally sustainable activities by defining technical screening criteria for each environmental objective through delegated acts [11].

A **first delegated act on sustainable activities for climate change adaptation and mitigation objectives was approved on 21 April 2021**, and formally adopted on 4 June 2021 [11], and sets technical screening criteria for economic activities in the sectors that are most relevant for achieving climate neutrality and delivering on climate change adaptation. The economic activities are classified in sectors such as forestry; environmental protection and restoration; manufacturing; energy; water supply, sewerage, waste management and remediation; transport; construction and real estate; information and communication; professional, scientific and technical activities; financial and insurance; education; human health and social work activities; arts, entertainment and recreation. This first delegated act on sustainable activities for climate change objectives was officially published by the Commission on 9 December 2021 and entered into force on 1 January 2022 [9].

A **second delegated act with technical screening criteria for the 4 remaining objectives**, including the **transition to a circular economy objective, will be published in 2022** [4, 11]. Therefore, the EC will adopt a **circular delegated act** to i) establish technical screening criteria for determining the conditions under which a specific economic activity qualifies as contributing substantially to the transition to a circular economy; and ii) establish, for each relevant environmental objective, technical screening criteria for determining whether an economic activity in respect of which technical screening criteria have established causes significant harm to one or more of those objectives. The Commission adopted the circular delegated act by 31 December 2021, with a view to ensuring its application from 1 January 2023 [6].

On 6 July 2021, the Delegated Act supplementing Article 8 of the Taxonomy Regulation [6] was adopted by the Commission for scrutiny by the co-legislators. This delegated act specifies the content, methodology and presentation of **information to be disclosed by financial and non-financial undertakings** concerning the proportion of environmentally sustainable economic activities in their business, investments or lending activities, considering at same time the differences between non-financial and financial companies [11, 12].

The **Platform on sustainable finance** [11] is continuing the work on developing criteria for the remaining four objectives of the Taxonomy Regulation: water, circular economy, pollution, and biodiversity, alongside work on Taxonomy usability and extension to social criteria and significantly harmful and low impact activities. The EC will regularly review the technical screening criteria and, where appropriate, amend the delegated acts adopted in accordance with the Regulation (EU) 2020/852 in line with policies, scientific and technological developments.

In the **Table 11** of Annex 5 is reported the EU Taxonomy regulation and delegated acts mentioned before and published officially until 15 December 2021. Delegated acts are living documents that will be added to over time and updated as necessary. Thus, **it is recommendable to consult the EU Taxonomy website** [11] to update that table of legislation package.

3.4. Enabling and transitional economic activities under EU Taxonomy

The European Union have prioritised economic activities that can make the most relevant contribution to the climate change mitigation and adaptation objectives under consideration, and therefore includes activities that are most relevant for reductions in GHG emissions and for improving climate resilience. Through the Taxonomy Climate Delegated Act [9], the EU Taxonomy criteria cover the economic activities of roughly 40% of listed companies, in sectors which are responsible for almost 80% of direct GHG emissions in Europe (**Figure 5**). Through this coverage, the EU Taxonomy can significantly increase the potential that green financing offers to support transition, in particular for carbon-intensive sectors where change is urgently needed [7, 4].

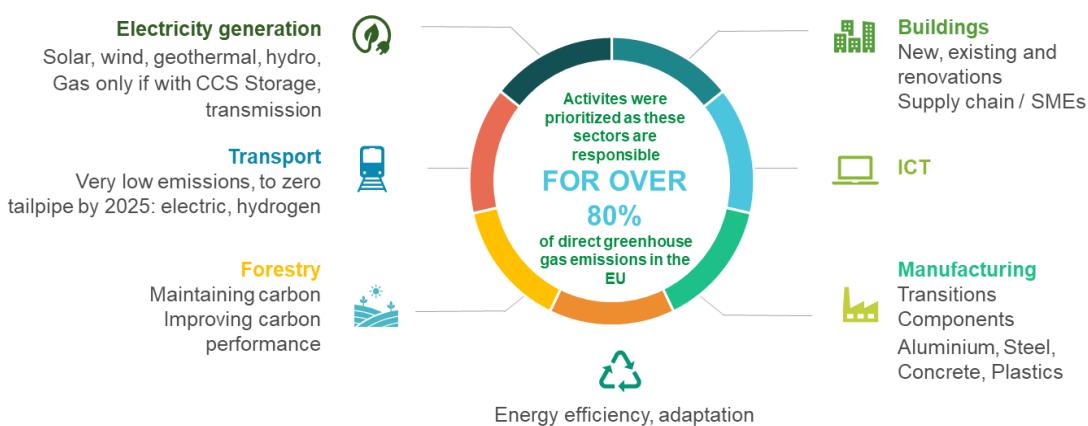


Figure 5 – First Set of economic activities from the Climate Delegated Act for climate change mitigation and adaptation objectives [13].

The **economic activities/sectors discriminated in the Climate Delegated Act [9]** are related to: Forestry; Environmental protection and restoration; Manufacturing; Energy; Water supply, sewerage, waste management and remediation; Transport; Construction and real estate; Information and communication; Professional, scientific and technical activities; Financial and insurance; Education; Human health and social work activities; Arts, entertainment and recreation.

Economic activities that are not recognised by the EU Taxonomy Delegated Acts (Table 11 - Annex 5) as substantially contributing to one of the EU's climate and environmental objectives are not necessarily environmentally harmful or unsustainable. And not all activities that can make a substantial contribution to the environmental objectives are yet part of the EU Taxonomy Delegated Acts [4]. Economic operators or public authorities that are not covered by Regulation (EU) 2020/852 [6] may also apply that Regulation on a voluntary basis [9]. Moreover, the EU Taxonomy will be developed gradually over time, and further delegated acts, or revisions of existing ones, will likely include other economic activities from different sectors and sub-sectors of the economy, as these become relevant and feasible to be integrated into the EU Taxonomy [7, 4].

According to the concept of “substantial contribution” described in subchapter 3.1, **the Taxonomy Regulation explicitly recognises two specific types of activities that can be considered Taxonomy-aligned, i.e., they make a substantial contribution to reaching the EU’s environmental objectives, such as:**

► **Enabling activities for environmental objectives:**

According to Article 16 from Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 [6], an economic activity shall qualify as contributing substantially to one or more of that six environmental objectives (**Figure 3 – subchapter 3.1**) by **directly enabling other activities to make a substantial contribution to one or more of those objectives**, implying that such economic activity:

- a)** does not lead to a lock-in of assets that undermine long-term environmental goals, considering the economic lifetime of those assets;
- b)** has a substantial positive environmental impact, on the basis of life-cycle considerations.

These are activities that directly enable others to make a substantial contribution to an environmental objective, i.e., an economic activity that ‘manufactures’ a component that improves the environmental performance of another activity [7]. **For example, this could include manufacturing of new materials from OFMSW and UWWS to replace non-biodegradable material production, research into waste valorisation for soil nutrition and erosion protection.**

Biowaste and wastewater material valorisation activities are therefore enabling activities, according to the EU Taxonomy regulation.

The several material valorisation activities from OFMSW and UWWS are reported in subchapter **3.5**. Enabling activities are also defined in Articles 10(1) and 13(1) of the Regulation (EU) 2020/852 [6] for climate change and circular economy “substantial contribution”, as thoroughly described below.

Regarding the climate delegated act, in accordance with Article 10(1) of the Regulation (EU) 2020/852 [6], an economic activity is qualified as contributing substantially to climate change mitigation where that activity contributes substantially to the stabilisation of GHG concentrations in the atmosphere at a level which prevents dangerous anthropogenic interference with the climate system consistent with the long-term temperature goal of the Paris Agreement through the avoidance or reduction of GHG emissions or the increase of GHG removals, including through process or product innovations.

In accordance with Article 13(1) of the Regulation (EU) 2020/852 [6], in establishing and updating the technical screening criteria for the environmental objective of the transition to a circular economy, **an economic activity is qualified as contributing substantially to the transition to a circular economy, including waste prevention, reuse and recycling, where that activity:**

- ◆ **uses natural resources, including sustainably sourced bio-based and other raw materials, in production more efficiently, including by:**
 - (i) reducing the use of primary raw materials or increasing the use of by-products and secondary raw materials; or**
 - (ii) resource and energy efficiency measures.**

- ◆ increases the durability, reparability, upgradability or reusability of products, in particular in designing and manufacturing activities;
- ◆ increases the recyclability of products, including the recyclability of individual materials contained in those products, *inter alia*, by substitution or reduced use of products and materials that are not recyclable, in particular in designing and manufacturing activities;
- ◆ substantially reduces the content of hazardous substances and substitutes substances of very high concern in materials and products throughout their life cycle, in line with the objectives set out in Union law, including by replacing such substances with safer alternatives and ensuring traceability;
- ◆ prolongs the use of products, including through reuse, design for longevity, repurposing, disassembly, remanufacturing, upgrades and repair, and sharing products;
- ◆ increases the use of secondary raw materials and their quality, including by high-quality recycling of waste;
- ◆ prevents or reduces waste generation, including the generation of waste from the extraction of minerals and waste from the construction and demolition of buildings;
- ◆ increases preparing for the re-use and recycling of waste;
- ◆ increases the development of the waste management infrastructure needed for prevention, for preparing for reuse and for recycling, while ensuring that the recovered materials are recycled as high-quality secondary raw material input in production, thereby avoiding downcycling;
- ◆ minimises the incineration of waste and avoids the disposal of waste, including landfilling, in accordance with the principles of the waste hierarchy;
- ◆ avoids and reduces litter.

► **Transitional activities for environmental objectives:**

According to Article 10(2) of the Regulation (EU) 2020/852 [6], **transitional activity** is an economic activity for **which there is no technologically and economically feasible low-carbon alternative** shall qualify as contributing substantially to climate change mitigation where it directly supports the transition to a climate-neutral economy consistent with a pathway to limit the temperature increase to 1,5 °C above pre-industrial levels, including by phasing out GHG emissions, in particular emissions from solid fossil fuels, and where that activity:

- a) has GHG emission levels that correspond to the best performance in the sector or industry;
- b) does not hamper the development and deployment of low-carbon alternatives;
- c) does not lead to a lock-in of carbon-intensive assets, considering the economic lifetime of those assets.

Those activities can play a crucial role in mitigating climate change and waste production by substantially reducing their currently high carbon and waste footprint, including by helping to phase out reliance on fossil fuels or raw materials/resources [7, 9].

Transitional activities may be part of an economy in transition, but not all activities that are part of an economy in transition are transitional activities. “Transitional activities”, as defined above, refers to a specific sub-set of activities making a substantial contribution to climate change mitigation. The term relates to how an activity is performed, not the nature of the activity or the sector within which it sits. The Taxonomy Regulation clearly indicates that a transitional activity must comply with the relevant technical screening criteria [14].

► Economic activities without NACE codes:

NACE codes were used as a framework to capture all economic sectors, and hence almost all economic activities. There are, however, economic activities that are not directly covered by NACE codes. Some of these are important for climate change mitigation and adaptation, and other objectives like circular economy [7]. Screening criteria have been developed for priority sectors within NACE. Other activities may be also eligible, so long as the company or investor can demonstrate compliance with the substantial contribution criteria and that no significant harm has been done to any other environmental objectives [15]. The NACE codes will be published on the Platform for Sustainable Finance [3] and Taxonomy [11] websites and updated regularly.

Economic activities, operators or investments that are not covered by Regulation (EU) 2020/852 may also apply that Regulation on a voluntary basis.

EU Taxonomy regulation and TEG expertise recommend to **encouraging disclosures by those economic activities non-covered by the Taxonomy**. They could complement their Taxonomy-alignment disclosure with an explanation that the results reflect that their activities are not yet covered by the Taxonomy - as opposed to them being unable to meet technical screening criteria [7]. This aspect is developed in subchapter **3.6**.

3.5. Taxonomy's technical screening criteria for biowaste and wastewater activities: principles, thresholds and DNSH assessment

The Taxonomy provides many tools for financing the transition of economies towards clear environmental goals. These include screening criteria that are currently high but will ratchet down over time, the recognition of CAPEX and OPEX that contribute to meeting the screening criteria over time, and the inclusion of improvement measures to reduce emissions and improve energy efficiency where the best available technologies and practices are used today [7].

The technical screening criteria are established to determine the conditions under which an economic activity qualifies as contributing substantially to one environmental objective (climate change mitigation or adaptation), and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, including circular economy [6, 7, 9, 15]. **At technical level, it would be convenient to have the taxonomy characterisation of each bioeconomy investment project in order to facilitate the needed parameters/thresholds to be used, i.e., the so-called technical screening criteria.**

Actually, the technical screening criteria were only created for the two climate objectives - climate change mitigation and adaptation (**Figure 3** – subchapter 3.1), published in the Climate Delegated Act as referred in subchapter 3.3. Nevertheless, applying the technical screening criteria to that climate change objectives, **biowaste and wastewater activities are identified for several economic sectors and their specific economic activities**, as showed in the **Figure 6** for Manufacturing sector, **Figure 7** for Energy sector and **Figure 8** for Water Supply, Sewerage, Waste Management and Remediation sector.

The technical screening criteria 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. 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 (BREFs). In addition, the DNSH criteria aim to specify the minimum requirements to be met to avoid significant harm to environmental objectives relevant to each economic activity. These criteria were established for all objectives, i.e., the environmental impacts of the activity itself, as well as of the products and services provided by that activity throughout their life cycle shall be taken into account, notably by considering their production, use and end-of-life [7, 15].

Thus, **to align with the EU Taxonomy, circular bioeconomy projects for European Cities and Regions must make a substantial contribution to climate mitigation, or adaptation, and for each project type, a threshold is used to define this substantial contribution**, as described in the tables of the EU Taxonomy Compass [16] similar to **Table 1** in subchapter 3.5.1 for the three macro-sectors selected.

The EU Taxonomy website [11] has developed a taxonomy tool, named **EU Taxonomy Compass** [16], which provides an easy visual representation of the contents of the EU Taxonomy in terms of technical screening criteria, where is possible to choose the economic activity where the investment project is oriented and find on it the taxonomy criteria. In other words, the platform enables users to check which activities are included in the EU Taxonomy (taxonomy-eligible activities), to which objectives they substantially contribute and what criteria they have to meet, including minimum safeguards.

The following subchapters describe some bioeconomy aspects for biowaste and wastewater related activities selected for each macro-sector, as well as the technical screening criteria for each bioeconomy activity identified for climate change objectives.

3.5.1. Tables of technical screening criteria for bioeconomy activities from biowaste and wastewater

As explained before, the **HOOP portfolio counts on 17 biotechnologies**, i.e., bioprocesses, for the material valorisation of OFMSW and UWWS. Bioprocesses can be referred to specific bioeconomic activity, like “biochar production”, each of them belonging to an economy macro-sector (NACE), like manufacturing or energy. Thanks to the taxonomy system, technical screening criteria can be obtained for each bioeconomic activity.

18 bioeconomic activities applied to biowaste and wastewater, and respective macro-sector and technical screening criteria, were identified in accordance with the format of **Table 1**, based on the EU Taxonomy Compass [16]. The objectives/criteria taken into consideration are the only two available so far: those related to climate change, as explained in subchapter 3.3.

The **17 biotechnologies and processes currently included in the HOOP portfolio, and ready to evolve to investment projects, can be classified among 3 macro-sectors of bioeconomic activity**, namely:

- ❖ **C - Manufacturing sector.**
- ❖ **D - Energy sector.**
- ❖ **E - Water Supply, Sewerage, Waste Management and Remediation sector.**

The projects of investment and its specific bioeconomic activity must be classified according to NACE level(s) and code(s). The NACE codes are available for consultation on the website of statistical classification of economic activities in the European Community by EUROSTAT [17]. The NACE codes initiate with the letter corresponding to the macro-sector identification described above. In order to identify directly the technical screening criteria for determining the conditions under which a bioeconomic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation, and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, the structure of that tables are like the **Table 1**, covering the following topics:

- ❖ Sector and activity classification with NACE level and codes, and related description;
- ❖ Climate change mitigation and adaptation substantial contribution criteria: principle, metrics & thresholds;
- ❖ DNSH assessment for the remaining five environmental objectives, which circular economy transition is one of them;
- ❖ Minimum safeguards.

The topics above and contents of the Tables of technical screening criteria for climate change objectives are established on the recent delegated act published officially in the Journal of the European Union [9], the TEG final report annex [15] and the EU Taxonomy Compass platform [16].

Table 1. Structure of Table and respective kind of contents applied to the climate change mitigation and adaptation technical screening criteria for bioeconomic activities from biowaste and wastewater.

Sector and activity classification	
Macro-sector	Name and letter code of the macro-sector where the bioeconomic activity is applied, in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006 [17].
NACE level	Identification with NACE level of the specific bioeconomic activity, in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006 [17].

NACE code(s)	Identification with NACE code of the specific bioeconomic activity, in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006 [17]. Bioproducts are identified with a specific CPA (Classification of Products by Activity) code [17], more detailed than NACE code. These CPA codes are used for 2008 and 2014 versions. Nevertheless, the 2014 one is officially published and has been used by EU organisations from Member States. Since CPA 2014 version is more detailed than CPA 2008, but the coding system remains the same, identical codes can be used in both versions of CPA but with different content, i.e., corresponding to different sections, divisions, groups, classes, categories and subcategories. The 2008 version has been used yet by several organisations and companies.
Description	A short description of the specific bioeconomic activity applied to biowaste and wastewater management and valorisation.
Climate Change Mitigation substantial contribution criteria	
Principle	Description of the underlying rationale for how the bioeconomic activity result in a substantial contribution and/or avoidance of significant harm to the climate change mitigation.
Metrics & Thresholds	Description of the method(s) by which the environmental performance of the bioeconomic activity will be measured, including defining the boundary for this measurement and the qualitative or quantitative conditions which must be met to enable the performance of the activity in a way that is considered environmentally sustainable.
Climate Change Adaptation substantial contribution criteria	
Principle	Description of the underlying rationale for how the bioeconomic activity result in a substantial contribution and/or avoidance of significant harm to the climate change adaptation.
Metrics & Thresholds	Description of the method(s) by which the environmental performance of the bioeconomic activity will be measured, including defining the boundary for this measurement and the qualitative or quantitative conditions which must be met to enable the performance of the activity in a way that is considered environmentally sustainable.
DNSH assessment	

Climate change adaptation (if climate change mitigation is the substantial contribution)	This section refers to the screening criteria for DNSH to climate change adaptation by: A. reducing material physical climate risks: 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 climate risk assessment. For existing activities, the implementation of those physical and non-physical measures may be phased and executed over a period of time of up to 5 years. For new activities, implementation of these measures must be met at the time of design and construction. 2) The above-mentioned climate risk 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. B. Supporting system adaptation: 1) The activity and its adaptation measures do not increase the risks of an adverse climate impact on other people, nature and assets. Consideration should be given to the viability of “green” or nature based-solutions (NBS) over “grey” measures to address adaptation. 2) The activity is consistent with sectoral, regional, and/or national adaptation efforts.
Climate change mitigation (if climate change adaptation is the substantial contribution)	This section refers to the screening criteria for DNSH to climate change mitigation, where that economic activity has the potential to produce and/or increase substantial GHG emissions, considering life-cycle emissions of the activity.
Sustainable use and protection of water and marine resources	This section refers to the screening criteria for DNSH to water and marine resources, where that activity is detrimental to the good status, or where relevant the good ecological potential, of water bodies, including surface waters and groundwaters, or to the good environmental status of marine waters.
Transition to a circular economy	This section refers to the screening criteria for DNSH to circular economy, where that activity leads to significant inefficiencies in the use of materials and the direct or indirect use of natural resources such as non-renewable energy sources, raw materials, water and land 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, with the exception of incineration of non-recyclable hazardous waste, or where the long-term disposal of waste may cause long-term harm to the environment.
Pollution prevention and control	This section refers to the screening criteria for DNSH to pollution prevention, where that activity leads to a significant increase in the emissions of pollutants into air, water or land, as compared to the situation before the activity started.
Protection and restoration of biodiversity and ecosystems	This section refers to the screening criteria for DNSH to biodiversity and ecosystems, where that activity is detrimental to a significant extent to the good condition and resilience of ecosystems or where that activity is detrimental to the conservation status of habitats and species, including those of Community interest.
Minimum safeguards	
The minimum safeguards (social, working, ethic and other aspects) to have into account during and after the project of investment/bioeconomic activity.	

Regarding the generic criteria to climate change adaptation [16] in the DNSH assessment, the EU Taxonomy established a classification of climate-related hazards, as showed in the **Table 2**, necessary to understand and accomplish these criteria when climate change mitigation is considered the substantial contribution criteria.

Table 2. Classification of climate-related hazards for DNSH climate change adaptation criteria.

	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 or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline acidification	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, groundwater)	Subsidence
			Glacial lake outburst	

3.5.2. Manufacturing sector

Manufacturing is the second largest contributor to CO₂e emissions but is also 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 [15].

The biowaste and wastewater economic activities covered, related to manufacture of products from renewable feedstocks (all kind of biowaste, sludge and biomass), in the technical screening criteria for Manufacturing sector were selected and indicated in **Figure 6**. The economic activities covered include sectors that account for a high share of industrial GHG emissions and therefore offer large potential for GHG

emissions reduction, where includes the manufacturing of low carbon technologies, organic and inorganic chemicals, fertilisers and nitrogen compounds, and plastics.

The manufacture of low carbon technologies includes economic activities of manufacture of renewable energy technologies, where renewable energy is defined in Article 2(1) of Directive (EU) 2018/2001, and manufacture of technologies aimed at substantial GHG emission reductions in other sectors of the economy.

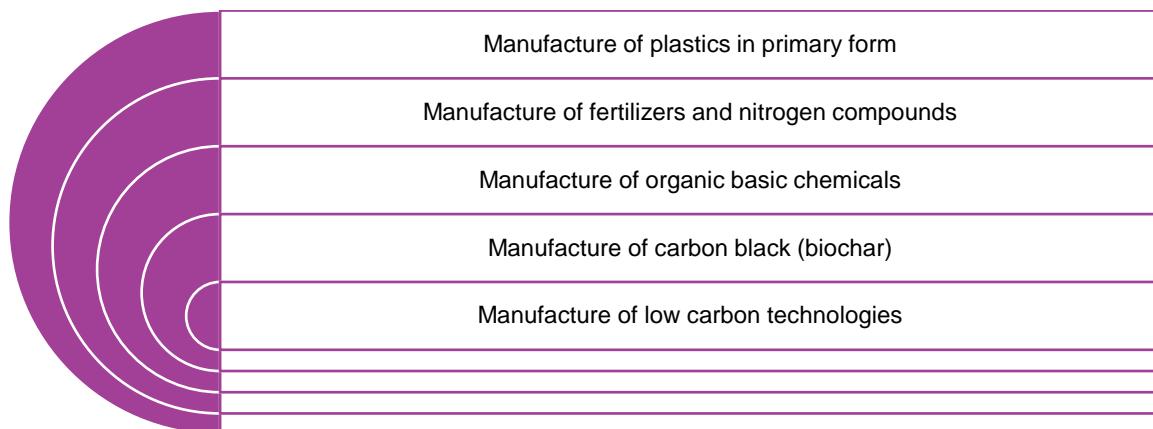


Figure 6 – Biowaste and wastewater economic activities covered in the technical screening criteria for Manufacturing sector and climate change objectives.

The manufacturing sector, and its economic activities, is identified by the NACE level of 4 [17]. The following **Table 3** summarises the bioproducts and technologies, and their related NACE codes, from renewable feedstocks of biomass, sewage sludge, industrial and municipal biowaste for each manufacturing activity.

Table 3. Bioproducts covered in the biowaste and wastewater economic activities from Manufacturing sector.

Manufacturing activity	NACE code	Bioproducts and technologies
Manufacture of low carbon technologies	several NACE codes	<p>Manufacturing of products, key components, and machinery that are essential for eligible renewable energy technologies.</p> <p>Manufacture of other low carbon technologies that result in substantial GHG emission reductions in other sectors of the economy (including private households).</p>
Manufacture of carbon black	C20.13	Biochar

Manufacture of organic basic chemicals	<p>C20.14</p> <p>High volume chemicals: acetylene; ethylene; propylene; butadiene; hydrogen.</p> <p>Aromatics: mixed alkylbenzenes, mixed alkylnaphthalenes; cyclohexane; benzene; toluene; o-xylene; p-xylene; m-xylene and mixed xylene isomers; ethylbenzene; cumene; biphenyl, terphenyls, vinyltoluenes; benzol (benzene), toluol (toluene) and xylol (xylenes) I; naphthalene.</p> <p>Vinyl chloride; styrene; ethylene oxide; monoethylene glycol; adipic acid.</p> <p>Other organic chemicals: saturated acyclic monocarboxylic acids and their derivatives; unsaturated monocarboxylic, cyclanic, cyclenic or cycloterpnic acyclic polycarboxylic acids and their derivatives; aromatic polycarboxylic and carboxylic acids with additional oxygen functions, and their derivatives, except salicylic acid and its salts.</p>
Manufacture of fertilizers and nitrogen compounds	<p>C20.15</p> <p>Anhydrous ammonia Nitric acid</p>
Manufacture of plastics in primary form	<p>C20.16</p> <p>Manufacture resins, plastics materials and non-vulcanisable thermoplastic elastomers, the mixing and blending of resins on a custom basis, as well as the manufacture of non-customised synthetic resins.</p>

Enabling activities are also included in manufacturing which covers both those activities included under “low carbon technologies” and also “mitigation measures” which when combined result in achievement of the thresholds. Then, it is necessary to have into account the following aspects [15]:

- ▶ **Low carbon activities** refers to the manufacturing of products, key components, equipment and machinery that are essential to a number of key renewable energy technologies; 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). **There are no explicit thresholds for those manufacturing activities listed under the category “low carbon technologies”.**
- ▶ **Mitigation measures** are included as enabling activities since they are recognised as critical steps supporting the transition of economic activities in these high emitting manufacturing sectors towards reaching the defined thresholds.

The thresholds for the manufacturing activities 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 [15]. For this reason, **it is recommendable to consult periodically the technical screening criteria and this respective threshold in order to update if necessary.**

3.5.3. Energy sector

Heat and electricity generation are responsible for over a quarter of the EU's GHG emissions. Ambitious emissions reductions in this sector are vital to decarbonisation. The Taxonomy on the heat and power sector has attempted to recognise this finding by developing suitably ambitious requirements within a model of supporting a transition to the EU's emission reduction goals towards carbon neutrality [15].

The biowaste and wastewater economic activities covered, related to energy production from renewable feedstocks (biomass and biofuels from biowaste, biogas from AD and other waste management facilities) - bioenergy, in the technical screening criteria for Energy sector were selected and indicated in **Figure 7**. The economic activities covered include sectors that account for a high share of GHG emissions reduction trajectory, from EU political commitments, to reach a reduction of 43% by 2030 in the sector and then linearly decline to net-zero emissions by 2050, where includes the production of electricity from bioenergy, manufacture of biomass, biogas and biofuels, cogeneration of heat/cool and power from bioenergy, production of heat/cool from bioenergy and using waste heat.

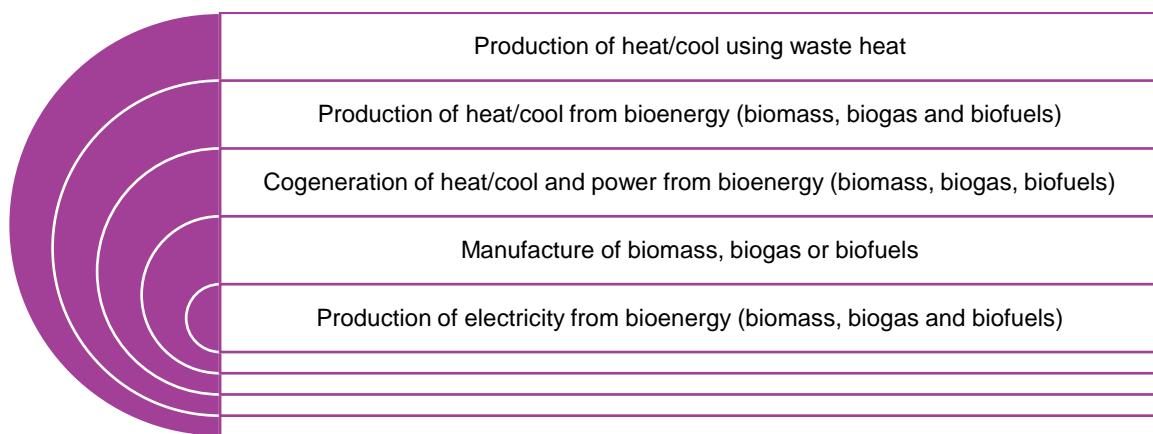


Figure 7 – Biowaste and wastewater economic activities covered in the technical screening criteria for Energy sector and climate change objectives.

The Energy sector, and its economic activities, is identified by the NACE level of 4 [17]. The following **Table 4** summarises each bioenergy activity description, and their related NACE codes, from renewable feedstocks of biomass, biogas and biofuels (from biowastes and waste treatment facilities like AD) provided by waste management of municipal biowaste and sludge in the Energy sector.

Table 4. Bioenergy production covered for the biowaste and wastewater economic activities from Energy sector.

Energy activity	NACE code	Bioenergy activity description
Production of electricity from bioenergy (biomass, biogas and biofuels)	D35.11	Construction and operation of electricity generation installations that produce electricity exclusively from biomass, biogas or bioliquids/biofuels, excluding electricity generation from blending of renewable fuels with biogas or biofuels.
Manufacture of biomass, biogas or biofuels	D35.21	Manufacture of biomass, biogas or biofuels for use in transport and for the manufacture of bioliquids.
Cogeneration of heat/cool and power from bioenergy (biomass, biogas and biofuels)	D35.11 D35.30	Construction and operation of installations used for cogeneration of heat/cool and power exclusively from biomass, biogas or bioliquids, and excluding cogeneration from blending of renewable fuels with biogas or bioliquids.
Production of heat/cool from bioenergy (biomass, biogas and biofuels)	D35.30	Construction and operation of facilities that produce heat/cool exclusively from biomass, biogas or bioliquids/biofuels, and excluding production of heat/cool from blending of renewable fuels with biogas or bioliquids.
Production of heat/cool using waste heat	D35.30	Construction and operation of facilities that produce heat/cool using waste heat.

The Taxonomy methodology considers the average annual emissions factors over a period of 40 years from the time of commissioning. Thus, the **threshold is defined into 100 g CO₂e/kWh for Energy sector (power, electricity and heating/cooling generation)**. For a given investment or activity to be compatible with this trajectory, its average emissions over its physical lifetime, or 40 years, must be lower than this threshold [15].

The threshold varies by year of commissioning. To avoid updating it annually, and to provide some stability and certainty for investors, the threshold is fixed for a period of 5 years from 2020 and will be revised in 2025. During future reviews of this threshold, actual Energy sector emissions and generation, as well as long-term projections and policy targets will be updated as necessary [15]. For this reason, **it is recommendable to consult periodically the technical screening criteria and this respective threshold to update if necessary**.

3.5.4. Water Supply, Sewerage, Waste Management and Remediation sector

The sector Water Supply, Sewerage, Waste Management and Remediation covering NACE-Codes E36 to E39 contributes to a rather small share of the EU's total GHG 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 GHG emission reductions in other sectors of the economy through waste prevention, separate waste collection, waste reuse, recycling and material valorisation [15].

The biowaste and wastewater economic activities, related to waste management facilities and valorisation of biowaste and sewage sludge (composting, anaerobic digestion, material recovery and bioenergy), covered in the technical screening criteria for Water Supply, Sewerage, Waste Management and Remediation sector were selected and indicated in the **Figure 8**. The collection and treatment of wastewater, and collection and transport of urban waste in segregated fractions activities were also included, given that they are typical and important operations for the cities. These activities are also essential to obtain better quality of urban biowaste and wastewater sludge.

The economic activities covered include waste sectors that show an interesting potential for GHG emission reduction trajectory, from EU political commitments, towards net-zero emissions by 2050. Circular bioeconomy has crucial relevance to meet that climate commitments in the urban solid waste and wastewater sectors. Therefore, an integrated approach describing the climate and circular impacts on a closely interrelated and combined environmentally sustainable activities will have an increased potential.

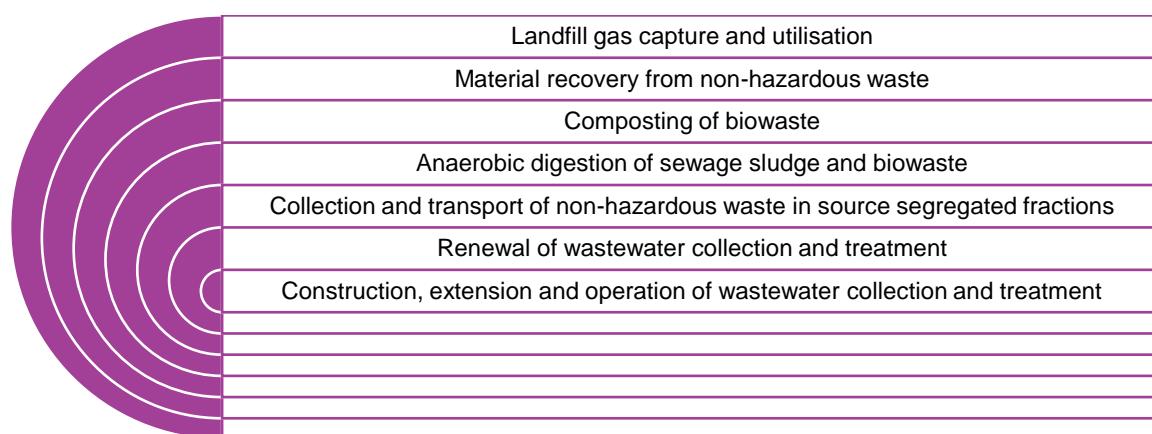


Figure 8 – Biowaste and wastewater economic activities covered in the technical screening criteria for Water Supply, Sewerage, Waste Management and Remediation sector and climate change objectives.

The Water Supply, Sewerage, Waste Management and Remediation sector, and its economic activities, is identified by the NACE level of 4 [17]. The following **Table 5** summarises each waste management activity description, and their related NACE codes, addressed to waste management and valorisation of municipal biowaste and sewage sludge in the Water Supply, Sewerage, Waste Management and Remediation sector.

Table 5. Bioenergy production covered for the biowaste and wastewater economic activities from Water Supply, Sewerage, Waste Management and Remediation sector.

Water Supply, Sewerage, Waste Management and Remediation activity	NACE code	Waste management activity description
Construction, extension and operation of wastewater collection and treatment	E37.00 F42.99	Construction, extension and operation of centralised wastewater systems including collection and treatment.
Renewal of wastewater collection and treatment	E37.00	Renewal of centralised wastewater systems including collection and treatment. It implies no material change related to the load or volume of flow collected or treated in the wastewater system.
Collection and transport of non-hazardous waste in source segregated fractions	E38.11	Separate collection and transport of non-hazardous waste in single or comingled fractions aimed at preparing for reuse or recycling.
Anaerobic digestion of sewage sludge	E37.00 F42.99	Construction and operation of facilities for the treatment of sewage sludge by anaerobic digestion with the resulting production and utilisation of biogas or chemicals.
Anaerobic digestion of biowaste	E38.21 F42.99	Construction and operation of dedicated facilities for the treatment of separately collected biowaste, through anaerobic digestion with the resulting production and utilisation of biogas and digestate and/or chemicals.
Composting of biowaste	E38.21 F42.99	Construction and operation of dedicated facilities for the treatment of separately collected biowaste, through composting with the resulting production and utilisation of compost.
Material recovery from non-hazardous waste	E38.32 F42.99	Construction and operation of facilities for the sorting and processing of separately collected non-hazardous waste streams into secondary raw materials involving mechanical reprocessing, except for backfilling purposes.
Landfill gas capture and utilisation	E38.21	Installation and operation of infrastructure for landfill gas capture and utilisation in permanently closed landfills or landfill cells using new or supplementary dedicated technical facilities and equipment installed during or post landfill or landfill cell closure.

The quantitative thresholds are defined for an ambitious level of high or substantial improvement of the energy efficiency in the water collection and treatment system. Despite the heterogeneity of Water Supply, Sewerage, Waste Management and Remediation sector, **the contribution of this sector to a low carbon and circular economy is unquestionable [15]**.

There are two last considerations linked to this sector and the **use of biowaste and sewage sludge**:

- ❖ Waste management activities dealing with the valorisation and cascading uses of biowaste (e.g., extraction of nutrients and biochemical feedstock from biowaste substituting production from fossil sources) are still in their “infancy” but will gain strong importance in the future [15];
- ❖ Remediation activities involving the installation of biofilters or the implementation of other landfill gas abatement measures are more environmental and economic advantageous, where the installation of active landfill gas collection and utilisation systems are not economically viable [15].

3.6. Disclosures and financial KPIs for non-financial companies in urban waste and wastewater sector

In the European Cities and Regions, there are public, private and public-private companies responsible by the waste and wastewater management and valorisation activities. In this context, it is important to mention the topic of this subchapter in order to understand better the methodology behind the indicators and disclosures for testing the alignment to EU Taxonomy. The Taxonomy regulation applies to three different parties of Taxonomy users [7], as described in **Figure 9**.



Figure 9 – Taxonomy target users.

Financial market participants were required to complete their first set of disclosures against the Taxonomy, covering activities that substantially contribute to climate change mitigation and/or adaptation, by 31 December 2021. Non-financial companies, like waste management companies looking for financing, will be required to disclose in the course of 2022 [7]. An expanded set of disclosures covering activities that substantially contribute to all six environmental objectives will be required by the end of 2022. More information about delegated acts and other relevant regulation is listed and described in subchapter 3.3.

The Article 8 of the Taxonomy Regulation (EU) 2020/852 [6] is related to transparency of undertakings in non-financial statements. **Its appliance will increase transparency in the market and mitigate risks of greenwashing, and subsequent reputational risks for financial institutions, by providing information to investors about the environmental performance of assets and economic activities of financial and non-financial undertakings.**

For non-financial companies, economic activities and investments, the disclosure must specify the financial key performance indicators (KPIs) related to:

- the proportion of **turnover aligned with the Taxonomy**: **turnover** gives a clear picture of where a company currently is relative to the Taxonomy. It allows investors to report the percentage of their fund invested in Taxonomy-aligned activities [7].
- **CAPEX and OPEX expenditures aligned with the Taxonomy**: **CAPEX and OPEX**, in contrast, gives investors a very good sense of a company's direction of travel. It is a key variable for assessing the credibility of a company's strategy, and it helps investors decide whether they agree with their strategic approach. Companies that disclose their CAPEX investments in economic activities as part of a plan to be Taxonomy-aligned provide invaluable information for constructing green portfolios, and for analysing companies' transition plans and/or environmental sustainability performance and strategies [7].

Large undertakings that are required to publish non-financial information pursuant to the Non-Financial Reporting Directive (NFRD) shall disclose information to the public on how and to what extent their activities are associated with environmentally sustainable economic activities. Other companies (e.g., SMEs, non-EU companies) may decide to disclose this information on a voluntary basis for the purpose of getting access to sustainable financing or for other business-related reasons.

The Commission Delegated Regulation (EU) of 7.7.2021 [12] specifies the content and presentation of information to be disclosed by undertakings concerning environmentally sustainable economic activities, and also specifies the methodology to comply with that disclosure obligation. This disclosure should be made as part of the non-financial statement, which may be located in annual reporting or in a dedicated sustainability report. This delegated act considers the differences between non-financial and financial companies. More information about this delegated act and its annexes and excel file templates for the KPIs are listed and described in the **Table 11** in Annex 5.

3.6.1. Defining, calculating and using Financial KPIs: approach for non-financial companies, economic activities and investments

As referred in the section before, the Taxonomy Regulation requires companies to provide company-level disclosures. However, these need to arise from an understanding of the economic activities in which a company is involved (companies may be involved in multiple economic activities). The financial KPIs considered by the Taxonomy Regulation are **turnover, CAPEX and OPEX, which must be aligned with the EU Taxonomy principles and criteria**, where are listed and described in terms of definition and use [7] in the **Table 6**.

Table 6. Description of financial KPIs for company disclosures.

Financial KPI	Definition	Use
Turnover	<p>Net turnover means the amounts derived from the sale of products and the provision of services after deducting sales rebates and value added tax and other taxes directly linked to turnover. Overall turnover is equivalent to a firm's total revenues over some period of time.</p> <p>Turnover ratios are used by financial analysis to understand a company's efficiency and profitability based on data found in financial statements.</p>	The primary way of aggregating from an economic activity to a company level. Some companies may need to aggregate from asset to economic activity level.
CAPEX	CAPEX is a payment for goods or services recorded, or capitalised, on the balance sheet instead of expensed on the income statement.	Aside from helping investors analyse a company's investment in its existing and new fixed assets, capital expenditures can give an indication of a company's strategy for improving environmental performance and resilience.
OPEX	OPEX are shorter-term expenses required to meet the ongoing operational costs of running a business.	

In the **Table 7** is listed and described the differences in calculation approaches for company climate change mitigation and adaptation [7], when these environmental objectives are considered as substantial contribution criteria.

Table 7. Differences in calculation approaches for climate change objectives.

Financial KPI	Climate change mitigation	Climate change adaptation
Turnover	Can be counted where economic activity meets Taxonomy technical screening criteria for substantial contribution to climate change mitigation and relevant DNSH criteria.	Can be recognised only for activities enabling adaptation. Turnover cannot be recognised for adapted activities at this stage.
CAPEX and OPEX	Can be counted where costs incurred (CAPEX and OPEX) are part of a plan to meet Taxonomy technical screening criteria for substantial contribution to climate change mitigation and relevant DNSH criteria.	Can be counted where costs incurred (CAPEX and OPEX) are part of a plan to meet Taxonomy technical screening criteria for substantial contribution to climate change adaptation and relevant DNSH criteria.

The **Figure 10** represents a scheme of Taxonomy alignment approach and analysis applied for a hypothetical non-financial company and its activities and investments [13].

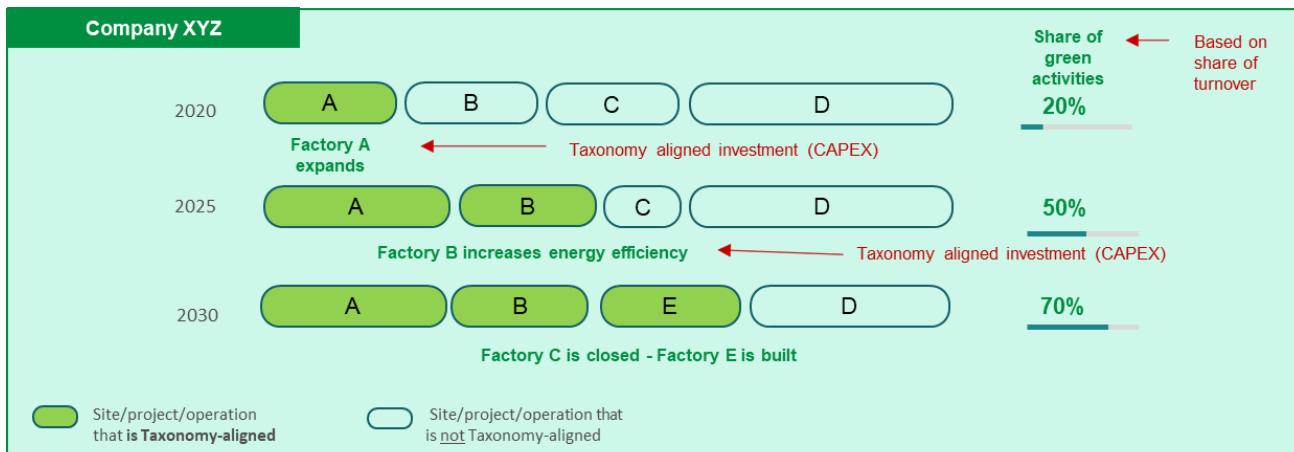


Figure 10 – Taxonomy alignment approach for non-financial companies [13].

3.6.2. Reporting for financial undertakings

Companies and other issuers disclosing against the Taxonomy will need to assess their compliance with minimum safeguards and technical screening criteria. When applying DNSH, companies and issuers are encouraged to follow the risk-based guidance from ISO 31000:2018 Risk Management Guidelines and ISO 14015:2010 Environmental management. **Where companies do not provide the necessary information on qualitative criteria and/or on minimum safeguards, investors may need to form an independent judgement [7].**

The DNSH technical criteria provide specific guidance to companies on the potential adverse environmental impacts that are more likely to affect activities given their nature. What DNSH criteria usually do not consider is the specific context in which different companies operate, e.g., location or size. These should be factored in when conducting the risk assessment [7].

Financing directly to or within funds provides another opportunity for financiers and investors to identify their alignment with environmental objectives. There is no disclosure regulation that obliges green bond or loan issuers to disclose Taxonomy alignment. However, investors will need the information when reporting on the portion of Taxonomy alignment of their funds [7].

Non-financial companies may help this transition by defining green economic activities, not companies. **The Taxonomy enables companies to transition by gradually increasing their share of “green” activities.** Therefore, there are some aspects must be included in reporting for financial undertakings, according to The Commission Delegated Regulation (EU) of 7.7.2021 [12]:

Recital 13: Financial undertakings may, however, and on a voluntary basis, disclose exposures to taxonomy aligned bonds and taxonomy aligned debt securities that are issued by central governments, central banks or supranational issuers. Separately from the KPI.

Local governments (cities and regions) financing e.g., social housing, public transportation, etc. shall be included in both numerator and denominator of the KPI [13].

3.7. Engaging Recovery and Resilience Fund applied for cities and regions with EU Taxonomy

The EU leaders and Member States worked on the preparation of economic stimuli plans at the end of 2020 during COVID-19 pandemic crisis, known as Recovery and Resilience Plans (RRPs) 2020-2024, which it was critical that environmental and social criteria were taken into account in the choices of budget allocations for each European country. Green conditionality and incentives could be incorporated into financial instruments such as conditional loans issued by the European Safety Mechanism, guarantees or recapitalisation, with the emerging EU Taxonomy serving as potential guidelines to set criteria and evaluate the environmental eligibility of current and future projects to access the sustainable investment and financial instruments – **this approach and mechanism will have a strong positive climate and circular impact in the European Cities and Regions, boosting the circular and green economy of the cities to a low-carbon, climate resilient and resource-efficient society** [18].

National RRPs detailed their precise contributions to meet the EU's climate neutrality, the 2030 energy and climate targets and provided concrete steps to achieve a 37% climate mainstreaming target. Member States RRPs also described in detail how all planned measures respect the DNSH principle to the six climate and environmental objectives defined in the Taxonomy Regulation [8].

The following **Figure 11** describes the last three key historic European milestones achieved in EU, during the pandemic crisis, in order to define the priorities and guidelines for the financing and funding of the post-COVID-19 projects, investments and economic activities into a digital, ecological, resilient and sustainable transition.

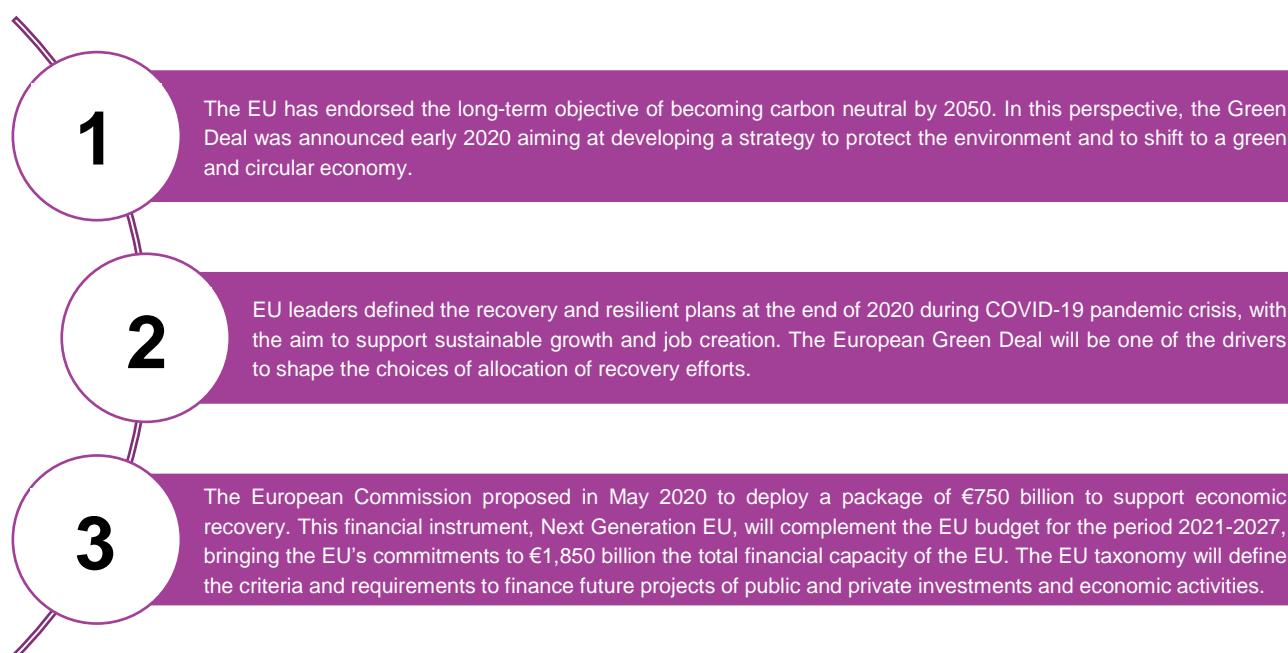


Figure 11 – Three key articulate short-term recovery measures with long-term climate and circular commitments [7, 8, 18].

Therefore, in the National RRP, the recovery investments, grants and spending must avoid environmental harm by respecting the DNSH and minimum safeguards requirements of the EU Taxonomy, as described in **Figure 4**. The EU TEG on Sustainable Finance summarises 7 fundamental reasons, as indicated in **Figure 12**, to implement and use the Taxonomy in EU recovery planning for green recovery of cities, regions and countries in Europe. **The European Cities and Regions must include the taxonomy analysis and assessment of their future investment projects based on those 7 statements.**

-
- 1** The EU Taxonomy was designed to help direct finance to support a sustainable investment system.
 - 2** The Taxonomy has been precisely tailored to identify investments that can drive delivery of the EU's environment and climate objectives, and to identify activities at risk of causing significant harm to progress against those objectives.
 - 3** The Taxonomy is robust, science-based and avoids unintended consequences.
 - 4** The Taxonomy directly responds to the EU's environmental challenges.
 - 5** The Taxonomy can direct finance to the transition.
 - 6** The Taxonomy is a tool to prevent social harm.
 - 7** The Taxonomy can enable better cooperation between the EU, Member States, companies, municipalities, public finance institutions and investors.

Figure 12 – The 7 fundamental reasons to use the EU Taxonomy in the Recovery and Resilience Plans and Funds by the cities and regions in Europe [19].

EY teams identified projects in the European cities and regions that can support jobs in the short-term and contribute to the EU's climate and circular objectives. **This huge project pipeline across all European cities and regions underpins a green and resilient recovery from the Covid-19 economic crisis [18].**

Projects were identified in 5 sectors (energy, building, transportation, industry and land-use), using an online survey, databases and consultations with around 170 stakeholders (governments, public organisations,

investors, project developers, start-ups and industrial corporations). The 2,000+ “shovel-ready” opportunities offered were reviewed and 1,000 projects across the EU-27 Member States selected, all having the potential to create social, environmental and economic value in the next 2 years for the European cities and regions. About 20% of these local and regional projects selected are small and require investments of up to EUR 5 million [18].

The application of the EU Taxonomy at the project level has the advantage of being able to include an assessment of doing no significant harm in the non-climate components of the Taxonomy through appropriate Environmental Impact Assessments [8].

The projects reviewed were compared with the EU Taxonomy [6] and circular economy action plan [20] – and the conclusion reached is: **with a green and circular economy approach and investment, the projects selected have the potential to unlock positive environmental value and to contribute to carbon neutrality.** Depending on the technology, size and context of the projects, the aggregated GHG emissions avoided are estimated at around 2.3 Gt CO₂e over the projects' lifetime [18].

The next main conclusions and recommendations, to support a green and resilient recovery in Europe, were emerged from taxonomy compliance analysis and stakeholder consultations applied to the projects [18].

- ▶ Demonstrating compliance with the EU Taxonomy turned out to be a difficult exercise in several domains, especially in the buildings, waste management or land use sectors, where compliance depends on the level of foreseen energy saving performance or global environmental analysis.
- ▶ Most public and private project developers do not yet refer explicitly to the EU Taxonomy to demonstrate their projects' climate benefits, nor disclose specific threshold information that can prove compliance, and yet even without the detail many thresholds were applicable with the information provided.
- ▶ The EU Taxonomy guidelines cover most economic activities which contribute to climate change mitigation and adaptation. A limited number of areas are uncovered yet, which could not be confirmed as “Taxonomy compliant”, include several manufacturing activities (eco-design, hazardous waste management, etc.).
- ▶ A rigorous use of EU Taxonomy guidelines led to differentiate **priority 1 projects** (projects are aligned with EU taxonomy and have a clear climate benefit) and **priority 2 projects** (projects with clear environmental benefits but for which we could not check compliance with EU taxonomy with available information).
- ▶ The roll-out of the 1,000+ projects identified will require the use of public and private financial instruments and some regulatory measures.
- ▶ All projects are potentially impacted by risk concerns from investors in a post-Covid-19 environment, potentially increasing financing costs or leaving a shortage of capital for innovative new ventures.
- ▶ Financing is only one of the aspects holding back the deployment of green projects. For 49% of the projects selected, the main barrier is non-financial (regulatory, administrative, commercial, etc.). This means that beyond financing instruments, policy and regulatory measures will also be required in order to deliver environmental and social values.

3.8. Applying the Taxonomy to Next Generation EU Instruments

Next Generation EU proposed to be financed through European Commission borrowing of EUR 750 billion [8, 18, 19]. Aligning the deployment of the recovery instruments with the Taxonomy would enable the Commission to issue EU Green Bond Standard aligned debt. Within the Next Generation framework, InvestEU and its new Strategic Investment Facility, two Taxonomy baselines was taken into account [19]:

1. The Multiannual Financial Framework and Next Generation EU must avoid harm by respecting the DNSH and minimum safeguards requirements of the EU Taxonomy.
2. The quantity of spending and investments making a substantial contribution, in line with the Taxonomy criteria and framework, should be prioritised. The Taxonomy should be used in tracking progress on climate and circular financing commitments.

The Next Generation EU has considered some funding and financing instruments which the Taxonomy can be applied, as described in the **Table 8**.

Table 8. Applications of the Taxonomy to Next Generation EU instruments and other EU programmes [19].

Pillar 1 - Supporting Member States to recover
<ul style="list-style-type: none"> ❖ Recovery and Resilience Facility. ❖ State Aid. ❖ REACT-EU (cohesion funding). ❖ Rural development (agriculture is a well-developed Taxonomy area). ❖ Just Transition Fund (which should be considered part of the overall support in cases where economic impacts of the environmental transition are accelerated by the COVID recovery).
Pillar 2 - Kick-starting the economy and helping private investments
<ul style="list-style-type: none"> ❖ Solvency Support Instrument. ❖ InvestEU. ❖ Strategic Investment Facility (implemented as an additional policy window within InvestEU).
Pillar 3 - Learning the lessons from the crisis
<ul style="list-style-type: none"> ❖ Health Programme. ❖ RescEU. ❖ Horizon Europe (research and innovation). ❖ Neighbourhood, Development and International Cooperation. ❖ Humanitarian Aid.

The Taxonomy can be used to:

- a) identify companies with high potential for green transition;
- b) demonstrate compliance with high-level social and environmental safeguards;
- c) form the basis of green transition plans that ensure all future CAPEX and OPEX are directed towards Taxonomy-alignment and all existing activities should be screened for potential to cause significant harm with reference to the Taxonomy screening criteria [19].
- d) The Taxonomy should be used in tracking progress on climate and circular financing and political commitments.

3.9. Good practices in applying EU Taxonomy to companies and funds

Actually, it is hard to find a company which is not promoting some kind of climate or environmental activity and it is genuinely hard to separate the leaders from the greenwashing. The world has reached an all-time high for ESG reporting with 90% of S&P 500 companies publishing sustainability reports in 2019. Managing ESG also matters to fund managers as it is increasingly positively linked to outperformance [8].

"The companies are under increasing stakeholder and regulatory pressure to describe the impacts of their operations in an integral sense, as a global citizen, and not just in a narrow economic sense."

Companies using the EU Taxonomy to report a "percentage of alignment" have to add up taxonomy aligned revenues and divide by their total revenues.

The EU Taxonomy is the cornerstone of multiple regulations impacting company reporting, disclosure, bond issuance, labels, engagement rules and benchmarks." [8]

According to the technical screening criteria from EU Taxonomy, **companies or other kind of projects from cities, regions and countries, at municipal/public or public-private dimension, can achieve taxonomy aligned revenues in the following four steps** described in **Figure 13**, which use the same basic tools as for project assessment [8].

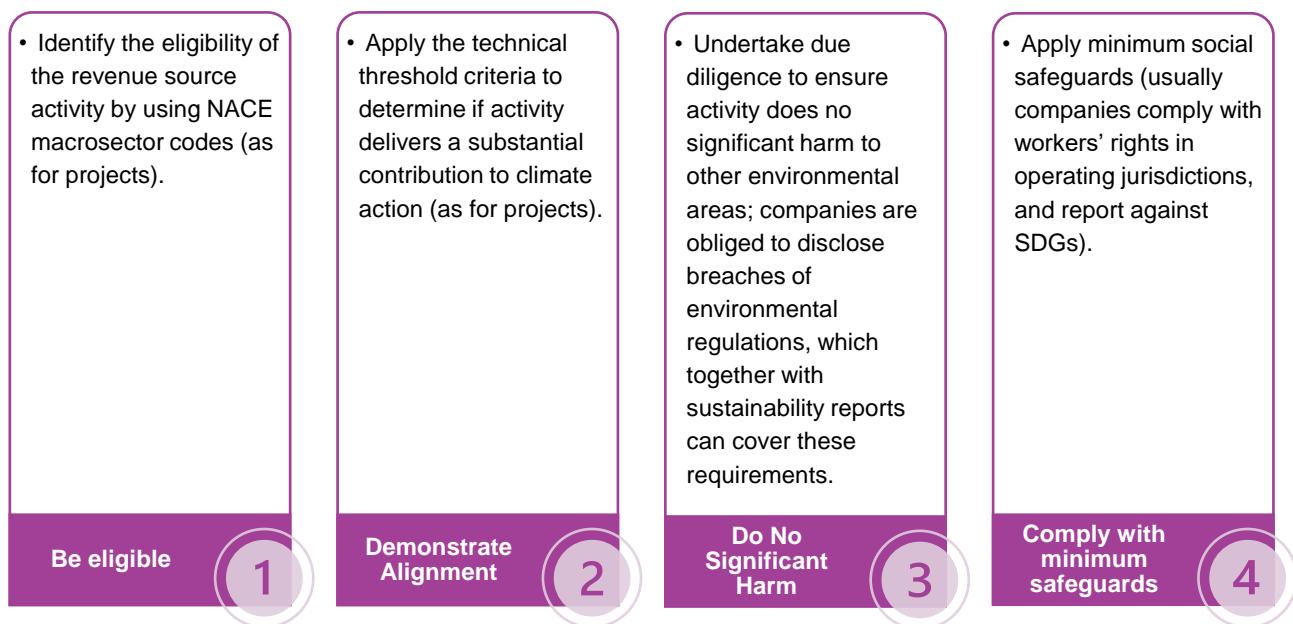


Figure 13 – How to achieve taxonomy aligned revenues according to EU Taxonomy’s technical screening criteria [8].

For companies and funds, two regulations that use EU taxonomy definitions, are critical and must have into account [8]:

1. Non-Financial Reporting Directive (NFRD).
2. Sustainable Finance Disclosures Regulation (SFDR).

Regarding the application of EU Taxonomy, important challenges were identified like poor-quality reporting, lack of access to data and issues that arose from creating new processes to adapt to the Taxonomy. In addition, policymakers could support the practical application of the EU Taxonomy to companies and funds by, for example, putting in place EU certification schemes that provide ESG-relevant data [8]. Given the relative newness of the processes and clear needs for greater shared practice, the following **Table 9** summarises some good practice approaches to facilitate implementation of the EU Taxonomy to companies and funds.

Table 9. Good practices in applying the EU Taxonomy to companies and funds [8].

Data sourcing and matching	Documented judgements and proxy assumptions made to interpret technical screening criteria and thresholds are helpful, and appropriate in cases of imperfect fit.
	Peer analysis is particularly helpful to note proxy assumptions in particular activities.
	Sustainability specialists and investment teams can help establish a process to assess the due diligence aspects of ESG.

	Alignment criteria for CAPEX and OPEX are non-competitive information and hence peers can share specific information (in)directly via ESG data providers can help verify and validate data.
	Stakeholders and investors can identify service providers to support baseline expectations to take into account minimum safeguards and DNSH.
Adapting to the taxonomy approach	Use a framework based on existing sector peer experiences or offered by an experienced service provider with a track record in the sector.
	Consider involving third party validator at relatively early stage.
	Ensure that relevant resources are available before engaging with key stakeholders to pre-empt threshold data requirements.
Starting a taxonomy process	Build in-house capabilities for the implementation of EU Taxonomy.
	Start small, evaluating selected activities to identify the specific challenges. Use this initial evaluation to engage with providers and establish a constructive dialogue.

3.10. Complementary resources and tools

There are some additional resources and tools that may be useful **for cities and regions to implement the EU Taxonomy and report the alignment with it, on circular bioeconomy investments and activities from the valorisation of urban biowaste and sewage sludge**, as described in the **Table 10**.

Table 10. Complementary resources and tools supporting companies, investors, cities and regions.

	Category	Description
EU Taxonomy Compass [16]	Digital platform with excel matrix and interactive dashboard	The EU Taxonomy Compass provides a visual representation that makes the contents of the EU Taxonomy easier to access for a variety of users. It enables users to check which activities are included in the EU Taxonomy (taxonomy-eligible activities), to which objectives they substantially contribute and what criteria they have to meet. This platform has been updated to include future delegated acts specifying technical screening criteria for additional economic activities substantially contributing to the climate and environmental objectives of the Taxonomy Regulation.
Platform on Sustainable Finance [3]	Digital platform	The platform is an advisory body for the European Commission on several tasks and topics related to further developing the EU taxonomy and support the Commission in the technical preparation of delegated acts. This platform also includes reports, opinions and recommendations. The Platform responds to the need of amending the technical screening criteria over time, in order to reflect, for instance, changing EU environmental legislation or technological developments.

Transformative Actions Program [21]	Digital platform	Transformative Actions Program is a global initiative to support local and regional governments transform their net-zero emission and resilient development infrastructure concepts into mature, robust and bankable projects ready for financing and implementation.
Bankability Checklist [22]	Brochure	The Bankability Checklist, developed by ICLEI's Transformative Actions Program, is another tool that can complement the EU Taxonomy Compass, and it is available for cities in assessing their level of investment preparedness including concepts as political commitment, investment maturity, business model, technical, financial, and economic viability, replicability, and scalability, as well as social benefits.
Celsia [10]	Digital tool	Celsia developed a digital tool to report degree of project/activity/investment alignment with the taxonomy, through: 1. Screen the business' activities against activities in the taxonomy; 2. Map relevant directives and standards referenced to in the criteria per activity; 3. Interpret the collected material; 4. Create a framework for assessing the activities against the criteria; 5. Conduct the assessment.
Green Eligibility Checker [23]	Digital tool	The online tool “Green Eligibility Checker” was developed with a limited number of inputs for simplified climate impact estimation for more than 40 measures and across several sectors. Users provide basic project information and then let the tool do the work. At the end of the assessment, they receive a PDF report “Green Eligibility Results”. The report explains whether the project is eligible for green financing from the EIB and how it is estimated to have an impact on the environment.
Sustainalytics’ EU Taxonomy Solution [24]	Digital tool	Sustainalytics currently offers a Taxonomy Data solution and a Managed Portfolio Service. The Managed Portfolio Service provides a portfolio-level alignment assessment, and the Data solution provides company-level assessment along with the supporting underlying company-level data. Companies receive one of four assessments: Aligned, Partially Aligned, Not Aligned and No Evidence.
Transition Finance [14]	Report	The Platform on Sustainable Finance provides advice on transition financing. This report sets out the Platform’s key findings and recommendations, by responding to six questions from the EC. This report focusses primarily on transition in the context of climate change.
Testing the Taxonomy: insights from the PRI Taxonomy practitioners group [25]	Report	This report is the first comprehensive set of case studies around how to use the Taxonomy. The report also summarises recommendations from the group to policymakers and supervisors who will oversee the implementation and development of the taxonomy. The PRI hopes that by circulating these findings, this report will foster confidence and facilitate implementation of the taxonomy.
Testing the application of the EU Taxonomy to core banking products [26]	Report	The report shares key insights from the information collected, including case studies and subsequent discussions between participating banks, focusing on the benefits and challenges experienced by banks whilst also proposing high level principles to follow in order to apply the EU Taxonomy to retail banking, SME lending and corporate banking, including trade, export and project finance.

3.11. Key findings and recommendations

The EU Taxonomy Regulation is the first uniform and credible standard that allows economic parties to align with the transition to low carbon, resilient and sustainable pathways. It establishes a common understanding of what economic activities qualify as environmentally sustainable throughout the EU, provides visibility for investors who want to invest in sustainable activities and assists in preventing greenwashing [27].

In practical application of the EU Taxonomy, challenges were identified like poor-quality reporting, lack of access to data and issues that arose from creating new processes to adapt to the Taxonomy [8]. Some controversial sectors like solid fossil fuels are excluded in the EU Taxonomy, and nuclear and gas are neither explicitly included or excluded [25]. Therefore, **implementing the EU Taxonomy is an exercise that involves multiple components with a high degree of complexity** [8].

The EU Taxonomy Regulation is referenced directly in several EU funds, programmes, environmental regulation, financial instruments, plans, strategies, recommendations, policy briefs, recovery and resilience facility/plans, and so on. In fact, **it is the regulation of the future and sustainability! For this reason, Taxonomy will play an important role for the financing and green transition to circular bioeconomy from waste sector (OFMSW and UWWS).**

One example of where the Taxonomy will become important is lending. If companies ask for a green loan, then there may be a requirement for the company to meet or demonstrate planned improvements to meet Taxonomy criteria. As part of this, banks might introduce e.g., sustainability-linked loans. This would motivate companies in providing the relevant data to obtain such financing, including detailed transition plans [3].

3.11.1. Key reasons to start being Taxonomy aligned

The following key reasons for non-financial companies to be aligned to the taxonomy resulted from the Ramboll analysis [27], which also includes constraints and opportunity points. **These topics are also addressed to urban solid waste, wastewater management and waste valorisation companies.**

1 Compliance:

The EU Taxonomy will be mandatory for a significant number of European financial institutions and companies. A financial institution (or public bodies issuing grants, etc.) should disclose to what extent it uses the EU Taxonomy, to what environmental objectives its investments contribute, and the percentage of underlying investments that are EU Taxonomy-aligned.

Non-financial companies are to disclose the financial metrics aligned with the EU Taxonomy (turnover, CAPEX or OPEX), whether and how it complies with the minimum (social) safeguards, and that it does not significant harm to any of the environmental objectives. This should be disclosed in the companies' non-financial statement, included in the annual reporting or in a dedicated sustainability report.

2 Reputation and risk management:

A high taxonomy alignment for non-financial companies means that their economic activities are contributing to environmental sustainability, which would enhance the company's reputation. An enhanced reputation will also likely attract more investors that are seeking to distinguish sustainable investments from regular investments.

Alignment with the EU Taxonomy Regulation may also reduce risk across company supply chains. A common sustainability language and criteria across a supply chain can help mitigate disruption and delay as well as build supply chain resilience.

3 Access to finance:

Financial institutions that wish to increase their share of taxonomy-aligned investments will look to invest in companies that have taxonomy-aligned activities and that have disclosed this. Due to the timeline of the EU Taxonomy Regulation, financial institutions will have to comply first before the non-financial companies. Companies that voluntarily align their activities with the EU Taxonomy before it is mandatory will, most probably, experience a first-mover advantage.

4 Assessing & communicating sustainable impact of activities:

By assessing economic activities with the best-practice metrics offered by the Taxonomy, companies will achieve an increased understanding of the sustainable impact of their activities. This assessment will allow them to benchmark themselves against the best practices in order to make possible improvements.

To ensure that the technical screening criteria are always up to date and that it reflects in the fast-changing nature of science and technology and policies, it is to be reviewed constantly by the EU Platform for Sustainable Finance [3]. This assures that the metrics used for the assessment and benchmarking will be up to date and in line with the most recent findings concerning environmentally sustainable practices. The alignment process also enables both financial institutions and non-financial companies to utilise it as a means of communication internally throughout their organisations. Impact, especially positive, can be communicated providing encouragement and motivation to continue upon the journey whilst helping to adapt the overall culture within an organisation.

5 Building Resilience:

Aligning with the Taxonomy will assist business and enterprises in building resilience thus providing greater overall confidence be it as shareholders, investors or customers. By illustrating overall preparedness some uncertainty is alleviated and this can raise overall company value (stocks and bonds). By aligning with the EU Taxonomy Regulation, companies can identify potential hazards, measure exposure and determine overall vulnerability.

Alignment will also help in ensuring that initiatives or programmes do not inadvertently increase vulnerability to a particular hazard. However, alignment may also present opportunities to make future development and programs resilient to climate change and its risks. For business, companies and enterprises it provides an opportunity to be recognised as a sustainability leader, one that is embracing the inevitable green transition.

3.11.2. Recommendations to investors

These recommendations resulted from PRI report [25].

1st Establish a framework:

- ❖ Ensure adequate resources are set aside and management is aware of this regulatory requirement;
- ❖ Integrate the taxonomy into the investment strategy;
- ❖ Manage expectations.

2nd Develop a process:

- ❖ Start early. Allocate time and expertise for detailed analysis;
- ❖ Quantify findings as far as possible;
- ❖ Start small. Test one sector, product, region or city;
- ❖ Apply a step-by-step approach;
- ❖ Take a bottom-up approach.

3rd Identify challenges:

- ❖ Strictly adhere to thresholds wherever possible;
- ❖ Carefully consider reliability levels for different sources of data;
- ❖ Verify with companies when in doubt;
- ❖ Provide context for results.

4th Find solutions:

- ❖ Engage on data;
- ❖ Share with partners;
- ❖ Work with data providers;
- ❖ Support innovation and improvement from data providers;
- ❖ Investigate validation and external assurance.

3.11.3. Recommendations to policymakers and supervisors

These recommendations resulted from PRI report [25].

1 Data:

The taxonomy regulation will require corporate disclosure against the taxonomy. While this is recognised by participants as very significant, policymakers should go further to ensure that the right data, at the right level of granularity, and for the right issuers, is available.

2 Guidance and supervisory expectations:

Investors anticipate a need for significant practical and interpretive guidance for all taxonomy users (investors, corporates and service providers), as well as clear expectations from supervisors.

3 Taxonomy development:

Investors desire greater clarity on the selection, and exclusion, of some indicators and activities. Consistent with other studies, investors recognise the need to avoid competing international taxonomy frameworks.

3.11.4. Recommendations to countries, regions and cities

These recommendations were adapted from EY report [18] in order to prepare and capacity the countries, regions and cities for the taxonomy requirements in order to improve the circular bioeconomy approach and model.

- 1 Promote formal and informal innovation platforms to support new partnerships and cross-fertilisation of ideas. Enable regulatory sandboxes to accelerate innovation not anticipated by the current legislative and regulatory framework, in order to allow companies to quickly test their innovations on a small scale.
- 2 Create a level-playing field for sustainable solutions and support competitiveness of low carbon and biotechnologies and processes in comparison with conventional fossil alternatives.
- 3 Support the development of circular economy and green projects by deploying grants or risk-coverage instruments for innovative technologies.
- 4 Develop a guarantee mechanism, a project development capital and early stage equity for first market commercialisation of innovative low carbon technologies (covering the costs of loss of operational revenue for example) to support the uptake of new technologies.
- 5 Financing of the projects has to go hand in hand with establishing a policy framework that creates markets for zero carbon and bio-based materials (e.g., product standards, contracts for differences, public procurement rules), whilst ensuring the competitiveness of investing industrial and SME actors.

- 6** Stimulate local ecosystems combining local communities, universities, cities and companies and facilitating their access to funding for the implementation of innovative circular bioeconomy projects.
- 7** For circular bioeconomy, developing decentralised approaches bringing together local stakeholders (local authorities, industries, etc.).
- 8** Create a level-playing field for environmentally sustainable solutions. In the current market uncertainty, industrial companies are particularly risk adverse and not keen to invest in new technologies and processes.
- 9** Support competitiveness of low-emissions technologies relative to conventional fossil alternatives, and circular economy through supporting new bio-based products, solutions, technologies and processes from urban biowaste and wastewater sludge.
- 10** Prioritise continued public investment in fossil-free, competitive industrial processes and circular bioeconomy that can reduce industrial GHG emissions and waste generation. Increased environmental requirements in public procurement have a role to play.
- 11** Efforts need to be refocused on skills development and on support to innovative and transformational projects for the waste sector, in order to promote regenerative and resilient business models for circular bioeconomy. Providing clarity on the framework conditions for production of innovative bioproducts by, for example, removing the uncertainty with respect to views about taxes and fees linked to the operations of valorisation.
- 12** Support the emergence of projects via technical assistance and capacity building in order to support the emergence of a strong waste sector and potential users/consumers of bioproducts from OFMSW and UWWS.
- 13** Innovative remunerations can support the transition to circular bioeconomy, such as including a carbon component in the pricing of bioproducts to reflect the soil carbon sequestration performance and, for example, ecosystem restoration inputs. Ensure that biodiversity and carbon performance are included in public procurement criteria.
- 14** Promote enhanced cooperation between all public agencies at local, regional and national levels, with other important stakeholders (universities and schools, communities, companies, SME, supermarkets, HoReCa, agriculture and forestry actors, etc.) to support the development of circular bioeconomy projects from waste and wastewater, including environmental awareness for local communities and society in general in order to persuade better acceptance and knowledge addressed to production and consumption of bioproducts derived from OFMSW and UWWS.
- 15** Regions and local authorities lack substantial financial sources to scale-up circular bioeconomy projects, which have the potential to contribute to green job creation in marginalised areas, to food self-sufficiency and to carbon offsetting.

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5. Annex: EU Taxonomy regulation and delegated acts package

The **Table 11** reports the EU Taxonomy regulation and delegated acts published officially until 15 December 2021. Delegated acts are living documents that will be added to over time and updated as necessary. Therefore, it is recommendable to consult the EU Taxonomy website [11] to update that table of legislation package.

Table 11. EU Taxonomy regulation and delegated acts package.

Legislation	Contents	Ref.
Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment , and amending Regulation (EU) 2019/2088.	This Regulation establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable for the purposes of establishing the degree to which an investment is environmentally sustainable. This Regulation also includes important concepts regarding EU Taxonomy literacy.	[6]
Commission Delegated Regulation (Eu) 2021/2139 of 4.6.2021 about supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives .	<p>This Delegated Regulation specifies the technical screening criteria under which certain economic activities qualify as contributing substantially to climate change mitigation and climate change adaptation and for determining whether those economic activities cause significant harm to any of the other relevant environmental objectives.</p> <p>This Delegated Act includes:</p> <ul style="list-style-type: none"> - Annex 1: Technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation, and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, for the following economic sectors: 1) Forestry; 2) Environmental protection and restoration; 3) Manufacturing; 4) Energy; 5) Water supply, sewerage, waste management and remediation; 6) Transport; 7) Construction and real estate; 8) Information and communication; 9) Professional, scientific and technical activities. - Annex 2: Technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change adaptation, and for determining whether that economic activity causes no significant 	[9, 11]

	<p>harm to any of the other environmental objectives, for the following economic sectors: 1) Forestry; 2) Environmental protection and restoration; 3) Manufacturing; 4) Energy; 5) Water supply, sewerage, waste management and remediation; 6) Transport; 7) Construction and real estate; 8) Information and communication; 9) Professional, scientific and technical activities; 10) Financial and insurance; 11) Education; 12) Human health and social work activities; 13) Arts, entertainment and recreation.</p>
<p>Commission Delegated Regulation (EU) .../... of 7.7.2021 about supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by specifying the content and presentation of information to be disclosed by undertakings subject to Articles 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation.</p>	<p>This Delegated Regulation specifies the content and presentation of information to be disclosed by undertakings subject to Article 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation.</p> <p>This Delegated Act includes:</p> <ul style="list-style-type: none"> - Annex I: KPIs of non-financial undertakings, which includes 1) content of KPIs to be disclosed by non-financial undertakings and 2) methodology for reporting of KPIs to be disclosed by non-financial undertakings. - Annex II: Templates for the KPIs of non-financial undertakings, namely: 1) Proportion of turnover from products or services associated with Taxonomy-aligned economic activities - disclosure covering year N; 2) Proportion of CAPEX from products or services associated with Taxonomy-aligned economic activities - disclosure covering year N; 3) Proportion of OPEX from products or services associated with Taxonomy-aligned economic activities - disclosure covering year N. - Annex III: KPI of asset managers, which includes 1) content of KPI to be disclosed by asset managers and 2) methodology for preparing and reporting the KPI to be disclosed by asset managers. - Annex IV: Template for the KPI of asset managers, i.e., standard template for the disclosure required under Article 8 of Regulation (EU) 2020/852 (asset managers). - Annex V: KPIs of credit institutions, which includes 1) content of KPIs to be disclosed by credit institutions and its methodology. - Annex VI (Excel template): Template for the KPIs of credit institutions, which includes the following contents/sheets: 0. Summary of KPIs; 1. Assets for the calculation of GAR; 2. GAR sector information; 3. GAR PKI stock; 4. GAR KPI flow; 5. KPI off-balance sheet exposures; 6. KPI on fees and commissions income from services other than lending and asset management; 7. KPI Trading book portfolio. - Annex VII: KPIs of investment firms, which includes content of KPIs to be disclosed by investment firms.

- **Annex VIII (Excel template): Template for KPIs of investment firms**, which includes the following contents/sheets: 0. Summary of KPIs to be disclosed by investment firms under Article 8 Taxonomy Regulation; 1. KPI IF - Dealing on own account services; 2. KPI IF Other services.
- **Annex IX: KPIs of insurance and reinsurance undertakings**, which includes 1) KPI related to investments and 2) KPI related to underwriting activities.
- **Annex X: Template for KPIs of insurance and reinsurance undertakings**, i.e., the underwriting KPI for non-life insurance and reinsurance undertakings.
- **Annex XI: Qualitative disclosures for asset managers, credit institutions, investment firms and insurance and reinsurance undertakings**.