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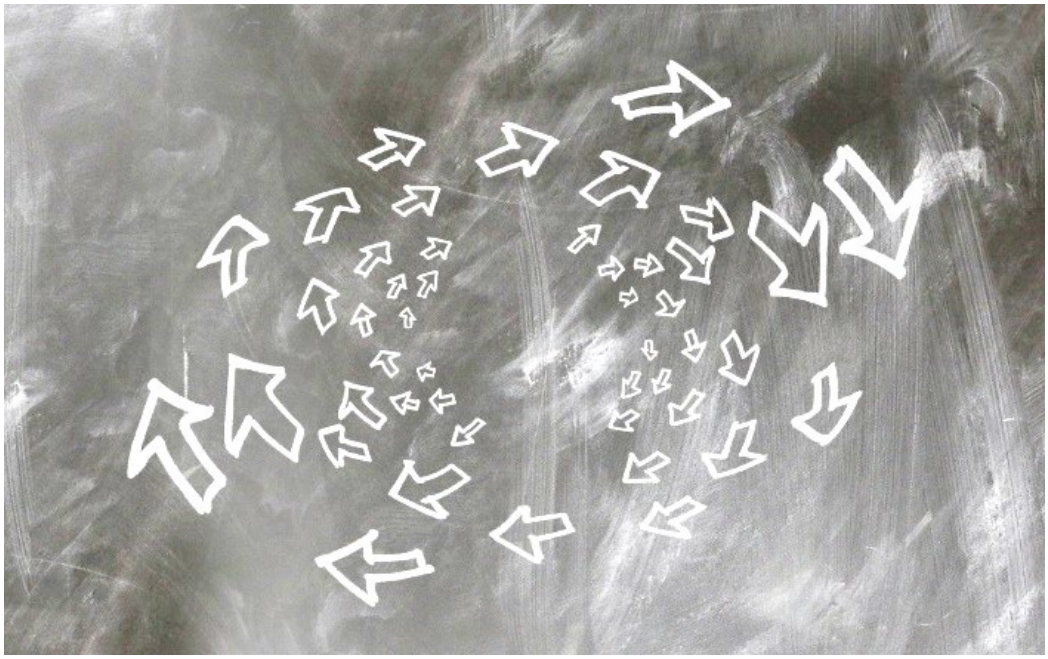

Sustainable Finance

Introduction to the EU Taxonomy for a Circular Economy

Holger Bär and Isabel Schrems
with the support of David Bohnenberger
April 2021

On behalf of

Forum Ökologisch-Soziale Marktwirtschaft e.V. • Green Budget Germany

Imprint

Forum Ökologisch-Soziale Marktwirtschaft (FÖS)
Schwedenstraße 15a
13357 Berlin

Tel +49 (0) 30 76 23 991 – 30
Fax +49 (0) 30 76 23 991 – 59
www.foes.de - foes@foes.de

About FÖS

Forum Ökologisch-Soziale Marktwirtschaft (FÖS) has been researching and disseminating information about the potential and benefits of environmental fiscal reform (EFR), the application of market-based instruments (MBI) and the removal of environmentally harmful subsidies for more than twenty years. FÖS is widely recognized among policy-makers, NGOs, companies and trade unions for its expertise in fiscal instruments, environmental and climate policy and foremost for its capacity to evaluate and develop policy proposals in the field of EFR. Over the last years FÖS has led and participated in numerous research projects and has a proven track record in the development, analysis and evaluation of environmental policies.

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Introduction to the EU Taxonomy for a Circular Economy

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Executive Summary

This report is an **introduction to the EU Taxonomy**, its relevance, primary goals and design. Its purpose is to help environmental experts **to understand the development, structure and mode of operation of the EU Taxonomy**. The EU Taxonomy is a classification system for sustainable economic activities. Its overall goal is to **create transparency and disclose the impact of investments**. The Taxonomy aims **to enable the financial system to guide investment decisions into a more sustainable direction** and thus **accelerate the transition to a circular economy** in Europe and beyond.

The European Commission is currently translating the environmental objective of the transition to a circular economy (and three other objectives of the Taxonomy) into criteria upon which the sustainability of an investment is evaluated. Therefore, it develops criteria to measure substantial contribution to the transition to a circular economy, as well as for significant harm ("do no significant harm" (DNSH) criteria). This report uses examples from key sectors to illustrate the application of the Taxonomy and highlights tasks in the further development of the Taxonomy. Its intention is not to make recommendations to the ongoing process within the EU-Sustainable Finance Platform or to present in detail all issues involved in the development of criteria, but **to enable readers to follow and engage in the ongoing development of the Taxonomy**.

The transition to a circular economy affects all aspects of a supply chains and requires fundamental changes to business models. Overarching goals for it do not exist yet, but the European Circular Economy framework is evolving and can serve as a reference for the development of criteria and thresholds.

This reports outlines **seven key industries and sectors** in which challenges and opportunities of a transition to a circular economy are highest. We use two of them (electronics & ICT as well as construction & buildings) as examples to discuss key questions regarding the development of criteria (for both substantial contribution and do no significant harm).

There are a number of different **types of substantial contribution** to the transition to a circular economy:

a) **Circular design (and production)** models focus on the development of existing or new products and processes which allow and optimise circular uses.
b) **Circular use** models aim to increase the value and use of a product during its (extended) lifetime.
c) **Circular value recovery** models focus on maximising the recovery and recycling of products and materials after use into new products or useful resources in order to reduce waste.
d) **Circular support** models focus on the management and coordination of networks and resource flows, provide incentives for circularity and other supporting activities.

We discuss these different types of substantial contribution in the two key sectors, outline points of reference and some specific criteria to assess economic activities that fall into these categories. The report uses the Circular Economy classification system proposed by the European Commission to discuss what the assessment of a **substantial contribution** as well as the **do no significant harm** principle on the transition to a circular economy could look like. Finally, we outline what **economic activities could be excluded** from consideration under the taxonomy with regard to the circular economy. The examples and suggestions presented in this report serve as a starting point for the continuous engagement with the taxonomy. It specifically is does not present a list of recommendations for criteria.

The ability of the Taxonomy to successfully guide economic activities into a more sustainable direction is dependent on whether the criteria for being taxonomy-compliant are ambitious and science-based. **Ambitious enough to lead to greater sustainability** than the status quo and **yet rooted in science and recent authoritative scientific research.**

It will be a critical task for readers and the non-governmental community to accompany the development of the Taxonomy and make sure that the application criteria, thresholds and benchmarks are actually in line with science, and are being **regularly reviewed and strengthened over time according to newest research.**

Zusammenfassung

Dieser Bericht ist eine **Einführung in die EU-Taxonomie** und geht auf ihre Bedeutung, ihre Hauptziele und ihren Aufbau ein. Er soll Umweltexpert*innen **als Hilfestellung dienen, um ein Verständnis für die Entwicklung, Struktur und Funktionsweise der EU-Taxonomie zu entwickeln.** Die EU-Taxonomie ist ein Klassifizierungssystem für wirtschaftlich relevante Aktivitäten. Ihr übergeordnetes Ziel ist es, **Transparenz zu schaffen und die Auswirkungen von Investitionen** offenzulegen. Die Taxonomie soll das Finanzsystem in die Lage versetzen, Investitionsentscheidungen in **eine nachhaltigere Richtung zu lenken** und so den Übergang zu einer Kreislaufwirtschaft zu beschleunigen.

Die Europäische Kommission arbeitet momentan daran, den Übergang zu einer Kreislaufwirtschaft (und drei weitere Ziele der Taxonomie) in messbare Kriterien zu übersetzen, anhand derer die Nachhaltigkeit einer Wirtschaftsaktivität bzw. Investition bewertet werden kann. Dazu werden Kriterien entwickelt, die den **substanziellen Beitrag** einer Wirtschaftsaktivität zum Übergang zu einer Kreislaufwirtschaft erfassen können. Zudem sind Kriterien notwendig, um einen **signifikanten Schaden** für den Übergang zu einer Kreislaufwirtschaft abzubilden. Dieser Bericht stellt anhand von Beispielen aus relevanten Sektoren die Anwendung der Taxonomie dar und zeigt Potenziale für ihre Weiterentwicklung auf. Dabei sollen weder klare Empfehlungen ausgesprochen werden, noch auf alle Aspekte der Entwicklung von Kriterien in Detail eingegangen werden. Der Bericht soll den Leser*innen vielmehr ein Grundverständnis der Taxonomie ermöglichen, um sich in Zukunft in den weiteren Ausgestaltungsprozess einbringen zu können.

Der **Übergang zu einer Kreislaufwirtschaft** betrifft alle Aspekte einer Lieferkette und erfordert grundlegende Änderungen in Produktionsweisen und Geschäftsmodellen. Übergreifende Ziele dafür gibt es noch nicht, aber das europäische Rahmenwerk für eine Kreislaufwirtschaft entwickelt sich und kann als Referenz für die Entwicklung von Kriterien und Schwellenwerten der Taxonomie dienen.

Dieser Bericht identifziert **sieben Schlüsselindustrien und Sektoren**, in denen die Herausforderungen und Chancen eines Übergangs zu einer Kreislaufwirtschaft am größten sind. An zwei davon (Elektronik sowie Bauen & Gebäude) werden beispielhaft Schlüsselfragen in der Entwicklung von Kriterien diskutiert (sowohl für den substanziellen Beitrag als auch für die Vermeidung von signifikantem Schaden).

Für den Übergang zur Kreislaufwirtschaft gibt es eine Reihe **verschiedener Arten von substanziellen Beiträgen**:

a) Modelle für **Kreislaufdesign- und Produktion** konzentrieren sich auf die Entwicklung von bestehenden oder neuen Produkten und Prozessen, die eine kreislauforientierte Nutzung ermöglichen und optimieren.

b) **Kreislaufnutzungsmodelle** zielen darauf ab, den Wert und die Nutzung eines Produkts während seiner (ehemaligen) Lebensdauer zu erhöhen.

c) **Kreislaufwirtschaftsmodelle** konzentrieren sich auf die Maximierung der Rückgewinnung und des Recyclings von Produkten und Materialien am Ende des Lebenszyklus und für deren Nutzung in neuen Produkten, um Abfall zu reduzieren.

d) Modelle zur **Unterstützung der Kreislaufwirtschaft** konzentrieren sich auf das Management und die Koordination von Netzwerken und Ressourcenströmen, bieten Anreize für die Kreislaufwirtschaft und andere unterstützende Aktivitäten.

Auf Basis dieser, von der Europäischen Kommission veröffentlichten Klassifizierung für die Kreislaufwirtschaft, diskutieren wir in den beiden genannten Sektoren verschiedene Arten von substanziellen Beiträgen und skizzieren Bezugspunkte und einige spezifische Kriterien, um wirtschaftliche Aktivitäten zu bewerten, die in diese Bereiche fallen. Der Bericht diskutiert Kriterien sowohl für die Frage des **substanziellen Beitrags** als auch für **signifikanten Schaden**. Abschließend diskutieren wir die Frage, welche wirtschaftlichen Aktivitäten im Hinblick auf die Kreislaufwirtschaft **ausgeschlossen werden sollten**. Die in diesem Bericht vorgestellten Beispiele und Vorschläge dienen als Ausgangspunkt für die weitere Auseinandersetzung mit der Taxonomie. Sie sind ausdrücklich nicht als Liste von Empfehlungen zu verstehen.

Inwiefern die Taxonomie wirtschaftliche Aktivitäten erfolgreich in eine nachhaltigere Richtung lenken wird, hängt davon ab, ob die Kriterien für die Taxonomiekonformität ambitioniert und wissenschaftlich fundiert sind. Die Kriterien für die Einhaltung der Taxonomie müssen **ehrgeizig genug** sind, um tatsächlich eine nachhaltige Entwicklung vorantreiben zu können. Gleichzeitig müssen sie **in der Wissenschaft und neueren maßgeblichen wissenschaftlichen Untersuchungen** verwurzelt sein.

Es wird eine herausfordernde Aufgabe für die Leser und die nichtstaatliche Gemeinschaft sein, die Entwicklung der Taxonomie zu begleiten und sicherzustellen, dass die Anwendungskriterien, Schwellenwerte und Benchmarks **tatsächlich im Einklang mit der Wissenschaft stehen und im Laufe der Zeit entsprechend der neuesten Forschung regelmäßig überprüft und verstärkt werden.**

1 Scope and goals of this report

This report is an **introduction to the EU Taxonomy**, its relevance, primary goals and design. Its purpose is to help experts from various environmental fields and other interested readers **to understand the development, structure and mode of operation of the EU Taxonomy**.

The report discusses how the environmental objective of the protection and restoration of biodiversity and ecosystems is translated into criteria – both for a substantial contribution to an environmental objective as well as for the assessment of the "do no significant harm" (DNSH) principle. It uses examples from key sectors to illustrate the application of the Taxonomy and to highlight tasks in the further development of the Taxonomy. This shall **enable experts to take part in the political debates on the development of the Taxonomy** in 2021 and in the future.

Its **purpose is not** to outline **what the Taxonomy**, its points of reference and criteria, **should look like in key sectors**. Even attempting to do so would overwhelm the scope of this paper[1]. It aims at helping readers to understand the Taxonomy's mode of operation and enable them to follow and engage in its further development.

2 Introduction to the EU Taxonomy

2.1 Overall goal of the Taxonomy

The EU Taxonomy is a classification system for sustainable economic activities. **Its overall goal is to create transparency and disclose the impact of investments.** It is part of the EU Action Plan Financing Sustainable Growth (European Commission 2018a). The Taxonomy aims **to enable the financial system to guide investment decisions into a more sustainable direction** and thus **accelerate the transition to a circular economy** in Europe and beyond[2].

The EU Taxonomy will affect a number of actors directly or indirectly. **Companies** that are already required to provide non-financial information (under the CSR-Directive) will have to disclose the share of their Taxonomy-aligned activities. For them, the EU Taxonomy is improving access to capital for investments in (more) sustainable economic activities. It helps them measure the sustainability of a particular investment and gradually increase the share of a company's sustainable economic activities (i.e. in line with the Taxonomy). In order to serve these purposes, the Taxonomy needs to define sustainable economic activities. It is very important to note that it does not assess companies but only economic activities[3].

Further, the Taxonomy affects **financial market participants** who are offering sustainable finance products. It will help them to avoid investments in greenwashing and support institutional investors (such as insurance companies or pension funds) to invest their long-term capital in sustainable economic activities, thus accelerating the transition to a more sustainable economy. For private persons interested in how "their money" is invested, the Taxonomy makes it easier to identify which banks or funds are most compliant with the Taxonomy. It enables them to move their capital to banks with the highest level of sustainability (i.e. highest taxonomy compliance). In essence, the taxonomy can spur a "virtuous cycle"[4] toward greater sustainability.

Further, the EU Taxonomy could be used to define green financial products via the EU Ecolabel or EU green bond standards (DIW 2020).

In total, the EU Taxonomy has six environmental objectives, which help to define sustainable economic activities (see Figure 1).

[1] The nearly 600 page technical annex outlining technical screening criteria for the substantial contribution and DNSH to the environmental objectives of climate change mitigation and adaptation in all relevant sectors is an indicator for the complexity of the matter.

[2] While the Taxonomy's reach is by definition European, it aims to ensure the harmonization of taxonomies worldwide. To that end, the EU has initiated with the IMF & World Bank the International Platform on sustainable finance (European Commission).

[3] This is important as the gradual transition is taking place within a company.

[4] Opposed to the concept of „vicious cycle" of competition based on lower environmental standards, the Taxonomy's transparency approach promises competitive advantages for those companies, banks, etc. that act more sustainably.

Figure 1: Six environmental objectives established by the Taxonomy (Article 9 of the Regulation)

Source: EU Technical Expert Group on Sustainable Finance (TEG 2020)

2.2 Process and timeline

The EU Taxonomy is a two-level regulation: it consists of the Taxonomy regulation (level 1) and subsequent delegated acts (level 2). Figure 2 presents the timeline of the whole process.

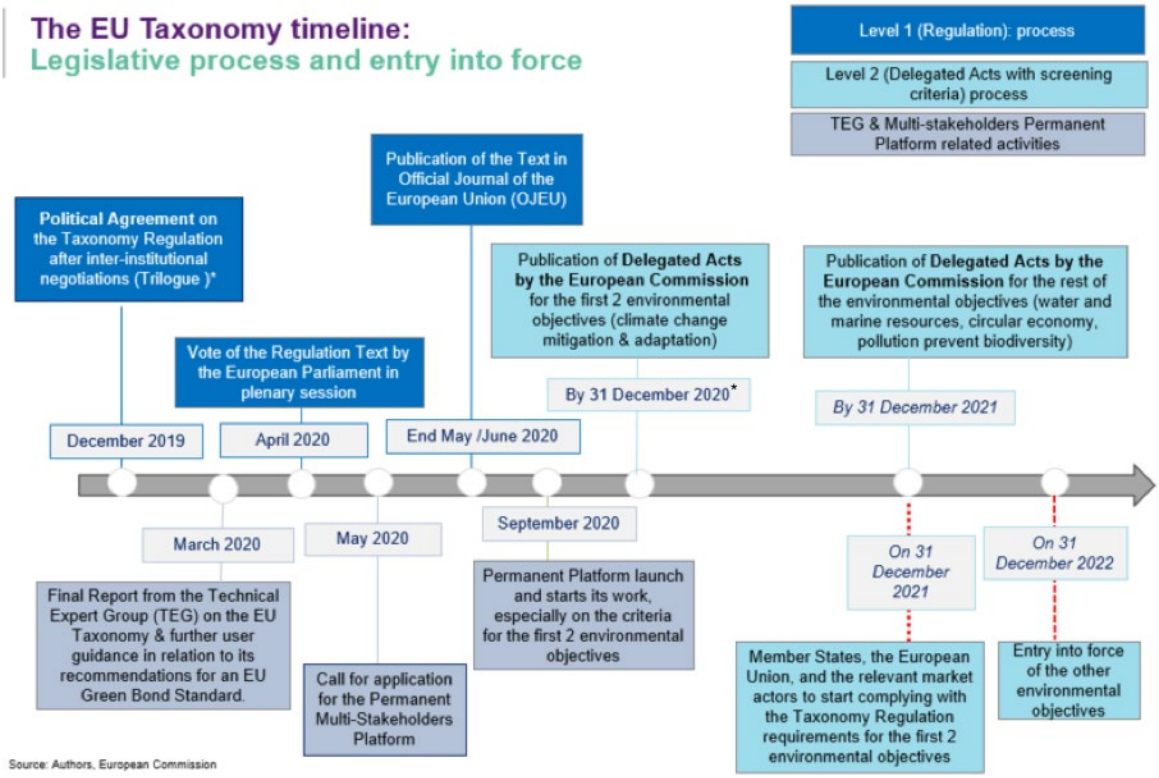
The Taxonomy Regulation was published on 22 June 2020 and entered into force on 12 July 2020. The environmental objectives are translated into criteria (technical screening criteria) to evaluate the sustainability of an economic activity. The development of these criteria requires a lot of attention to detail. They are subsequently developed and adopted as delegated acts.

The draft delegated act for the first two environmental objectives (climate change mitigation and adaption) was foreseen to be published by the European Commission in December 2020 and is now, with a delay of four month foreseen to be published in April 2021, The Technical Expert Group (TEG) on Sustainable Finance played a crucial role in this process and published recommendations for criteria for these two objectives in March 2020 (TEG 2020).

The draft delegated acts for the remaining four environmental objectives are expected to be published in December 2021. The Platform on Sustainable Finance is advising the European Commission in this process. This platform is composed of a wide range of stakeholders from the private and public sector including private stakeholders from financial, non-financial and business sectors, academia, NGOs, civil society and public institutions (European Commission 2021).

The Taxonomy is expected to go into force for the first two environmental objectives by the end of 2021, and for the remaining four objectives by the end of 2022 (see Figure 2), the Taxonomy will be fully operational by 2023.

Figure 2: The EU Taxonomy timeline



* The delegated act for the first two environmental objectives was foreseen to be published by the European Commission in December 2020 and is now foreseen to be published in April 2021.

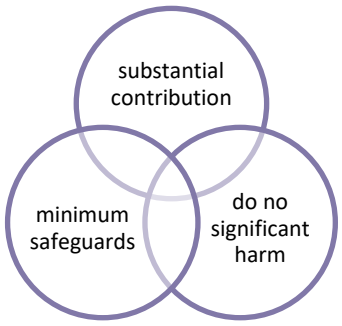
Source: (NATIXIS 2020)

2.3 Development of criteria

According to the Taxonomy Regulation, an economic activity is considered taxonomy-compliant if it:

- makes a **substantial contribution** to at least one of six environmental objectives,
- **does no significant harm** (DNSH) to the other environmental objectives (where relevant),
- and meets **minimum safeguards**, e.g. with regard to social and human rights.

Figure 3: Requirements for compliance with the Taxonomy



Source: own depiction based on Article 3 of the Taxonomy Regulation

In order to evaluate an economic activity, criteria are necessary to assess whether it contributes substantially to an environmental objective and to ensure that such an economic activity does not create significant harm to another objective at the same time.

Figure 4 below illustrates how **environmental objectives** are translated into precise criteria to assess economic activities.

First, environmental objectives are translated into overarching goals, such as the "net-zero CO_2-emissions by 2050 and a 50-55% reduction by 2030" goals on EU-level for climate mitigation (cp. TEG 2020). These serve as the basis for the development of specific criteria.

Secondly, **sectors** are identified that are of particular relevance for each environmental objective. In these sectors, criteria are developed that can measure the contribution of economic activities to the overarching goals in this particular sector.

The third step differentiates how an economic activity contributes to the overarching objective. It distinguishes different **types of substantial contribution**. For the objective of climate change mitigation, the TEG (2020) differentiates between three types of substantial contribution:

1. **"Green activities":** These activities directly contribute to the overarching target as they have already very low or no greenhouse gas emissions.
2. **"Greening of activities"** or "transitional activities": These activities support the transition to a carbon-neutral economy as there does not exist an environmentally sustainable activity yet[5].
3. **"Enabling activities"**: These activities enable another economic activity to contribute to climate mitigation. An example is the production of certain product components, which improve the environmental performance of an activity.

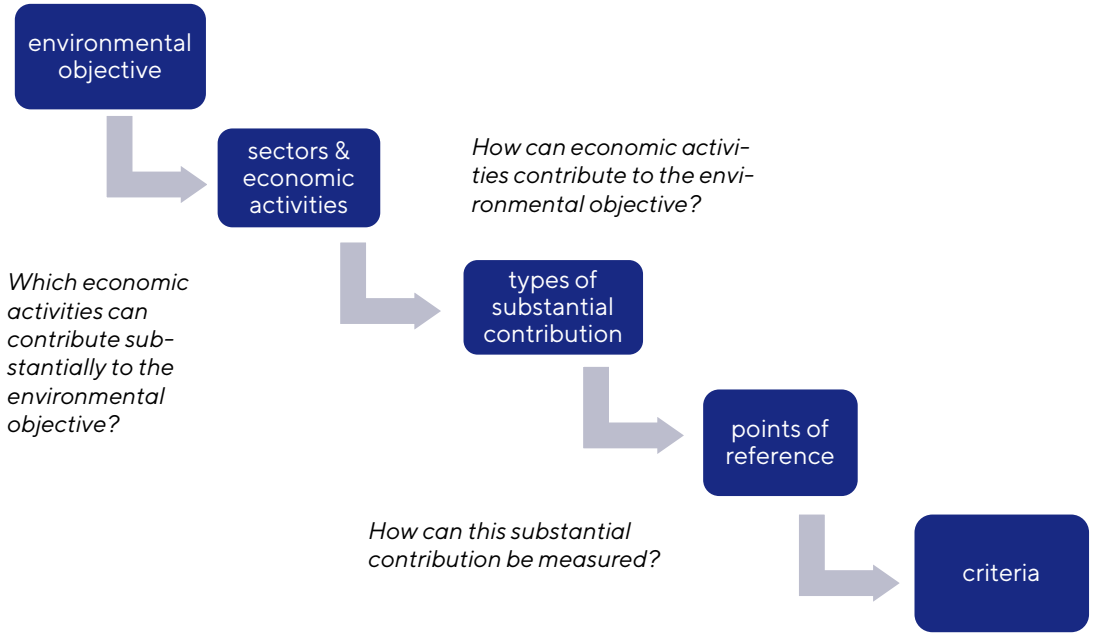
In a fourth step, **points of reference** are developed to distinguish different aspects that are relevant to a type of contribution. They also serve as a basis for the selection (or development) of specific criteria.

Fifth, the **criteria** derived from the previous steps allow answering the question whether an economic activity can be considered compliant with the Taxonomy. Criteria can be either qualitative or quantitative. Typically, they consist of three components: principles, metrics, and associated thresholds. An example on climate mitigation in cement production is outlined in (Germanwatch, E3G 2020):

1. **Principles:** The emissions from cement production must be minimized
2. **Metrics:** Specific emissions of production (in tCO_{2e} per ton of cement produced)
3. **Thresholds:** 0,498 tCO_{2e} per ton of cement produced for substantial contribution[6]

Whereas the threshold for substantial contribution must ensure that economic activities significantly enhance the environmental objective in question, the DNSH threshold is set lower. Its purpose is to ensure that economic activities, which substantially contribute to another environmental objective, do not do significant harm to other environmental objectives (as defined by the DNSH criteria & thresholds).

Figure 4: Development of criteria



Source: own depiction

[5] Examples are activities that still produce greenhouse gases, but significantly lower than with previous technologies and lead to a transition towards climate-neutrality – e.g. in cement production or car manufacturing, etc.

[6] For DNSH, the criteria are not quantitative, but qualitative. The technical annex stipulates that economic activities would need to be either: (1) proven to be aligned with an internationally recognised method for determining low carbon transition pathway or (2) (...) lower than the average global emissions (based on emission performance standard determined by internationally recognised data) for that economic activity (EU Technical Expert Group on Sustainable Finance 2020)

2.4 Review and strengthening of criteria over time

The Taxonomy shall serve as a tool to distinguish sustainable from non-sustainable economic activities. For companies, it should serve as a transition tool to increase the sustainability of their operations over time. This idea of continuous improvement toward greater sustainability underscores the need to regularly review and update the Taxonomy's criteria[7]. Criteria that are connected with political goals that have a certain date (e.g. to achieve a certain threshold by a certain year) can require an updating the criteria. Similarly, as overarching goals for environmental objectives are strengthened over time, the criteria to assess economic activities must be updated accordingly. There is no fixed schedule for the review of criteria, but the TEG has signalled a recommended trajectory for many of the quantitative climate change mitigation criteria.

The TEG emphasised the need for the Taxonomy to be predictable and therefore suggests to review criteria that are relevant for "transitional activities" every third year (Platform on Sustainable Finance 2020).

2.5 How to use the Taxonomy

When assessing economic activities and their compliance with the Taxonomy, it is key to keep in mind possible trade-offs between different environmental objectives (for substantial contribution and DNSH). An economic activity might substantially contribute to one environmental objective, and yet causes significant harm to another. Such activities do not comply with the Taxonomy Regulation in the end.

We use two sets of examples to illustrate how the Taxonomy helps to identify sustainable economic activities in practice. The first two are examples on climate mitigation, for which criteria have already been developed by the TEG (EU Technical Expert Group on Sustainable Finance 2020). The latter two are hypothetical examples that illustrate possible trade-offs and how the Taxonomy logic would be consequently applied to them. The criterion of minimum safeguards is not explicitly addressed in this report.

2.5.1 Practical examples on climate mitigation

Manufacturing of cement

A company produces cement in five plants. Two of the five cement plants emit less than 0,489 tons of CO_2 on average in the production of one ton of cement. Therefore, they operate below the relevant threshold value and **contribute substantially** to climate change mitigation.

In order to be taxonomy-compliant, these two plants must **do no significant harm** to any of the other five environmental objectives. One of these plant is located in an area with a precarious water situation. Due to its high water consumption, cement production of this plant is detrimental to the goal of sustainable use of water resources and thus not taxonomy-compliant, while the other plant, being located in an area with sufficient water supply, does not significantly harm this environmental objective.

In conclusion, one of the five plants is considered a sustainable economic activity according to the Taxonomy. Depending on how much this plant is producing and contributing to the company's sales, this percentage of the company's sales would be taxonomy-compliant (BMWi 2020).

Production of offshore wind energy

A company produces offshore wind energy. According to the Taxonomy, this economic activity **is substantially contributing** to climate change mitigation.

However, the production and operation of offshore wind energy may do **significant harm** to biodiversity, especially if badly sited (NABU/BirdLife 2020). The company must ensure that underwater noise emitted during the construction and operation of the wind turbines stays within permissible limits to ensure protection of local marine biodiversity and avoid negative impacts on ecosystems such as the bird habitat (regarding the biodiversity/ecosystem-goal) (Germanwatch, E3G 2020).

2.5.2 Hypothetical examples related to the circular economy and biodiversity

The following examples are hypothetical examples intended to illustrate how economic activities that are substantively contributing to one environmental objective may conflict with others. They illustrate why it is necessary to evaluate the substantive contribution of

[7] Thus, the TEG report describes it as a dynamic, flexible tool: "The Taxonomy design includes quantitative criteria wherever possible so that solutions can be specified by the market and evolve over time. Criteria which should be tightened later have been signalled in advance to provide predictability to markets, while offering a clear review mechanism for the future Platform on Sustainable Finance." (TEG 2020)

an economic activity as well as whether it harms other environmental objectives.

Greater use of materials from biomass

One approach to advance the circular economy is the wider use of biomass materials as substitutes for conventional materials that are environmentally harmful and hard to recycle (e.g. timber in construction). Their use could make a **substantial contribution** for the transition to a circular economy.

However, expanding the production of such materials puts stress on ecosystems such as forests or croplands[8]. Therefore, this could also negatively impact ecosystems and violate the **do no significant harm** criteria regarding the protection of biodiversity and ecosystems.

An app for more clothes sharing

Digital tools that enable us to use products collectively, for a longer time or more intensively, can be important components of and make a **substantial contribution** to a circular economy in line with the EU Waste Hierarchy. A number of digital tools for sharing or re-selling already exist. In the apparel sector such digital tools are already established.

While such platforms are likely to contribute to a more circular use of clothes, they could also support the "fast fashion" trend and thereby cause an ever higher speed of circulation of clothes along with increased resource needs for packaging and transport emissions. Therefore, a thorough assessment of such an app would have to consider both its contribution to the circular economy and the fulfilment of the **do no significant harm criteria.**

[8] In the case of food crops, higher demand for material uses could also intensify conflicts between different uses of biomass (material, food, feed, energy, as ecosystems) (EEA 2018).

3 The Taxonomy for a Circular Economy

Due to rising living standards and population growth, particularly the share living in cities, **levels of material consumption are likely (to continue) to grow**. UNEP and the International Resource Panel expect them to double between 2015 and 2050. The World Resources Institute suggests that business-as-usual could lead to a tripling of our total resource consumption (European Investment Bank 2020; van Kruchten/van Eijk 2020). Transforming our largely linear (take-make-waste) mode of industrial production holds a lot of potential environmental benefits – in addition to opportunities in other areas (innovation, employment, reduced import dependence for raw materials, etc).

Doing so can address **environmental and social challenges related to the mining and production of virgin materials** and the harm they create when they are wasted. Further, it can reduce 45% of global **greenhouse gas emissions** that are not related to energy consumption and often overlooked in the debate. Circular economy approaches can significantly cut down these emissions in five key sectors: steel, aluminium, cement, plastics and food (Ellen MacArthur Foundation 2020).[9]

The following sections discuss the overarching goals on the global and European level that guide the development of the circular economy concept; identify challenges in key sectors. The second part of the chapter shows how the categorisation system for the CE published by the European Commission (2020a) derives from the CE concept. It further presents the structure of the proposal, possible criteria to assess economic activities with regard to their circularity. Using two exemplary sectors, we discuss which aspects the application of the Taxonomy could possibly consider when assessing a substantial contribution and the "do no significant harm" criteria as well as the question which activities to exclude entirely.

3.1 Overarching goals

While there is an emerging understanding of what a circular economy is and how circular business models differ from linear ones, there are hardly specific overarching goals for it. The Sustainable Development Goals provides guide rails and the EU Circular Economy framework is evolving. Therefore, it will become more specific and thus could be useful as a frame of reference for the implementation of the Taxonomy. The following frameworks might help defining the most important overarching goals for the circular economy:

Sustainable Development Goals: Several SDGs touch upon important components of a circular economy – the circular economy concepts itself is not part of the SDG framework. Proponents of the circular economy emphasize that the concept contributes to the achievement of the SDGs (van Kruchten/van Eijk 2020; Schroeder et al. 2019). Key SDGs with relevance to the circular economy are:

1. SDG 6 (Ensure availability and sustainable management of water and sanitation for all),
2. SDG 7 (Ensure access to affordable, reliable, sustainable and modern energy for all),
3. SDG 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all),
4. SDG12 (Ensure sustainable consumption and production patterns) and
5. SDG 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss).

In total, a circular economy (CE) is found to directly contribute to 21 SDG targets (and indirectly to 28 more) and to synergies with other SDGs, e.g. between economic development, poverty reduction and ending global hunger (Schroeder et al. 2019). A CE contributes to achieving the SDGs, but the SDG framework does not help us in defining points of reference and criteria to assess an economic activity's contribution to the circular economy.

EU Circular Economy Action Plan: The EU's 2020 Circular Economy Action Plan comprise a broad range of measures to advance the CE. It emphasizes the importance of **making circular design the norm** for production in Europe, **empowering consumers** (e.g. right to repair) and public buyers. It further addresses the need to reduce waste, establish recycling processes and create markets for **secondary raw materials** (European Commission 2020b).

The current EU monitoring framework for the Circular Economy adopted in 2018 comprises ten indicators in four groups. It does not (yet) include specific overarching goals, such as to halve the material footprint (European Commission 2018b). The current action plan outlines the goal of updating this framework and including new indicators to strengthen the positive

[9] The EIB lists a large number of studies highlighting the positive spillovers between adressing the circularity and climate mitigation (see Annex 4 in European Investment Bank 2020).

spillover effects between circularity, climate and elimination of pollution.[10] In this context, the **European Parliament** adopted a resolution calling on the Commission "to propose binding EU targets for 2030 to **significantly reduce the EU material and consumption footprints** and bring them within planetary boundaries by 2050" and "to introduce by 2021 harmonised, comparable and uniform **circularity indicators**" (European Parliament 2021). The Parliament did not specify these targets, while a number of environmental organizations called for a halving the material footprint by 2030 (DNR 2021).

3.2 Identifying important industries and sectors

The EU Circular Economy Action Plan highlights **key sectors** where challenges as well as environmental opportunities related to greater circularity are highest:

1. **Electronics and ICT:** The fastest growing waste streams in the EU stem from electronic and electrical equipment. Products become waste, when they are not repairable, a battery cannot be replaced, a software is no longer supported or materials incorporated into devices are not recoverd. Only about 40% of the electronic waste is currently recycled in the EU. Under the Circular Electronics Initiative, the European Comission will mobilise existing and new instruments to promote longer lifetimes. This should be achieved by strengthening eco-design requirements (for energy efficiency, durability and reparability, upgradability and recycling), the right to repair, requirements for longer durability and improving waste collection and treatment through take-back schemes.
2. **Batteries and vehicles**: Electric mobility will be the dominant driver of an enormous growth in demand for lithium-ion batteries in the coming decades. [11] Developing circular approaches can reduce environmental pressures of the growing demand for key materials (such as lithium, cobalt nickel and manganese) as well as the EU's import dependence for such raw materials.[12] In the long-term, up to 40% of global lithium demand in 2050 could be met from recovered secondary lithium, at least partly reducing the need for virgin lithium (Öko-Institut 2017). For that to happen, the development of second-life uses for batteries and efficient and safe recycling practices must be developed as quickly as possible.
3. **Packaging**: The per capita consumption of packaging materials is still on a growth trajectory and only about 80% is recovered, respectively only two-thirds recycled in the EU (2018)[13]. The 2030 goal to ensure all packing is reusable or recyclable can be addressed through reducing demand for (over)packaging/packaging waste, improved circular design and strategies that fully replace the need for packaging.
4. **Plastics**: The EU has adopted a Strategy on Plastics in the Circular Economy in order to manage the expected continued growth in the consumption of plastic products. Addressing the sector's circularity includes regulations, such as the ban on certain single-use plastic products, phasing out certain types of plastics, setting waste reduction targets and recycling contents for key products. In addition to recycled plastics, expanding the use of bio-based and compostable materials to replace today's plastics is also part of the strategy.
5. **Textiles**: The sector is a key driver for the demand for primary raw materials as well as a major source of greenhouse gases. Circular approaches can greatly contribute to reducing both environmental pressures. Specific measures are for instance:

[10] The action plan says specifically: "The Commission will also update the Monitoring Framework for the Circular Economy. Relying on European statistics as much as possible, new indicators will take account of the focus areas in this action plan and of the interlinkages between circularity, climate neutrality and the zero pollution ambition. At the same time, projects under Horizon Europe and Copernicus data will improve circularity metrics at various levels not yet reflected in official statistics" (European Commission 2020b).

[11] While demand for batteries will also grow in electronics and battery storage, electric mobility application will dominate demand. The World Economic Forum expects total demand for batteries to increase tenfold between 2020 and 2030, with electric mobility accounting for 89% of demand in 2030 (World Economic Forum; Global Battery Alliance 2019),

[12] Lithium and cobalt are both included on the EU's list of critical raw materials and European demand for them is expected to increase by 2030 five-fold for cobalt and 18-fold for lithium (European Commission 2020c).

[13] See Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics

- eco-design measures (e.g. design for repairability and easy access to repair services and materials),
- use of secondary raw materials,
- eliminating the use of hazardous materials,
- supporting products-as-a-service business models that promise longer lifespans,
- high levels of collection, re-use and recovery of materials.

6. **Construction and buildings**: The construction sector accounts for half of all extracted materials and 35% of the EU's total waste generation. CE approaches can have a major impact on reducing these negative impacts and turning waste into new (secondary) materials for (circular) construction in the future. Key strategies to promote circularity include increasing the use of recycled materials, improving the durability and adaptability of buildings over time, improving recovery targets for waste and its use as secondary raw materials.
7. **Food**: About 20% of food is either lost or wasted in the EU. This means that the area used for food production (including its ecosystem services) is unnecessarily cultivated. It further intensifies the conflicts between nature and the production of food and bio-based materials. Reducing waste and environmentally sound uses of biomass waste and residues are key challenges in the sector.

The production of renewable energy and the efficient use of energy are key components of a circular economy, but are not included in the categorization system for the circular economy on purpose.

3.3 Substantial contribution to the transition to a circular economy

The **purpose of the Taxonomy** is to guide capital into innovations that are (or have the potential to be) more circular than the status quo and to **accelerate changes towards the circular economy**. Without any intervention, prices for scarcer resources would surely rise and businesses would use resources more efficiently in the long run. In order to avoid the (environmental) damages from ever-growing resource consumption, it is prudent to use tools like the Taxonomy to accelerate the development of the circular economy (European Investment Bank 2020). Environmental improvements can originate from all steps of the supply chains – from the production of raw materials, the production processes, the design of products, the way we use and reuse them to the question what we do with them after a product has reached the end of its life.

The proposed categorisation system identifies these different types of contribution and its criteria for the circular economy. First of all, the difference between a linear and circular economy and its implications for business models is addressed in chapter 3.3.1. The next section (3.3.2.) focuses on the Taxonomy regulation framework for the circular economy before we turn to the proposed categorization system in the section 3.3.3.

3.3.1 What is a Circular Economy and what is the role of sustainable finance in the transition to a CE?

The environmental objective of the transition to a circular economy is very different in its nature from other environmental objectives, such as climate mitigation or biodiversity. It cannot be derived from the carrying capacity of an ecosystem or measured in one indicator, such as CO_2.

Rather, it is a **management approach** to transform our linear production mode into a circular one step-by-step. It fosters changes in all kinds of step in the supply chain **to make production more circular**. The fundamental goal of the approach is to ensure that production and consumption fits **within planetary boundaries** and to reduce harm as much as possible. Scientific literature is full of varying definitions of what the circular economy is and what the different challenges are in particular sectors (see for example Bocken et al. 2019). In essence, they differentiate two cycles through which biological and technical materials return after their use. While biological materials return to nature and their waste is the food for the growth of new materials, technical materials (such as metals), are finite. For both, it is true that their production requires many resources and we should use them as often (in cascades[14]) and as intensively as possible before their end of life and prevent waste.

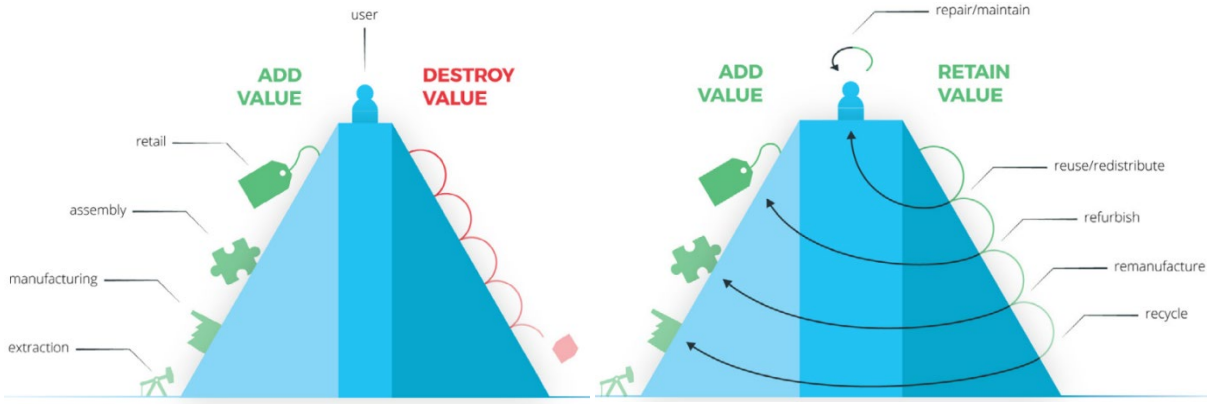
Transitioning to a circular economy is not "just" a question of materials or production or the way we use things. It is all of the above. The transition from a linear to a circular economy affects basically all aspects of a product: from the materials it is made of to its design principles, its manufacturing processes, its durability and ability to be repaired, refurbished, repurposed, reused, etc.; the

[14] This is particularly true for biological resources, such as wood. Examples, how cascading can contribute to a resource efficient use of wood and wood products (Mair-Bauernfeind/Stern 2017).

way and intensity with which a product is being used and – at the end-of-life of a product, the question whether its biological materials can be fed back into the biological cycle as nutrients and whether its technical materials can be recycled in the same quality and used in a new product.

For businesses and investors, this means that in order to realize the environmental improvements of a circular economy, **business models must change** and be reinvented. The business model changes with the transition from a linear to a circular economy. In a linear economy, businesses focus on improving the left side of the hill (pre-use and use phases) and maximize the amount of products that can be sold. The right side of the hill represents destroyed value (products in a landfill).

Figure 5: The value hill in a linear economy (left) and in a circular economy (right)



Source: (Achterberg et al. 2016)

In a circular economy, "value" is not added on one side of the hill and lost on another, but added or retained on all. It is the core concept of nature that **there is no waste** and that all resources that are no longer used in one system are the nutrients/ food in another. For a business, this means that improving **circularity can take place at every aspect of the value chain**, for instance:

- in the pre-use phase:
  - the production and the share of recycled materials used for it;
- the design of products focused on durability, modularity and repairability in the use-phase:
  - the ability to repair, refurbish, upgrade or repurpose products;
  - the development of sharing or products-as-a-service business models in order for each product to be used more intensively[15]
- in the post-use phase:
  - the collection of redundant products and wastes
  - the recovery of high-quality materials from recycling processes for high-quality use[16] in new products

Investments that substantially contribute to the circular economy can therefore be located in many different parts of the value chains and address entirely different aspects.

3.3.2 How the EU taxonomy can accelerate the transition to a circular economy

3.3.2.1 Circular economy in the taxonomy regulation

Article 13 of the Taxonomy outlines the goals of the Taxonomy with regard to the transition to a circular economy. The breadth of the article and the criteria for a "substantial contribution" illustrate the complexity of the subject (e.g. compared to the relative simplicity of criteria for climate mitigation).

[15] As one example, if hardware stores offer high-quality power tools as a service rather than (cheap) products, less people will "need" (or want) to own their own drills, saws, etc. and the more durable, more intensively-used products will require less resources overall in the long term (compared to many people owning cheap tools that are hardly used).

[16] A true circular economy must avoid downcycling and downgrading of materials with every circulation.

Figure 6: Requirements for a substantial contribution to the transition to a CE (article 13)

1. An economic activity shall qualify as contributing substantially to the transition to a circular economy, including waste prevention, re-use and recycling, where that activity:

(a) 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 materi-als or increasing the use of by-products and secondary raw materials; or

(ii) resource and energy efficiency measures;

(b) increases the durability, reparability, upgradabil-ity or reusability of products, in particular in design-ing and manufacturing activities;

(c) 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;

(d) 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;

(e) prolongs the use of products, including through reuse, design for longevity, repurposing, disassembly, remanufacturing, upgrades and repair, and sharing products;

(f) increases the use of secondary raw materials and their quality, including by high-quality recycling of waste;

(g) prevents or reduces waste generation, including the generation of waste from the extraction of minerals and waste from the construction and demolition of buildings;

(h) increases preparing for the re-use and recycling of waste;

(i) increases the development of the waste management infrastructure needed for prevention, for preparing for re-use and for recycling, while ensuring that the recovered materials are recycled as high-quality secondary raw material input in production, thereby avoiding downcycling;

(j) minimises the incineration of waste and avoids the disposal of waste, including landfilling, in accordance with the principles of the waste hierarchy;

(k) avoids and reduces litter; or (l) enables any of the activities listed in points (a) to (k) of this paragraph in accordance with Article 16

Source: EU Taxonomy regulation, Article 13, paragraph 1.

3.3.2.2 A categorisation for contributions to a circular economy

In order to operationalize what is laid out in Article 13 of the Taxonomy Regulation, a framework is necessary to translate the circular economy into criteria upon which to judge whether an investment (into a new or into existing projects) can be deemed to substantially contribute to the circular economy – or not. A special **task force of the EU Commission's Directorate-General Research and Innovation** has put forward such a proposal (European Commission 2020a). The proposal incorporates previous work on the CE (e.g. by the Ellen MacArthur Foundation and by financial institutions). The structure of the proposal is based on the **Value Hill Business Model Tool** developed by Achterberg et al. (2016). The proposal contains:

- "a generic, **sector-agnostic circular economy categorisation system** that defines distinct categories of activities substantially contributing to a circular economy;
- a **set of minimum criteria** to be met by activities under each defined category in order to be considered as substantially contributing to a circular economy; and
- **methodological guidance** including an indicative list of **typical investments/projects** for each circular economy category" (European Commission 2020a).

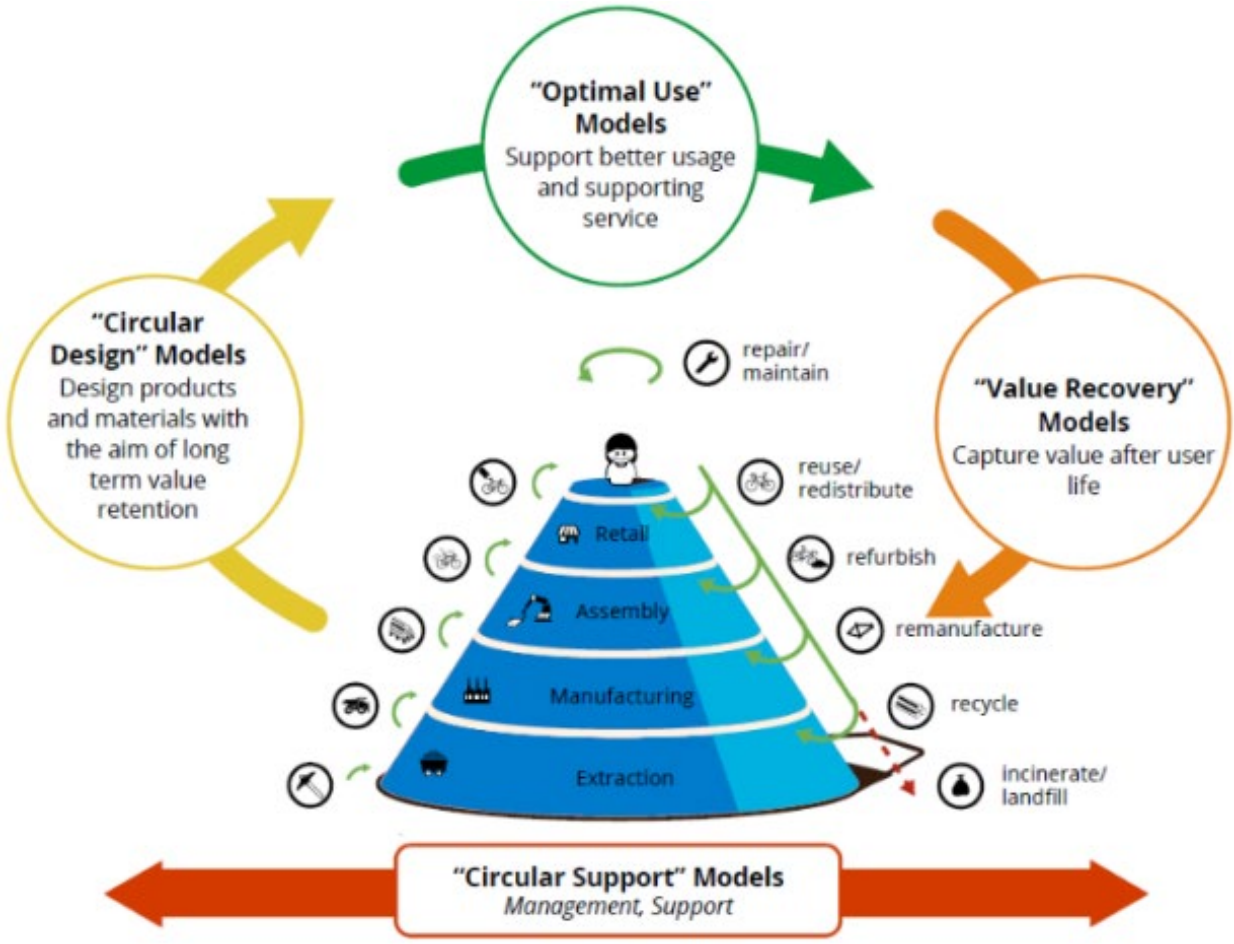
The categorisation system proposed by the European Commission's task force (European Commission 2020a, 'the proposal') consists of four groups of circular categories:

1) Circular Design and Production
2) Circular Use
3) Circular Value Recovery
4) Circular Support

Each group presents an area in which changes can significantly improve circularity and therefore reduce emissions, environmental impacts related to the production or use of products and services. For each circular category, there are specific criteria, which an economic activity must meet. The structure of the categorisation system is in line with the Taxonomy, but uses slightly different terms: its "groups of circular categories" correspond to different types of substantial contribution; its "circular categories" to points of reference and its "specific circularity criteria" to criteria (technical screening criteria).

Figure 8 gives an overview on the structure of the categorisation system. Table 2 in the annex provides the full classification system.

Figure 7: Translating the value hill concept into circular business models, categories and criteria for the taxonomy[17]



Source: (Achterberg et al. 2016) in (European Commission 2020a)

Four Groups of circular categories[18]

Group 1 (yellow): Circular design (and production) models focus on the **development of existing or new products and processes** which allow and optimise circular uses. For example, products are designed **to last longer, be easy to maintain, repair, upgrade, refurbish, remanufacture or recycle**. Additionally, **new materials** are used which are bio-based, less resource-intensive or fully recyclable. While the criteria address the wider use of secondary raw materials and by-products and mandates the substantial reduction of substances of concern, it does not specifically discuss the mining of virgin materials.[19]

Group 2 (green): Circular Use/ Optimal use models aim to **increase the value and use of a product during its (extended) lifetime**. Such business models often build on **retaining ownership** of a product and providing it as a service rather than selling it. They take responsibility for the product throughout its useful life, e.g. through **maintenance services, or add-ons to extend the life of a product**. Such **product-to-service models** have

[17] The proposed categorisation system uses slightly different titles than the figure based on Achterberg (2016). The titles used throughout the paper are based on the categorisation system.

[18] The description of groups is based on European Investment Bank (2020) with emphases added by authors.

[19] The focus of the proposed system lies on enabling circularity, not primarily on reducing environmental impacts. This could be the explanation why mining of raw materials is not specifically mentioned as well as why substances of concern are not per se ruled out (but required to be "substantially" reduced). An economic activity that substantially contributes to the CE while using virgin raw materials might still not be compliant with the Taxonomy if this activity creates harm on other environmental objectives (e.g. on biodiversity or pollution prevention).

financial implications as well as practical challenges in product tracking and legal issues surrounding ownership of collateral and its value depending on the EU-country.

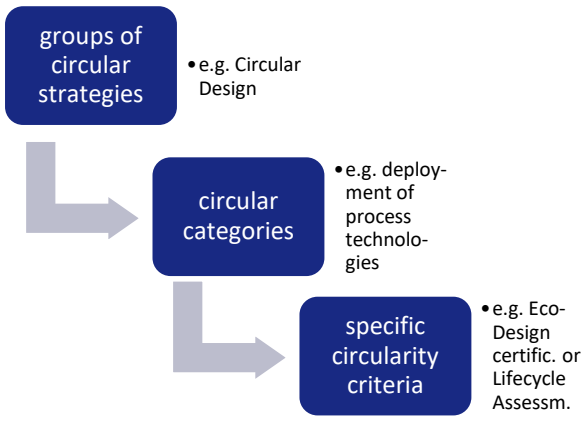
Group 3 (orange): Circular Value recovery models focus on **maximising the recovery and recycling of products and materials after use** into new products or useful resources in order to reduce waste. The development of r**everse logistics**, i.e. the return from point of consumption to point of production, is essential for this model. For some materials, recycling involves a loss of quality and for products also loss of design, and technical and energy inputs. Thus, there is a qualitative **difference between different kinds of value recovery: downcycling** (which results in lesser quality and reduced functionality), closed-loop-recycling (where a recovered resource is used again for the same purpose) and **upcycling** (which involves transforming by-products and waste into new materials or products of higher quality or better environmental value).

Group 4 (red): **Circular support models** focus on the **management and coordination of networks and resource flows**, provide incentives for circularity and other supporting activities. Circular support models also include the development or deployment of **key technologies** supporting, enabling and facilitating circular business models. The fourth group therefore has indirect impacts by enabling changes in the other three groups – e.g. through apps that support shared use of products, information to enable the use of recycled materials, etc. It is similar to the enabling activities (such as power storage and power grid improvements) in the field of climate mitigation (Cp. Schütze et al. 2020).

Groups, circular categories and specific circularity criteria

The four groups contain a total of 14 circular categories. Each circular category must meet a number of specific circularity criteria as stipulated in the proposal. The figure illustrates the hierarchy of elements of the system.

Figure 8: Structure of the proposed categorization system: groups, circular categories and criteria



Source: own depiction based on (European Commission 2020a)

The set of categories and criteria proposed in this categorisation system can be understood as eligibility criteria that economic activites are required to meet in order to qualify as substantially contributing to the circular economy. Within a group, an economic activity needs to meet several specific—circularity criteria. Which of these it needs to meet, depends on the particular economic activity and the question into which groups it falls. Using the catergorisation system, an economic activity that manufactures a product, would for example need to:

- Result in overall resource savings (compared to a benchmark)
- Support or enable the retention and recovery of materials
- Have comparable or increased quality, properties and technical functionality (compared to a benchmark)
- And bio-based materials must be traceable.

If the production uses secondary materials to substitute virgin materials[20], these must be shown to:

- Satisfy EU industry specific standards and
- Not increase safety and health risks for users throughout the value chain.[21]

Within each criterion, the proposal stipulates that lifecycle assessment methods should be used to demonstrate the contributions of a certain economic activity to the CE. The benchmarks and metrics against with economic activities should be measured can be lifecycle assessments or other methods that guarantee

[20] While the first four specific circularity criteria are mandatory to all activities, this category is optional and applied only when secondary raw materials are used.

[21] All examples taken from European Commission (2020a).

resource improvements, such as eco-design certifications.

The specific circularity criteria (and thresholds) in the Taxonomy's delegated act on the transition to a circular economy will have to be derived from the precise context and sector. For some criteria, there will be the possibility to also define quantitative thresholds, for example with regard to the question of material recovery and recycling efficiency. For some sectors and materials, recycling targets (e.g. for batteries or packaging waste) exist and other metrics like lifecycle assessments that can serve as criteria[22]. In some cases, there might not be the possibility to develop quantitative, but only qualitative criteria.

The complete proposed categorisation system by the European Commission for the four groups of circular strategies, the circular categories, their specific circularity criteria and examples for economic activities is presented in Table 2 in the annex.

The next sections of this report aim at illustrating examples of how the Taxonomy could be applied to economic activities in two key sectors for the circular economy: in electronics and ICT and the construction and buildings sector.

3.3.3 Economic activities in electronics and ICT

Smartphones, computers, smart home devices, etc. require an enormous amount of materials and generate huge amounts of e-waste worldwide – only 17,4% of which is being collected and recycled. In the EU, e-waste amounts to 16,2 kg per capita per year, of which 42,5% is being collected and recycled (Forti, Vanessa et al. 2020).[23]

Currently, the sector's high degree of linearity is a major problem, but it is also an example how the Taxonomy's criteria can be used to identify economic activities that improve circularity in different ways.

A study by the Ellen MacArthur Foundation outlines **four key challenges for a CE in the electronics sector** (Ellen MacArthur Foundation 2017):

- Longer use of electronic devices, by one or more users
- Devices are access points to services in cloud computing, thus enabling longer use and reducing waste
- Products and components circulate between different users and are used as long as possible
- Products and components are cascaded, in order to reap the most benefit from them before the go into recycling

The electronics sector is a useful example to illustrate the many different criteria to improve circularity, as opportunities for improvements can be found in all groups of criteria.

With regard to **Circular Design and Production Models**,

- Changes in design (e.g. through modular design) allow for better repair, upgrades, refurbishment, recyclability – either by users themselves or by technicians
- Use of bio-based materials for parts of devices produced from conventional plastics today – only if it leads to improvements in the environmental performance[24]
- Exchanging primary raw materials to secondary raw materials (such as recycled plastics or metals)

In the field of **Circular Use Models**,

- Services for repair, refurbishment, upgrades, etc. that extend the lifespan of an electronic product
- Wider use of products-as-a-service models that allow for temporary use of electronic devices rather than the "need" for ownership

Regarding **Circular Value Recovery Models**:

- Establishing consumer-friendly systems for the take-back of broken products for repair,

[22] It should be emphasized that a high recycling rate itself is insufficient to judge circularity, e.g. if the quality of recycled materials is too low to be used as a substitute for virgin materials. A full assessment should, for example, also measure how many virgin materials are substituted by recycled materials.

[23] The overall recycling rate is based on mass and does not say much about the recovery of specific materials, such as rare earth materials.

[24] A wider use of bio-based materials is might be necessary in order to replace fossil fuel based materials. However, the sustainability of such materials can vary widely depending on how these materials are grown (e.g. with regard to use of genetically modified organisms); whether residual materials are used or whether such materials are recyclable. Trade-offs between circularity and other environmental objectives (e.g. protection of ecosystems or regarding biodiversity and GMOs), would be addressed in the logic of the taxonomy when verifying that an economic activity does not create significant harm to other objectives.

refurbishment[25], processing of products no longer in use

Finally, **Circular Support** models offer many different options, such as:

- Information tools to improve the durability of components (e.g. predictive maintenance)
- Platform for exchanging/ re-selling electronic devices
- Digital material passports to facilitate the (re-)use, trading and tracing of secondary raw materials

3.3.4 Economic activities in construction and buildings

The construction sector is key to reducing waste and unlocking the potentials of the circular economy. Today, construction and demolition waste accounts for 25-30% of the EU's entire waste, containing a multitude of materials, such as concrete, bricks, gypsum, wood, glass, metals, plastic, solvents, asbestos and excavated soil (European Commission 2019). It has been identified as a priority waste stream for which the EU has set a recovery rate target of 70% (by 2020). While most countries are expected to reach the target, current recovery largely takes the form of backfilling and low-grade uses, such as in recycled aggregates in roads (European Enviroment Agency 2020). In other words: while a lot of material is recovered, much of a material's quality is lost and they can only be used for lesser tasks such as backfilling. Addressing the current problems in the sector would include efforts like:

- waste prevention;
- design for circular use of products and construction materials;
- more and better quality recycling processes;
- higher trust in the quality of secondary raw materials;
- addressing the lack of information on the composition of recovered construction materials (European Enviroment Agency 2020).

Similar to the electronics sector, improving circularity requires action in several groups of circular categories.

With regard to **Circular Design and Production Models**:

- purposeful design of products to be fit for modularity, easy disassembly[26] and recycling;
- the wider use of sustainable construction materials, such as timber;
- The use of secondary raw materials in construction.

The group **Circular Value Recovery Models** is of key importance for the sector, e.g. through:

- Dismantling of construction waste that allows for higher quality re-use of the secondary raw materials recovered, e.g. through new dismantling, separation and sorting techniques and processes.

Finally, **Circular Support** can enable circularity in construction through:

- Information tools, such as material passports[27] that standardize information on the composition of materials is key support recovery and re-use of materials.

3.4 "No significant harm" to the circular economy

The DNSH assessment intends to ensure that "progress against some objectives are not made at the expense of others" (EU Technical Expert Group on Sustainable Finance 2020). If an economic activity significantly contributes to one (or more) of the other environmental objective(s), what CE criteria should be considered a red line at which the CE could face significant harm?

Article 17 of the Taxonomy regulation outlines three aspects that shall be considered to cause significant harm to the circular economy:

[25] Establishing such systems that allow consumer to use products longer are a key factor in reducing waste from electronics.

[26] One practical example are window systems that are designed modularly so that they can easily be repurposed or recycled in a way that all materials can be sorted correctly and do not lose quality ion the process. See: (Schüco 2020)

[27] There are various examples for such initiatives, e.g. (Heinrich/Lang 2019).

Figure 9: Article 17 DNSH to the circular economy

"... economic activity shall be considered to significantly harm the circular ecoomy, 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; or
(iii) the **long-term disposal of waste** may cause significant and long-term harm to the environ-

Thus, the regulation outlines the requirement for economic activities that significantly contribute elsewhere to not cause significant trade-offs or long-term harm. Defining what constitutes a "significant ineffiency" will be part of work that the EU Sustainable Finance Plattform currently undergoes in elaborating the Taxonomy. To give the readers a better understanding: a theoretical example for a DNSH could be a climate mitigation or pollution prevention technology that uses hazardous substances that create the need for long-term disposal of its waste.

3.4.1 Economic activities in electronics and ICT

A large amount of products in the electronics and ICT sector are currently manufactured in a linear fashion yet they are still being collected and recycled to a certain degree. Improving the overall circularity, the recovery of specific materials and the quality of recycling processes are important incremental improvements.

An aspect that serves as an example and might be considered a DNSH criterion for the circular economy is the use of hazardous substances. In this example, these should only be used in products whose **components containing hazardous substances can be safely disassembled** thus allowing for a **safe disposal**[28].

In the future, as the CE will be strengthened over time, design requirements might be considered to **avoid designs or production processes that preclude high quality re-use, recovery and recycling** of valuable materials.

3.4.2 Economic activities in construction and buildings

The technical annex for climate mitigation and climate adaptation discusses DNSH criteria for CE in the construction sector. For both environmental objectives and in all sub-sectors, the annex outlines exactly the same goal for 80% of construction and demolition waste to be re-used or recycled[29].

The defined threshold does not seem to be too ambitious. While it is set above the EU's 2020 target to reach 70% recovery, many EU countries had already met it in 2016. However, the DNSH criterion specifically includes backfilling, which should – at best - be viewed as a bad (low-quality) recovery option. In order to **limit the use of backfilling** to seemingly bolster recovery rates, the European Commission tightened the definition in the 2018 Waste Directive in order to limit the widespread use (Cp. European Enviroment Agency 2020).

The one existing criterion for DNSH in the construction sector lacks ambition and it should be considered complementing a strengthened **recovery target** with criteria on other aspects, such as **limiting the use of substances of concern** or **minimum eco-design requirements**.

3.5 Activities to be excluded

To a large extent, the current state of production and consumption is still linear and not circular. A few general rules can be formulated upon which to base the exclusion of certain activities. Of key importance is the question if they run contrary to core ideas of the circular economy. Economic activies might be excluded if:

1) (Primary or Secondary) **Materials** used in production are **not safe and can be harmful** when released into the environment at the end of their lifetime;

[28] Chemicals and materials policy complement this by reducing the use of such hazardous substances altogether.

[29] „At least 80% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material defined in category 17 05 04 in the EU waste list) generated on the construction site must be prepared for re-use or sent for recycling or other material recovery, including backfilling operations that use waste to substitute other materials." (EU Technical Expert Group on Sustainable Finance 2020).

2) Products have a **negative affect on human health and safety** or **increase pollution** and therefore negatively impact ecosystem[30];
3) Economic activities do not foster **material use of (inevitable) wastes** and contradict the priorities of the **waste hierarchy** (prevention of waste, re-use and recycling) as well as the **use of resources in cascades**.

Economic activies that promote the **energetic use of waste** fall into this last category. They are excluded in the task force's proposal: while waste-to-energy and waste-to-fuel processes can be interpreted as some form of circular use, the resource efficiency gains from waste-to-energy and waste- to-fuel activities are small "particularly when considering the loss of value of potentially recyclable materials" (European Investment Bank 2020) and is not in line with the cascade use principle (Birdlife 2015). Including them could promote lock-in effects in linear modes of production.

4 Conclusion and next steps

This report aims to enable readers to understand the EU Taxonomy, its relevance, primary goals and design and to highlight tasks in the current development of the Taxonomy. The classification system for the circular economy published by the European Commission can serve as a basis upon which to develop ambitious criteria that define the Taxonomy for the transition to a circular economy.

The framework is broad and flexible enough to address a multitude of different challenges in transforming our linear economies into circular ones in a broad range of different sectors. Specifying what criteria are of particular importance for what sector or which indicators and thresholds should be set for substantial contribution or DNSH are a key challenge for the close future. The ability of the Taxonomy to successfully guide economic activities into a more sustainable direction (no matter with regard to which environmental objective) is dependent on whether the benefits for being taxonomy-compliant are significant**Ambitious enough to lead to greater sustainability** than the status quo and **science-based.**

It will be a critical task for readers and the non-governmental community to accompany the development of the Taxonomy and make sure that the criteria, thresholds and benchmarks are **regularly reviewed and strengthened over time.** Accompanied by ambitious regulatory and economic policy instruments, the Taxonomy can play a major role in accelerating transformative changes towards sustainable economic activities.

[30] Exclusion criteria based on (Deloitte 2019).

5 Literature

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6 Annex

Table 1: Detailed Overview of Business Models per Value Hill category

Value Hill category	Business Model	Description
Circular Design (Uphill)	Circular product design	Designing products with their end-of-life in mind by making them easy to maintain, repair, upgrade, refurbish or remanufacture
	Classic long life	Delivering longevity of a product with high levels of guarantees and services for a high price upfront
	Encourage sufficiency	A high price per product can justify lower volumes
	Circular materials	Utilise input materials such as renewable energy, bio-based-, less resource intensive- or fully recyclable materials
Optial Use (Tophill)	Life Extension	Sells consumables, spare parts and add-ons to support the longevity of products
	Repair & Maintenance Service	Repairs, maintains and possibly upgrades products that are still in use
	Product leasing (Product as a Service)	Delivers access to a product rather than the product itself so that the service provider retains ownership of the product. The primary revenue stream comes from payments for the use of the product and a single user uses the product at any given time.
	Product renting (Product as a Service)	Delivers access to a product rather than the product itself so that the service provider retains ownership of the product. The primary revenue stream comes from payments for the use of the product and different users use the product sequentially.
	Performance provider (Product as a Service)	Delivers product performance rather than the product itself through a combination of product and services, where no predetermined product is involved and the service provider retains ownership of the product. The primary revenue stream is payments for performance of the product, i.e. pay-per-service unit or another functional result
	Sharing Platforms	Enables an increased utilization rate of products by enabling or offering shared use/access or ownership through which, different users use the product sequentially
	Sell and buy-back	Provides a product and agrees on repurchasing the product after some time
Value Recovery (Downhill)	Recaptured material supplier	Supplies recaptured materials and components to substitute the use of virgin or recycled material
	Refurbisher	Refurbishes used products if necessary and re-sells them
	Second hand seller	Provides used products
	Remanufacturer	Provides products from recaptured materials and components.
	Recycling facility	Transforms waste into raw materials. Additional revenue can be created through pioneering work in recycling technology.

Network Organisation (Crosshill)	Recovery provider	Provides take back systems and collection services to recover useful resources out of disposed products or by-products
	Process design	Provides services around processes that increase the re-use potential and recyclability of industrial and other products, by-products and waste streams
	Value management	Provides services around managing information, materials, transparency, payments and governance in a circular value network. For example ICT solutions for smart contracts and payment systems, or consultancy on circular management systems.
	Tracing facility	Services to facilitate the trading and the marketing of secondary raw materials

Source: (Achterberg et al. 2016)

Table 2: Categorisation system for the Circular Economy: groups, circular categories, specific circularity criteria and examples for typical investments

Circular categories	Specific circularity criteria	Examples of typical investments
Activities contributing to Circular Design and Production aim at increasing resource efficiency through (i) design innovation, (ii) process innovation and reengineering and/or (iii) material innovation and substitution. While such interventions take place early in the product lifecycle, their positive environmental impacts mostly materialise in the use and after-use phases and through reduced use of virgin materials. The following circular activity categories / project types substantially contribute to circular design and production in cases where they apply circular economy (9 R's) strategies listed above and comply with the specific circularity criteria listed below.		
1.a Design and production of products and assets that enable circular economy strategies through e.g. (i) increased resource efficiency, durability, functionality, modularity, upgradability, easy disassembly and repair; (ii) use of materials that are reusable, recyclable or compostable. 1.b Development and deployment of process technologies that enable circular economy strategies 1.c Development and sustainable production of new materials (including bio-based materials) that are reusable, recyclable or compostable 1.d Substitution or substantial reduction of substances of concern in materials, products and assets to enable circular economy strategies 1.e Substitution of virgin materials with secondary raw materials and by-products	For activities under the circular categories 1.a, 1.b, 1 c and 1.d to substantially contribute to a circular economy, they must demonstrate that: 1. the activity results in significant overall net resource savings and impact reductions as compared to a benchmark material/product/asset/process that meets the current EU or international industry standards AND 2. the activity supports or enables circular value retention or recovery strategies (R4 – R9) AND 3. the materials/products/assets produced have comparable or increased quality, properties, technical functionality and application areas as compared to a relevant benchmark that meets the current EU or international industry standards AND 4. bio-based materials used are demonstrably traceable to sustainable biomass production AND (in addition only for circular category 1.e) 1. secondary raw materials used satisfy current EU or international or national industry specific standards and legislation AND 2. secondary raw materials used do not increase safety and health risks for users and the environment throughout value chains.	▪ RDI programmes and infrastructure, including pilot and demonstration facilities, enabling activities under circularity categories 1.a, b, c, d, e ▪ Scale-up and deployment of new technology and/or facilities at commercial scale supporting activities under circularity categories 1.a, b, c, d, e ▪ Design and construction of new buildings and infrastructure incorporating circular products, materials (including recycled materials), construction processes and technologies including circular categories 1.a, b, c, d, e
Activities contributing to Circular Use aim at increasing resource efficiency through (i) product and asset lifecycle extension based on reuse, repair, repurposing, refurbishment or remanufacturing strategies and/or (ii) product and asset use-optimizing leasing and sharing models. Such interventions typically take place during or at the end of the use phase of products and assets. The following circular activity categories / project types substantially contribute to circular use in cases where they apply circular economy (9 R's) strategies listed above and comply with the specific circularity criteria listed below.		

2.a Reuse, repair, refurbishing, repurposing and remanufacturing of end-of-life or redundant products, movable assets and their components that would otherwise be discarded	For activities under circular category 2.a to substantially contribute to a circular economy, they must demonstrate that: 1. the products/movable assets would otherwise be redundant and discarded AND 2. the activity achieves significant overall net resource savings and impact reductions, on a lifecycle basis, compared to a new, replacement product/movable asset that meets the current EU or international industry standards AND 3. the products/movable assets are put back to their original use possibly with extended properties, or in case they have outlived their original purpose, to an adaptive re-use (by repurposing) AND 4. efforts made to promote the life extension will not compromise the ability to recover or recycle the products/movable assets or their associated materials at the end of a new life-cycle AND, specifically for refurbishment and remanufacturing 5. refurbished/ remanufactured products/movable assets meet a generally accepted specific EU or international, national industry specific standard (as new condition in the case of remanufactured products/assets) and accompanied by relevant warranties for the refurbished assets, as well as materials used, with warranty periods in accordance with legal requirements.	▪ Refurbishment, retrofitting and remanufacturing of end-of-life or redundant products/movable assets ▪ Construction, expansion or retrofitting of manufacturing facilities, ancillary equipment and technology for refurbishing and remanufacturing purposes ▪ Establishment of small scale businesses or not-for profit organisations for the reuse and repair of consumer products (e.g. clothing, furniture, bicycles, household appliances)
2.b. Refurbishment and repurposing of end-of- design life or redundant immovable assets (buildings/infrastructure/facilities)	For activities in circular category 2.b to substantially contribute to the circular economy, they must demonstrate that: 1. the activity is deliberately circular by design; meaning that it prioritises strategies that prioritise resource efficiency gains, while simultaneously promoting other objectives such as increasing energy efficiency and/or the quality/resilience of the immovable asset (see guidance section on the right) AND 2. the activity achieves significant overall net resource savings and impact reductions, on a lifecycle basis,	

	compared to a replacement new immovable asset (building/infrastructure/facilities) that meets the current EU or international industry standards AND 3. the buildings/infrastructure/facilities are put back to their original use, possibly with extended functionalities, or in case they have outlived their original purpose, to an adaptive re-use (by repurposing) AND 4. a plan is put in place to enhance the reuse and recycling of materials and components removed during the intervention AND 5. efforts to promote the life extension will not compromise the ability to disassemble the immovable assets (buildings/infrastructure/facilities) and reuse/recycle their associated materials at the end of life, in line with category 3.b AND 6. warranties are provided for the refurbished assets as well as the materials and products used with warranty periods in accordance with legal requirements AND 7. the activity does not contradict current EU or international spatial/urban planning standards, whereby the use of the land for other developments takes precedence.	
2.c Product-as-a-service, reuse and sharing models based on, inter alia, leasing, pay-per-use, subscription or deposit return schemes, that enable circular economy strategies	For activities in circular category 2.c to substantially contribute to the circular economy, they must demonstrate that: 1. the contractual model shows that the entity carrying out the activity retains responsibility for the upkeep, maintenance and end- of-life management of the product AND 2. the business model enables circular economy strategies AND 3. the activity increases the overall resource efficiency of the product or asset, on a lifecycle basis, as compared to existing use practice.	

2.d Rehabilitation of degraded land to return to useful state and remediation of abandoned or underutilized brownfield sites in preparation for redevelopment	For activities in circular category 2.d to substantially contribute to the circular economy, they must demonstrate that: 1. the activity is an enabling step for the subsequent reuse/redevelopment of the land (e.g. urban, industrial, agricultural use) AND 2. the activity ensures that remedial targets are protective of natural resources (e.g. water, soils) and human health.	
Activities contributing to Circular Value Recovery aim at increasing resource efficiency through the recovery of wastes in preparation for reuse and recycling or other circular economy strategies. Such interventions typically take place during the after-use phase of products and assets. The following circular activity categories / project types substantially contribute to circular value recovery in cases where they apply circular economy strategies and comply with the specific circularity criteria listed below.		
3.a Separate collection and reverse logistics of wastes as well as redundant products, parts and materials enabling circular value retention and recovery strategies	For activities in circular category 3.a to substantially contribute to the circular economy, they must demonstrate that : 1. wastes, redundant products, parts and materials are collected and transported separately and otherwise managed in a way to enable reuse, repair, refurbishment, remanufacture, high quality recycling and/or valorisation (circular categories 2.a, 3.b and 3.c) AND, in the case of activities involving the collection of wastes: 2. targeted communication and education programs to sensitise waste producers about the importance of waste prevention and segregation are an integral part of the activity.	Reverse logistics systems: ▪ Any physical equipment, transport and building infrastructure needed to organise the take back and reverse flow of products and materials to relevant facilities for repair, refurbishing, remanufacturing or recycling Separate waste collection: ▪ Movable equipment (bins, containers) ▪ Waste collection and transport vehicles ▪ Supporting infrastructure for waste collection, transport and temporary storage (e.g. civic amenity centres, transfer and reloading stations, vehicle depots, facilities for refuelling/recharging, washing, maintenance and repair)
3.b Recovery of materials from waste in preparation for circular value retention and recovery strategies (excluding feedstock covered under 3.c)	For activities in circular category 3.b to substantially contribute to the circular economy, they must demonstrate that: 1. the feedstock constitutes or originates from source segregated and separately collected waste fractions AND 2. the activity contributes to attaining material recovery rates that are aligned with targets established for relevant waste types in EU or national law as well as in local waste management plans; and collaborates with other actors in the value chain to increase the quality of recovered materials to the extent that is both technically feasible and economically viable AND 3. secondary raw materials as well as product parts recov-	▪ Material recovery facilities (MRF), process technology and mobile equipment, involving manual, semi-automated and/or fully automated mechanical processes (dismantling, separation, sorting, crushing, shredding, cutting, post-treatment technologies, etc.) ▪ Chemical recycling plants involving various types of technologies and processes (e.g. depolymerisation, solvolysis, gasification, pyrolysis, etc) Note that specific criteria may need to be further developed for different material recovery/recycling technologies, to take into account their individual recovery performance and environmental impacts on a lifecycle basis. On the matter, see for instance the study on chemical recycling by CE

	ered are suitable for reuse or recycling and meet relevant EU or international or national industry specific regulations, standards and/or user specifications AND 4. the management of residues from the recovery process shall follow the EU waste hierarchy principle.	Delft (https://www.cedelft.eu/en/publications/2173/exploratory-study-on-chemical-recycling-update-2019).
3.c Recovery and valorisation of biomass waste and residues as food, feed, nutrients, fertilisers, bio- based materials or chemical feedstock	For activities in circular category 3.c to substantially contribute to the circular economy, they must demonstrate that: 1. the feedstock constitutes or originates from non-hazardous source segregated and separately collected biomass waste and residues, i.e. these are not separated from mixed residual waste AND 2. the recovery process seeks to give the highest possible economic use to the feedstock, subject to technical and economic viability AND 3. the products from the recovery/valorisation process meet relevant EU or international, national industry specific regulations and legislation, standards and/or user specifications for the intended use AND 4. material recovery and valorisation is a primary objective of the recovery process. By-products and residues from the primary recovery process are diverted to further recovery operations with the intention to maximise total value recovery in accordance with the EU waste hierarchy principle, where technically and economically viable AND 5. energetic use of by-products and residues of the recovery process is allowed to cover own energy needs or where there is no other economically viable higher use for these AND specifically for processes that divert (i) crops residues (e.g. straw, corn stover, etc.), (ii) animal by-products (e.g. slurry, manure, etc.) or (iii) forest residues (e.g. small trees, branches, tops and un-merchantable wood left in the forest after the cleaning, thinning or final felling of forest stands)	▪ Biorefinery facilities and process technology for the extraction of bio-based products and feedstock from bio-wastes and residual biomass, wastewater and sludge from organic origin ▪ Anaerobic digestion and composting plants utilizing the resulting digestates/composts as fertilisers/soil conditioners

	from their standard use in the agricultural / forest cycles for use as feedstock … 6. the allowed biomass extraction levels should be determined on a case-by-case basis, factoring in pedo-climatic conditions, to avoid any depletion to soil fertility. If certain by-products (e.g. digestates, ashes, nutrients (N-P-K-S and other minerals), organic matter, etc.) are incorporated back to agricultural / forest soils while satisfying to relevant EU or other international, national industry specific standards as well as user specifications, the maximum allowance levels could be adjusted.	
3.d Reuse/recycling of wastewater	For activities in circular category 3.d to substantially contribute to the circular economy, they must demonstrate that: 1. it satisfies EU legal provisions or recognised international standards and user specifications for re-used/recycled wastewater AND 2. it does not increase pollution, safety and health risks for users and the environment AND 1. appropriate technical measures and/or economic instruments are in place or planned to improve resource efficiency in the overall water use cycle, subject to technical and economic viability.	▪ Equipment and technology to collect treat and distribute wastewater in order to reuse it for household, industrial or agriculture purposes instead of dischargingit For the sake of clarity, only the additional investment cost related to the objective of reusing the wastewater is included. Not the mandatory onsite treatment of wastewater.
Activities in the Circular Support category group aim at enabling other circular activities/projects and thus indirectly contribute to increasing resource efficiency. The following circular activity categories / project types substantially contribute to the circular economy in cases where they apply or enable circular economy (9 R's) strategies listed above and meet the specific circularity criteria listed below.		
4.a Development/deployment of tools, applications, and services enabling circular economy strategies	For activities in circular category 4.a to substantially contribute to the circular economy, they must demonstrate that: 1. the circular support tools, applications and services demonstrably enable circular economy strategies and result in significant overall net resource savings.	▪ ICT tools for predictive maintenance and repair to extend the life of products ▪ Digital tools and applications to facilitate reverse logistics (tracking, take-back of products for reuse, repair or recycling), improve resource efficiency and avoidance of waste production (e.g. food waste in restaurants, shops) ▪ Virtual marketplaces for secondary raw materials or second hand/repaired/upgraded products ▪ Digital material passports and related data repositories to facilitate the tracing, marketing and trade of secondary raw materials

		in end- of-life products and constructions ▪ Methodological frameworks and tools for measuring and monitoring of progress in the transition to a circulareconomy ▪ Digital tools and applications for consumer awareness raising/education on the application and benefits of different circular economy strategies Advisory services to companies and public authorities for strategising, preparing and implementing circular economytransitions

Source: (European Commission 2020a)