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Measuring the green economy

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Abstract

Policymakers globally have been and remain interested in understanding the scale of economic activity associated with various aspects of the green economy. But defining what is 'green' is not straightforward, and standard industrial classifications are unhelpful for many areas of green activity which involve relatively new technologies. This research has been funded by the Office for National Statistics as part of the research programme of the Economic Statistics Centre of Excellence (ESCoE). The report reviews the definitions of 'green' economic activity used in a variety of contexts, and considers whether and how the UK's approaches to estimating the 'Environmental Goods and Service Sector' could be improved.

Keywords: Green Economy, Environmental Policy, Green Jobs, Environmental Regulation, Sustainability Indicators, Green Economic Activity, Environmental Accounting, Green Technologies, Environmental Data

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Measuring the green economy

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1 Introduction: why measure green economic activity?

Policymakers globally have been and still are interested in understanding the scale of economic activity associated with various aspects of the green economy. But defining what is 'green' is not straightforward, and standard industrial classifications are unhelpful for many areas of green activity which involve relatively new technologies. This report reviews the definitions of 'green' economic activity used in a variety of contexts, and considers whether and how the UK's approaches to estimating the 'Environmental Goods and Service Sector' could be improved. This research has been funded by the Office for National Statistics as part of the research programme of the Economic Statistics Centre of Excellence (ESCoE)

To set the scene for the report, we first consider why it is useful to assess the scale of green economic activity. At least three reasons are often given:

- To understand the costs associated with the achievement of environmental objectives, including the costs associated with environmental regulation[1].
- To understand and identify economic opportunities, vulnerabilities and dynamics associated with environmental goods and services.[2]
- Track the progress of emerging new industries related to ongoing transitions of relevance to the environment, in particular the energy transition and the shift to a more circular economy. This may include developing related indicators.

The stakeholders with whom we consulted for this report (see details in section 10), also highlighted two broadly different approaches to using estimates of economic activity associated with the environment. One use case is largely political. Public debate frequently invokes scale of green jobs or economic opportunities arising from environmental policy. A second use is analytic: using data on economic activities to inform understanding of the likely or actual impacts of policy choices and consumer trends. This report is largely organised based around the latter, i.e. it seeks to develop

[1] Schenau 2018. Research agenda for the SEEA-CF. https://seea.un.org/sites/seea.un.org/files/research_agenda_seea_cf_2018_2.pdf; UN 2017, System of Environmental-Economic Accounting 2012: applications and extensions.
[2] Schenau 2018 ibid; Livesey 2010, Measuring the environmental goods and services sector, https://link.springer.com/article/10.1057/elmr.2010.165

ways of thinking about green goods and services that are useful for the policy analysis that underpins decision-making.

We have searched the academic and policy literature for examples of use of key datasets produced by many national statistical agencies including the ONS, that capture green economic activity. This includes Environmental Goods and Services Sector (EGSS) estimates, Environmental Protection Expenditure (EPE) estimates and other approaches for measuring green economic activity. There is considerable academic use of measures of environmental protection expenditure, both in Europe and elsewhere (particularly the US). EPE measures are used both as a measure of compliance costs[3], and as a proxy indicator for the stringency of environmental regulation[4].

We also identified use of ONS' Low Carbon and Renewable Energy Economy (LCREE) estimates and definitions in a range of studies, both in the academic literature[5] and policy debate, where they are used to provide an understanding of the scale of economic activity and jobs related to low carbon energy activity – whether in specific sectors or regions.

Lists of green goods prepared as an input to trade negotiations are also prominent in academic and policy discussions. Several recent studies have made use of such lists to analyse the dynamics of the 'green economy'[6]. We have identified very few academic studies that make use of EGSS estimates.[7]

2 Our approach to reviewing green economy definitions and measurement approaches

We have reviewed a range of approaches to measuring and defining green economic activities.

This has included five main sources:

- **Methods guidance, applied examples, and ongoing associated debates related to the treatment of environmental goods and services in the System of Environmental Economic Accounting – Central Framework (SEEA-CF)[8]**. This includes guidance documents from EUROSTAT on defining and measuring Environmental Goods and Services (EGS) and Environmental Protection Expenditure (EPE), and presentations on this topic of meetings of the London Group. We have also reviewed the proposals from the UN Statistical Division to revise the classification of environmental activities, alongside consultation responses to those proposals. In order to understand how SEEA-CF guidance is being applied, we also reviewed documents related to EGS Sector (EGSS) statistics from a selection of countries,

[3] See Kneller and Manderson, https://doi.org/10.1016/j.reseneeco.2011.12.001
[4] See e.g. Leiter et al. https://doi.org/10.1016/j.ecolecon.2010.11.013 and Costantini and Crespi. https://doi.org/10.1016/j.ecolecon.2007.10.008
[5] E.g. https://doi.org/10.1080/09654313.2019.1595533; https://doi.org/10.1016/j.erss.2022.102681; https://doi.org/10.1016/j.marpol.2020.103905
[6] Baba Ali et al. https://doi.org/10.1016/j.gsf.2023.101695
[7] For an example, see Sulich, A., Sołoducho-Pelc, L. The circular economy and the Green Jobs creation. *Environ Sci Pollut Res* **29**, 14231–14247 (2022). https://doi.org/10.1007/s11356-021-16562-y
[8] Note that the SEEA-CF is undergoing a process of revisions, details of which are available here: https://seea.un.org/content/global-consultation-initial-list-issues-update-seea-central-framework

including Canada, Denmark, Poland and Germany, and academic efforts to develop estimates of EGSS consistent with SEEA-CF definitions in the US[9].

- **Academic and policy literature** that either proposes or makes use of statistical measures of environmental goods and services, beyond the SEEA-CF framework.
- **Proposed lists of green goods associated with trade debates**. There is an ongoing process of debate about the possibility of reducing trade barriers for environmental goods, as part of international efforts to accelerate a transition to a greener economy. Such processes involve international proposals for lists of goods and services that could be protected from tariffs.
- **Green taxonomies for financial investors**. There have been efforts in many regions in the past few years to identify green criteria for investment projects. Such criteria help investors understand their exposure to climate-related policy risks, and help communicate to stakeholders the environmental impacts of investment portfolios.
- **Indicators of circular economy economic activity**. Several organisations, including the OECD and the European Commission, have developed measurement approaches for the circular economy that include attempts to assess economic activities related to circularity, notably recycling, repair and reuse.

3 The current SEEA-CF framework and recent developments

The SEEA-CF sets out a set of shared definitions for the measurement of economic activities associated with environmental protection. This measurement system has evolved, with EUROSTAT playing a key role in driving forward revisions to definitions, and producing methods guidance. The foundation of the SEEA-CF approach is the definition and identification of environmental "activities"[10], and since most relevant "activities" are the production of a good or service there is strong alignment with a product-focused view. Estimates focused on *producers*, i.e. "clean firms" are rarer – mostly because many firms produce both EGSS and non-environmental goods.

3.1 Definitions of 'environmental' activities and products

For both activities and products, SEEA-CF guidance starts from a "main purpose" definition. Something is an environmental activity or product if its main purpose is to "reduce or eliminate pressures on the environment", or "make more efficient use of natural resources"[11].

In its guidance on estimating EGSS[12] and EPE[13], Eurostat then goes on to make clear that a) it also includes activities whose primary purpose is something else, but which have an environmental secondary purpose (e.g. EV manufacturing). In practice, because of the difficulties associated with identifying whether the 'main purpose' is environmental, the handbook makes use of an approach based on the "*technical nature"* of produced goods and services. Eurostat argues that the 'technical

[9] Fixler et al. 2023, Accounting for Environmental Activity: Measuring Public Environmental Expenditures and the Environmental Goods and Services Sector in the US. https://www.nber.org/papers/w31574
[10] Eurostat 2016, Handbook on Environmental Goods and Services Sector. https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-09-012
[11] Eurostat 2017. Environmental Protection Expenditure Accounts Handbook. https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-gq-17-004
[12] Eurostat 2016 ibid.
[13] Eurostat 2017. Ibid.

nature' of an activity *"determines whether or not the activity is suitable to reduce the pressure on the environment, through prevention, reduction and elimination of pollution or through the reduction of the use of natural resources, whatever the stated motivations and presumed or real effects are.*" This suggests that in practice, judgements are made by identifying activities that are cleaner or environmentally beneficial relative to some relevant alternative. This deviates substantially from a definition built on 'main purpose', and is much broader.

3.2 Typologies of environmental "activity": CEPA, CReMA and the move to CEP

The SEEA-CF 2012 described a Classification of Environmental Protection Activities (CEPA). These are activities that have a main purpose of protecting the natural environment. European countries, co-ordinated through Eurostat, added to this set of definitions with the addition of a Classification of Resource Management Activities (CReMA).[14] These provide an agreed framework for associating financial flows with specific categories of environmental protection and resource management.

However, this approach was flawed. It was frequently not obvious into which category a particular activity belongs, since many activities relate to multiple categories[15]. Eurostat guidance on electric vehicles, for example, suggested that they should be reported under CEPA 1 ("Protection of ambient air and climate"), rather than CReMA 13b ("Energy saving and management") – but noted that this is "by convention". This was problematic, because it undermined the clarity for policy or research audiences about what the categories really meant. In this case, the diffusion of electric vehicles may have a more profound impact on total final energy demand than any other single product – but users of the statistics interested in economic activities associated with changes in energy will not find EVs in statistics on economic activities associated with energy saving.

The UN Statistics Division, in collaboration with Eurostat, has now developed an updated approach to the classification of environmental protection and resource management activities[16,17]. The CEPA and CReMA system is now becoming a "Classification of Environmental Purposes" (CEP)[18].

The CEP is structured as a hierarchy, in much the same way as existing sectoral classifications. This will potentially facilitate clarity, but it does not overcome the core challenge if the categories are exclusive. As discussed earlier, some 'environmental' goods and services are defined by the 'main purpose', and others by their 'secondary purpose'. Since a product—like an EV—may have multiple 'secondary purposes', it is not clear that the shift to CEP will help to resolve the allocation of specific activities to particular environmental categories, and there is no clear basis for articulating which is the more important secondary purpose. For example, is anaerobic digestion of food waste largely related to 'production of energy from renewable sources' or 'treatment and disposal of non-hazardous waste'?). This matters, because from a policy perspective one may be interested in statistics that reflect both purposes, rather than allocating individual activities by convention into one category or other. A policy analyst wishing to understand economic activities associated with

[14] Eurostat 2016 ibid.
[15] Schenau 2018, ibid
[16]https://seea.un.org/sites/seea.un.org/files/Global_consultation_CEF/unsd_letter_global_consultation_cef.pdf
[17] https://seea.un.org/content/global-consultation-classification-environmental-functions
[18] https://unece.org/sites/default/files/2024-02/S2c_2_Eurostat_update%20on%20CEP.pdf

waste management will want to include data on anaerobic digestion, as will their colleague working on renewable energy. Creating a mutually exclusive categorisation of 'purposes' is not helpful when it prevents meaningful use of the data.

A preferable approach, in our view, would be to use CEP categories to 'tag' activities with environmental purposes and/or environmental characteristics. This would follow the model of the patent code system, which has developed patent codes that describe and categorise technologies: patent codes are not exclusive and inventions are tagged with multiple codes[19]. There is also a (relatively new) system for tagging inventions that are related to climate change mitigation[20]. Patent codes enables users of the data to identify areas of inventive activity that are associated with specific characteristics, regardless of whether these characteristics were the 'main' purpose, or one of several 'secondary' purposes.

A tagging system of this kind would enable activities such as the production of electric vehicles to be tagged with a variety of environmental characteristics: lower energy consumption, lower CO_2 emissions, lower air pollution, and lower noise. This kind of many-to-many matching of specific economic activities (or products) to environmental characteristics would facilitate analysis much more than data that uses arbitrary conventions to assign many-to-one relationships, as takes place within the current CEPA/CReMA and proposed CEP systems.

3.3 Categories of product types

The SEEA-CF suggests categories of products: environment-specific services, sole-purpose products, adapted goods, end-of-pipe technologies and integrated technologies. Some countries (e.g. Austria) report their EGSS estimates using that breakdown. Adapted goods are those that have a primary purpose that is not environmental, but which have been adapted, for example, by having higher levels of energy efficiency.

More recent Eurostat guidance[21] has suggested adapting that older framework, and recommends distinguishing between:

- **Environmental-specific products**, which "*primarily serve environmental protection or resource management*". [22]
- **Cleaner and resource efficient products**, which "*primarily serve a non-environmental purpose but may serve a secondary environmental purpose because they are specifically designed to be more environmentally friendly or more resource efficient than normal products of equivalent use.*" [23]

3.4 Integration of EGSS, EPEA and ReMEA

[19] https://www.wipo.int/classifications/ipc/en/
[20] https://www.sciencedirect.com/science/article/pii/S0172219016300618
[21] Eurostat 2016 ibid.
[22] Eurostat 2016 ibid.
[23] Eurostat 2016 ibid.

Environmental expenditures are intended to be broadly consistent with definitions of environmental goods and services, though there are important differences in scope and definition. In a sense, environmental protection expenditure accounts measure the 'demand' for goods and services specific to environmental protection, i.e. a subset of environmental goods and services. However, there are challenges here. While Eurostat has proposed closer integration of the accounts[24], a 2017 UNSD report[25] notes that the scope of EPEA can be broader than that captured by EGSS, because expenditures for an environmental purpose could include, for example, purchases of a vehicle with which to perform an environmental function, even if that vehicle itself is not an environmental product. This highlights the challenges in reconciling the accounts.

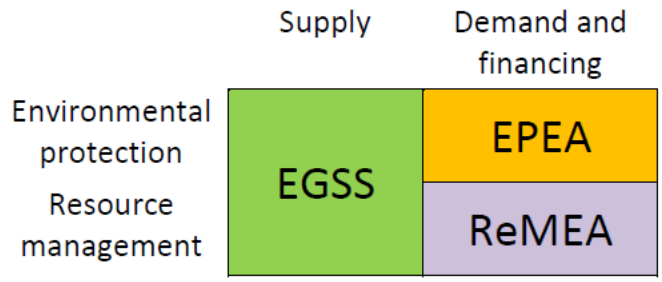

Figure 1. Proposed integration of EGSS, EPEA and ReMEA. Source: Eurostat 2018

3.5 EPE guidance, the green premium, and a missing opportunity to track investments/spending on win-win products

EPE guidance suggests that for 'cleaner products' that have only a secondary environmental purpose, only the 'extra costs' associated the clean products should be accounted for[26]. This is reflected in the UK's EPE survey[27], and the approach is consistent with the idea that EPE captures spending that has a main purpose of environmental protection. It is consistent with an interpretation of EPE as the costs of protecting the environment. It helps provide insights into the costs of compliance with environmental regulation, plus the costs that firms are willing to incur in order to protect the environment for other reasons (such as attracting green-minded consumers).

However, in many areas, and in particular in the context of the energy transition, it is not always the case that environmentally preferable options are more expensive, particularly on a total cost of ownership basis. For example, purchasing an electric car may cost more upfront, but can cost less over the total ownership of the vehicle depending on usage patterns[28].

Indeed, the approach in the EPE is inconsistent with the EGSS approach, in which the full value of cleaner products is included, rather than just that share of the value of output relates to the 'green premium'. This makes it more challenging to integrate EPE and EGSS estimates. Perhaps more

[24] Eurostat 2018, Integrated framework for environmental activity accounts. Published on the UNSD SEEA website
[25] UN 2017, System of Environmental-Economic Accounting 2012: applications and extensions.
[26] Eurostat 2017, ibid.
[27] ONS, UK EPE Survey
[28] Bauer et al. 2025: https://doi.org/10.1016/j.apenergy.2025.125764, Parker et al. 2021: https://doi.org/10.1016/j.trd.2021.102893

importantly, it makes it impossible to track spending by firms on 'win-win' spending, such as investments in energy efficient products. Part of the challenge here relates to the distinction between 'environmental protection' and 'resource management' activities. Currently, in the absence of data collection for ReMEA, electric cars are captured in EPE surveys based on their additional costs. But as soon as they reach cost parity with conventional cars, they cease to be captured in demand-side estimates. ReMEA are less well developed than EPEA and EGSS – including in the UK. The EPE survey does not include questions targeted at expenditures on resource management (e.g. it would not capture additional spending on equipment that has higher energy efficiency).

4 Challenges operationalising existing EGSS and EPE definitions

Our review highlights that there are several important weaknesses of the current EGSS and EPE definitions, which reduce the extent to which it meets policy needs. The system is at times an unhappy compromise between an attempt to generate a narrow and statistically sound definition (main purpose environmental protection) and a broader definition that satisfies policy demands (including such policy-salient activities as renewable energy and EVs).

4.1 Confusion between 'main purpose', 'secondary purpose' and 'technical nature'

The core definitions underpinning EGSS and EPE estimates are the cause of some confusion. As the Eurostat handbook[29] makes clear, the application of the environmental purpose criterion "involves a degree of subjectivity, changes over time and may not be fully comparable across countries."

Methods guidance documents exemplify this instability of definitions. The production of renewable energy is variously described as having a 'primary' and 'secondary' environmental purpose in different Eurostat and SEEA guidance documents.

This situation means that borderline choices are not stable: individual analysts may make different choices about whether to apply a definition based on primary purpose (which results in a very narrow definition) or on the basis of the 'technical nature'. It is not clear that these choices are being driven by user needs, or by an attempt to seek clarity in definitions, but rather by the practicalities of inferring purpose or differences in the 'technical nature'. One frustrated expert commentator recently described the confusion between the 'technical nature' and 'main purpose' perspectives as generating "nonsense"[30].

[29] Eurostat 2016, Ibid.
[30] Migotto 2023, Response to the CEF consultation. https://seea.un.org/sites/seea.un.org/files/Global_consultation_CEF/comments_form_global_consultation_cef_mauro_migotto.pdf

4.2 "Technical nature" and system inter-dependencies: supply chains and indirect environmental harm

The Eurostat Handbook includes goods and services that have a 'technical nature' of higher environmental performance. However, the sustainability or otherwise of some goods and services depends on the performance of a wider system. The environmental attributes of a product cannot always be unambiguously determined by the technical nature of the product itself, but may depend on the context in which it is used. The environmental performance of 'hydrogen ready' boilers depends entirely on whether there is a transition to widespread use of hydrogen in gas distribution networks, and how that hydrogen is produced. Whether the product is, or is not, an environmental good or service can only be judged in the context of the system in which it is operating. A German project on EGSS[31] wrestled with this problem in the context of electric cars, seeking to identify the share of electric cars that were powered exclusively with renewable energy.

4.3 Relative definitions and shifting baselines

Society's perception of whether something has an 'environmental' main purpose is likely to change over time, as the economy changes. In a world dominated by fossil fuels, renewable energy appears to be unambiguously a resource management activity. But in a world that has already transitioned to a renewable energy system, people will simply see renewables as the cheapest way of generating power. Indeed, this shift is already taking place. Similar issues remain if the definition of environmental activities in practice is determined by their technical nature. Electricity, as an energy vector, is unambiguously cleaner than using gas, oil, biomass, or coal directly as fuels in homes or industry. But electricity is not typically identified as an environmental good. The baseline against which we understand something to have an environmental purpose shifts.

On a 'technical nature' basis, what counts as an environmental product shifts as new environmental problems are revealed, and as environmental performance improves across the economy. The Eurostat EPEA guidance in 2017 invokes "lead-free petrol" as an example of an 'environmental protection product', which seems wildly anachronistic. Leaded petrol was phased out in the EU twenty years ago, and since the advent of electric vehicles no fossil fuel for passenger vehicles can be regarded as an environmental product. A similar situation is now developing with condensing gas boilers (see Box 1).

Box 1. Condensing gas boilers

The LCREE dataset includes manufacturing of condensing gas boilers, since the guidance to firms filling in the survey explicitly lists condensing gas boilers as an example of an energy efficient product. They are also included in Eurostat's "Indicative compendium of environmental products", which aims to support consistent estimates of EGSS. However, such boilers can no longer be considered green. As of 2025, they are not permitted in new build homes because of their environmental impact. The relevant alternative products to which they can be compared are cleaner heating technologies such as heat pumps, rather than non-condensing boilers which have been

[31] Buchner (2015): Environmental Accounts -Environmental Goods and Services Sector, Final Report on Eurostat project, grant number 50904.2012.004-2012.431, Federal Statistical Office of Germany (DESTATIS)

banned since 2005. Despite being included within the LCREE dataset, condensing gas boilers do not appear to be included within the UK's EGSS estimates.

The issue raises challenges for the consistent interpretation of trends over time. As the energy transition unfolds over decades, we would not necessarily expect the 'green economy' thus defined, to grow. We would expect particular 'generations' of green technology and practices to grow until they became the norm, at which point they are no longer relatively environmental benign. Indeed, there will be times when the loss of a specific activity from the 'green economy'—and thus a shrinkage in measured 'green economic activity'—will represent positive progress towards a more sustainable society. The loss of condensing gas boilers from EGSS or LCREE estimates will show a reduction in apparent environmental activity, but this reduction would not suggest a weakening of the UK's 'green economy'.

A similar example is hybrid cars. The LCREE sector definitions include the manufacture of hybrid cars as examples of low emissions vehicle activity. This was appropriate when the survey sectors were first defined. But as illustrated in the figure below, what counted as a low emissions vehicle in 2010 can no longer be seen as such today.

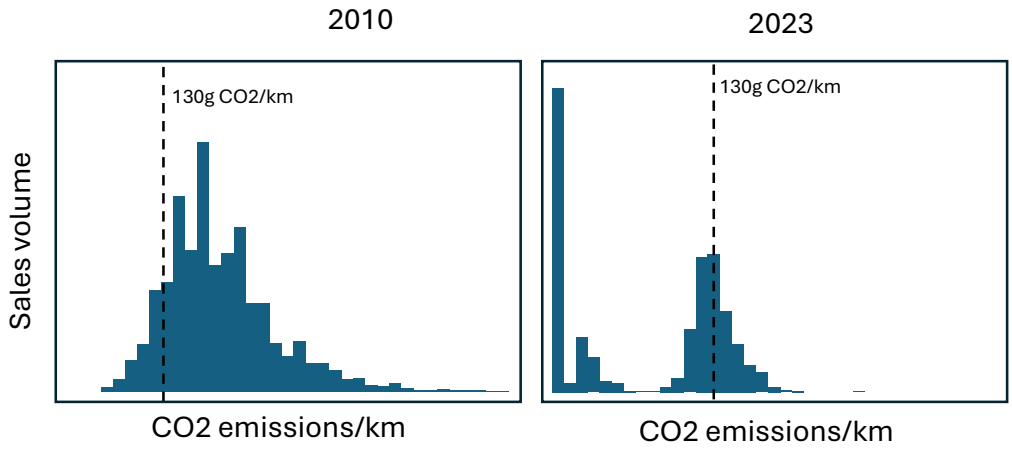

Figure 2. Showing the different distributions of sales of cars in 2010 and 2023. Data from the Netherlands, note that the Y axes for the two years do not use the same scale – the figure seeks to highlight the different shapes of the distributions. Data from the European Environment Agency. In 2010, so-called 'show-room' VED rates were zero for cars with < 130gCO_2/km, indicating that these were considered 'clean' at the time[32]

This problem is complicated by the fact that the rate at which technologies change differs between product types. Compact fluorescent light bulbs have gone from being promoted as a green alternative to being targeted for phase-out on environmental grounds within a decade, while wind turbines have been seen as green for decades and this is unlikely to change soon.

Datasets built from micro-data that enables revisions (enabling the removal of specific activities from historical data) would provide a much stronger basis for statistical analysis, as definitions are periodically updated over time. This may mean it is necessary to ask survey respondents to indicate

[32] https://www.smmt.co.uk/2010/03/showroom-tax-and-increased-ved-rates-take-effect-1-april-2010/

specific technologies or product types, as is done for example within the Canadian Survey of Environmental Goods and Services[33].

4.4 Contested greenness and trade-offs between dimensions of environmental performance

Economic activities generate a wide range of environmental pressures, which have differing effects on different aspects of the natural environment. Products that improve environmental performance against one dimension may not improve it for others. There can be trade-offs between different dimensions of environmental performance of a product. Importantly, society's judgements about these trade-offs shifts over time. Greenhouse gas impacts have become increasingly dominant, as concerns about climate change grow.

Examples of environmental goods for which such trade-offs are highly relevant include:

- **Waste incineration**. This has long been included within waste management activities, including in the UK EGSS, because incineration avoids leakage of waste into the environment. However, it results in the combustion of fossil-derived plastics, and thus contributes to CO_2 emissions. Waste incineration without carbon capture and storage may thus be incompatible with science-based targets, i.e. zero emissions.
- **Biomass heating**. Since bioenergy is renewable, generating heat from biomass—including in log-burning woodstoves—is considered an environmental activity in the UK EGSS. This is despite policy efforts to phase out biomass combustion in cities because of the severe impacts on air quality.

One approach to dealing with these trade-offs is to put 'guardrails' around definitions, to prevent the inclusion of products that perform well against one environmental dimension while causing serious harm elsewhere. This approach has been implemented in finance taxonomies, such as that adopted by the EU. The EU Taxonomy achieves this by both specifying environmental performance benchmarks for some goods and services (e.g. bioenergy is only included if it meets certain life-cycle GHG criteria), and with a more general "no significant harm" principal that automatically excludes options that cause significant environmental harm on some dimension. Imposing benchmarks in the LCREE survey could be possible, to ensure that polluting activities within broadly green categories (such as bioenergy) are excluded.

For future iterations of the LCREE survey, some simple benchmarks or minimum criteria could be added to the guidance, providing clarity for responding firms on their activities. This could include, for example, the requirement that any reported wood fuel production is derived from forests with sustainability certification.

While good data—and more specific criteria—can sometimes resolve debates around trade-offs, it is likely that there will always be contestation around any attempt to arrive at a list of 'green' activities. There is no single unambiguously 'right' set of activities, and there are fundamental

[33] Statcan (2023) 2023 Annual Survey of Environmental Goods and Services, Questionnaire https://www.statcan.gc.ca/en/statistical-programs/instrument/1209_Q2_V11

reasons for this[34]. To the extent that the definitions of environmental products express a social choice about the relative desirability of different options, such product lists are subject to the difficulties described by social choice theory and Arrow's "impossibility theorem". In short, there is no analytic way of determining what the right view is for such trade-offs if people disagree about what is important. Furthermore, there is limited knowledge about the potential long-term consequences of many environmental pressures (such as micro-plastics), making it difficult to assess the relative importance of such pressures when examining trade-offs.

The implication is that any typology or definition will be a subjective choice made by the ONS in consultation with relevant stakeholders (principally government departments but also other policy actors). Granular data that enables users to identify—and if necessary remove—specific activities can reduce this issue somewhat, since users may wish to exclude certain activities that they do not see as green.

4.5 Supply chain issues

Policymakers may be interested in the full economic consequences of changes in demand for environmental goods and services, including upstream effects. In the context of the UK's offshore wind industry, government has worked hard to ensure that there is a UK supply chain for offshore wind, comprising an ecosystem of companies that provide services and products to offshore wind manufacturers and operators.

The Eurostat EGSS guidance indicates that supply chain products should only be included where they are specifically designed or intended for downstream environmental products[35]. For example, silicon ingots prepared specifically as an input into solar PV manufacturing would be counted as environmental products, but undifferentiated silicon production would not be.

In contrast, lists of green goods developed for trade deals—including the UK's trade deal with New Zealand—includes supply chain goods required for e.g. renewable energy and electric vehicles, even where these goods are not specifically designed as inputs into downstream environmental products. It is worth noting that the UK policy debate is already using data of this kind, though not derived from EGSS or LCREE data. The 2024 Industrial Strategy Green Paper[36] cites analysis based on green product lists, which are being used to inform judgements about the relative strengths of different sectors.

One approach would be to estimate inputs using input-output tables, particularly hybrid input-output tables that have disaggregated representation of key environmental products/sectors, such as renewable energy production. Hybrid input-output tables, developed to track the environmental and economic 'footprint' of various goods and services, provide evidence on the approximate scale of demand of various upstream goods and services required to produce downstream environmental

[34] Stirling, A. (1999). The appraisal of sustainability: some problems and possible responses. Local Environment, 4(2), 111-135.
[35] Eurostat 2016, EGSS Handbook ibid.
[36] Department for Business and Trade (2024), Invest 2035: the UK's modern industrial strategy. https://www.gov.uk/government/consultations/invest-2035-the-uks-modern-industrial-strategy/invest-2035-the-uks-modern-industrial-strategy

goods. However, this is data intensive, and is based on modelling typical production pathways rather than tracking actual UK production networks.

A second approach to capturing supply chain activities is to make use of lists of green products identified in trade negotiations, such as that developed between the UK and New Zealand. This is explored further in section 5 below.

5 Comparison of EPE and EGSS definitions with other 'green economy' taxonomies

There is an increasing variety of attempts to categorise various green economy activities. These serve a different purpose from the statistical measurement approaches related to the SEEA-CF. However, they provide a valuable perspective on alternative ways of understanding what should, and should not, be perceived as "green". The EPE and EGSS definitions described by the SEEA-CF and related methods approaches are based on a broadly common definition of environmental purpose. Our review identifies some alternative approaches.

5.1 Finance taxonomies

The purpose of such taxonomies is to support investors to understand the environmental characteristics of investment portfolios. This helps investors meet customer demands (i.e. green finance products), and helps them to manage risks associated with exposure to unsustainable investments. Some taxonomies (such as the Climate Bonds Initiative, or CBI) focus narrowly on assets, activities and projects that address climate change[37]. Investors use a wide range of sustainability criteria, using a wide variety of definitions and frameworks. We draw on them here to illustrate the diversity of approach to assessing what is—or is not—'green', in order to explore alternative perspectives to the approach set out by Eurostat.

Unlike the SEEA-CF approach, such taxonomies are not designed to enable estimates across the whole economy. Rather, they provide a set of rules that can be applied to specific assets, to determine whether the asset can be regarded as environmentally sustainable. As a result, finance taxonomies typically apply environmental performance criteria[38], such as benchmark levels of CO_2 per unit power generation. This has the strength of transparency in the judgements about the 'technical nature' of an environmental product – in contrast to the rather vague formulations in various EGSS and EPE approaches.

Finance taxonomies also show some marked differences with EGSS and EPE approaches in terms of scope and inclusions. For example, the Eurostat Handbook explicitly rejects the inclusion of electricity transmission and distribution infrastructure. From an energy transition perspective, large

[37] Climate Bonds Initiative 2021, https://www.climatebonds.net/files/files/CBI_Taxonomy_Jan2021.pdf
[38] European Commission 2025, EU Taxonomy Navigator, https://ec.europa.eu/sustainable-finance-taxonomy/

increases in such infrastructure are seen as critically important for enabling the transition to net zero. In consequence, such activities are included in finance taxonomies[39].

In contrast to the core EGSS and EPE definitions, finance taxonomies also frequently include considerations of social implications as well. For example, the EU taxonomy defines environmentally sustainable economic activities as those which '*make a substantial contribution to at least one of the EU's climate and environmental objectives, while at the same time not significantly harming any of these objectives and meeting minimum safeguards'*[40]. This corresponds with the definition of UNEP, in which a green economy '*results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities*'[41].

5.2 Lists of 'green goods' in trade negotiations

Countries have sought to facilitate the transition to a greener economy by facilitating global trade in 'environmental products' by removing tariffs and other trade barriers from them[42]. This requires the development of lists of 'environmental products'[43]. As such, these approaches are all defined at the product level.

As part of such debates, a distinction has typically been made between two broad types of environmental product[44]:

- Environmentally Preferred Products (EPPs). This relates to the environmental performance of goods themselves, across their lifecycle (produced using cleaner methods, or producing lower environmental pressures in their use or disposal). Examples might include organic agriculture products,
- Goods for environmental management (GEMs).

This results in the 'tagging' of various traded goods and services as 'environmental'. While this results in the exclusion of largely non-traded environmental goods and services (such as wastewater treatment), such debates provide an alternative way of identifying and defining environmental products. Any agreements under such processes are likely to result in measurable flows of environmental products.

5.2.1 The Mealy/Andres Green Products List

The green product list identified by Mealy and Teytelboym[45], which draws directly on lists of green goods developed for trade negotiations, has now been adapted and used in a variety of academic and thinktank reports. This includes reports cited by government as evidence underpinning the

[39] Climate Bonds Initiative 2021, https://www.climatebonds.net/files/files/CBI_Taxonomy_Jan2021.pdf
[40] European Commission 2025, ibid.
[41] UNECE, no date, https://unece.org/green-economy-3
[42] Asian Trade Centre, 2023, The Devilishly Hard Job of Defining an Environmental Good
[43] Steenblick 2005, Environmental Goods: A Comparison of the APEC and OECD Lists. Paris: OECD
[44] Asian Trade Centre, 2023, The Devilishly Hard Job of Defining an Environmental Good
[45] Mealy and Teytelboym 2022, https://doi.org/10.1016/j.respol.2020.103948

recent industrial strategy green paper[46]. The list, and trade data associated with it, has been updated by Andres and Mealy and is now hosted at https://green-transition-navigator.org.

This approach offers a different perspective from the traditional EGSS definitions, implying that a much broader array of activities is 'green'. A key conceptual point is that many of the green products on such lists are intermediate inputs into green technologies and processes, and by themselves are not obviously green. This green product list includes products that are only indirectly associated with green activities as articulated by the EGSS guidance. For example, among the products listed as relevant for renewable energy are "730890 structures and parts of structures, iron or steel" and "761090 aluminium structure and parts not elsewhere specified, for construction". Production of these goods does not meet the Eurostat EGSS definitions: they are not 'main purpose' or 'secondary purpose' environmental goods, and their technical characteristics are also not environmentally superior. They are also not "specifically designed to be more environmentally friendly or more resource efficient than normal products of equivalent use".[47] In short, the approach by Mealy and Teytelboym—derived from lists of 'green products'—includes the supply chains that are necessary for the creation of environmental goods, not just the goods themselves.

In a recent report focused on net zero, the Institute for Public Policy Research (IPPR) matched a subset of the Mealy/Teytelboym list of green goods to the sectors that produce them, at the SIC4 level[48]. This link to sectors provides a way of identifying sectors producing inputs for green goods and services, i.e. sectors delivering the products required for the net zero transition. The IPPR study identified 32 manufacturing sectors at the class (four digit) level, along with an estimate of the share of their output that corresponds to the list of green products. The resulting list includes sectors that are not currently captured in the EGSS data, and which would be unlikely to be captured in the LCREE. This includes sectors that are currently polluting, but which are key inputs into renewable energy supply chains, such as SIC 23.61 "manufacture of articles of concrete products for construction purposes" and SIC 23.14 "manufacture of glass fibres".

Green goods lists—particularly those developed by Mealy and Teytelboym—have thus been used in analysis that informs policy decision-making in relation to the UK's *potential* or *capabilities* in the production of green technologies. From this perspective, it is irrelevant whether the product is currently used as an input into an environmentally preferred product, or a coal power station: the analysis explores whether the UK has potential strengths in an area that facilitates the green transition. Studies of this kind are more interested in assessing the UK's strengths and capabilities, rather than tracking the economic activities associated with reducing environmental pressures.

Note however, that it would be possible to generate lists of green goods from a narrower perspective, i.e. identifying the goods that both meet traditional EGSS definitions, and for which an HS/CN or prodcom/CPA code exists. A product list of this kind, linked to sectors, could provide a valuable supplement to existing ONS publications on EGSS, enabling tracking of a group of 'core' environmental goods.

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[46] https://www.gov.uk/government/consultations/invest-2035-the-uks-modern-industrial-strategy
[47] Eurostat 2016, EGSS Handbook, ibid.
[48] IPPR 2023, Manufacturing Matters. London: Institute for Public Policy Research. https://www.ippr.org/articles/manufacturing-matters

The key differences between an approach built on green product lists, and the existing LCREE approach, are highlighted in Table 1 below.

Table 1. Comparison of EGSS approaches built on LCREE data and SIC codes, vs. built on lists of green products

	LCREE and SIC	Green products lists linked to sectors
Core definitions	Activities in the 17 environmental sectors of interest (LCREE) and specific green SIC codes (like recycling)	Narrow view: captures the subset of environmentally preferred products and goods for environmental management that are identified with specific HS/CN or PRODCOM codes Wide view: Production of products that can be inputs into environmental goods or services
Data sources	LCREE survey and ABS	Two main data sources: - Production (PRODCOM data) - Trade (COMTRADE)
Key strengths	Captures sectors for which no SIC codes exist, or product groups where no CPA code exists; captures ser vices	Wide view can capture *productive capacity* for the green economy, rather than actual output used for green activities.
Key limitations	Misses the wider supply chain; Less granular data	Excludes services; fails to capture sectors for which no suitable product code exists;

5.2.2 The UK-New Zealand Green Products List

The UK's recently finalised trade deal with New Zealand includes an agreement to liberalise tariffs on a long list of 288 green products[49]. This makes it substantially larger than the list produced by Mealy, Teytelboym and Andres.

This list includes goods whose production would not be captured under the EGSS statistics currently published by the ONS. This is true for:

1. Goods that are defined as green in the trade agreement but not in the UK's previous EGSS or LCREE definitions, e.g.:
    - Rail-related products (carriages, rails, etc.);
    - Bicycles
    - Various natural fibres that are environmentally preferred in comparison to fossil-based plastic fibres (including wool, flax, jute)
2. Goods with green potential, where not all production is dedicated to a clean use (e.g. production of silicon, some of which is destined for solar cell production, but some of which is used in e.g. computer chips).

[49] https://www.gov.uk/government/publications/uk-new-zealand-fta-chapter-22-environment

3. Goods that are environmentally preferred subsets of broader product categories, sometimes with specific benchmarks.
    - HS391732 “Flexible tubes, pipes and hoses of plastics, not reinforced or otherwise combined with other materials, without fittings” are included where they are “of a kind used in agricultural drip irrigation”.
    - Wood-based construction materials and other wood products, where these are “sustainably sourced”.
    - HS850151 “Electric motors; AC motors, multi-phase, of an output not exceeding 750W” are included where they “meet or exceed the requirements of efficiency class IE4 of the Norm IEC 60034-30-1”.

It would be possible to incorporate some of these into the UK’s EGSS estimates with relatively little effort – particularly for the first category where existing SIC codes directly enable inclusion. The third category is much more challenging, since this requires data that can disaggregate greener goods from a broader product category. Such disaggregation may be impossible without sector-specific data based on clear sustainability benchmarks.

6 Possible EGSS scope changes: Waste management and the circular economy

On the basis of our review of lists of environmental goods (from trade debates), academic papers, reports (e.g. Arup), and finance taxonomies, we have identified a number of possible changes to the scope of UK EGSS and related estimates. This includes environmental goods and services that appear not to be captured in either the UK EGSS or LCREE estimates, and which are not specifically identified through the EPE survey.

6.1 Waste management

The UK currently includes all of SIC 38 as an environmental activity in its estimates of EGSS.

Waste management offers a conundrum for measuring environmental goods and services. All waste management activities are by definition an environmental good or service, because their primary purpose is to prevent the leakage of waste into the environment. However, the widely accepted notion of the waste hierarchy makes clear that different waste management approaches—and particularly circular economy approaches—have very different environmental profiles. Traditional waste management, characterised by landfill and incineration, are at the bottom of the waste hierarchy and are widely seen as environmentally problematic. Waste-to-energy and incineration plants generate significant CO_2 emissions, including from fossil-derived plastic. Such activities are therefore difficult to reconcile with climate change concerns, and there is scope for debate about whether they should remain listed as ‘environmental’ activities.

Finance taxonomies typically exclude as unsustainable some traditional waste management activities. The CBI taxonomy excludes waste going to landfill, as well as collection and transport

unless certain emissions criteria are met. It also excludes energy production from waste unless emissions criteria are met. The EU taxonomy is the strictest, not even allowing waste-to-energy incineration.

There are data challenges here, since the companies that manage incineration and landfill are typically the same companies that also manage collection and sorting—essential precursors to recycling. This makes it difficult to separate the activities using business activity data organised by standard industrial classifications. One option here is to use data on waste flows (in tonnes)[50], along with data on the typical costs associated with landfill and incineration (in £/tonne)[51], to generate estimates of the value of activities of waste management companies minus those directly associated with landfill and incineration. This applies much the same logic as is currently used to estimate the value associated with the generation of renewable electricity, which is based on physical production data (in GWh of energy) and typical costs (in £/GWh)[52].

6.2 Resource efficiency and circular economy: re-use, repair, recycling and related services.

The UK EGSS estimates include recycling (based on SIC 38.3). However, they do not include a variety of other economic activities that relate to resource efficiency. Examination of circular economy indicators suggests a range of other activities that could be included under EGSS, as activities that have the 'technical nature' of improving environmental performance at the system level. This section sets out the broad frameworks used, and their potential application for the UK EGSS.

6.2.1 Frameworks and definitions

EU countries, and the European Commission, have done most to develop approaches to measuring economic activity associated with the circular economy. In their definition of the circular economy (CE), the EU[53] divides the CE into three stages of product cycles (corresponding with *10 "R strategies"*). They further identify sectors that approximately map onto each category, at least to some extent. This is presented in Table 1. The rest of this section explores each of these three categories.

Table 2. CE activities and sectors. Drawn from the EU circular economy indicators, with own elaboration

Category	**"R" strategy**	**Related activities for which data exists**
Use and create products more intelligently	refuse, rethink, reduce	Rental and leasing

[50] https://www.gov.uk/government/statistics/uk-waste-data/uk-statistics-on-waste
[51] https://www.wrap.ngo/sites/default/files/2021-01/Gate-Fees-Report-2019-20.pdf
[52] EGSS Methods Annex, https://www.ons.gov.uk/economy/environmentalaccounts/datasets/ukenvironmentalgoodsandservicessectoregssmethodologyannex/current
[53] Economic Aspects of the Circular Economy. CE list of economic activities.' 2022. https://ec.europa.eu/eurostat/cache/metadata/en/cei_cie011_esmsip2.htm

Lifetime extension of products and parts	re-use, repair, refurbish, remanufacture, repurpose	Re-use (second-hand shops) Repair sectors
Useful application	Recycle, recover	Recycling sector

6.2.2 Use and create products more intelligently

Generally, it is recognised that data on this first category are difficult to measure statistically due to unavailability or low quality of data[54], other than the rather limited scope of rental and leasing activities.

The most straightforwardly measurable set of activities in this category is rental and leasing, because these are represented by a range of standard industrial classification codes. This includes renting and leasing of cars, recreational and sports goods, personal and household goods, and machinery and equipment in agriculture, manufacturing and construction. Rental and leasing can reduce material consumption to deliver the same level of service: tool hire, for example, enables large numbers of users access to tools with a lower throughput of material resources than would be required if each user purchased tools. On this basis, the Dutch statistical agency CBS in 2018 recommended inclusion of all rental and leasing NACE codes (except those related to real estate and accommodation) as part of the circular economy, while noting that this may risk over-stating the scale of services that could be considered to genuinely contribute to circularity[55]. Eurostat now tracks employment in rental and leasing as part of the EU's circular economy indicators framework[56].

The EU Taxonomy also suggests inclusion of activities that increase the 'durability, reparability, recyclability or reusability of products'. Data on these attributes of products is currently scarce and contested. However, the new Extended Producer Responsibility scheme for packaging charges different fees based on the relative recyclability of different packaging materials[57]. This process will create a data trail that would enable the identification of the share of packaging that is recyclable. This would enable the inclusion of 'recyclable' packaging within the framework of EGSS activities.

6.2.3 Lifetime extension of products and parts

Re-use reduces the demand for new products. Economic activities related to re-use include second-hand shops and online peer-to-peer re-use platforms (such as vinted.com for clothes, or musicmagpie.co.uk for mobile phones). Such activities are consistent with the 'technical nature'

[54] UNECE, 2023. Conference of European Statisticians Guidelines for Measuring Circular Economy Part A: Conceptual Framework, Indicators and Measurement Framework. URL: https://unece.org/sites/default/files/2024-02/ECECESSTAT20235_WEB.pdf

[55] Statistics Netherlands, 2018. Extension of the environmental Goods and Services Sector with Circular economy activities. URL: https://www.cbs.nl/-/media/_pdf/2019/02/final-report-extension-of-the-egss-with-ce-activities.pdf

[56] https://ec.europa.eu/eurostat/databrowser/view/cei_cie011/default/table?lang=en

[57] https://www.gov.uk/guidance/recycling-assessment-methodology-how-to-assess-your-packaging-waste

perspective of environmental goods described by EGSS/SEEA definitions. It appears possible to include such reuse activities in UK EGSS accounts while remaining consistent with SEEA principles – indeed, second hand shops have previously been included in UK EGSS estimates, but were removed from 2015 onwards[58]. While the 2016 Eurostat EGSS recommends that activities related to second hand shops are no longer part of the Eurostat EGSS, more recent CE indicator systems do include activities of second-hand shops.

Countries differ somewhat in precisely what is included in estimating retail trade associated with reuse. Statistics Finland[59] reports turnover from "flea market" trade, defined as establishments operating in the NACE industries 47791 Antiques shops; 47792 Second-hand bookshops; 7793 Auction houses; and 47799 Retail sale of other second-hand goods in stores. Similarly, Statistics Netherland includes code '47799 Retail sale of second-hand goods in stores' in their approach of extending the EGSS system with CE activities[60]. Sale of antiques is excluded but the sales of other second-hand goods is included.

A particular measurement challenge relates to the very large increase in trade in second-hand goods via online platforms. In the UK, it does not appear to be straightforward to capture such activities using SIC codes. To take an example, Vinted in the UK has grown rapidly, with turnover of around £100m in 2019 growing to over £500m in 2023. However, the company is registered at Companies House with a SIC code of "96090 - Other service activities not elsewhere classified". Depop, a similar online clothes re-sale platform, is registered with a SIC code of "82990 - Other business support service activities not elsewhere classified". While existing SIC codes capture sales of second-hand goods (£3.9bn in 2022[61]), they currently fail to capture sales from online-only second-hand platforms, and thus exclude a large and growing portion of the total second-hand market. Our analysis using TheDataCity suggests that such firms had a turnover of around £650m in 2022, but this is not an estimate of the total value of the goods exchanged on the platforms. It is thus not directly comparable with the turnover of physical second-hand shops, whose turnover does include the value of the goods exchanged.

The volume of UK exports of second-hand clothing is also large, and can be straightforwardly identified, because it is recognised by a distinct product code: HS4 63.09. Used clothing exports were around £390m in 2023[62]. However, not all exported second-hand clothing is re-used or recycled, so this is likely to overstate the value in terms of circularity.

Repair and maintenance activities extend the life of products, and thus are an important part of efforts to preserve the value of materials in the economy. There are several repair activities captured in existing SIC classifications. The European Commission has highlighted repair activities as a 'circular economy sector'[63]. Repair and maintenance have as their primary purpose the avoidance

[58] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2010to2015
[59] Statistics Finland, n.d.. Indicators for the circular economy. URL: https://stat.fi/tup/kiertotalous/kiertotalousliiketoiminnan-indikaattorit_en.html
[60] Statistics Netherlands, 2018. Extension of the environmental Goods and Services Sector with Circular economy activities. URL: https://www.cbs.nl/-/media/_pdf/2019/02/final-report-extension-of-the-egss-with-ce-activities.pdf
[61] Based on ONS Retail Sales Index – Main Reference Tables, table 2A
[62] https://wits.worldbank.org/trade/comtrade/en/country/ALL/year/2023/tradeflow/Exports/partner/WLD/product/630900
[63] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023SC0306

of premature product failure, which is a form of resource inefficiency. Repair and maintenance activities therefore appear to be consistent with a 'primary purpose' criterion for environmental activities, as well as a 'technical nature' criterion.

It is relatively straightforward to include repair-related SIC codes within estimates of circular economy or EGSS statistics. It is likely that this would be an underestimate: much repair is undertaken by manufacturers, including through warranty arrangements, and that those manufacturers would typically be listed under a SIC code unrelated to repair. Such repair activities would not be captured, nor would repair services provided by businesses whose primary activity is retail.

Recycling is uncontroversial as an environmental activity, since it is a resource management activity that reduces the required input of virgin raw materials into the economy. This is captured in the current UK EGSS through SIC 38.3.

However, this SIC code is not an accurate representation of the scale of recycling activities in the UK. This SIC code captures the activities associated with the collection and sorting of secondary materials, and in some sectors it captures the initial processing into intermediate secondary materials (e.g. production of pellets from collected plastic waste for use by plastic product manufacturers). However, the actual recycling—i.e. the conversion of an end-of-life product into a valuable secondary material—is not necessarily captured by activities under that SIC code. In many sectors, the conversion of an end-of-life product or material into a valuable secondary material happens in the manufacturing process of the new product. For example:

- Steel: Steel from scrap using electric arc furnaces currently accounts for around 20% of UK steel output, a figure that is expected to grow substantially following the announced closure of the blast furnace at Scunthorpe and its replacement with an electric arc furnace[64].
- Paper and board: 80% of paper and board produced in the UK is derived from secondary material.[65]
- Glass: around 40% of glass produced in the UK is derived from secondary material.[66]
- Plastic: the share of plastic produced in the UK that is from secondary plastic was estimated at around 14% in 2020[67], while a more recent estimate from 2023 puts the figure at just 3%[68].

One option here is to identify material sectors with a significant consumption of secondary materials, and use data on the total sector value added together with the share of secondary material inputs to estimate the value added associated with recycling. Estimates produced in this way would be dependent on assumptions about the relative value of products made with secondary vs. virgin materials, which in some cases are different. However, such an estimate would be a more accurate depiction of the value added associated with recycling activities in the UK than relying on

[64] https://www.recyclingtoday.com/news/british-steel-jingye-bof-eaf-conversion-recycling-informational-meetings-decarbonization
[65] https://paper.org.uk/CPI/CPI/Content/News/Press-Releases/2023/End-of-Waste-for-paper-and-board.aspx
[66] https://eunomia.eco/wp-content/uploads/2022/09/HOW-CIRCULAR-IS-GLASS.pdf
[67] https://discovery.ucl.ac.uk/id/eprint/10117315/3/Domenech%20Aparisi_Domenech_Teresa_HowCircularArePlasticsintheUK_submitted.pdf
[68] https://pubs.acs.org/doi/full/10.1021/acs.est.3c00263

SIC 38.3 alone. It would also have the benefit of capturing the transition of sectors to a more circular system, as the share of output produced using secondary materials increases.

7 Possible EGSS scope changes: nature, forestry and agriculture

The EGSS does not specifically include activities that aim to protect or facilitate ecosystem services, except in so far as these activities are recorded in relation to existing CEPA and CReMA activities. This appears to be a missing opportunity for understanding the relationship between economic activities and the maintenance and preservation of specific areas of natural capital and ecosystem services.

Under the broad heading of nature-based solutions, some finance taxonomies (such as the CBI) include nature-based solutions under specific emissions criteria. The EU taxonomy mentions some aspects, for example nature-based solutions for flood and drought risk prevention and sustainable urban drainage systems.

7.1 Forests

The current UK EGSS includes all activities from SIC 021 (silviculture and other forestry activities) and SIC 024 (support services to forestry). It excludes SIC 022 (logging). However, harvesting timber is a core part of the supply chain of forest products, which if derived from sustainably managed forests can be environmentally preferred products that displace more environmentally harmful alternatives. Various wood products are included as 'environmental goods' within the UK's trade agreement with New Zealand.

One straightforward option here would be to include SIC 022, but adjust this according to the share of UK production that is from certified forests. Sustainability certification is used as the benchmark for the inclusion of wood products as an 'environmental' product in the UK-NZ trade agreement, and data on the share of UK forest products that are certified is published annually by Forest Research[69].

7.2 Biodiversity conservation

Much biodiversity conservation activity relates to services delivered by government agencies and charitable organisations, or by land-owners such as farmers (for agriculture and forestry, see below). Specialist services—from ecological consultants, for example—are also involved in delivering these services. As such, these activities are captured within the existing EGSS framework. However, there are emerging products and services that may be missed. One of these is the emerging field of conservation technology – providers of specialist products for the purposes of environmental monitoring and conservation (such as specialist drones). This sector is still currently very small. The second, and rapidly growing sector, is emerging in response to new policy requirements around 'biodiversity net gain' in developments. This is creating a market for habitat creation and

[69] See table 2.28, https://cdn.forestresearch.gov.uk/2024/09/Ch2_Timber_FS2024.pdf

management services, which may not be captured in existing definitions. It is likely too early in the development of such markets to identify these activities with any accuracy.

7.3 Agriculture

The UK's EGSS estimates include organic agriculture, but there are no other food or agriculture-related components in EGSS, LCREE or EPE. In the UK EGSS, sustainable or environmentally-benign farming and agriculture has been equated with organic agriculture. This is unnecessarily restrictive: there have been developments in agri-tech that have a main purpose, secondary purpose or 'technical character' of reducing environmental pressures. This includes precision agriculture techniques[70] that reduce the required application of pesticides and fertilizers, management approaches and dietary supplements that reduce methane emissions from cattle, systems that reduce tillage requirements thus protecting soil, agroecology systems and many others. Estimates of environmentally preferable agricultural practices are thus substantially underestimated through a focus only on organics. However, it is also true that consistent data sources are not straightforwardly available for many of these agricultural techniques.

Such technologies and practices have typically not been reflected in national EGSS estimates beyond the UK. Canada is an exception, in that precision agriculture measured through their EGSS survey and reported in their estimates. It is interesting to observe that the Canadian system has in some years included some aquaculture activities, but these appear to now be excluded – presumably reflecting debates about the environmental performance of this sector.

Other approaches to defining green goods and services have taken a broader view. In particular, green trade agreements have included agricultural or horticultural technologies that support the reduction of energy and water consumption for farming, e.g. various monitoring technologies that facilitate reductions in inputs (see the UK-New Zealand trade list, for example).

There are two data sources that would enable an expansion of the UK's EGSS estimates in relation to agricultural *practices*: i) the Farm Business Surveys carried out in each nation of the UK, and ii) administrative data on payments to farms associated with various environmental land management schemes. These are payments made to farmers for delivering various ecosystem services. Data sources on the production of goods and services for use in environmentally improved agriculture (for example, technologies used to monitor or reduce methane emissions from cattle) are more difficult to identify in the absence of a dedicated survey, though TheDataCity does make it possible to identify companies producing such goods and services.

Farm business surveys

Farm Business Surveys are carried out in each nation of the UK[71]. However, the survey differs in each nation. England's Farm Business Survey is the most comprehensive, and it includes data that would enable the inclusion within EGSS estimates a range of additional agricultural practices. These data

[70] Precision agriculture is a broad term that refers to agricultural techniques that apply inputs (notably pesticides and fertilisers) with greater precision than traditional methods, enabling a reduction in the required volume of inputs.

[71] https://www.gov.uk/guidance/farm-business-survey-technical-notes-and-guidance#fbs-documents

are currently published as official statistics by Defra[72], under the heading of 'agri-environment activities'. The activities include eight broad categories: soil management (e.g. minimum tillage, cover groups), nature-friendly farming (e.g. flower-rich field margins), woodland creation/management, water quality, habitat creation, integrated pest management, agricultural decarbonisation and peatland restoration. For the first three, statistics are published on the breakdown of specific measures (i.e. various different approaches to soil management). The micro-data underpinning these statistics would enable estimation of the share of output associated with each of the measures, and would enable estimates of e.g. the share of English cereal value-added that adopts various 'nature friendly farming' approaches.

The Farm Business Survey also includes questions about fertiliser application, including in relation to precision agriculture techniques. The existence of this data would enable the inclusion of precision agriculture within English EGSS estimates—similar to Canada.

An advantage of the Farm Business Survey data is that it captures agri-environment activities undertaken by farms that are not enrolled in related funding schemes (and which are therefore not captured by the administrative data discussed below). However, a key limitation is the lack of UK-wide consistency. Farm business surveys for Scotland[73], Wales[74] and Northern Ireland[75] are less comprehensive in their coverage of agri-environment practices. While they do cover some environmental aspects (e.g. related to nitrogen), they do not enable the same analysis of farm-level adoption of green farming practices.

Administrative data from agri-environment schemes

Public money has supported various environmental activities on farms for many years. It is not clear whether from the UK EPE methods guidance whether the UK EPE accounts capture government spending on these schemes. The landscape of payments for UK farmers has changed in recent years, with the shift away from the 'basic payment' system (which required 5% of land to be allocated to 'ecological focus areas'). Currently, new systems are being introduced, providing farmers with payments under what are known as "environmental land management schemes" (or ELMs).

As with farm survey data, however, these schemes are operated differently within each nation of the UK, complicating the collection of harmonised administrative data.

In England, Farmers can now receive payments for participation in a range of environment-related schemes[76]. Defra publishes statistics on the uptake of these schemes, providing detailed data on the acreage farmland that has, for example, used a "pollen and nectar flower mix" to encourage pollinators, or data on woodland creation. The newness of these schemes (the draft scheme for Wales was published in November 2024) makes it difficult to assess precisely what data will be available from them. However, it seems plausible that the schemes will generate administrative data that could measure the scale of adoption of some pro-environment agricultural practices across the UK.

[72] https://www.gov.uk/government/statistics/agri-environment-activities/3b949b52-7ed0-47d7-96f2-fbd7ba6f8078
[73] https://www.gov.scot/publications/farm-business-survey-2021-22-farm-level-emissions-and-nitrogen-usage-methodology/pages/the-farm-business-survey-fbs/
[74] https://www.aber.ac.uk/en/ibers/research-and-enterprise/fbs/
[75] https://www.daera-ni.gov.uk/articles/farm-incomes-northern-ireland
[76] https://www.gov.uk/guidance/funding-for-farmers

7.3.1 Food: alternative proteins

Recent years have seen a proliferation of alternative protein products seeking to replace animal-derived products, ranging from plant-based dairy and meat alternatives to the potential in the near future for lab-grown meat. Many of these have been developed with an explicit environmental purpose, because of the significant environmental burdens associated with animal products—particularly those related to ruminants (i.e. beef and lamb, milk, cheese and other dairy products). Policy discussions also highlight the need to facilitate reduced meat consumption as part of efforts to combat climate change[77]. SEEA-consistent guidance on EGSS, including that produced by Eurostat, is silent on alternative proteins, and food is only mentioned in the context of organic agriculture. Given policy interest in dietary patterns, and associated economic activities, there is a case for exploring the measurement of alternative proteins as an environmental product.

There are no obvious existing data sources on this sector, since it is not identified in existing SIC or product codes. Our initial estimates using TheDataCity suggest that firms involved in alternative proteins had a turnover of around £670m in 2023, a figure broadly similar to that found by industry sources[78].

8 Possible EGSS scope changes: energy and transport

8.1.1 Public transport

In its 6th Carbon Budget, the Climate Change Committee highlights that reducing demand for travel by private car is an important component of achieving environmental targets in the transport sector, and that growth in public transport plays a role in this ambition. EGSS and EPE guidance has historically excluded public transport unless it is zero emissions, and the UK EGSS has historically not included any public transport services.

The UK LCREE estimates also exclude public transport services, except where public transport is generating demand for low carbon road transport fuels, or low carbon vehicles (both of which are included). While the survey would be expected to capture e.g. installation of charging facilities at bus depots, and the manufacture of electric buses, it would likely not capture the actual electric bus services, nor would it capture any rail-related services, manufacturing and infrastructure.

Finance taxonomies, on the other hand, do include public transport where it meets specific emission thresholds. In the EU taxonomy, to be considered 'green' passenger rail must have zero tailpipe emissions from 2025. For freight rail, vessels need to have 50% lower than average reference CO_2 emissions of heavy-duty vehicles. Rail for the transport of fossil fuels is excluded.

It would be possible to include electrified rail and electric buses within the UK LCREE and EGSS estimates. The 'technical nature' of both is such that they generate much lower environmental pressures than currently dominant forms of transport (largely private internal combustion cars).

[77] Climate Change Committee (2022): Government's Food Strategy 'a missed opportunity' for the climate. URL: https://www.theccc.org.uk/2022/06/13/governments-food-strategy-a-missed-opportunity-for-the-climate/
[78] https://gfieurope.org/uk/

They are also promoted by policymakers as part of the UK's efforts at decarbonisation (suggesting that environment and resource management are at least a secondary purpose). The UK-New Zealand trade agreement includes rail-related goods and services, including rail infrastructure and rolling stock (though excluding fossil-powered locomotives).

Incorporating rail-related activities consistent with the UK-NZ trade agreement would be straightforward, because the rail industry is well-covered by traditional SIC and product codes. The share of rail services that are operated with electricity is also provided by the Office of Rail Regulation.[79]

The share of bus services that are zero emissions (running on electricity) is also published annually in data from the DfT[80]. Data sources thus exist for the inclusion of zero-emission public transport infrastructure and services within the UK's estimates of LCREE and EGSS.

8.1.2 Bicycles and related equipment and infrastructure

Bicycles have been the focus of heated debates in the development of lists of green goods for trade purposes, with fierce arguments about whether they should or should not be counted as an environmental good[81]. Bicycles have been included as a green product in the UK's trade agreement with New Zealand[82], but have been excluded in the past from UK EGSS and LCREE estimates.

Bicycles are a zero-emissions form of transport that can directly replace more polluting forms of transport (it has a clean 'technical nature'). There are also consistent policy efforts in the UK and elsewhere to promote cycling, in part because of its environmental benefits, suggesting that policymakers see cycling as having a (secondary) environmental purpose. Eurostat guidance is silent on bicycles, and the current UK LCREE and EGSS estimates both exclude bicycles. However, the recent ONS Green Jobs estimates do aim to include jobs associated with public cycle hire schemes.

A substantial portion of bicycles are used principally for leisure cycling, which is clearly not an 'environmental' activity. Identifying data sources that could estimate the share of bicycle sales would enable the inclusion of transport cycling in LCREE and EGSS estimates. Such data is collected by the Bicycle Association—the trade body for cycling industries in the UK. An alternative data source that would provide a conservative minimum estimate of the share of bicycle sales that are associated with transport—rather than leisure—would be data from the Cycle to Work Scheme.

Relevant activities include:

- Manufacture of bicycles and related accessories (such as helmets and locks)
- Distribution and retail trade (activities of bike retail stores)
- Operation of cycle hire schemes and services
- Cycle-based services (couriers etc.)
- Maintenance and repair activities associated with cycles

[79] https://dataportal.orr.gov.uk/statistics/infrastructure-and-environment/rail-environment
[80] https://www.gov.uk/government/statistics/annual-bus-statistics-year-ending-march-2023/annual-bus-statistics-year-ending-march-2023
[81] Benson 2023, Beyond Bicycles: A New Momentum behind Environmental Goods Negotiations? (csis.org)
[82] https://www.gov.uk/government/collections/uk-new-zealand-free-trade-agreement

- Provision of cycling infrastructure (bike paths, bike parking racks, etc.)

Data on manufacturing is available from PRODCOM, but this is a small share of overall bicycle related economic activity. Most of the data set out above is also provided—for a fee—by the Bicycle Association, based on data submitted by their membership (bike shops and bike-related service providers).

8.1.3 Treatment of renewable energy

The Eurostat EGSS includes as green any renewable energy including biomass, while any fossil fuel source is excluded. CBI and the EU taxonomy take more differentiated approaches, applying emissions thresholds and also social safeguard standards to renewable energy sources, especially biomass, hydro, and geothermal. This recognises that renewables can generate environmental harms. For example, not all bioenergy, on a life-cycle basis, is preferable to fossil fuels. Similarly, some geothermal installations have high CO_2 emissions, because the geological conditions of their operate allow the release of CO_2 from deep underground.

8.1.4 Transmission and infrastructure for renewables

Transmission and distribution infrastructure is explicitly excluded from the Eurostat EGSS guidance and from the UK LCREE and EGSS estimates, in contrast to both the CBI and the EU taxonomy, and in contrast to the list of green goods identified in the UK-New Zealand trade agreement. The CBI includes infrastructure if dedicated to renewables. Similarly, the EU taxonomy allows inclusion of such infrastructure as an enabling activity under specific criteria, for example:

- more than 67% of newly enabled generation capacity in the system is below the generation threshold value of 100 gCO2e/kWh measured on a life cycle basis in accordance with electricity generation criteria, over a rolling five-year period;
- the average system grid emissions factor, calculated as the total annual emissions from power generation connected to the system, divided by the total annual net electricity production in that system, is below the threshold value of 100 gCO2e/kWh measured on a life cycle basis in accordance with electricity generation criteria, over a rolling five-year period

Inclusion of electricity transmission and distribution (SIC 35120, 35130, 35140) should be relatively straightforward, as should the manufacture of related equipment (SIC 27120: “Manufacture of electricity distribution and control apparatus”), since these are well-established product sectors and product categories.

8.1.5 Energy storage

The transition to a clean power system requires growth in energy storage, to ensure that renewable energy sources—which depend on weather—can always meet demand. The Eurostat EGSS includes ‘energy storage technology associated with renewable energy source’ (e.g. compressed air storage power stations, sensitive heat storage systems, latent heat storage system, hydrogen storage, power to gas i.e. storage of wind power in the form of hydrogen/methane) under CReMA 13A; as well as the ‘manufacturing and installing of all equipment used for energy storage (including PSHS)’ under

CREMA 13B. It seems that the UK EGSS estimates, however, do not include this, though data would be available from the LCREE survey.

The CBI is applying more detailed criteria, given the context that the Eurostat EGSS includes most renewable energy sources without any further emissions criteria while the CBI only includes renewables under specific emissions criteria. It includes dedicated storage for eligible technologies that:

a. Is a dedicated connection to a power production plant eligible under one of the Climate Bonds sector criteria (e.g. Solar)
b. Is a dedicated connection to a power production plant operating under the low carbon power threshold (100g CO_2/kWh)
c. The infrastructure is located on a system with a grid factor at or below 100g CO_2/kWh
d. The infrastructure is located on a system for which at least 67% of its added generation capacity in the last 5 years falls below the low carbon power threshold

8.1.6 Minerals and material for the energy transition

The Eurostat EGSS guidance specifically excludes: “measures and activities that improve the efficiency of mineral resources extraction”. Yet such measures are promoted by governments seeking to enable the energy transition, for example through improvements to lithium extraction technologies. The UK is not a major location for significant extraction or processing of the most prominent energy-related minerals, though there are efforts to explore the potential for lithium extraction in Cornwall. However, the UK does have many companies offering services to the mining industry globally. Given the growing prominence of critical material debates for the energy transition, it may be worthwhile expanding the LCREE to include a section on critical material supply chains.

8.1.7 Energy performance of buildings

Current UK estimates are based on the LCREE survey. However, several EU countries use the share of buildings that meet a ‘zero carbon’ standard. Unlike many other types of product, new buildings have consistent labelling, so this is an area to explore for a potential alternative data source for construction that has a secondary purpose of environmental protection.

9 Climate Change Adaptation

The Eurostat EGSS guidance, and the UK’s EGSS estimates exclude climate change adaptation measures, such as disaster prevention expenditure dedicated to extreme weather events such as storms, heat waves, droughts, and flood.

9.1.1 Attempts to define and measure adaptation

The most recent UK EPE survey included a question on adaptation expenditure. This was a yes/no question, and thus did not help to actually measure expenditure.[83] However, it also included a free text field that asked "What adaptations were made to address actual or expected changes in the climate?", and which has presumably yielded insights into the measures taken by firms.

Statistically, the SSEA-CF and other prominent frameworks do not yet capture adaptation expenditure adequately. Climate change adaptation expenditures have not been included in the SEEA-CF activities accounts; there is currently no comprehensive standard or agreed upon/official statistical definition for classifying climate change adaptation expenditures in the economy. The scope of SEEA-CF as currently constructed likely requires that climate change adaptation expenditures are collected outside of expenditures in the environmental activity accounts (like a satellite account). However, it appears that the SEEA-CF and the SEEA-EA both capture disaster related metrics. For example, the SEEA-CF captures 'reduction in stocks: catastrophic losses' under assets and Disaster Risk Reduction expenditure accounts' under monetary flows (see also the SEEA-CF).

In order to better collect data on adaptation expenditure, the Data Gap Initiative 3[84] suggests that a thematic account on expenditure estimates pertaining to economic activities in climate change mitigation and adaptation are compiled, by identifying expenditures embedded in existing government finance statistics, national accounts statistics, and environmental-economic accounts statistics. Furthermore, in an approach (PACINAS project) by an Austrian team including the environmental agency, a top-down approach was applied to screen the federal government's budget plan, realization reports, and global and detailed budgets by using key terms such as, "environment", "energy efficiency", "constructional measures", "climate change", "flood", "preventive measures", and "adaptation" to identify relevant spending[85]. Then, a number of budget positions were inspected more closely and ministerial staff members were interviewed to develop expert estimates of the climate adaptation portion of the budgetary line items, combined with the OECD Development Assistance Committee Rio Markers for adaptation and the EU common methodology. Finally, experts' estimates were used to gauge the actual adaptation costs using the proportion of the total expenditures that were directly relevant. Conversely, a bottom-up approach identified which costs arise from implementing the adaptation measures of the Austrian national adaptation strategy, considering only those measures that are currently in place and are funded by the federal government. The results of the top-down and bottom-up approach respectively show an expenditure of EUR 488 million per year (top-down) and EUR 385 million per year (bottom-up) (Knittel et al., 2017)[86].

The CBI does not specifically include climate change adaptation, but it includes some disaster prevention and management aspects, such as for water monitoring (smart networks; early warning systems for storms, droughts, floods or dam failure; water quality or quantity monitoring processes), as well as flood defences (Surge barriers; pumping stations; levees; gates).

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[83] Environmental Protection Expenditure Survey Questions. https://www.ons.gov.uk/surveys/informationforbusinesses/businesssurveys/surveyofenvironmentalprotectionexpenditure

[84] Data Gap Initiative 3, Ninth Joint OECD-UNECE Seminar on SEEA Implementation, 2024. https://unece.org/sites/default/files/2024-03/S3b_3_DGI-3_Recs6and7_UNECE.pdf

[85] https://www.eea.europa.eu/publications/assesing-the-costs-and-benefits-of

[86] EEA: Assessing the costs and benefits of climate change adaptation. URL: https://www.eea.europa.eu/publications/assesing-the-costs-and-benefits-of

In the EU taxonomy, climate change adaptation is included as one of the six overarching categories. Thus, the climate adaptation category:

- includes adaptation solutions that either substantially reduce the risk of the adverse impact of the current climate and the expected future climate on that economic activity or substantially reduce that adverse impact, without increasing the risk of an adverse impact on people, nature or assets; or
- provides adaptation solutions that contribute substantially to preventing or reducing the risk of the adverse impact of the current climate and the expected future climate on people, nature or assets, without increasing the risk of an adverse impact on other people, nature or assets.

International climate finance debates have started to develop definitions and measures of adaptation spending, because adaptation finance has become an important part of global climate negotiations. International climate adaptation finance has seen significant growth, with the Climate Policy Initiative reporting a record high of USD 63 billion, reflecting a 28% increase from 2019/2020[87]. The OECD estimated a lower figure of USD 28.6 billion in 2020, noting variability due to differing tracking methods. Multi-lateral development banks have harmonized principles for tracking adaptation finance, emphasizing the need to address climate vulnerabilities in projects. Despite progress, challenges persist in tracking and quantifying adaptation activities[88]. Domestic adaptation expenditures, particularly in low- and middle-income countries, remain underexamined[89]. Although domestic spending is likely the largest source of adaptation funds in many LMICs, there is no systematic tracking framework or agreed-upon methodology for capturing this expenditure, making it difficult to assess and compare across countries. Tracking and tagging such expenditures, using methods like budget tagging, can improve transparency and accountability, but current efforts are inconsistent and lack standardization.

9.1.2 Challenges of including adaptation as part of EGSS

While there is clearly a strong case to understand spending associated with adaptation to climate change, it is less obvious that this belongs alongside spending or production activities associated with preventing environmental damages. Efforts to measure environmental goods and services or environmental expenditure have traditionally not included sectors like flood-related infrastructure, despite these being long-standing activities. Moreover, it is not obvious that a 'green' economy is one in which adaptation spending is particularly high. Adaptation-related spending should be captured, but it is recommended that it should be reported a separate set of measures, rather than bundled alongside environmental expenditures or activities.

10 Insights from stakeholders

[87] Climate Policy Initiative, 2023. Global Landscape of Climate Finance 2023 URL: https://www.climatepolicyinitiative.org/wp-content/uploads/2023/11/Global-Landscape-of-Climate-Finance-2023.pdf

[88] EIB (2023): 2022 Joint report on multilateral development banks' climate finance. URL: https://publications.iadb.org/en/publications/english/viewer/2022-Joint-Report-on-Multilateral-Development-Banks-Climate-Finance.pdf

[89] UNEP (2023): Adaptation Gap Report 2023. URL: https://www.unep.org/resources/adaptation-gap-report-2023

We conducted interviews with 19 analysts and statisticians in several government bodies, thinktanks and in parliament. The government bodies that spoke to us were: Department for Energy Security and Net Zero, Department for Business and Trade, Department for Environment, Food and Rural Affairs, Office of Environmental Protection, Welsh Government, Northern Ireland Executive. This section summarises the key findings from those interviews.

10.1 How data is being used

The stakeholders we identified distinguished two broad use cases for green economy data (i.e. data that measures green economic activities). The first use case is largely political/rhetorical. For this purpose, aggregates can be useful, as they enable ministers and others to make broad statements about the scale and significance of economic activities associated with the environment.

The second use case is for analysis that can inform policy choices. This includes, for example, using data to understand UK capabilities, and how the expansion of a sector might influence others through supply-chain relationships. We were repeatedly told that, for analytic purposes, granular data that can be disaggregated is essential. The capacity to link datasets to other existing data sources (e.g. through breakdown by SIC code) was also viewed as important.

Several stakeholders said that they saw the EGSS dataset as largely relating to the first use case, because it was difficult to use for more technology or sector-specific analysis. One thinktank told us that "EGSS is too aggregated to be anything but a headline", while a government department said "a reason why we haven't much use of that data is [that]… it needs to have a certain level of granularity…"

10.2 Which dimensions of green economic activity are of greatest interest?

Most stakeholders we spoke to had a primary interest in net zero, with some interested also (or exclusively) in the circular economy, or in economic activities associated with the conservation of nature. Several described net zero as a major challenge of economic transformation, requiring data to track key activities and implications. These stakeholders felt that the pursuit of a broad 'environmental' dataset was less useful than data that enabled the tracking of economic responses to specific environmental challenges: climate, nature and resources.

We heard from several that it was useful to make a distinction between different types of green economic activity. Stakeholders were generally interested in sectors/activities that are expected to grow significantly, such as renewables, energy storage, etc. There was less interest in what one person described as "steady state" green economy activities, such as waste-water treatment. It was also highlighted that there is a useful distinction between sectors/product groups that will grow significantly, and those that are expected to transform in terms of environmental performance (such as glass manufacturing, which is currently high emissions but which must undergo a transformation to cleaner processes). These distinctions are not currently clear in existing EGSS guidance.

10.3 Temporal and international comparability

We heard mixed views on both of these issues. In general, stakeholders are very keen to see that definitions enable consistent tracking of trends over time. In discussing the challenges associated

with shifting baselines of what constitutes “green” (e.g. in the context of energy efficiency, where condensing gas boilers or hybrid cars are no longer relatively green), we heard that people trust the ONS to be “robust” to such issues. There may be risks here, since ONS is resource-limited in keeping on top of shifting baselines. Collection of granular data was seen as important for addressing this issue, enabling analysts to drop data on activities that are no longer considered green (and remove that activity from past estimates). None of the analysts we spoke to had looked closely at the meta-data or definitions underpinning the efficiency-related categories in the LCREE, despite this being an area in which baselines have shifted substantially since the survey was introduced.

On international comparability, we heard that while this was “nice to have”, it was seen as less important than having coherent and granular UK data. Only one stakeholder highlighted international comparability as a priority.

10.4 Supply chain detail

We heard repeatedly that analysts want to better understand the supply chains for critical emerging sectors, particularly those related to net zero such as electric vehicles, offshore wind, energy storage and so on. This was a priority for many of the stakeholders that we spoke with, and had driven users away from LCREE/EGSS data to other sources (particularly those based on product lists arising from trade negotiations).

10.5 Granularity and link-ability: technologies and sectors, not environmental themes

Stakeholders are, perhaps unsurprisingly, very keen to have data that is granular, enabling flexibility to link to other datasets, and to focus on the issues of greatest interest – for specific regions and sub-sectors. It is more useful, for example, for people to understand the activities associated with the supply chain for electric cars than it is to understand the scale of activity associated with a particular CEPA or CReMA category. People are also keen to be able to link datasets, which is facilitated by reporting by SIC code, rather than by CEPA/CReMA category.

All of the stakeholders we spoke to saw value in data on specific sectors, activities or supply chains associated with achieving environmental goals. However, none expressed a strong interest in broadly defined ‘environmental’ definitions – stakeholders are more concerned with specific sectors, technologies or supply chains that map directly onto specific policy goals or domains.

11 Conclusions

This report has examined the definitions upon which the ONS’s key measures of green economic activity (LCREE, EGSS and EPE) are based. It has highlighted challenges with the current definitions, and reviewed some alternative ways of exploring green economic activity. Here, we draw some high-level conclusions.

11.1 Expanding the UK's approach to measuring green economic activity

The UK's EGSS, EPE and LCREE estimates currently exclude various activities that appear to be broadly compatible with SEEA-CF definitions, and which are included by other systematic attempts to identify and characterise 'environmental' activities or products (e.g. in finance taxonomies, and the UK's 'environmental goods' trade agreement with New Zealand). In some cases, there are easily available statistics that could incorporate these activities into EGSS data. These are highlighted in sections 6-8 of this report. It would be relatively straightforward to incorporate some of these into EGSS estimates. Similarly, EPE accounts currently exclude large areas of the economy, because the EPE survey is limited to a subset of sectors.

11.2 Reforming the structure of EGSS reporting

Stakeholders highlighted an appetite for distinctions that are not currently made within the SEEA/Eurostat approach. In particular, they distinguished between i) "steady state" activities that serve a green purpose, but which are not expected to grow substantially (such as wastewater treatment, or the production of pollution abatement equipment such as catalytic converters); and ii) technologies and sectors that must grow if environmental targets are to be achieved (e.g. offshore wind). The elision of these two different kinds of environmental activity makes it hard to interpret changes in aggregations across them: declines in some activities correspond with shifts away polluting activities, while declines in others represent a failure of environmentally preferable goods and services to diffuse through markets.

CEPA and CReMA categories have in the past exacerbated some of the challenges of measurement of environmental goods and services, since they demand that environmental activities be judged in terms of the principal environmental purpose. This results in unhelpful and sometimes arbitrary allocation of activities to specific CEPA/CReMA categories. The recent shift to CEP categories is unlikely to ameliorate this. A 'tagging' system, in which activities can be tagged with multiple environmental categories, would be preferable both for users and for ONS, since it would no longer be necessary to make difficult decisions about the allocation of specific activities to a principal environmental purpose.

Moreover, the CEP classification system does not directly respond to the identified interest from policy analysis in clearly distinguishing 'steady state' and 'growth' dimensions of green activity, though it does create a hierarchy from which such disaggregations could be produced. An aggregation most useful for the UK policy stakeholders consulted might distinguish four main domains:

1. **Traditional environmental industries**. This would capture traditional waste management, wastewater treatment, and pollution abatement. These are activities that are not expected to significantly grow, and which would ideally shrink as the economy becomes greener and more efficient (and thus generates less waste, or makes use of production technologies that use less-polluting fuels or inputs).
2. **Activities related to the energy transition** (renewables, EVs, grid infrastructure, batteries, etc.). These are activities that are expected to grow in order to achieve net zero, and is close in spirit to the UK's estimates of the Low Carbon and Renewable Energy Economy. This might usefully include the supply chains for key technologies, since this is an area of policymaker concern. Note that this could be expanded to include many activities (such as

investments in electricity transmission infrastructure) that are currently excluded from EGSS and LCREE estimates.

3. **Circular economy activities** (recycling, repair, re-use and activities related to product design). These are different from 'waste management' activities in that they aim to avoid the creation of waste. In other words, they aim to ensure that the value of used goods and materials is maintained, such that they do not become waste. These activities are expected to grow and become a larger share of the economy, as the economy increasingly makes use of secondary materials and shifts to a circular, rather than linear model.
4. **Agriculture, food and nature**: activities that contribute to the preservation and enhancement of ecosystem services.

11.3 Unstable definitions and the desirability of more granular data

The report also highlights that there are serious questions about the coherence and usefulness of the definitions embedded in international EGSS and EPE guidance. The implication is that the definitions are insufficiently robust by themselves to enable estimates with strong international comparability or interpretability of trends over time. The *de facto* dependence of the EU approach on an indicative compendium is a result of the difficulties faced in operationalising EGSS definitions.

These definitions have been developed to respond to a perceived need to track "environmental" goods and services, encompassing all goods and services related to the environment. However, the policy analysts and stakeholders we spoke to did not see this as a priority. They did not see a direct policy advisory or analytic role for a headline figure on the total scale of "environmental" goods and services, in part because of doubts about the integrity of the definitions underpinning such an estimate. They have a stronger interest in understanding sector- and domain-specific estimates of economic activity, such as sectors or activities that might be expected to grow in the transition to net zero, or which are enabling the emergence of a circular economy. The existing definitions appear to be attempting to provide a product for which there is not a strong demand from policy analysts.

For several reasons, it would be desirable to gather data that is more granular than that which is currently collected. More granular data collection would facilitate international comparison, and would facilitate the update of estimates over time, enabling historic data to be re-estimated according to more recent definitions. For example, if data had been collected specifically on the production of condensing gas boilers, these could now be removed from estimates of low-carbon activities both now and in historic datasets, enabling consistent interpretation of trends over time. It would also enable data to be reported based around key areas of policy interest, such as those set out above. Finally, granular micro-data would enable researchers to link key datasets at the firm level, which would substantially increase the utility of the data.

This report sets out a range of data sources that would enable the inclusion of granular estimates of specific green goods and services, however, these sources are limited. A more granular data collection approach could be supported by adapting existing surveys (notably the LCREE) to require a more detailed itemisation of the specific activities or goods/services in which firms are engaged, as in the example of Canada's Survey of Environmental Goods and Services.

There are two principal drawbacks to a granular approach to data collection. The first is that doing so would require the development and maintenance of detailed lists of products and activities which are qualitatively different from alternatives (facilitating measurement and identification), and which have superior environmental performance. Such lists are resource-intensive to maintain, but they ensure that the meaning of the statistics arising from them are clear. The second is that the burdens on survey respondents are greater. However, there may be limited ways in which granularity could be increased, such as breaking out a small number of additional categories of the LCREE survey.