European Network of the Heads of Environment Protection Agencies (EPA Network)

Interest Group on Green and Circular Economy

# MEASURING PROGRESS TO A CIRCULAR ECONOMY: *SOCIO-ECONOMIC INDICATORS*

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**Preface and Acknowledgement:**

This document is a discussion paper elaborated and compiled within the EPA Network interest group Green and Circular Economy. Our intention is to follow up on the work on the Bellagio declaration on Circular Economy monitoring principles. An outcome of the Bellagio process was the identification of gaps in the European Monitoring Framework for Circular Economy. The report aims to gather evidence of national activities in the area of socio-economic indicators of relevance for the Circular Economy so as to inspire further work towards a more comprehensive monitoring framework along the principles of the Bellagio declaration.

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This position paper is the result of the work of the EPA Network's Interest Group on Green and Circular Economy. While it reflects the inputs of all participants of the Interest Group, it is only endorsed in this form [including policy recommendations] by those Agencies mentioned on the front page.

# Executive summary

The Bellagio declaration[1] on principles for Circular Economy monitoring, endorsed by the EPA Network at the end of 2020, and referenced by the European Council at the same time, calls for monitoring to apply indicators along four axes:

1. ***Material and waste flow indicators*** to monitor changes throughout the material life cycle including resource efficiency dimensions.
2. ***Environmental footprint indicators*** to capture the impacts across the full life cycle of products and materials, so that spill-over effects are assessed, and planetary boundaries are respected.
3. ***Economic and social impact indicators*** to capture positive as well as negative impacts that may occur during the structural changes of the circular economy transition.
4. ***Policy, process, and behaviour indicators*** to capture the implementation of specific Circular Economy policy measures and initiatives, in particular for key sectors.

At the same time, it is recognized that existing indicator sets have their strength along axis 1 and 2, while both axis 3 and 4 are less well covered. On this basis the Interest group on Green and Circular Economy set out to map experience with such indicators, both at European level and in a selected number of countries and regions.

An initial review of European level indicator sets concluded that a number of developments around indicators are ongoing. Over time, those may lead to new indicators, but in the short-term it is not expected to add significant additional substance around the socio-economic indicator axis.

Two key processes at EU level in this area are:

- Ongoing work to develop a taxonomy for green investment as a means to provide investors with a clear indication of the "greenness" of investments. While this may have significant influence on directing investment flows towards greener alternatives, it will have less impact on social issues (although working conditions is listed as a factor).
- The EU CE monitoring framework is under review, but with limited new elements expected to be added at this time. A more extensive revision is expected ca. 2025, and this could consider a broader set of socio-economic indicators if relevant data and methodologies is ready by then. Thus, experimentation with new indicators help prepare this process.

The review also considered national experiences by examining approaches used in the Basque Country, Finland, France, Netherlands and Sweden. Based on this review a set of observations is presented, leading to five recommendations:

**Observations**

1. Both on EU and country levels, waste, and recycling still dominate in circular economy monitoring systems. A key reason for that is an ongoing difficulty to define the system boundary of the circular economy. Some country monitoring systems try to expand the scope. For instance, Finland and France zoom in on specific sectors (sharing economy, flea markets, repair, remanufacturing tires and reusing electronic waste). The Netherlands

[1] https://www.eea.europa.eu/themes/waste/measuring-europes-circular-economy/BellagioDeclaration.pdf/view

combines different approaches to provide a comprehensive overview of circular activities along transition pathways.

2. All country monitoring systems reviewed here include metrics on the number of circular companies, industries or jobs. These indicators are binary and suppose that the entire activity of a company or a person is dedicated to circular economy (or not at all). In the real world it is much more complex. The approach currently taken at the EU-level is also considered too restricted, because the included sectors are mainly waste and recycling focussed. While traditional repair activities also get some attention, the current scope doesn't do justice to the concept of a true circular economy.

3. All the countries include biomass and food to some extent in their monitoring frameworks. However, circular activities in these sectors are not highlighted in the different monitoring approaches applied at country level. The existing categorization approaches including R-strategies are traditionally more focused on manufacturing sectors and abiotic materials.

4. From studying national efforts, it is apparent that social impact indicators have received far less attention than the economic indicators. The number of jobs is perhaps the only social indicator considered, but the quality of jobs is rarely discussed. Moreover, current socio-economic indicators are mainly *state* indicators (e.g. number of jobs), but not *impact* indicators (e.g. quality of the jobs). The socially-oriented indicators are lacking, as well as indicators clearly focusing on innovation.

5. It would be possible to enhance monitoring frameworks using more qualitative indicators and case studies. Currently countries use the qualitative approaches mainly to disseminate good practices and inspirational cases. For instance, the Finnish Innovation Fund SITRA issues the "100 best circular firms" publication. In France, the service economy business model shift is either followed with the number of entities being supported or the case studies (especially on the local level). Both approaches promote the efforts and disseminated ideas to be replicated.

**Recommendations**

Based on the observations, six recommendations have been developed that could contribute to a more rapid development and up-take of socio-economic indicators. They are directed at national statistical, environmental, economic offices or ministries, academia as well as European institutions.

**1. <u>Define a common categorisation for the circular economy</u>**

Most of the time circularity does not fit in a single, specific economic sector. Although some NACE codes do isolate circular activities such as repair, reuse or recycling, detecting circularity in the activity of traditional or large companies is still very difficult. A clearer scope of circular economy will require further discussion on a common categorisation system for the circular economy such as one proposed by the European Commission in 2020 using the R-strategies as a foundation. EU Member States and other European countries should be engaged in this process – potentially through the Eionet network.

**2. <u>Ensure a balanced approach to monitoring across key economic areas</u>**

In addition to the established focus on industrial production, monitoring circular transitions in the biomass and food production systems also warrant attention. This is especially important in the context of their contribution to greenhouse gas emissions and other environmental impacts and overall strategic significance in the EU economy. It is also worth looking into which sectors should and can be added easily to existing circular economy definition with a view to expanding the focus of

circularity beyond enhanced waste management approaches. In addition, a more combined approach might be considered to link sectoral activity with its circular performance.

3. **Focus business metrics on the degree of circularity**

It is useful to look at the number of circular firms and jobs, and the related investments and revenue or added value. Ideally, indicators should also be able to provide insight into the degree of circularity of a sector or firm. Further critical discussion is required on what a circular activity or circular firm is. Further research is needed to establish adequate indicators that can determine the degree of circularity within a firm. This requires a move from a binary approach (circular or not) to a more detailed and nuanced analysis. Based on different criteria, the degree of circularity in existing activities and/or a measure of circular innovations could be determined, although this requires intensive effort at a qualitative level. However, it is through the monitoring of these aspects that the most useful information regarding the transition towards a circular economy is obtained. Short-term priorities in this regard include:

- Improve the list of defined circular activities and its translation to the economic sectors.
- Add indicators measuring economic activity in specific sectors contributing to the upstream steps of the R-ladder, such as prevention, reuse and repair activities.

4. **Develop social and economic distributional impact indicators to monitor human transition to circular models**

Specific, additional effort is required to provide insights on societal transition towards circular models. The framework for the social impact indicators will be required to measure progress towards the circular economy and to identify bottlenecks. Some key areas for development in this area are:

- Behaviour dynamics in terms of engagement and consumption temperance from circular measures such as the sharing-economy, product-as-a-service and paying more for durability.
- A discussion regarding sufficiency or temperance in consumption in particular for higher consuming segments.
- Develop indicators to measure/monitor the social impacts of the transition to circular economy (incl. social justice and the distribution of social benefits and disadvantages related to e.g. health, employment and education opportunities)
- Develop indicators to monitor changes in consumer and citizen behaviour, attitudes and skills in relation to the CE. (This could be monitored e.g. with surveys.)
- Circular economy skills development and the impact of the circular economy on current employment patterns and distribution

5. **Integrate qualitative metrics into monitoring frameworks**

Both country and EU monitoring framework should accommodate the inclusion of qualitative indicators, as these can provide insights into issues in which quantification is difficult. Qualitative approaches might particularly help in terms of understanding social aspects of circular economy. An example could be in skills development.

6. **Support development of innovative indicators**

In so far as possible, monitoring frameworks should leave space for the development of innovative indicators. As soon as countries collect different data, it is more feasible to consider a new indicator and make it measurable on a country scale. These experiments at country-level can provide signals on prevailing and emerging issues and also can potentially inform later EU-wide indicator framework development.

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# 1. Introduction

The European Commission adopted the new circular economy action plan in March 2020[2]. This action plan is one of the main building blocks of the European Green Deal. The EU aims to reduce pressure on natural resources and create sustainable growth and jobs with the transition to a circular economy. The EU's view on circular economy covers all aspects of the economy, focusing on initiatives along the entire life cycle of products, product design, sustainable consumption, waste prevention and more.

To assess the progress of the transition and to allow adjustments to policies to be implemented in a targeted manner, monitoring is crucial. Due to the broad scope of the circular economy transition, determining relevant indicators and setting up a monitoring framework is challenging. In order to guide national and European authorities in the development of monitoring frameworks and indicators, the "Bellagio Declaration" was formulated in 2020[3]. The declaration is a set of principles on how to ensure that a monitoring framework of the transition to a circular economy captures all relevant aspects and involve all relevant parties.

The first principle states that "*Monitoring the transition towards a circular economy needs to holistically consider all relevant initiatives – public and private - across the economy. It should capture the full extent of changes happening to the material and waste flows, products over their life cycles, business models, and consumer behaviour, including the economic, environmental and social dimensions of these changes*". In order to capture this broad range, the second principle identifies four key groups of indicators: *material and waste flow; environmental footprint; economic and social impact*; and *policy, process and behaviours*.

While traditionally much attention has been given to the material and waste flow indicators, and environmental footprint indicators, economic, social, policy and process indicators have received less attention. The need is thus recognized by frameworks such as Bellagio, but also in OECD and ISO work but indicators, at an international level, have been missing due to lack of data or methodology.

## Scope and research objective

This paper argues that, during this early phase of the transition, economic and social impact indicators are highly relevant to monitor. A transition entails long-term change processes. It might take several years before disruptive changes are seen in the material flow and environmental footprint indicators. However, a wide range of activities related to the circular economy transition are already taking place, such as policy actions, research, innovation, and entrepreneurial initiatives. Tracking these actions can be a precursor to eventual changes in material flow and environmental footprint indicators. In particular for the early phase of the transition, monitoring economic and social impact indicators will provide timely insights into the way the circular economy transition is unfolding (or being hindered), and thereby provides policy insights for steering the transition along the way.

This study aims to provide an overview of economic impact indicators, as well as economic-related social impact indicators (together we call these socio-economic indicators) that are relevant for the progress of the CE transition, and that are currently being implemented or tested by member states. This overview is not limited to indicators that follow RACER-criteria (Relevant, Accepted, Credible, Easy to monitor, and Robust). In line with the Bellagio Declaration, this study includes new and innovative ways to measure progress, that could impact future developments of monitoring frameworks.

The project provides insights for the further development of circular economy monitoring frameworks at the EU- and national levels. This study is complementary to the work being done by EEA, the European Commission and Eurostat regarding the long-term development of indicator sets for measuring the circular economy transition. At the same time, this study aims to stimulate knowledge exchange between member states and academia as well as to inspire countries with regard to the development of indicator sets.

[2] https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

[3] https://www.eea.europa.eu/themes/waste/measuring-europes-circular-economy/BellagioDeclaration.pdf

# 2. Relevant indicators in a monitoring framework

In a circular economy the value of products, materials and resources is maintained in the economy for as long as possible. In this way, a circular economy facilitates the optimal use and reuse of material resources in the various links along production chains: from the extraction of raw materials all the way to the consumption and disposal phase. Optimal use and reuse take environmental, economic, and social factors into account. In itself, a circular economy is not a goal, but rather means to address several societal challenges (see quote below). The transition towards a circular economy can thus not only lead to a reduction of the input of primary or virgin materials and of waste, but also reduce the environmental pressures related to the extraction, processing, use and disposal of resources, reduce short-term and long-term risks of supply as well as drive economic and social development.

*"A circular economy is instrumental in delivering our ambitious goal of turning Europe into a climate-neutral continent by 2050, in reducing pollution and in halting biodiversity loss, while reinforcing EU's sustainable competitiveness and industrial base. The circular economy must become beneficial not just for the front-runners but to all citizens and economic players across value chains, throughout Europe and beyond. The EU can play an important role in establishing the circular economy at the core of achieving the Sustainable Development Goals globally."* (Circular Economy Action Plan, 2020)

## Monitoring the circular transition requires a broad, holistic approach

The transition towards a circular economy encompasses a broad field, ranging from recycling plastic waste to plant-based proteins in food, product-as-a-service systems, refurbished furniture and much more. Furthermore, this transition encompasses new technologies, but also different approaches, different behaviour, new products, services and knowledge, and alternative business models. The transition towards a circular economy is a complex bundle of widely varying processes which can ultimately lead to fundamental changes in all aspects of the economy (Bode et al., 2019, Bellagio Declaration 2020).

A monitoring framework of the circular economy transition should be able to adequately cover core aspects, such as the use of material resources and the generation of waste, but also the environmental, economic and social impacts. The Bellagio Declaration (2020) emphasizes this: "*Monitoring the transition towards a circular economy needs to holistically consider all relevant initiatives – public and private - across the economy. It should capture the full extent of changes happening to the material and waste flows, products over their life cycles, business models, and consumer behaviour, including the economic, environmental and social dimensions of these changes*".

Four indicator groups cover the relevant aspects:

- *Material and waste flow indicators* to monitor changes throughout the material life cycle including resource efficiency dimensions.
- *Environmental footprint indicators* to capture the impacts across the full life cycle of products and materials, so that spill-over effects are assessed, and planetary boundaries are respected.
- *Economic and social impact indicators* to capture positive as well as negative impacts that may occur during the structural changes of the circular economy transition.
- *Policy, process, and behaviour indicators* to capture the implementation of specific Circular Economy policy measures and initiatives, in particular for key sectors.

In considering economic and social impact indicators in the context of this paper, the following points are noted:

- Economic indicators are related to the size, impact and type of economic activities. They could be used to monitor added value, turnover, investments, business activities, etc.
- Socio-economic indicators are related to types and quality of CE jobs, volume of jobs and distributional impact.
- The use of terms such as circular economic activities, circular sectors, circular firms can be problematic as it may relate only to certain activities. Many companies recycle material waste from their production and so this part of the process represents circularity, but the entire company is not circular. Therefore, circularity must be regarded as an aspect of how things are done, which will rarely reach 100%, but is also often not at a zero level either.

## Overview of EU-indicators

Since 2019, many efforts have been made to develop circular economy metrics (PACE 2021). In order to enable communication and target setting, it is crucial to develop indicators that are consistent, meaningful, widely accepted, and easy to use and understand. At the EU- and national level, different monitoring frameworks for the move towards a circular economy have been created. However, an aligned set of indicators does not exist yet (PACE 2021). Furthermore, the monitoring frameworks that are currently being used do not fully capture the aspects covered by the four indicator groups above.

Generally speaking, indicators related to material and waste flows, as well as environmental footprints were already being monitored (to some degree), before the topic of a circular economy gained prominence. This is not to say that these indicators are without challenges. For instance, at a macro level, the material flows coming into a country have been available from standard statistics for some time. But there are many different circularity options that could reduce material flows, often depicted as a ladder of value retention strategies (the "R-strategies"). However, measuring material flows related to these processes, e.g. re-use and repair, at the macro level is challenging (PBL 2021).

In several EU-level frameworks related to the circular economy, material resource use and environmental impact indicators are present. However, economic and social impact indicators, as well as policy, process, and behaviour indicators are often missing or receive minimal attention.

The ***EU Resource Efficiency Scoreboard Framework*** (2015) contains resource productivity as a headline indicator and has dashboard indicators for materials, land, water and carbon. There are also several thematic indicators, leading to a total of 32 indicators. Of these, only three indicators relate to economic impact or policy/process indicators, and the focus is generally more on implementation activity rather than the outcome:

- Eco-innovation index
- Total environmental tax revenues as a share of total revenues from taxes and social contributions
- Energy taxes by paying sector (households)

The **Raw Materials Scoreboard**[4] (2021), while mostly linked to material flows and environmental aspects, does include some indicators linked to socio-economic aspects:

[4] https://op.europa.eu/en/publication-detail/-/publication/eb052a18-c1f3-11eb-a925-01aa75ed71a1

- *Value added and jobs:* Raw materials extraction and intermediate manufacturing industries create added value in the economy.
- *Financing:* After a downward trend in global financial indicators in 2011-2015 for the metals and mining sector, in 2016 the sector started becoming more attractive to investors. For the EU-based companies this rebound occurred already in 2015.
- *Responsible sourcing:* This aspect provides insights into efforts to ensure a transparent and sustainable supply of raw materials, covering environmental and social considerations. Due diligence is becoming an increasingly common practice in companies.
- *Occupational safety:* Ensuring employment and decent working conditions are longstanding policy targets for the EU, complemented more recently by the European Pillar on Social Rights. Occupational health and safety is vital since the raw material sectors are more exposed than others to occupational risk.
- *Jobs:* The EU Industrial strategy recognises the role of raw materials in job creation, particularly in manufacturing industries. Ongoing changes, such as the move to a more circular and low-carbon economy, are reflected in the types of sectors in which jobs are being created.

The ***EU Circular Economy Monitoring Framework*** (2017) was established under the first EU Circular Economy Action Plan to assess the progress towards circular economy in the European Union. One of the actions in the European Green Deal and the revised Circular Economy Action Plan is a revision of this to encompass more elements. At the outset it was established based on existing data, and as such Eurostat/DG ENV had little room to include aspects that were not yet covered. A smaller revision is ongoing that will start to address some issues, but mainly environmental ones, and a larger revision is expected to take place in 2024/25 with the aim of including broader aspects.

Presently the framework has one indicator with some elements linked to the socio-economic space: Indicator-9 which is reporting on private investment, jobs and gross value-added. However, it is noted that the framework is largely based on the material flow cycle with limited further coverage of framing conditions such as competitiveness and innovation. Overall, less attention is given to the detailed exploration of policy processes, the R-strategies (beyond recycling) or to social and economic aspects.

The ***Eco-Innovation Action Plan*** (2021) has a set of indicators linked to value added in green industries. Most of these indicators capture the innovation process and its outcomes, but only captures social aspects with respect to job creation.

- Governments environmental and energy R&D appropriations and outlays (% of GDP)
- Total R&D personnel and researchers (% of total employment)
- Total value of green early-stage investments (USD/capita)
- Implementation of resource efficiency actions among SMEs (Score)
- Implementation of sustainable products among SMEs (% of surveyed firms)
- Number of ISO 14001 certificates (per mln population)
- Eco-innovation related patents (per mln population)
- Eco-innovation related academic publications (per mln population)
- Eco-innovation related media coverage (per mln population)
- Exports of products from eco-industries (% of total exports)

- Employment in environmental protection and resource management activities (% of workforce)
- Value added in environmental protection and resource management activities (% of GDP)
- Material productivity (GDP/Domestic Material Consumption)
- Water productivity (GDP/total freshwater abstraction)
- Energy productivity (GDP/gross inland energy consumption)
- GHG emissions intensity (CO2e/GDP)

There are a number of developments around indicators ongoing. These may over time lead to new indicators, overall, it is not expected to add a lot of further substance around socio-economic indicators. In this context, work is continuing on the development of a taxonomy for green investment as a means to provide investors with a clear indication of the "greenness" of investments. While this may have significant influence on directing investment flows towards greener alternatives, it will have less impact on social issues, albeit working conditions is listed as a factor for consideration[5].

[5] Other relevant initiatives not covered in detail are:
- The Austria and JRC develop a monitoring concept for zero pollution by end of 2022.
- The 8th Environment Action Programm (EU 2022/591) includes the establishment of a monitoring framwork including the establishment of a dashboard.
- In 2021, the EC proposed a directive on corporate sustainability reporting (COM(2021) 189 final)). It sugggets, among ohter things, the provision of data regarding resource use and circular eonomy. In 2022, the EFRAG published a corresponing report on "Resource use and circular economy".
- EU work on social taxonomy https://finance.ec.europa.eu/system/files/2022-08/220228-sustainable-finance-platform-finance-report-social-taxonomy_en.pdf
- EU work on EMAS https://ec.europa.eu/environment/emas/pdf/other/report_EMAS_Circular_Economy.pdf

# 3. Country inputs

This chapter starts with a short overview of the circular economy monitoring frameworks of the following member states and regions (that provided input): Basque country, Finland, France, The Netherlands, and Sweden. We will shortly discuss shared and unique elements, and to what extent they encompass the four indicator groups from the Bellagio Declaration. In the next section, we present the most relevant socio-economic indicators that are currently being implemented or tested by the participating member states.

## Monitoring frameworks per country/region

**Basque Country (Spain)**

The monitoring framework of the Basque Country, one of Spain's regions, provides a regional overview of circular economy indicators, even though it is in some cases difficulties to obtain certain statistical data for a region in comparison with a country.

Basque Country (see: https://www.ihobe.eus/publicaciones/indicadores-economia-circular-euskadi-2021 ) was the first European region to apply the EU Circular Economy Monitoring Framework in 2017, which is updated periodically but does not really facilitate decision-making for a circular transition.

The Basque Circular Economy Strategy 2030 establishes, apart from the indicators shown in the annex with GHG reduction (scope 3) as the main environmental indicator, three socio-economic indicators, whose calculation however needs to be improved, although the method is currently defined.

The indicators are:

| Indicator | Data 2016 | Objective 2025 | Objective 2030 | Measurement method | Critical analyses of method |
|---|---|---|---|---|---|
| Turnover of companies in more circular products (billion €) | 2.852 | 7 | 19 | Based on a regular survey of companies that have evidence of working in eco-design and circular innovation (in 2016, 235 companies). Includes companies certified in eco-design (ISO 14006) with eco-labels type I and III (EPD, Ecolabel) and companies that have participated with projects in Ihobe's Circular Eco-innovation Programme in the last three years. | The concept of "more circular products" is not homogeneous, so the turn over figures are not based on the same criteria. In general, eco-design has been considered, without taking into account the intensity of environmental improvement. The responses of the different companies have also not been audited independently. The concept is quite adequate as long as the definitions are improved. Harmonisation at EU level would be desirable. |
| Number of new jobs in the circular economy sectors (nº) | Base line 18,463 | +1,874 | +3,000 | EU Circular Economy Monitoring Framework 2017 | By only including the repair and recycling sectors the metric is strongly underestimated. There are many sectors with almost all circular economy jobs (e.g. HEA steel mills) and others with part of the activity (e.g. OEM machinery maintenance) that are excluded in this way. |
| Material productivity (GDP/DMC ratio in €/kg) | 3.34 | 3.98 | 4.34 | DMC calculated periodically on the basis of input-output tables. | Material productivity is not yet broken down by NACE sectors. The assessment of causes is complex and often does not allow decision making towards circular transition. |

Table 1: Socio-Economic Circular Economy Indicators of the Basque Circular Economy Strategy

On the other hand, different experiments have been carried out in the last three years in order to develop socio-economic indicators to monitor the circular transition, as described in table 2

| Indicator | Nº | Mode of calculation | Year | Result | Measurement entity | Evaluation and learnings |
|---|---|---|---|---|---|---|
| Circulares Companies (nº) | 1 | Experimental. Enterprises (NACE sectors, two-digit) that report having:<br>- Reduced consumption of materials (or hazardous substances in product), and/or<br>- Recycled materials or waste, and/or<br>- Reduced the carbon footprint at the customer, and/or<br>- Extended the useful life of their products, and/or<br>- Facilitated end-of-life recycling at the customer's site. | 2020 | 12,5% | Eustat-Instituto Estadístico Vasco (Innovation Survey) | It makes sense not to include companies with <10 employees. Claims are not data-driven or auditable. It is not known whether the actions are limited or transformative. |
| Circular Turnover (million €) | 2 | Experimental. Turnover linked to environmental protection and resource efficiency (NACE 2-digit sectors) | 2022 | Under evaluation | Department of Economic Development, Mandatory Questionnaire | Large companies always perform some actions, so they automatically over-perform on the indicator. It may make sense for SMEs |
| | 3 | Experimental. Sum of the turn over of the companies that claim to realise the assumptions of indicator no. 1 in this table. | 2020 | Under evaluation | Eustat-Instituto Estadístico Vasco (Innovation Survey) | Large companies always perform some actions, so they automatically over-perform on the indicator. It may make sense for SMEs |
| Circular Employment | 4 | EU Circular Economy Monitoring Framework 2017 (see: https://www.ihobe.eus/publicaciones/indicadores-economia-circular-euskadi-2021 ) | 2019 | 17.298 | Eustat-Instituto Estadístico Vasco | Incomplete. Not representative for monitoring the circular transition. |
| | 5 | Experimental. Environmental protection and resource efficiency employment (NACE 2-digit sectors) | 2022 | Under evaluation | Department of Economic Development, Mandatory Questionnaire | Environmental protection (=zero pollution) has not been differentiated from resource efficiency (=circular economy). There are doubts about the ability of companies to respond adequately. |
| | 6 | Experimental. Sum of employment of enterprises claiming to perform the assumptions of indicator 1 of this table | 2020 | Under evaluation | Eustat-Instituto Estadístico Vasco (Innovation Survey) | Large companies always perform some actions, so they automatically over-perform on the indicator. It may make sense to SMEs |
| Circular R+D+i r (nº projects, nº enterprises and investment €) | 7 | Experimental. Based on the expert and detailed review of 1,000 projects participating in EU (Horizon, Life), Spain (Cdti) and Basque Country (Hazitek, Ihobe) R&D&I programmes. | 2019 | Projects (nº): 46<br>Ent (nº): 426<br>€: 38,5 Million (additional projects with 158 million € integrate circular innovation in some degree) | Ihobe | Very suitable indicator to monitor the circular transition. Currently the main R&D&I programme (Hazitek: €150 million/year) has defined how to measure the circular economy, so from 2023 the results will be straightforward. Experimentation required too many resources. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mercado Circular emergente | 8 | Experimental. Forecast of a relevant increase of environmental requirements from customers on our products and services (% companies with > 10 employees) | 2011 (2019) | 34% | Ihobe, Basque Industrial Ecobarometer Vasco (each 5 years) | Perception indicator. Sampling error 4%. |
| | 9 | Experimental. Future environmental regulations or future customer requirements have been the motivation to ecoinnovate | 2020 | 8,2% (over all companies) | Eustat-Instituto Estadístico Vasco (Innovation Survey) | Driver are future requirements. It is an anticipation indicator, could be interesting to detect Circular Transition |

Table 2: Experimentations done in the Basque Country to evaluate suitability and cost-effectiveness of proposals of different Circular Transition Indicators

**Finland**

The national circular economy monitoring in the Strategic Programme to Promote a Circular Economy in Finland includes material and waste flow indicators, economic indicators, and behavioural indicators (see below). Most of the indicators rely on official statistics, yet there are also new indicators under development, such as RMC and the indicators based on circular economy barometers.

*Table 3. Indicators for the Finnish Strategic Programme to Promote the Circular Economy (Ministry of the Environment, 2021).*

| Indicator Group | Indicator |
|---|---|
| Material and waste flow indicators | Domestic material consumption (DMC) |
| | Material input required for domestic end-use material-specifically (RMC) |
| | Circular material use rate (CMU) |
| | Municipal solid waste, packaging waste and construction waste: amounts and recycling rates |
| Economic and social impact indicators | Turnover of circular economy sectors and number of enterprises |
| | Eco-innovations |
| | Innovative public procurements |
| | Resource profitability (GDP/RMC) |
| Policy, process, and behavioural indicators | Circular Economy Barometer: A survey and interview-based study for companies and consumers on attitudes and operating models that support the circular economy (commissioned survey for example, every four years, the first one to be carried out in 2023) |

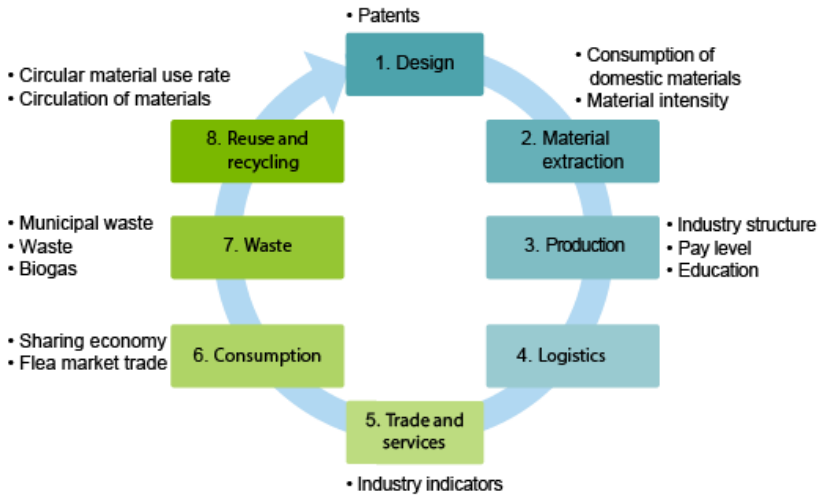



*Figure X. Circular business indicators by Statistics Finland.*

### France

Circular economy is often categorized in France according to seven fields of circular economy defined by ADEME. The French circular economy monitoring includes waste and material flow indicators, footprint indicators, environmental, social and economic impact indicators, behavioural indicators, as well as policy and process indicators. The French circular economy national monitoring system includes 11 indicators covering those seven fields:

| Circular economy field | Indicator | Trend* (average annual growth rate) | Year | Amount in France | Amount in EU-28 |
|---|---|---|---|---|---|
| **Sustainable supply and green procurement** | 1. DMC | -4,7% between 2010 and 2018 (-0,6%) | 2018 | 11,6 t/inhabitant | 13,5 t/inhabitant |
| | 2. Resource efficiency | +12,3% between 2010 and 2018 (+1,5%) | 2018 | 2,96 €/kg | 2,30 €/kg |
| | 3. RMC | -4,4% between 2010 and 2018 (-0,56%) | 2018 | 13,9 t/inhabitant | 14,0 t/inhabitant |
| **Ecodesign** | 4. Number of EU Ecolabel licenses | Impossible to follow | 2019 | 342 licences (including 208 touristic sites) | 1 623 licences (including 357 touristic sites) |
| **Industrial and territorial ecology (industrial symbiosis)** | 5. Number of industrial synergies | Impossible to follow | 2020 | 152 synergies | No data |
| **Product-service system** | 6. Number of public and private organizations being advised in the service economy projects | +161 organizations (+68%) | 2018 | 174 organizations since 2013 | No data |
| **Responsible consumption** | 7. Food waste | Impossible to follow | 2016 | 150 kg/inhabitant/year | 173 kg/inhabitant/year |
| **Increasing the products lifespan** | 8. Households repair expenditure (excluding vehicles) | +3% between 2010 and 2019 (+0,35%) | 2019 | 107 €/inhabitant | No data |
| **Recycling (material and biomass)** | 9. Landfilled waste | +1% between 2010 and 2018 (+0,10%) | 2018 | 26% of non-mineral non-hazardous waste | 23% of non-mineral non-hazardous waste |

| | | | | | |
|---|---|---|---|---|---|
| | | | | is landfilled (20 Mt, 300 kg/inhabitant) | is landfilled (162 Mt, 316 kg/inhabitant) |
| | 10. Import of recycled materials | +1 point of material circularity indicator between 2010 and 2017 (+0,87%) | 2017 | 18,6% of the material consumption is covered by recovered materials | 11,7% of the material consumption is covered by recovered materials |
| Increasing the products lifespan | 11. Jobs in reuse, repair, waste collection and materials recovery | Impossible to follow | 2017 | 455 600 jobs<br>1,6% of total jobs | 4 million jobs<br>1,7% of total jobs |
| | | | | | |

*Trends:

Trend is quickly progressing towards the target
Trend is slowly progressing towards the target
Trend is stagnating
Trend is impossible to follow due to the change of scope

At the same time an experience is held on the monitoring systems for local level. The Circular Economy action catalogue by ADEME proposes 32 indicators:

- Material and waste flows (5)
- Environmental impacts and footprints (10)
  [indicators on resources - food, water, soil, energy]
- Economic and social impacts (4)
  - *Annual waste management expenditure for municipalities (€)*
  - *Private R&D and innovation investment mobilized with public investment (€)*
  - *Part of businesses contributing to the "Extension of product lifespan" in the total number of businesses of the territory (%)*
  - *Part of businesses contributing to the reuse in the total number of businesses of the territory (%)*
- Policy, process, and behaviour indicators (13)

Those indicators are not RACER compliant, but, for some of them, innovative and are to be tested with the local governments.

**The Netherlands**

The national circular economy monitoring framework in the Netherlands includes material and waste flow indicators, environmental and socio-economic impact indicators as well as footprint indicators.

## Overview of material resource use and its impact

| Indicator | Magnitude | | | Trend | | Compared with EU-27 |
|---|---|---|---|---|---|---|
| | 2010 | 2016 | 2018 | 2010–2018 | 2016–2018 | per capita in 2018 |
| **Natural resources required** | | | | | | |
| Material resources for domestic use, DMC[1] (Mt) | 195 | 193 | 195 | 0% | 1% | -22% |
| Material resource footprint domestic use, RMC[2] (Mt)** | - | - | - | - | - | - |
| Resource efficiency (GDP in EUR/kilo DMC) | 3 | 4 | 4 | 12% | 5% | +125% |
| Material resources for the economy, DMI[3] (Mt) | 401 | 402 | 397 | -1% | -1% | +95% |
| Material resource footprint of the economy, RMI[4] (Mt) | 597 | 627 | 647 | 8% | 3% | +89% (2017) |
| Share bio-based resources (kilo/DMI, in %) | 24 | 25 | 26 | 8% | 5% | +5% |
| Total sustainable renewable material resources (kilo/DMI) | - | - | - | - | - | - |
| Share secondary materials, CMUR (kilo secondary/DMI, in %) | - | 13 | 14 | - | 6% | +167% (2017) |
| **Use phase** | | | | | | |
| Lifespan | - | - | - | - | - | - |
| Value retention | - | - | - | - | - | - |
| **Waste processing and recovering** | | | | | | |
| Dutch waste (Mt) | 60 | 60 | 61 | 2% | 2% | +44% (2016) |
| Share recycled waste in processed waste (recycled waste/waste, in %) | 81 (2012) | 79 (2012) | 80 | -1%* | +1% | +31% |
| Waste recycled in the Netherlands (Mt) | 54 (2012) | 52 | 53 | -1%* | 3% | +111% (2016) |
| Incinerated waste in the Netherlands (Mt) | 10 (2012) | 10 | 11 | 11%* | 6% | +74% (2016) |
| Landfilled waste in the Netherlands (Mt) | 2 | 3 | 3 | 51% | 14% | -81% (2016) |
| **Effects** | | | | | | |
| **Environmental impact** | | | | | | |
| National greenhouse gas emissions ($MtCO_2$ eq) | 214 | 195 | 188 | -12% | -4% | +33% |
| Greenhouse gas emission footprint of consumption ($MtCO_2$ eq) | 300 | 252 | 282 | -6% | 12% | +35% (2015) |
| Greenhouse gas emission footprint of production ($MtCO_2$ eq) | 462 | 432 | - | -7% (2016) | - | +54% (2015) |
| Emissions to air, water and soil, such as nitrogen and particulate matter | - | - | - | - | - | - |
| Land-use footprint of consumption (million ha) | 10 | - | 10 (2017) | 3% (2017) | - | -15% (2015) |
| Land-use footprint of production (million ha) | 11 | 12 (2015) | - | 9% (2015) | - | -28% (2015) |
| Water abstraction | - | - | - | - | - | - |
| Water footprint consumption ($km^3$) | 52 (2008) | - | - | - | - | +21% (2008) |
| Biodiversity footprint of consumption (million MSA loss ha/year) | 19 | - | - | - | - | +1% (2010) |
| Biodiversity footprint of production (million MSA loss ha/year) | 20 | - | - | - | - | +2% (2010) |
| Toxicity | - | - | - | - | - | - |
| **Socio-economic impact** | | | | | | |
| Supply risks (indicator being developed) | - | - | - | - | - | - |
| Added value of circular activities (EUR billion) | 28 | 31 | 34 | 23% | 9% | - |
| Share circular activities (added value circular / GDP in %) | 4 | 4 | 4 | 1% | 0% | - |
| Circular employment (no. of circular jobs in FTEs) (*1,000) | 311 | 318 | 326 | 5% | 2% | - |
| Share circular employment (no. of jobs/total no. of jobs in %) | 4 | 4 | 4 | -2% | -2% | - |

## Legend

Trends
- trend is moving in the right direction
- trend is moving in the wrong direction
- trend is stable; hardly any differences (up to 5%)

Compared with EU-27
- NL scores better than EU
- NL scores worse than EU
- hardly any differences (up to 5%)

Deviating years are provided between brackets

* 2012–2018, no data available for 2010
** RMC requires a new calculation
- No data available

[1] Domestic Material Consumption
[2] Raw Material Consumption
[3] Domestic Material input
[4] Raw Material Input

The Netherlands also uses transition process indicators that measure the speed and direction of change towards a circular society. The figure below shows the eight key processes that are crucial for the success of the circular economy transition. Each cog is measured using several indicators, including socio-economic indicators. The table below provides concrete examples of these indicators.


Source: PBL 2013; based on Hekkert et al. 2021

**Sweden**

The Swedish national circular economy monitoring is based on the official indicators for the Sustainable Development Goals (SDGs) by the United Nations' Agenda 2030 (Figure X). Further details are included in the annex.


*Figure X. Swedish circular economy strategy has four focus areas with indicators based on Sustainable Development Goals (Ministry of the Environment (2020)). (Picture modified from Ministry of the Environment (2020) and the United Nations)*

## Overview of socio-economic indicators from member states

Table 1 presents an overview of socio-economic indicators that are currently in use by member states or are in an experimental stage. There were more indicators, but focus on those that fit best with scope of this study (i.e. policy indicators were left out, as well as indicators measuring number and type of scientific publications).

Socio-economic indicators from different countries were grouped according to topic. The table presents indicators related to firms, consumers, education, investments. Where possible, we will discuss to what extent the indicators are RACER compliant.

We focus on “low hanging fruit”, i.e. indicators that can be implemented (at the EU-level or by other member states) in the short term, or modifications of indicators that could be implemented in the short term.

**Table 1: Overview of socio-economic indicators currently in use or are in an experimental stage.**

| | Finland | France | Netherlands | Sweden | Basque Country |
|---|---|---|---|---|---|
| | | | | | |
| *Firms, jobs, turnover General overview* | Number, turnover and personnel of circular economy establishments in 2013 to 2019 (turnover also per region) | Employment in Circular economy | Number and type of circular firms, jobs | | Experimental: Number of circular business or firms (nº) |
| | Median pay of circular economy industries and all industries in 2010 to 2018 | Number of EU Ecolabel licenses | Number and type of innovative circular firms, jobs | | Turnover of companies in more circular products (billion €/year) |
| | Barometer results on the circular economy in Finnish companies (business models, impact of CE, not yet available) | Number of industrial symbiosis initiatives | Value added by circular businesses | Number of workplaces, turnover and gainfully employed persons in the environmental sector | Number of jobs in the circular economy sectors (nº) |
| | | | | | Material productivity (GDP/DMC ratio in €/kg) |
| *Specific sectors* | Share of turnover in service industries in the whole economy in 2013 to 2018 | Employment in repair and material recycling (number of jobs) | | | |
| | Number, turnover and number of personnel of establishments in flea market industries in 2013 to 2019 | Experimental : Annual waste management expenditure | | | |
| | Value of retreading of heavy vehicle tires (remanufacturing), amount of electrical and electronic waste reused as a whole (reuse) | Experimental : Part of businesses contributing to the “Extension of product lifespan” in the total number of businesses of the territory (%) | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Experimental : Part of businesses contributing to the reuse in the total number of businesses of the territory (%) | | | |
| *Consumers* | Households' average purchase and sales sums in different flea market types in 2019, barometer results on consumer behaviour | Households repair expenditure (excluding vehicles) | Consumer acceptance and behaviour regarding circularity | | |
| *Education* | Persons employed in circular economy industries within one year of graduation by level of education in 2010 to 2018 (educational level). Experimental indicator: monitoring of higher education in circular economy | | Number of study programmes focusing on circular economy | | |
| *Investments and subsidies* | | Experimental: Private R&D and innovation investment in circular activities mobilized with 1€ of public investment | Share of government budget for CE, investments via 2 policy instruments | Investments of industry in environmental protection per environmental area | Experimental: Private R&D and innovation investment in circular activities mobilized with 1€ of public investment |
| *Knowledge/ technology* | Circular economy patents per one million population | | Number of scientific publications (categorized by topic) | | Experimental: Circular R+D+i r (nº projects, nº enterprises) |

- RACER criteria in table?
- Additional explanation in table?
- Discussion below per topic, some examples from the countries, use figures.

# 4. Observations

In light of the EU context and country profiles discussed above several observations can be made regarding the social and economic indicators:

1. Both on EU and country levels, waste, and recycling still dominate in circular economy monitoring systems. A key reason for that is an ongoing difficulty to define the system boundary of the circular economy. Some country monitoring systems try to expand the scope. For instance, Finland and France zoom in on specific sectors (sharing economy, flea markets, repair, remanufacturing tires and reusing electronic waste). The Netherlands combines different approaches to provide a comprehensive overview of circular activities along transition pathways.

2. All country monitoring systems reviewed here include metrics on the number of circular companies, industries or jobs. These indicators are binary and suppose that the entire activity of a company or a person is dedicated to circular economy (or not at all). In the real world it is much more complex. The approach currently taken at the EU-level is also considered too restricted, because the included sectors are mainly waste and recycling focussed. While traditional repair activities also get some attention, the current scope doesn't do justice to the concept of a true circular economy.

3. All the countries include biomass and food to some extent in their monitoring frameworks. However, circular activities in these sectors are not highlighted in the different monitoring approaches applied at country level. The existing categorization approaches including R-strategies are traditionally more focused on manufacturing sectors and abiotic materials.

4. From studying national efforts, it is apparent that social impact indicators have received far less attention than the economic indicators. The number of jobs is perhaps the only social indicator considered, but the quality of jobs is rarely discussed. Moreover, current socio-economic indicators are mainly *state* indicators (e.g. number of jobs), but not *impact* indicators (e.g. quality of the jobs). The socially-oriented indicators are lacking, as well as indicators clearly focusing on innovation.

5. It would be possible to enhance monitoring frameworks using more qualitative indicators and case studies. Currently countries use the qualitative approaches mainly to disseminate good practices and inspirational cases. For instance, the Finnish Innovation Fund SITRA issues the "100 best circular firms" publication. In France, the service economy business model shift is either followed with the number of entities being supported or the case studies (especially on the local level). Both approaches promote the efforts and disseminated ideas to be replicated.

## Recommendations

Recommendation 1. **Define a common categorisation system for the circular economy**

Most of the time circularity does not fit in a single, specific economic sector. Although some NACE codes do isolate circular activities such as repair, reuse or recycling, detecting circularity in the activity of traditional or large companies is still very difficult. A clearer scope of circular economy will require further discussion on a common categorisation system for the circular economy such as one proposed

by the European Commission in 2020 using the R-strategies as a foundation. EU Member States and other European countries should be engaged in this process – potentially through the Eionet network.

Recommendation 2. **Ensure a balanced approach to monitoring across key economic areas**

In addition to the established focus on industrial production, monitoring circular transitions in the biomass and food production systems also warrant attention. This is especially important in the context of their contribution to greenhouse gas emissions and other environmental impacts and overall strategic significance in the EU economy. It is also worth looking into which sectors should and can be added easily to existing circular economy definition with a view to expanding the focus of circularity beyond enhanced waste management approaches. In addition, a more combined approach might be considered to link sectoral activity with its circular performance.

Recommendation 3. **Focus business metrics on the degree of circularity**

It is useful to look at the number of circular firms and jobs, and the related investments and revenue or added value. Ideally, indicators should also be able to provide insight into the degree of circularity of a sector or firm. Further critical discussion is required on what a circular activity or circular firm is. Further research is needed to establish adequate indicators that can determine the degree of circularity within a firm. This requires a move from a binary approach (circular or not) to a more detailed and nuanced analysis. Based on different criteria, the degree of circularity in existing activities and/or a measure of circular innovations could be determined, although this requires intensive effort at a qualitative level. However, it is through the monitoring of these aspects that the most useful information regarding the transition towards a circular economy is obtained. Short-term priorities in this regard include:

- Improve the list of defined circular activities and its translation to the economic sectors.
- Add indicators measuring economic activity in specific sectors contributing to the upstream steps of the R-ladder, such as prevention, reuse and repair activities.

Recommendation 4. **Develop social and economic distributional impact indicators to monitor human transition to circular models**

Specific, additional effort is required to provide insights on societal transition towards circular models. The framework for the social impact indicators will be required to measure progress towards the circular economy and to identify bottlenecks. Some key areas for development in this area are:

- Behaviour dynamics in terms of engagement and consumption temperance from circular measures such as the sharing-economy, product-as-a-service and paying more for durability.
- A discussion regarding sufficiency or temperance in consumption in particular for higher consuming segments.
- Develop indicators to measure/monitor the social impacts of the transition to circular economy (incl. social justice and the distribution of social benefits and disadvantages related to e.g. health, employment and education opportunities)
- Develop indicators to monitor changes in consumer and citizen behaviour, attitudes and skills in relation to the CE. (This could be monitored e.g. with surveys.)
- Circular economy skills development and the impact of the circular economy on current employment patterns and distribution

Recommendation 5. **Integrate qualitative metrics into monitoring frameworks**

Both country and EU monitoring framework should accommodate the inclusion of qualitative indicators, as these can provide insights into issues in which quantification is difficult. Qualitative approaches might particularly help in terms of understanding social aspects of circular economy. An example could be in skills development.

Recommendation 6. **Support development of innovative indicators**

In so far as possible, monitoring frameworks should leave space for the development of innovative indicators. As soon as countries collect different data, it is more feasible to consider a new indicator and make it measurable on a country scale. These experiments at country-level can provide signals on prevailing and emerging issues and also can potentially inform later EU-wide indicator framework development.

# Appendix 1 – detailed country inputs

## Basque country

### 1. Institution

IHOBE is a publicly-owned company of the Basque Government with the mission to support the Basque Government's Ministry for the Economic Development, Sustainability and Environment in implementing environmental policy and in spreading the green sustainability culture within the Basque Autonomous Community.

### 2. Policy background

The "Basque Circular Economy Strategy 2030" was approved in January 2020, and contains three strategic objectives and ten action lines. The results indicators are limited to turnover, GHG emissions reduction (by material, product and services improvement from a Life Cycle perspective) and employment.

| ACTION PLAN RESULTS INDICATORS | 2025 RESULT | 2030 RESULT |
|---|---|---|
| 1. Turnover of companies in more circular products, €2852 million in 2016 | €7 billion | €19 billion |
| 2. Carbon emissions associated to material consumption were cut in 2016 by 16.5 million t eq. $CO_2$ | | 26% |
| 3. Number of **new jobs** in the circular economy sectors. 18,463 people employed (2015) | 1874 | 3.000 |

### 3. National/Regional monitoring framework

Ihobe understands that Circular Indicators are key to take policy action, even more than to justify some results. If the focus is not on Policy Action, the effectiveness of a monitoring system will be much lower.

The Basque Regional Monitoring Framework, supported by the Basque Statistic Agency EUSTAT, has adopted fully the EU Monitoring Framework, "Basque Circular Economy Regional Indicators – European Framework", that is being yearly coordinated and reviewed by Ihobe. The Basque Country has been the first Region in EU adapting this framework. It´s to be emphasized, that regional statistics about materials import/export are extremely complicate to work out. On the other hand, they are relevant to be monitored because the capacity for circular action at regional level is high. Additionally, Circular Strategies KPIs are yearly calculated, as seen showed below.

| STRATEGIC OBJECTIVES | 2025 TARGET | 2030 TARGET |
|---|---|---|
| 1. **Material productivity** (GDP/ DMC ratio). 3.34 €/kg (2016) | 3.98 €/kg | 4.34 €/kg |
| 2. **Circular material** use rate (recycled material / (recycled material + DMC) ratio). 9.9% (2016) | 11.7 % | 12.8 % |
| 3. Total amount of **waste generated**, excluding the main mining waste, per GDP unit in thousands of euros. 67 kg/K€ (2016) | 53.9 kg/K€ | 46.7 kg/K€ |
| 3.1 Total amount of **food waste** generated per year. 172 kg/inhab (2016) | 117 kg/inhab | 86 kg/inhab |
| 3.2 Percentage of **plastic containers put on the market** that are **recyclable** | 80 % | 100 % |

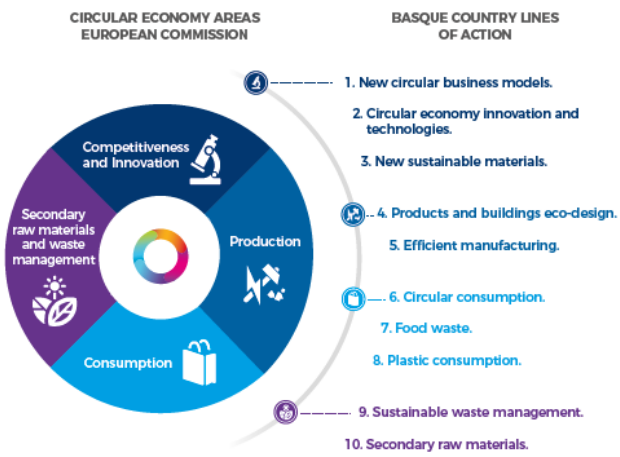
The critical aspect is that the regular and statistically based monitoring of the "Results indicators" (turnover, GHG emissions and employment) is poorly standardized (except employment, where an insufficient EU indicator is yet used) and based on specifically Studies. Although not integrated in the monitoring framework, like EU, consumer and economic activity awareness & perception about resource efficiency and circularity (and even climate) is measured regularly each 3-4 years (Basque Industrial Ecobarometer and Social Ecobarometer). In addition, green investment (public and private) and green innovation is statistically calculated but neither integrated in the Circular Strategy, because it´s a broader concept than only "Circularity".

There is also an historic calculation of the TMR (Total Material Requirement) indicator, that is adequate to include the Life Cycle perspective that fails when establishing the DMC-DMI (domestic material consumption) indicator. Some other KPIs that also contribute to circular economy (such as land-use) are included in the yearly Basque Environmental Framework Programme monitoring system.

## 4. Description/definition/scope of circular economy

Circular Economy is described as integrating Life Cycle Thinking in materials, products and services. Because Basque Regions economy, circular economy focuses strongly in industrial activities, followed by construction and forestry. Mining, agriculture and services (including tourism) have a lower relevance in of the circular scope of the Basque region.

Circularity for society is mainly addressed via municipalities and, in a more exquisite way, via capacity building and of graduates (about 100/year in the Basque Circular Hub) .




Criteria to select sectors for circularity are economic relevance, environment life cycle impact, degree of innovation, improvement potential and, most important, the existence of an EU strong circular driver (emerging regulation, instrument) that accelerates the circular transition.

Main priority areas are ecodesign, product value retention, product service systems, efficient metals, circular plastics, food efficiency, sustainable construction materials and bio-forestry, not forgetting the relevance of digitalization as priority cross activity of the RIS3 Regional Specialization Strategy.

It´s considered to focus also to the circular instrument mix to be applied efficiently. Ihobe establishes in two different focuses:

1. **Own regional instruments:** the Basque Country has its own tax system (unique in Europe) and capacity to regulate most of the taxes (except VAT). So, Circular Tax deductions (existing on technologies, similar to NL VAMIL scheme), landfill and incineration tax (being just developed), Green Public Procurement (huge results already reached), Research and Innovation integral Support on Circular economy (about 40 MM €/year and 60 RTD projects launched yearly), Public Private Partnership to boost Green Supply Chain Management (10 years experience of the Basque Ecodesign Center with 14 multinationals) and knowledge transfer activities to SMEs and Municipalities (and its citizens).

2. **Efficient implementation of EUs instruments:** most key Circular Instruments (ErP Ecodesign Directive, Extender Product Responsibility, Waste Regulation, Construction Materials Directive, BATs of IED Directive,…) and initiatives (Sustainable Products Initiative, Steel-Aluminium-Cement GHG tax,…) are EU ones, but implementation and control is set at country and/or regional level. The effectiveness of the application of the EU key instruments is mainly delegated. Circular Indicators should support to detect the need of higher efficiency in the application of this EU instruments.

## 5. Discussion of most relevant (socio-economic) indicators (for our study)

The indicators to measure strategic objectives are not sufficient to anticipate a circular transition. And one of the most relevant, material productivity, is not yet calculated on a sector NACE way, what would facilitate to improve the circular policy mix to be applied.

Indicators should be exploited by sectors. But to be action oriented and really useful to drive policy measures, it´s relevant that the indicators should be set by different typologies of Circular Economy (CE) like Ecodesigned Products, Near Zero Waste Production, Sustainable Use and maintenance, Product value Retention (reuse, repair, retrofitting, reman), material value retention, … This is a key point, where references like the EIB taxonomy or the EU´s Climate Taxonomy can be adequate for a consensus, to integrate in the future in EU and countries statistics.

| Indicator | Relevance | Implementation degree | Data method | Benefits and challenges | RACER |
|---|---|---|---|---|---|
| **Circular Turn Over (€/year)** | | Done in BC. EU wide, poor, based on assignment of some NACE to CE | In BC done by interviews to Circular Companies (239x). EU wide, to include in statistics? | Critical Indicator to motivate the markets | High: R, A<br>Medium: C, E,RO |
| **Circular Benefits (€/year)** | | NOT existing | Only data from 100 Circular Innovation Projects available | Key to complete Turn Over. Benefits is the real circular driver. | High: R, A<br>Medium: C<br>Low: E, RO |
| **Employment (nº)** | | Done in BC. EU wide, Existing but based on Eu assignment of some NACE to CE | EU official Monitoring Framework (insufficient).<br>Skilled employment not defined.<br>Could be linked to Turn Over. | Relevant if it can be differenced by circular typology (ecodesign, value retention,..) | High: R<br>Medium: A, C, E<br>Low: RO |
| **GHG emissions reduction (ton/year)** | High, but not socio-economic KPI | In BC done for Circular Innovation Projects. In EU, NOT existing. Only some studies (material economics,…) | LCA view. Too complicated to be delegated by questions in statistics. Sectorial and typology ratios to be developed combining with Turn Over?. Special focus on durable products… not only materials. | Although toxicity or biodiversity is lost, it´s the KEY indicator to show climate contribution. | High: R, A, C<br>Medium: RO<br>Low: E |
| **Circular companies (nº)** | | Done in BC. In EU poor, based on assignment of some NACE to CE | Two ways /by sector and circular typology): statistical questionnaire or | Together with Circular Turn Over, excellent policy monitoring possible | Medium: R,A,C,E<br>Low: RO |
| **Circular innovation projects (nº)** | | In BC done, but not fully standardized (two levels, circularity as main or collateral goal) | Only EU, National and Regional Funds supported projects | Shows if in 5 years radical solutions could be ready (good transition indicator) | Medium: R, A, C, E, R, RO |
| **Business Circular Attitude and Behaviour** | | In BC done, although irregularly repeated. EU wide, Eurobarometer. | Key question is “Expected relevant circular requirements/demand for your business in next 3 years” | Good cost-benefit if centralized by Eurobarometers. Method to be standardized by EU , if Regions or Countries will additionally do. | High: A, C, E<br>Medium: R<br>Low: RO |
| **Consumer Circular Attitude and Behaviour** | | In BC done with strong climate focus. EU wide, Eurobarometer. | Different questions | Good cost-benefit if centralized by Eurobarometers. Method to be standardized by EU , if Regions or Cities will additionally do. | High: A, C, E<br>Medium: R<br>Low: RO |

*Table: Ihobe´s Proposal of most adequate socio-economic circular transition indicators, indicating policy action relevance, implementation degree, methods, benefits and challenges and RACER compliant (R relevance , A acceptability, C clarity, E easiness, RO robustness)*

The current EU Circular Monitoring Framework, building on already existing information, attributes some sectors to circular economy (employment, …). This is a provisional result that hinders any real policy-oriented monitoring. For it, there are two alternatives:

- To integrate new questions in EU and national statistics (best quality but complex)

- To redefine the scope of sectors to be considered as circular (less quality, faster, but not feasible in the long term), establishing ratios of circularity, that are renewed periodically (each 3 years) at national (or even regional) level.

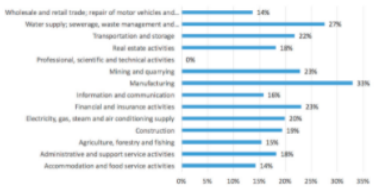
## 6. Upcoming/future developments

EU is working in the "Update of the EU monitoring framework for the circular economy" to be published end of 2021. Related to this work, there are several indicators under the "Competitiveness and Innovation", just being evaluated. Ihobe wants to comment about them:

- *9a Private investments in circular economy sectors (waste management, repair and reuse):* this indicator will promote recycling infrastructures and not really support circular transition. Relevant investments, extremely hard to detect and quantify are done for circularity (digitalization…)
- *9b Employment in circular economy sectors:* wrong conclusions will be taken if at least, some ratios (to be updated regularly) for the different sectors by typologies (ecodesign, product value retention…) are not established. As example, today 30% of all EU Circular Employment are located in Car Repair Shops, that undergoes a hard crises that probably will reduce strongly employment…
- *9c Gross added value in circular economy sectors:* similar to 9b discussion. If Circular Sectors are what is defined today, no real transition monitoring possible.
- *10 Patents related to waste management and recycling:* The number of patents in EU is not the key indicator for innovation and circular transition. There are better Indicators of the EU Ecoinnovation Index, in our opinion, that could engage a Circular Transition.

Deepening in the EU´s "Eco-innovation scoreboard and the eco-innovation index" , Ihobe sees some potential to be still analysed, mostly on Eco-innovation INPUTS and ACTIVITIES, more than on "outputs" and "socio-economic outcomes". Three possible indicators to be discussed are:

**% OF INNOVATIVE COMPANIES IN EU THAT IMPROVED MATERIAL EFFICIENCY (BY SECTOR)**



Download data set

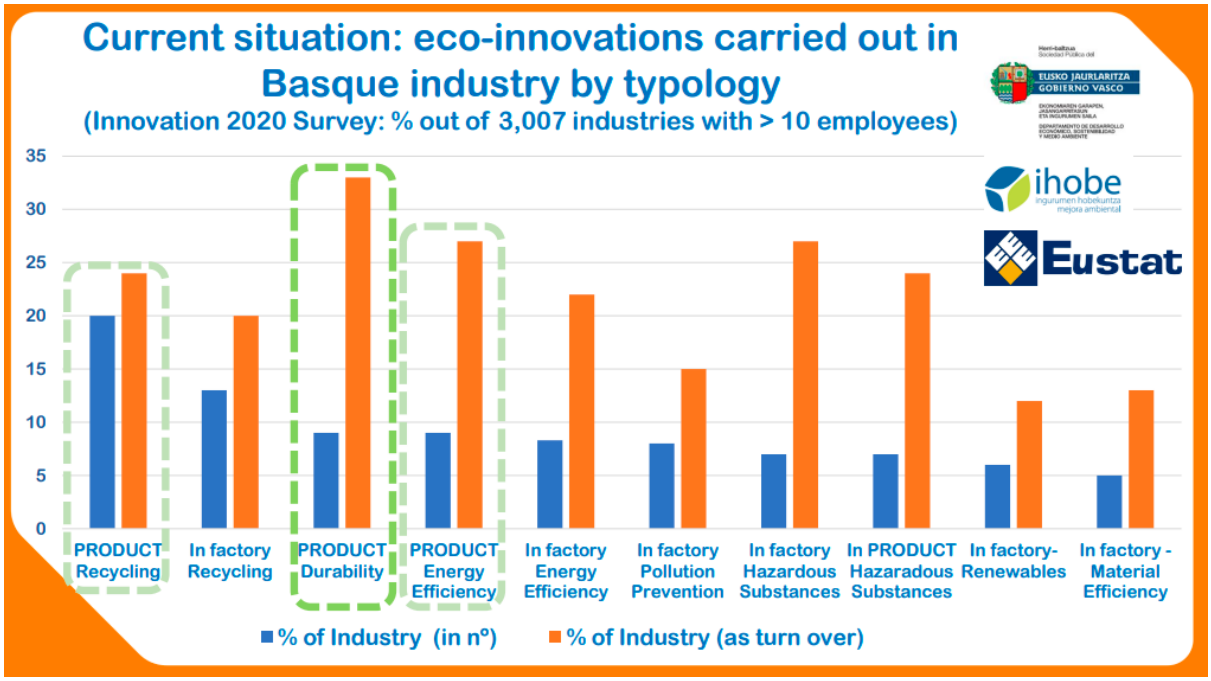
Source: Community Innovation Survey 2008

On average one in four innovative European companies make efforts in improving material efficiency

- Governments environmental and energy R&D appropriations and outlays (% of GDP): it has to be reviewed, if Circularity can be extracted clearly.
- **Implementation of resource efficiency actions among SMEs** (Score): seems to fit totally with Circularity! If yearly updated (to be confirmed), an ideal indicator (see graphic below).
- Implementation of sustainable products among SMEs (% of surveyed firms): to be reviewed more in depth and to be checked if regularly calculated.

**Final debate about the Definition of what is a "Circular Business"**

Actual EU Definition make not possible to measure Circularity and even less, circular transition. Definition of Circular Business is the only way to get better KPIs on Circular Turn Over and Employment (and other Circular Transition Indicators).




There can be done by:

- SCENARIO A: Establishing a clear limit of when a company is circular or not. Questions and answers to be integrated in official statistics, but not data based. So, If a company is considered "Circular", all its turn over and employment scored as circular. It´s a simplification, but needs few work for companies. This way, companies are not delegated to fulfill complex data of what´s a circular employee or circular turn over. It´s relevant to ask:
  a) The situation now
  b) The foresight expected in 5 years (to have an overview about transition intentions)

  As shown in the graphic above, the % of companies that have innovate in product durability (or even on product recyclability) could be eventually considered as "circular companies". At this time, sectorial data in Basque Country are not yet of high quality in official statistics.

- SCENARIO B: data based questionaire and answers. Only products and services that are circular, are scored

| Concept | KPI Description | Proposed Limit (for Scenario A) | Evidences? Comments |
|---|---|---|---|
| **Ecodesing** | New Products and Services are systematically ecodesigned (focus durability and value retention, use phase or material efficiency) | **All new products** of the company include LCA and have relevant improvements (around 20% of mPoints or embedded GHG) comparing to previous one or standard ones. There is an internal ecodesign team or a middle-longterm stabile external team for it | Company has to have possibiit to design materials, components or products or servcces; design certifications on: ISO 14006 certified, EN 4992-9, EN …<br>Good to ask: situation now? And expected in 3 years? |
| **Circular R&D&i** | The company has regularly R&D&I Projects that integrates Circular challenges after initial Life Cycle Thiking | **All new R&D&I projects** integrate the LCA challenge and look to be more circular. Only when at least **5% of Turn Over in R&D&I** (or 3% in Circular R&D&i) | Public Supported R&D&I Projects should have integrated LCA / Life Cycle thinking |
| **Products based on recyclates** | Materials or products produced are mainly based on recyclates | The sum of materials or products sold have at least **70%** of recycled material (in weight, not in value). Based on indicative input-output analysis | He limit could be lower (50%) or could be focused on value. This would mean that HEA Steelfactories or some Paper Industry would score here. |

| | | | |
|---|---|---|---|
| **Product Value Retention** | The Maintenance and Product Value Retention (reuse, repair, retrofit and reman) is a relevant activity of the company | The sum of Product Value Retention (reuse, repair, retrofit and reman) turnover (incl. maintenance) is at least **30%** of company turnover | Limit could also be 20 or 25%. Reman turnover in OEMs is usually about 12% maintenance higher. Use of data (like Digital product Passport) is key for it |
| Circular Strategy | The Business Model has been revised to be circular and Life Cycle Thinking Oriented | Scoring Systems (Ecovadis, Cdp,…) evaluate in highest percentile 30% related to environmental sustainability | NOT SURE TO BE STRONG ENOUGH: : most huge companies will have a Circular Strategy, even when the real circular commitment is lower |
| Circular Monitoring | The company measures and renew yearly it´s Circular KPIs and the related improvement plan | Monitoring is usually done if improvement is intended. | NOT SURE TO BE STRONG ENOUGH: most huge companies will have a Monitoring System, even when the real circular commitment is lower |

Table X: A first proposal of "circular business" definition. The last two items (circular strategy and monitoring) should not be included because of low robustness

# Finland

**1. Institution**

Finnish Environment Institute Syke / Statistics Finland

**2. Policy background**

**a. Short description of national CE-policy and targets**

**b. Link between policy and monitoring**

The Finnish roadmap for circular economy (Suomen itsenäisyyden juhlarahasto Sitra, 2016) and its updated version (Suomen itsenäisyyden juhlarahasto Sitra, 2020) have profiled Finland as a forerunner in promoting a circular economy. This is also demonstrated by the hosting of the World Circular Economy Forum.

In 2020, the Finnish Government launched a Strategic Programme to Promote a Circular Economy. This led to a Government resolution stating targets, monitoring, and actions to reach the targets in order to reach the vision of "*Finland in 2035: Our economic success is founded on a carbon-neutral circular economy society*" (https://ym.fi/en/strategic-programme-to-promote-a-circular-economy). This strategy defined targets and indicators for monitoring a circular economy on a national level beyond the European circular economy monitoring framework for the first time in Finland.

### Vision and objectives of the programme

The vision of the Circular Economy Programme is "Finland in 2035: Our economic success is founded on a carbon-neutral circular economy society":

- sustainable products and services are mainstream of the economy and the sharing economy is part of our everyday lives;
- our choices are future-proof and they strengthen our fair welfare society;
- more for less: the use of natural resources is sustainable and materials remain in circulation longer and more safely;
- the breakthrough of a circular economy has been achieved through innovations, digital solutions, smart regulation, and responsible investors, businesses and consumers;
- with a circular economy, Finland is a strong player in the global arena and a provider of sustainable solutions on the international market.

Making this vision true requires sustainable and efficient use of natural resources. This will be guided by the following steps and objectives:

- The consumption of non-renewable natural resources will decrease and the sustainable use of renewable natural resources may increase to the extent that the total consumption of primary raw materials in Finland in 2035 will not exceed what it was in 2015. Natural resources used to manufacture products for export are not covered by the objective*.
- The productivity of resources will double by 2035 from what it was in 2015.
- The circular material use rate (CMU) will double by 2035.

**The objective takes into account Finland's total consumption that includes the imported products needed to run our everyday lives and infrastructure and the consumption of domestic raw materials. Finland's total consumption includes raw material consumption in countries where the products are manufactured minus the raw materials used to manufacture Finnish products for export. The total consumption is shown by the Raw Material Consumption (RMC) indicator calculated by using the ENVIMAT tool developed by the University of Oulu and Finnish Environment Institute.*

The indicators listed in the strategic programme are based on official statistics or have been developed in research and development projects, such as the RMC indicator. Some new indicators will be developed during the coming years. Circular economy barometers for companies and consumers are planned to fill in the gaps in knowledge in the development of the circular economy outside the official statistics and material flow indicators.

When comparing to the indicator groups listed in the Bellagio principles on monitoring the circular economy, footprint indicators are missing. Socio-economic indicators and behavioural indicators, such as the barometer-based indicators, are currently being developed. Policy indicators are not included, either.

## 3. National monitoring framework

### EU MONITORING FRAMEWORK

In the table below, the Finnish monitoring results in the European circular economy monitoring framework can be found. Some of the monitoring, such as monitoring of food waste, is still under development.

**Table 8.** National-level circular economy indicators of the circular economy monitoring framework of the European Commission (European Commission 2018) and resulting values for Finland.

| Theme | Indicator Type | Indicator | Results for Finland (most recent value, if data available) |
|---|---|---|---|
| Production and consumption | 1. EU self-sufficiency for raw materials | | N/A |
| | 2. Green public procurement | | N/A |
| | 3. Waste generation | Generation of municipal waste per capita | 551 kg, annual data 2014–2018 |
| | | Generation of waste excluding major mineral waste per GDP unit | 73kg/EUR 1,000, semi-annual data 2008–2016 |
| | | Generation of waste excluding major mineral wastes per domestic material consumption | 8.2%, semi-annual data 2008–2016 |
| | 4. Food waste | | N/A |
| Waste management | 5. Recycling rates | Recycling rate of municipal waste | 42.3%, annual data 2014–2018 |
| | | Recycling rate of all waste excluding major mineral waste | 37%, semi-annual data 2010–2016 |
| | 6. Recycling / recovery for specific waste streams | Recycling rate of overall packaging | 65.2%, annual data 2013–2017 |
| | | Recycling rate of plastic packaging | 26.5%, annual data 2013–2017 |
| | | Recycling rate of wooden packaging | 14.5%, annual data 2013–2017 |
| | | Recycling rate of e-waste | 48.2%, annual data 2013–2017 |
| | | Recycling rate of biowaste | 72%, annual data 2013–2017 |
| | | Recovery rate of construction and demolition waste | 87%, semi-annual data, 2010–2016 |
| Secondary raw materials | 7. Contribution of recycled materials to raw materials demand | End-of-Life recycling input rates (EOL-RIR) | N/A |
| | | Circular material use rate (CMU) | 2.2%, annual data 2013–2017<br>7%, Finnish data on 2018 (Lesonen & Pirtonen 2020) |
| | 8. Trade in recyclable raw materials | Imports from non-EU countries | 28,449, annual data 2015–2019 |
| | | Exports to non-EU countries | 304,599, annual data 2015–2019 |
| | | Intra EU trade | 139,656, annual data 2015–2019 |
| Competitiveness and innovation | 9. Private investments, jobs and gross value added | Gross investment in tangible goods | 0.08% of GDP at current prices, annual data 2014–2017 |
| | | Persons employed | 1.58% of total employment, annual data 2014–2017 |
| | | Value added at factor cost | 0.88% of GDP at current prices, annual data 2014–2017 |
| | 10. Patents | Number of patents related to recycling and secondary raw materials | 16.46, annual data 2011–2015 |

## FINNISH STRATEGIC PROGRAMME TO PROMOTE A CIRCULAR ECONOMY

The first national monitoring framework for circular economy in Finland was presented in the monitoring of the Strategic Programme to Promote Circular Economy in 2021. The soon to be established steering group for the Strategic programme to promote circular economy, which will report to the Ministerial Working Group on Climate and Energy Policy, will be responsible for and co-ordinate the implementation of the programme.

Most of the indicators listed in the programme are based on official statistics, but some are more experimental indicators developed in the research. For an example, circular economy business indicators have been developed by Statistics Finland under a project *Circwaste – Towards Circular Economy in Finland* that has been funded by EU LIFE IP programme. RMC methodology in Finland is based on a collaboration project *SURE* carried out by Thule Institute in University of Oulu, Finnish Environment Institute SYKE and Geological Survey of Finland GTK (Mäenpää, ym., 2017).

The monitoring of the Circular Economy Programme also sets new data requirements. Development is needed for the monitoring of RMC, CMU, circular economy business, and the indicators from

business and consumer barometers. Funding has been granted by the programme to support development. It has also been noted that a new kind of monitoring is needed to better monitor the transition to a circular economy.

*Table 2. Indicators for the Finnish Circular Economy Programme (Ministry of the Environment, 2021).*

| Indicator | Data Source |
|---|---|
| Domestic material consumption (DMC) | Eurostat/Statistics Finland |
| Material input required for domestic end-use material-specifically (RMC) | Statistics Finland & Syke |
| Resource profitability (GDP/RMC) | Statistics Finland & Syke |
| Circular material use rate CMU | Statistics Finland |
| Turnover of circular economy sectors and number of enterprises | Statistics Finland |
| Eco-innovations | Eurostat/Statistics Finland |
| Innovative public procurements | Eurostat/Statistics Finland |
| Municipal solid waste, packaging waste and construction waste: amounts and recycling rates | Statistics Finland, Syke & Pirkanmaa Centre for the Economic Development, Transport and the Environment |
| Circular Economy Barometer: A survey and interview-based study for companies and consumers on attitudes and operating models that support the circular economy (commissioned survey for example, every four years, the first one to be carried out in 2023) | (to be determined) |

**4. Description/definition/scope of circular economy**

- **a. Short description of general definition and/or used scope when looking at CE**
- **b. Included circularity elements/strategies**
  - **i. Or: what are criteria for selecting sectors/activities/firms/etc as being circular**

### Scope of the Circular Economy Business Indicators

The current indicators aim to measure the scope and development of circular economy business in Finland. Most of the indicators are based on data that is already collected for statistical purposes.

- Circular economy is a system-level change that requires innovation and investments. Therefore, design has been considered as a requirement for circular economy transition.
- Circular economy aims to minimise the use of virgin materials and promote the use of recycled materials instead. Planning of material extraction is required to achieve the aim of minimised virgin material use. Extended recycling and circulation of materials saves resources and lowers greenhouse gas emissions.
- Production is considered important within the indicators as the circular economy aims for more sustainable products and services.
- Although logistics does not yet have a set indicator, the current consideration of circular economy business in Finland does think that logistics holds an essential role in the circular economy.
- Consumers and consumption behaviour have an essential role in the circular economy transition. The current indicators aim to measure consumption from a consumers' point of view.

- The circular economy aims to sustain the value of materials and products as long as possible. This aims also to prevent the production of waste. Therefore, also waste data are considered in the set of indicators.
- However, the energy sector is mainly excluded in the set of indicators.

### Scope of the Monitoring in the Finnish Strategic Programme to Promote Circular Economy

Circular economy has been defined in the Finnish Circular Economy Programme in the following way.:

"*In a circular economy, materials are utilized efficiently and sustainably, and they remain in circulation for a long time and safely. Products are also shared, leased, repaired and recycled. Servicification is part of the circular economy, for example, when services replace the ownership of products by paying for use or result.*

*The circular economy is a new operating method for the economy that produces economic well-being within the limits of the planet's carrying capacity. It utilises digitalisation efficiently and will renew the structures and operating models of society. The circular economy is a means for reducing the use of natural resources.*" (Ministry of the Environment 2021, https://ym.fi/en/strategic-programme-to-promote-a-circular-economy)

The monitoring aims at a comprehensive monitoring of the national transition to a circular economy, however, it is noted that development in the monitoring is still required.

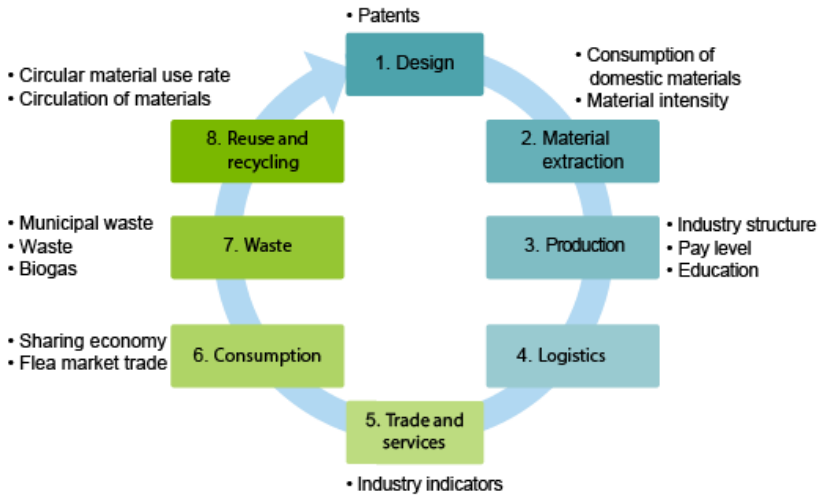
## 5. Discussion of most relevant (socio-economic) indicators (for our study)

### Circular Economy Business Indicators by Statistics Finland

The set of circular economy indicators consists of 15 indicators grouped under eight themes. The themes include: design, material extraction, production, logistics, trade and services, consumption, waste, and reuse and recycling.

Overall, these indicators are mostly RACER-compliant as they are retrieved from Official National Statistics by Statistics Finland. They can be found from open statistical databases. Some indicators, such as the indicator on flee market trade, are only experimental statistics which may not be regularly updated.

All the circular economy indicators by Statistics Finland and their descriptions are described in English here: https://www.stat.fi/tup/kiertotalous/kiertotalousliiketoiminnan-indikaattorit_en.html.




The indicators aim to acknowledge circular economy business activities from an array of perspectives. The indicators do not hold equal value, nor should they be compared with each other. Instead, the indicators aim to provide a holistic picture that consists of indicators that are complementary to each other. The indicators are combined from existing data and are therefore able to present information from past years. Most of the 15 indicators cover the years from 2013 to 2018 and will be updated.

The main challenge related to these indicators is that they all rely on the current statistics and statistical classification of sectors. The classification considers mostly environmental and waste management sectors, whereas the circular economy activities in other sectors are not regarded.

In the following chapters, the most relevant circular business indicators are discussed in more detail.

**Design – patents**

Relevance

The design has a significant role in the circular economy but is hard to measure. Registered patents that can be classified as circular economy-related are used as indicators for design.

Data and methods

Data is collected from Eurostat's database and the Finnish Patent and Registration office's public Espacenet database.

Benefits

Information about patents is readily available.

Challenges

Patents are not the best way to measure circular economy-related design and innovation.

**Production - number, turnover and personnel of circular economy establishments, circular economy business activity by region, pay level in circular economy industries, and persons employed in circular economy industries by level of education**

Relevance

An important part of circular economy is to minimize raw material use and transfer towards sustainable production and services. Therefore, production activity indicators aim to measure how well the circular economy is achieved within organizations.

Data and methods

The subject companies are established enterprises identified to belong to circular economy industries. Data for number, turnover and personnel of circular economy establishments and circular economy business activity by region indicator is collected from Statistics Finland's structural business and financial statement statistics. Moreover, the data for the indicator of pay level in circular economy industries are found from Statistics Finland's structure of earnings statistics. Lastly, the data for the indicator of persons employed in circular economy industries by the level of education is gained from Statistics of Finland's statistics on the transition from school to further education and work.

Benefits

The currently present statistics and classifications are a good starting point for measuring circular economy activities within the economy.

Challenges

It is still challenging to gain a comprehensive understanding of all the circular economy-related activities taking place within the economy.

**Trade and services – share of service industries**

Relevance

In a circular economy, it is essential to transfer towards consuming services instead of products. The share of service industries indicator can monitor the change.

Data and methods

The indicator can be measured by considering the share turnover from service industries within the entire economy. The indicator has been produced from Statistics Finland's Enterprise Structure and Financial Statements Statistics. The service sectors are classified as TOL2008 categories from transport and storage to other service activities (H-S, excluding category K financial and insurance activities).

Benefits

Challenges

**Consumption – sharing economy, flea market trade, and flea market trade by region**

Relevance

The consumption activity focuses on measuring the circular economy from consumers perspective as consumers have an important role in circular economy implementation. Therefore, two indicators for consumption are sharing economy and flea market trade.

Data and methods

The data for sharing economy indicator is collected from Statistics Finland's experimental statistics Peer and sharing economy phenomena in households. While the data for flea market trade and flea market trade by region comes from Statistics Finland's Enterprise Structure and Financial Statements Statistics and data of companies' locations.

Benefits

The data gained for the sharing economy indicator includes a lot of interesting information about the average annual purchases and sales of households by different types of flea markets in 2019, turnover of companies operating in the flea market industries and the number of locations and personnel.

Challenges

There are some challenges with the companies' location data used for the indicators. The indicator includes all locations reported to operate in the industries mentioned above. The indicator, therefore, also covers companies in which only part of the activity takes place in the industries in question. Of the locations, only those with a turnover and number of employees greater than 0 are included. The indicator does not include data from Åland for data protection reasons.

**Circular economy barometers for businesses and consumers**

Relevance

Barometers can provide further information on both the transition into a CE and its impacts perceived by companies and individuals.

Data and methods

The barometers will be carried out for the first time in 2023. The use of the data from the barometers will be determined later. Data from the barometers can be used to monitor trends if the surveys will be regularly repeated.

Benefits

Barometers can provide data outside the statistics. This can show the people's and companies' views on the circular transition well as their readiness to take up circular activities. The trends in the barometer results may show signs of the transition before the impact is visible in national material balances.

Challenges

Interpreting survey results in determining the transition to a CE is hindered by cognitive dissonance. In addition, it is possible that the people or companies most active in the CE are more numerously represented in the ones answering the questionnaires.

**Eco-innovations**

Relevance

The monitoring of eco-innovation is based on Eurostat's Eco-innovation scoreboard (https://green-business.ec.europa.eu/eco-innovation_en).

Data and methods

EU-wide data collection and monitoring of the Eco-Innovation Index.

Benefits

Robust and comparable index on eco-innovation on a European level.

Challenges

Eco-innovation is not limited to circular innovation.

**Innovative public procurements**

Relevance

A knowledge centre for innovative public procurement in Finland (KEINO) has carried out a survey on organisations' strategies on public procurements (https://www.hankintakeino.fi/sites/default/files/media/file/KEINO-hankintojen-strat-johtamisen-tilan-kartoitus-2021.pdf). In the survey, there are questions on economic, social and ecological sustainability, including taking material efficiency into account in the public procurement strategies. The survey data can be used to monitor the development in the survey answers.

Data and methods

Data from surveys can be used to monitor the trends if the surveys will be regularly repeated.

Benefits

Surveys can provide new insight on the development of innovative public procurements.

Challenges

The survey does not provide quantitative values for circular public procurements.

## 6. Upcoming and future developments

According to the Finnish Strategic programme to promote circular economy, there is an urgent need to develop monitoring for the circular economy nationally. Some indicators suggested in the programme require production of new data (e.g., RMC and barometers for companies and consumers). It is also stated in the Programme that monitoring of the circular economy needs to be developed further beyond the set of indicators currently presented in the programme.

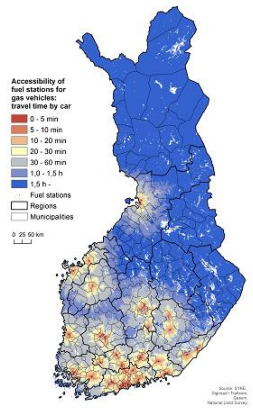
### EXPERIMENTAL INDICATORS DEVELOPED IN THE RESEARCH

More experimental indicators trying to capture the inner circles of the circular economy have been developed for instance in the project *Circwaste – Towards a circular economy in Finland*. A particular focus there has been on the social indicators for the circular economy. (Myllymaa, ym., 2021) All circular economy indicators developed in Circwaste are updated on the public website: https://materiaalitkiertoon.fi/en-US/Monitoring/.

**Accessibility of fuel stations and charging points for methane gas and electric vehicles**

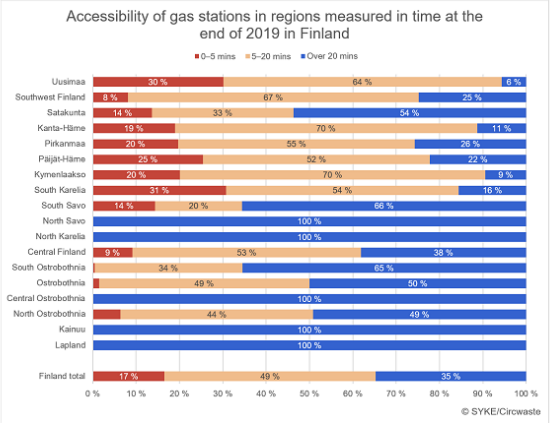
Accessibility of the fuel stations for methane gas (biogas) personal vehicles monitors the ease of access to the use of alternative vehicle fuel, derived mainly from waste materials (https://www.materiaalitkiertoon.fi/en-US/Monitoring/Gas_and_Electric_Vehicles). Also, the accessibility of electric car charging points is monitored. The accessibility data is available on regional basis as well as detailed geographic data, annually updated in Syke's geographical database Liiteri (https://liiteri.ymparisto.fi/).

**The accessibility of fuel stations for gas vehicles as the length of drive**



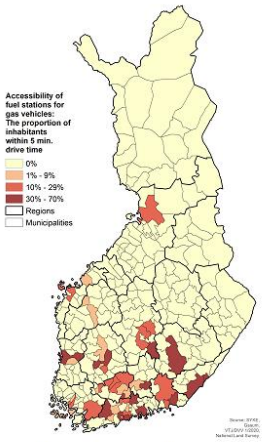

Fuel stations for gas vehicles are concentrated in Southern Finland at the end of 2019. In the Norther and Eastern parts of the country, there are long drives to reach the stations. Download large map (png). © SYKE/Circwaste, 2020

**The accessibility of the nearest fuel station for gas vehicles as time distance from home with a car**



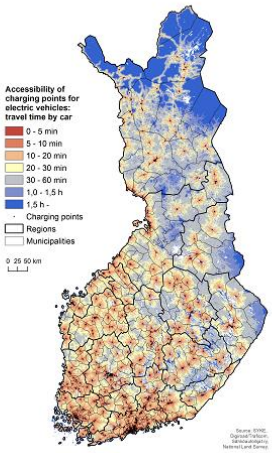

There were significant differences in the accessibility of gas fuel stations between regions at the end of 2019 in Finland. In Kainuu, Central Ostrobothnia, Lapland, North Karelia and North Savo regions, the entire population lived far away from the gas fuel stations. Download large graph (png). © SYKE/Circwaste, 2020

**The accessibility of fuel stations for gas vehicles measured as the share of population living within a five-minute drive in each municipality**



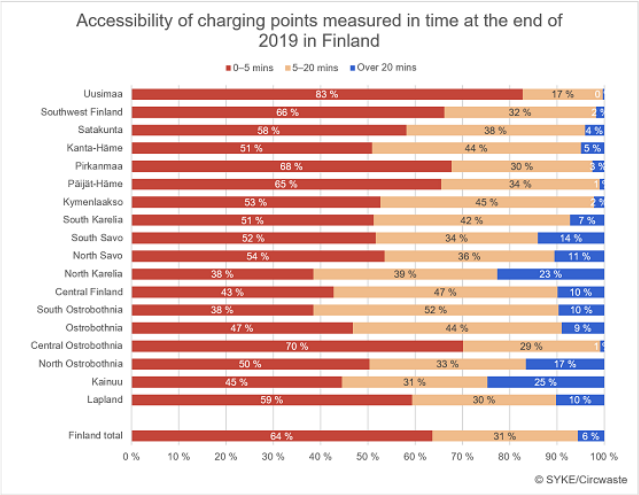

Using biogas in personal cars is easiest in bigger cities as well as in the Southern parts of the country at the end of 2019. In Northern Finland, the only fuel station for gas vehicles is in the city of Oulu. Download large map (png). © SYKE/Circwaste, 2020

**The accessibility of charging points for electric cars measured as the length of drive**



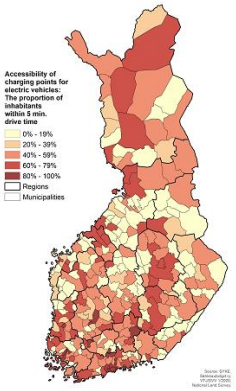

The charging points for electric vehicles are accessible throughout the country, yet most readily in Southern and Southwestern Finland at the end of 2019. Download large map (png). © SYKE/Circwaste, 2020

**The accessibility of the nearest charging point for electric vehicles as time distance from home with a car in each region**




The differences between Finnish regions in the accessibility of electric car charging points were smaller than the differences in accessing the gas fuel stations. From the population, 75–100 % lived at the maximum of a 20-minute drive away from the charging points. Download large graph (png). © SYKE/Circwaste, 2020

**The accessibility of charging points for electric vehicles measured as the share of population living within a five-minute drive in each municipality**



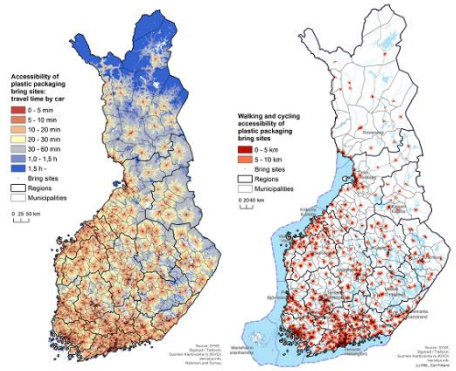

The accessibility of charging points for electric vehicles is not equal within the regions in 2019. The charging points are least accessible to people living in towns further away from centres of growth, particularly in the municipalities in Eastern and Northern Finland as well as in Central Finland, Ostrobothnia, and Southwest Finland. Download large map (png). © SYKE/Circwaste, 2020

The ease of access to collection points is related to more active sorting behaviour. The pilot indicators include a set of accessibility indicators that cover the collection points for plastic packaging waste, waste electrical and electronic equipment as well as reusable textiles (https://www.materiaalitkiertoon.fi/en-US/Monitoring/Accessibility_of_bring_sites).

## Accessibility of bring sites for plastic packaging waste, reusable textiles, and waste electrical and electronic equipment (WEEE)

**Plastic packaging waste bring sites**

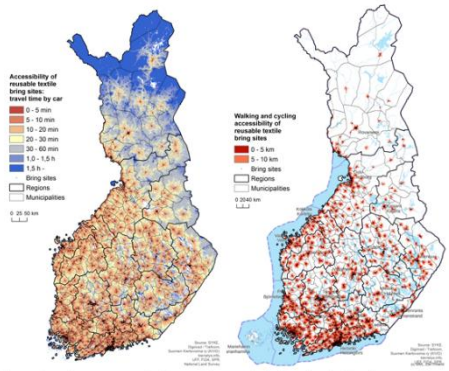
**Accessibility of plastic waste packaging bring sites: length of driving distance and accessibility on foot or bike in 2019**



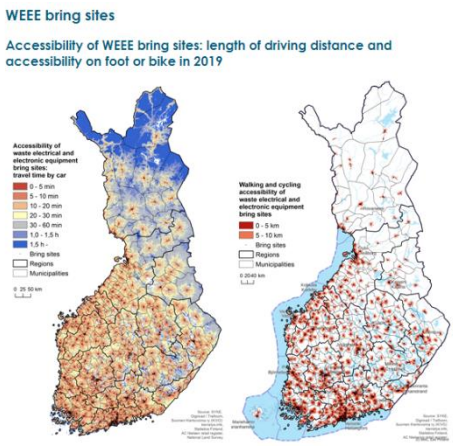

In the end of 2019, there were bring sites for plastic packaging waste in almost all Finnish municipalities. In the Northern and Eastern Finland the points are accessible only with a car. © SYKE/Circwaste 2020

**Reusable textile bring sites**

**Accessibility of textile bring sites: length of driving distance and accessibility on foot or bike in 2019**



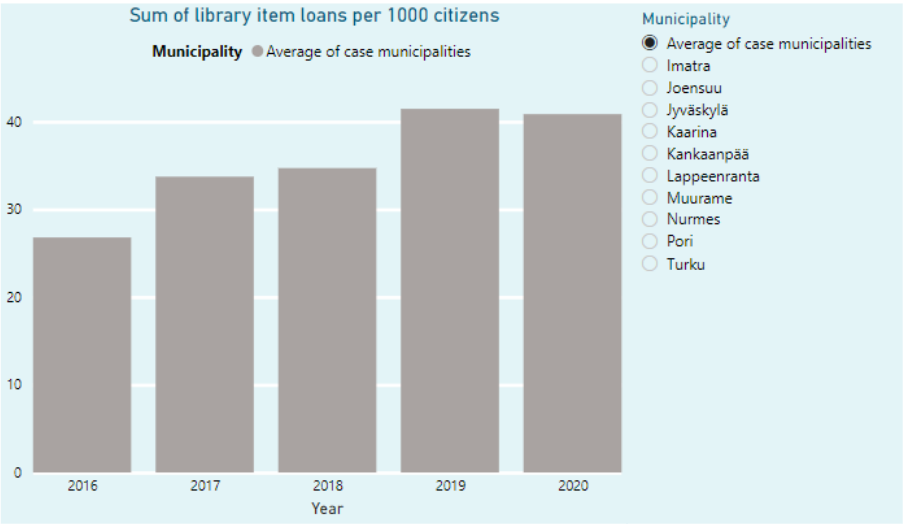

There is a dense network of reusable textile bring sites in Southern and Southwestern Finland and many municipalities have bring sites provided by different operators. © SYKE/Circwaste 2020




The WEEE bring sites and retail stores taking back discarded electric appliances were usually situated in population centers in the end of 2019.
© SYKE/Circwaste 2020

**Sharing economy**

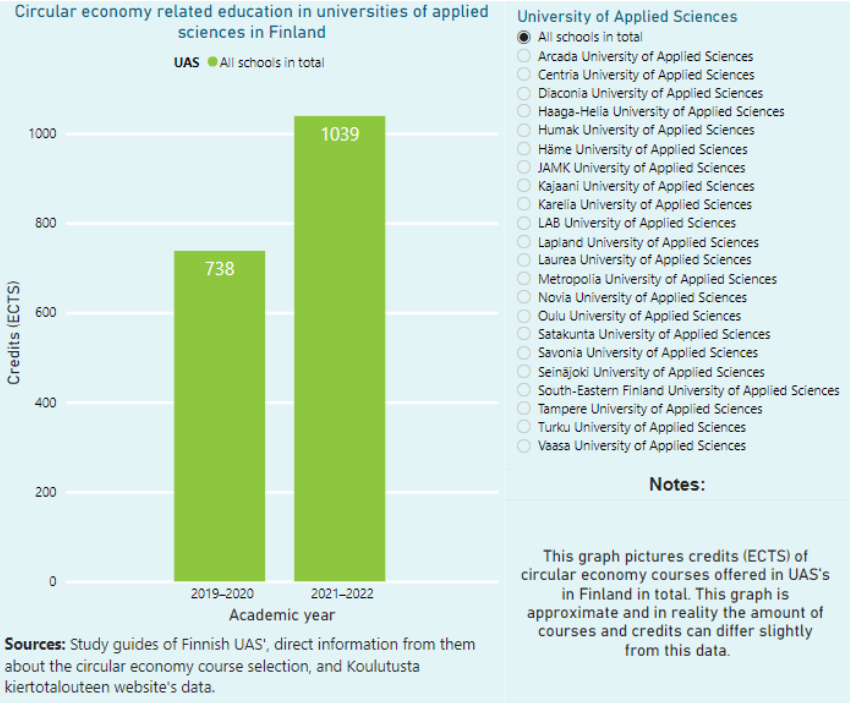
The indicators for sharing economy include the monitoring of the availability (number and use) of city bikes in Finnish municipalities as well as the availability and use of "non-traditional" library items (other items than books, CDs, and DVDs) loaned out from public libraries in Finland (https://www.materiaalitkiertoon.fi/en-US/Monitoring/Sharing_economy). The data collected on sharing economy has been piloted in 2020 and will be updated at least until 2023 in SYKE.




**Education**

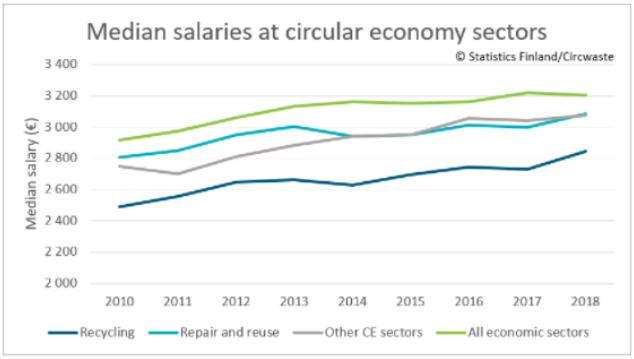
Education in circular economy has been noted as a key action in the Finnish Circular Economy Programme. However, data on still scarce. In Circwaste, the circular economy education has been monitored in the Finnish Universities of Applied Sciences (https://www.materiaalitkiertoon.fi/en-US/Monitoring/Education). Circular economy ECTS course credits have been selected so that all the courses whose name or description includes the term circular economy either in Finnish, Swedish, or English, have been included in the monitoring. One of the Universities of Applied Sciences has taken up monitoring and has built a new website for it (https://koulutustakiertotalouteen.turkuamk.fi/in-english/). It is hence likely that the monitoring will be continued even after the project (2023).

## Circular economy related education in universities of applied sciences in Finland

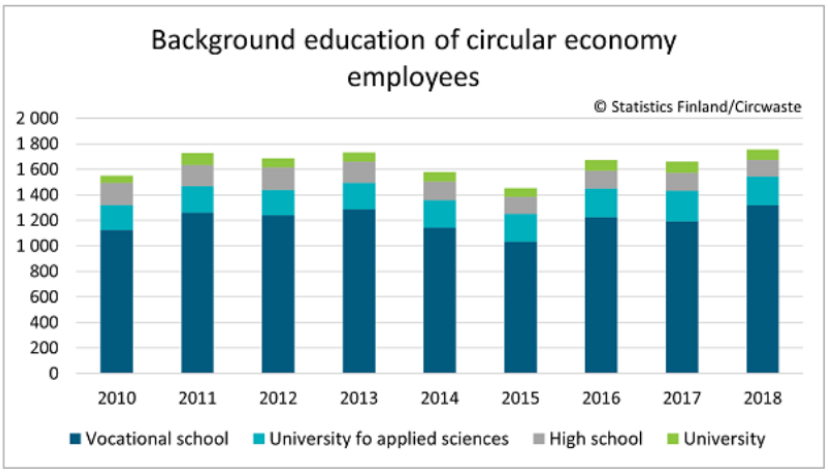



### Employment

Circular economy aims at increasing the wellbeing of people through economic growth and creation of new jobs. The overall numbers of employment, however, do not talk much about the quality of the employment. The employment indicators measure how the circular economy employment opportunities are socially distributed. The indicators measure the average income in circular economy sector jobs, division of jobs between different background education categories and employment opportunities of vulnerable groups (https://www.materiaalitkiertoon.fi/en-US/Monitoring/Employment). Data for the income and background education in circular economy sector jobs is produced by Statistics Finland. The indicators are produced only on national level.




The median salaries in circular economy sectors are lower than the average income in Finland. © Statistics Finland/Circwaste




Data for vulnerable groups' employment is received from the Employment Service Statistics compiled by the Ministry of Economic Affairs and Employment. The indicator focuses on the employment of people as refuse sorters through work trials and wage subsidies in the different regions. People who work as refuse sorters work in tasks related to the take-back, collection, sorting and handling of paper, cardboard, metal, glass, and plastic. The work can also be related to the receiving or selling used things, furniture, clothes, and equipment. Work trials and wage subsidies, in turn, are public labour services targeted especially at vulnerable groups such as the uneducated youth, immigrants, disabled, and long-term unemployed.

Out of the over 1 100 different job titles, refuse sorter is of the most common occupation for work trials and wage subsidised work. In 2019 3.6% of all work trials and 3.9% of wage subsidised work periods were carried out as refuse sorters nationally. In some of the regions the percentages are even higher. The importance of recycling work has increased during the past years in almost all the regions. This suggests that the importance of CE related work is increasing for providing employment opportunities for the vulnerable groups with limited professional skills.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# France

## 1. Institution

ADEME

## 2. Policy background

### a. *Short description of national CE-policy and targets*

France had firmly introduced the Circular Economy into its regulation set via the **Law on Energy Transition and Green Growth (LTECV)** in 2015**.** It aims at moving from linear economy to a circular one through an integrated approach between the waste management and the climate issues.

In 2016, selective sorting of 5 waste flows becomes compulsory for the economic actors: paper/ cardboard, metal, plastics, glass and wood.

In 2018, **Circular Economy Roadmap (FREC)** paves the way towards certain objectives of ONU 2030 Agenda, particularly the one on sustainable production and consumption. It contains 50 measures.

Early 2020 French government adopted the **Law relative to the fighting against waste and to the circular economy (AGEC)**. Its goal is to implement the Circular Economy Roadmap and to transpose the EU Directives on circular economy published in 2018. It aims at 5 main domains: quit the disposable plastics, better inform the consumers, fight against waste and for the inclusive reuse, act against the planned obsolescence and produce in a more sustainable way.

The main objectives of the current measures are:

- Reduce the consumption of resources by 30% by 2030 compared to 2010
- Progress towards zero disposable plastics by 2040
- Reduce GHG emissions : save additional 8 million tons of CO2 equivalent each year through the plastics recycling
- Create over 300 000 additional jobs including new jobs
- Recycle and recover 55% of non-dangerous waste by 2020 and 65% by 2025
- Reduce by 50% the quantity of landfilled non-dangerous waste by 2025 compared to 2010

The implementation of these orientations is supported throughout the regional planning and development scheme.

### a. *Link between policy and monitoring*

There are several sets of indicators used for the ecological transition monitoring. Some of them include the circular economy indicators such as the set of 13 indicators for the ecological state of play of local projects proposed in the framework of the ecological transition fund.

Regarding the specific circular economy monitoring sets there are:

- A national set of 11 indicators covering the seven pillars of circular economy and as well as four other indicators of circularity. First, it was published in 2017 with a set of 10 indicators, and then it was updated in 2021 with the set of 11.
- At the local level: A set of 32 indicators designed for the local level (cities, municipalities and intercommunal level) proposed by ADEME in the framework of its Circular Economy Action Catalogue. This set of indicators is designed according to the Bellagio Principles to

allow the common set for the circular economy monitoring by the municipalities. It might be considered relevant in the framework of the project.

## 3. National monitoring framework

**The 11 national Indicators:**

- 6 indicators on the activity of economic actors in extraction/exploitation and sustainable procurement, eco-design, industrial and territorial ecology and service economy
  - DMC
  - Resource efficiency (DMC/GDP)
  - RMC
  - Number of EU Ecolabel licenses
  - Number of industrial symbiosis initiatives
  - Number of public and private organizations being advised in the service economy projects
- 2 indicators on the consumer behaviour (responsible consumption, longer life)
  - Food waste
  - Households repair expenditure (excluding vehicles)
- 2 indicators on the recycling
  - Landfilled waste
  - Import of recycled materials
- 1 indicator on employment
  - Reuse, repair, waste collection and materials recovery

**The 32 indicators of Circular Economy action catalogue by ADEME**:

- material and waste flows (5)
- environmental impacts and footprints (10) : indicators on resources (food, water, soil, energy)
- economic and social impacts (4)
- policy, process and behaviour indicators (13)

## 4. Description/definition/scope of circular economy

Circular economy is about preserving natural resources by optimizing its use in the economy. It means recover materials from waste, produce in a resource efficient way and especially question our consumption and stop wasting (food and all other resources).

The French circular economy approach is based on the seven pillars of CE : Sustainable extraction/manufacturing and supply chain, Eco-design od products and processes, Industrial Symbiosis, Service Economy, Extension of product lifespan, Responsible consumption, Recycling.

The business models change is in the very core of the circular economy definition.

## 5. Discussion of most relevant (socio-economic) indicators (for our study)

The scope of the socio-economic indicators certainly covers economy indicators. It might also cover education and consumer-oriented indicators as skills and behaviour aspects related to circular economy.

| | | |
|---|---|---|
| **Households repair expenditure (excluding vehicles)** | National CE indicator | Consumer |

The indicator follows the main category of goods: domestic IT equipment, clothing and shoes, furniture, house appliances, other culture and leisure goods. This indicator is to compare with some associated data, for example, the new products expenditure without the same category or the number of repair cafés. This indicator is useful to follow-up the impact of the product environmental sustainability index.

The indicator is RACER-compliant.

| | | |
|---|---|---|
| **Employment in repair and material recycling (number of jobs)** | National CE indicator | Economy |

The indicator includes data repair in both households (including vehicles) and industry, waste collection and materials recovery and reuse as well as waste and debris wholesale. It measures jobs with a low risk of abroad relocation and highly relevant for the professional integration and inclusive society.

The challenge for this indicator is mainly to include the part of jobs in the entities with a mix of activities. In such entities the repair, reuse or recover part are introduced as an additional service or new business model.

The indicator is RACER-compliant.

| | | |
|---|---|---|
| **Number of EU ecolabel licenses active in the French companies (number)** | National CE indicator | Economy |

The follow up separates the product and touristic licenses.

The indicator is globally RACER-compliant. Recently its follow-up was confused by the reorganization of the EU ecolabel categories, which led to an artificial decrease in the number.

| | | |
|---|---|---|
| **Employment in Green economy (number of jobs)** | National level | Economy |

The scope of this indicator is larger than Circular Economy as it represents the 'Green Economy'. The methodology is based on the national observatory for green jobs ONEMEV approach[6]. Certain NACE and some national reference statistics codes can be isolated for the circular economy. The regionalization of the data set is a big challenge with work in progress.

The indicator is not RACER-compliant on the national level, but not on the local level.

| | | |
|---|---|---|
| **Annual waste management expenditure for municipalities (€)** | Local indicators for municipalities | Economy |

The goal of this indicator is to motivate the municipality to optimize its waste management system as well as reduce the waste flow. There is a robust national methodology provided. However, not all the municipalities have calculated there expenditure yet.

The indicator is almost RACER-compliant (the acceptability is to improve).

[6] (FR) https://www.notre-environnement.gouv.fr/rapport-sur-l-etat-de-l-environnement/themes-ree/economie-verte/emplois/les-emplois/article/les-emplois-dans-les-activites-de-l-economie-verte

| | | |
|---|---|---|
| **Private R&D and innovation investment mobilized with 1€ of public investment (€)** | Local indicators for municipalities | Economy |

This indicator is innovative in France. It addresses mainly big municipalities with a developed innovation policy. It is not compulsory, but the goal is to stress the circular economy initiatives.

The indicator is not RACER-compliant.

| | | |
|---|---|---|
| **Part of businesses contributing to the "Extension of product lifespan" in the total number of businesses of the territory (%)** | Local indicators for municipalities | Economy |

The methodology is based on the national observatory for green jobs ONEMEV approach. The regionalization of the data set is a big challenge with work in progress.

The indicator is not RACER-compliant at the local level.

| | | |
|---|---|---|
| **Part of businesses contributing to the reuse in the total number of businesses of the territory (%)** | Local indicators for municipalities | Economy |

The methodology is based on the national reuse professionals available through the SINOE database (national wastes information system – ADEME). The regionalization of the data set is a big challenge with work in progress.

The indicator is not RACER-compliant at the local level.

## 6. Upcoming/future developments

The main challenges are:

- Develop regional and local datasets to follow up the indicators compatible with a national framework.
- Improve the framework of the Food waste and Employment indicator by extending the available dataset.

# Netherlands

## 1. Institution

PBL

## 2. Policy background

Dutch policymakers started to focus on a circular economy for the first time in the programme **From Waste to Resources**. The programme strongly emphasised waste stream management, with measures such as promoting recycling and halving the amount of incinerated or landfilled Dutch waste by 2023.

**Nederland Circulair 2050** is the first government-wide Dutch programme for the circular economy. It formulates the ambition to achieve a fully circular economy in the Netherlands by 2050. The programme covers all the material resources in the Netherlands but has a specific target for abiotic resources (minerals, metals and fossil fuels): to halve the use of primary abiotic resources by 2030. This comes on top of existing targets for waste, such as the cap on the volume of waste and the target for separation of household waste.

The government-wide programme describes five priority transition themes and five interventions that form the core of the circular economy policy in the Netherlands. The five transition themes 'are important to the Dutch economy, exert high environmental pressure, already count on a great deal of social energy for the transition towards a circular economy, and are in line with the priorities of the European Commission' (IenM and EZ, 2016). These themes are: Biomass and Food, Plastics, the Manufacturing Industry, Construction, and Consumer Goods. The five interventions are coherent bundles of policy instruments labelled as: smart market incentives, stimulating legislation and regulation, financing, knowledge and innovation, and international cooperation.

The government wants to take up the challenge to realise a circular economy explicitly with other parties from society. The 2017 **Raw Materials Agreement** has been signed by more than 400 societal stakeholders, including the employers' organisation VNO-NCW, the SME organisation MKB, the FNV trade union, provincial authorities, municipalities and water boards, NGOs, and several large enterprises. Grouped into five transition teams, representatives of these parties further worked up the ambitions for the individual transition themes into **five transition agendas**, which were presented in early 2018.

In its response to the transition agendas, the government has labelled ten of the overarching topics identified by the transition teams as priorities and indicated what its plans and highest concerns are for accelerating the transition towards a circular economy together with the societal stakeholders involved. The ten resulting clusters of policy instruments are: (1) producer responsibility, (2) legislation and regulation, (3) circular design, (4) circular procurement, (5) market incentives, (6) financing instruments, (7) monitoring, knowledge and innovation, (8) behaviour and communication, education and labour market, (9) international commitment and (10) the business support organisation Versnellingshuis.

These crosscutting themes have been worked out in greater detail in the **2019–2023 implementation programme**, which also contains actions and projects of the transition teams and is updated yearly. The programme aims to make the step from planning to actual implementation. The transition agendas and their elaboration into an implementation programme, play an important role in the approach of Dutch circular economy policy.

*Link between policy and monitoring*

The Dutch government has stressed the importance of monitoring the CE-transition for several years. In 2018, the Dutch Cabinet explicitly requested an integral report on the circular economy (ICER). It did so from the conviction that the transition towards a circular economy requires changes throughout society. To enable a more radically efficient use of material resources in the long term, production techniques need to change, requiring new product designs and production methods, as well as different legislation and regulations, tax reforms and new ways of consuming. These coherent and fundamental changes are what the national government refers to as 'the transition towards a circular economy'.

The integral circular economy reports (ICER) are to provide the knowledge base for government policy to achieve the transition towards a circular economy. PBL has been asked 'to further develop the monitoring system, together with other knowledge institutes, to achieve a fully fledged measurement and control system. The purpose of this system is to monitor government policy and the efforts of parties in society, and to provide insight into the progress made on achieving the circular objectives, to determine whether policy adjustments are necessary' (IenW, 2019). In order to fulfil this role of analyst and manager of knowledge development, PBL will be publishing an integral report on the circular economy (ICER) every two years, with the help of other knowledge institutes.

## 3. National monitoring framework

The framework can be considered with regard to two aspects: (1) resource use and effects, (2) transition process indicators.

### Resource use and effects:

Overview of material resource use and its impact

| Indicator | Magnitude | | | Trend | | Compared with EU-27 |
|---|---|---|---|---|---|---|
| | 2010 | 2016 | 2018 | 2010–2018 | 2016–2018 | per capita in 2018 |
| **Natural resources required** | | | | | | |
| Material resources for domestic use, DMC[1] (Mt) | 195 | 193 | 195 | 0% | 1% | -22% |
| Material resource footprint domestic use, RMC[2] (Mt)** | - | - | - | - | - | - |
| Resource efficiency (GDP in EUR/kilo DMC) | 3 | 4 | 4 | 12% | 5% | +125% |
| Material resources for the economy, DMI[3] (Mt) | 401 | 402 | 397 | -1% | -1% | +95% |
| Material resource footprint of the economy, RMI[4] (Mt) | 597 | 627 | 647 | 8% | 3% | +89% (2017) |
| Share bio-based resources (kilo/DMI, in %) | 24 | 25 | 26 | 8% | 5% | +5% |
| Total sustainable renewable material resources (kilo/DMI) | - | - | - | - | - | - |
| Share secondary materials, CMUR (kilo secondary/DMI, in %) | - | 13 | 14 | - | 6% | +167% (2017) |
| **Use phase** | | | | | | |
| Lifespan | - | - | - | - | - | - |
| Value retention | - | - | - | - | - | - |
| **Waste processing and recovering** | | | | | | |
| Dutch waste (Mt) | 60 | 60 | 61 | 2% | 2% | +44% (2016) |
| Share recycled waste in processed waste (recycled waste/waste, in %) | 81 (2012) | 79 (2012) | 80 | -1%* | +1% | +31% |
| Waste recycled in the Netherlands (Mt) | 54 (2012) | 52 | 53 | -1%* | 3% | +111% (2016) |
| Incinerated waste in the Netherlands (Mt) | 10 (2012) | 10 | 11 | 11%* | 6% | +74% (2016) |
| Landfilled waste in the Netherlands (Mt) | 2 | 3 | 3 | 51% | 14% | -81% (2016) |
| **Effects** | | | | | | |
| **Environmental impact** | | | | | | |
| National greenhouse gas emissions ($MtCO_2$ eq) | 214 | 195 | 188 | -12% | -4% | +33% |
| Greenhouse gas emission footprint of consumption ($MtCO_2$ eq) | 300 | 252 | 282 | -6% | 12% | +35% (2015) |
| Greenhouse gas emission footprint of production ($MtCO_2$ eq) | 462 | 432 | - | -7% (2016) | - | +54% (2015) |
| Emissions to air, water and soil, such as nitrogen and particulate matter | - | - | - | - | - | - |
| Land-use footprint of consumption (million ha) | 10 | - | 10 (2017) | 3% (2017) | - | -15% (2015) |
| Land-use footprint of production (million ha) | 11 | 12 (2015) | - | 9% (2015) | - | -28% (2015) |
| Water abstraction | - | - | - | - | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Water footprint consumption (km$^3$) | 52 (2008) | - | - | - | - | +21% (2008) |
| Biodiversity footprint of consumption (million MSA loss ha/year) | 19 | - | - | - | - | +1% (2010) |
| Biodiversity footprint of production (million MSA loss ha/year) | 20 | - | - | - | - | +2% (2010) |
| Toxicity | - | - | - | - | - | - |
| **Socio-economic impact** | | | | | | |
| Supply risks (indicator being developed) | - | - | - | - | - | - |
| Added value of circular activities (EUR billion) | 28 | 31 | 34 | 23% | 9% | - |
| Share circular activities (added value circular / GDP in %) | 4 | 4 | 4 | 1% | 0% | - |
| Circular employment (no. of circular jobs in FTEs) (*1,000) | 311 | 318 | 326 | 5% | 2% | - |
| Share circular employment (no. of jobs/total no. of jobs in %) | 4 | 4 | 4 | -2% | -2% | - |

Legend

Trends
- trend is moving in the right direction
- trend is moving in the wrong direction
- trend is stable; hardly any differences (up to 5%)

Compared with EU-27
- NL scores better than EU
- NL scores worse than EU
- hardly any differences (up to 5%)

Deviating years are provided between brackets

* 2012–2018, no data available for 2010
** RMC requires a new calculation
- No data available

[1] Domestic Material Consumption
[2] Raw Material Consumption
[3] Domestic Material input
[4] Raw Material Input

**Transition process:**

The monitoring framework for the transition process contains eight components that are crucial to the transition and are therefore also referred to as key processes. Each component is measured with one or more indicators. Furthermore, qualitative case studies complement the monitoring results. None of the indicators if fully RACER-compliant. Some will likely be replaced in the future by better alternatives, while others are close to being RACER-compliant. The indicators per key process are:

- entrepreneurship (experimenting and scaling up innovations);
  - nr and type of circular firms
  - nr and type of innovative circular firms
  - nr and type of start-ups
  - nr and type of innovation projects (RVO)
- developing knowledge;
  - nr and type of scientific publications
- exchanging knowledge;
  - nr of conferences on CE
- guiding the search process (by stating goals and solutions);
  - nr and type of actions
  - reflection on goals (qualitative)
- creating markets;
  - investments in CE through specific policy instrument
  - circular procurement
- mobilising resources;
  - share of government budget for CE
  - nr of study programmes
- counteracting resistance to change (by creating legitimacy and intensifying the pressure for change on the established system);

    - barriers in existing rules, norms and behaviours (qualitative)
    - consumer attitudes and behaviors
- and finally, coordinating the complex bundle of different change processes that exist in the transition.
    - Nr and type (intent, proposed, established) of policy instruments

## 4. Description/definition/scope of circular economy

A circular economy is, in essence, about the possibilities to organise material resource use in a significantly or radically more efficient way. It is crucial for dealing with several environmental issues like climate change, the plastic soup, the loss of biodiversity and land-use. Furthermore, it can be used to reduce supply risks.

The switch from the current economy to a circular economy requires a transition process, i.e. a long-term, disruptive change. A selection of R-strategies is used to determine the scope of a circular economy. These R-strategies can be summarized as focusing on narrowing the loop, slowing the loop and closing the loop. In addition, attention is given to circular design, new business models, institutional change and the substitution of primary abiotic materials with biomaterials or other materials with less environmental impacts.

## 5. Discussion of most relevant (socio-economic) indicators (for our study)

### Number and type of (innovative) circular firms/jobs

This indicator measures how many firms apply one or more of the R-strategies in practice. For each firm, details on company size, location, sector/SBI and highest applied R-strategy are collected. Data are obtained from (1) existing company statistics, (2) an extensive web crawl and (3) a detailed manual online search. Benefits are relevance and acceptance (policy makers and municipalities are very interested), and the possibility to provide interesting and compelling narratives. Challenges are related to determining which activities, SBIs, etc. can be considered circular, the fact that it is a binary indicator (there is no degree of circularity) and the false hits obtained in a web crawl.

### Number and type of CE innovation projects

This indicator measures how many innovation projects that receive subsidy from RVO.nl are aimed at the different R-strategies.

### Number of scientific publications (categorized by topic)

This indicator measures how many scientific publications explicitly deal with the circular economy (they contain the search term “*circular* *econom*” in the title, abstract or running text).

### Number and type of policy actions

This indicator shows how actions that have been formulated by the government and other involved parties (such as the transition teams) can be categorized by R-strategy.

### Circular procurement

There are several indicators related to circular procurement: how much did the government spend on circular procurement, the share of procurement with circularity requirements, the R-strategies that

receive the most encouragement through procurement, and the potential of circular measures versus the effects that have been realized by procurement.

**Consumer acceptance and behaviour**

These indicators measure if consumers buy or sell second-hand goods, and if they are open to borrowing, sharing, leasing, and buying recycled or refurbished products. Data are obtained via questionnaires.

# Sweden

**Policy background**

The most important policy process related to the circular economy in Sweden is the circularity strategy "Circular economy – Strategy for the transition in Sweden" published in 2020 https://www.regeringen.se/49096d/globalassets/regeringen/bilder/klimat--och-naringslivsdepartementet/klimat-och-miljo/cirkular-ekonomi---strategi-for-omstallningen-i-sverige (only available in Swedish)

"The transition to a circular economy is a tool to achieve national and international environmental and climate objectives, as well as the Sustainable Development Goals in the 2030 Agenda. As this is also the overall goal of the transition to a circular economy, progress will be tracked through a selection of the indicators in existing tracking systems for these goals and objectives. The Swedish environmental objectives system consists of one generational goal, sixteen environmental quality objectives and several milestone targets. The generational goal – to hand over to the next generation a society in which the major environmental problems have been solved, without increasing environmental and health problems outside Sweden's borders – is an overall goal for Swedish environmental policy and provides guidance for environmental work at all levels of society. Circular economy contributes to several of the 17 Global Goals for Sustainable Development in the 2030 Agenda. The Agenda's Goals cover all three dimensions of sustainable development: the economic, social, and environmental dimension".

The strategy identifies that a circular economy will be achieved through four focus areas (see below). For each of the focus areas, there is a list of the most relevant SDGs to be monitored (Figure X).

1. Sustainable production and product design
2. Sustainable ways of consuming and using materials, products and services
3. Non-toxic and circular material cycles
4. Innovation and circular business models (business sector and other actors)

***Figure X**. The four focus areas in the Swedish circular economy strategy cover: production and design, consumption, safe circulation of materials, as well as business.*

**Swedish national circular economy monitoring framework**

Monitoring of the circular economy in Sweden is directly connected to the Sustainable Development Goals (SDGs) from the UN Agenda 2030. The SDG targets that are relevant for circularity are selected in the Swedish circular economy strategy (Table X). The monitoring of the SDGs linked to the circular economy strategy is carried out along with the ongoing monitoring of the SDGs by Statistics Sweden.

***Table X.** The Sustainable Development Goals and their indicators related to the Swedish circular economy strategy.*

| Focus Area | SDG Target |
|---|---|
| 1 – Circular economy through sustainable production and product design | 3.9 By 2030, substantially reduce the **number of deaths and illnesses** from hazardous chemicals and air, water and soil pollution and contamination.<br>-> Mortality rate attributed to household and ambient air pollution<br>-> Mortality rate attributed to unsafe water, unsafe sanitation and the lack of hygiene.<br>-> Mortality rate attributed to unintentional poisoning<br>-> Air quality in or around the home |
| | 8.4 Improve progressively, through 2030, global **resource efficiency in consumption and production** and endeavour to **decouple economic growth from environmental degradation**, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.<br>-> Domestic Material Consumption (DMC)<br><br>9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased **resource-use efficiency** and greater adoption of clean and e**nvironmentally sound technologies** and industrial processes, with all countries taking action in accordance with their respective capabilities.<br>-> CO2 emissions per unit of value added<br>-> Number of workplaces, turnover and gainfully employed persons in the environmental sector in Sweden<br>-> Investments of industry in environmental protection per environmental area (SEKm)<br><br>12.2 By 2030, achieve the sustainable management and **efficient use of natural resources**.<br>-> Domestic Material Consumption (DMC) |
| 2 – Circular economy through sustainable ways of consuming and using materials, products and services | 8.4 Improve progressively, through 2030, global **resource efficiency in consumption and production** and endeavour to **decouple economic growth from environmental degradation**, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.<br>-> Domestic Material Consumption (DMC) |
| | 12.3 By 2030, halve per capita global **food waste** at the retail and consumer levels and reduce **food losses** along production and supply chains, including post-harvest losses.<br>-> Food waste generated per person along production and supply chains (kg per capita)<br><br>12.7 Promote **public procurement practices** that are sustainable, in accordance with national policies and priorities.<br>-> Greenhouse gas emissions from public consumption expenditure (million tons of CO2-eq.) |

| | |
|---|---|
| 3 – Circular economy through non-toxic and circular material cycles | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to **air quality** and municipal and other **waste management**.<br>-> Proportion of municipal solid waste collected and managed in controlled facilities (% in Stockholm)<br>-> Levels of ambient particulate matter (PM2.5) in cities<br>-> Total processed quantity of household waste and per capita<br>-> Air quality in or around the home |
| | 12.4 By 2020, achieve the environmentally sound management of **chemicals** and all **wastes** throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to **minimize their adverse impacts** on human health and the environment.<br>-> Parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement<br>-> Hazardous waste generated per capita and proportion of hazardous waste treated, by the type of treatment<br>-> Chemical use per GDP (tons per SEK million)<br><br>12.5 By 2030, substantially **reduce waste generation** through prevention, reduction, recycling and reuse.<br>-> National recycling rate<br><br>14.1 By 2025, prevent and significantly **reduce marine pollution** of all kinds, from land-based activities, including marine debris and nutrient pollution.<br>-> Index of coastal eutrophication and floating plastic debris density |
| 4 – Circular economy as a driving force for the business sector and other actors through measures to promote innovation and circular business models. | 8.2 Achieve **higher levels of economic productivity** through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors.<br>-> Annual growth rate of GDP per employed persons |
| | 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased **resource-use efficiency** and greater adoption of clean and **environmentally sound technologies** and industrial processes, with all countries taking action in accordance with their respective capabilities.<br>-> CO2 emissions per unit of value added<br>-> Number of workplaces, turnover, exports and gainfully employed persons in the environmental sector in Sweden (number and SEK million)<br>-> Investments of industry in environmental protection per environmental area (SEKm) |

***Attachment, the full list of the SDGs included in the Swedish CE strategy***

*Focus area 1:*

## Target 3.9

## Reduce the number of deaths and illnesses from hazardous chemicals and pollution

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

**3.9.1 Mortality rate attributed to household and ambient air pollution**
Number of premature deaths due to exposure to $NO_2$, $PM_{2.5}$ and $PM_{10}$ in the ambient air, 2015, model calculation

| | |
|---|---|
| Total | 7,614 |
| Percentage of all deaths | 8.4 |

Source: The Swedish Environmental Research Institute, IVL, and population statistics Sweden. Updates are performed once every five years. Comparisons with previous years cannot be made as the calculation method was updated in 2015 compared with 2005 and 2010.

**3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)**
Deaths per 100,000 population, UN estimate

| | |
|---|---|
| 2016 | 0.2 |

Source: WHO, Global Database

**3.9.3 Mortality rate attributed to unintentional poisoning**
Number deaths per 100,000 women and men

| | Women | Men |
|---|---|---|
| 2019 | 0.9 | 2.2 |
| 2017 | 1.1 | 3.0 |
| 2015 | 0.9 | 3.3 |

Source: The cause of death register, National Board of Health and Welfare, and Population Statistics, Statistics Sweden A large proportion of the deaths are poisonings by substances and pharmaceuticals

**3.9.4(N) Air quality in or around the home**
Percentage of the population aged 18–84 troubled by car exhaust fumes

| | Women | Men |
|---|---|---|
| 2015 | 20.3 | 13.6 |
| 2007 | 21.8 | 14.5 |
| 1999 | 17.7 | 13.3 |

Source: Environmental Health Survey, Public Health Agency of Sweden

## Target 8.4

## Improve resource efficiency in consumption and production

Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.

**8.4.2 Domestic material consumption**
Index 1998=100

| | Domestic material consumption | Per capita | Per GDP |
|---|---|---|---|
| 2018 | 138 | 120 | 86 |
| 2017 | 134 | 117 | 84 |
| 2015 | 124 | 112 | 82 |

Source: Environmental accounts, Statistics Sweden

## Target 9.4

## Upgrade all industry and infrastructure to make them more sustainable

By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

**9.4.1 CO2 emission per unit of value added**
Tons of CO2 per SEK million of value added

| | |
|---|---|
| 2018 | 11.66 |
| 2017 | 11.98 |
| 2015 | 13.09 |

Source: Environmental accounts, Statistics Sweden

**9.4.2(N) Number of workplaces, turnover, exports and gainfully employed persons in the environmental sector in Sweden**
Number and SEK million

| | Number of local units | Net turnover and exports in SEK million | | Number of gainfully employed persons | |
|---|---|---|---|---|---|
| | | Turnover | Exports | Women | Men |
| 2018 | 15,257 | 222,546 | 35,535 | 19,275 | 47,529 |
| 2017 | 15,399 | 203,826 | 33,840 | 18,680 | 47,400 |
| 2015 | 15,945 | 200,035 | 29,724 | 18,091 | 47,798 |

Source: Environmental accounts, Statistics Sweden

**9.4.3(N) Investments of industry in environmental protection per environmental area**
SEKm

| | Air | Water | Waste | Other |
|---|---|---|---|---|
| 2019 | 3,692 | 1,399 | 814 | 1,547 |
| 2017 | 2,203 | 1,691 | 511 | 979 |
| 2015 | 2,043 | 1,456 | 654 | 1,074 |

Source: Environmental accounts, Statistics Sweden

## Target 12.2

## Sustainable management and efficient use of natural resources

By 2030, achieve the sustainable management and efficient use of natural resources.

**12.2.2 Domestic material consumption**
Index 1998=100

| | Domestic material consump-tion | Per capita | Per GDP |
|---|---|---|---|
| **Reference year = 1998** | **100** | **100** | **100** |
| 2018 | 138 | 120 | 86 |
| 2017 | 134 | 117 | 84 |
| 2015 | 124 | 112 | 82 |

Source: Environmental accounts, Statistics Sweden

*Focus area 2:*

## Target 8.4

## Improve resource efficiency in consumption and production

Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.

**8.4.2 Domestic material consumption**
Index 1998=100

| | Domestic material consumption | Per capita | Per GDP |
|---|---|---|---|
| 2018 | 138 | 120 | 86 |
| 2017 | 134 | 117 | 84 |
| 2015 | 124 | 112 | 82 |

Source: Environmental accounts, Statistics Sweden

## Target 12.3

## Halve per capita global food waste

By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post harvest losses.



**12.3.1(P) Food waste generated per person along production and supply chains**
Kilos per capita

| | Total | Households | Primary production | Catering facilities | Restaurants | Food industry | Grocery stores |
|---|---|---|---|---|---|---|---|
| 2018 | 127 | 90 | 10 | 7 | 7 | 4 | 10 |
| 2016 | 126 | 94 | 10 | 7 | 7 | 5 | 3 |
| 2014 | 131 | 97 | 10 | 7 | 7 | 8 | 3 |

Source: Volumes of food waste in Sweden, Swedish Environmental Protection Agency

No update has been made to volumes from primary production since 2014. There was a change in method for calculating the volume of food waste from grocery stores in 2018.

## Target 12.7

## Promote sustainable public procurement practices

Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

**12.7.2(N) Greenhouse gas emissions from public consumption expenditure**
Million tons of carbon equivalents

| | |
|---|---|
| 2018 | 8.66 |
| 2017 | 8.75 |
| 2015 | 9.44 |

Source: Environmental accounts, Statistics Sweden

*Focus area 3:*

## Target 11.6 Reduce the environmental impact of cities

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

**11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities**
Percentage in Stockholm

| | |
|---|---|
| 2015 | 100 |

Source: UN-HABITAT, Global Database

Stockholm is the only city that reports to the UN from Sweden due to size limits. The figure of 100 percent however applies for the entire country.

**11.6.2 Levels of ambient particulate matter (PM2.5) in cities**
Micrograms per cubic metre, moving three-year average

| | |
|---|---|
| 2019 | 5.7 |
| 2017 | 5.7 |
| 2015 | 6.5 |

Source: SWEDEN'S ENVIRONMENTAL TARGETS, Swedish Environmental Protection Agency

Urban environment: Reported data for measurements of PM2.5 in Burlöv, Stockholm and Umeå.

**11.6.3(N) Total processed quantity of household waste and per capita**
Total and per capita

| | Total (tons) | Per capita (kilos) |
|---|---|---|
| 2018 | 2,705,700 | 262 |
| 2016 | 2,483,110 | 248 |
| 2014 | 2,190,680 | 225 |

Source: Waste statistics, Swedish Environmental Protection Agency

**11.6.4(N) Air quality in or around the home**
Percentage of the population

| | Women | Men |
|---|---|---|
| 2015 | 20 | 14 |
| 2007 | 22 | 15 |
| 1999 | 18 | 13 |

Source: Environmental Health Survey, Public Health Agency of Sweden

## Target 12.4

## Responsible management of chemicals and waste

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

**12.4.1 Parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement**
The extent to which Sweden is considered to fulfil its undertakings, by convention/agreement

| | Basel Convention | Minamata Convention | Montreal Protocol | Rotterdam Convention | Stockholm Convention |
|---|---|---|---|---|---|
| 2015–2019 | 80 | 66.67 | 100 | 96.55 | 87.5 |
| 2010–2014 | 100 | | 100 | 100 | 100 |

Source: Environment Live, Global Database

**12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment**
Kg per capita and percentage by type of treatment

| | Kg per capita |
|---|---|
| 2018 | 282 |
| 2016 | 238 |
| 2014 | 264 |

| Type of treatment | 2018 | 2010 |
|---|---|---|
| Pre-treatment and sorting | 49 | 56 |
| Depositing | 21 | 20 |
| Incineration with energy recovery | 13 | 5 |
| Conventional materials recycling | 6 | 6 |
| Other recycling | 6 | 7 |
| Incineration without energy recovery | 4 | 5 |
| Refilling | 1 | - |
| Biological treatment | 0 | 0 |

Source: Waste statistics, Swedish Environmental Protection Agency

**12.4.3(N) Chemical use per GDP**
Chemical intensity (tons per SEK million)

| | Tons per SEK million |
|---|---|
| 2018 | 5.1 |
| 2017 | 5.1 |
| 2015 | 5.8 |

Source: The Swedish Chemicals Agency and the Environmental accounts, Statistics Sweden

## Target 12.5

## Substantially reduce waste generation

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

**12.5.1 National recycling rate**
Percentage of finally treated waste by type of treatment

| | Materials recycling | Other recycling | Disposal |
|---|---|---|---|
| 2018 | 25 | 58 | 17 |
| 2016 | 25 | 54 | 21 |
| 2014 | 24 | 56 | 21 |

Source: Waste statistics, Swedish Environmental Protection Agency
Waste volumes are ex. mining waste.

## Target 14.1 Reduce marine pollution

By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

**14.1.1 Index of coastal eutrophication and floating plastic debris density**
Percent of chlorophyll-a deviations based on remote sensing, UN estimate

| | |
|---|---|
| 2019 | 0.64 |
| 2017 | 0.29 |
| 2015 | 0.21 |

Source: Environment Live, Global Database

*Focus area 4:*

## Target 8.2 Foster economic productivity through diversification, technological upgrading and innovation

Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors.

**8.2.1 Annual growth rate of GDP per employed person**
Volume progression, percent

| | |
|---|---|
| 2018 | 0.3 |
| 2017 | 0.1 |
| 2015 | 3.0 |

Source: National accounts, Statistics Sweden

## Target 9.4 Upgrade all industry and infrastructure to make them more sustainable

By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

**9.4.1 CO2 emission per unit of value added**
Tons of CO2 per SEK million of value added

| | |
|---|---|
| 2018 | 11.66 |
| 2017 | 11.98 |
| 2015 | 13.09 |

Source: Environmental accounts, Statistics Sweden

**9.4.2(N) Number of workplaces, turnover, exports and gainfully employed persons in the environmental sector in Sweden**
Number and SEK million

| | Number of local units | Net turnover and exports in SEK million | | Number of gainfully employed persons | |
|---|---|---|---|---|---|
| | | Turnover | Exports | Women | Men |
| 2018 | 15,257 | 222,546 | 35,535 | 19,275 | 47,529 |
| 2017 | 15,399 | 203,826 | 33,840 | 18,680 | 47,400 |
| 2015 | 15,945 | 200,035 | 29,724 | 18,091 | 47,798 |

Source: Environmental accounts, Statistics Sweden

**9.4.3(N) Investments of industry in environmental protection per environmental area**
SEKm

| | Air | Water | Waste | Other |
|---|---|---|---|---|
| 2019 | 3,692 | 1,399 | 814 | 1,547 |
| 2017 | 2,203 | 1,691 | 511 | 979 |
| 2015 | 2,043 | 1,456 | 654 | 1,074 |

Source: Environmental accounts, Statistics Sweden

*Reference: Statistics Sweden 2021 (https://www.scb.se/contentassets/aa58c75f441c4dd7bacb9653cc251578/mi1303_2021a01_br_x41br2103.pdf).*

Statistics Sweden has been commissioned by the Swedish government to publish a national list of the SDG indicators annually, which can be updated after consultation with the authorities responsible for indicators and ministries between publications (Nationell indikatorlista 2021 (scb.se)). Recently Statistic Sweden published a voluntary national reporting to the UN High-level Political Forum on the implementation of the 2030 Agenda (Appendix 1, Statistical review 2021 (scb.se)).

**Research activities and experimental indicators**

Research is needed in Sweden particularly to assess the impacts of circularity initiatives, such as the Swedish circular economy strategy, to the transition towards a more circular economy. The Swedish strategic innovation programme *RE:Source* has completed a research project to determine the level of circularity of the Swedish economy. The knowledge of the baseline circularity level is needed to assess the potential of circularity, prioritise political initiatives as well as to monitor the change in circularity over time. The report includes development and adaptation of assessment methodology to Swedish conditions. Also, an analysis of the Swedish economy and calculation of Sweden's circularity measures are included in the research project that ended in 2022. https://resource-sip.se/app/uploads/2022/07/Circularity-Gap-Report-Sweden.pdf

The Swedish government has appointed a Delegation for Circular Economy. As a part of the Delegation, there an expert group for measuring the circular economy was nominated. In late 2020, the expert group presented a comprehensive listing of both short- and long-term recommendations for measuring the circular economy (Table X).

https://delegationcirkularekonomi.se/download/18.79179b21176dc0a6fcb10584/1610703311781/Expertgrupp%20ma%CC%88tnings%20slutrapport%20till%20Delegationen%20fo%CC%88r%20cirkula%CC%88r%20ekonomi%202020(tillg%C3%A4ngligt%203).pdf

***Table X.*** *The main short- and long-term recommendations to develop the Swedish monitoring of circular economy by the expert group on monitoring circular economy in the Swedish Delegation for Circular Economy.*

| Short-term recommendations |
| --- |
| Invest in the development of a certification system for monitoring of circularity |
| **Provide examples of measuring circular economy in procurements** |
| **Provide funding for research to develop the measuring of circular economy** |
| Assign Statistics Sweden to produce new data and statistics to measure the transition of the Swedish economy towards circularity |
| Assign Statistics Sweden to monitor, test and contribute to data and statistics on circular economy at the national level |
| Ensure Swedish contributions to standardisation within CEN and ISO regarding metrics for circular economy |
| **Long-term recommendations** |
| Ensure the relevance of the metrics for circular economy via Statistics Sweden and the market |
| Develop data quality requirements for the evaluation of data quality at market-driven monitoring of circular economy |
| Include biological cycles in the monitoring of circular economy |
| Ensure that investments in the development of monitoring cover also material sustainability and efficient use, not only recycling |
| **Develop support and guidance for measuring circular economy in procurement** |
| **Coordinate the development of circular economy monitoring in the finance** |

5d33734d-en.pdf (oecd-ilibrary.org)

162. Based on the selected literature (Saidani et al., 2019[117]; Ekins et al., 2019[106]; Potting et al., 2018[107]), and an international expert workshop on the topic (Koch and Coelho, 2020[118]), a CE indicator set could include the following dimensions:

- Consumption of resource inputs – i.e., indicator(s) measuring the use of primary resources (take into account direct/ indirect resource consumption). The goal of a CE is to reduce primary resource use over time. Several existing indicators measure this dimension and are being commonly used in the CE monitoring frameworks (e.g., resource productivity, domestic material consumption, etc.).

- Generation of waste as outputs – i.e., indicator(s) measuring the amount of resources that leave the economy as waste. The goal is to reduce waste generation. Several existing indicators (and targets) exist to measure this dimension. There is work ongoing by UNECE to update waste indicators to include circularity aspects.

- Use of R-strategies – i.e., indicator(s) measuring resource efficiency, e.g., the use of reuse, repair, recycling, remanufacturing, etc. Several indicators already exist that measure the use of R-strategies (e.g., recycling, recovery). However, modified or new indicators are needed to measure robustly such strategies, as remanufacture, repair or value retention. This is a crucial element in the monitoring framework as it measures the circularity concept itself (e.g., inner loops).

- Impacts of CE activities – i.e., indicator(s) measuring the environmental, socioeconomic impacts of CE activities on overarching goals. This dimension is currently underdeveloped. Existing indicators cover socio-economic impacts, such as turnover and jobs related to CE. However, coverage of environmental impacts on meso- or macro-level is largely missing (e.g., measuring the contribution of CE to decarbonisation).

- Level of aggregation – i.e., choose to what extent indicator(s) measure different levels of aggregation (macro-, meso- and micro-) and transversality (generic, sector-, product-, material-, and service-specific). Large variation exists in impacts, resource efficiency, consumption and waste generation among such groups. Feasibility of monitoring various levels and groups needs to be taken into account when designing the monitoring framework and including different levels of aggregation.