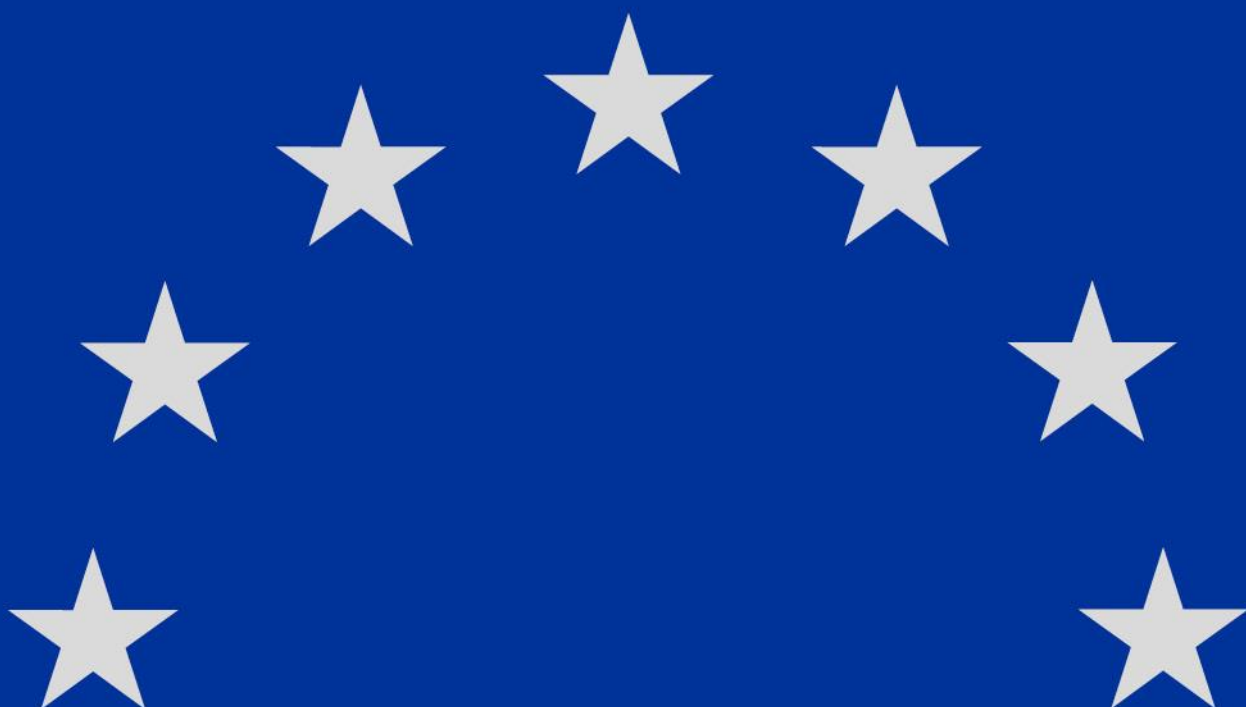


New indicators measuring transition to circularity

Policy Brief

Independent Expert Report



New indicators measuring transition to circularity - Policy brief

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Policy Brief

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Contents

Executive Summary	3
The context	3
The project	3
The lessons.....	4
1. Introduction.....	5
1.1. Methodology.....	6
2. Current EU policy and monitoring landscape	7
3. Policy area recommendation summaries	8
3.1. Bioeconomy	8
3.2. Product-service systems	9
3.3. Cities and regions	11
3.4. Households	12
3.5. Electronics and ICT.....	14
3.6. Batteries and vehicles	15
3.7. Packaging	17
3.8. Plastics	18
3.9. Textiles.....	19
3.10. Construction and buildings.....	20
3.11. Food, water and nutrients.....	22

Executive Summary

The context

As the European Union's Political Guidelines for 2024- 2029¹ reiterate the importance of continuing to strive towards the ambitious carbon emissions reduction target of 90% by 2040, the Circular Economy has a significant role to play. An acceleration of the transition to circularity will unlock decarbonisation benefits from the more sustainable use of materials and resources.

Alongside these clear environmental benefits, circularity also carries the potential to support various complementary political, economic and social aims. Reduced material demand will boost strategic autonomy and increase resilience to geopolitical volatility, particularly relating to strategic and critical raw materials. More efficient use of resources, reduction of waste management expenses, and the adoption and proliferation of innovative circular business models will improve competitiveness for individual organisations, Member States and the Union as a whole. These new models will also offer green jobs and skills, and facilitate the principle of a just transition away from the fossil-fuel based global economic system. Circular activities such as vehicle sharing, tool sharing libraries, reuse 'swap-shop' meetings and repair skills sessions, can also bring local, green, jobs and can all encourage greater societal cohesion, building community resilience against division of all natures.

The transition to circularity for the EU, though, will not happen without support and facilitation from policy makers and influential stakeholders at all levels. The European Commission, Member State governments and regulatory bodies, city and regional administrations and individual sector trade bodies and community-of-interest groups all have a role to play. To be successful, the policies, regulations and initiatives that fall within the remit of these entities need to be designed, monitored and iteratively developed based on knowledge gained from a sound, robust and relevant set of indicators and metrics. Existing monitoring efforts cover some of the relevant aspects well, notably systems such as the Circular Economy Monitoring Framework², the Bioeconomy Monitoring System³ and the Circular Cities and Regions Initiative⁴. There is a need, however, to develop complementary indicators that both expand the focus of traditional efforts to give greater attention to higher-value circularity activities, and allow for the specificity of relevant policy focus areas, economic sectors and material streams. What constitutes good progress towards circularity for, say, the construction industry is very different to what does for households and citizens in general, and the monitoring efforts therefore need to be similarly bespoke.

The project

This two-year research project aims at a thorough understanding of existing and potential circularity indicators and metrics, and tests, develops and proposes a suite of options for monitoring across 11 priority policy focus areas and material streams:

- Batteries and vehicles
- Bioeconomy
- Cities and regions
- Construction and buildings
- Electronics and Information and Communications Technology (ICT)
- Food, water and nutrients
- Households
- Packaging
- Plastics
- Product-Service Systems
- Textiles

¹ https://commission.europa.eu/about/commission-2024-2029_en

² <https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework>

³ https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en

⁴ <https://circular-cities-and-regions.ec.europa.eu/>

The project has sought to cover indicators at the macro, meso and micro levels of implementation, i.e., from international to household or company level, and select those with the potential to provide intelligence on current levels of circularity, progress of those levels over time, and the environmental, social and economic impacts of circular policies and initiatives. The project's objective was to identify and investigate indicators with a high degree of innovation, which either were not currently monitored at all, or were monitored but not at study-specific level of implementation. In purposely choosing to test and develop innovative indicators, it aimed to identify and investigate the inherent challenges posed in their deployment, and suggest options, both regulatory and technical, to tackle those challenges.

The project has progressed from the initial development of a **comprehensive policy and funding framework report**⁵, through the cataloguing and taxonomisation of over 730 existing and potential circularity indicators, to the selection and in-depth testing of 60 indicators across the 11 focus areas. The selection process was informed by a series of substantial, sector-specific stakeholder engagement exercises, and was delivered via an **adaptable multi-criteria-analysis tool**⁶ which forms part of the project output toolkit for policy makers.

The testing process led to the development of **19 stand-alone case studies**⁷, grouping the 60 indicators by focus area and targeted sub-theme, and a **roadmap of recommended actions and targets** for those classed as most straight-forward to develop further. Parallel to the case studies and roadmap, a separate **sector targeted policy brief** was developed. This summarises the policy context and the learnings from the indicators tested for each sector, and proposes an 'ideal' suite of indicators to consider developing further, selected from those tested and existing or other potential monitoring efforts.

The lessons

The stakeholder engagement, indicator testing, and the reflection on the results, all corroborated the need for **tailored regulatory and monitoring approaches** for the varying focus areas, in order to work towards maximum sector-specific circularity. The suites of indicators suggested for each theme draw from several existing and potential frameworks to allow for a holistic understanding to be built. It is not necessarily advised, however, for specific formal frameworks to be developed for each. This could be useful for areas, such as product-service systems, where there is little to no formal monitoring in place, but other areas could benefit more from some high-level coordination and facilitation of collaboration between existing mechanisms and initiatives.

Alongside the **tailored approach recommended for individual policy areas**, several cross-cutting learnings have emerged from the project process. With one of the express intentions of this work being to **identify and test innovative indicators** which were **not currently well-explored**, it was inevitable that challenges and barriers to their full development would be encountered. By far the most prevalent and most significant of these challenges was the gaining of access to, and indeed in some cases the very lack of existence of, relevant data. Reasons behind data issues include the inability of key data-holding stakeholders to supply the relevant info, either due to commercial sensitivities or simply a lack of time or staff resource. Other issues include methodological inconsistencies in data recording practices, making it difficult to draw accurate comparisons, and a lack of sufficient granularity in existing datasets to allow any significant analysis. While proxy datasets and extrapolation techniques could be deployed as Plan B or C for this project, the recommendations made in the project outputs give steps towards addressing the root causes. These include suggestions for new reporting requirements and regulations, and ways to support collection and reporting through enhanced harmonisation and simplification, and development of digital tools and portals. Whilst any potential increase in administrative burden is obviously a clear concern, if the desire is to develop a thorough understanding of circularity, its

⁵ <https://www.ricardo.com/ce-indicators>

⁶ https://research-and-innovation.ec.europa.eu/research-area/environment/circular-economy_en

⁷ <https://www.ricardo.com/ce-indicators>

progress and its impact in the focus areas, then more and better data is going to be needed. It is the role of policy-makers and sector wide supporting bodies to minimise that burden as much as possible by ensuring open collaboration, well designed processes and requirements, and comprehensive support and guidance.

The provision of general guidance and information was another key theme to emerge from the work completed. This ranged from recommendations for public-facing information to raise awareness and encourage more circular personal choices, to more technical guidance suggestions such as circular design guidance for ease of repair and recoverability of priority materials or products. Again, collaboration is key here, between regulatory institutions, research bodies, industrial trade associations and innovation platforms. Effective and open stakeholder engagement and communication, across national and sectoral borders where appropriate, is needed to help develop a mutual understanding of the challenges, good practice in overcoming them, and the best shared approach to progress.

Final considerations arising from the project include the importance of understanding that increased circularity alone does not necessarily guarantee a positive environmental output. For example, the material demand reduction facilitated by the reuse of a certain piece of machinery could in theory be overshadowed by a higher lifetime operational energy demand than a newer version. True environmental impact understanding of any product or service can only be achieved through a holistic impact calculation, as delivered through Life-Cycle Assessment. This should be considered for development into the planning and deployment of any regulatory or monitoring initiatives, to avoid a net unintended environmental harm.

Similarly, circularity indicators should not always be appraised in isolation. Instead, consideration should be given to potential interactions between indicators. Indicator sets taken together, such as, for example, public awareness and perception, actual use, and the quantitative impact of a specific product-service system can give a holistic overview of its successes and challenges. This in turn allows policy makers to more fully understand what works, what doesn't, and why, to iteratively develop and deploy more impactful circular economy policies and support mechanisms.

This project has prompted significant development in the understanding required to aid that process. It has delivered a comprehensive overview of the status-quo, delved into the possibilities for innovation and expansion of the understanding of true, sector-specific circularity, and has resulted in a set of lessons and usable tools for any interested policy-makers or influencers. Its learnings and outputs lay the initial groundwork for the future development and enhancement of circularity monitoring across a wide range of economic sectors and societal levels, further unlocking the potential for the circular economy to be a driving force, not only in tackling the climate crisis, but also in transitioning to a more sustainable, just, and equitable society.

This document is a targeted policy brief, which is an extraction of Section 6 of the full final report of the project.

1. Introduction

This policy brief provides a summary of the key findings from the project *“Indicators and methods for measuring transition to climate neutral circularity, its benefits, challenges and trade-offs”*, which ran from December 2022 to November 2024.

The transition to a circular economy (CE) needs to occur on multiple levels, from households and individual consumers to national and cross-border ecosystems. Measuring and monitoring the development of this transition is an ambitious task and is ideally supported by indicators relevant to all steps in that process. To make the systemic transition towards a CE and society measurable, and to help the European Commission (EC) improve the quality of its policy work and its research and innovation programming, a robust monitoring system needs to exist to measure circularity in all its facets.

This research project has the following key objectives:

- Developing and presenting a comprehensive understanding of:
 - Current policy framework for CE and its monitoring, across the European Union (EU).
 - Existing circular indicators in use at macro, meso and micro levels.
- Identifying, assessing, developing and testing new potential indicators to facilitate a greater understanding of the following **facets** of CE:
 - **Current levels of circularity** – for horizontal comparison of circularity, such as for two products providing the same functionality or for two comparative cities or regions.
 - **Transition progress** – analysis to allow baselining and measure progress over time.
 - **Impact** – analysis of the triple-bottom-line impacts (environmental, social and economic) of sectoral innovations and policy or regulatory interventions.

These objectives have been delivered across the five key policy areas, and sub-areas, which form the basis of EU CE policy focus and ambition, most predominantly the Circular Economy Action Plan (CEAP)⁸. These are 'Cities and regions', 'Households', 'Bioeconomy', 'Product-service systems' and 'Priority products/materials' (namely 'Electronics and Information and Communications Technology (ICT)', 'Batteries and vehicles', 'Packaging', 'Plastics', 'Textiles', 'Construction and buildings' and 'Food, water and nutrients').

1.1. Methodology

The overall methodological plan for the project is shown in Figure 1. For further detail on the methodology undertaken, please view the full report titled: *Indicators and methods for measuring transition to climate-neutral circularity, its benefits, challenges and trade-offs - Final Report*.

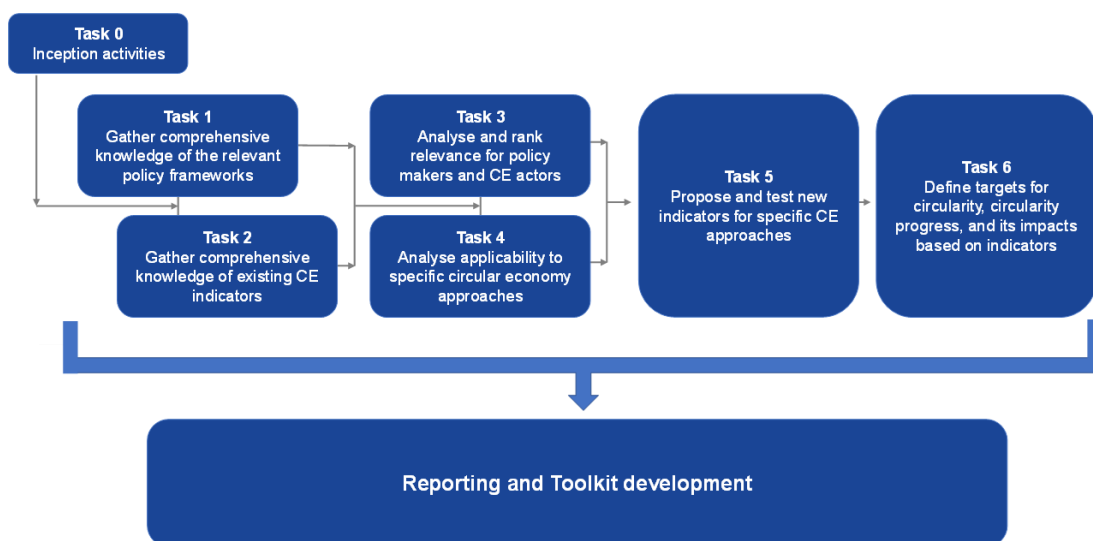


Figure 1. Overall methodological approach

⁸ https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

2. Current EU policy and monitoring landscape

The transition towards a CE is a complex, multifaceted endeavour requiring effective incentivisation through policy measures, and corresponding monitoring and evaluation frameworks to track progress across diverse sectors. By focusing on the policy areas and material streams mentioned above, and discussed in detail through the outputs of this project, the CEAP targets sectors with high potential for increased circularity, and resultant environmental benefits. The strategic aims of the plan are to reduce waste, empower consumers, producers and public buyers, and to make sustainable products the norm in the EU.

Since its adoption in March 2020, several initiatives and actions instigated and adopted as part of the CEAP have addressed circularity in the focus policy areas, both in general and with specific targeted instruments. These include the Batteries Regulation, initiatives designed to tackle the proliferation of microplastics, the proposal on consumer right to repair, and the Ecodesign for Sustainable Products Regulation. These latter two are good examples of high-level strategic initiatives which will require diverse tailoring for specific sectors and material streams. What circularity means in different sectors, and how mature and ready they are for transitioning towards it, varies with the relevant sectoral context. As such, a flexible approach to overall CE policy is required to ensure that legislative requirements do not become burdensome in sectors where they are not really relevant, and that no opportunities are missed.

This flexible, tailored, approach to policy for the focus areas and sub-areas requires, by definition, similar flexibility and bespoke approaches to monitoring of progress. The Circular Economy Monitoring Framework (CEMF)⁹ is a comprehensive framework designed to facilitate the assessment of circular economy initiatives across the EU. By providing a structured approach to monitoring circularity, the CEMF aims to support EU Member States in reporting their progress towards circular economy objectives, enhancing transparency and accountability. The CEMF consists of a set of indicators that track various aspects of circularity, including resource efficiency, waste management and material recovery. It was revised in 2023 to reflect shifts in CE policy, and incorporated new indicators looking at:

- Material footprint;
- Resource productivity;
- Consumption footprint;
- Greenhouse gas emissions from production activities, and;
- Material dependency.

While these new indicators do allow the CEMF to provide a more a holistic overview of levels of circularity, and the rate of transition at Member State and EU level, they still generally track performance at the national economy-wide level, rather than flows of individual priority material streams. The CEMF therefore is not able to give the granular insight required at individual policy focus area and material stream level to track the bespoke policy landscapes discussed above.

By investigating indicators deemed innovative and relevant to the bespoke concept of 'true' circularity for each focus area, this study has sought to develop an understanding of how gaps in monitoring of area-specific 'true' circularity could be filled, and developed a proposal for an 'ideal' suite of indicators for each. These suites incorporate, where relevant, indicators already included in the CEMF, those tested as part of this study, and any others analysed in early stages but not fully tested.

⁹ <https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework>

3. Policy area recommendation summaries

3.1. Bioeconomy

To enhance the assessment of the bioeconomy, a refined suite of complementary indicators is proposed, focusing on what is achievable and can be effectively monitored both in the short and long term. These indicators aim to address gaps in the existing CEMF metrics while ensuring alignment with the EU Bioeconomy Strategy.

Table 1 provides the 'ideal' suite of indicators to adequately assess the policy gaps and the assessment of the bioeconomy. The proposed indicators provide a clear path forward for enhancing the bioeconomy, aligning with the CEMF and addressing the identified gaps.

High-level theme	Specific indicator	Source	Justification for inclusion
Socio-economic benefits	Number of jobs created related to the bioeconomy sector	Tested / EU Bioeconomy Strategy	Provides insights into the economic impact of the bioeconomy and informs policy decisions
	Gross value added related to the private bioeconomy sector	Tested / EU Bioeconomy Strategy	Helps measure the economic contributions of the bioeconomy and assess growth potential
Environmental benefits	Number of products with the EU Ecolabel that are bio-based	Tested	Encourages consumer awareness and market uptake of sustainable products.
	Specific productivity of bio-based materials	CEMF	Provides insights into how efficiently bio-based resources are utilised, allowing for targeted policy initiatives
	Proportion of bio-based materials reused, recycled, or reintroduced into the economy	CEMF	Enhances understanding of the circularity of bio-based materials and supports the development of targeted policies
	GHG emissions associated with bio-based production practices (excluding Net GHG emissions from agriculture and from LULUCF)	CEMF	Crucial for assessing environmental impacts and guiding sustainable practices within the bioeconomy. Currently, the BMS includes 2 related indicators: Net GHG emissions from agriculture and from LULUCF
Resource Management	Share of local forestry by-products going to energy generation	Tested	Evaluates resource utilisation and supports energy transition goals

High-level theme	Specific indicator	Source	Justification for inclusion
	Share of renewable resources used	EU Bioeconomy Strategy	Gauges the transition from fossil-based to bio-based materials
	Amount of organic waste recycled or used in bio-based applications	EU Bioeconomy Strategy	Reflects circularity and resource management in the bioeconomy
	Share of biological waste treated with anaerobic digestion (AD)	Tested	Provides insights into waste management practices and identifies opportunities for resource recovery

Table 1. Summary of the 'ideal' suite of indicators for bioeconomy.

The actions needed to implement these recommendations effectively, are as follows:

Policy development recommendation for medium-term (1.5 – 5 years): Strengthen policies to align bioeconomy principles with circular economy strategies, focusing on measurable outcomes. This includes establishing specific quantitative targets for bio-based materials to enhance current levels of circularity.

Data support recommendation for medium-term (1.5 – 5 years): Develop robust data collection methods that specifically measure bio-based material flows. This includes assessing current levels of circularity through baseline data and monitoring progress over time with regular updates.

Technical support recommendation for short-term (0.5 – 1.5 years): Provide guidance for industries on best practices for utilising bio-based materials. This will help businesses improve their operational efficiency and contribute to circularity, thereby supporting positive triple bottom line impacts.

Industry engagement recommendation for short-term (0.5 – 1.5 years): Foster collaboration among stakeholders, including government agencies, industry bodies and communities. Engaging stakeholders will raise awareness of bioeconomy practices and support the assessment of triple bottom line impacts.

3.2. Product-service systems

The various types of product service systems (PSS) often referred to in the EU as product-as-a-service models, play a critical role in promoting circularity. The CEAP defines PSS as a business model in which producers keep ownership of the product or the responsibility for its performance throughout its lifecycle. Though some existing indicators for example: "Resource productivity," "Circular material use rate," and "Consumption footprint" (Eurostat / CEMF) may indirectly capture the effects of PSS models within the economy, they do not adequately assess the contribution or progress of these models compared to traditional ownership structures.

In this project, several indicators have been tested which emphasise, for example, the presence of policy references to PSS, measures of the market size of PSS models, and consumer perspectives on PSS. The general conclusion across indicator testing is that much work is needed to facilitate their development and implementation. The recommended suite of indicators for consideration for progressing of PSS are shown in Table 2. Summary of the 'ideal' suite of indicators for 'PSS'

High-level theme	Specific indicator	Source	Justification for inclusion
Consumer preference & awareness of PSS	Consumer perception of the attractiveness of PSS models	Testing	Monitoring consumer experience with and perception of PSS models is a relevant proxy for understanding their penetration and relevance of in the economy. There are interesting opportunities for including CEAP priorities, such as PSS, in the DG EFA's consumer surveys.
	Percentage of citizens who have used PSS models		
Market share and volume of PSS models	Share of electric passenger vehicles (EV) operationally leased by consumers (B2C)	Testing	These indicators hold potential for providing stronger data and insights on the role of PSS across various products groups. There is a strong policy relevance of PSS across product groups, but a need for better data to assess their penetration and impact. By including indicators such as these in monitoring frameworks, and combining it with targeted initiatives, such data generation and the PSS models may be promoted.
	No. of companies offering PSS solutions for EEE / ICT		
Public support and investment in PSS	No. of public procurement contracts for EEE / ICT that incorporate PSS models	Testing	National and EU policies highlight the potential of PSS for promoting sustainability and circularity priorities. Indicators are needed to monitor how this translates to concrete policy support and financial initiatives. These indicators do not provide direct measurements of circularity, but give an indication of what priority is given to PSS on an EU and national level.
	EU funding for R&D in PSS		
	No. of MS that include PSS in national CE strategies		
	No. of public financial incentives directed at PSS providers/models		

Table 2. Summary of the 'ideal' suite of indicators for 'PSS'

The recommendations recognise the current lack of research and data to sufficiently document the benefits of PSS models and categorise and systematise the foundations for these benefits to be generalised across products, countries, use cases, etc. These shortcomings greatly reduce the general acceptability and credibility of PSS indicators. Developing indicators on PSS requires, first and foremost, further research and data on the field and prioritising sectors that hold the most potential. The recommendations for further developing these indicators are as follows:

Development of methodology and guidance (1.5 – 5 years): Development of the NACE code system to provide for better registration of PSS models and the related economy and employment.

Development of methodology and guidance (1.5 – 5 years): Support research investigating the actual benefits of PSS models within the most promising products groups and defining the most relevant metrics for these product groups. The research may enable a prioritisation of monitoring efforts on the availability and benefits of PSS solutions. This may provide the foundation for improved target setting and for creating or developing indicators in the CEMF.

Stakeholder initiative (0.5 – 1.5 years): Promote and potentially fund the creation of national networks on PSS and circular business models within specific sectors, e.g. by creating PSS networks within existing associations, to help foster improved knowledge sharing and facilitate easier data collection on PSS performance in future.

3.3. Cities and regions

To enhance the assessment of the Cities and Regions, a refined suite of complementary indicators is proposed, focusing on measurable metrics that can be effectively monitored in both the short and long term. These indicators aim to address identified gaps while aligning with the EU CEAP (see Table 3. Summary of the 'ideal' suite of indicators for Cities and Regions

).

High-level theme	Specific indicator	Source	Justification for inclusion
Circular procurement	Share of public procurement notices that stipulate specific CE aspects	Tested	Public procurement is an essential tool to stimulating the adoption of CE practices within regional supply chains.
	Budget of public procurement notices that stipulate specific CE aspects	Tested	As above.
Circular transition	The number of local and regional entities implementing circular transition agendas aligned with regional targets	Tested	It enables administrations to track the awareness of, and alignment with, local and/or regional CE objectives among public and private entities in the region.
Circular business activity	Number of public and semi-private entities providing regional CE support programmes	Tested	Provides clarity on effectiveness of local policies in stimulating circular job and business generation.
	Persons employed in CE-related sectors	CEMF	As above.
	Private investments in CE related sectors	CEMF	As above.
	Total Quantity of Byproducts Valorised Annually Due to Regional Industrial Symbioses Systems and Partnerships	Tested	Provides IS-specific data on circular material consumption rates.
	CO2 savings through industrial symbiosis	CCRI	IS-specific CO ₂ e savings data, augments previous metric.
	Number of repair spaces by population size	Tested	It provides insight into availability of infrastructure required to facilitate citizen-

High-level theme	Specific indicator	Source	Justification for inclusion
			led repairs within a city's boundaries.
Waste & resources	GHG-emissions from waste	CCRI	Provides insight into carbon impact of waste streams.
	Waste generated per capita per stream	CEMF	Provides insights into material consumption rates.
	Generation of industrial waste per capita	CCRI	As above.
	Recycling rates of waste by waste stream	CEMF	Data indicates effectiveness of recycling infrastructure.

Table 3. Summary of the 'ideal' suite of indicators for Cities and Regions

The actions needed to implement these recommendations effectively include:

Data support (1.5 – 5 years): Development of digital reporting platforms for regional administrations to facilitate collection of data regarding CE capacity-building programmes, CE procurement and valorisation of byproducts as a result of IS systems.

Industry & Policymaker engagement (1.5 – 5 years): Engagement to gain consensus on standardisation of criteria to monitor CE transition agendas, capacity building programmes, and practices, such as IS, repair and procurement.

Policy (1.5 – 5 years): Development of minimum monitoring requirements for circular procurement practices.

3.4. Households

Table 4. Summary of the 'ideal' suite of indicators for 'Households'.

provides the 'ideal' suite of indicators has been recommended to adequately assess the policy gaps and subsequent circularity of households across four key themes.

High-level theme	Specific indicator	Source	Justification for inclusion
Food and water consumption	Water footprint of private consumption.	Tested	Measures the water used to produce goods/services used by households and signals areas of high consumption.
	Impacts of differing food consumption on European biodiversity through potential species lost.	Tested	Investigates how varied diets impact biodiversity and identifies food sources with high biodiversity impacts.

Utilisation of household goods	Unused household goods.	Tested	Provides clarity on the 'use' phase and quantifies the 'lost opportunity'.
	Comparison of life of household furniture as estimated by manufacturers and the actual use time by households	Tested	Quantifies the success of product life extension interventions.
	Level and perception of peer-to-peer use and sharing.	Tested	Explores the current use of these models and monitors circular behaviours/purchases in households.
Product life extension of household goods	Items of clothing repaired by households ¹⁰ .	Tested	Supportive of higher value retention activities and will gain understanding of the current adoption of repair.
	Household spending on maintenance and repair.	Tested	As above.
Waste generation and management	Generation of municipal waste per capita.	CEMF	Measures the waste collected by municipal authorities and generated by households.
	Recycling rate of municipal waste.	CEMF	Measures the waste collected by municipal authorities and generated by households which is subsequently recycled.

Table 4. Summary of the 'ideal' suite of indicators for 'Households'.

The main actions needed to support the eventual implementation of this suite of indicators are summarised as follows:

R&D (0.5 – 1.5 years): Development of classification systems across key household products (such as textiles and furniture) to support harmonisation across the EU and EU Member States.

Policy (1.5 – 5 years): Development of a new target to monitor the repair rate of priority products within the CEAP.

Legislation (1.5 – 5 years): Provide economic and commercial incentives to encourage the implementation of household water meters and support the collection of usage data.

¹⁰ For the nature of this testing programme, the scope of these indicators were reduced to cover only one household good. Their inclusion in the monitoring framework assumes these indicators are rolled out to other high priority CEAP products.

3.5. Electronics and ICT

To enhance the assessment of the electronics & ICT sector, a refined suite of complementary indicators is proposed, focusing on measurable metrics that can be effectively monitored in both the short and long term. These indicators aim to address identified gaps while aligning with the EU CEAP. Table 5. Summary of the 'ideal' suite of indicators for 'Electronics & ICT'.

provides an overview of the ideal indicators for electronics and ICT.

High-level theme	Specific indicator	Source	Justification for inclusion
Percentage of citizens opting for sustainable alternatives	Percentage of consumers choosing to repair electronic and ICT products.	Tested	Shows how consumers engage with circularity by repairing products rather than discarding.
	Percentage of electronic and ICT products sold through second-hand markets.	Tested	Provides insight into transition progress in consumer choices towards circular business models.
	Rate of borrowing or leasing electronic and ICT products.	Tested	Tracks alternative consumption models, helping to understand how these models are contributing to progress in reducing material consumption.
Material Circularity Index	Proportion of recycled content in products.	CEMF	Provides insights into resource efficiency and use of virgin materials.
	Proportion of reused components in manufacturing.	CEMF	Helps with understanding how the supply chain relies on virgin materials.
Percentage of public sector ICT equipment purchased second-hand or leased	Percentage of public sector procurement that includes circular criteria.	Tested	Measures how circular principles are integrated in public sector procurement.
	Proportion of electronic and ICT products purchased by the public sector that are refurbished or second-hand.	Tested	Provides a benchmark for transition progress and promotes circular procurement practices.
Real recycling rate of electronic and ICT equipment	Mass of critical raw materials recovered from e-waste.	Tested	Ensure recycling rates go further than just overall volume, instead also focussing on critical raw materials.
	Percentage collected prepared for reuse, repair, and refurbishment.	Tested	Shifts focus from waste collection to waste preparation, supporting higher R-strategies.

Table 5. Summary of the 'ideal' suite of indicators for 'Electronics & ICT'.

The actions needed to implement these recommendations effectively are as follows:

Ecodesign Criteria Compliance (1.5 – 5 years): Ensure a high share of consumer electronics fulfil ecodesign criteria, focusing on factors such as repairability and recyclability.

Public engagement (0.5 – 1.5 years): Develop guidance and run awareness campaigns to encourage consumer and industry uptake of repair, reuse, and sustainable purchasing behaviours.

Incentivising circular business models (1.5 – 5 years): Introduce incentives encouraging alternatives to purchasing new household electrical items and communications equipment. This aims to minimise the number of new products purchased by households.

Data collection integration (0.5 – 1.5 years): Integrate data collection into existing EU-wide surveys to improve the quality and quantity of data related to electronics and ICT usage patterns, including repair and reuse behaviours.

Public sector procurement (1.5 – 5 years): Increase public sector purchases of second-hand/refurbished ICT equipment or those acquired through renting/leasing models to promote circular procurement practices.

Real recycling rate improvements (1.5 – 5 years): Improve methodologies for calculating real recycling rates across the EU to ensure reliable tracking of material recovery from electronic waste.

Policy (1.5 – 5 years): Extend Ecodesign Directive to include circular criteria like disassembly and repairability.

3.6. Batteries and vehicles

Table 6. Summary of the ‘ideal’ suite of indicators for ‘Batteries and vehicles’.

provides the ‘ideal’ suite of indicators has been recommended to adequately assess the policy gaps and subsequent circularity of households across four key themes.

High-level theme	Specific indicator	Source	Justification for inclusion
Ease of dismantling	Ease of disassembly of vehicles	Tested	This indicator presents a quantitative method of measuring the “progress over time” across the higher-priority R-strategies reflecting the benefits of circular design in vehicles. By making vehicles easier to dismantle, we can facilitate more efficient recycling processes and enhance the recovery of valuable materials.
Circular design initiatives	Virgin versus recycled raw material (e.g. plastics) in vehicles	Tested	Focuses on the facet of “measuring progress over time” for the recycled content targets set for 2030 and beyond, as part of the EC’s proposed “End of Life Vehicle Directive”. This will provide insights into the effectiveness of policies aimed at increasing the use of recycled materials in vehicle manufacturing.

Batteries recovered at EoL	Automotive batteries reused at vehicle EoL	Tested	Provides further focus on the automotive sector and prioritises the “reuse” R-strategy specifically, which is not currently part of the CEMF. The reuse of batteries can significantly extend their lifecycle and reduce waste, supporting a more sustainable approach to battery management.
Car Sharing	Car sharing frequency	Tested	Measures the three highest priority R-strategies and the by presenting a way to measure current and future reduction in the requirement for future car manufacturing and associated material consumption at source through journey sharing.

Table 6. Summary of the ‘ideal’ suite of indicators for ‘Batteries and vehicles’.

Summarised below are some of the key recommendations for progressing the above indicator themes to address the policy area gaps previously identified. Please note that these recommendations are general and applicable across multiple indicators.

Legislation/Policy (1.5 – 5 years and >5 years): It is essential that appropriate legislation and policy is proposed and passed where it is identified as the only way to ensure a certain indicator can be successfully implemented. This could include tax incentives, outreach initiatives or raw material requirements in manufacturing (e.g. recycled plastic content).

Technology (1.5 – 5 years and >5 years): It is important to ensure the appropriate technology is in place to ensure indicators can be delivered. This could include technology to support circularity in the manufacturing itself (e.g. remanufacturing technologies) and/or technologies to support the data recording/reporting.

Training, guidance and education (0.5 – 1.5 years): Several of the indicators require new data collection, recording and calculation methodologies to be applied to industry stakeholders to ensure successful delivery. To gain endorsement from key industry stakeholders it is important that they feel supported in applying these new methods. The development of appropriate training, guidance and education will be critical to ensuring stakeholder “buy-in” and the collection of reliable data e.g. guidance documents/training on the recording of dismantling time of vehicles.

3.7. Packaging

In order to address the gaps in current legislation and indicators measured by the CEMF, it is proposed that the indicators detailed in Table 7. Summary of 'ideal' suite of indicators for 'Packaging'.

are introduced:

High-level theme	Specific indicator	Source	Justification for inclusion
Legislation	Number of legislative incentives created to encourage circularity in the European Union packaging industry	Tested	To fully understand the current legislative landscape that regulates the packaging industry.
Circular design (reuse)	Percentage, by weight of packaging placed on the market, designed by circular principles	Tested	To measure and understand the packaging quantities currently designed with principles such as 'reuse' in mind
	Share of takeaway meals and drinks provided in reusable packaging	Tested	To measure the quantity of takeaway food and drink packaging that is reusable, as this industry produces some of the greatest packaging waste quantities.
Packaging waste and recycling	Packaging waste generated per capita	CEMF	To measure the amount of overall packaging waste generated in each member state.
	Recycling rate of overall packaging	CEMF	To measure the amount of overall packaging that is being recycled in each member state, and to understand the recycling rate in comparison to packaging waste generated.

Table 7. Summary of 'ideal' suite of indicators for 'Packaging'.

The main actions needed to support the eventual implementation of this suite of indicators are summarised, as follows:

Legislation (1.5 – 5 years): Incentives encouraging the use of reusable packaging.

R&D (1.5 – 5 years): Further testing and development of the indicators.

R&D (1.5 – 5 years): Stakeholder engagement to support the development and measurement of the indicators.

3.8. Plastics

The following 'ideal' suite of indicators in Table 8. Overview of 'ideal' indicators for 'Plastics'.

has been recommended to adequately assess the policy gaps and subsequent circularity of households across four key themes:

High-level theme	Specific indicator	Source	Justification for inclusion
Circular production	Number of pilot/demonstration projects on the circular production and treatment of plastics	Tested	Explores the implementation of circular principles in the production and the post-use phase of plastics.
Legislation	Number of legislative incentives created to encourage circularity in the plastics industry	Tested	Provides an understanding of the current legislative landscape for the plastics industry.
Waste generation and management	Generation of plastic packaging waste per capita	CEMF	Measures the plastic packaging waste collected by municipal authorities and generated by households.
	Recycling rate of plastic packaging	CEMF	Measures the plastic packaging waste collected by municipal authorities and generated by households which is subsequently recycled.

Table 8. Overview of 'ideal' indicators for 'Plastics'.

The main actions needed to support the eventual implementation of this suite of indicators are summarised as follows:

R&D (1.5 – 5 years): Improvement of Eurostat indicators.

R&D (1.5 – 5 years): Consider tracking indicators over multi-year period to increase statistical significance of results.

Policy (1.5 – 5 years): Develop a digital portal where Member States can directly report information on legislative incentives to European Commission.

3.9. Textiles

Table 9. Overview of 'ideal' indicators for 'Textiles'.

provides the 'ideal' suite of indicators has been recommended to adequately assess the policy gaps and subsequent circularity of textiles.

High-level theme	Specific indicator	Source	Justification for inclusion
Product use/consumption	Jobs in textile repair	Tested	Serves as a proxy for textile repair activity, highlighting repair services as a key component of product life extension.
	Apparent consumption	ETC/CE (2022) ¹¹	Tracks the consumption volumes of textiles, which are a key driver of environmental and climate pressures stemming from the textile value chain.
	Reused textiles	ETC/CE (2025, forthcoming) ¹²	Captures the volume of reused items, as a critical strategy to extend product lifetimes and reduce waste generation.
Product design	Shared of recycled content put on the market	Tested	Reflects the substitution of virgin raw materials with recycled materials, promoting circular design and sourcing practices.
Disposal	Separate collection of textiles	Tested	Indicates the volumes of separate collection, which are a prerequisite for sorting for reuse and recycling.
	Capture rate	ETC/CE (2025, forthcoming) ¹³	Measures the effectiveness of the collection systems, representing the share of separately collected textiles.
End-of-life	Textile waste treatment	ETC/CE (2024) ¹⁴	Assesses the share of separately collected textile waste going to incineration or landfill, instead of cycling further.
	Output from textile recycling	Tested	Reflects the amount of secondary raw materials available for fibre production, derived from recycled textiles.

¹¹ https://www.researchgate.net/publication/358493746_Textiles_and_the_Environment_-_The_role_of_design_in_Europe's_circular_economy

¹² Unpublished report by the ETC/CE to which the Consortium team members had been provided access.

¹³ *ibid*

¹⁴ <https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-report-2024-5-textile-waste-management-in-europes-circular-economy>

Table 9. Overview of 'ideal' indicators for 'Textiles'.

The recommendations presented below address the significant lack of transparency in tracking materials and the fate of textiles in the European market, along with inconsistencies in the classification of used textiles and textile waste and the absence of clear circularity targets at both EU and national levels.

Developing effective indicators for textile circularity, as explored in this project, first requires enhanced reporting requirements for EU textile brands to increase transparency regarding the products placed on the European market. Implementing EPR schemes for textiles could further support transparency and data availability by requiring brands to report the share of secondary materials used in their products. To close current monitoring gaps in the post-consumer textile value chain, it is necessary to establish standardised definitions at the EU level—particularly for textile waste and used textiles—and to implement a harmonised reporting methodology for textile collection and processing.

Leveraging existing initiatives, such as the Right-to-Repair, the ESPR, and EPR schemes, can enhance transparency and data collection in the textile sector. In the longer term, revising economic activity classifications, such as the NACE system, will help better reflect textile-specific categories, although this will be a complex and resource-intensive process.

The main actions needed to support the eventual implementation of this suite of indicators are summarised as follows:

Legislation (1.5 – 5 years): Introduction of mandatory reporting requirements for brands and retailers putting textile products on the European market regarding fulfilment of ecodesign criteria, such as share of recycled content / post-consumer textile waste.

Legislation (1.5 – 5 years): Harmonisation of the collection approaches, reporting standards and definitions on textile waste / reused textiles across EU Member States.

Revision of economic activity classifications (> 5 years): Revision of the NACE classifications to provide for better registration of textile repair and recycling activities.

3.10. Construction and buildings

Table 10. Summary of the 'ideal' suite of indicators of 'Construction and buildings'

provides the 'ideal' suite of indicators has been recommended to adequately assess the policy gaps and subsequent circularity of construction and buildings.

High-level theme	Specific indicator	Source	Justification for inclusion
Circular documentation	Share of EPDs with circular properties	Tested	It offers the opportunity to document development over time at product level.
	Number of certified buildings with schemes including circularity requirements	Tested	It offers the opportunity to document development over time at building level.

High-level theme	Specific indicator	Source	Justification for inclusion
Maintain building stock	Utilisation of existing building stock	Tested	Documentation on the vacancy of existing building stock to identify potential for better utilisation rather than constructing new buildings.
	Total renovations vs. demolition and new buildings: <ul style="list-style-type: none"> • Total m2 of building permissions per year. • Total m2 of demolitions projects per year. • Total m2 of renovation/ rehabilitation projects per year. 	Bauer et al. (2024) ¹⁵	Documentation on the development in construction of new buildings.
Construction and demolition waste	Total amount of construction and demolition waste	Bauer et al. (2024) ¹⁶	The CEMF currently does not include an indicator for construction and demolition waste.
	Construction and demolition waste per capita, in relation to turnover for the sector, or per new m2 built.	Bauer et al. (2024) ¹⁷	Same as above.

Table 10. Summary of the 'ideal' suite of indicators of 'Construction and buildings'

The main actions needed to support the eventual implementation of this suite of indicators are summarised as follows:

Development of methodology and guidance (1.5 – 5 years): Pursue implementation of more circular criteria in certification schemes and monitor the share of certified buildings.

Development of methodology and guidance (1.5 – 5 years): Monitor total renovations vs. demolition and new buildings via local authorities.

¹⁵ <https://pub.norden.org/nord2024-024/index.html>

¹⁶ *ibid*

¹⁷ *ibid*

Development of methodology and guidance (1.5 – 5 years): Develop more detailed reporting requirements for waste management companies to be able to monitor the share of waste derived from construction and demolition.

3.11. Food, water and nutrients

Several of the R-strategies are less relevant to food than to other key product value chains (e.g. Reuse, Repair, Refurbish, Remanufacture and Repurpose), therefore although they are not particularly addressed in the relevant policy framework, this should not necessarily be seen as a gap to be addressed. Nevertheless, a suite of indicators to more adequately assess the circularity of food and food production than the current CEMF could include the following:

High-level theme	Specific indicator	Source	Justification for inclusion
Climate and food	Presence of guidance (labelling) on climate impact of food product categories	Tested	To highlight CO ₂ e emissions related to food and encourage consumption of less climate-impactful foods.
	GHG emissions from production activities (kg CO ₂ e per capita)	CEMF	To measure GHG emissions from agricultural production.
Sustainable public procurement	Presence of requirements for organic products in public procurement of food	Tested	To add granularity on procurement requirements for organic food.
	Green public procurement	CEMF	To measure the share of public procurement procedures above the EU thresholds that include environmental elements contributing to circularity.
Waste generation and management	Food waste treatment	EU EEA Swedish waste management association ¹⁸	To better understand how treatment of generated food waste contributes to circularity
	Food waste generation/consumer food waste	CEMF	To measure food waste generation and inform EU targets to reduce food waste.

¹⁸ <https://www.avfallsverige.se/>

High-level theme	Specific indicator	Source	Justification for inclusion
Food consumption	Sustainable Calorie intake per capita gap of animal-based food consumption	Tested	To complement the food waste and consumption footprint indicators by giving a better understanding of the impact of healthy, sustainable diets.
	Land-use footprint of production or consumption	PBL Netherlands Environmental Assessment Agency ¹⁹	To understand the land-use impacts of food production and/or consumption
	Consumption footprint	CEMF	To estimate the environmental impacts of EU and Member States' food consumption.

Table 11. Summary of the 'ideal' suite of indicators of 'Food, water and nutrients'

The main actions needed to support the eventual implementation of this suite of indicators are summarised below. Additional scoping of the tested indicators would help to create sound definitions of the indicators to ensure they fit with and complement the existing CEMF indicators. The development and application of robust data collection, calculation and sharing methods, including through stakeholder engagement, would contribute to the successful implementation of the tested indicators. An update to the EU organic label would ensure it is in line with recent developments in circularity for food, contributing to the rollout of the tested indicators. Finally, the tested indicators would be introduced and implemented, to complement the existing CEMF and ensure that the circularity of food and food production can be more adequately assessed.

The main actions needed to support the eventual implementation of this suite of indicators are summarised as follows:

R&D, info/guidance provision (0.5 – 1.5 years): Further scoping of the tested indicators, e.g. to create sound indicator definitions.

Data support, industry/public engagement (1.5 – 5 years): Develop and apply data collection/calculation/sharing methods to implement the tested indicators

Policy, info/guidance provision (1.5 – 5 years): Update the EU organic label to be more in line with recent developments in circularity for food.

Policy (1.5 – 5 years): Test and introduce the tested indicators, to complement existing CEMF.

¹⁹ <https://www.pbl.nl/en/publications/the-price-of-protein-review-of-land-use-and-carbon-footprints-from-life-cycle-assessments-of-animal-food-products>

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This document is an extract of the full final report of a 2-year project to identify and investigate opportunities for innovation in the monitoring of circularity across the EU. The project provides a comprehensive baseline of current policy and funding frameworks, and monitoring efforts across 11 priority policy themes. A multi-faceted taxonomy of over 700 indicators was developed by the Consortium into a multi criteria assessment tool, for bespoke use by any policy maker or interested party, allowing them to shortlist indicators based on a range of priority options. 60 indicators were tested as part of the project, leading to conclusions and recommendations for each of the individual policy areas.

Studies and reports

