Co-creation process -- Literature on CE monitoring

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| Field | Source | Summary information | Key message for CE monitoring |
| General/ monitoring | Haas, W., Krausmann, F., Wiedenhofer, D., & Mayer, A. (2020). Spaceship earth’s odyssey to a circular economy - a century long perspective. Resources, Conservation & Recycling, 163(105076). <https://doi.org/0.1016/j.resconrec.2020.105076> | The paper gives insights on the distance-to-target regarding a full circular economy. For the first time, a century long perspective is taken to reveal the development of substantially growing material flows. The authors in particular point to the problem that a major part of all material flows is used ‘to manufacture or operate stocks’, hence retaining considerable amounts of materials from potential recycling processes. Realising the transformative potential of the circular economy requires addressing key challenges: limit the growth of material stocks, establish clear criteria for ecological cycling, avoid unsustainable biomass production, integrate the decarbonisation of energy systems in circular economy strategies, and prioritize absolute reductions of non-circular flows over maximizing (re)cycling rates. | It is necessary to monitor trends in material flows over time in absolute terms too, and not only as rates. |
| General/ monitoring | **Eco-Innovation Observatory (2020).** The Eco-Innovation Scoreboard and the Eco-Innovation Index. <https://ec.europa.eu/environment/ecoap/indicators/index_en>  and <https://ec.europa.eu/environment/ecoap/indicators/circular-economy-indicators_en> ; next report 2020 is going to be released shortly | The Eco-Innovation Scoreboard (Eco-IS) and the Eco-Innovation Index  illustrate the eco-innovation performance across the EU Member States. They aim at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five dimensions: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes. Links between eco-innovation and circular economy have been strengthened and the revised index also encompasses new circular economy indicators such as data on employment and revenue in eco-industries and circular economy. The project also compiles 28 country profiles. | Eco-innovation (monitoring) is a indispensable element of circular economy transition. |
| General/ monitoring | Mayer, A., Haas, W., Wiedenhofer, D., Krausmann, F., Nuss, P., & Blengini, G. A. (2019). **Measuring Progress towards a Circular Economy** - A Monitoring Framework for Economy-wide Material Loop Closing in the EU28. *Journal of Lndustrial  Ecology*, *23*(1), 62–76. <https://doi.org/10.1111/jiec.12809> | The paper investigates the material flows in the four well-known material groups through the EU28 economy depicting that secondary materials only count for a small part of material input needed to run the economy (approx. 9 per cent in 2014). The authors state that “recycling was surprisingly low, considering the fact that the EU-28 has strict waste regulations, elaborate waste collection and recovery systems, and high material category-specific recovery rates that range from 25% for biomass to 70% for metals”. The authors propose a comprehensive set of indicators that measure the scale and circularity of total material and waste flows and their socioeconomic and ecological loop closing by contrasting input and output oriented CE indicators. | Approach shows input-and output-side CE indicators |
| General/ monitoring | Moraga, G., Huysfeld, S., Mathieux, F., Blengini, G.A., Alaerts, L., Van Acker, K., Meester, S. de, and Dewulf, J. (2019).**Circular economy indicators?**What do they measure? Resources, Conservation & Recycling *146*, 452–461. <https://doi.org/10.1016/j.resconrec.2019.03.045>  | The paper develops a classification framework to categorise indicators according to reasoning on what (CE strategies) and how (measurement scope). To illustrate the classification framework, the authors select quantitative micro scale indicators (products, businesses, and companies) from literature and macro scale indicators from the European Union ‘CE monitoring framework’. It shows that most of the indicators focus on the preservation of materials, with strategies such as recycling. However, micro scale indicators can also focus on other CE strategies considering a Life Cycle Thinking approach, while the European indicators mostly account for materials often without taking life cycling thinking into account. None of the available indicators can assess the preservation of functions instead of products, with strategies such as sharing platforms, schemes for product redundancy, or multifunctionality. This calls for a wider and advanced set of indicators. | None of the currently available indicators can assess the preservation of functions instead of products. |
| General/ monitoring | Eurostat Manuals and guidelines (2014), **Towards a harmonised methodology for statistical indicators**, **Part 1: Indicator typologies and terminologies**<https://ec.europa.eu/eurostat/documents/3859598/5937481/KS-GQ-14-011-EN.PDF/82855e3b-bb6e-498a-a177-07e7884e9bcb> | Publication aims to provide a point of reference for general questions about indicators and indicator sets: why do we use them? what can they measure? and how do they represent reality? by referring to the existing literature on indicators and to concrete examples drawn from the experience of Eurostat and the European Commission as a whole, as well as other national and international institutions. This paper is the first in a series of three papers on statistical indicators published by Eurostat. A second paper on Communicating through indicators was published in 2017. The third paper on Relevance for policy making was released in 2017.  | Information about indicators in general |
| General/ monitoring | Eurostat Manuals and guidelines (2017), **Towards a harmonised methodology for statistical indicators, Part 2: Communicating through indicators**<https://ec.europa.eu/eurostat/documents/3859598/7862432/KS-GQ-17-001-EN-N.pdf/3a226be6-efe0-4668-b09f-3dcd20f8ff11> | Indicators are used in many areas of social and environmental science, economics, business, and project management. A vast empirical experience of communicating through indicators now exists. However, only limited attempts to develop a methodology for this topic have so far been carried out. The purpose of this paper is to make an initial summary of the existing best practices on this theme encompassing communication and statistical knowledge. The paper should be regarded as an occasion to raise awareness and stimulate a debate about what is good communication through statistical indicators.This paper is the second in a series of three papers on statistical indicators published by Eurostat. A first paper on Indicator typologies and terminologies was published in 2014. The third paper on Relevance for policy making was released in 2017.  | Information about indicators in general |
| General/ monitoring | Eurostat Manuals and guidelines (2017), Towards a harmonised methodology for statistical indicators, Part 3: Relevance for policy making, https://ec.europa.eu/eurostat/documents/3859598/8071770/KS-GQ-17-007-EN-N.pdf/7d34c904-2d07-4e71-bd6f-8fe9ee373b60 | This paper aims to help professionals who develop, produce and communicate policy indicators. It analyses how indicators are used at particular stages of the policy making process; it considers the implications of the increasing role of statistical indicators in policy making for official statisticians and indicator developers; finally, it includes recommendations on how to develop and maintain policy relevant indicators. And in describing the opportunities and pitfalls of indicator use in the policy making process, the paper will also be relevant for policymakers using the indicators.This paper is the last in a series of three papers on statistical indicators published by Eurostat. The first paper on Indicator typologies and terminologies was published in 2014. The second paper on Communicating through indicators' was released in 2017.  | Information about indicators in general |
| Metrics for CE monitoring | Parchomenko, A., Nelen, D., Gillabel, J. and Rechberger H. (2019). Measuring the circular economy – A Multiple Correspondence Analysis of 63 metrics. Journal of Cleaner Production, 210, pp. 200–216. <https://doi.org/10.1016/j.jclepro.2018.10.357> | The authors observed there is no generally accepted framework that allows monitoring progress towards a circular economy. The paper analysed existing assessment methodologies and the corresponding metrics that cover different and varied aspects of the CE transition. The main contribution of this paper is the provision of a structured picture of the current stock of CE metrics. 63 CE metrics were assessed and 24 features relevant to CE, such as recycling efficiency, longevity and stock availability. The analysis identified three main clusters of metrics, (1) a resource-efficiency cluster, (2) a materials stocks and flows cluster, (3) a product-centric cluster. The analysis shows a poor integration of resource-efficiency and product-centric perspectives, while the product-centric and system-dynamic perspectives are least frequently assessed. A standardized visualisation framework for CE metrics is derived, which allows to compare individual metrics in a simple and illustrative way. | Monitoring progress towards circular economy requires a balanced set of metrics that covers all relevant features of circular economy. |
| Spatial system boundaries | Graedel, T., Reck, B., Ciacci, L., & Passarini, F. (2019). On the Spatial Dimension of the Circular Economy. Resources, 8(1), 32. <https://doi:10.3390/resources8010032> | The authors observed that circular economy approaches thus far are clearly focused on materials, often considering a regional, mostly European scale. It is however economically impractical to imagine that a circular economy system can be realized within arbitrary geographical borders, due to globalized systems of production and consumption. The authors show in a case study on the national life cycle stages of four metals and one alloy, that a material flow approach is useful to highlight the magnitude of carbon emissions embodied in international trade, but that production-based emissions inventories may be preferable for demonstrating implications to global climate policy. They conclude that circular economy must be conceived at the global level, and must be cognizant of the losses that are inevitable at every life stage, and that the circularity concept should not be slavishly followed to the detriment of other environmental goals. A truly circular economy can only be realized at the global level. | The monitoring of environmental and economic effects of regional or national circular economy strategies is only meaningful when considering the global level. |
| Rebound effects | Zink, T., & Geyer, R. (2017). **Circular economy rebound**. Journal of Industrial Ecology, 21(3), 593-602. <https://doi.org/10.1016/j.rcrx.2019.100028> | The authors observed that idea of substituting lower‐impact secondary production for environmentally intensive primary production gives the circular economy a strong intuitive environmental appeal. They found that the central tenet behind the environmental merits of the circular economy is whether secondary production activities actually reduce, or 'displace,’ primary production. If so, the intuitive promise of the circular economy is achieved; if not, we are left with the impacts of increased secondary production in addition to the impacts of primary production. Circular economy rebound occurs when circular economy activities, which have lower per‐unit‐production impacts, also cause increased levels of production, reducing their benefit. The paper describes the mechanisms that cause circular economy rebound, which include the limited ability of secondary products to substitute for primary products, and price effects. They then offer some potential strategies for avoiding such rebound. | Monitoring methods of circular economy effects should carefully consider the substitution potential of (products with) secondary raw materials in order to account for the risk of rebound effects. |
| EU Circular Economy Action Plan | Pantzar, M., & Suljada, T. (2020). Delivering a circular economy within the planet’s boundaries: An analysis of the new EU Circular Economy Action Plan. Institute for European Environmental Policy (IEEP) and Stockholm Environment Institute (SEI). <https://ieep.eu/publications/an-analysis-of-the-new-eu-circular-economy-action-plan> | Publication contains analysis assesses to what extent actions included in the new EU Circular Economy Action Plan that relate to demand may help reduce environmental pressures and contribute to a more circular European economy within the boundaries of the planet**.** Attention is paid also to analysis ofupdating the Circular Economy Monitoring Framework to reflect new policy priorities and develop further indicators on resource use, including consumption and material footprints | Analysis of the EU Circular Economy Monitoring Framework |
| CE indicators for business | WBCSD (2020). Circular transition indicators V1.0 - Metrics for business, by business (Geneva: World Business Council for Sustainable Development). <https://www.wbcsd.org/Programs/Circular-Economy/Factor-10/Metrics-Measurement/Resources/Circular-Transition-Indicators-V1.0-Metrics-for-business-by-business> | The publication deals with the results of the work of 26 WBCSD member companies on the Circular Transition Indicators (CTI). CTI is an objective and quantitative framework for companies of any industry, value chain position and size to consistently measure their circularity and understand the associated risks and opportunities to the business. Through this framework, companies can understand their progress in moving towards circularity, monitor this over time, and use it to inform key decisions and advise key stakeholders. It also contains user´s manual of CTI online tool that structures data and calculates the outcome. (www.ctitool.com). | Circular Transition Indicators online tool for business |
| CE monitoring in cities | OECD (2020). The Circular Economy in Cities and Regions (Paris: Organisation for Economic Co-operation and Development).  <https://www.oecd.org/regional/cities/circular-economy-cities.htm> | Brochure is the survey that gathered data and information on the status of the circular economy in 34 cities and regions (31 cities and 3 regions), and the main tools, obstacles and good practices available to date. It targeted cities and regions at any level of implementation of circular economy initiatives, from pioneers to newcomers. The OECD is developing a set of tools towards a circular economy framework. First is key input, process and output indicators regarding circular economy initiatives in place, with a focus on the economic and social aspects, second is a scoreboard for measuring how circular a city/region is, based on key dimensions, such as innovation, system change, jobs and skills, economic and finance and third functional approach and a self-assessment tool to identify whether governance conditions are in place, work well or need to be improved.  | The survey gathered data and information on the status of the circular economy in 34 cities and regions. |
| LCA and impact of consumption | JRC (2019). Indicators and assessment of the environmental impact of EU consumption - Consumption and Consumer Footprints for assessing and monitoring EU policies with Life Cycle Assessment (Luxembourg: Publications Office of the European Union).<https://publications.jrc.ec.europa.eu/repository/bitstream/JRC114814/science_for_policy_report_final_on_line.pdf>  | This report provides an overview of the result of the application of Life Cycle Assessment (LCA) to assess the environmental impacts of consumption in the European Union (EU) as a basis to support policies and to improve the appraisal of impacts and benefits thereof. This study has proposed the implementation of different LCA-based approaches to estimate environmental pressures and impacts due to EU Consumption, distinguishing 16 impacts on the environment and resources (e.g. climate change, freshwater ecotoxicity, land use, water use). The assessment has been performed at different scales: the EU as whole, 28 individual Member States, sectors and products, and individual citizens. It is the first study that systematically explores different approaches to model the impact of EU consumption, to evaluate the decoupling of EU economic growth from environmental degradation (including 16 impact categories), comparing their results, including assessment to the Planetary Boundaries and aiming towards a single headline indicator (a weighted score of the 16 environmental impacts covered) for communicating these results. | The application of Life Cycle Assessment (LCA) to assess the environmental impacts of consumption in the EU. |
| Solutions, good practice, future options | Milios, L. (2020). **Policy Framework for Material Resource Efficiency - Pathway Towards a Circular Economy**. Lund University, The International Institute for Industrial Environmental Economics. <https://portal.research.lu.se/portal/files/77553169/PhDthesis_LM_web.pdf> | This doctoral thesis traces the theoretical and political lines from the material efficiency policies towards an integrated circular economy and provides an overview of the gaps in the policy framework, the obstacles to implementation, potentials and the enabling conditions of a circular economy. | Overview of the gaps in the CE policy framework. |
| Drivers & Barriers | Grafström, J. Aasma, S. (2020). **Breaking Circular Economy Barriers**. Stockholm, The Ratio Institute. DOI: [10.13140/RG.2.2.12383.48809](https://www.researchgate.net/deref/http%3A//dx.doi.org/10.13140/RG.2.2.12383.48809?_sg%5B0%5D=uS8hpM3sk2fi1_V2ooVwouf0hh733xAGcxBEZSbdJ12ZiZRgAuVqYIukP7ie3sCB2IUeik2UAVHfAgzbI7GNmQ21og.gTlOoNSDrBh87bZlFZKTN4cWb-uNDwY-9R_u0_UbaoFrJYrJFV_z3Xdh4we-2tiZKOawh23Oq4qglwczEtomhQ) | Implementation of a circular economy (CE) in most areas is generally slow. The paper examines the potential causes to this and illustrates different types of barriers (technological, market, institutional and cultural) The systematic literature review revealed as most cited barriers: 1) Lack of a market and bad institutions, 2) inconsistent policies across countries and for trade, 3) high up-front investment costs with poor access to finance, 4) low consumer awareness and 5) externalities not internalised through taxes (and subsidies). | Investigation of CE barriers and their implications. |
| Drivers & Barriers | Kirchherr, J. et al. (2018). **Barriers to the Circular Economy**: Evidence From the European Union (EU), Ecological Economics 150 (2018), 264-272, Doi: <https://doi.org/10.1016/j.ecolecon.2018.04.028>  | Limited progress has been accomplished regarding the implementation of the CE concept. Most scholarly studies blame this on various technological barriers. The authors find that cultural barriers, particularly a lack of consumer interest and awareness as well as a hesitant company culture, are considered the main circular economy barriers by businesses and policy-makers. These are driven by market barriers which, in turn, are induced by a lack of synergistic governmental interventions to accelerate the transition towards a circular economy. | Inter alia, provides a visual overview of the core CE barriers and their possible interactions, hampering the transition to a CE.  |
| Drivers & Barriers | Morseletto, P. (2020). **Targets** for a circular economy. Resources, Conservation & Recycing 153 (2020), 104553, doi: <https://doi.org/10.1016/j.resconrec.2019.104553>  | The paper examines which targets can facilitate the transition towards a circular economy, focusing on both on existing and new targets. A framework based on 10 common circular economy strategies (i.e. recover, recycling, repurpose, remanufacture, re- furbish, repair, re-use, reduce, rethink, refuse) is applied to scrutinise the selected targets. The study clarifies that existing targets for recovery and recycling do not necessarily promote a circular economy, despite the most commonly applied targets so far. Due to efficacy lack of recovery and recycling, targets should favour other circular economy strategies.  | The shows need for an expanded set of new targets. |
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