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Measuring the circular economy's performance

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Title of the feature in Science Trends: Measuring the circular economy's performance

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Original journal article title: A taxonomy of circular economy indicators

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Science allows us to understand the mechanisms of the environment we live in, as well as how we, as human being, have an impact on it. As such, the human influence and negative impact on climate change, natural habitat destruction, or resource depletion, is widely acknowledged. Particularly, the business-as-usual and so-called “take-make-waste” linear industrial production system is no longer sustainable. Shifting towards more circular industrial eco-systems appears then as a suitable endeavor to meet the goals of a sustainable development. A circular economy is indeed looking for a better management of resources throughout the lifecycle of systems, and it is characterized by closed loops, promoting maintenance, sharing, leasing, reuse, remanufacturing and recycling. It aims to retain the highest utility and value of products, materials, and resources at all times, to minimize the generation of waste.

Yet, a circular economy is still an umbrella concept that can mean different things to different people: there is no standardized definition of a circular economy, and more than 100 definitions have been reviewed by researchers in 2018. In the meantime, new methods and tools, including indicators, are needed to support industrial practitioners in their transition towards more circular practices. Businesses are notably looking for new set of key performance indicators to measure and monitor their progress within a circular economy. As a result, numerous circularity indicators have been developed in the last few years (n.b. more than 50 sets have been inventoried), but in an inconsistent and fuzzy manner regarding their scopes, purposes, and possible applications.

To help decision-makers – such as industrial managers, engineers or designers (e.g., during product design and development phases) – identifying the most appropriate set of circularity indicators in regard to their needs, taxonomy can be incredibly useful. Historically used to classify living organisms, taxonomy, which translates from Ancient Greek as “arrangement method” is a tool for categorizing elements in groups (or taxa) based on common features. From a research point of view, the organization of knowledge, here through taxonomy, is fundamental to understand and build on the current database of circularity indicators, so that one can select the indicator(s) appropriate to his or her need, but also to identify patterns, relationships, and make inferences between these indicators. From a more operational point of view, and to facilitate the identification of suitable circularity indicators, a selection tool “The C-Indicators Advisor”, linked to the database of more than 50 sets of circular economy indicators, has been developed.

In this first taxonomy of indicators for a circular economy published in 2019, which includes 10 categories, circularity indicators are differentiated regarding criteria such as the levels of circular economy implementation (micro, meso, macro), the circular economy loops (maintain, reuse, remanufacture, recycle), the performance (intrinsic, impacts), the perspective of circularity (actual, potential) they are taking into account, or their degree of transversality (generic, sector-specific) (Saidani et al., 2019).

All in all, this taxonomy provides a synthesis and clarification to the emerging and must-needed research theme of circular economy indicators. Eventually, this synthesis and organization of indicators can also

notably be useful to identify remaining gaps among the clusters of circularity indicators. For instance, at a micro level of circular economy implementation (n.b. level of materials, products, companies), circularity indicators – such as the Material Circularity Indicators, the Circular Economy Indicator Prototype, or the Circularity Potential Indicator – can be used as a time-efficient tool (i.e., in comparison of performing a lifecycle analysis) to provide a first trend (e.g., an estimation during product design and development phases) of the intrinsic product circularity performance over life cycle, and to compare design alternatives. Yet, the correlation between the circularity and sustainability performance of products is not directly taken into account through these indicators, which is an important point to consider in the future design of circular economy indicators, to ensure the development and monitoring of truly circular and sustainable eco-products, systems and services.

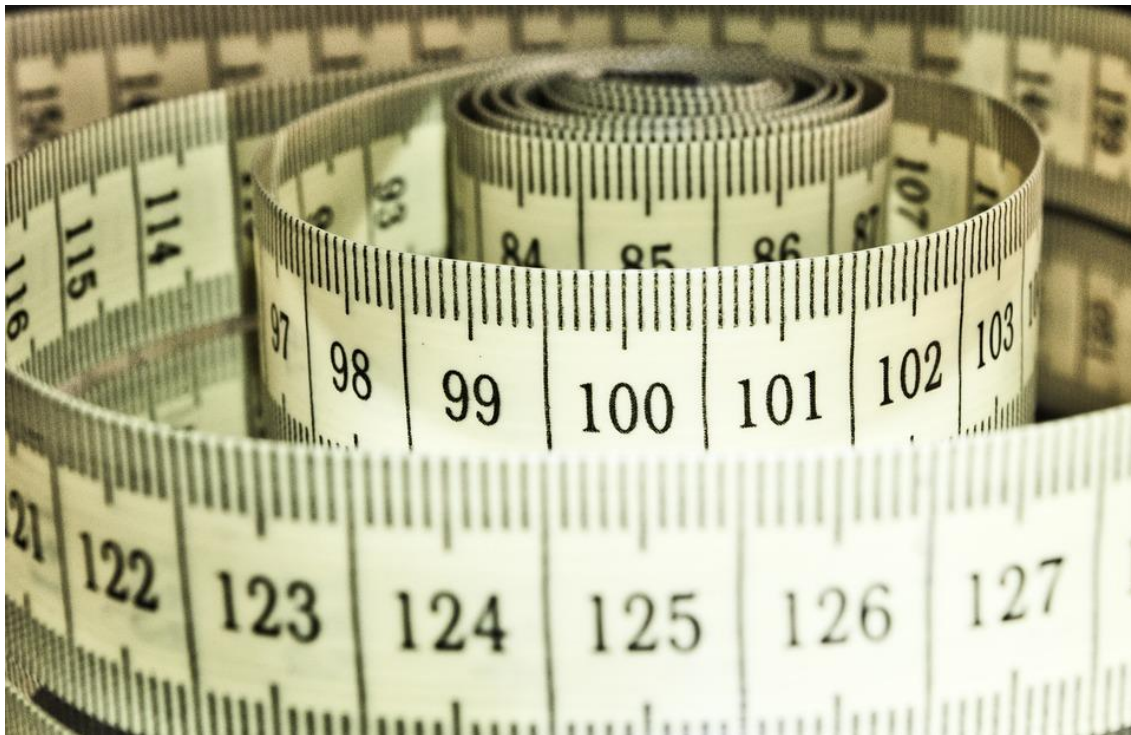
Quotation:

These findings are described in the article entitled “A taxonomy of circular economy indicators”, recently published in Journal of Cleaner Production. This work was conducted by Michael Saidani, Bernard Yannou, Yann Leroy, and François Cluzel, from CentraleSupélec, Université Paris-Saclay, and by Alissa Kendall from the University of California-Davis.

Reference:

Saidani, M., Yannou, B., Leroy, Y., Cluzel, F., Kendall, A. 2019. A taxonomy of circular economy indicators. Journal of Cleaner Production, 207, 542-559.

Illustration:



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