



Monitoring Circularity Performance for Enhancing Environmental and Economic Sustainability

Michael Saidani

► To cite this version:

Michael Saidani. Monitoring Circularity Performance for Enhancing Environmental and Economic Sustainability. Beyond Institute, 2021. <hal-03377082>

HAL Id: hal-03377082

<https://hal.science/hal-03377082v1>

Submitted on 4 Nov 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Title:

Monitoring Circularity Performance for Enhancing Environmental and Economic Sustainability

Author:

Dr. Michael Saidani (michael.saidani@centralesupelec.fr)

Keywords:

Circular economy, indicators, performance management, impact, circularity, sustainability.

Body text:

Measuring the ecological impact of organizations is key to ensure sustainable actions and sound decisions. In the meantime, an increasing number of organizations are transitioning towards more circular economy strategies as a means to achieve several of their sustainable development goals. In this line, these organizations are looking for the right set of circularity indicators that would enable them to assess, monitor, and achieve their objectives.

On the one hand, it seems that these circularity indicators - which can be seen as high-level heuristics or key performance indicators (KPIs) - and their associated tools are more rapidly deployable and easier to understand (Saidani et al., 2019a) than environmental assessment methods and indicators such as life cycle assessment (LCA). On the other hand, to support sustainable decision-making, it remains to provide tangible proof that these indicators are correlated with actual economic, environmental and/or societal improvement (Pena et al., 2021). It is thus necessary to be able to validate whether this shift to more circular practices leads to a "better" outcome regarding the three pillars of sustainable development, for example, by comparing a variation of the circularity score with environmental indicators computed through LCA (Saidani et al., 2021).

It is of the utmost importance to keep in mind that trying to maximize the circularity score/rate is not always the best option when taking into account the cost and energy required to achieve such a circularity performance (for example, associated with product collection, disassembly process, and processing of certain materials). Indeed, achieving full circularity is often incompatible with the industrial and economic reality, end-of-life channels, and best available technologies. With that in mind, we argue that the circularity performance should be used and optimized as a lever (one can see it as a cursor to be adjusted) to guarantee both economic and environmental benefits. In practice, these trade-offs between economic, environmental, and circularity performance should be considered and optimized simultaneously. For example, a mathematical optimization model (Saidani et al., 2019b) has been recently developed to find the circularity performance(s), maximizing the economic profit and minimizing the carbon footprint.

These findings are further described in the SCORELCA study NB 2020-03 entitled "Benchmark of circularity indicators and links with LCA" (SCORELCA, 2021), including: (i) a classification of 105 sets of circularity indicators; (ii) a method to select and combine the appropriate indicators according to the organization's context and needs; (iii) and a correlation analysis between circularity and LCA indicators, illustrated through three case studies. This work was conducted by Michael Saidani from Université Paris-Saclay, CentraleSupélec, in collaboration with Stéphane Le Pochat and Aude Monteil from EVEA, and under the supervision of Bernard Yannou from Université Paris-Saclay, CentraleSupélec, Jade Garcia and Philippe Osset from SCORELCA.

References:

Pena, C., Civit, B., Gallego-Schmid, A., Druckman, A., Caldeira-Pires, A., Weidema, B., ... & Motta, W. (2021). Using life cycle assessment to achieve a circular economy. *The International Journal of Life Cycle Assessment*, 26(2), 215-220.

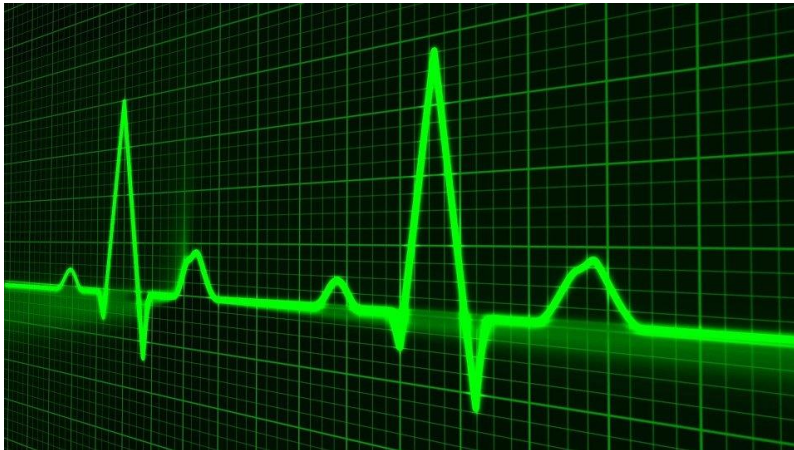
Saidani, M., Kim, H., Yannou, B., Leroy, Y., Cluzel, F. (2019b). Framing Product Circularity Performance for Optimized Green Profit. *Proceedings of the ASME 2019 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 4: 24th Design for Manufacturing and the Life Cycle Conference*, Anaheim, California, USA. August 18–21, 2019.

Saidani, M., Kravchenko, M., Cluzel, F., Pigosso, D. C., Leroy, Y., Kim, H. (2021). Comparing life cycle impact assessment, circularity and sustainability indicators for sustainable design: results from a hands-on project with 87 engineering students, *ICED 21*, Aug. 2021.

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

SCORELCA. (2021). Benchmark of circularity indicators and links with LCA. SCORELCA, Villeurbanne, France. Study NB 2020-03.

Illustration:



Credit: Pixabay (<https://pixabay.com/illustrations/pulse-trace-healthcare-medicine-163708/>)