



OPEN ACCESS

EDITED AND REVIEWED BY
Faik Bilgili,
Erciyes University, Turkey

*CORRESPONDENCE
Jan Brusselsaers,
jan.brusselsaers@vu.nl

SPECIALTY SECTION
This article was submitted to
Environmental Economics and
Management,
a section of the journal
Frontiers in Environmental Science

RECEIVED 08 September 2022
ACCEPTED 12 September 2022
PUBLISHED 23 September 2022

CITATION
Brusselsaers J, Can M and Sturm B
(2022), Editorial: Green indicators to
inform circular economy under
climate change.
Front. Environ. Sci. 10:1039778.
doi: 10.3389/fenvs.2022.1039778

COPYRIGHT
© 2022 Brusselsaers, Can and Sturm. This
is an open-access article distributed
under the terms of the [Creative
Commons Attribution License \(CC BY\)](#).
The use, distribution or reproduction in
other forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which does
not comply with these terms.

Editorial: Green indicators to inform circular economy under climate change

Jan Brusselsaers^{1,2*}, Muhlis Can³ and Bodo Sturm^{4,5}

¹VU Amsterdam, Institute for Environmental Studies, department of Environmental Economics, Amsterdam, Netherlands, ²Flemish Institute for Technological Research (VITO), Unit of Sustainable Materials, Antwerp, Belgium, ³BETA Akademi SSR Lab, Istanbul, Turkey, ⁴HTWK Leipzig, Faculty of Business Administration and Industrial Engineering, Leipzig, Germany, ⁵ZEW Leibniz Centre for European Economic Research (ZEW), Mannheim, Germany

KEYWORDS

green indicators, circular economy, renewable energy, climate change, trade, financial inclusion, technological innovation, time series analysis

Editorial on the Research Topic

[Green indicators to inform circular economy under climate change](#)

This Research Topic gathers research which makes use of indicators to assess the environmental impact of economies and proposed sustainability transitions. A helicopter view of the combined set of insights reveals a number of relevant trends in this area of research. First, we can distinguish between indicators at different levels (macro versus micro). Second, it is observed that some of the useful indicators in this context are generic in nature, while others specifically focus on environmental aspects or even specific sustainability transitions (e.g., circular economy). Third, the indicator-based research provides useful information for policy makers and multiple stakeholders in general and, given its importance, the financial sector in particular.

The obstacle of climate change is among the major concerns that mankind is experiencing today. Climate change poses remarkable risks to the planet and human health such as extreme weather conditions, decreasing of agricultural productivity, and lack of food.

The quest for solutions to protect the environment in combination with achieving sustainable development is difficult. These solutions should arise out of societal, economic and technological transitions. These proposed transitions are very different in nature, and consequently, it is very difficult to assess the impact of the different transitions on the environment and sustainable development. To tackle this issue, researchers increasingly make use of indicators either describing the state of the environment or the transitions. In this context, the number of available indicators is growing rapidly, and more data is gathered over longer periods in time. Both evaluations allow more detailed and robust (often econometric) analysis.

The aim of these studies is to scan for correlations or causal relations between social, economic, and technological parameters on the one hand and environmental outcomes on the other hand. This field of research is rapidly growing and gaining importance throughout the world. The latter is also demonstrated by the geographical coverage of papers published in the framework of this

Research Topic. The Research Topic encompasses research which covers China, the European Union, Central and Eastern Europe, the Organisation for Economic Co-operation and Development (OECD) countries, the so-called BRICS countries (i.e., Brazil, Russia, India, China and South Africa) and the G7 countries (i.e., Canada, France, Germany, Italy, Japan, the United Kingdom, the United States of America). In addition, authors such as [Yu et al.](#) present a comparative analysis for some of these regions.

The number of proposed transitions is rapidly growing, and the transitions are diverse in nature. Consequently, also the number of proposed indicators is expanding, as they aim to capture information on very different aspects of the proposed transitions. Nevertheless, some trends become apparent. First, the current Research Topic presents papers on a wide range of indicators which aim to describe the state and use of technology within an economy. Some of these indicators are rather generic and cover for example “technological spill-over” ([Huang and Pei](#)) and “technological innovations” ([Ahmad et al.](#)), “economic complexity” ([Neagu et al.](#)), “high-tech manufacturing co-agglomeration” ([Peng et al.](#)), “import of intermediates” ([Huang and Pei](#)), and “producer service industry” ([Peng et al.](#)).

A second category of indicators specifically monitors the importance of green infrastructure and carbon-neutral production facilities. Such kind of indicators used in the studies gathered in this Research Topic for example are the “green openness” of an economy ([Ahmad et al.](#)), the “green total factor productivity” ([Tang and Qin](#)), “green total factor energy efficiency” ([Wang et al.](#)), “green development” ([Zhang et al.](#)), “carbon neutrality” ([Lu et al.](#)) and “eco-investment” ([Constantinescu et al.](#)).

While the second category of indicators has a focus on environmental-friendly technology in general, there are also indicators which are specifically designed to monitor trends of specific aspects of sustainability transitions. Examples are the transition towards a more circular economy, or the uptake of renewable energy production and consumption. In this context, this Research Topic gathers studies which make use of indicators such as the “renewable energy technology budgets” ([Ahmad et al.](#)) and “green energy consumption” ([Peng G. et al.](#)), the set of “circular economy indicators” presented by EUROSTAT (e.g., recycling rates, self-sufficiency of raw materials . . .) or “circular material use rate” ([Platon et al.](#)). These types of indicators allow for more detailed analyses of specific trends in the structure of economies.

This Research Topic is designed to expand the knowledge of the relationship between the environment and various social and economic indicators to enable reliable and long-term plans. As the Research Topic identifies the crucial micro- and macro-determinants of environmental quality and sustainable development, the outcome of the Research Topic provides valuable insights to policy makers in specific.

That link to policy is also apparent from the topics covered in the Research Topic. Many of the presented papers focus on a selection of policies which directly impact an economy’s structure and hence the indicators mentioned. This demonstrates the presumed steering potential

of policies such as “carbon emission trading schemes”, “carbon market pricing”, “environmental taxes”, or “innovation support”. The usefulness of research on these aspects is twofold. First, (often econometric) research assesses the efficiency and impact of existing policies. Second, research identifies possible pathways for the design of future policies which envisage a more sustainable production system.

In addition to policy makers and researchers, the presented studies also provide information to other stakeholders involved in the transition towards more sustainable economies. Economic actors along the value chain of different products can draw important lessons from the presented research. We in particular would like to stress the importance of the financial sector in this context. Since the papers often focus on technology-related indicators, this straightforwardly leads to analyses which also cover indicators linked to access to funding and financial products in general. Worth mentioning here are the “access to green credit” ([Qin and Cao](#)), “financial inclusion” ([Ahmad et al.](#)), “eco-investments” ([Constantinescu et al.](#)), “financial risk” and “renewable energy technology budgets” ([Ahmad et al.](#)), and “supply chain finance” ([Liu et al.](#)). Various studies in this Research Topic stress the importance of financial risk as a barrier to sustainable transitions. The latter is especially crucial in case transitions are mainly technology-based (instead of, for example, societal transitions). The mediating role of the financial sector, and possible financial products to tackle that barrier is crucial and deserves attention by both the sector itself and policy makers. Innovative financial products should facilitate the funding for research and development and investments in (the up scaling of) sustainable and green technology and business practises which seek not to harm the natural environment. However, the financial products should also move beyond the pure funding-type of products. Sustainability transitions also for example require insurance products for new products, business models, or innovative services.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher’s note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.