

Supporting sustainability science

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Background

Sustainability science is officially 20 years old. Today, it is a dynamic and growing field that has demonstrated its ability and potential to contribute to solving the challenges of sustainable development. However, for sustainability science to flourish, a change in our scientific culture is needed.

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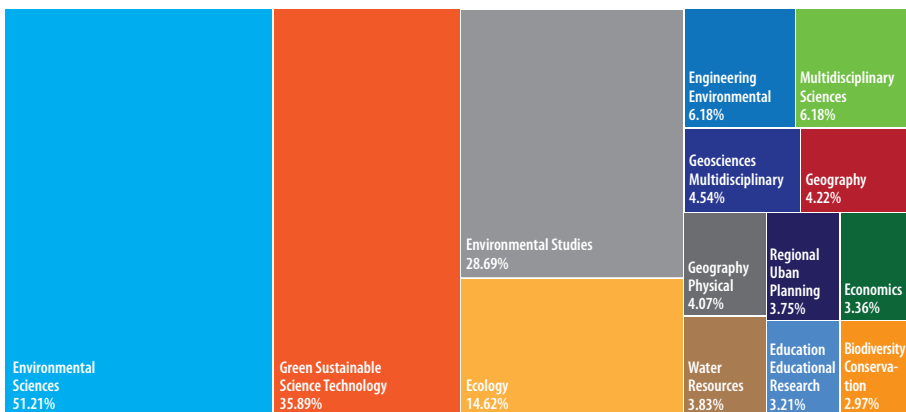
Further reading

PALOMO I., LOCATELLI B., OTERO I., COLLOFF M., CROUZAT E., CUNI-SANCHEZ A., LAVOREL S., 2021 – Assessing nature-based solutions for transformative change. *One Earth*, 4 (5) : 730-741.

Introduction

A landmark moment for science occurred in 2021 with the twentieth anniversary of an article that marked the emergence of a continuously growing discipline: sustainability science (Kates R. W., Clark W. C. et al., 2001 – Sustainability Science, Science, 292: 641-642). Sustainability science is, like agricultural science or health, defined by the subject it addresses: sustainable development. Sustainability science, therefore, seeks to understand the fundamental way in which nature and society interact. As a solution-oriented science, the key attributes of sustainability science, are its engagement with the policy agenda, such as the Sustainable Development Goals (SDGs), interdisciplinarity and transdisciplinarity. The figure below shows the most common disciplines incorporating sustainability science, which is still largely dominated by the environmental sciences, with a smaller contribution

from the social sciences and humanities. The rapid rise of sustainability science is evident from the number of publications that explicitly cite it. It is also evident in the long list of university programmes focused on sustainability, the continued growth of the Sustainability Science journal (launched in 2006), and the involvement of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in multiple programmes on sustainability science. Wikipedia features a list of 126 environmental research institutes from 35 different countries. The Global Sustainable Development Report, created at the Rio+20 conference in 2012 and published every four years, is written by an independent group of scientists appointed by the UN Secretary General. The latest report, published in 2019, assesses progress towards achieving the SDGs.



Percentage of publications on sustainability science across various disciplines.

Advances in sustainability science

Over the past twenty years, sustainability science has demonstrated its ability and potential as a research discipline. One example is the emergence of the concept of ecosystem services or Nature's Contributions to People (NCPs), understood as the direct and indirect contributions of biodiversity and ecosystems to human well-being. They include aspects such as the provision of drinking water or timber by natural ecosystems, the regulation of the climate and water cycle and the pollination of crops, along with the recreational and health benefits of frequent contact with nature. Recognising these contributions is another ethical reason why we need to conserve biodiversity given its intrinsic value. It highlights how our economic system, our health, our well-being, and even our own survival as a species, depend on nature. The emergence of these concepts in the 1990s has given us a better understanding of how human activities that have an impact on nature can ultimately have negative effects on humans. NCPs are not automatically transferred from ecosystems to society but are instead the result of a process of co-production and interaction between societal and ecological systems. The field of ecosystem services is also one of the drivers of the United Nations System of Environmental-Economic Accounting (SEEA), which combines economic and environmental data to provide a more complete picture of the interrelationships between the economy and the environment.

It is also an essential component of Payment for Ecosystem Services (PES) schemes and similar efforts that support biodiversity conservation and human well-being around the world. For this progress to take place, significant advances have been made in interdisciplinary research, and disciplines such as environmental and ecological economics are now well established. Transdisciplinarity and the co-production of knowledge with non-academic stakeholders is also one of sustainability science's long-term goals. Considerable progress has been made, especially through international science and policy initiatives such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). However, several challenges still need to be met to increase transdisciplinarity in sustainability science.

The challenges and the way forward

Sustainability specialists often struggle to take part in traditional recruitment competitions or to identify funding programmes that are aligned with their work. Without competitions that focus specifically on sustainability science, their research may be viewed by the social sciences as too ecologically oriented and vice versa. Transdisciplinarity may be difficult to achieve for some sustainability science researchers, given the considerable time commitment, the sometimes conflicting motivations (academic development vs. problem solving) and the specific skills needed to be

involved in the decision-making arena. Growing competition in the research and development world for permanent positions, with a need for short-term results and publications, does not foster transdisciplinarity either, as it often takes a long time to develop. This difficulty is compounded by the fact that the research world still places too much emphasis, when recruiting, on the quantity of scientific output rather than on its quality and impact. Some of these challenges can be overcome with a fundamental change in current scientific culture. If sustainability science is going to respond to the major challenges we face, such as the climate emergency and the biodiversity crisis, greater recognition must be given to researchers whose work contributes to solving these challenges. This would require a shift away from the current tendency to measure academic excellence solely in terms of the quantity and quality of published articles. This paradigm shift, which may seem easy,

is in fact a considerable challenge in itself because of how difficult it is to assess the impact of researchers' and academics' work on society or, for example, on environmental management and restoration. For sustainability science to be viable, both the academic or research institutes that drive each institution's own strategy and the research funders must work hand in hand on its core elements: interdisciplinarity and transdisciplinarity. There is a need to assess and value the merits of sustainability science and researchers not through traditional indicators (list of papers published, number of projects, number of students supervised), but through innovative impact indicators. The recent development in France of highlighting the impact of researchers' work in their curricula vitae, emphasising the importance of a limited number of outputs (not only research articles, but also computer programs, videos, protocols and patents), is an important step in this direction.

KEY POINTS

Sustainability science has helped to provide important solutions to environmental challenges such as the climate emergency and the global biodiversity crisis. However, solving these challenges, which are among the most important that humanity has ever faced, requires stronger and more aggressive sustainability science. To achieve this, individual researchers and academic institutions need to embrace a cultural shift in the way we define and measure scientific excellence.

SUSTAINABILITY SCIENCE

UNDERSTAND, CO-CONSTRUCT, TRANSFORM

Collective thinking coordinated
by Olivier Dangles and Claire Fréour

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