Ecology, Economy and Society–the INSEE Journal 2 (2): 41–44, July 2019

CONVERSATIONS: Practising Sustainability Science: Challenges in Teaching and Research

The Current State and Challenges to Advancing Sustainability Science and Education

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1. PREAMBLE

Key circles and players in the global community, including the general public, policy makers, and scientists, have become convinced by the mounting scientific evidence over the past three decades that the viability of life on earth is seriously threatened by the accelerating pressures from population growth and urbanization rates, expansion in energy-intensive production and consumption activities, climate change, etc. The world has responded in various ways to these risks, recognizing the need for urgent action to prevent or ameliorate the expected disastrous consequences of crossing the boundaries of natural limits. Commitment to the emergent sustainable development (SD) agenda through several global initiatives, protocols, policy measures, and action programmes and strategies has, as a result, dominated the international political and professional debates and cooperative interactions. Examples of such responses include major intergovernmental processes such as the Intergovernmental Panel on Climate Change (IPCC) and its protocols (Kyoto, Paris, etc.), Millennium Ecosystem Assessment (MEA), Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), protection of biodiversity and combating desertification protocols, and UN Declaration on Sustainable Development, among others.

Emergence of sustainability science in research and education is one such important response. Scientific research has generated credible knowledge

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Published by Indian Society for Ecological Economics (INSEE), c/o Institute of Economic Growth, University Enclave, North Campus, Delhi 110007.

ISSN: 2581-6152 (print); 2581-6101 (web).

about the causes, nature, magnitude, and consequences of the various threats to the integrity of life on earth and potential technological, policy, and institutional innovations and intervention options to address them. The design and implementation of the above-mentioned global responses and initiatives have generally been informed by findings of scientific research relying primarily on inter and transdisciplinary collaboration, which has defined the principle foundations of sustainability science (Clark 2007, Salas-Zapata *et al.* 2017). Many challenges, however, remain in face of the need to advance the role and contributions of SS in research and education.

2. CHALLENGES FACING THE PRACTICE OF SUSTAINABILITY IN RESEARCH AND EDUCATION

The rise of SS is evident from the vast volume of published research outputs and the large number of authors, journals, and networks (fora, conferences, societies, etc.) engaged in this field over the past two decades (Bettencourt and Kaur 2011). One key and novel feature of sustainability science is that it aims at finding solutions to societal problems associated with managing the complex dynamic interactions between nature and society. This requires transdisciplinary collaboration and engagement of affected communities and other non-academic entities (business, government, etc.) in all phases of the research undertaking, from framing the research questions, through implementing the scientific investigation, to reaching solutions (Spangenberg 2011, Lang *et al.* 2012). These principal features, however, present major challenges, many of which remain unresolved in the way of advancing the practice of sustainability science.

The difficulty with integration across disciplinary boundaries in adaption and use of mixed methods for cogeneration of systemic knowledge and development and validation of solutions remains, maintaining a persistent divide, especially between natural and social sciences (Wehrden *et al.* 2017). This divide is also found in the still limited integration of normative knowledge from the diverse social, political and value systems of non-academic stakeholders, leading to weak participation and ownership, especially in framing of problems and co-creation of solutions (Brandt *et al.* 2013, Lang *et al.* 2012). In this conversation on sustainability science, Rai explains more, with examples, how academics and researchers can be discouraged from critical scientific examination of the underlying objectives of major state initiatives to preserve the status quo and protect interests of key stakeholders.

The SD agenda triggered a series of global, regional and national higher education declarations committing to sustainability, from the Talloires

(1990) to the Ubuntu (2002) and Bonn (2009) Declarations and the UNESCU Conference on Higher Education in 2009 (Tilbury 2011). This led to an upsurge of various university alliances and networks committing to infusing sustainability in teaching and learning and emergence of specialised course modules, including tertiary degree training programmes on sustainability in a number of universities, particularly in the North (Kates 2011). Nevertheless, resistance due to disciplinary loyalties, fear of intrusion into academic freedom, weak structural incentives and low demand for specialized skills in sustainability science continue to hinder progress in transforming curricula and the practice of sustainability science in teaching and learning (Jones, Selby and Sterling 2010).

3. SUSTAINABILITY SCIENCE AND EDUCATION IN THE DEVELOPING WORLD

Apart from a few exceptional cases, progress with practicing sustainability science in knowledge generation and education in the developing world has been very limited. Observed participation and engagement of developing countries in sustainability projects and initiatives has been primarily catalysed through support from international promoters (Tilbury 2011). There is a pressing need for home-grown initiatives and genuine national and regional level commitment to and sufficient investments by public and private sectors in advancing the practice of sustainability science through academies of sciences, universities and research institutions in these parts of the world. Successful experiences of the Southern African Development Community Regional Environmental Education Program (SADC-REEP) provide an example to be enhanced and replicated for effective promotion of the practice of sustainability science in research and education (Mandikonza and Lotz-Sisitka 2016). Purushothaman and Rai document valuable lessons from the experiences of Azim Premji University and Ashoka Trust for Research in Ecology and the Environment, respectively, in advancing sustainability science education in Asia.

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