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# Redefining environmental sustainability

## Editorial overview

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Current Opinion in Environmental Sustainability

2013, 5:272–277

For a complete overview see the [Issue](#)

Available online 30th August 2013

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<http://dx.doi.org/10.1016/j.cosust.2013.07.006>

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Prof. Dr Rik Leemans (1957, The Netherlands) is Professor of Environmental Systems Analysis and Earth Systems Science at Wageningen University (The Netherlands). His research focuses on ecosystems and biodiversity, and accentuates resilience, vulnerability and sustainability. His early studies at Uppsala University (Sweden) and the International Institute of Applied System Analyses (Austria) emphasized the dynamics of boreal forests. He then directed the development of IMAGE-2, a global climate change model, at the Dutch National Institute of Public Health and the Environment. He also chaired one of the Working Groups of the Millennium Ecosystem Assessment, enacted several leadership roles in the ICSU/ISSC international interdisciplinary global change programmes, and is involved in the assessments of the Intergovernmental Panel on Climate Change.

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Prof. Solecki's research focuses on urban environmental change and transition, and climate change and cities. He is the Director of the CUNY Institute for Sustainable Cities and Professor of Geography at Hunter College-CUNY. He is currently serving as the co-chair of the New York City Panel on Climate Change, a lead author for the IPCC AR5, WGII Urban Areas chapter, as convening lead author for U.S. National Climate Assessment Urban, Infrastructure, and Vulnerability chapter, as co-chair of the New York Panel on Climate Change (NPCC), and as a member of the scientific steering committee of IHDP, Urbanization and Global Environmental Change (UGE) Core Project. He is a co-founder of the Urban Climate Change Research Network (UCCRN) and co-editor of the recent Climate Change and Cities Assessment (ARC3) Report published by Cambridge University Press. He also has served as the leader or co-leader of several climate impacts studies in the greater New York and New Jersey region.

### Introduction

Human activities are rapidly changing both positively and negatively the Earth system and its components at local, regional and global scales. Greenhouse gas emissions continue to increase in most regions [1]. The atmospheric carbon dioxide concentration has just passed the elicited boundary of 400 ppm (<http://keelingcurve.ucsd.edu>). Oceans are acidifying and arctic ice was at its lowest observed extent ever in September 2012 [2]. Land use is intensifying in many places and biodiversity continues to decline [3]. The human population surpasses seven billion and, although at a slower pace, is still increasing. The global economy valued at market price has grown tenfold over the past decades and will continue to expand, not only in the developed world but also in the emerging economies in Asia, Africa and Latin America. But the benefits of this development are not shared by all. Distributive justice is getting delayed and its continued denial is anticipated to increase destabilizing social actions in newly developing countries [4]. Twenty per cent of all people use eighty per cent of all resources and income gaps continue to increase in many countries. An American family, for example, consumes as much as eight Bangladeshi families or twenty-five Ethiopian families. Although extreme poverty has been reduced in many regions recently and other successes have been reported [5], such as the global expansion of a middle class, environmental change and its impacts, the current economic crisis, and unfinished agendas of social justice issue undermine further progress.

The recent United Nations Conference on Sustainable Development (RIO+20) in June 2012 acknowledged all these negative trends and initiated the development of sustainable development goals. In its final document 'The Future We Want' [6] commitments for action and agreement by world leaders on a path for a sustainable future are laid out. This visionary document provides some striking observations. For example, it is clearly recognized that all these problems cannot be solved by technology, policies or individual countries alone. Human creativity needs to be more directed towards new pathways of coexistence between humans and other species. All nations, sectors and actors must contribute. Additionally, a large role is seen for brainstorming through interaction among disciplinary scientific research and innovation. However, such research should not be accomplished in traditional 'academic ivory towers' but in close collaboration with stakeholders, such as business, governments and civil society. Finally, development research should be further integrated with environmental and socio-economic research. The new sustainability science discipline emerges through productive visionary research programmes [7].

At the same time the International Council for Science (ICSU) and the International Social Science Council (ISSC), together with the Science and Technology Alliance<sup>1</sup> launched a new integrated research initiative 'Future Earth: research for global sustainability' [8<sup>\*</sup>,9,10<sup>\*\*</sup>], which will attempt to answer fundamental questions about how and why the global environment is changing, what are likely future changes, what are risks and implications for human development and the diversity of life on Earth, and what the opportunities are to reduce risks and vulnerabilities, enhance resilience and innovation, and implement transformations to prosperous and equitable futures. The Earth System Science Partnership (ESSP [11<sup>\*</sup>]) has already joined Future Earth and the various international global change programmes (DIVERSITAS, IGBP, IHDP and WCRP) will follow soon or strongly collaborate. Future Earth continues to deliver the best science, but will enhance its scientific utility and applicability by developing innovative trans-disciplinary approaches through actively linking to stakeholders to co-design the major research questions, co-create new knowledge, and to continuously monitor the research's utility. Effective linkages with the international conventions not only through the official science-policy assessments (e.g. IPCC and IPBES) but also through new active dialogues between researchers, scholars and decision makers (from governments, private sectors and civil organizations), have to be strengthened. Finally, the original global-change research should in Future Earth be better connected to development research, capacity building and young investigators from all regions of the world.

These recent societal, policy and scientific developments require revisiting and shifting the focus of Current Opinion in Environmental Sustainability (COSUST). In the inaugural editorial [12], we approached environmental sustainability from a systemic basis. Every annual volume was divided into six dedicated issues each emphasizing a different system (i.e. climate, energy, terrestrial, aquatic, biogeochemical and urban systems). This system approach resulted in a rapid ISI Web-of-Science listing, an increasing impact factor (2.4 for 2011 and 3.2 for 2012) and a large visibility in the global-change research community. However, the recent rapid developments in sustainability science and the discussions towards a sustainable society, now demand a still better integrative approach in which human thinking, solutions, interdisciplinarity, transdisciplinarity and outreach to society should obtain more emphasis. In COSUST this has

<sup>1</sup> The Alliance members consist of the International Council for Science (ICSU), the International Social Science Council (ISSC), the Belmont Forum of funding agencies, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), and the World Meteorological Organization (WMO) as an observer.

already been done in some of the open issues, targeting, for example, the 'Planet Under Pressure' conference participants [13,14]. Also this issue takes a more integrated sustainability approach. The remainder of this editorial will present and discuss the new approach for COSUST and the content of this issue.

Although the arrangement of topics will change, we will not alter the publication process [12]. The Editors-in-Chief, after consulting with the editorial board, will continue to select and appoint issue editors, who are major authorities in their field. These editors then propose and commission reviews from experts on each topic that they have selected, and write a short overview at the beginning of the issue to introduce the reviews and to draw the reader's attention to any particularly interesting developments. The invited authors write concise review articles in which they present and discuss recent developments, emphasizing the aspects that, in their opinion, are most important and relevant for advancing scientific understanding. All contributions are peer-reviewed and revised, if necessary, before publication. This open issue is an example of possible future topics to be published by COSUST. In addition to these issue themes, COSUST will continue to publish papers on strategic research plans of Future Earth and related global-change projects.

Anand Patwardhan also rotated off the Editors-in-Chief team. His broad expertise as systemic economist and his ample experience with several global-change projects definitely advanced COSUST. His hands-on links with international climate-change policy negotiations and his extensive network helped to define timely topics and identify the appropriate issue editors. Over the last year, he observed the limitations of the current structure of COSUST and provided suggestions for improvements. The current outcome results from his worries and ideas, and we are grateful for all his insights and contributions to COSUST.

We also remember our Board Member Abeeku Brew-Hammond who passed away in March this year. Abeeku energetically developed the world's sustainable energy agenda. He always stressed energy needs for the poor and especially those in Africa [15,16]. We will remember Abeeku's high ambition and his academic and societal drive for sustainability.

### A new approach for COSUST

The existing six systemic themes have become an intellectual strait-jacket in discussing timely environmental sustainability issues. For example, many social sciences' and humanities' issues were difficult to insert into a specific system because they covered only a part of a system, intersect several systems or were important sustainability issues in their own right. These include issues such as population, human well-being, health, social

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