Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

Stockholm University

ICSU
International Council for Science

Issue Brief: Integrating social-ecological resilience, biodiversity and ecosystem services into the Sustainable Development Goals

A contribution of **Stockholm Resilience Centre** and **ICSU** (International Council for Science) for the 8th Session of the UN General Assembly Open Working Group on Sustainable Development Goals, New York, 4-8 February 2014

Authors: Albert Norström, Hanna Wetterstrand, Maria Schultz, Thomas Elmqvist, Sarah Cornell, Marcus C Öhman, Tim Daw, Fredrik Moberg, Åsa Persson, Garry Peterson, Johan Rockström, Ellika Hermansson Török

Key messages:

1. The SDGs need to promote human prosperity within Earth's safe operating space, defined by planetary boundaries.
2. The SDGs need to reflect the contribution that biodiversity and ecosystem services make to human wellbeing and to our sustainable development
3. Conservation and sustainable use of biodiversity should be an SDG in its own right
4. The SDGs must be made operational through a bottom-up approach with scalable and responsive indicators and its targets needs to add up to real sustainability progress.
5. The SDGs should be founded on principles of universality, integrity, equity, and quality of life in all its forms.

The context: SDGs in the Anthropocene

Within the last century, humanity has become a dominant force for planetary change and there is growing scientific consensus that we have entered a new geological epoch, the "Anthropocene" [1]. Today, humans are changing the composition of the Earth's atmosphere [2], have modified or transformed most of the Earth surface [3], substantially altered the flows of water [4], changed elemental cycles and flows of mineral resources [5], and radically changed the distribution of plants and animals [6]. As a result of the rapid expansion of the extent and intensity of human activities, the world faces growing turbulence due to rapid regional and global change, producing more frequent social and environmental stresses, shocks, and surprises. We must maintain the world's capacity to buffer these changes, so that humans can adapt, and where necessary to respond in sustainable and transformative ways. A resilience approach addresses the ability of social-ecological systems to deal with complex changing conditions, respond appropriately to disturbances, and still continue to thrive. Framing today's urgent global concerns in terms of resilience is crucial. This approach can shed valuable light on the links between global environmental stewardship and poverty alleviation in potential development frameworks and future goals.

A resilience approach acknowledges that the biosphere (all life on Earth), in all its diversity, shapes the environmental processes and the ecosystem services that are key to achieving the global sustainable development goals (SDGs). Losing biodiversity erodes the

basis for sustainable development; it undermines ecosystem services and social and ecological resilience, which reduces the capacity for adaptive responses in a rapidly changing world. However, the current discussions about global SDGs do not adequately recognize the fundamental connections between humanity and the biosphere on which we depend. A sharper focus on integrating biodiversity and reconnecting people and the biosphere should be at the heart of sustainability discussions, and needs to be mainstreamed in the SDG process. It means that the proposed SDGs must go beyond a "shopping list" of social, economic and ecological objectives defined independently of each other, to different types of goals that recognize and respect the dynamic interactions and interdependencies of societies and our environment.

We make the following recommendations for integrating social-ecological resilience, biodiversity and ecosystem services into the sustainable development goal framework:

1. Sustainable Development Goals need to promote human prosperity within Earth's safe operating space, defined by planetary boundaries. Respecting planetary boundaries means recognizing the fundamental biophysical thresholds that characterize our planet's dynamics and which define a safe operating space for humanity. Crossing these thresholds takes humanity into conditions of unprecedented and often unpredictable risks.

The concept of planetary boundaries has recently been introduced to define a "safe operating space for humanity" in the Anthropocene [7]. The planetary boundary framework seeks to define boundary levels in nine Earth system processes - climate change, biodiversity loss, changes in the nitrogen and phosphorus cycles, freshwater use, land system change, ocean acidification, stratospheric ozone depletion, chemical pollution and atmospheric aerosol loading - that regulate the stability of the Earth system. In other words, it seeks to define the planetary conditions under which human societies can continue to develop and prosper. What the planetary boundary concept shows is that specific types of human activities can reduce or risk reductions in the ability of the planet to provide the ecosystem services that support humanity. Transgressing a boundary thus does not mean that humanity immediately faces the imminent risk of a catastrophic tipping point. Rather, it means that the world (or its major ecosystems) has entered a danger zone where large-scale, permanent and socially very costly changes are likely to occur. Similarly, human activities do not act on single planetary boundaries but rather impact on multiple processes at once. For instance, land-use change is a key driving force behind reductions in biodiversity, changes in the properties and distribution of atmospheric aerosol, and the prevalence of chemical pollution, and it profoundly influences the biogeochemical cycles of carbon, nitrogen and phosphorus.

The SDGs must adapt this planetary boundaries work, and be based on a nested and integrated sustainable development framework of "development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends".

2. The SDGs need to reflect the contribution that biodiversity and ecosystem services make to human wellbeing and our sustainable development. Sustainable use and conservation of biodiversity (and ecosystem services) should be integrated in all SDGs as well as become a SDG in its own right, building coherence among other proposals related to healthy, productive and resilient ecosystems. It is important to take as a starting point the past 20 years of experience, policy and practice of the

Convention of Biological Diversity (CBD). More specifically, the SDGs should make use of internationally agreed language on the 2050 Vision, Goals and Targets under the Strategic Plan for Biodiversity 2011-2020.

Ecological, economic and social systems are increasingly viewed as interlinked and inseparable social-ecological systems. Mounting research is showing that people are part of ecosystems and shape them, from local to global scales, and are at the same time fundamentally dependent on the capacity of these systems to provide services for human wellbeing and societal development. Ecosystem services are the benefits that natural ecosystems provide to people and are often distinguished as a) provisioning services, such as food production; b) regulating services, that maintain a resilient environment and protect against environmental disturbance, such as flood defense; c) cultural services that are reflected in religious, recreational or cultural values and practices; and d) supporting services, comprising the underlying ecological structures and processes on which all other services rely.

The Millennium Ecosystem Assessment applied the concept of ecosystem services specifically to 'human wellbeing and poverty alleviation', highlighting how ecosystem services can contribute to multiple dimensions of wellbeing including security, basic material for a good life, health, good social relations and freedom of choice and action. The impact of ecosystem services on human wellbeing can appear most tangible and obvious at the local level, but they also operate at all intermediate scales right up to the global. The planetary boundaries aim to identify the conditions under which regulating ecosystem services can be maintained at the planetary scale. These are the Earth system processes that maintain conditions for prosperous development, dubbed 'Earth system services'[1].

SDGs should be designed to enhance the awareness of, and focus on, the role of ecosystem services within (not alongside) economic development and poverty reduction. Similarly, targets for SDGs focused on the environment need to be formulated not only in favor of preserving the biosphere, but also to ensure continued societal development. In a sense, the world has already decided that is the case, when it agreed upon the 1992 Convention on Biological Diversity, with its objectives and the subsequent processes of target-setting and implementation. The twenty Aichi Biodiversity Targets, under the CBD Strategic Plan for Biodiversity contains a number of elements, which are readily available for integration into the SDGs. The incorporation of these goals, targets and indicators into the SDGs has multiple benefits, not only ensuring policy coherence and building on existing implementation processes, but also reflecting the political will of the Parties to the Convention on Biological Diversity. The newly established Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) can play a critical role in addressing the needs of the SDG framework to incorporate knowledge on the complex relationship between ecosystem services and human society.

3. The SDGs must be made operational through a bottom-up approach with scalable indicators and its targets needs to add up to real sustainability progress.

Measuring progress on the SDGs will require agreed sets of indicators for use at national, regional and international levels and in developed and developing countries. Although environmental indicators have been developed since the 1960's, they have in the past been treated separately from social and economic indicators. While significant advances toward developing indicators for multidimensional policy targets have been made, much work remains to be done [8–10]. Principally, two major obstacles are impeding further progress:

(1) inadequate data with which to measure changes in the biosphere, human well-being, poverty, and other components relevant to policy targets and (2) the difficulty in actually measuring the policy target of interest, often on account of poorly understood, unquantified, and complex concepts (e.g. ecosystem services, poverty, and well-being).

The Millennium Ecosystem Assessment (MA 2005) developed a framework that allowed for the use of a wide range of indicators[11], although these still lacked integration and were not scalable. Indicators were originally designed to span national to global scales but it has been repeatedly emphasized that there is a need for a set of scalable indicators, which could be used for up scaling of observations from local to global scales as well as downscaling. A global observation network with the aim of providing the data and indicators needed by the scientific community, international conventions and IPBES, is now being developed under the auspices of the Group on Earth Observations Biodiversity Observation Network [11,12].

The task of developing more integrated and scalable indicators will be crucial for SDGs, since it is important to base information on the results of localized interactions. Using indicators that make sense on a local scale and then possible to scale up on a regional and global scale opens up the possibility to engage local stakeholder, citizen groups, indigenous groups and many other knowledge holders in the monitoring, reporting and development of the SDGs. One example which aims to do this is the IPBES decision to base assessments on the enriched picture provided by multiple knowledge holders and recognition of multiple sources of evidence for understanding drivers of change and responses in social-ecological systems, the Multiple Evidence Base approach (MEB) [13].

MEB implies that different knowledge systems are viewed as generating equally valid evidence for interpreting change, trajectories, and causal relationships in ecosystem assessments. A peer-review process for a MEB approach takes into account that different criteria of validation should be applied to data and information originating from different knowledge systems. Placing insights from knowledge systems side by side will enable an enriched understanding of the social- ecological system or the issues at hand (such as understanding effects of climate change in the Arctic, rangeland dynamics, or the role of sacred sites for human well- being). A MEB approach can serve as a learning platform for generating insights and triangulation across knowledge systems, as well as a basis for further co-production of knowledge

4. The SDGs should be founded on principles of universality, integrity, equity, and quality of life in all its forms.

We have so far emphasized biodiversity, but diversity of human perspectives and knowledge contributions must also be at the heart of the SDGs. The shift from Millennium Development Goals (oriented towards the world's poorest people) to the Sustainable Development Goals (which at least tacitly involve all the world's people) requires that the SDG framework should be a human development process founded on principles of universality, integrity, equity, and quality of life in all its forms. It needs to recognize the importance of true involvement and engagement of all stakeholder groups in the goal setting, measuring, monitoring and follow-up evaluation processes.

For example, protecting indigenous people's rights is vitally important – partly because they have a key role as authorities in their territories and "keepers of the land", and also because protecting their rights, and engaging them in deliberative processes about global

sustainability, keeps the spotlight on the good governance principle of participatory inclusiveness. It is already widely agreed that decision-makers must engage better with indigenous, local and traditional communities since their deep knowledge is essential for effective response: in a complex dynamic world, there is a need for two-way exchange of information and knowledge. Maintaining and protecting cultural diversity sustains people's livelihoods, and confers resilience by keeping different tracks open for development.

We recommend that a system of co-responsibility underpin the governance of natural resources, not only for decision-making but also for planning, implementation and evaluating policies. A meaningful partnership among players such as civil society, local communities, local authorities and governmental bodies as well as private sector entities would strengthen governance and ensure a common future with equitable distribution of rights and responsibilities. This type of governance would also ensure equitable access and equitable sharing of benefits resulting from the use of natural resources. This means a greatly expanded and deepened engagement with civil society and local communities in priority-setting and decision-making processes that affect them now and in future generations.

SDGs need to be embedded in an adaptive governance context that allows for recursive adjustments of goals and strategies [14]. Adaptive governance is characterized by collaborative, flexible and learning based mechanisms, which recognize and value the diversity of knowledge, legal systems and institutional richness – that persist among indigenous, traditional and local communities – as a source of cultural resilience. Information underpins resilient and adaptive institutions. Institutions that foster learning and allow rapid feedback to decision makers, alongside investments in improved data collecting and reporting systems for SDGs, can provide further adaptive capacity, in the light of potentially rapid or abrupt global changes.

References

1. Steffen, W. *et al.* The Anthropocene: From Global Change to Planetary Stewardship. *Ambio* **40,** 739–761 (2011).
2. IPCC. *Climate change 2007: The physical science basis. Contribution of working group I to the fourth assessment report of the Intergovernmental Panel on Climate Change*. *Clim. Chang. 2013 Phys. Sci. Basis* 1–36 (Cambridge University Press, 2013).
3. Ellis, E. C., Klein Goldewijk, K., Siebert, S., Lightman, D. & Ramankutty, N. Anthropogenic transformation of the biomes, 1700 to 2000. *Glob. Ecol. Biogeogr.* **19 (5)**, 589-606 (2010).
4. Vörösmarty, C. J. *et al.* Global threats to human water security and river biodiversity. *Nature* **467,** 555–561 (2010).
5. Steffen, W. *et al.* Abrubt changes: The achilles heel of the earth system. *Environment* **46,** 8–20 (2004).
6. MEA. *Millenium Ecosystem Assessment. Ecosystems and Human Well-being: Synthesis*. (Island Press, 2006).
7. Rockström, J. *et al.* A safe operating space for humanity. *Nature* **461,** 472–5 (2009).
8. Attaran, A. An immeasurable crisis? A criticism of the millennium development goals and why they cannot be measured. *PLoS Med.* **2,** e318 (2005).
9. Walpole, M. *et al.* Ecology. Tracking progress toward the 2010 biodiversity target and beyond. *Science* **325,** 1503–1504 (2009).
10. Reyers, B. *et al.* Getting the measure of ecosystem services: a social–ecological approach. *Front. Ecol. Environ.* **11,** 268–273 (2013).

11. Pereira, H. M. *et al.* Essential biodiversity variables. *Science* **339,** 277–278 (2013).
12. Scholes, R. J. *et al.* Toward a Global Biodiversity Observing System. *Science (80-.).* **321,** 1044–1045 (2008).
13. Tengö, M., Malmer, P., Brondizio, E., Elmqvist, T. & Spierenburg, M. The Multiple Evidence Base as a framework for connecting diverse knowledge systems in the IPBES. (2013).
14. Folke, C., Hahn, T., Olsson, P. & Norberg, J. Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.* **30,** 441–473 (2005).