RESEARCH INSIGHTS

Stockholm Resilience Centre
Research for Governance of Social-Ecological Systems

Stockholm University

INSIGHT #4 Social-Ecological Innovations

Technological and social innovations must become more sensitive to ecosystem dynamics and respect interacting planetary boundaries

Emerging technological and social innovations involve huge potential to improve our lives in a sustainable way, but only if we incorporate knowledge of social-ecological systems and planetary boundaries in framing their future development.

There is no deficiency of social and technological innovations in the world. In fact, the tremendous expansion of humanity and the great acceleration into the Anthropocene is a reflection of an amazing innovative capacity (Steffen et al. 2011). However, much of this innovation has occurred without reference to ecological integrity or complex system interactions. This is one of the reasons why humans have pushed the earth system towards unsustainable trajectories.

Innovations and technologies that have improved human life have degraded the life-support systems on which they ultimately depend upon. It is clear that humans must reconnect development to the resilience of the biosphere (Folke et al. 2011).

A central research issue at the centre is how innovations can reverse trends that are creating tipping points in the earth system, and the required conditions to escape current lock-ins. This research investigates how technological and social innovations can be more sensitive to ecosystem dynamics and help us reconnect to the biosphere.

The concept of social-ecological innovation has been developed by SRC researchers to increase our understanding of patterns in innovation and transformation (Olsson and Galaz 2011).

Social-ecological innovations involve the integration of three spheres: technology, governance, and ecosystem stewardship. Together these spheres support the emergence and diffusion of new ways of managing and governing social-ecological systems.

The concept combines perspectives on transition management, social innovation and entrepreneurship with resilience thinking and research on social-ecological systems. Social-ecological innovation is defined as technological and social innovation - including new strategies, concepts, ideas, institutions, and organizations - that enhance the capacity of social-ecological systems to generate bundles of essential ecosystem services. These have the potential to improve the capacity to learn from, respond to, and manage environmental feedback from dynamic ecosystems.

Social-ecological innovation can connect ecosystems and governance systems, help move to new trajectories of sustainability, and contribute to the overall resilience of social-ecological systems.

Urban social-ecological innovation: a vision of the Albano Resilient Campus in Stocholm, an urban planning based on resilience principles. Photo: Q book, Albano 4.

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KEY FINDINGS:

Information and communications technology has an untapped potential to improve new models of governance and management of social-ecological systems
For example, search engines or web crawlers can be designed to tap into online news reports and market information to allow for a rapid detection of ecosystem change and more flexible and coordinated responses. However, any efficient use of this technology must be embedded into an institutional framework that can validate and "filter" increasing amounts of information, and coordinate management responses on the ground (Galaz et al. 2010). Recent attempts include the USDA Forest Service's Western Wildland Environmental Threat Assessment Center (WWETAC), currently exploring webcrawlers to facilitate wildland threat assessments.

Emergence and diffusion of new governance modes can reconnect institutions and social-ecological dynamics
Examples here include the diffusion of Marine Spatial Planning (MSP) across the world (Merrie 2011); the integrated governance of very large scale seascapes such as the Great Barrier Reef (Australia) (Olsson et al. 2008); new water governance schemes at the Sabie River (South Africa), and Yahara Lakes (Wisconsin, USA) (Biggs et al. 2010); methods in land-use planning (Bergsten 2012); and adaptive co-management schemes in coastal areas of Chile (Gelcich et al. 2010).

Governments around the Baltic Sea have agreed on a unique social-ecological innovation for managing transboundary pollution
The technology used is an ecosystem model developed by Baltic Nest Institute which estimates critical loads or regional boundaries for emissions of nutrients. The model is used as a tool to develop policies on improved water quality (Österblom et al. 2010). New data are continuously incorporated to measure and revise progress in order to reach agreed targets.

Substantial national investments for monitoring, control and enforcement technology have improved the governance of vulnerable marine resources in the Southern Ocean
The technical innovation have been diffused by several countries (Österblom and Sumaila 2011). Innovative management approaches to protect these ecological resources involve crowdsourcing information from non-state actors to support government responsibilities (Österblom and Bodin in press). Governance innovations include changing legal frameworks, designing and implementing unique traceability schemes and black-listing mechanisms for vessels. Some of these innovations are tested in other regions and are increasingly discussed at global policy level.

Small-scale water system innovations in sub-Saharan Africa have increased productivity and multi-functionality at landscape level
Innovations like rainwater harvesting and conservation tillage are key for livelihoods in areas with high poverty levels and for farmers critically dependent on small-scale rainfed agriculture (Enfors and Gordon 2009). Successful use of these innovations are however dependent on a range of social and ecological variables beyond water management, including addressing factors contributing to poverty traps (Gordon and Enfors 2008).

The ability to seize windows of opportunity and coordinate innovation processes across scales is of crucial importance to release lock-ins and enable shifts into new trajectories
Institutional entrepreneurs are instrumental in creating the right links, at the right time, around the right issues and connecting promising innovations to broader institutional resources and responses (Olsson et al. 2004, 2006, 2008, Rosen 2011).

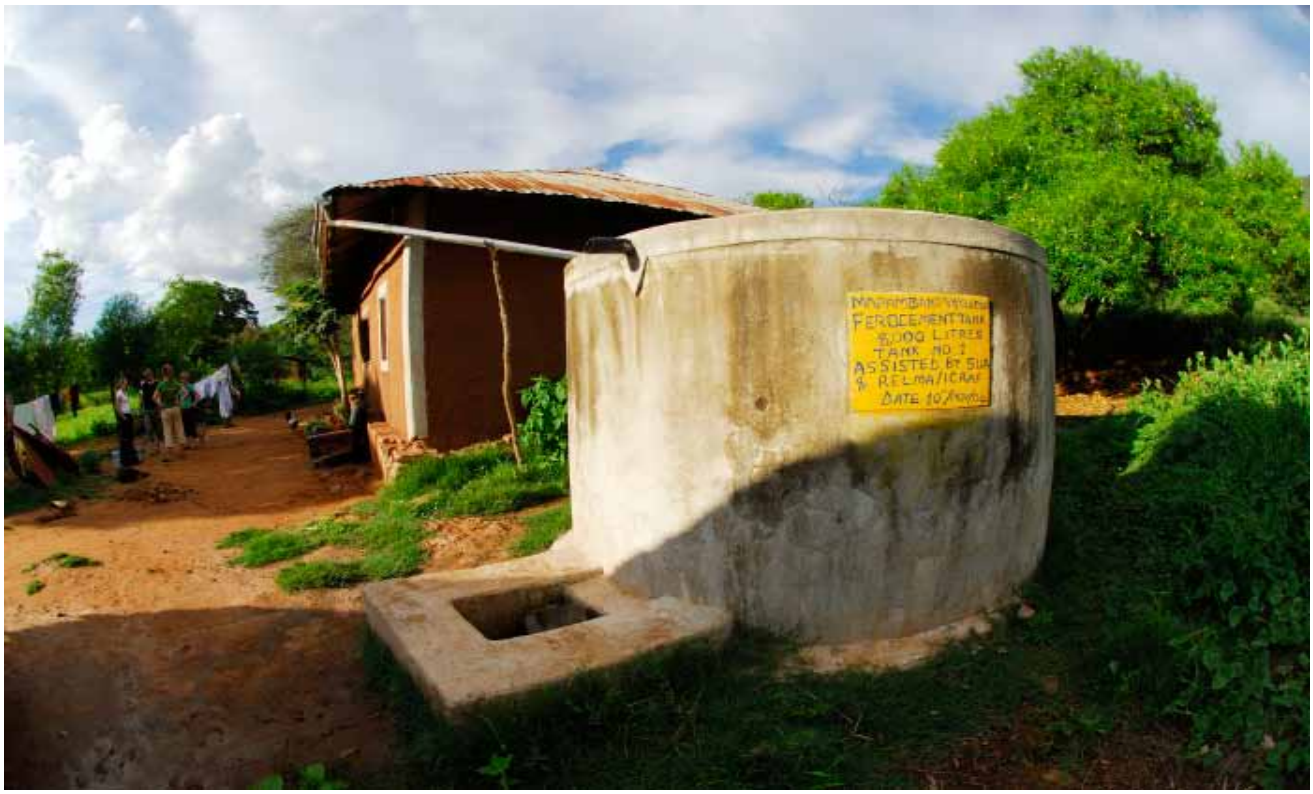
Shadow networks and institutional entrepreneurs are key to designing and developing experiments and promoting innovation
Shadow networks are incubators for new ideas and approaches for governing social-ecological systems (Olsson et al. 2006). In the Chile case (see above), actors within informal networks experimented with new ecosystem management approaches, innovations that were ready to be scaled up when a window of opportunity opened. Similarly, in Kristianstad Vattenrike (Olsson et al. 2004), a shadow network initiated collaborative experiments to reduce nutrient loads to the rivers.

Experiments and "beta testing" of policy options are important when preparing for a transformation that can be implemented when an opportunity comes along
There is a need for policies platoforms that support new ideas and social-ecological innovations (Olsson and Galaz 2009, 2011). For example, the UNESCO's Man and the Biosphere Programme supports the creation of Biosphere Reserves as learning sites and "policy laboratories" for sustainable development (Schultz et al. 2011). It links global environmental governance with place-based ecosystem management and spans local-regional, national, and international scales.

There is a growing need for integrated global governance for resolving conflicts and facilitating coordination in institutionally fragmented settings
Current analyses tend to focus on a single sector (like energy) or one problem (like climate change). However, the linked nature of environmental problems and planetary boundaries calls for global, integrated approaches (Walker et al. 2009) that can focus on innovative ways of addressing the interface between sectors and problems (Olsson and Galaz 2011, Westley et al. 2011, Rosen and Olsson 2011). This includes new multi-level governance solutions for addressing the interface between climate change, biodiversity, and ocean acidification (Galaz et al. 2012).

Innovations in urban planning have the potential to increase flows and management of ecosystem services
This can be achieved through land-use design (Colding 2007) and urban form (Barthel et al. 2010); combining inter- and transdisciplinary knowledge frameworks and institutional frameworks and an understanding of the role of local ecosystem stewards in managing ecosystem services (Colding et al. 2009). This blend of design, technology and new modes of management are currently being explored by centre researchers in the planning and design of Albano University Campus in Stockholm.

Disturbances and crises can create opportunities for innovations that cause radical shifts and transformations in social-ecological systems
Centre researchers have identified a range of factors linking sustainable social-ecological innovations to a specific opportunity context (Folke et al. 2009, Olsson and Galaz 2011, Westley et al. 2011). Key factors include experimentation, institutional entrepreneurs, shadow networks and creative platforms. For example, a new governance approach for marine resources in Chile in the late 1980's came about in a time of extensive political turbulence and crises in marine resources (Gelcich et al. 2010). The approach helped scientists and fishermen to collaborate and renew their organisation, scale up the innovation, and influence the new national fishery legislation in Chile. Hence, transformations at one scale do not take place in a vacuum but in a cross-scale context (Ernstson et al. 2011, Folke et al. 2010, Olsson et al. 2008, Österblom et al. 2011).



Rainwater harvesting in Tanzania: Innovations like rainwater harvesting and conservation tillage are key for livelihoods in areas with high poverty levels and for farmers critically dependent on small-scale rainfed agriculture Photo: R. Kautsky/Azote.

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