Stockholm Resilience Centre
Research for Governance of Social-Ecological Systems

Stockholm University

Annual Report 2007

A centre with: SEI Stockholm Environment Institute; The Beijer Institute of Ecological Economics

FUNDED BY MISTRA

Stockholm Resilience Centre Annual Report 2007

Stockholm Resilience Centre Annual Report 2007
Printed by ARKET Officin AB, 2008
Edited by Ellika Hermansson Török,
Stockholm Resilience Centre and
Fredrik Moberg, Albaeco
Graphic design: Christine Clifstock
Cover photos: C. Folke, N. Kautsky/azote.se,
R. Kautsky/azote.se, B. Christensen/azote.se

Stockholm Resilience Centre
Stockholm University
SE-106 91 Stockholm, Sweden
Visiting address: Kräftriket 2B
Phone: +46 8 674 70 70

Contents

Preface

There was good reason to believe, when Mistra in 2006 invited Swedish universities to submit proposals to establish a long-term internationally leading scientific centre for sustainable governance and management of social-ecological systems, that this timely initiative would generate ripples of interest and engagement among knowledge institutions around the world.

The Stockholm Resilience Centre has already proven Mistra right. The mission given to the new Centre resonates strongly with the complex social and ecological challenges facing humanity, from local ecosystem degradation to global environmental change. The rapid establishment of a fully operational centre, today with 40 staff members engaged in research across eight interdisciplinary themes, is a result not only of strong leadership. It is also a response to the swell of demand for social-ecological systems research and knowledge, translated into a willingness to collaborate with the new Centre from Swedish and international research and policy organisations.

The Centre will "Advance the understanding of complex social-ecological systems, and generate new and elaborated insights and means for the development of management and governance practices, with the aim of securing ecosystem services for human wellbeing and building resilience for long-term sustainability".

It will achieve its mission through;

- internationally recognised inter- and transdisciplinary research that integrates social science, the humanities and natural sciences;
- fostering an international arena for science, practice and policy dialogues;
- capacity-building by providing academic programmes and high quality inputs to academic curricula and training; and
- strategic communication for improved policy and decision support.

Today the Centre, even though still in a formative phase, is engaged in all four of its mission areas and is working with them in an integrated manner. It has established itself firmly in the UN follow-up of the Millennium Ecosystem Assessment, and offers an exciting arena for senior and young scientists from around the world to carry out innovative inter- and transdisciplinary research. With more than 30 peer-reviewed scientific papers already published after its first year of existence, the Centre promises to become an interesting and agenda-setting knowledge hub in the field of resilience and sustainability science.

The institutional arrangement is important to the development of the Centre. Placed directly under the Vice-chancellor of Stockholm University, the Centre provides a strong incentive for collaborative research across faculties and disciplines. As a joint Centre with the Royal Swedish Academy of Sciences, and its International Beijer Institute of Ecological Economics, and the Stockholm Environment Institute, the Stockholm Resilience Centre inherently provides a very strong institutional capacity for science, practice and policy research, capacity development and policy impact.

The years to come will no doubt be challenging, creative and exiting for the Stockholm Resilience Centre!

Professor Arild Underdal
Chairman of the Board

Directors' view

Evidence of the acceleration of global environmental change and growing insights on cross-scale ecological interactions and reinforcing feedbacks has only over the past five years placed sustainability science and the sustainable development policy agenda on a new footing. Governance and management approaches remain embedded in the obsolete perspective that change is incremental, generally linear, predictable and even controllable. Future growth and human well-being is "planned" along projections that exclude not only nature but above all unexpected and abrupt change, with ecological shifts and social transformations. This approach to social and economic development worked on a planet with ample resilience and less human pressures, but is no longer valid. Humanity has entered the Anthropocene, the planetary phase of sustainability, where the way we govern and manage natural capital and its generation of ecosystem services, such as climate regulation and food production, affects the Earth system as a whole. Humanity is faced with the largest challenge ever, to redefine our relationship with the Biosphere, and translate this into operational governance and management to enable transitions to sustainable futures.

The Stockholm Resilience Centre is at the heart of this challenge, contributing inter- and transdisciplinary science on governance and management for sustainability in times of turbulent social-ecological change.

The research framework is defined and guided by three boundary conditions:

- Society and nature represent truly interdependent social-ecological systems
- Social-ecological systems are complex adaptive systems, implying that governance has to be adaptive to unexpected change
- Cross-scale interactions in time and space cause social-ecological feedbacks and pose new challenges for governance and management

This framework sets a particular focus on the dynamic evolution of societies and nature and on the ability to reorganise and develop in the face of sudden change, i.e. on social and ecological resilience. A particular focus is on understanding how to navigate tipping points and regime shifts.

International research collaboration forms an integral part of the Centre. The aim is to establish the Centre as a scientifically attractive and policy relevant international hub for innovative sustainability science. At the same time, we put a strong emphasis on policy dialogues, capacity development and communication. This broad mandate – from science to change – is made possible through the incredibly strong support from the three founding institutions of the Centre. We are a Centre at Stockholm University, where we have the privilege of integrating the former Centre for Transdisciplinary Environmental Research (CTM), to host the Baltic Nest Institute and collaborate with researchers, research groups and university departments. The Beijer Institute of the Royal Swedish Academy of Sciences provides state-of-the-art thinking on the ecology and economics of resilience, and the Stockholm Environment Institute (SEI) gives the Centre systems oriented policy research and policy bridging on broad environment and development issues. Together we form a complementary research environment, today nothing less than the strongest concentration of interdisciplinary scientists on environment and development issues in Sweden. Mistra has given us a simply fantastic opportunity, which we will nurture with resolve and care.

We invite all those interested in building synergies with the Stockholm Resilience Centre to knock on our door!

Johan Rockström
Professor
Executive Director

Carl Folke
Professor
Science Director

Photo:L. Haydaryan/azote.se

Development of the Stockholm Resilience Centre

The mission of the Stockholm Resilience Centre is to advance the understanding of complex social-ecological systems and to generate new and elaborated insights and means for governance and management of ecosystem services for long-term sustainability. We fulfil our mission through research, policy dialogues, capacity building and communication. However, how we carry out these activities is of critical importance for the ability to live up to our mission. Already from the start, we set out to develop a centre environment that stimulates inter- and transdisciplinary research in an international context. This has been done through several key initiatives, which will be briefly developed in the following section.

Key initiatives to stimulate inter- and transdisciplinary research at the Centre

1. Placement of the Centre outside of the faculty structure
2. Establishment of an internationally recognised Centre board
3. Co-location of the Stockholm Resilience Centre, the Stockholm Environment Institute's headquarters, Albaeco, and parts of the Beijer Institute under the same roof, in offices that are conducive and adapted for interdisciplinary collaboration and research
4. Launch of a theme-based research organisation, with a mix of theory development and problem-based thematic research areas, led by pairs of theme leaders from different disciplinary backgrounds
5. A structure that promotes the integration with faculties and research departments at Stockholm University, through collaborative arrangements and the integration of the well-established University-wide Centre for Transdisciplinary Environmental research (CTM) into the Stockholm Resilience Centre
6. Establishment of collaborative research agreements with several key knowledge institutions around the world
7. Recruitment of research staff both from the social and natural sciences.
8. Building a professional communication platform and engagement in science to practice and policy bridging
9. Incorporation of academic education as a key pillar of the Stockholm Resilience Centre mission, through the integration of CTM with the Centre
10. Building of an interdisciplinary creative Centre identity

Stockholm University Vice-Chancellor Kåre Bremer (left) with Executive Director Johan Rockström and Science Director Carl Folke (right) during the centre inauguration May 29, 2007. Photo: J. Lundberg

New offices

The Stockholm Resilience Centre was inaugurated in May 2007, some two months after having moved into the offices at Kräftriket on the campus of Stockholm University. The building is shared with Stockholm Environment Institute and Albaeco. The Beijer Institute at the Royal Swedish Academy of Science is within close walking distance from the Centre, making our new integrative environment for sustainability research and policy truly unique.

Staff development

As of the end of 2007, the Centre had a staff of 35 full-time-equivalents (FTE), or approximately 60 persons. This includes only staff funded from the Mistra grant (corresponding to 8 FTE), from programmes and projects under the Centre (e.g. the Formas Centre of Excellence, the Baltic Nest Institute and the Centre for Transdisciplinary Environmental Research, CTM), and direct in kind support from SEI and the Beijer Institute (see Annex D for the full staff list). We also have several additional researchers closely associated with the Centre, who are involved in our activities but are funded by different institutions. This includes researchers of the Beijer Institute and SEI, researchers and PhD students from other departments at Stockholm University, other Swedish universities and also from international collaborators. A key relationship in this regard is with the Department of Systems Ecology at Stockholm University, particularly the Natural Resource Management Group.

The Centre is in a formative and expansive phase, where we are recruiting key competencies and building an organisation with strong capabilities in research, capacity building, communications and management/administration. A key aim is to establish a diversity of social- and natural scientists, with a good age, gender and international mix. During the second half of 2007 we started the recruitment of a senior social scientist, a central recruitment for the Centre.

Centre organisation

The Stockholm Resilience Centre is a centre at Stockholm University, strategically placed directly under the Vice-Chancellor, i.e. outside of the faculty structure. This ensures a truly interdisciplinary endeavour for the Centre. We thereby rely on close collaboration with faculties and departments at the University, as academic staff appointments, PhD positions and academic education cannot be run by the Centre alone.

The three patron organisations of the Stockholm Resilience Centre – Stockholm University, SEI and the Beijer Institute – have together chosen an integrated approach to the development of the Centre. The aim is to establish a joint Centre that functions as an open arena between the three core institutions, while at the same time building a distinct Centre identity, focus and culture. This is illustrated in Fig 1, by the mutual in-kind contributions from the core partners, and the open and integrated structure between them. This means, for example, that apart from the major support from Stockholm University (core funding and administrative support), SEI and the Beijer Institute are contributing core functions (support staff), research staff and joint projects.

During the course of 2007, CTM was integrated with the Centre adding 12 staff (8 FTE) and 16 PhD students from different faculties engaged in a CTM-led PhD forum for inter- and transdisciplinary research (with 5-15 percent time commitment per person). All CTM activities (research, education and communications) have continuously been integrated with the Centre. CTM had a board, with representatives from the four faculties at Stockholm University (Natural Sciences, Humanities, Law and Social Sciences). The Centre has decided to maintain the functions of this board, by establishing a council for interdisciplinary environmental studies (Rådet för Tvärvetenskapliga Miljöstudier, RTM), which will serve as an important platform for cross-faculty collaboration between researchers and departments at Stockholm University and the Stockholm Resilience Centre. Former CTM chairman and Professor in History Klas Åmark, and Professor in Environmental Law and head of CTM Jonas Ebbesson, will continue to provide strategic support to the integration of the Centre with Stockholm University (see Annex D for the composition of the CTM board during 2007). The Baltic Nest Institute (BNI), a systems-oriented research programme on marine environments (described further in this Annual Report), set up by the Mistra MARE program and now funded through the Swedish EPA, has been placed at the Stockholm Resilience Centre. The BNI has its own budget and is governed by a board, that includes the Executive Director of the Stockholm Resilience Centre (Annex D).
The Centre has also established a close institutional collaboration with Albaeco, an independent organisation focused on the communication of sustainability science. Albaeco forms an integral part of the communications team at the Centre. Similarly, we have chosen to establish close links between the communication capacities at SEI and the Beijer Institute, with the aim of developing a strong joint communications platform between the core partners of the Stockholm Resilience Centre.

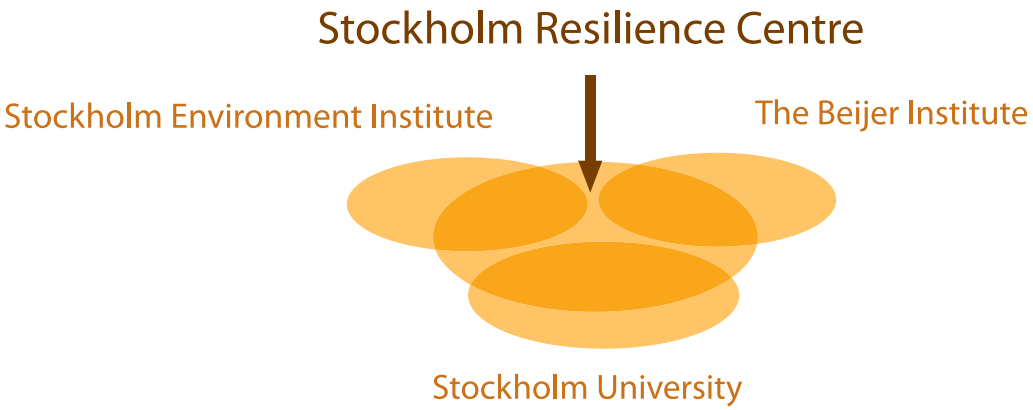


Figure 1. *Drawing upon synergies and complementary strengths to build a strong new Centre and an open arena for transdisciplinary research.*

Stockholm Resilience Centre is located in Kräftriket. Photo: ORASIS foto

The way we work

We have decided to develop a flat and flexible organisation, with a high degree of self-organisation and delegated responsibilities. The eight research themes together with the communications team form the core organisational structure of the Centre. Each theme is an arena for inter- and transdisciplinary research, open for core Centre staff, researchers at SEI, the Beijer Institute and Stockholm University, and other collaborating partners in Sweden and internationally. The themes are all led by two or more researchers who have the responsibility to lead the development of the theme research agenda, coordinate theme research, facilitate interactions between theme members, keep up-to-date with current research and oversee the core budget of the themes.

To ensure strong cross-thematic interactions (we believe that many of the most important research outputs may be generated through cross-thematic learning) we have established both organised and informal theme leader meetings, in order to advance a joint Centre-wide research agenda and working culture. Themes are open arenas, and researchers can, over time, engage to varying degrees in different themes. The themes are furthermore flexible structures, with a clear understanding from the start, that while some themes may expand, others may evolve in new directions or even be closed down. An internal monitoring and evaluation system is being developed in order to internalise a continuous process of internal learning and adaptation.

Given the broad inter- and transdisciplinary research agenda of the Centre, a strong emphasis has been put on organising open seminars and workshops at the Centre as a means of sharing advancements in different research areas. Weekly staff meetings are organised and an intranet is under development, as additional means of keeping staff up-to-date with Centre developments. Several international guest researchers have actively contributed to the Centre's core activities, and about 30 short-term visitors from our international partners have spent time at the Centre.
The Centre has established a shared leadership between Professor Johan Rockström (Executive Director) and Professor Carl Folke (Science Director). An internal Advisory Group with senior staff at the Centre has been established to help guide the Centre leadership (including Professors Katarina Eckerberg, Sverker Sörlin, Thomas Elmqvist, Jonas Ebbesson, Assistant Director Christina Schaffer, Head of Finance and Administration Kristina Hagkvist and Head of Communications Ellika Hermansson Török).

Scholars with deep experience of inter- and transdisciplinary collaboration and from a diverse set of disciplines and research areas are represented at the Centre, including anthropology, agronomy, development studies, ecology, ecological economics, economic history, education, environmental and resource economics, environmental history, environmental law, history, history of ideas, human geography, hydrology, institutional economics, natural resource management, physical geography, physical oceanography, political science and sociology.

Photo: B. Christensen/azote.se

Centre Governance

The Centre has an international and independent board governing the strategic directions of the Centre, which is appointed by the Vice-Chancellor in consultation with the Stockholm Environment Institute and the Royal Swedish Academy of Sciences. The Centre board had its inaugural board meeting on the 28th of May 2007. We are very proud to have a high-profile board with persons from science and policy strongly committed to the development of the new Centre.

Board:

- Chair Prof. Arild Underdal, Oslo University
- Prof. Carole Crumley, University of North Carolina
- Ass Prof. Christofer Edling, Stockholm University (represents SU)
- Prof. Rashid Hassan, University of Pretoria
- Prof. Roger Kasperson, Clark University (represents SEI)
- Leif Lindfors, Stockholm University (represents SU)
- Prof. Jacqueline McGlade, European Environmental Agency
- Prof. Elinor Ostrom, Indiana University
- Prof. Thomas Rosswall, ICSU (represents Beijer/KVA)
- Prof. Brian Walker, CSIRO, Resilience Alliance
- Prof. Frances Westley, University of Waterloo
- Anders Wijkman, European Parliament

International Collaboration

We are in the process of developing innovative forms of collaboration with our key international partners. In addition to collaborative international research projects and programs, we have initiated international joint positions and exchange of post docs and researchers. The purpose is to create a mobile research platform among internationally leading research groups and institutes to make progress on the understanding of integrated social-ecological systems.

Memoranda of understanding for collaboration have been developed and signed with the Australian Research Council Centre of Excellence for Coral Reef Studies, Townsville, Australia; the Resilience and Adaptation Program of the University of Alaska Fairbanks, USA; the Nelson Institute for Environmental Studies, Centre for Sustainability and the Global Environment (SAGE) at the University of Wisconsin-Madison, Wisconsin, USA; The Oxford University Centre for the Environment, Oxford, UK; The Fenner School of Environment and Society, Australian National University, Canberra, Australia and the UNESCO, Man and the Biosphere Program, MAB. Several others are in progress.

Photo: M.Ormestad/azote.se

Reports from research themes

At the Stockholm Resilience Centre we have initially organised research collaboration into eight transdisciplinary themes framed by our three boundary conditions; society and nature represent truly interdependent systems; they are complex adaptive systems; with cross scale and dynamic interactions representing new challenges for governance and management of social-ecological systems and ecosystem services.

Four of these themes are organised under the "Insight cluster" and advance theory and methods, covering broad areas of research, from regime shifts and a new welfare economics to social learning and multilevel governance. The other four themes are thematic, more applied and on the ground, covering water and food, urban dynamics, coastal and marine systems and adaptive governance of dynamic landscapes and seascapes. A ninth theme on understanding ecosystem dynamics for generating ecosystem services is under development. The themes feed into each other through an ongoing dynamic process of inductive-deductive science, practice and theory with active involvement of scholars from the natural and social sciences and the humanities from within the Centre, in Sweden and internationally.

The aim of the themes is to provide flexible collaborative arenas for sharing different perspectives and blending knowledge from different disciplines and areas in a transdisciplinary learning process with multi-directions of inquiry and diverse discoveries. The objective is not to search for consensus, but for creative disagreement within the context of the research framework, mission and vision of the Stockholm Resilience Centre. Each theme has theme leaders that facilitate the theme, its research agenda and direction, and develop practices for sharing information and keeping up to date with the research field and the international research arena.

The themes have been quite active during the first less than a year of operation, with several meetings and theme interactions. There are themes that have come to serve as forums for the integration of scholars new to social-ecological systems analyses, providing an entrance into the Centre's activities. Tight collaborations have also developed between scientists across themes with joint transdisciplinary projects and applications, multi-authored research papers and anthologies are in progress. Centre leadership, the advisory group and theme leaders have had, and will continue to have, strategic meetings to identify emerging insights and develop cross-theme syntheses. Successful themes may expand and generate new themes, and less creative themes may be dissolved. The future will tell.

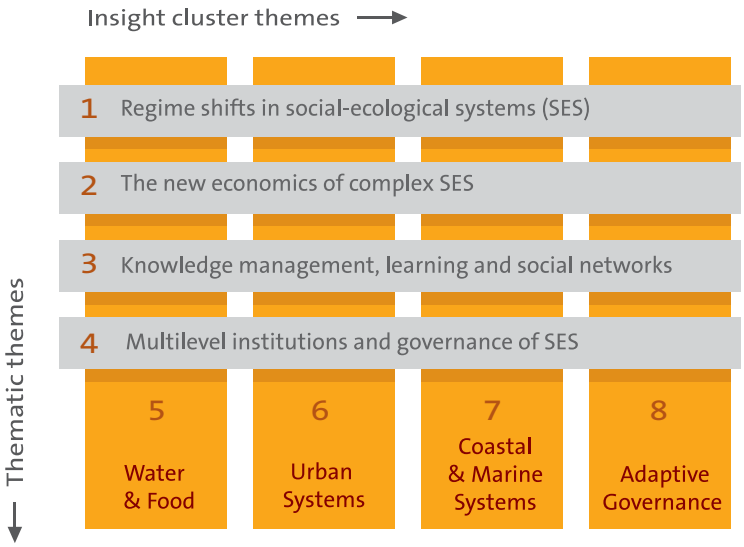


Figure 2. *The eight research themes are divided into four themes under the "Insight cluster" (1-4), which advances theory and methods, and four themes that are "Thematic" (5-8) and more applied, with ample interactions across all themes.*

Photo: J. Lundberg

1. Regime shifts, scales and sources of reorganisation in social-ecological systems

The "Regime shifts" group explores from a broad range of disciplinary perspectives how change occurs in systems on different scales and how these systems reorganise after crises or perturbations. This is a topic that brings work in many resilience fields together. It is almost by necessity quite theoretical, and certainly at the cutting edge of current discussions. Our work draws on earlier attempts to write "social ecological histories" in different disciplinary frameworks (anthropology, archaeology, environmental history, human ecology and others).

We also address time scales and singularities. In particular we wish to take these issues – typically addressed within longer time scales of millennia or ancient civilisations – to the social ecologies of modernity and globalisation. We draw on ongoing empirical work among several groups and individuals within the Stockholm Resilience Centre and its affiliated partners, for example the Resilience Alliance. The group involves researchers ranging from the ecological sciences to various strands of history and the social sciences including economics. Work goes on among smaller research groups and in individual projects. The group as a whole is engaged in work towards a collection of synthesis articles on *Regime Shifts and Creative Reorganisations – Social Ecological Histories* (working title). The possibility of hosting the secretariat of IHOPE, "Integrated History and future Of People on Earth" has been explored during the year. IHOPE was initiated by the global change research community (IGBP, IHDP) and is now spreading among historians, anthropologists and archaeologists. Understanding the reasons for the emergence, sustainability, decline, or collapse of human societies is a key prerequisite for creating a sustainable and desirable future.

A further purpose of the theme is to advance new cross-breeding ideas on resilience and social-ecological systems in order to contribute to the long-term vitality of the Stockholm Resilience Centre's research program at large. This will also be a way of harvesting the fruits of many years of investment in many, hitherto diverse, research groups. The theoretical work is also a way to build links between different disciplines and research traditions within the Stockholm Resilience Centre and identify common ground on which to focus in future cooperative work. In particular, this ambition is pertinent to the deeper integration of social and natural sciences at the Centre, which has been termed "Big Interdisciplinary". A more far reaching ambition is to conceptualise new ways of understanding change in social systems and the implications for the interplay with ecological systems.

Theme leaders:
Sverker Sörlin and Carl Folke

Photo: J. Lokrantz/azote.se

2. The new economics of complex social-ecological systems

Conventional models, based on dynamics approximated by linear models, are of limited use for the purpose of navigating society towards sustainability. This theme addresses economic issues from a complex systems perspective and is rooted in and orchestrated by researchers and networks of the Beijer Institute of Ecological Economics.

Most economics research on natural resources and the environment have been based on linearity (or rather convexity), which excludes the existence of critical transitions and regime shifts. Very little has been done to incorporate ecosystem services and resilience in general in the analysis or spatial aspects of resource and ecosystem dynamics. Current macroeconomic indicators, such as GNP or NNP or HDI (Human Development Index) are not set up for monitoring the sustainability of an economy. The existence of positive feedback leading to non-convex dynamics and regime shifts makes it a challenge to use standard economic instruments in an efficient way. New understanding and tools are needed.

The theme organised an international workshop in September on 'Accounting for ecosystem services'; has participated in European policy meetings on national accounting systems beyond GDP; and hopes to, as a continuation of this work, start collaboration with Stanford University on the Natural Capital project. The theme has been engaged with Baltic Nest in the development of a project on a Stern-like report for the Baltic Sea region; involved in a joint workshop with the ARC Coral Reef Centre of Excellence, Australia, on 'Understanding social and economic benefits in coral reef systems: multiple actors, scales and inter-dependencies'; given lectures at e.g. Harvard/MIT, and developed a PhD course that will take place in spring 2008 at Stockholm University.

Research of the theme concentrates on:

- The economics of complex ecological systems and their management including investigations into cooperative behaviour
- Incorporation of spatial aspects in economic models for understanding social-ecological system dynamics
- National accounting and valuation of ecosystem service
- Economic policy issues for global problems and challenges

Theme leaders:
Aart de Zeeuw and Karl Göran Mäler

Photo: N. Kautsky/azote.se

3. Knowledge management, learning and social networks in social-ecological systems

Successful management of complex social-ecological systems requires adaptive approaches and a system of continuous learning for building knowledge and effective management practices to interpret and respond to ecological feedbacks. The generation of knowledge on such complex systems is an ongoing process which typically takes years to accumulate. Learning is essential for individuals, communities, other stakeholders and agencies to develop their ability to deal effectively with new situations and to prepare for change and surprise. In addition, the cumulative knowledge should be embedded in the management process.

This theme addresses the issues of information sharing, knowledge generation, participation, learning, organisation, leadership, agency, (co-) management of common pool resources, social networks and social simulation, in order to explore how these social processes promote or constrain management of ecosystem services.

During 2007 the theme co-organised a course on using computer modelling as a means to facilitate stakeholder dialogue together with Dr Michel Etienne from the Agri-Food Research and Development Initiative in Avignon, France. Furthermore, the theme participated in the ongoing process of developing the Man & Biosphere research initiative with the aim of promoting a dynamic learning community of Man & Biosphere researchers and practitioners.

During her stay in May-June 2007, Prof. Frances Westley held a workshop on leadership and qualitative research methods.

In October 2007 a change of theme leadership took place and a new round of recruitment of theme members was initiated. Several of the new recruits are affiliated with the Stockholm Environment Institute in addition to staff from the Stockholm Resilience Centre, the Beijer Institute, and Stockholm University departments.

Prioritised activities during the first half of 2008 will be the reconciliation of the enlarged theme. Further, the development of the research agenda and research network will continue, as will the development of the theme work processes and member collaborations.

Theme leaders:
Örjan Bodin and Åsa Swartling (from October 2007).
Cecilia Lundholm (Jan – Oct). From 1 October 2007 on a fellowship in England.

Photo: Å. Gallegos Torell/azote.se

4. Multilevel institutions and governance of social-ecological systems

Research within the theme focuses on governance of social-ecological systems, with a special emphasis on issues of institutional design, environmental policy, and crisis management. In particular, we study how societal actors succeed or fail to create institutions and governance systems that affect and are affected by ecological systems. Despite the vast challenges posed by global environmental change, social science has been slow in taking on the scientific and governance challenges posed by interconnected social-ecological systems and non-linear dynamics in complex systems.

Our ambition is to create a group that not only advances a world-leading research agenda focusing on governance of dynamic social-ecological systems and global environmental change, but also to create a group devoted to contributing to the Centre's transdisciplinary research environment. In order to reach these goals, activities during 2007 have to a large extent been directed at team-building within the theme itself, and at establishing contacts with potential research partners. The theme is at present in the process of establishing partnerships with for instance CRISMART (Swedish National Defence College) and the Center for Environmental Strategic Research at KTH (Sweden), and key individual researchers around the world, for example at FOI (Sweden), STEPS (UK), Öko-Institut (Germany) and SEI-Oxford. Some of the highlights of 2007 include a total of five scientific articles published by theme members and an additional six manuscripts submitted or under preparation. Theme members have also been involved in a number of policy outreach activities, for example through the leading daily papers Dagens Nyheter and Svenska Dagbladet, as well as through channels such as the Swedish Environmental Advisory Council, Stockholm International Water Institute (SIWI), Tällberg Foundation, the Commission on Climate Change and Development, and the Swedish Government Inquiry on climate change and vulnerability. During the fall of 2007 we were also responsible for a highly successful graduate student workshop entitled "Complexity and the Social Sciences".

Priority research questions

1. Can complexity be governed, and if so, how?
2. How may resilient governance systems be designed and maintained? What factors create "success"?
3. How do we develop new modes of governance with improved ability to govern complex social-ecological systems?
4. What kind of new tools and methods are needed for the study of social and political complexity in natural resource management?

Theme leaders:
Andreas Duit, Victor Galaz and Katarina Eckerberg

Photo: J. Lundberg

5. Governing freshwater for food and ecosystem services

How to deal with increasing water-induced trade-offs between food production and other ecosystem services in complex agricultural landscapes is an enormous challenge for society. Agriculture enables food security and is a major driver behind economic growth. However, it currently covers around 40 percent of all terrestrial land and its impact on water resources and hydrology has major consequences on a global scale. Agriculture currently consumes 70 percent of all blue water withdrawn from rivers and aquifers. It alters the green water flows to the atmosphere, and impacts water quality through alterations of nitrogen and phosphorous cycles. During the first year we have initiated research in four main directions:

1. Water for resilience in semi-arid sub-Saharan Africa: Tropical savannah regions in sub-Saharan Africa are challenging in terms of resilience building. Water availability is often scarce and highly variable; crop yields are often low and crop failures due to droughts are common; and there are high levels of malnutrition and poverty. The research focuses on understanding the potential role of investments in small-scale water system innovations in rain-fed agriculture to build resilience in smallholder societies. During 2007 we have published an analysis of the water dimensions of meeting the Millennium Development Goals in these regions as well as continued work in our case-study areas in Tanzania and South Africa.

2. Bundles of ecosystem services in agricultural landscapes: We are developing conceptual frameworks for improving analysis of how multiple ecosystem services, including water provisioning and food production, interact in order to generate synergies and produce trade-offs.

3. Global green water assessment: Since most freshwater assessments so far have focused on blue water resources, we are developing a new global green water assessment to investigate how a green water perspective changes the analysis of water scarcity and availability globally. Several Centre researchers served as lead authors on the Comprehensive Assessment of Water in Agriculture. We are also developing a collaborative project together with some of the world's leading hydrological modellers to address these issues, and will host an international workshop in early 2008.

4. Tipping points in the biosphere: water, agriculture and resilience: We analyse how agriculture, through its effects on hydrology, affects the risk of 'tipping points' or regime shifts in ecosystems. During 2007 a review of these types of regime shifts has been accepted for publication. We co-organised a symposium at the Ecological Society of America's annual conference on this important issue.

Theme leaders:
Line Gordon and Johan Rockström

Photo: J. Lundberg

6. Urban social-ecological systems and globalisation

The global and multidimensional process of urbanisation has major impacts on the generation and provisioning of ecosystem services which are fundamental for human well-being and for the social-ecological capacity to buffer and deal with change. The research activities of the urban theme focus on increasing our understanding of urban ecosystem services and how governance systems and urban designs can be developed to strengthen the provisioning of these services.

Research and framework

The research consists of several lines of inquiry that are envisioned to cross-fertilise each other. One line merges insights generated on common-pool resource management systems, social-ecological adaptations for resilience building, and governance and management of urban ecosystem services. The framework builds on the Millennium Ecosystem Assessment and particularly on experiences from the Stockholm MA sub-global assessment (SUA) as well as urban resilience research developed within the Resilience Alliance. The notion of ecosystem services is particularly promising for deepening our understanding of cities as integrated social-ecological systems. This research will strengthen the MA initiatives as well as contribute to a deeper understanding of 'hotspots' and 'coldspots' in the provisioning of ecosystem services in urban landscapes and provide a framework for the adaptive testing of designs and governance structures for restoration of services.

The theoretical framework will be tested within a larger international collaborative network, involving site-based urban research groups in Bangalore, Cape Town, Canberra, Helsinki, Istanbul, New Delhi, New Orleans, New York City, Phoenix and Stockholm.

Science-Policy interface

To initiate a dialogue between researchers, policy makers and civil society, the urban research theme has organised events at the World Congress on Biosphere Reserves in February 2008, and will carry out activities at both the Resilience 2008 Conference in Stockholm in April 2008, and at the 9th meeting of the Parties to the Convention on Biological Diversity in Bonn in May 2008. Investigations into the relevance of the UNESCO Man and the Biosphere concept in several urban areas have revealed that Urban Biospheres could provide alternative modes of public space to invest in a dynamic relationship between people, their natural environment and the various forms of governance of urban landscapes. Based on the accumulated experience and knowledge in the network, links are now formed with UNESCO and the IUCN WCPA task force on urban biodiversity.

Theme leaders:
Johan Colding and Thomas Elmqvist

Photo: J. Lokrantz/azote.se

7. Governance and ecosystem management of coastal and marine systems

The overall goal of coastal and marine ecosystem management is to secure the ability of the oceans to provide ecosystem services for societal development. While there have been some local successes, current management of marine social-ecological systems has largely failed to achieve this goal at regional and global scales.

Marine environments worldwide are in serious decline primarily due to over-harvesting, pollution, disease and climate change. In many locations around the world, human induced stress to marine ecosystems has exceeded their regenerative capacity, causing dramatic shifts in species composition and ecosystem states that result in severe economic and social costs.

Anticipating and preventing unwanted regime shifts will require improved understanding of the complex dynamics and processes that support or undermine resilience and of the socio-economic drivers and governance systems that shape the use of living marine resources and services. Thus, responding to the global marine crisis requires new approaches that focus on supporting and sustaining social-ecological resilience. Such approaches contest current management and metrics and stress the significance of multilevel adaptive governance systems for marine and aquaculture management. Such governance systems need features that can deal with cross-scale socio-economic drivers of globalisation to avoid vulnerability to coastal and marine social-ecological systems.

A number of collaborative projects are in development with researchers around the world (e.g. **ARC Centre of Excellence** for Coral Reef Studies, CSIRO, Resilience Alliance Marine Group, West Indian Ocean Marine Association (WIOMSA), Tyndall Centre, Chiang Mai University, the Sustainable Mekong Research Network (Sumernet)).

Priority areas for future research

- Reorganisation after extreme events
- Application of resilience in coastal & marine areas
- Costs of phase shifts for human welfare
- Globalisation and future seafood production
- Restoring key tropical coastal and marine habitats – a global review
- Sustainable management of the Baltic Sea - using the unique ecosystem model NEST
- Ecological and social resilience in coastal fishing communities and implications for sustainable fisheries resource management

The theme will have a session at the Resilience 2008 Conference focusing on resilience in the context of environmental changes and risks in coastal social-ecological systems and produce a joint synthesis paper on critical insights and knowledge gaps for sustaining coastal & marine ecosystem resilience.

Theme leaders:
Henrik Österblom, Max Troell and Frank Thomalla

Photo: J. Lokrantz/azote.se

8. Adaptive governance of dynamic land- and seascapes

The overall aim of the theme is to examine dynamic governance of complex social-ecological systems. The purpose is to better understand the emergence of new forms of governance and management of such systems and the social features and strategies that make transitions to ecosystem management possible, including the significance of building understanding of ecosystem dynamics into governance systems. The theme is unique in that it aims to link strands of ecosystem management, adaptive management and multi-level governance. The theme focuses on transdisciplinary, empirical case studies on both the local and global levels and the interactions between them, while also focusing on developing theories on governance that reflect transformations of the 21st Century.

The theme's strategic approach includes networking and collaboration with a range of international and national organisations and institutions such as University of Manitoba and University of Waterloo Canada, Oxford University, Arizona State University, University of Alaska Fairbanks and James Cook University Australia, to name a few.

Some of the highlights of 2007 include the establishment of a Memorandum of Understanding between the Stockholm Resilience Centre and UNESCO. This achievement has provided interesting and exiting collaborative linkages between the adaptive governance theme, the Centre and the UNESCO Man and Biosphere Program, as well as the start of research and long-term collaboration across sites in Sweden, Canada, France, India and South Africa on the barriers and bridges of adaptive governance. Other highlights include the publication of various papers and book chapters on adaptive governance, with examples from some of the most important and threatened ecosystems, such as the Great Barrier Reef in Australia, Amazonia in Brazil and the dry forests of Madagascar. Emerging insights of how these systems are being governed, in response to the climate crisis, gives hope to the possibility that institutions are learning how to incorporate that new experience into action.

A number of interesting meetings with international research programmes are leading to new exiting collaborations. One such example is the synergies with the work of the International Human Dimensions Programme and the Earth Systems Governance Programme. Other important emerging network collaborations are with the Tyndall Centre; in particular the Adaptive Governance theme is collaborating closely on aspects of adaptive governance and development in natural resource dependent communities. Work on transitions in social-ecological systems is developing with Öko-Institut in Berlin and the STEPS Centre and University of Sussex.

Theme leaders:
Per Olsson and Emily Boyd

Photo: F.Wulff

Baltic Nest Institute

The Baltic Nest Institute forms an integral part of the Stockholm Resilience Centre and mainly performs research linked to the theme of Governance and ecosystem management of coastal and marine systems. Specifically, Baltic Nest Institute hosts and develops the Nest decision support system, which was created during the Mistra funded MARE program (Marine Research on Eutrophication).

The decision support system is developed to give advice on the management of the Baltic Sea, related to eutrophication and fishing. The Nest system is a unique ecosystem model describing the dynamics of nutrient flow from land to sea, the internal dynamic of these nutrients in the Baltic as well as the effects on the ecosystem. Nest can be used to perform scenarios on future developments (e.g. changes in agricultural practices or fishery management) and, more importantly, to link actions on land to effects in the sea. The decision support system was successfully used to identify needed nutrient reductions in order to reach politically agreed goals in the Baltic Sea area. The recommendations by the Baltic Nest Institute formed a substantial part of the Baltic Sea Action Plan, agreed on by all the states bordering the Baltic, on November 15, 2007. Nest is thus not only a research institution but also a tool to provide science-based advice to policy makers, contributing to the formulation of policies for sustainable use of the Baltic Sea.

During 2007, the Baltic Nest Institute has recruited additional scientists to further develop the decision support system, for example by developing components looking at the effects of climate change on eutrophication and the food web, as well as developing an ecosystem model focusing on the effects of fishing on other ecosystem components. A Danish branch of Baltic Nest was also established in 2007 at Århus University in order to foster international co-operation and increase the capacity to provide timely advice to relevant policy processes.

Contacts:
Fredrik Wulff and Henrik Österblom

Photo: S.Zeff /azote.se

Research highlights, core projects and

Research highlights

During the year the Stockholm Resilience Centre has been engaged in many international project and research collaborations, through the emerging activities of the themes and other efforts.

More than 30 articles have been published in scientific journals and books, 7 books are in progress and a number of popular and outreach articles have been produced, and there are several articles in press (see appendix A). Among the highlights of the Stockholm Resilience Centre's research findings we can report on the following.

1. Agricultural expansion and intensification substantially alters freshwater flows and dynamics, which may cause catastrophic ecosystem shifts.

2. Global food demand over the coming 50 years will generate major water induced trade-offs between agriculture and other ecosystem services, which will require a new green-blue water paradigm to build social-ecological resilience and enable human wellbeing.

3. New economic measures for human wellbeing that capture changes in ecosystem services and resilience provide a comprehensive assessment of wealth with more accurate estimates of economic progress.

4. Stable or increased forests cover in Madagascar are found in areas with the highest human population density and well developed market access, while the highest loss of forest cover occurs in areas with low population density and lack of secure property rights.

5. Informal institutions, like taboo systems with strong social norms and social capital, is central in sustaining keystone endemic species and associated ecosystem services in dry-forest landscapes.

collaborations

The findings 1 to 10 above each refer to a specific scientific article indicated in the publication list with the same number (see Appendix B).

In addition, there are book contracts with Cambridge University Press, Columbia University Press, Palgrave MacMillan, Springer Verlag and Taylor & Francis Group. During the year papers have been published or accepted for publication in e.g. Science, PLoS One, PNAS, Ambio, Ecology Letters, Environmental Conservation, Global Environmental Change, Ecology and Society, Phil. Trans.

6. Strong social capital among fishermen in an African coastal area is insufficient to prevent overexploitation of fish stocks; appropriate leadership is needed as well.

7. Blueprint policies seldom work because interactions of social-ecological systems vary across space, time, and organisational units with past couplings having legacy effects on present conditions and future possibilities.

8. Social-ecological inventories complement ecological inventories and help reduce social tension by identifying and engaging people with ecosystem knowledge and practice fundamental in ecosystem management and associated governance systems.

9. A flexible governance regime and skilful navigation generated a social tipping point and transition of governance of the Great Barrier Reef seascape towards ecosystem-based management.

10. Governance theory is challenged to address the steering capacity of governance at all political levels subject to non-linear dynamics, threshold effects, cascades and limited predictability.

Photo: J. Lokrantz/azote.se

Centre of Excellence

A central project is *Resilience and Sustainability: Integrated Research on Social-Ecological Systems*, a five year Swedish Centre-of-Excellence project provided by FORMAS – the Swedish Research Council for the Environment, Agricultural Sciences and Spatial Planning. This grant, of which three years remain, has been instrumental in the start-up phase of the Resilience Centre and the focus of the research serves as a core for the Centre's research agenda. Like the Centre, the project is a joint effort between the Beijer Institute, Stockholm University and SEI with a strong focus on complex systems, regime shifts and resilience. We argue that because of positive feedbacks causing non-linear dynamics and regime shifts in social-ecological systems a resilience approach will be required for guiding management and policy towards sustainability.

Resilience Alliance

One of the most central partners is the Resilience Alliance (RA), an international network of leading research organisations that collaborate to explore the dynamics of social-ecological systems (www.resalliance.org). The RA and the focus on social-ecological systems emerged out of research programmes at the Beijer Institute in the 1990s and during its first year the Centre has received a central role in the Resilience Alliance (RA). The Board of Members of the Alliance have elected a new Executive Committee that will be chaired by the Centre's Science Director and two out of three Executive Deputy Directors of the RA are Centre researchers. The new Resilience Alliance Young Scholars (RAYS) group is also coordinated by the Stockholm Resilience Centre.

Centre of Excellence: Research agenda

- What are basic processes and sources of resilience in social-ecological systems and features behind loss of resilience and how do they interact across temporal and spatial scales?
- How can governance systems be shaped and stimulated to emerge across spatial and temporal scales in order to cope with uncertainty, surprise and vulnerability in social-ecological systems? What are the lessons from past experience and history?
- To what extent is there a need to revise current approaches to economic policy, indicators of wealth, and governance in the light of complex systems and cross-scale interactions? In particular, is it possible to assess the value of resilience so as to include it in an accounting framework?

Expect the Unexpected! Collage: C. Clifstock Photo: New York/C. Clifstock, Lemur/J. Lundberg

Resilience 2008 – Resilience, Adaptation and Transformation in Turbulent Times

The first international science and policy conference on resilience will take place on Stockholm University campus and the Royal Swedish Academy of Sciences April 14-17, 2008. It brings together scientists from all over the world working with the complex dynamics of interconnected social-ecological systems to present and discuss with policy makers from government, business and other actors the current understanding of resilience, adaptability and pathways of transformation in such systems. New ways of interacting, including a collaborative effort between resilience science and art are part of the conference. The Centre has been strongly engaged in the planning of this major event, which is a joint conference of the Resilience Alliance, International Council of Science (ICSU), the Royal Swedish Academy of Sciences and the Royal Swedish Academy of Fine Arts.

Other selected research collaborations

The Centre has been involved in many international workshops and meetings during 2007, including the first workshop of the new Para Limes Institute, the Netherlands; a resilience and adaptation workshop at Tyndall Centre for Climate Change Research; a resilience and development workshop at the Oxford University Centre for the Environment; the IHDP Earth System Governance meeting, Amsterdam; the assessment and development of the Earth System Science Program (ESSP); a Symposium at the annual meeting of the Ecological Society of America; a Session with IHDP at the Stockholm Water Week; the inauguration and science board of SARAS (the South American Institute for Resilience and Sustainability Studies), Uruguay; host for the bioSUSTAINABILITY International Project Office of DIVERSITAS; etc.

Several memoranda of understanding with key international collaborators have been signed (see page 11).

Researchers from the Centre have been visiting scientists or done post docs at the Centre for Institutional Diversity and School of Human Evolution and Social Change, Arizona State University; Australian Research Council Centre of Excellence for Coral Reef Studies, Townsville; McGill University, Montreal; the Fenner School of Environment and Society, Australian National University, Canberra; University of Cape Town; etc.

Science, practice and policy

The Stockholm Resilience Centre has already during our first year of existence engaged actively in science to policy bridging. The reason is not only to take responsibility for the impact of science on policy development and decision making, but also as a strategic way of interacting with practice and policy as part of the research process, as well as for receiving feedback on research priorities for the Centre already at an early stage of its evolution.

Top priority initiatives in science to policy bridging:

- The Follow-up of the UN Millennium Ecosystem Assessment
- Collaboration with the Tällberg Foundation and the science to policy dialogues at the Tällberg fora

In addition, the Centre is actively engaged in science-practice-policy processes in local and regional social-ecological systems through activities of the research themes.
Our resilience and sustainability research agenda is inspired by the achievements of the UN Millennium Ecosystem Assessment (MA). The Mistra call for proposals to establish a new Centre on "sustainable governance and management of linked ecological and social systems" actually took its starting point in the MA and in finding ways to secure ecosystem services for human wellbeing. The MA framework fits nicely with our research agenda on social-ecological systems, and the follow-up of the MA is a top priority process in our science to policy bridging.

Follow-up of the UN Millennium Ecosystem Assessment

The Centre initiated a process during the second half of 2007 to host an MA follow-up meeting in Stockholm, with the purpose of advancing the formulation of a follow-up strategy for the MA. Based on consultations with several MA stakeholders, among them UNEP (hosting the follow-up work), UNDP, WRI, Sida and SwedBio, a meeting was organised, hosted by Sida and UNEP, in Stockholm in October 2007. This meeting gathered the key stakeholders of the MA, and developed a framework for the continued MA follow-up work, focusing on: (1) developing further the knowledge base; (2) taking knowledge to action (implications of the MA to governance and management); (3) sub-global assessments and periodic global assessments (the question of a 2nd MA and whether an intergovernmental panel should be considered); and (4) capacity building and outreach.

The Stockholm Resilience Centre has been proposed as the lead organisation on academic capacity building, and a partner in advancing the knowledge base and sub-global assessments (essentially new research). The Centre is also proposed to have a person on the executive committee of the follow-up work. Together with UNEP and SwedBio, a special side-event was organised for the UNEP Governing Council meeting in Monaco 19-22 February 2008 (the 10th Special Session of the UNEP Governing Council/Global Ministerial Environment Forum). This side-event, with representation from the Swedish Minister for the Environment, and Ministers from developing and developed countries, was organised as a launch event of the MA follow-up strategy.

Taking a broader approach to global sustainability

The Swedish, European and global environmental agenda has over the past two years increasingly

Photo: R. Kautsky/azote.se

focused on the climate change agenda. While this is incredibly positive, there is a risk that other ecosystem-related issues are being neglected. Even more important, the risk of focusing strongly on mechanisms for mitigation of greenhouse gases (which have dominated the agenda) is that the interdependencies between human wellbeing, ecosystem services and climate change, both in terms of mitigation (the climate regulation function provided by ecosystems) and adaptation (the ecological resilience provided by ecosystems to buffer climate shocks) are forgotten in policy and governance. Consequently, the Stockholm Resilience Centre has been active during the year to convey the links to policy makers between climate change and ecosystem management. Furthermore, this has been done in a broader social-ecological systems perspective, by connecting the two with human wellbeing, in particular the urgent need to address ecosystem resilience and climate change in the context of poverty alleviation. This has been tied to the three UN processes (depicted in Figure 3) that need to develop a coherent joint approach to social-ecological resilience and development, but which until today have made little progress in addressing interdependencies (climate-poverty, poverty-ecosystems, ecosystems-climate).

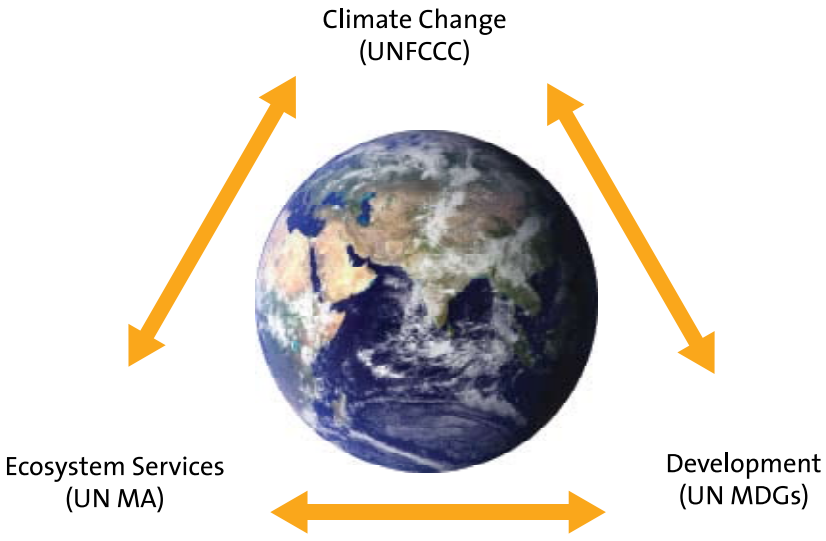


Figure 3. Three closely interdependent UN policy processes with limited interrelations: the UN Framework Convention on Climate Change, the UN Millennium Development process (with the Millennium Development Goals) and the UN Millennium Ecosystem Assessment (which also includes the Convention on Biodiversity, the French IMoSEB initiative on Biodiversity, and the Potsdam Initiative on the Economics of biodiversity/Ecosystem services)

Photo: A. Löf

Tällberg Consensus

The Tällberg Forum has established itself, after 30 years of work to take a holistic approach on the relationship between Man and Nature, as an internationally recognised arena for knowledge bridging and dialogue between science, political leaders, the private sector and civil society. The Centre has established a close collaboration with the Tällberg Foundation on a project named the "Tällberg Consensus" that has the purpose of carrying out a knowledge-driven dialogue process, in search of a consensus, on the governance and management implications of the rapidly emerging evidence of the unprecedented magnitude of environmental challenges facing humanity. Together with SEI, the Stockholm Resilience Centre will coordinate several sub-projects, advancing and synthesising our understanding of resilience, transformations, and tipping points, and also co-host science-policy meetings at the Tällberg Forum.

The International Commission on Climate Change and Development

The Swedish government, lead by Gunilla Carlsson, Minister for Development Cooperation, has established an international commission on climate change and development, with a focus on adaptation to climate change in developing countries. The Secretariat of the commission has been located at SEI, i.e., in the same offices as the Stockholm Resilience Centre. The Carlsson Commission will include a focus on the role of ecosystems and ecosystem services for adaptation and mitigation of climate change. The Resilience Centre was invited to prepare a Policy brief on the role of ecosystem management for adaptation and mitigation of climate change, which was presented at the first meeting of the Commission.

Valuation of Ecosystem Services

The European Environment Agency (EEA) has taken the initiative to carry out a European assessment of the economic value of ecosystem services. The Resilience Centre together with the Beijer Institute has attended preparatory expert meetings, and the aim is to contribute scientific expertise into this process.

Commission on Sustainable Development

The Swedish Prime Minister, Fredrik Reinfeldt, has established a Commission for Sustainable Development, with the aim of supporting Swedish policy on sustainability issues, with an initial focus on climate change. We have had several interactions with the secretariat of the Commission, which has requested from the Resilience Centre a policy synthesis on the role of resilience and ecosystem services for sustainable development, to be produced during 2008.

Swedish Government Inquiry on Climate Change and Vulnerability (Klimat- och sårbarhetsutredningen).

As part of the Swedish government inquiry on vulnerability and adaptation requirements in Sweden to climate change, the Stockholm Resilience Centre led the writing of a report on the health effects of climate change, and prepared a report on the role of resilience for adaptation to climate change. Moreover, researchers at the Centre have during the year served on the

Swedish government's Scientific Council on Climate Issues.

Science-practice-policy processes in local and regional social-ecological systems

Through our network of partners and activities of several of the themes we are involved in bridging the science-policy interface all the way down to the local level by interacting and engaging with stakeholders for practice and policy. During the year the Centre has been involved in developing the science-practice-policy interface within the Man and Biosphere-programme (MAB), particularly in Sweden (Kristianstads Vattenrike and other emerging MAB sites), South Africa (Cape Winelands BR), India (through our partner ATREE), Canada (McGill University and University of Waterloo) and in collaboration with MAB-coordinators and scientists in France. Such collaborations have also taken place in the context of the governance of the Great Barrier Reef, Australia, coastal areas in East Africa and South East Asia, the dry forest of Madagascar, and been initiated for collaborative learning and management in Swedish lake fisheries. Centre scientists and local farmers have collaborated on rain-fed agriculture in Africa, including field schools, social learning processes with policy briefs from those experiences produced and spread internationally. As part of the Urban theme, established science policy dialogues have intensified during 2007 in cities like New Orleans, Phoenix, Cape Town and Canberra, with a special focus on developing the concept of Urban Biospheres as a tool for addressing ecosystem services.

Further interactions with the Private Sector, Agencies, Political processes and civil society

The Resilience Centre has during the course of its first year had several dialogues and interactions with government agencies (e.g. Sida, Swedish Environmental Protection Agency and the Swedish Emergency Management Agency) and ministries (e.g. half-day dialogue with the Minister for the Environment Andreas Carlgren on ecosystem services and the follow-up of the Millennium Ecosystem Assessment; presentation to the Environmental and Agricultural Committee of the Swedish Parliament, and to the Globalisation Council of the Swedish Government) and there have been presentations in Swedish Parliament. Furthermore, in Sweden, the Centre gave a keynote address at the Charity Ratings conference 2007, which gathered several key Civil Society organisations in Sweden, and prepared and presented a report on Agriculture, Water and Ecosystems for the Swedish Water House.

On the international stage, the Centre hosted a side-event at UNESCO, launching an institutional agreement of collaboration between the Centre and UNESCO. The Centre also gave a presentation on aquaculture at FAO, and panel input on climate change and sustainability at the COP13 Bali meeting. The Centre was presented to the 15th session of the Commission of Sustainable Development at the UN in New York and represented at the G8-UNESCO World Forum on 'Education, Research and Innovation: New Partnership for Sustainable Development' in Trieste, Italy.

Apart from the close interaction with the Tällberg Foundation, which includes dialogues with the private sector, the Centre has collaborated with the World Resources Institute and Albaeco on the semination of a corporate Ecosystem Services Review (ESR) and has contributed significant inputs to the strategic sustainability planning of Ericsson.

Photo: J.Lokrantz/azote.se

Teaching and training

Stockholm Resilience Centre offers several interdisciplinary courses on the first level (Undergraduate), second level (Master) and third level (Postgraduate). The courses are part of the CTM legacy, which until 2007 developed and promoted interdisciplinary courses at Stockholm University (SU). Consequently, all courses are developed in collaboration with several departments at SU. This also opens up for extended networking opportunities and new research collaborations.

The synergy-effect of integrating Centre research with education generates course content that is closely linked to the Centre's core research. For instance, one of the Master programmes departs from the principles of the Millennium Ecosystem Assessment. Furthermore, guest researchers and various research activities help increase the quality of the courses. The research benefits from the students' works (projects and theses) and involvement in education provides an arena to foster the next generation of researchers.

The transdisciplinary PhD Group

The transdisciplinary PhD group is a cross faculty forum for PhD students from all departments at SU. Their academic backgrounds vary from law, human geography, sociology, systems ecology and zoology. This arena was started by CTM in 2000 and some 40 PhD students have since been involved in this group. The aim is to create a forum where researchers early in their careers can communicate with people from different academic backgrounds. This is a precondition for interdisciplinary research, and several of the young generation of scientists at Stockholm Resilience Centre has a background in this forum.

Courses at the Stockholm Resilience Centre

- *Hållbar samhällsutveckling, 60 credits.* An introductory course at the Department of Physical Geography. Eight departments at Stockholm University are involved and Stockholm Resilience Centre plays an active role in the course.
- *Världens Eko, 7,5 credits.* An introductory course on sustainable development, initiated and driven by students.
- *Miljövetenskapliga seminarier, 7,5 credits.* An interdisciplinary course offered for students at the Environmental Science program at the Institute for Applied Environmental Science (ITM).
- *Sustainable development and resilience perspectives, 7,5 credits.* An introductory course for exchange students within the Swedish Program.
- *Ecosystems, Governance and Globalisation (EGG), 120 credits.* An interdisciplinary Master's Programme in cooperation with several departments at Stockholm University.
- *Sustainable Enterprising, 120 credits.* A Master´s Programme that is a partnership between Stockholm Resilience Centre, the School of Business, the Department of Law and the Department of Biology Education at Stockholm University.
- *Third level courses (Postgraduate)* A combined workshop and PhD course, "Complexity and the social sciences, 5 credits.", was given at SRC in September 2007. PhD students from six different countries participated, representing a wide range of academic backgrounds. Key note lecturer was Professor Steve Lansing from the Santa Fe Institute, California.

Communications

Strategic communication for improved policy and decision support is an important part of the Stockholm Resilience Centre's mission.

During its first year the Centre has invested much time and resources into establishing effective communication channels and developing a graphic profile for the Centre.

Website developments

The website, www.stockholmresilience.su.se, is an important channel for communication and the ambition has been to develop a website that reflects a centre that is in the very forefront of its field. This also includes research communication. The website uses modern video technology to accompany textual information along with an extensive use of pictures. Seminar videos, specially designed movies and pictures are all provided by professional partners.

The website offers several full-length videos of key speakers from the Stockholm Seminars: Frontiers in Sustainability Science and Policy, a series given by the Centre in cooperation with the Royal Swedish Academy of Sciences among others. Here, leading scientists present their research on sustainable development. Furthermore, the website offers video interviews with visiting scientists explaining key issues of resilience research. A monthly electronic newsletter is under development together with a new centre intranet.

Media coverage

Researchers at the Stockholm Resilience Centre have been frequently interviewed by the Swedish media. During 2007 there have been some 40 newspaper articles, TV and radio programmes, as well as some debate articles and editorials in national daily newspapers. Collaboration is established with media consultants to improve the contacts with international media. All press clippings are available on the Centre website.

Seminars

We have during 2007 organised a number of open seminars. These include 14 *Stockholm Seminars* at the Royal Swedish Academy of Sciences, with leading scientist from around the world. Another example is the new series called Wisdom Seminars, with talks by Paul Ehrlich and CS Holling during the fall 2007.

Other key activities

One of the key start-up activities has been to present the Centre to important stakeholders both in Sweden and internationally. The Centre was successfully inaugurated in May, in the presence of more than 200 Swedish stakeholders. Furthermore, the Centre has been presented to important international stakeholders on several occasions, including the 15th session of the Commission of Sustainable Development in New York in May and the UNESCO general conference in Paris in October.

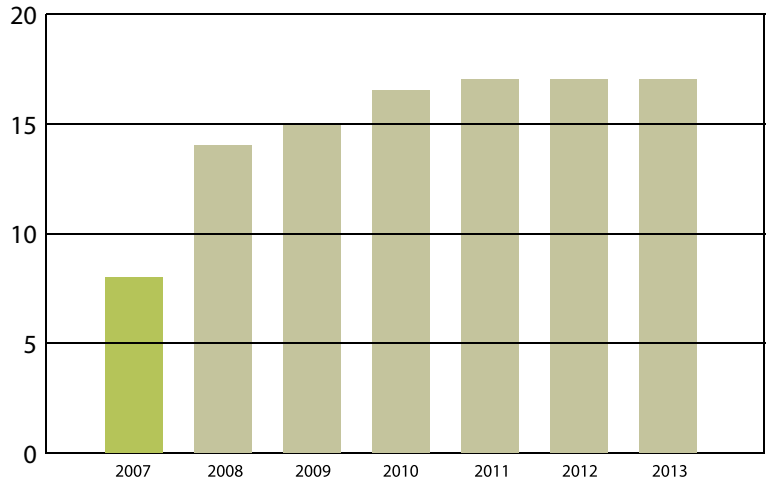
We are currently preparing for the Resilience2008 conference in Stockholm in April. This will be a major event attracting media interest to key issues such as resilience, adaptation and transformation in turbulent times. For more information on the conference, see page 27 or www.resilience2008.org.

Collaboration with Albaeco

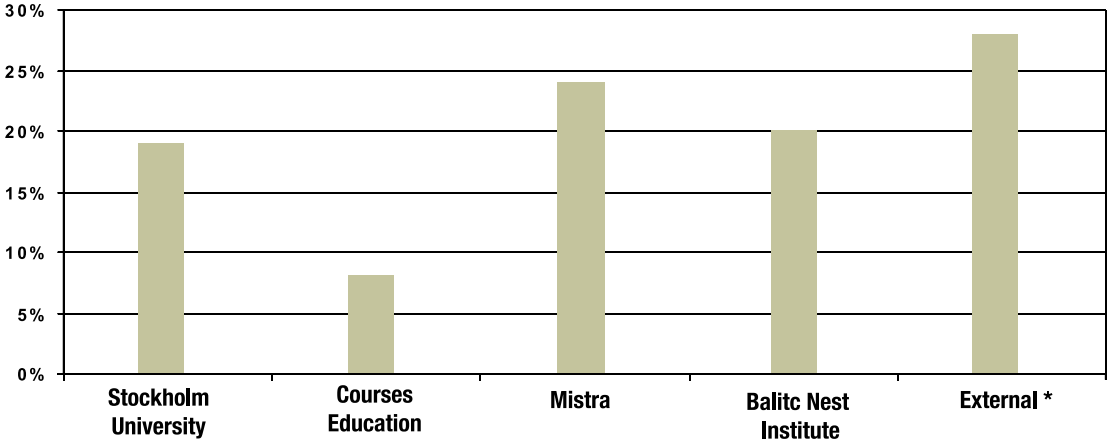
The Stockholm Resilience Centre works in close collaboration with Albaeco, located in the same building as the centre. Albaeco is an independent non-profit organisation working to mainstream insights from the transdisciplinary research on resilience and ecosystem services among individuals as well as policy makers within the public and private sector. Albaeco assists in many of the communications activities of the centre, including the production of news items and video for the website, and arranging seminars and media contacts. Albaeco and the centre have also co-produced "Manna – Food in a New Light", an exhibition on the links between food production, resilience and ecosystem services. Apart from this, Albaeco is also engaged in the communication of resilience science through its own channels, including the Sida-financed newsletter "Sustainable Development Update".

Accounts in brief

MISTRA financing of the Stockholm Resilience Centre is a grant of 105 MSEK in total for seven years, distributed as follows:



The total funds allocated in 2007 to the Stockholm Resilience Centre was 37,7 MSEK and divided according to the following table. In addition, the Beijer institute and the Stockholm Environment Institute contributed in-kind approximately 2 MSEK during 2007.



The subsidy from Stockholm University is in total 7,3 MSEK, including a PhD-grant of 4 years (1,54 MSEK).
Courses and Education gave 3,1 MSEK.
Baltic Nest Institute is funded by the Swedish EPA with 7 MSEK per year.
*External grants during 2007 were 10,7 MSEK, divided among the following funders:

* External sources:	
FORMAS:	7,6 MSEK
SWEDISH EPA:	0,5 MSEK
SIDA:	2,0 MSEK
OTHER:	0,6 MSEK

Appendix A.
Publications

Books in progress (signed contracts)

Baker, S. and K. Eckerberg (eds.) *In Pursuit of Sustainable Development: New Governance at the Sub-National Level in Europe*. Routledge, Taylor & Francis Group, London.

Boyd, E. and C. Folke (eds.).*Governing Social Ecological Systems: Adapting to the Challenge of Global Environmental Change*. Cambridge University Press, Cambridge UK.

Chapin, T, G. Kofinas and C. Folke (eds.). *Principles of Natural Resource Stewardship: Resilience-Based Management in a Changing World*. Springer Verlag, New York.

Niemelä, J., J. Breuste, G. Guntensberger, N. McIntyre, T. Elmqvist and P. James (eds). Handbook of Urban Ecology. Oxford University Press.

Norberg, J. and G. Cumming (eds.). *Complexity Theory for a Sustainable Future*. Columbia University Press, New York.

Rickinson, M., C. Lundholm and N. Hopwood. *Environmental Learning. Insights from Research into the Student Experience*. Springer Verlag, Amsterdam.

Sörlin, S. and P. Warde (eds.), *Nature's End: Environment and History*. Palgrave MacMillan, London.

Scientific articles 2007

Chapin, F.S. III, K. Danell, T. Elmqvist, C. Folke, and N. Fresco. 2007. Managing Climate Change Impacts to Enhance the Resilience and Sustainability of Fennoscandinan Forests. Ambio 36:528-33.

Deutsch, L., S. Gräslund, C. Folke, M. Huitric, N. Kautsky, M. Troell and L. Lebel. 2007. Feeding Aquaculture Growth through Globalization; Exploitation of Marine Ecosystems for Fishmeal. Global Environmental Change 17:238-249.

Duit, A. 2007. Path Dependency and Institutional Change: The Case of Industrial Emission Control in Sweden. Public Administration 85: 1097-1118.

(4.) Elmqvist T., M. Pyykönen, M. Tengö, F. Rakotondrasoa, E. Rabakonandrianina et al. 2007. Patterns of Loss and Regeneration of Tropical Dry Forest in Madagascar: The Social Institutional Context. PLoS ONE 2(5): e402.doi:10.1371/journal.pone.0000402

Enfors, E. and L. Gordon. 2007. Analysing Resilience in Dryland Agro-ecosystems: A case study of the Makanya catchment in Tanzania over the past 50 years. Land Degradation & Development 18: 680 — 696.

Fabricius C., C. Folke, G. Cundill and L. Schultz. 2007. Powerless Spectators, Coping Actors, and Adaptive Co-Managers? A Synthesis of the Role of Communities in Ecosystem Management. Ecology and Society 12(1):29. [online] URL: http://www.ecologyandsociety.org/vol12/iss1/art29

Folke, C. 2007. Social-Ecological Systems and Adaptive Governance of the Commons. Ecological Research 22:14-15.

Folke, C., L. Pritchard, F. Berkes, J. Colding and U. Svedin. 2007. The Problem of Fit Between Ecosystems and Institutions: Ten Years Later. Ecology and Society 12(1): 30. [online]
URL: http://www.ecologyandsociety.org/vol12/iss1/art30/

Galaz, V. 2007. Water Governance, Resilience and Global Environmental Change: A Reassessment of Integrated Water Resources Management. Water Science and Technology 56: 1-9.

Gunderson, L. and C. Folke. 2007. Looking Forward, Looking Back. Ecology and Society 12(1): 32. [online]
URL: http://www.ecologyandsociety.org/vol12/iss1/art32/

Gunderson, L., C. Folke, and M. A. Janssen. 2007. Reflective Practice. Ecology and Society 12(2): 40. [online]
URL: http://www.ecologyandsociety.org/vol12/iss2/art40/

Hughes T.P., D.R. Bellwood, C. Folke, L.J. McCook and J.M. Pandolfi. 2007. No-Take Areas, Herbivory and Coral Reef Resilience. Trends in Ecology and Evolution 22:1-3.

Hughes T.P., L. Gunderson, C. Folke, A. Baird, D. Bellwood, F. Berkes, B. Crona, A. Helfgott, H. Leslie, J. Norberg, M. Nystrom, P. Olsson, H. Österbloom, M. Scheffer, H. Schuttenberg, R.S. Steneck, M. Tengö, M. Troell, B. Walker, J. Wilson, and B. Worm. 2007. Adaptive management of the Great Barrier Reef and the Grand Canyon World Heritage Areas. Ambio 36:586-592.

Jansson, Å. and J. Colding. 2007. Tradeoffs between environmental goals and urban development: The case of nitrogen load from the Stockholm County to the Baltic Sea. Ambio 36: 650-656.

Liu, J., T. Dietz, S.R. Carpenter, C. Folke, M. Alberti, C.L. Redman, S.H. Schneider, E. Ostrom, A.N. Pell, J. Lubchenco, W.W. Taylor, Z. Ouyang, P. Deadman, T. Kratz and W. Provencher. Coupled Human and Natural Systems. Ambio 36:639-649.

7. Liu, J., T. Dietz, S.R. Carpenter, M. Alberti, C. Folke, E. Moran, A.C. Pell, P. Deadman, T. Kratz, J. Lubchenco, E. Ostrom, Z. Ouyang, W. Provencher, C.L. Redman, S.H. Schneider, W.W. Taylor. 2007. Complexity of Coupled Human and Natural Systems. Science 317:1513-1516.

Olsson, P., C. Folke, V. Galaz, T. Hahn and L. Schultz. 2007. Enhancing the Fit through Adaptive Comanagement: Creating and Maintaining Bridging Functions for Matching Scales in the Kristianstads Vattenrike Biosphere Reserve Sweden. Ecology and Society 12(1): 28. [online]
URL: http://www.ecologyandsociety.org/vol12/iss1/art28/

Österblom, H., S. Hansson, U. Larsson, O. Hjerne, F. Wulff, R. Elmgren and C. Folke. 2007. Human-induced Trophic Cascades and Ecological Regime Shifts in the Baltic Sea. Ecosystems 10:877-889.

(2.) Rockström, J., M. Lannerstad and M. Falkenmark. 2007. Assessing the Water Challenge of a New Green Revolution in Developing Countries. Proceedings National Academy of Sciences USA (PNAS) 104: 6253-6260.

Rockström, J. and J. Barron. 2007. Water Productivity in Rainfed Systems: Overview of challenges and analysis of opportunities in water scarcity prone savannahs. Irrigation Science 25:299-311

Savage, V., C. Webb and J. Norberg. 2007. A General Multi-trait-based Framework for Studying the Effects of Biodiversity on Ecosystem Functioning. Journal of Theoretical Biology 247: 213-229

(8.) Schultz, L., C. Folke and P. Olsson. 2007. Enhancing

Ecosystem Management through Social-Ecological Inventories: Lessons from Kristianstads Vattenrike, Sweden. Environmental Conservation 34: 140-152.

(6.) Tengö, M., K. Johansson, F. Rakotondrasoa, J. Lundberg, J.-A. Andriamaherilala, J.-A. Rakotoarisoa and T. Elmqvist. 2007. Taboos and Forest Governance: informal protection of hot spot dry forest in southern Madagascar. Ambio 36: 683-691.

Tittensor, D.P., F. Micheli, M. Nyström and B. Worm. 2007. Human Impacts on the Species-Area Relationship in Reef Fish Assemblages. Ecology Letters 10:760-772.

Worm, B., E.B. Barbier, N. Beaumont , J.E. Duffy, C. Folke, B.S. Halpern. J.B.C. Jackson, H.K. Lotze, F. Micheli, S.R. Palumbi, E. Sala, K.A. Selkoe, J.J. Stachowicz and R. Watson. 2007. Biodiversity Loss in the Ocean: How Bad Is It? Response. Science 316:1282-1284.

Book chapters

de Fraturier C., D. Wichelns, J. Rockström, E. Kemp-Benedict, N. Eriyagama, L.J. Gordon, M.A. Hanjra, J. Hoogeveen, A. Huber-Lee and L. Karlberg. 2007. Looking Ahead to 2050: Scenarios of Alternative Investment Approaches. In. Molden D. (editor) Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. pp. 91-145. Earthscan, London.

Falkenmark M., C.M. Finlayson. L.J. Gordon, E.M. Bennett, T. Matiza Chiuta, D. Coates, N. Gosh, M. Gopalakrishnan, R.S. de Groot, G. Jacks, E. Kendy, L. Oyebande, M. Moore, G.D. Peterson and J.M. Portugez. 2007. Agriculture, Water and Ecosystems: Avoiding the Costs of Going too Far. In. Molden D. (editor) Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. pp. 233-277. Earthscan, London .

Folke, C., J. Colding, P. Olsson and T. Hahn. 2007. Integrated Social-Ecological Systems and Adaptive Governance of Ecosystem Services. In: Pretty, J., A. Ball, T. Benton, J. Guivant, D. Lee, D. Orr, M. Pfeffer and H. Ward (editors). Sage Handbook on Environment and Society, Chapter 37: 536-552. Sage Publications, London.

McCook L.J., P. Marshall, C. Folke, T. Hughes, M. Nyström, D. Obura and R. Salm. 2007. Ecological Resilience, Climate change and the Great Barrier Reef . In: Vulnerability of the Great Barrier Reef to Climate Change. The Great Barrier Reef Marine Park Authority (GBRMPA) and the Australian Greenhouse Office.

Olsson, P. 2007. The Role of Vision in Framing Adaptive Co-Management Processes: Lessons from Kristianstads Vattenrike ,SouthernSweden. In: Armitage, D., F. Berkes and N. Doubleday (editors). Adaptive Co-Management: Collaboration, Learning, and Multi-level Governance. Chapter 14: 268-285. UBC Press, Vancouver.

Rockström, J., N. Hatibu, T. Oweis, S. Wani, J. Barron, A. Bruggeman, Z. Qiang, J. Farahani and L. Karlberg. 2007. Managing Water in Rainfed Agriculture. In. Molden D. (editor) Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. Chapter 9: 315-348. Earthscan, London.

Policy papers, reports and editorials

Boyd, E., Galaz, V., A-S Crepin, J. Norberg and P. Olsson. 2007. Klimat och resiliens - underlagsrapport till den svenska Klimat- och sårbarhetsutredningen. [Climate Change and Resilience - expert report for the Swedish Government Inquiry on Climate and Vulnerability]. October.

Deutsch, L. 2007. Svensk mat som sätter internationella spår. chapter in: Konsumtion i ett hållbart samhälle: Business as usual - eller måste vi ändra livsstil? Formas Fokuserar nr. 12. In Swedish. The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas).

Deutsch, L. and J. Björklund. 2007. How Swedish is a Swedish Cow? How Swedish consumption and production of food is dependent on and affects ecosystems in Sweden and abroad. Kungliga Skogs- och Lantbruksakademien (KSLA) and SIDA.

Ekman, B., T. Ries, J. Rockström, Goda möjligheter bli vinnare, Svenska Dagbladet, Brännpunkt, 2007-03-25.

Ekman, B., C. Folke, C. Mossfeldt, J. Rockström. 2007. Vår Tids Största Utmaning. Svenska Dagbladet Brännpunkt. 2007-06-28.

Falkenmark, M. and V. Galaz. 2007. Agriculture, Water and Ecosystems. Swedish Water House Policy Brief Nr. 6. SIWI, 2007.

Folke, C. 2007. Vår Miljö: En Ödes- och Utvecklingsfråga. Nyhetsbrev Nr. 9 från Mistra, oktober 2007. p. 2.

Galaz, V. 2007. Klimat och politik, Essä Dagens Nyheter Kultur, 2007-03-14.

Galaz, V. 2007. Varning för klimatkrisens överraskningar, Essä Svenska Dagbladet Kultur, 2007-10-25.

Galaz, V. 2007. Jordens akilleshälar synas i komplexa system, Miljöforskning, nr 4, 2007.

Galaz, V., L. Gordon, F. Miller and G. Han. 2007. Water and Agricultural Systems under Stress: Avoiding Regime Shifts by Building Resilience in Policy and Institutions. Policy Report III, The Swedish Water House/Stockholm International Water Institute.

Larsen, R.K., F. Miller and F. Thomalla. 2007. Vulnerability in the Context of Post 2004 Indian Ocean Tsunami Recovery: Lessons for Building More Resilient Coastal Communities. A Synthesis of Documented Factors Contributing to Tsunami Related Vulnerabilities in Sri Lanka and Indonesia. SEI Risk, Livelihoods & Vulnerability Report, Stockholm Environment Institute, Stockholm, Sweden, December 2007, 44 pp.

Larsson, M., and T. Hahn. 2007. Tillväxt, välfärd och miljö. Tvärdrag nr. 1, 2007.

Larsson, M., A. Löf and T. Hahn. 2007. Local Organic Food System in Järna Ecosystem Management and Multilevel Governance in Agricultural Production GEM-CON-BIO Case Study Report.

Larsson, M. 2007. Trust, Social Capital and Community Development - A Caste study of Environmental Entrepreneurs. Conference proceedings of International Sustainable Development Research Conference, Västerås, June 2007.

Lindgren, E. 2007. Klimat- och sårbarhetsutredningens betänkande Sverige inför klimatförändringar hot och möjligheter, SOU 2007:60, underlagsrapport om hälsoeffekter. M2007:60

Lundqvist, J., J. Barron, G. Berndes, A. Berntell, M. Falkenmark, L. Karlberg, and J. Rockström. 2007.

Water pressure and increases in food and bioenergy demand - implications of economic growth and options for de-coupling (ch.3). Scenarios on economic growth and resource demand´ Background report to the Swedish Environmental Advisory Council memorandum 2007:1

Olsson, P. 2007. Förvaltning av lokala fiskbestånd. In H Tunón, M Iwarsson, S Manktelow (eds) Människan och Faunan: etnobiologi i Sverige 3, pp. 380-381. Wahlström & Widstrand, Stockholm.

Olsson, P. 2007. Vattenriket i Världen. In M. Starendal (ed) Mat, råvaror, och energi: en kunskapsresa i Linnés anda, pp 91-97. Formas, Stockholm.

Olsson, P. 2007. The rich wetlands of Kristianstad. In M. Starendal (ed) Food, raw materials, and energy: a knowledge journey in the spirit of Linnaeus, pp 91-97. Formas, Stockholm.

Rockström, J., Berntell, A., Moulden, D., FN-rapport: Vattenbrist redan verklighet - och värre blir det, Göteborgs-Posten, debatt, 2007-03-21

Publications in press

(5.) Bodin, Ö. and B. Crona. Management of Natural Resources at the Community Level: Exploring the Role of Social Capital and Leadership in a Rural Fishing Community. World Development.

Boyd, E. Navigating Amazonia under Uncertainty: Learning from Past and Present Forms of Environmental Governance. Phil. Trans. Royal Society.

Chopin T., S.M.C. Robinson, M. Troell, A. Neori, A. Buschmann and J.G. Fang. Ecological Engineering: Multi-Trophic Integration for Sustainable Marine Aquaculture. In: Jorgensen, S.E. (editor.), Encyclopedia of Ecology. Elsevier, Oxford.

Elmqvist, T and Tengö, M. Spontaneous Regeneration of Tropical Dry Forest in Madagascar In: Nagendra H and Southworth J (editors) Forest Regeneration: Patterns and Processes. Springer Verlag, Amsterdam.

Elmqvist, T., C. Alfsen and J. Colding. Urban Systems. In: Jorgensen, S.E. (editor), Encyclopedia of Ecology. Elsevier.

(10.) Galaz, V. and A. Duit. Governing Complexity: Emerging Challenges for Governance Theory. Governance.

Galaz, V., T. Hahn, P. Olsson, C. Folke and U. Svedin. The Problem of Fit Between Governance Systems and Environmental Regimes. In: Young, O., L.A. King and H. Schroeder (editors). Institutions and Environmental Change: Principal Findings; Applications and Research Frontiers, MIT Press, Boston.

(1.) Gordon, L.J., G.D. Peterson and E. Bennett. Agricultural Modifications of Hydrological Flows Create Ecological Surprises. Trends in Ecology and Evolution.

Gordon, L.J, E. Enfors. Land Degradation, Ecosystem Services and Resilience of Smallholder Farmers in Makanya catchment, Tanzania. Book Chapter prepared for the Comprehensive Assessment book "Reversing the Trends in Land and Water Degradation".

Lundholm, C. 2008. Discourse, Cause and Change: A Study on Economics Students' Conceptions of Child Labour. In Öhman, J. (Ed.) Ethics and Democracy in Education for Sustainable development. Contributions from Swedish Research. Stockholm: Liber.

(3.) Mäler, K.-G., S. Aniyar and Å. Jansson. Accounting for Ecosystem Services. Proceedings National Academy of Sciences, USA

Milly, P.C.D., J. Betancourt, M. Falkenmark, R.M. Hirsch, Z.W. Kundzewicz, D.P. Lettenmaier, R.J. Stouffer. 2008. Stationarity is Dead: Whither Water Management. Science 319:573-574.

(9.) Olsson, P., C. Folke and T.P. Hughes. Navigating the Transition towards Ecosystem-Based Management of the Great Barrier Reef Marine Park, Australia. Proceedings National Academy of Sciences, USA

Robertson-Andersson, D.V., M. Potgieter, J. Hansen, J. Bolton, M. Troell, R.J. Anderson, C. Halling and T. Probyn. Integrated Seaweed Cultivation on an Abalone Farm in South Africa. Journal of Applied Phycology.

Rockström, J., P. Kaumbutho, J. Mwalley, A.W. Nzabi, M. Temesgen, L. Mawenya, J. Barron, J. Mutua and S. Damgaard-Larsen. Conservation Farming Strategies in East and Southern Africa: Yields and Rain Water Productivity from On-Farm Action Research. Soil & Tillage Research.

Sörlin, S. Essay review: Sharon E. Kingsland. The Evolution of American Ecology, 1890-2000. Baltimore, MD: Johns Hopkins University Press: 2005, and other works on the modern history of ecology. Lychnos.

Troell, M. Integrated Marine and Brackish Water Aquaculture in Tropical Regions: Research, Implementation and Prospects. FAO Technical Report. 76 p.

Master theses of the Stockholm Resilience Centre

During the year the Ecosystem, Governance and Globalization programme has produced 17 master theses and the Sustainable Enterprising program 14 master theses.

Appendix B.
Partnerships

The Stockholm Resilience Centre collaborates with a great number of international research partners including:

Resilience Alliance

ARC Center of Excellence for Coral Reefs Studies, James Cook University, Australia

The research group on social-ecological resilience at University of Alaska Fairbanks, USA

The Fenner School of Environment and Society, Australian National University, Australia

Nelson Institute for Environmental Studies and the Center for Sustainability and other groups at University of Wisconsin, USA.

Oxford Centre for the Environment, University of Oxford, UK

Ashoka Trust for Ecology and the Environment (ATREE), Bangalore, India

Institute for Economic Growth, Dehli

Tyndall Centre, University of East Anglia, Norwich, UK

Center for the Study of Institutional Diversity and School of Human Evolution and Social Change, Arizona State University, USA

CSIRO, Canberra and Townsville, Australia

SARAS, South American Institute for Resilience and Sustainability, Montevideo, Uruguay

Potsdam Institute for Climate Impact Research, PIK, Germany

Department of Environmental Sciences, Wageningen University, The Netherlands

Natural Resources Institute, University of Manitoba, Winnipeg, Canada.

Gund Institute for Ecological Economics, University of Vermont, USA

International Geosphere-Biosphere Program, (IGBP)

International Human Dimension program on Global Environmental Change (IHDP)

Earth Systems Science Program (ESSP)

Governance for Sustainable Development program at the Donald Bren School of Environmental Science and Management, USA

School of Earth Science and other groups at Stanford University, USA

Sustainability Science Initiative and Clark University, USA
UNESCO, Ecological and Earth Science and Man and the Biosphere Program MAB

University of Cape Town, South Africa

Rutgers University, USA

International Institute for Environment and Development, IIED, UK

Several CGIAR institutes, particularly IWMI, ICRISAT and ICRAF.

The SEI research network Sumernet (Sustainable Mekong Research Network) that includes research institutions in the Mekong river basin.

Appendix C.
A selection of presentations

Scientific presentations

UK-India Young Scientists Networking Conference on Extreme Weather Events in the Context of Climate Change, British Council, New Delhi, India, Boyd, E., Invited speaker, Talk title: 'Cultural interpretations of floods in UK and India in 2007', November.

Conference Adaptive and Integrative Water Management (CAIWA), Basel, Switzerland, Folke, C. Plenary presentation, November.

McGill School of the Environment Speaker Series, Gordon, L. Invited speaker."Water, food and ecosystem services: Building resilience of agricultural landscapes", November.

ECPR (European Consortium for Political Research), Pisa, Italy, Olsson, P., Duit, A. paper presentations, September.

IGBP 20 year anniversary, Stockholm, Rockström J., "Adaptation and Sustainable Development", September.

Ecological Society of America, Symposium on "Tipping points in the biosphere: Water, agriculture and resilience", Gordon, L., Invited speaker, "Human modification of green water flows: Influencing tipping points in ecosystems" August.

European Society for Ecological Economics (ESEE), Leipzig, Germany, Folke, C. Plenary presentation, June.

Centre for the Environment, workshop Resilience, Realities and Research in African Environments, Oxford University, Folke, C. Invited pres., June.

IHDP open meeting, Amsterdam, Olsson, P. invited keynote speaker, and Galaz, V., Duit, A. paper presentations, May.

Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia, Thomalla, F., "Governance and Ecosystem Management of Coastal and Marine Systems: Defining the Research Agenda for the Stockholm Resilience Centre", May.

IARU Young Scholars Workshop, The Australian National University- ANU Canberra, Australia, Session: Sustainable Water Management at the Local, Regional and Global Scales, Deutsch, L., "Global Trade, Food Production and Ecosystem Support", March.

Learning for Sustainable Development, Conference, Umeå, Eckerberg, K., "Lärande för hållbar utveckling i globalt, nationellt och lokalt perspektiv", February.

Skinnskatteberg International Workshop on Sustainable Landscapes, Hahn, T., Invited speaker, "Accounting systems and areas for sustainable landscapes: Economic analysis." February

Policy fora

UNFCCC Bali, Boyd, E., Panel speaker, "Can we reduce emissions from the atmosphere and achieve sustainable development?", December.

UNESCO AquaTerra Integrated Project, Venice, Gordon, L., Keynote speaker on the resilience perspective, December.

EuroMAB conference in Antalya, Turkey, Elmqvist, T., Olsson, P., Schultz, L., opening talk, keynote talk and presentation, November.

European Commission, DG Environment and the European Parliament, Brussels. de Zeeuw, A.: "Beyond GDP: Measuring progress, true wealth, and the well-being of nations", November.

UNEP Trondheim Conference "Ecosystems and people - Biodiversity and Development-The Road to 2010 and beyond", Elmqvist, T., Keynote speaker. October -November.

Millennium Ecosystem Assessment (MA) follow-up meeting, the Ministry for Environment, Stockholm, Elmqvist, T., Folke. C., Rockström, J., October.

UNESCO general conference, side event on Biosphere Resilience, Elmqvist, T., Folke, C., Rosswall, T., October.

Global Sustainability - A Nobel Cause, Nobel Laureates symposium led by German Chancellor Angela Merkel on global sustainability.

Potsdam Institute for Climate Impact Research (PIK), Johan Rockström, October.

Sida Development Area, Stockholm, Schultz, L., "Ecosystems, livelihoods and climate change: How can we manage ecosystems to improve human wellbeing?" September.

Meeting the Climate Challenge, Seminar with Nicholas Stern, Aula Magna, Stockholm University. Panel presentations, Folke, C., Mäler, K-G., June.

Scientific Exchange and Technical Review Meeting on "Development Co-operation for Marine Research in East and West Africa: Lessons Learned and Future Directions", organised by Sida, IUCN, Swedish Water House, PRCM, FIBA and Stockholm Resilience Centre, Stockholm, Sweden, Thomalla, F. and Folke. C., "Building Research Capacity for Improved Governance of Coastal & Marine Systems", May.

Commission of Sustainable Development 15th session, UN, New York, Elmqvist, T and Sörlin, S., "Research on resilience and the Stockholm Resilience Centre", May.

G8-UNESCO World Forum on 'Education, Research and Innovation: New Partnership for Sustainable Development', Trieste, Italy, Sörlin, S., Rapporteur's Report, session, "Environment: Global Challenges", May.

FAO, Workshop on "Ecosystem approach to Aquaculture development, Mallorca, Spain, Troell, M. Presentation "Integrated Aquaculture in the Tropics", May.

The Norwegian Institute for Urban and Regional Research 40-year jubilee, Eckerberg, K., "Globala perspektiv på miljö och utveckling", April.

Swedish Parliament, the Environmental and Agricultural Committee, Elmqvist, T., Hahn, T., Lundholm, C., Invited speakers, March.

Swedish Environmental Protection Agency, Hahn, T., Invited speaker "The ecosystem approach in practice: Kristianstads Vattenrike Biosphere Reserve (KVBR)." February.

Appendix D.
Staff

Below are only staff members that have been employed or financed directly from the Stockholm Resilience Centre during 2007.

MANAGEMENT, ADMINISTRATION AND COMMUNICATION

Executive Director Johan Rockström, Prof.

Science Director Carl Folke, Prof.

Assistant Director Christina Schaffer, MSc

Head of Finance and Administration Kristina Hagqvist, BSc

Finance Administrator Rickard Castillus, MSc

Head of Communications Ellika Hermansson Török, MSc

Communications Officer Cajsa Martinsson, MSc

Web Editor Sturle Hauge Simonsen, BSc

ED Assistant Teresa Ogenstad

Office Manager Christine Börjesson, MSc

Project Coordinator Rebecka Henriksson, MSc

Research and Project Assistant Annette Löf, MSc

EDUCATION

Director of Studies Thomas Hahn, PhD

Programme Director Lisa Deutch, PhD

Programme Director Miriam Huitric, PhD

Course assistant/administrator Johan Ahlenius, MSc

Course Coordinator Marmar Nekoro, MSc

Course Coordinator Jennie Svedén, MSc

Course Coordinator Johan Törnberg, MSc

Course Leader Markus Larsson, PhD student

RESEARCH THEMES

The new economics of complex social-ecological systems

Theme Leader Aart de Zeeuw, Prof.

Karl-Göran Mäler, Prof.

Multi-level institutions and governance of social-ecological systems

Theme Leader Andreas Duit, PhD

Theme Leader Katarina Eckerberg, Prof.

Theme leader Victor Galaz, PhD

Adaptive governance of dynamic land- and seascapes

Theme Leader Per Olsson, PhD

Theme Leader Emily Boyd PhD

Regime shifts, scales and sources of reorganisation in social-ecological systems

Theme Leader Sverker Sörlin, Prof.

Theme Leader Carl Folke, Prof., Science Director

Governing freshwater for food and ecosystem services

Theme Leader Johan Rockström, Prof., Executive Director

Theme Leader Line Gordon, PhD

Governance and ecosystem management of coastal and marine systems

Theme Leader Frank Thomalla, PhD

Theme Leader Henrik Österblom, PhD

Theme Leader Max Troell, Associated Prof.

Urban social-ecological systems and globalisation

Theme Leader Thomas Elmqvist, Prof.
Theme Leader Johan Colding, PhD

Knowledge management, learning and social networks in social-ecological systems

Theme Leader Åsa Swartling, PhD
Theme Leader Örjan Bodin, PhD
Cecilia Lundholm, PhD

Researchers

Jennie Barron, PhD
Maria Bohn, PhD student
Ann-Sophie Crepin, PhD
Henrik Ernstsson, PhD student
Malin Falkenmark, Prof
Jacob von Heland, PhD student
Louise Karlberg, PhD
Elisabeth Lindgren, PhD
Vikrom Mathur, PhD student
Jon Norberg, Associated Prof.
Markku Pyykönen, GIS Manager
Lisa Segnestam, PhD student
Uno Svedin, Prof.
Fiona Miller, PhD

Baltic Nest Institute

Director BNI Fredrik Wulff, Prof.
Research Engineer Miguel Rodriguez-Medina, PhD
Researcher Oleg Savchuk, PhD
Researcher Alexander Sokolov
Researcher Christoph Humborg, Associate Prof.
Researcher Magnus Mörth, Associate Prof.
Researcher Thorsten Blenckner, PhD
Policy Officer/Researcher Henrik Österblom, PhD
Assistant Martina Kadin, MSc

PhD-forum at SRC

Adolfine Kateka
Angelina Sandersen
Dan Wilhelmsson
Fredrik Hannerz
Hanna Kling
Jenny Appelblad
Joakim Philipson
Karin Reuterswärd
Katrin Holmström
Li Wang
Lisbeth Segerlund
Lisen Schultz
Paul Fuehrer
Per Mühlenbock
Supriyo Das
Åsa Romson

Visiting Scientists

Frances Westley, Prof. University of Waterloo, Canada
Steve Lansing, Prof. University of Arizona and Santa Fe Institute, US
Will Steffen, Prof. Australian National University, Australia

Post doc

Jagdish Krishnaswamy, PhD, India

CTM BOARD (From 1 January 2008 The Council For Transdisciplinary Environmental Studies)

Chair: Klas Åmark, Prof. History
Faculty of Law: Jonas Ebbeson, Prof. Environmental Law
Faculty of Social Sciences: Christofer Edling, Ass. Prof. Sociology
Faculty of Natural Sciences: Margaretha Ihse, Prof. Physical Geography
Faculty of Humanities: Ulf Jonsson, Prof. Economic History

BOARD OF THE BALTIC NEST INSTITUTE

Niels Peter Revsbech, Professor, University of Aarhus, Institute of Biological Sciences (Chair)
Henrik Sandbech, Director, National Environmental Research Institute, Aarhus University
Johan Rockström, Executive Director, Stockholm Resilience Centre, Stockholm University
Erik Fellenius, Director of the Research Secretariat, Swedish Environment Protection Agency (Naturvardsverket)

Postal address: Stockholm Resilience Centre
Stockholm University, SE-106 91 Stockholm, Sweden

Phone: +46 8 674 70 70, Fax: +46 8 674 70 20
E-mail: info@stockholmresilience.su.se
Visiting address: Kräftriket 2B

Visit our website: www.stockholmresilience.su.se