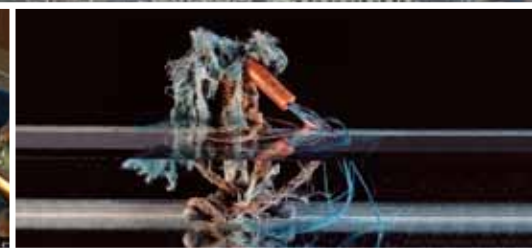


# Annual Report 2008



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Stockholm Resilience Centre Annual Report 2008

# Contents

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Preface	4
Directors' view	5
Centre developments 2008	7
Resilience 2008 conference	9
Changing Matters – the Resilience Art Exhibition	12
Core projects and collaborations	13
Research themes and highlights	23
Science, practice and policy	31
Teaching and training	34
Communications	36
Resilience 2008 photo collage	38
Accounts in brief	40
Appendices	41
A) Publications	41
B) Partnerships	46
C) Presentations	46
D) Staff	49

Stockholm Resilience Centre Annual Report 2008

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# Preface

After only two years of existence, it is satisfying to be able to communicate that the Stockholm Resilience Centre is essentially in full operation, and has already established itself as an internationally recognized node for inter- and transdisciplinary science on social-ecological resilience. The international science conference on resilience hosted by the Centre together with the Resilience Alliance, the Royal Swedish Academy of Sciences, and The International Council for Science in April 2008, which attracted almost 600 participants, was a strong manifestation of the scientific momentum in social-ecological research on transdisciplinary strands of sustainability science, covering research on resilience, adaptability and transformations.

The Stockholm Resilience Centre is not only an international platform for the advancement of sustainability science, it is also a hub for collaborative research among Swedish universities and research institutions. A particular emphasis is on the integration of the Centre across faculties at its host university, the Stockholm University, which includes research collaboration with academic departments at all faculties, Natural

Sciences, Social Sciences, the Humanities, and Law. Building these partnerships will continue to be an important priority, stimulated not least by a recent assessment by Mistra (the Foundation that funds the Stockholm Resilience Centre) of strong environmental research institutions in Sweden, where Swedish research colleagues ranked the Centre very highly. This is encouraging, and importantly, a reminder of the well-motivated expectations and responsibilities placed on the Centre, to not only generate and communicate top quality research, but also continue to develop research collaborations among colleagues in Sweden and beyond.



*Arild Underdal,  
Chair of the board*



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

# Directors' view

Resilience thinking is increasingly influencing governance, management and practice. Adaptation to climate change is more and more often framed in terms of building resilience, not only to prepare for and cope with unavoidable impacts, but also in order to invest in new development trajectories in a rapidly changing environment. It will also require investments in more profound transformative change. Resilience, the capacity to persist in a desired social-ecological state, to adapt and develop within a desired state after a disturbance, and the capacity to transform into a new development trajectory after a crisis, provides a broader palette of options when navigating turbulent times. For turbulent times it is, both in the social and the ecological domains. Food and energy turbulence and the global financial crisis in the second half of 2008 show strong similarities with resilience dynamics described for both ecosystems and local to regional social-ecological systems.

Understanding social-ecological challenges is central to the development of sustainable solutions regarding governance, management and practice in relation to the ecosystem services generated by the Biosphere. This is at the heart of our Centre research agenda. The year 2008 included the firm international rooting of our Centre as a global science and policy bridging node on resilience research; the strengthening of our research collaborations; and the making of our Centre operational in our four closely inter-related areas of work – science, policy bridging, communications and academic capacity building.

We are now approximately 80 colleagues at the Centre carrying out research across our nine research themes, which cover transdisciplinary research from ecosystem and economic dynamics, regime shifts, knowledge systems, learning platforms, networks, multilevel and adaptive governance, to social-ecological resilience in the context of freshwater, food and ecosystem services, marine ecosystems, urban areas and global change. We have developed an innovative and ambitious communications program, and we are heavily engaged in policy processes at the heart of our own research agenda, with a

priority on the follow-up of the UN Millennium Ecosystem Assessment and the international efforts to develop an equivalent to the IPCC on biodiversity and ecosystem services. We host two Master's programs on the advancement of sustainability thinking and sustainable entrepreneurship from a resilience perspective.

Based on these developments of our own research and capacity building efforts, we started in 2008 the important step of developing a research school at the Centre on social-ecological systems and resilience. This school will include our Master's programs and a PhD program, which will be carried out together with research departments at Stockholm University including international collaboration. The growing interest in resilience theory and practice was furthermore manifested in 2008, through the well recognized Volvo Environment Prize, which was awarded to the father of resilience thinking, Professor Buzz Holling. Buzz, who introduced the theory of resilience in the 1970s based on empirical work on terrestrial and aquatic ecosystems, has since been a leading source of intellectual leadership and inspiration to resilience research across the world. He was a key source of inspiration in the establishment of the Stockholm Resilience Centre, and he remains a leading mentor to our work of advancing resilience thinking for a more sustainable world.



*Johan Rockström  
Professor  
Executive Director*



*Carl Folke  
Professor  
Science Director*

# Centre developments 2008

By the end of 2008 we had essentially reached the planned scale of the Resilience Centre for the first three year start-up phase (2007-2009). We have been able to attract excellent new staff to the Centre from different parts of the world including researchers from both social and natural sciences. With approximately 80 colleagues, including both centre staff and guest researchers, corresponding to some 55 full-time equivalents of staff all-in-all, we were able to make significant progress in building research teams and advance science across our nine interacting research themes, generate fantastic achievements in our communications and science-practice-policy work, and further develop our academic capacity building efforts.

## Hosting the Resilience 2008 conference

Hosting the first international scientific conference on resilience, “Resilience 2008”, in April 2008, was a major event, our highlight of the year, which firmly established the Stockholm Resilience Centre on the international arena. Some 600 participants from all corners of the world gathered for a dense trans-impulsive program including science, art-exhibitions, music, culture, social events, and a high-level science-policy event. This was our largest activity in 2008 which engaged some 20 staff in the massive preparations and all centre staff were engaged in running the conference (see detailed section on the conference on page 9).

“Resilience 2008” was a major achievement both externally – advancing the transdisciplinary research agenda on resilience and sustainability science – and internally – building a strong centre identity and opening doors for new partnerships and research collaborations. We all got a good practical experience and loads of positive feedback.

## New staff recruitments

Parallel to the major “Resilience 2008” event, the centre developments have evolved gradually with an emphasis on continuing to build our teams of staff for research, communications, policy dialogues, education, management and administrative functions. Among the 10 new scientific staff recruitments in 2008, several

were international. Carole Crumley, Professor in anthropology at the University of North Carolina, will join us in 2009 as a senior social scientist at the Centre. Her experience in social-ecological research cutting across historical ecology, complex system theory and global environmental change, is a tremendous addition to our Centre. Carole will, amongst others, lead our efforts in contributing to the IGBP (International GeoBiosphere Programme) initiative of launching IHOPE (a research programme on the Integrated History and future Of People and the Environment).

Two further international recruitments, of very well recognized younger researchers, were made to strengthen our research on the dynamics of social-ecological systems, with a particular focus on understanding the interplay between slow and fast variables, periods of slow and abrupt change, and the existence of tipping points and occurrence of regime shifts. Dr Garry Peterson, with a long track record on resilience science in human-dominated ecosystems, joined us from McGill University, to advance our research on social-ecological system dynamics and to lead our work in developing an interdisciplinary modeling lab at the Centre. Dr Oonsie Biggs, with a strong research interest in identifying and managing thresholds in social-ecological systems, joined us as a Post-Doc after finishing her PhD research at the University of Wisconsin. Oonsie, will lead the Centre’s work on developing a knowledge base on thresholds in social-ecological systems.

We strengthened our research collaboration within Stockholm University and with international partners by affiliating senior scientists to the Centre, e.g., Professor Kevin Noone from ITM (Department of Applied Environmental Science) at Stockholm University, and Professor Will Steffen, from the Australian National University.

## Many guest researchers at the Centre

During 2008, we had the privilege to host 15 guest researchers for longer periods of time and some 20 researchers for shorter periods. We were particularly proud to host Susan Owens,

Professor in Environmental Policy at Cambridge University, who was awarded the King Carl XVI Gustaf Professorship in Environmental Studies. The position is shared with the Royal Institute of Technology (KTH). Professor Owens will be based at the Resilience Centre until April 2009 and at KTH from then until September 2009. Susan Owens, one of the world's most recognized researchers on environmental governance and policy processes, contributes invaluable insights into the Centre's transdisciplinary research endeavors.

### Baltic Nest Institute & SU

The Centre's engagement in marine research has continued to grow through the successful research of the Baltic Nest Institute at the Centre. BNI has received several new EU research projects, and continued to use the NEST model to communicate the latest science on pollution abatement in the Baltic Sea to policymakers, which was recognized when the HELCOM Baltic Sea Action plan (which built its knowledge base on NEST modeling results) won the European Regions Champions Award (end of 2007).

The Stockholm Resilience Centre is placed outside of the Faculty structure at Stockholm University and thus falls directly under the Vice-Chancellor of the University. This is a strategic placement, in order to enable a true cross-faculty and cross-disciplinary research development. It places a high degree of responsibility on the Centre and the University to integrate and collaborate in research and education.

### CTM transforms into RTM

From first of January 2008 the Centre for Trans-disciplinary Environmental Research (CTM) was closed down. The former staff became an integrated part of the Resilience Centre and the former CTM board became a council for interdisciplinary studies, RTM, with representatives from all four faculties at Stockholm University. Its main purpose is to strengthen the links between the Centre and other departments at Stockholm University. Through the RTM we have continued to build bridges with colleagues, stimulate cross-faculty interactions among PhD students, and further develop our collaborative MSc programmes across faculties at Stockholm University. On March 6th the Resilience Centre arranged a seminar to present the CTM's new role at Stockholm University. In the introduction by the Vice Chancellor, Kåre

Bremer, it was stressed that this was not an end, but an upgrading of CTM. There was also a panel debate on the potential effects on research from the increased attention on environmental problems as well as in the media as on the political agenda. Participants: Ulf Jonsson, Line Gordon, Henning Rodhe, Sverker Sörlin, Lisen Schultz and Henrik Österblom. New research collaborations within Stockholm University have been initiated with e.g., the Departments of Physical Geography and Quaternary Geology, Political Sciences, Systems Ecology, Economic History, History, Human Geography, Sociology, Education, Law, and Applied Environmental Sciences (ITM).

### The Resilience Graduate School

A very high priority initiative in 2008 was to start the development of a Research School on Resilience at the Centre. This school will include our Master's programmes and will develop a PhD program structure that integrates our own PhD training courses with those from research departments across Stockholm University. The aim is to establish a collaborative Research School that trains and provides a creative research environment for the next generation of trans-disciplinary thinkers. Already today, we host some 10-15 PhD students, who all have double affiliations, with the Centre and with academic research departments at universities around the world. We also host the interdisciplinary PhD forum; currently 10 PhD students from all faculties at Stockholm University working 5-20 percent at SRC.

### The Centre expands into new buildings

We are gradually expanding from our current office to new buildings on the Stockholm University campus, which follows our original plans of gradual growth during our first three years. We have also started the planning for our long-term physical location, where we are now part of the planning process, led by the leadership of Stockholm University and Akademiska Hus, for a move to the new Albano area (an expansion of the University campus that will link Stockholm University with the Royal Institute of Technology (KTH). This important development, will give the Stockholm Resilience Centre a permanent location in offices adapted for trans-disciplinary research collaboration that will correspond to our planned stable size at full operation (of around 100 persons). The move is planned for 2012.



Photo: R.Kautsky/azote.se

## Resilience 2008 – successful first major international conference on resilience!

The first international science and policy conference ever on resilience took place on the Stockholm University campus and at the Royal Swedish Academy of Sciences, April 14-17, 2008. The conference labelled “Resilience, adaptation and transformation in turbulent times - preparing for change in social-ecological systems” was a great event. It brought together leading scientists from all over the world working with the complex dynamics of interconnected social-ecological systems and attracted a lot of media attention. The Stockholm Resilience Centre hosted this seminal event, which was a joint effort with the Resilience Alliance, the Royal Swedish Academy of Sciences and the International Council for Science, ICSU.

More than 600 participants answered the call issued by the organizers and arrived in Stockholm for a four-day event that aimed to be much more than a regular science conference. On the agenda were plenaries, panels, working groups and poster sessions, but also a policy forum, a unique resilience inspired art exhibition and a number of musical performances. Among

the large number of exciting presentations there were cutting-edge lectures by the father of resilience theory Buzz Holling, political scientist Elinor Ostrom and ecologist Steve Carpenter. Other key speakers included Brian Walker, Marten Scheffer, Frances Westley, Will Steffen as well as the Centre's own Carl Folke and Johan Rockström. A number of the conference events were made available via Web TV through an advanced web television interface provided by the Web TV supplier Qbrick in liaison with IT Services Media production at Stockholm University. Several special features of journals, books and articles are now in the pipeline, presenting findings and syntheses of the conference.

### Science fair and speed talks

Every afternoon during the conference a Science Fair took place. It was made up of a ‘smörgåsbord’ of different activities, including panels on central topics, poster pubs, “speed talks”, and musical performances. There were also plenty of opportunities for self-organised informal



Dr. Kasper Kok leading a speed talk during the Resilience 2008 conference.

meetings and workshops, and participants had the opportunity to test the new video conferencing technology supplied by the Centre for Sustainable Communications at the Royal Institute of Technology (KTH) in Stockholm.

The “speed talks” were very appreciated as a new and more communicative format for presenting research results. It proved that it is actually possible to hold an academic presentation in five minutes and still make sense. After a presentation session, where five speakers were given five minutes each to present their key ideas and results, presenters station themselves at separate tables. This second part of the speed talks, enabled a more extended and informal conversation with a group of colleagues who were specifically interested in each presenter’s research.

### Musical performances

Resilience 2008 showed that music and resilience actually have a lot to do with each other. A number of events gave participants the opportunity to listen to some of the resilience scientists that proved to

also be talented musicians, e.g. the jam session that took place at the House Warming Party at the Stockholm Resilience Centre and the concert which was held by Professor Marten Scheffer during the conference dinner at Hotel Rival (owned by former ABBA-member Benny Andersson).

These musical events contributed to a nice atmosphere throughout the conference and served the purpose to entertain as well as helping participants to relax and get to know their colleagues better.

### House warming party at the Stockholm Resilience Centre

During the Resilience 2008 conference the Centre took the opportunity to invite all the participants to our international house warming party. Several hundreds of people joined us for a bite of food, mingling and music to celebrate our new Centre. One of the most appreciated ingredients of this house warming exercise was the jam session where participants were encouraged to bring their own instruments and join the jam...



“Music captures life. It grips our emotions in a way that science or rationality never can.”

Marten Scheffer, professor in Aquatic Ecology at Wageningen University: key speaker who held a concert with his band Scheffer, Bont & De Gans on the second day of the conference.

Photo: J.Lokrantz/azote.se



Gunnar Öquist, Permanent Secretary of the Royal Swedish Academy of Sciences (right), Thomas Rosswall, Director of ICSU (centre) and Kåre Bremer, Vice Chancellor at Stockholm University held the opening speeches.

### The policy day

The last day of the conference, experts from an array of countries and across a number of disciplinary fields of research and policy met to discuss the policy implications of the scientific part of the conference. It included a high-level policy dialogue with representatives from the International Commission on Climate Change and Development, Nordic governments, the EU Parliament, the Swedish Governments’ Commission for Sustainable Development, environmental NGOs and business. Parallel to this a number of thematic workshops and “simulated speed dating” sessions took place.

A concluding panel examined how science and policy can work together to meet the sustainability challenge. Learning platforms for science and policy are needed including dialogues with private and public actors. Society is currently not organized to deal with the complex issues at hand. This goes for all levels of society, from EU institutions, to education and research. Current economic approaches in use in policy fail to

“The conference brought together leading scientists from all over the world, people who work to integrate the natural and social sciences to better understand the global challenges and develop innovative solutions to complex problems.”

Carl Folke, head of the Steering Committee for the conference and Science Director at Stockholm Resilience Centre

capture our dependency on functional ecosystems. New leaderships need to emerge. There is potential for international political tipping points to develop regarding many such issues.

Finally, the panel concluded that there is a growing need for new innovative policies that can take society’s dependency on viable ecosystems into account. One such innovation would be an international panel on ecosystem services, which could guide policy analogous to the Intergovernmental Panel on Climate Change, IPCC. There is also a need for a stable agreement following the UN’s Climate Change Conference in Copenhagen 2009. The Nordic countries should play a key role in both of these processes.

### Acknowledgements

The Resilience 2008 conference was supported by the Stockholm Resilience Centre, through grants from the Foundation for Strategic Environmental Research, Mistra, and the Swedish Research Council FORMAS, by the Beijer Institute of the Royal Swedish Academy of Sciences, The Christensen Fund, International Council for Science, Oscar och Maria Ekmans donationsfond, Qbrick and Stockholm University.



Participating artists: Gunilla Bandolin/Sverker Sörlin (Swe), Jon Brunberg (Swe), Center of Attention (Fra/Eng), Olle Cornèer, Christian Hörgren and Martin Lübke (Swe), Todd Gilens (USA), Paul Matosic (Eng), Teemu Mäki (Fin), Tuula Närhinen (Fin), Michael Rodemer (Ty/USA), Etta Säfve (Swe), Angelo Vermeulen (Be) och Christine Ödlund (Swe).



Photos 1-3: R.Kautsky/ 4: J. Lokrantz/lazote.se

Photo: J.Lokrantz/lazote.se

## Changing Matters – the Resilience Art Exhibition

A central message of the Resilience 2008 Conference was that resilience is not just an ecological issue – it involves ecological, economic, cultural, ethical and other social dimensions and values. To explore this and to complement and enhance the scientific conference, artists were invited to submit proposals for an exhibition Changing Matters, which took place between April 12 and September 7, 2008, at The Swedish Museum of Natural History (Naturhistoriska Riksmuseet).

“Changing Matters – the Resilience Art Exhibition” was a joint project of the Royal Academy of Fine Arts, through Mejan Labs in Stockholm and the Royal Swedish Academy of Sciences through the Beijer Institute and the Stockholm Resilience Centre at Stockholm University, in collaboration with the Resilience Alliance. A jury with respected representatives from the art scene and science selected 12 artists/artists groups among the in total 220 proposals. Directly following morning plenary presentations there were discussions between artists and

scientists about resilience as part of the conference program, one of the works was exhibited in Aula Magna, the main conference venue, and there were guided tours of the exhibition.

It has been estimated by the Museum that the exhibition was visited by more than 45 000 people. The exhibition received substantial attention in Swedish television and other media. The art exhibition was set up as an integrated part of the Resilience 2008 conference and a new experiment in interpreting resilience for innovation and for communicating resilience thinking to help spur new ideas towards sustainability of integrated social-ecological systems.

**“The unexpected is the truly creative. A thought that hasn’t been thought before, that leaps forward and leads to a solution to a series of unsolved problems. Perhaps it is art, really, that produces the new thoughts.”**

**Peter Hagdahl, artist and Professor of Fine Art at the Royal University College of Fine Arts and director of MejanLabs.**

## Core projects & collaborations

During the year the Centre has been engaged in numerous international project, workshops and research collaborations, through the activities of the themes and other efforts. Below, we provide examples of such projects.

### Centre of excellence

A central project is the Resilience and Sustainability: Integrated Research on Social-Ecological Systems, a five year Swedish Centre-of-Excellence (Formel-Exc) project provided by FORMAS – the Swedish Research Council for the Environment, Agricultural Sciences and Spatial Planning. This grant, of which two years remain, has been instrumental in the start up phase of the Resilience Centre and the focus of the research serves as a core from which the Centre’s research agenda has emerged. The project is a joint effort between the Beijer Institute, Stockholm University and the Stockholm Environment Institute with a strong focus on complex systems, regime shifts and resilience.

The research framework developed under the Formel-Exc grant highlights three major features;

- the existence of tipping points (thresholds) and regime shifts and the challenges that implies,
- the adaptability of social-ecological systems to deal with such changes, uncertainty and surprise,
- the ability to steer away from undesired regimes and possibly even transform social-ecological systems into new improved trajectories that sustain and enhance ecosystem services and human wellbeing.

Research under Formel-Exc is divided into two major interacting parts:

- a) Advancing theories on social-ecological systems with 1) a focus on regime shifts, or shifts between multiple states and 2) Policy implications and adaptive governance.
- b) Place-based regional case studies for learning and adaptation with 1) social-ecological resilience of coastal and marine systems, 2) freshwater, food, ecosystem services in productive landscapes, 3) resilience and reserves in dynamic landscapes and 4) urban social-ecological systems.



The transdisciplinary platform has during 2006-2008 generated some 100 scientific publications with a mean impact factor of the journal in which the articles have been published of 4.51 (range 0.709-26.372).

The first three years of the Centre-of-Excellence project have been subject to external evaluation and the concluding statement of the evaluation committee appointed by Formas reads as follows:

“We have made a careful assessment of the Progress Report in light of the 10 items suggested in the evaluation guideline. We found that the Resilience and Sustainability research group has not only fulfilled their promises as outlined in the proposal, in most cases they have surpassed their own goals. The volume and quality of research outputs and their resulting outcomes in the form of further development of research platforms have been exemplary. Also, the magnitude of international and national collaborations was extensive and very effective. Overall, the program has already laid a strong ground for creating a highly competitive, strategically important research environment concerning resilience and sustainability. We recommend highly the continuation of the funding for the remaining two year period. It is envisioned that such funding will be worthwhile in all respect of Formas’s goals and objectives.”

### The Resilience-vulnerability colloquium

This colloquium was held in April, prior to the Resilience 2008 conference. Leading scholars from the vulnerability and resilience research communities continued the dialogue on the similarities, differences and synergies of the two approaches in relation to livelihoods, development and environmental change. A multi-authored article Resilience and Vulnerability: Complementary or Conflicting Concepts? has been submitted with Fiona Miller, Henny Osbahr, Emily Boyd and Frank Thomalla as lead authors.

### Principles of ecosystem stewardship: Resilience-based natural resource management in a changing world

During the year researchers of the Stockholm Resilience Centre have been engaged in a project

producing a major book for PhD and Master students. The purpose of the Principles of Ecosystem Stewardship textbook is to provide a new framework for resource management – a framework based on the necessity of managing ecosystem services in a world dominated by uncertainty and directional change. The book links recent advances in the theory of resilience, sustainability, and vulnerability with practical issues of ecosystem management. It is edited by Terry Chapin, Gary Kofinas and Carl Folke for Springer-Verlag, with additional contributions from SRC researchers Oonsie Biggs, Per Olsson, Will Steffen, and Brian Walker. A workshop with the authors generating the synthesis chapter was held in April at SRC and an article Resilience-Based Stewardship: Sustainability Strategies in a Rapidly Changing World (Chapin, et al.) has been submitted.

### Integrated history and future of people and the environment - IHOPE

This project has grown out of a concern that the long term sustainability issues need a deeper confluence of new knowledge from both the geosystem sciences and the human historical sciences. A research prospectus for IHOPE is available ([www.aimes.ucar.edu/activities/ihope.shtml](http://www.aimes.ucar.edu/activities/ihope.shtml)) and, pending final approval by co-sponsoring international programmes (the IHDP and PAGES) in 2009, will be published later that year as an official IGBP document. A series of IHOPE workshops at the National Center for Ecological Analysis and Synthesis (NCEAS) is secured, thanks to SRC collaborating scientists Bob Costanza and Kathy Hibbard, the first held in November 2008. From that workshop, an infrastructure for a research information system was initiated through collaboration between the new, US-based National Ecological Observatory Network (NEON), the computing systems group at the National Center for Atmospheric Research (NCAR) and the Earth Portal. There is also a first synthesis paper, “Toward an Integrated History to Guide the Future”, submitted to PNAS. In addition, sub-regional and sub-thematic initiatives have started to form, for example, an e-corridor to investigate human settlement patterns and ecological gradients in northern Japan, a regional IHOPE Australia team working on long term historical change of the entire Australia-South Pacific region and a social sciences/humanities team organizing a series of

meetings during 2009 and 2010 under the title “History of Environmental Predictions”, funded by the Leverhulme Trust and the Center for History and Economics, based jointly at Cambridge and Harvard Universities. SRC researchers are Sverker Sörlin, Carole Crumley, Will Steffen and Carl Folke. The project is part of the Regime shift theme at the Resilience Centre.

### Planetary boundaries project

The project attempts to identify planetary boundaries within which humanity can operate. Transgressing the critical zone surrounding a planetary boundary puts humanity at risk of crossing thresholds that would result in catastrophic abrupt environmental change at continental to planetary scales. Nine boundaries are identified and assessed, including climate change, ocean acidification, stratospheric ozone, the nitrogen and phosphorous cycles, global freshwater use, land use system change, biodiversity, chemical pollution and atmospheric aerosol loading.

The project is part of the SRCs collaboration with the Earth System Science Partnership and linked to policy through the collaboration with the Tällberg Foundation. Smaller workshops were held at SRC and a science workshop was organized in conjunction with the Tällberg Forum 2008. SRC researchers involved in 2008; Johan Rockström, Will Steffen, Malin Falkenmark, Carl Folke, Kevin Noone, Åsa Persson, Björn Nykvist, Louise Karlberg, Uno Svedin and Sverker Sörlin. A scientific article Planetary Boundaries – Exploring the Safe Operating Space of Humanity in the Anthropocene has been submitted. The project is part of the Global Change theme.

### Multiple shocks and the challenges of the global economy

While climate disruption is firmly on the international policy agenda a number of other global challenges are neglected. All of them interact in terms of their effects on the environment and humanity and their synergies must be taken into account. There is lack of institutions to address the multiple, interacting factors involved. A global-scale social contract is needed that can build preparedness and help navigate global change. A workshop as part of this new project held at Askö outside Stockholm was organized by the Beijer Institute resulting in

a multi-authored manuscript Looming global-scale failures and missing institutions (Walker et al.). SRC researchers included Brian Walker, Victor Galaz, Gustav Engström, Carl Folke, Karl-Göran Mäler, Stephen Polasky and Aart de Zeeuw. The project is part of the Economic dynamics theme.

### Mapping regime shifts

Building on existing work (Gordon et al. 2008) SRC researchers classifies regime shifts into different types. This classification, which identifies how different types of fast and slow global environmental change variables, alter the resilience of these regimes, will be used to map regime shifts in the Arctic. If this is successful the approach will be extended to the Sahel. Another project on Arctic tipping points and its economic implications is in its initiation phase. SRC researchers include Garry Peterson, Line Gordon, Oonsie Biggs, Brian Walker, Anne-Sophie Crépin and collaboration with Gia Destouni, Stockholm University among others. Part of the work builds on and extends the Resilience Alliance threshold database, with the intention to develop a synthesis of the different types of regime shifts that have been documented in social-ecological systems that have marked implications for human well-being. The work is part of the Regime shift theme but also cross-thematic.

### Accounting for ecosystem services and regime shifts

In two articles Mäler et al. 2008 (PNAS, ERE) present how the concept of “inclusive wealth” (IW) can be used for creating accounts and develop tools for quantifying and valuing regulating ecosystem services in a landscape context. Using the Goulburn-Broken Catchment in south-eastern Australia Walker et al. (in review) explored the consequences of changes in a system’s resilience on the sustainability of resource allocation decisions, and incorporated an estimate of resilience in IW by taking account of known or suspected thresholds that can lead to irreversible changes in the productivity and value of assets and hence social welfare. SRC researchers have shown that the existence of flips and regime shifts has major implication for resource and environmental management, for economic policy and the political reform process. For example, Anne-Sophie Crépin, Jon Norberg and Karl-Göran Mäler have found that it is



most difficult if not impossible to use standard economic instruments like taxes in an efficient way in systems with regime shifts.

Results from work with challenges of sharing natural resources with complex dynamics show that resource degradation could also be imputed to threshold effects. To better understand the over-exploitation problem and design policy instruments that overcome them, SRC researchers and collaborators combine relevant ecological characteristics with relevant institutional structure. This work is part of the Economic dynamics and also the Regime shift themes.

### Understanding ecosystem service interactions

Ecosystem services are the benefits that people receive from nature. This concept has been successful but its application has often neglected the interconnections that characterize ecology, assessing individual ecosystem services in isolation, ignoring interactions in space and time.

SRC researchers are working to develop practical theoretical tools to assess the resilience of ecosystem services. Attempts are made to empirically characterize the patterns of interactions of multiple ecosystem services across space at multiple scales, to empirically determine how important interaction among ecosystem services in real landscapes. Preliminary research indicates that clusters of ecosystem services that strongly interact can be identified. The researchers are currently working to develop models of the dynamics of ecosystem services over time. SRC researchers include Garry Peterson,

Line Gordon, Regina Lindborg in collaboration with Elena Bennett (McGill University). This project is part of the Understanding and managing ecosystem dynamics theme and the Water theme.

### Learning platforms

Learning is a central process in resilience thinking. Learning-by-doing and learning across sectors and scales allow for adapting management practices, institutions and mental models to the changing nature of social-ecological systems. But what kind of learning processes that are needed to build resilience in social-ecological systems and how such learning can be facilitated is not fully explored.

This gap will be addressed in a special issue of Environmental Education Research, edited by SRC researcher Cecilia Lundholm together with Ryan Plummer (Brock University, Canada) and Marianne Krasny (Cornell University). Lisen Schultz is contributing with a study on Biosphere Reserves as learning platforms and Emily Boyd with a study on UK Department for International Development's Climate Change Programme. The project is part of the Knowledge management, learning and social network theme.

### Organizational theory and leadership processes in social-ecological systems

Leadership is critical in building trust, making sense of complex situations, managing conflict, linking actors, initiating partnerships among groups, compiling and generating knowledge, mobilizing broad support for change, and

developing and communicating visions for change. A review paper drawing on literature in organizational theory and lessons to be learned for management of ecosystem services addresses leadership issues in social-ecological systems in relation to crises, regime shifts, reorganization, and innovation.

SRC researchers involved: Örjan Bodin, Frances Westley, Lisen Schultz, Per Olsson, Beatrice Crona, Carl Folke, Christoffer Edling. The project is part of the knowledge management, leadership and social network theme.

### Social networks in natural resource governance

The existence of social networks has been identified as a common and important denominator in cases where different stakeholders have come together to effectively deal with natural resource problems and dilemmas. It has even been shown that social networks can be more important than the existence of formal institutions for effective enforcement and compliance with environmental regulations.

However, all social networks are not created equal. On the contrary, the structural pattern of relations (i.e. the topology) of a social network can have significant impact on how actors actually act. This project addressed these critical issues by using methods from the transdisciplinary field of Social Network Analysis. Together with collaborators at Sheffield University, University of Leeds, University of Toronto, Leuphana University Lüneburg, University of Wisconsin-Madison, Luleå University of Technology, and elsewhere, this project will host a special session on the IHDP conference 2009, co-author and edit a special issue of Ecology & Society, and are currently developing an edited book proposal.

SRC researchers working on networks include Örjan Bodin, Beatrice Crona, Henrik Ernstson, Jon Norberg, and in relation to bridging organization and leadership also Thomas Hahn, Per Olsson, Lisen Schultz. The project is part of the Knowledge Management, Learning and Social Networks theme.

### Multilevel institutions, governance and resilience

Research has emphasized how political and institution building in relation to the resilience of social-ecological systems is affected by i) ongoing

transformations of the political landscape globally (i.e. shift from "government" to "governance" and ii) abrupt and large-scale social-ecological crisis. One publication in Governance (Duit and Galaz 2008), and a forthcoming special issue in Global Environmental Change on Governance and Resilience, a manuscript on global governance of abrupt environmental change (Galaz, Biermann) elaborate on the international political system's ability to deal with abrupt biophysical change, and discuss the role of international cooperation and the UN system in the light of large scale and serious ecological surprises. SRC researchers include Victor Galaz, Andreas Duit, Jonas Ebbesson, Katarina Eckerberg.

### Adaptive governance

Adaptive governance is an evolving research framework for analyzing the social, institutional, economical and ecological foundations of multilevel governance modes that are successful in building resilience for the vast challenges posed by global change, and coupled complex adaptive social-ecological systems. Adaptive governance includes the following strategic directions for 2008/9. a) New challenges for Adaptive governance, b) Innovations and transformations in social-ecological systems, c) Abrupt change and governance.

These directions include a set of issues, projects, members and national and international collaborative partners such as University of Waterloo (Canada), Santa Fe Institute/ Arizona State University (USA), INRA-SAR (France), STEPS (UK), Öko institute (Germany), DRIFT (Netherlands), Free University Amsterdam (Netherlands), National Center for Crisis Management Research and Training (CRISMART), Swedish Institute of International Affairs (UI). The Resilience Centre and the theme Adaptive Governance, is also part of the IHDP Earth System Governance Project (ESP). This also implies that we will co-host the 2009 Amsterdam Conference, and especially the activities involving issues related to governance of adaptation and resilience. The theme is coordinated by SRC researchers Per Olsson, Emily Boyd and Victor Galaz.

## Shaping change: Understanding transformations in social-ecological systems

This research aims to increase our understanding of social-ecological systems' transformations to avoid or escape from undesirable trajectories. The main focus is on shifts to governance regimes that support flexible, integrated, holistic forms of management of natural resources and ecosystems. Researchers at the Stockholm Resilience Centre have been involved in developing and applying a framework for studying transformations in social-ecological systems. This includes probing case studies, comparative analysis, methods development and theory development. Listed below are some of the meetings and work done.

A meeting on innovation, transitions and governance was held in October at the SRC with special invites from Canada and Germany. A joint session with German and British scientists at the IHDP conference in Berlin in February has resulted in a forthcoming special issue on "Transitions, resilience and governance: linking technological, ecological and political systems" for the journal *Ecology and Society*. A book chapter on the implementation of the European Water Framework Directive in Sweden (Olsson and Galaz) has been prepared for a forthcoming book edited by Dutch scientists on transitions to adaptive water management and governance.

Further more, a paper on transitions to ecosystem-based management of the Great Barrier Reef, Australia, was published in *PNAS* (Olsson et al 2008), and two book chapters and an article manuscript has been prepared for the project *Principles of Ecosystem Stewardship*. A manuscript on the role of experimentation for transformations has been submitted to *TREE* (Cumming et al), and a manuscript on learning from the past for future transformations in the Doñana watershed (Spain) has been submitted to *Ecology and Society* (Gomez et al).

As a result of a series of discussions and a workshop between SRC, Oxford University and colleagues at Reading, Michigan and University of Leeds an article on "Resilience and 'Climatizing' Development: Examples and policy implications" (Boyd et al. 2008) was published in the journal *Development*. A manuscript on resilient livelihood transformations (Osborne and Boyd) has also been submitted to *Global Environmental Change* and a manuscript on 'Resilience in Practice' (Boyd and Osborne) has been prepared for a special issue on resilience and

social learning in Environmental Education. This came out of a policy meeting hosted by the United Nations in Vienna in 2007.

During the autumn, three master's students from the SRC course Ecosystems, Governance and Globalization have used the transformation framework for analyzing the establishment of a Unesco World Heritage site in Bali, Indonesia. A pilot phase of a research project was started on transformations and resilient adaptation in India, focusing on the events of the 2005 floods in Mumbai and the role of the media as a proxy for change.

The Shaping Change project is part of the Multi-level institutions and adaptive governance theme in collaboration with the Marine and the Knowledge management, learning and social network theme. SRC researchers include Per Olsson, Emily Boyd, Victor Galaz, Björn Nyqvist and Oonsie Biggs.

## Biosphere reserves and resilience

Biosphere Reserves (BRs) are potential real-world examples of resilience thinking and adaptive governance put into practice. There are now 531 BRs in 105 nations, and they have all been designated by UNESCO to be learning sites for biodiversity conservation and sustainable development. SRC researchers (Lisen Schultz, Andreas Duit, Cecilia Lundholm, Emily Boyd, Jacob von Heland, Per Olsson and Carl Folke) are engaged in assessing what conclusions about resilience thinking and adaptive governance can be drawn from experiences in BRs and from decision-making processes in the Man and Biosphere (MAB) program.

Currently, we are in the process of analysing a survey with 160 BR coordinators, assessing to what extent the world network of Biosphere Reserves and the MAB program actually is a real example of multilevel and adaptive governance or not, and what lessons can be learned from on-the-ground experiences in Biosphere Reserves.

Drawing on our work in Kristianstads Vattenrike BR, southern Sweden, we have during 2008 initiated a study of Cape Winelands Biosphere Reserve in South Africa (Thomas Elmqvist, Åsa Jansson, Lisen Schultz, Stephan Barthel, Magnus Tuvendal). The BR project is part of the Multi-level institutions and adaptive governance theme and also the Knowledge management, learning and social network theme.

## Madagascar social-ecological systems

The Madagascar work is truly cross-thematic and covers issues related to understanding ecosystem dynamics behind the generation of services like pollination of staple-crops, freshwater feedbacks, landscape dynamics and biodiversity, social taboos, global change influences and the role of deep cultural values in shaping the landscape and being shaped by it. This project is a close collaboration with scholars of the Natural Resource Management Group at the Department of Systems Ecology.

Stockholm Resilience Centre and University of Antananarivo have agreed to build an interdisciplinary research centre in Madagascar. This was initiated during a meeting between SRC and representatives of the Government of Madagascar in August in Stockholm, and concluded by the formal signing of a Memorandum of Understanding by the president of the University in Antananarivo on November 29. The centre "Voahary Mirindra Maharitra – the Madagascar Resilience Centre" is now formally established with statues and designated offices and staff and will have as its first objective to contribute to an assessment of ecosystem services in Madagascar.

## The ecosystem approach and marine social-ecological resilience

The ICES Working group for Integrated Assessments in the Baltic Sea (WGIAB) held a workshop at Stockholm Resilience Centre in October 2008, aimed at investigating the potential for collaboration with the Marine Theme at SRC. WGIAB is working with analyzing long term ecosystem change and regime shifts and the meeting resulted in a draft plan for collaboration as well as a time line for the production of a joint scientific review manuscript on social-ecological systems change in the Baltic Sea. Members of the Marine theme are also working on a number of additional manuscript describing regimes shifts, methodology (e.g. models and statistical tools), early warnings signals.

WGIAB will increasingly work with governance issues and it was agreed that further co-operation with SRC has large potential to 1) develop the biological understanding of the Baltic Sea, 2) understand governance structures and dynamics and 3) contribute to constructive policy advice. The theme is coordinated by Henrik Österblom and Max Troell.

## Coral reefs, marine seascapes and social-ecological systems

Centre researchers have a long history of coral reef work and perform analyses of the resilience of marine seascapes reef and regime shifts, their management and how to develop systems of governance of reefs, seagrasses and mangroves in dynamic seascapes. SRC researchers were involved in the Coral Reef symposium in Florida and the research process and results have engaged with various stakeholders, from local fishers in Africa, to reports for FAO, to presentations in the European Parliament (June, 2008). Insights from the marine theme and challenges and opportunities were presented to the Nordic Council of Ministers (Ministers of Environment) in August and at the ICES annual science conference. An MOU for collaboration with WorldFish has been developed. Our research on the resilience of coral reefs and the governance transition of the Great Barrier Reef has served as a bridge between experiences gained in Australia and challenges for the Baltic Sea region. The Baltic Nest Institute plays a central role here as part of the SRC. The project is cross-thematic and concerns all insight cluster themes and engage SRC researchers and collaborators, for example, Magnus Nyström, Henrik Österblom, Max Troell, Christoph Humborg, Thorsten Blenckner, Beatrice Crona, Per Olsson and Carl Folke.

## Urban social-ecological systems and globalization

The SRC has formed the 'Urban Network' consisting of twelve site-based research groups in Bangalore and New Delhi (India), Cape Town, Johannesburg (South Africa), Canberra (Australia), Helsinki (Finland), Istanbul (Turkey), Chicago, New Orleans, New York City and Phoenix (U.S.A.) and Stockholm (Sweden). The first common deliverable of the urban network research will be an 'Urban Social-Ecological Atlas' presenting the perspective, focus and work characteristic of each of the participating urban sites and providing lessons learnt and methodologies useful for scaling up and replication of urban ecosystem services and how different socio-economic groups are affected by environmental changes in urban regions. Throughout the project, the results will be available for the participating researchers via an internet-based interactive urban map portal. The



City of Stockholm

project involves post-doctoral exchange between Stockholm and Cape Town, Bangalore and Delhi. Thomas Elmqvist is leading this effort.

### The Greater Stockholm region

SRC researchers have shown that local steward groups in urban areas, like Stockholm, contribute in the generation and management of critical regulating ecosystem services, including seed dispersal, pollination, and insect pest regulation. Local steward groups also contribute to reversing declining fauna (Colding and Folke 2008, Colding et al. in press). Of key relevance is the recognition that urban biodiversity to a large extent seems contingent on socio-cultural rationales, that besides ecosystem management also contribute to social capital building and democratic governance promotion (Colding in press, Ernstson et al. 2008, Ernstson and Sörlin, in press). This intricate web of relationships has been entirely overlooked in previous urban research. The project is part of the Urban social-ecological theme and Johan Colding serves as of the theme leaders.

Under the subtheme “Urban social-ecological design for management of ecosystem services”, several research projects have started e.g. studies of Ecological land-use complementation (ELC), Institutional designs and ‘urban commons’, Urban learning arenas, Social-ecological memory for management of ecosystem services, Integrating ecosystem services in urban spatial planning, Green wedges as urban commons: Applying a complex social-ecological system approach to sustainable urban planning.

### ESCAPE – Governance of urban ecosystem services in Cape Town

As an integral part of the Urban Social-Ecological Systems and Globalization Theme, the ESCAPE project is a three-year collaborative research and exchange project between SRC/SU and the Environmental and Geographical Science Department at University of Cape Town (UCT). The work is organised around issues of scale, social networks and urban wealth/inequality and draws both on urban ecology, sociology and cultural geography and is funded by the Swedish Research Council and the South African National Science Foundation under Swedish Links (2008-2010).

### Urban theme book project

Urban Ecosystem Services and Governance: Building Resilience in Urban Landscapes. The overall objective of this book is to explore how capacity can be built to improve governance of ecosystem services (ES) in urban areas. Editors: Stephan Barthel, Johan Colding, Thomas Elmqvist, Henrik Ernstson, Åsa Jansson, Cathy Wilkinson.

### URBIS - Urban research-policy interface.

A joint collaboration between UNESCO and the Stockholm Resilience Centre, URBIS (the Urban Biosphere network) was launched at the first Mayors Conference on Local Action for Biodiversity, at the 9th Conference of the Parties to the CBD in Bonn, 2008. URBIS aims to re-establish the connection between people and their natural environment through innovative forms of knowledge networking and governance of the urban landscape. Active sites in the network are Canberra, Cape Town and Stellenbosch, New Orleans and Istanbul. Thomas Elmqvist and Christine Alfsen at UNESCO are leading this effort.

### Freshwater and ecosystem services

Our global research on water induced tipping points is further supported by efforts of adding spatial and temporal dynamics of freshwater flow changes into scenarios of future water for food challenges. Building on our global water for food assessments, we have integrated spatial and temporal dynamics of freshwater flows by downscaling freshwater availability to a higher resolution (30X30 km) and internalized climate change impacts on water resources (Rockström et al., in press). The analysis reveals that many water scarce regions, far from rivers, still have a significant opportunity to build water resilience in agriculture through improved management of local green water resources.

Work has also been conducted on how investments in smallholder agricultural systems in Tanzania can build resilience in dryland systems related to poverty dynamics and ecosystem services (Enfors and Gordon 2008), soil dynamics (Enfors et al. submitted), and future scenarios (Enfors et al. 2008). A project on the re-greening of the Sahel was started and funded by Sida.

### The Surprise Project

The Surprise Project is a collaborative project with the Resilience Alliance and Frances Westley, Carl Folke and Oonsie Biggs from SRC participate. (1) What do we know about the probability distributions of big important changes in social-ecological systems? (2) What are the characteristics of unpredictable changes in social-ecological systems? (3) How can diverse forms of knowledge be integrated to ask the questions that evoke resilience thinking? To address these questions,

we are evaluating case studies, analyzing models of extreme nonlinear and stochastic events, and exploring new approaches for integrating knowledge. There have been three meetings so far and two articles have been generated.

### Resilience Alliance

One of the most central partners is the Resilience Alliance (RA), an international network of leading research organizations who 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 of the Beijer Institute in the 1990s and during the year the Centre has received a central role in the Resilience Alliance (RA) and organized in 2008 the first major international resilience conference.

### The Resilience Alliance Marine Group

High profile papers are generated by a small group of international scholars focusing on coastal and marine social-ecological systems. The group is led by Terry Hughes and Carl Folke. A meeting was held in Chile in 2008.

### The Resilience Alliance Young Scholars (RAYS)

RAYS is a loosely connected international network of doctoral and post-doctoral scholars interested in pushing the boundaries of resilience thinking. The ambition is to focus collaborations on innovative ideas and projects with an explicit emphasis on transdisciplinary research and career development. RAYS is coordinated to a great extent by Resilience Centre researchers Victor Galaz, Beatrice Crona and Oonsie Biggs.

### Other selected research collaborations

Researchers from the Centre have been visiting scientists or done post docs at 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, University of Pretoria etc.

## International science programs hosted by the Centre

### bioSustainability

The Centre is hosting bioSustainability a core scientific programme of Diversitas. bioSustainability develops new knowledge to guide policy and decision making that support sustainable use of biodiversity; evaluating the effectiveness of current conservation measures; studying the social, political and economic drivers of biodiversity loss, as well as social choice and decision making.

Research priorities within the bioSustainability programme are:

- to address mismatches between biological, economic and political boundaries
- to incorporate ecosystem services into full-cost accounting of socio-economic decision making
- to improve decision making processes with multiple stakeholder groups
- to improve models of complex interactions between human and ecological systems to services to manage risks and uncertainties

Some of the projects in progress are; Urban Atlas Project, African Partnership Project on Ecosystem Services and Biodiversity, Natural Capital Project, Research collaboration Stockholm-Stellenbosch, and a bioSUSTAINABILITY workshop organized by bioSUSTAINABILITY of DIVERSITAS, Stockholm Resilience Centre, Beijer Institute and Natural Capital. A second DIVERSITATS Open Science Conference, “Biodiversity and Society: Understanding Connections, Adapting to Change” will also be organized in Cape Town, in October 2009.

Thomas Elmqvist (Stockholm University, Sweden) and Stephen Polasky (University of Minnesota, USA) are co-Chairs of the Science committee of bioSUSTAINABILITY. Project Coordinator/ Office Assistant is Rebecka Henriksson (Stockholm University, Sweden).

### Collaboration between SRC and India.

Through support from SIDA, SRC started in 2008 build partnership with the Ashoka Trust for Research in Ecology and the Environment (ATREE) in Bangalore and Institute of Economic

Growth (IEG) in Delhi. The first year of activities include developing the “Urban Social-Ecological Atlas” project and developing a post-doctoral exchange programme with Jagdish Krishnaswamy from ATREE spending six months at the centre, Preeti Kapuria from IEG, two months and Jenny Grönwall from the centre spending six months at ATREE in Bangalore. The first publication as a result of this partnership is: Krishnaswamy, et al., Quantifying and mapping biodiversity and ecosystem services: Utility of a multi-season NDVI based Mahalanobis distance surrogate, Remote Sensing of Environment (2009).

### Centre facilities

#### Landscape/Seascape Lab – SRC unit for geospatial analyses

The Landscape/Seascape Lab, a research-theme independent unit, was established to meet the increased demand of performing interdisciplinary spatial analyzes integrating ecological and socio-economic variables.

Of particular interest and importance is the possibility of integrating the spatial analytical capabilities of Geographical Information Systems (GIS), Remote Sensing (RS) and image processing, Global Positioning System (GPS) and Spatial Statistics.

The combination of different technologies offers new possibilities to perform time series analyses and build future scenarios in rapidly changing environments, especially urban environments. Special efforts will also be made to develop new ways of visualizing spatial information.

The Landscape/Seascape lab is together with external developers setting up a project specific web portal with an interactive Map Portal to serve the Global Urban Atlas Project. New attractive functionalities are developed and this knowledge will later be forwarded to other projects at SRC.

Courses are given with regular intervals to encourage and facilitate the use of GIS, RS and related technologies within Stockholm Resilience Centre and among affiliates. Since 2007 two 3-week long introductory GIS/RS courses have been given at SRC. One course has been given in statistics based on the open source software R. A two-day introduction in IDRISI Taiga will be given during April 2009 followed by a GIS/RS in September 2009.



Photo: A.Löflazote.se

## Research themes and highlights 2008

The research framework of the Stockholm Resilience Centre emphasizes that ecosystems in all parts of Planet Earth are shaped by people and, at the same time that all people are fundamentally dependent on the collective work of the Earth’s ecosystems – the Biosphere and its generation of critical ecosystem services.

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 sustainable futures. In this sense, environmental issues have become issues of how to increase the likelihood for societal development pathways that can generate, sustain and improve human welfare and wellbeing in collaboration with the Biosphere.

Resilience is often interpreted simply as recovery or buffer capacity to disturbance and change. In the Stockholm Resilience Centre we are particularly interested in the interplay between periods of gradual change and periods of abrupt change – how to turn crises into new opportunities. Therefore, we have a broader interpretation of resilience and emphasize three features of resilience thinking of significance for

analyzing social-ecological systems in relation to sustainability;

- persistence — in the face of change, buffer capacity, withstand shocks
- adaptability — the capacity of people in a social-ecological system to manage resilience in order to deal with change, move on and continue to develop
- transformability — the capacity of people in a social-ecological system to create new development pathways when ecological, political, social or economic conditions make the existing system untenable

The research collaboration of the Stockholm Resilience Centre is organized around nine 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.

The aim of the themes is to provide flexible

collaborative arenas for sharing different perspectives and bending 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 creative disagreement within the context of the research framework, mission and vision of the Stockholm Resilience Centre. Each theme has two or more 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 current nine themes are summarized in the figure below.

The themes have changed somewhat during the year. Five of the themes advance theory and methods, covering broad areas of research, from regime shifts and economic dynamics of social-ecological systems to understanding and managing ecosystem dynamics, to knowledge management, learning and social networks and to multilevel institutions and adaptive governance of

social-ecological systems.

Among the four thematic, more applied and on the ground themes, we focus on water and food, urban social-ecological systems, coastal and marine social-ecological systems and a new theme of this year namely global social-ecological systems change. 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, within the centre, in Sweden and internationally.

There have been continuous meetings and theme interactions. Tight collaborations have developed between scientists across themes with joint transdisciplinary workshops, projects, applications and multi-authored research papers and anthologies in press and progress. Themes simultaneously interact with practice and policy. Links with international collaborators have been strengthened and expanded. The activities of the themes are presented in more detail at [www.stockholmresilience.su.se](http://www.stockholmresilience.su.se)

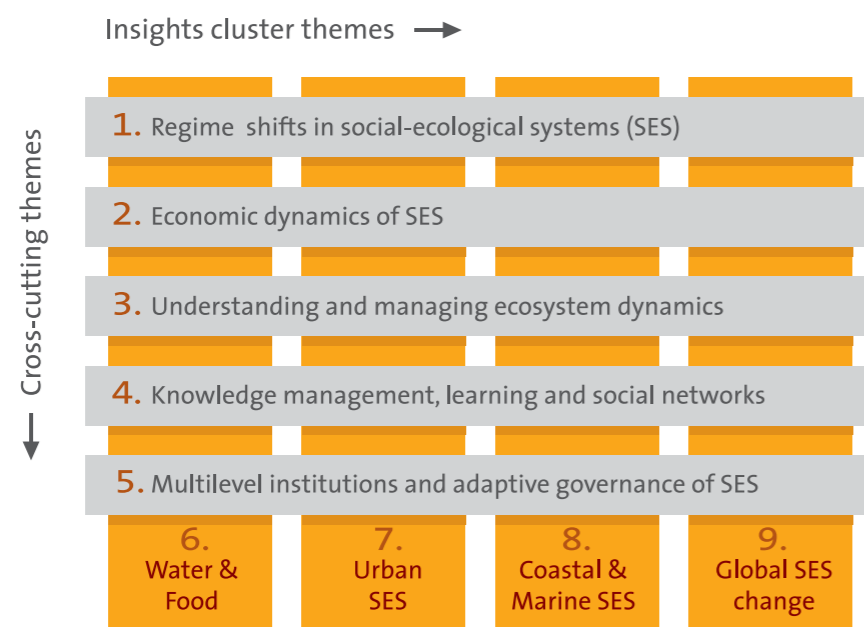


Figure A. Stockholm Resilience Centre's research themes



Photo: J. Lokrantz/lazote.se

## Publications

More than 60 articles have been published in scientific journals and as book chapters. Two books have been released in 2008 and the book *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (eds. Berkes, Colding, Folke) became available in paper in 2008.

During the year papers have been published in e.g. *Science*, *PNAS*, *Trends in Ecology and Evolution*, *Environmental and Resource Economics*, *Governance*, *Global Environmental Change*, *Ecology and Society*, *Ecological Applications*, *Ecology*, *Ecological Complexity*, *Science of the Total Environment*, *Phil. Trans. Royal Society*, *Development*, *Water Science and Technology*, *Landscape Ecology*, *Limnology and Oceanography*, *Marine Pollution Bulletin*, *Journal of Marine Systems*, *Coral Reefs*, *Oikos*, *Ecography*, *Scandinavian Studies in Law*, *Ecosystems*, *Cambridge Journal of Education*, *Agricultural Water Management*, *International Environmental Agreements*, *Environmental Sciences*, *Environment*, *World Development*.

Many popular and outreach articles have been produced, and there are several articles in press (see appendix publications). Among the research highlights of the Stockholm Resilience Centre's publications we can report on the following.

### Complexity theory for a sustainable future

Centre researcher Jon Norberg has co-edited the new book "Complexity Theory for a Sustainable

Future" together with Graeme Cumming from the University of Cape Town. The book, which is the result of our Formas-funded Centre of Excellence project and the Resilience Alliance, deals with resilience and sustainability of social-ecological systems. It focuses on different aspects of complexity theory, and how it can be applied to interactions between ecosystems and society.

— Our hope is that theoreticians, managers and policymakers will find the book useful in its attempt to turn complex adaptive systems theory into practical approaches for solving problems of natural resource management and climate change, Jon Norberg says.

The book is a significant contribution that reflects the transdisciplinary perspective and cross-theme collaborations of the Centre and the role of multiple adaptive processes in social-ecological systems and its importance for resilience at different scales. The book features scholars such as Buzz Holling, Steve Carpenter, and political scientist Elinor Ostrom. Other Centre-associated contributors to the book include Örjan Bodin, Carl Folke, Thomas Hahn, Per Olsson, Garry Peterson, Lisen Schultz and Brian Walker.

Norberg, J. and G. Cumming (eds.) 2008. *Complexity Theory for a Sustainable Future*. Columbia University Press, New York.

### Centre contribution to book on institutions and environmental change

Centre researchers Victor Galaz, Per Olsson, Thomas Hahn, Carl Folke and Uno Svedin contribute with a chapter in the synthesis volume



Photo 1&3: J.Lokrantz, 2: U.Manhammar lazote.se

of the IHDP effort Institutional Dimensions of Global Environmental Change (IDGEC) on the policy implications of global environmental change orchestrated by Oran Young and colleagues. The five Stockholm Resilience Centre researchers argue that the attributes of institutions (rights, norms, rules and decision-making procedures) must be transformed to better match the dynamics of the planet's biophysical systems in order to secure ecosystem services for human wellbeing.

— Institutions and policy prescriptions must acknowledge the strong interconnection between social and ecological systems. If not, we all run the risk of ending up with ill-founded advice that fail to tackle such emerging global problems as the loss of biological diversity, the degradation of forests and the overarching issue of climate change, the researchers say.

The chapter is a transdisciplinary update and expansion of a seminal article on “the problem of fit” between ecosystems and institutions, written ten years ago by Carl Folke, Lowell Pritchard Jr., Fikret Berkes, Johan Colding, and Uno Svedin.

Galaz, V., P. Olsson, T. Hahn, C. Folke, and U. Svedin. 2008. *The problem of fit among biophysical systems, environmental and resource regimes, and broader governance systems: Insights and emerging challenges*. Pages 147-182 in O. R. Young, L. A. King, and H. Schröder, editors. *Institutions and Environmental Change - Principal Findings, Applications, and Research Frontiers*. The MIT Press, Cambridge, USA.

### Scenario-planning helps small-scale farming

Researchers Line Gordon, Garry Peterson, Elin Enfors have together with Deborah Bossio from International Water Management Institute studied how scenario-planning can help small-scale farming in Tanzania landscapes.

— Scenario planning approaches have the potential to improve the robustness of

development decision making, particularly in turbulent regions, Elin Enfors says.

People farming in the world's drylands are some of the world's poorest people, their populations are growing, but they have to cope with a variable climate that causes frequent crop failures. To develop better approaches to investments in water management, Enfors, Gordon, Peterson and Bossio worked with farmers, local officials, and scientists in Tanzania to identify alternative ways for change in livelihoods, farming practices, and ecosystems over the next 25 years. The scenarios developed were all based on the present-day situation in Tanzania, but examined the consequences of different future changes in local governance, economy, climate, health, and values.

Enfors, E.I., L.J. Gordon, G.D. Peterson, B. Bossio. 2008. *Making Investments in Dryland Development Work: Participatory Scenario Planning in the Makanya catchment, Tanzania*. *Ecology and Society* 13(2): 42. [online] URL: [www.ecologyandsociety.org/vol13/iss2/art42/](http://www.ecologyandsociety.org/vol13/iss2/art42/)

### Stronger social networks help improve urban green areas management

Small community groups and social networks often possess important knowledge about urban green areas. But they are often ignored when planning decisions on these areas are taken. In their paper, Ernstson, Sörlin and Elmquist argue that power relations and social networks affect the decision-making process behind the development of urban green areas, and who gets access to these areas.

— With an accelerating urbanization, it is crucial to understand how urban ecosystems provide important ecosystem services for urban dwellers. Local interest groups such as allotment groups and outdoor associations, play an extremely important role in sustaining and managing these urban green areas. They possess



Photo1: J. Lokrantz, 2&3: S. Zeff lazote.se

important knowledge for the generation of urban ecosystem services that is often ignored, Henrik Ernstson says.

Based on several case studies in Stockholm, the researchers developed strategies for linking managers and user groups of Stockholm urban green areas, in order to improve the management and sustainable use of these areas.

Ernstson, H., S. Sörlin, T. Elmquist 2008. *Social Movements and Ecosystem Services; the Role of Social Network Structure in Protecting and Managing Urban Green Areas in Stockholm*. *Ecology and Society* 13 (2): 39. [online] URL: [www.ecologyandsociety.org/vol13/iss2/art39/](http://www.ecologyandsociety.org/vol13/iss2/art39/)

### How to save coral reefs

This article is an important step towards applying resilience theory as a tool to improve coral reef management. Faced with various threats, reefs seldom respond in a linear way but rather tend to undergo unexpected and dramatic (and sometimes irreversible) changes in community composition and ecological regime shifts. The implications of these are staggering, not only for biodiversity but also for critical ecosystem services in relation to tourism, fisheries and coastal protection.

— The rapid development of resilience thinking has been paramount for the understanding of dynamic ecosystem behaviour in everything from coral reefs and lakes to oceans and forests, but practical advancements of how to operationalize resilience theory have lagged behind, says lead author Magnus Nyström.

The article presents management features like “functional group approaches”, “the ratios of ‘good’ and ‘bad’ colonizers of space”, “measurements of spatial heterogeneity”, and “estimates of potential space availability against grazing capacity” of fish and sea urchins.

Nyström, M., N. Graham, J. Lokrantz, A. Norström. 2008. *Capturing the Cornerstones of Coral Reef Resilience - Linking Theory to Practice*. *Coral Reefs* 27: 795-809

### “Junk food” influence marine birds and mammals

Overfishing and changes in climate risk puts marine birds and mammals on a “junk food” diet, is the conclusion of this article published in *Oikos*. These findings came out of a study lead by Henrik Österblom, joint theme leader at the Stockholm Resilience Centre and researcher at the Baltic Nest institute. The research has also caught the interest of *New Scientist* and *Science*, the latter describing it as “some of the best field evidence for the junk-food hypothesis”.

As overfishing has led to the extensive removal of predatory fish, energy rich forage fish lower down the food chain has increased in numbers. An expanded commercial fishing on forage fish, coupled with changes in climate, can influence the fish stocks dynamics, both in terms of abundance and quality, in turn affecting marine predators, reducing the resilience of the whole marine foodweb. A switch from high energy- to low energy fish has been called switching to a “junk food” diet.

— Under adverse environmental conditions, scarcity of food and reduced food quality, can result in reduced breeding performance in top predators impairing on marine functional diversity and resilience, says Österblom.

Österblom, H., O. Olsson, T. Blenckner, R.W. Furness. 2008. *Junk Food in Marine Ecosystems*. *Oikos* 117:1075-1085.

### Warnings: Ecosystem “flips” imperil poor regions

Centre researchers Line J. Gordon, Garry Peterson and Elena Bennett of McGill University argue that global water management has been too focused on the “blue water” side of the hydrological cycle, neglecting the largely invisible changes humanity has had on “green water”, the freshwater that supports production of all



Photo: N. Desagher & B. Christensen /azote.se / C.Clifstock

terrestrial marine ecosystem services.

In their paper, the researchers look at the likelihood of loss of resilience caused by agriculture and land-use practices that may lead to catastrophic changes in the blue water, green water and atmospheric parts of the hydrological cycle.

— Our main point is that these effects aren't necessarily going to result in gradual change, they can result in surprising, dramatic changes, what we call 'ecosystem flips' or 'ecosystem regime changes,' which can be very difficult or even impossible to reverse, says Line Gordon.

Recent outbreaks of toxic algae blooms in Quebec lakes and off Sweden's Baltic Sea coast are prime examples of ecosystem flips, the consequence of nutrients from fertilizers permeating the soil and running off into streams, lakes and oceans.

*Gordon, L.J., G.D. Peterson, E. Bennett. 2008. Agricultural Modifications of Hydrological Flows Create Ecological Surprises. Trends in Ecology and Evolution. 23:211-219.*

### Out of the dry

Centre researchers Falkenmark and Rockström put the finger on the twin problems of "drought and desertification" from a water perspective, emphasizing that coping with desertification requires a new conceptual framework based on green-blue water resources to identify hydrological opportunities in a sea of constraints. Their approach brings together freshwater, ecosystem management and agricultural development to build social-ecological resilience to droughts and dry spells.

*Falkenmark, M and J. Johan Rockström Building resilience to drought in desertification-prone savannas in Sub-Saharan Africa: The water perspective. Natural Resources Forum 32: 93-102*

### Putting the money where the ecosystem is!

In their paper, centre-affiliated researchers Karl-Göran Mäler, Åsa Jansson and Sara Aniyar of the Beijer Institute have shown how ecosystems can be included in wealth measurements.

— The extensive development of valuation techniques has now made it possible to include ecosystem services into accounting systems and we present how to do it, says Åsa Jansson.

One of the major challenges in accounting for ecosystems is how to transform often abstract calculation models into workable and quantifiable systems. In order to do this, the three researchers have identified the necessary parameters for tangible measurements.

— We need to define the size of the system, including how many stocks are relevant to the system, as well as estimating the accounting prize and growth functions for each stock, Jansson continues.

One approach showed how forest-based pollinators increased Costa Rican coffee plantations by 20 percent or approximately USD 60 000 between 2000 and 2003. The researchers conclude that for now, it is impossible to design a standardised model for building a wealth-based accounting system for ecosystems. However, the potential is there.

*Mäler, K.-G., S. Aniyar, Å. Jansson. 2008. Accounting for Ecosystem Services as a Way to Understand the Requirements for Sustainable Development. Proceedings of the National Academy of Sciences, USA 105: 9501-9506*

### Redefining coral ecosystem management

Centre researchers Per Olsson and Carl Folke and Terry Hughes of the ARC Centre of Excellence for Coral Reef Studies in Australia have identified



Photo: R. Kautsky 1&3, T. Holland 2 /azote.se

the keys to successful marine ecosystem-based management. The paper highlights the role of leadership and associated strategies for shifting the perspective and framing of resource management, and credits the Great Barrier Reef Marine Park Authority with having sought and gained the support of the public, industry and governments at all levels for putting the management of the world's largest coral reef system onto an ecological footing.

— Our study shows the importance of leadership and strategies for responding to signals of change before ecosystem collapse occurs, Per Olsson says.

A critical step was to convince local communities that the reef was facing many threats, and to enlist public support for managing it more flexibly. The article concludes that laws alone cannot bring about the changes necessary to protect the world's ocean ecosystems - good science and public participation, understanding and support are also vital. The GBR case provides lessons for governance of other marine systems.

*Olsson, P., C. Folke, T.P. Hughes. 2008. Navigating the Transition to Ecosystem-Based Management of the Great Barrier Reef, Australia. Proceedings National Academy of Sciences, USA 105:9489-9494.*

### Social capital key to better fisheries management?

Örjan Bodin and Beatrice Crona of the Stockholm Resilience Centre have investigated the role of social capital and leadership for better fisheries management in eastern Africa.

The study was conducted in a rural fishing village 50 km south of Mombasa, the second largest city in Kenya. The small village of 1000 inhabitants is located in a coastal area suffering from declining fish stocks, but display surprisingly little unified response to deal with the overexploitation.

— This is really alarming considering that a majority of the villagers depend on fishing for their livelihood. More than 40 percent of the households are directly involved in fishery extraction, and many others benefit indirectly as fishery-generated income tend to be spent mostly in local stores, says Beatrice Crona.

Overall, the study concludes that it seems to take both high levels of social capital and good leadership to make effective community-based natural resource management happen.

*Bodin, Ö. and B. Crona B. 2008. Community-Based Management of Natural Resources: Exploring the Role of Social Capital and Leadership in a Rural Fishing Community. World Development 36: 2763-2779.*

### Development policy seen through a resilience lens

Resilience Centre collaborators Emily Boyd and Fiona Miller with colleagues explore the potentials and limitations of applying a resilience lens to assist development policy towards more successful livelihood transformations in the face of climate change.

They conclude that applying a resilience lens to poverty traps raises an array of issues on social and climate change in relation to sustainable futures and development challenges.

*Boyd, E., H. Osbahr, P.J. Ericksen, E.L. Tompkins, M. Carmen Lemos and F. Miller. 2008. Resilience and 'Climatizing' Development: Examples and Policy Implications. Development 51:390-396.*

### Turning back from the brink

Centre-affiliated researcher Reinet "Oonsie" Biggs, Stephen R. Carpenter and William A. Brock investigated whether new early warning indicators of regime shifts may provide sufficient warning to take action to avert undesirable regime shifts.





Photo: F. Wulff, B. T. Hermansson Snickars & R. Kautsky lazote.se

The researchers explored how close an ecosystem can get to an ecological threshold and still avert a regime shift by implementing management changes. The model was also used to find out which indicators might give warning before a “point of no return”.

*Biggs, R., Carpenter, S.R., and Brock, W.A. In press. Turning back from the brink: Detecting an impending regime shift in time to avert it. PNAS 106: 826-831.*

#### Doing it online: Internet can detect eco-crises

Centre researchers Victor Galaz, Beatrice Crona, Örjan Bodin, Magnus Nyström, Per Olsson as well as Tim Daw from University of East Anglia have made an initial exploration into the possibilities of using information posted on the Internet to detect ecosystems on the verge of tilt. The article highlights the fact that analysis and response might take place as the result of collaborations between different state and non-state stakeholders.

*Galaz, V., B. Crona, T. Daw, M. Nyström, Ö. Bodin, P. Olsson. In press. Can Webcrawlers Revolutionize Ecological Monitoring? Frontiers in Ecology and the Environment*

#### New research reveals alternative coral reef states

Stockholm Resilience Centre researchers present the existence of multiple alternative states in ecosystems as a consequence of human actions. They identify four unexplored alternative states of coral reefs that differ from the archetypical coral–macroalgae regime shift, and discuss their relations to human actions and pressures on coastal and marine environments.

*Norström, A, M. Nyström, J. Lokrantz and C. Folke. In press. Multiple States of Coral Reefs in Human Shaped Environments. Marine Ecology Progress Series*

#### New syntheses can reorganize fragmentary knowledge

In this short think piece the authors argue that there is a tendency to emphasize known computable aspects of a problem while neglecting aspects that are unknown and failing to ask questions about them. This tendency can be countered by considering a wide range of perspectives, encouraging transparency with regard to conflicting viewpoints, stimulating a diversity of models, and managing for the emergence of new syntheses that reorganize fragmentary knowledge.

*Carpenter, S.R., C. Folke, M. Scheffer and F. Westley. In press. Resilience: Accounting for the Non-Computable. Ecology and Society.*



Panel members during the Policy Dialogue Plenary conclusions (from left): Anders Wijkman, Maria Wetterstrand, Johan Rockström, Siv Nässtrand and Bo Ekman. Photo: R.Kautsky lazote.se

## Science, practice and policy

The Stockholm Resilience Centre has been deeply involved in science-policy dialogues during 2008, at global, European, national and local levels. The resilience 2008 policy day represented a proactive exercise aimed at stimulating international policy makers to engage in dialogue about the global challenges, which has become increasingly apparent and were well defined during the Resilience 2008 conference.

Centre staff have also invested a substantial amount of time to develop networks with policy makers for future dialogue about these global challenges, e.g. within the European Commission, the European Parliament and with the OECD secretariat. The value of these networks will likely become apparent only in the future, when ongoing policy processes can be more closely linked to centre research. We have also invested in participating in a large range of processes more re-actively, where our participation has contributed to shaping the outcome of these processes.

### Global policy processes

#### The Millennium Ecosystem Assessment follow-up process

The Centre has been identified as a key partner in the MA follow-up and implementation strategies and is a formal member in this process. This has included support to the drafting of a follow-up strategy (where we have been asked to be involved in sub-global assessment research and lead research capacity building efforts). We were involved in co-convening a session with the Swedish Minister for the Environment and UNEP, at the UNEP Governing Council in Monaco 2008, addressing the MA follow-up and the need to start planning for a second global assessment.

#### The process to establish an IPBES

Stockholm Resilience Centre has been deeply involved in the ongoing discussions to establish an International Platform for Biodiversity and Ecosystem Services (IPBES). This is an

initiative that is being led by UNEP (United Nations Environment Programme) and is a complementary process to the Millennium Ecosystem Assessment follow up and implementation strategies. The aim of an IPBES is to establish an international science-policy platform analogous to the IPCC. SRC has been engaged in dialogue with researchers at e.g. WRI (World Resources Institute) resulting in a statement of “non-negotiable” scientific criteria for setting up an IPBES, bearing in mind the political influence hampering a constructive dialogue within the Convention on Biological Diversity (CBD). The statement was presented at a first international stakeholder dialogue in Malaysia, where SRC was represented as part of the Swedish national delegation.

### The International Commission on Climate Change and development

The Commission will be presenting their final report during spring 2009 and researchers at SRC have been engaged in producing background syntheses to the Commission, e.g. on adaptation strategies, the role of ecosystem services in adaptation, and in giving presentations and participating at expert meetings.

### Mayors’ conference

Local governments stand for the well-being and the will of half of the world’s population and play therefore a key role in the successful implementation of international framework conventions such as the UN Convention of Biological Diversity. Mayors and key decision-makers from local governments around the globe convened on the occasion of the 9th Conference of the Parties of the UN Convention of Biological Diversity from 26-28 May in Bonn, Germany. They demonstrated their commitment towards cooperation and action and, at the same time, request a multilevel cooperation for improving biodiversity globally. Centre researchers were invited key speakers at the Mayors’ conference.

## EU-level policy processes

### The Swedish EU presidency

The Centre has been engaged in an informal planning group at the Swedish Ministry of Environment to develop strategies for realizing

the Swedish government priorities during the EU presidency in fall 2009. Activities include planning for a high level ministerial conference, organizing a scientific meeting prior to this ministerial conference, as well as discussing necessary background material for the meeting, aimed at discussing post 2010 targets for biodiversity within the CBD process. The centre is also involved in designing a European civil servant meeting on marine ecosystem services, organized by the Swedish Environmental Protection Agency.

### The European Parliament

Centre researchers have been presenting centre research in the European Parliament at several occasions. One such presentation (in June) was related to the Baltic Sea ecosystem dynamics, and parliamentarians requested an analysis on “decision options” for the Baltic Sea cod (see below).

### The European Council

Researchers at Baltic Nest Institute and SRC produced an analysis of the potential development of the Baltic Sea cod stock given a number of different scenarios of political decision-making, just prior to the annual Council decision on fishing quotas. The study was widely publicized and cited in the press release from the Swedish Ministry. Potentially, the analysis contributed to a rather favourable decision in Council.

### The Nordic Council of Ministers

Baltic Nest Institute and Stockholm Resilience Centre were invited as keynote speakers in an informal dialogue together with all Nordic Ministers of Environment, who met at Askö, during August 2008, to discuss marine governance issues and how the Nordic Council can assume a leading role in sustainable marine governance. The Ministers expressed an ambition to formalize this dialogue.

### HELCOM and the Baltic Sea Action Plan follow-up

Baltic Nest Institute has been working closely together with Helcom to follow up the nutrient reduction targets (as defined by BNI) with new information from member states. This ongoing analysis and decision support is becoming increasingly formalized within the Helcom



Photo: R. Kautsky, E. Wisniewska & N. Kautsky/lazote.se

framework. Researchers at Nest have also been engaged in a number of Helcom meetings, e.g. given presentations and participating in expert consultations.

## National policy processes

### The Swedish Parliament

Researchers at Baltic Nest Institute and Stockholm Resilience Centre have given a number of seminars and presentations to different groups within the Swedish parliament, e.g. a seminar about “The Economics of Ecosystem and Biodiversity” (TEEB), The environment and our economy, Baltic cod fisheries, etc.

### The “Reinfeldt Commission”

Stockholm Resilience Centre has been assigned to revise and expand on the 2002 Report on Resilience and Sustainable Development, published by the Swedish Environmental Advisory Council prior to the Johannesburg Summit. The report is co-authored by a number of centre colleagues and will be presented to the Government’s Commission on Sustainable Development.

### The Ministries of Environment and Agriculture

Staff at the centre is continuously involved in dialogue with the Ministries of Environment and the Ministry of Agriculture. Dialogue includes personal meetings with the Minister and political staff, as well as with civil servants. Baltic Nest researchers have been engaged in communicating Baltic Sea action plan nutrient allocations to the Polish ministry of environment as a “knowledge broker” assisting the Swedish Ministry. Issues

that have been discussed with the Ministry of Environment include strategic priorities for the presidency, government positions in relevant processes (e.g. IPBES and UNEP governing council meetings, Helcom meetings) and fisheries issues.

### National agencies

Centre staff are continuously engaged in dialogue with e.g. the Environmental Protection agency (including the National Council for Biodiversity), the National Board of Fisheries regarding their ongoing processes (e.g. contributing to national reports).

### The Tällberg Foundation

We have developed science-policy collaboration with the Tällberg Foundation, which has resulted in co-convening of several workshops at the annual Tällberg Forum. Our contributions have influenced their thinking into taking on resilience thinking, and particularly the need to address tipping points from local to global scales in governance.

In 2008 we hosted a core workshop on planetary boundaries that set the stage for the Tällberg Forum, a work that will continue in 2009. At the COP15 meeting in Poznan of the UN climate negotiations, the Centre, together with SEI and the Tällberg Foundation presented a scientific synthesis and policy assessment of global environmental change processes vis-à-vis the climate change agenda. This summary highlighted, amongst others, the growing evidence that understanding of positive feedbacks and threshold effects in sub-systems of the Earth system most likely will require an even sharper climate stabilization target at the global level.



## 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 teaching, or academic capacity-building, at SRC has several purposes. First, the networking opportunities with SU departments mentioned above. Second, the research at SRC is disseminated to students. Both our Master's programmes depart from the principles of the Millennium Ecosystem Assessment and the students usually write their master's theses within one of SRCs research themes. Third, some of the students are recruited as internships and PhD students at SRC or at other universities, becoming 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 and physical geography, economic history, sociology, systems ecology and zoology.

The aim of the group 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 since the start in 2000 almost 30 former members have been awarded a PhD, of whom several today belong to the young generation of scientists at Stockholm Resilience Centre.



### Courses at the Stockholm Resilience Centre

- **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. The programme includes courses such as Resilience, Adaptability, Transformability, Philosophy of science for interdisciplinary environmental research, Ecosystem Management, and Adaptive governance of social-ecological systems.
- **Sustainable Enterprising, 120 credits.**  
An interdisciplinary Master's Programme in cooperation with several departments at Stockholm University. The programme includes courses such as Resilience, Adaptability, Transformability, Management tools and change management, Environmental law, and Social Responsibility for Sustainable Enterprising.
- **Geographical Information Systems (GIS), 4 credits**  
An introductory course in GIS, GPS and remote sensing for PhD students and researchers at Stockholm Resilience Centre and affiliates.
- **And in collaboration with Department of Physical Geography and Quaternary: Hållbar samhällsutveckling, 60 credits.** An introductory programme at the Department of Physical Geography and Quaternary Geology. Eight departments at Stockholm University are involved and Stockholm Resilience Centre is co-coordinating the programme.

### Resilience Research School at the Stockholm Resilience Centre

A very high priority initiative in 2008 was to start the development of a Research School on Resilience at the Centre. This school will include our Master's programmes and will develop a PhD program structure that integrates own

PhD training courses with PhD programmes with research departments across Stockholm University. The aim is to establish a collaborative Research School that trains and provides a creative research environment for the next generation of trans-disciplinary thinkers. This will start in August 2009.



Resilience 2008 Conference: Expect the unexpected!

## Communications

### Resilience 2008 conference and art exhibition

The Resilience2008 conference, held in Stockholm 14-17 April, was a success in many ways (see page 9). Major Swedish newspapers, TV and radio channels reported from the Resilience Conference and from the Resilience Art Exhibition, as well as a number of international media. Some 40 plenary sessions, selected presentations and panel discussions were made available via Web TV. All in all the conference rendered about 60 media clippings, and as many as 45 000 people visited the art exhibition from April to September 2008. All press clippings and videos are available on the Centre website.

The Centre collaborates on a regular basis with the press secretaries and communicators at Stockholm University. In connection to the conference external media consultants were contracted to improve contacts with international media.

### Other key activities 2008

Copenmind in Copenhagen aims to be the worlds biggest marketplace for partnerships between universities and industry and Stockholm University was one of the participants 2008. In the Stockholm University exhibition stand visitors learned more about the research on climate and environment conducted at Stockholm University and at Stockholm Resilience Centre in particular.

The Volvo Environment Foundation awarded its 2008 Volvo Environment Prize to Professor Crawford “Buzz” Holling, for his pioneering lifetime work on ecosystem dynamics, transformation and resilience, and adaptive management. The Centre organized a seminar at the Royal Swedish Academy of Sciences in honour of Buzz Holling, and gave presentations in connections to the prize ceremony.

In October the Centre organized a seminar on trans- and interdisciplinary environmental science in collaboration with the Environmental Research Committee of the Royal Swedish Academy of Sciences. Key note speakers were Frances Westley, Waterloo University, and Eric Lambin,



Professor Buzz Holling was awarded the 2008 Volvo Environment Prize.

University of Louvain, Belgium. Moderator of the panel, with researchers from the major Swedish Universities, was Carl Folke.

“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 continued through 2008. Speakers this year include Susan Owens, John Porter, Will Steffen, Brian Walker, John Milton, Rattan Lal, Ilan Chabay, Nick Winder, Chris Reij, Susann Stoll-Kleemann and Douglas Webster.

### Website developments

2008 established the centre website as an important communication channel for research on social-ecological resilience. Launched in February 2008, it quickly marked itself through its strong use of pictures and an extensive video selection. A minimum of five news articles are produced every month, with an emphasis on research publications and Centre activities. These news articles form the basis for an electronic monthly newsletter, that not only is an important tool to generate traffic to the website, but it is also a key channel for disseminating Centre research and publications to the Centre’s stakeholders.

Stockholm Resilience Centre has also created its own channel on You tube, the world’s biggest video sharing portal. It currently offers some 50 videos including a six-minute presentation of the Centre and more than 35 short videos where Centre-affiliated researchers explain key concepts

within resilience research.

During 2008 a Centre intranet was launched, called “The Loop”. This website, which is password-restricted, provides staff and selected networking members with a regular update on centre news, potential funding and global media coverage of relevant research. It also provides the research themes with their own work space for documents, discussions and news.

### Collaboration with Albaeco

The Stockholm Resilience Centre works in close collaboration with Albaeco, 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, and has together with the Centre co-produced “Manna – Food in a New Light”, an exhibition on the links between food production, resilience and ecosystem services.

In cooperation with Albaeco the Centre also assists corporate organisations to perform a Corporate Ecosystem Services Review, developed by World Resources Institute, and based on the findings from the UN Millennium Ecosystem Assessment. It is a structured methodology for corporate managers to proactively develop strategies for managing business risks and opportunities arising from their companies’ dependence and impact on ecosystems.

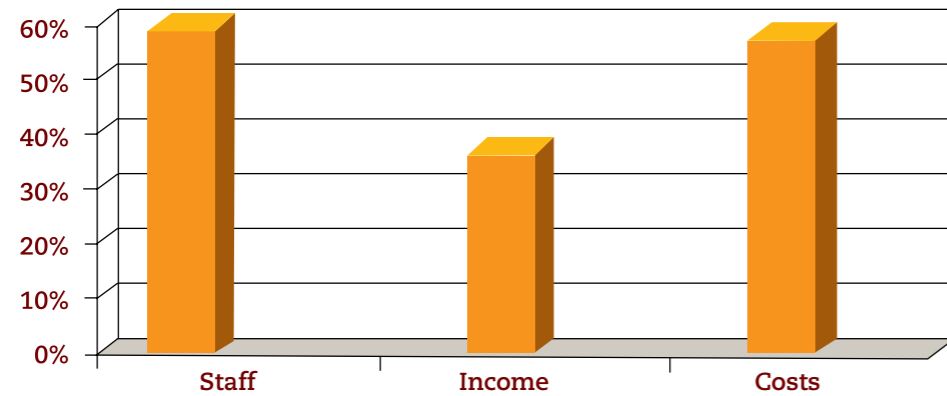


## Resilience 2008, 14-17 April

1. Opening of the Resilience 2008 conference
2. 600 researchers attended the conference
3. Gunnar Öquist, Permanent Secretary of the Royal Swedish Academy of Sciences (right), Thomas Rosswall, Director of the International Council for Science, Kåre Bremer, Vice Chancellor of Stockholm University
4. Professors Elinor Ostrom and Buzz Holling
5. Changing Matters – Be Your Own Enemy by Teemu Mäki
6. Changing Matters – Gemeinschaft und Gesellschaft by Centre of Attention
7. Changing Matters – Frutti di Mare by Tuula Närhinen
8. Professor Will Steffen
9. Changing Matters – small visitor
10. Science and Art discussions in Aula Magna
11. Changing Matters – Stress Call of the Stinging Nettle by Christine Odlund
12. Professor Johan Rockström, ED of SRC
13. Changing Matters – 19 Years by Jon Brunberg
14. Changing Matters – Sealed prototype by Gunilla Bandolin and Sverker Sörlin
15. Carola Magnusson, who made the organic food served
16. Researcher Lisen Schultz and Professor Johan Rockström during the policy day
17. Food in a New Light - The Manna Exhibition
18. Researcher Lisa Deutsch held a speed talk
19. Speed talks
20. Professor Steve Carpenter
21. Discussions over a glass of wine
22. Professor Brian Walker
23. Speed talk discussions
24. Mingle at the welcome reception
25. Professor Elinor Ostrom
26. Mingle at the welcome reception
27. Mediated bar: mingle with researchers in York (UK)
28. Mingle at the welcome reception
29. Professor Frances Westley
30. Concert with Professor Marten Scheffer and his band Scheffer, Bont & De Gans
31. Scheffer, Bont & De Gans in Concert at Hotel Rival
32. Professors Buzz Holling and Brian Walker were celebrated, i.e. through improvisation theatre
33. Mediated bar: mingle with researchers in York, UK.
34. Professor Carl Folke, Science Director of SRC
35. Panel discussions during the policy day
36. Professor Thomas Elmqvist, Professor Terry Chapin and Mimi Chapin, played at Aula Magna
37. Mingle at Stockholm Resilience Centre's courtyard
38. Professor Carl Folke sang Rockin' in a Free World during the jam session at the centre
39. Aula Magna, Auditorium 1 & 2

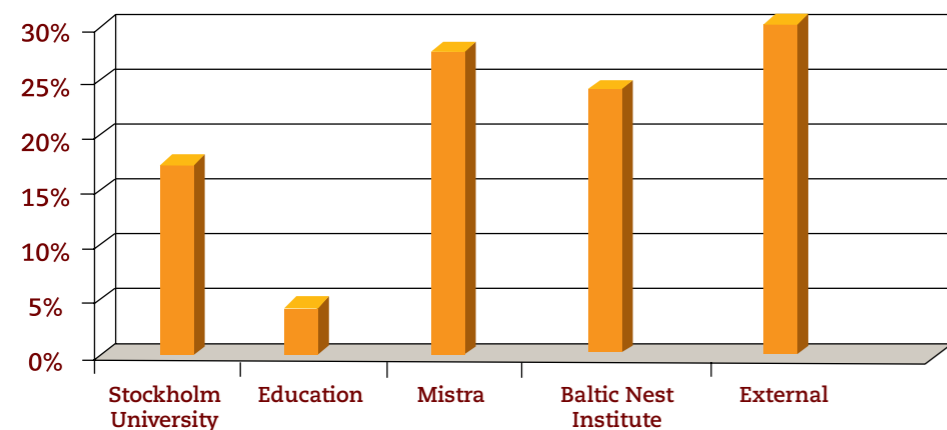
# Accounts in brief

## Expansion of Stockholm Resilience Centre



- Expansion in terms of increased number of research staff of 20 Full Time Equivalent (FTE)/ or 59%. SRC now have FTE 54.
- In-Kind support from SEI and the Beijer Institute was FTE 2, or 7 persons or approximately 2 MSEK.
- Total Income increased with 36%, or 11,8 MSEK
- Total Costs increased with 56%, or with 16,1 MSEK

## Grant Allocated to SRC 2008 (Total: 37,4 MSEK)



- The subsidy from Stockholm University is in total 6 MSEK.
- Courses and Education gave 1,5 MSEK.
- Mistra gave 10 MSEK.
- Baltic Nest Institute allocated 8,8 MSEK, where 7,4 MSEK came from The Swedish EPA.
- External grants during 2008 were 11,1 MSEK, divided among Formas 6,9 MSEK, Sida 2,1 MSEK and other 2,1 MSEK.

## Appendix A. Publications

### Books in progress (signed contracts)

Boyd, E. and C. Folke (eds.). In manus. *Governing Social-Ecological Transformation: Adapting to the Challenge of Global Environmental Change*. Contract with Cambridge University Press, Cambridge UK.

### Scientific articles 2008

Andersson, E. and Ö. Bodin, 2008. Practical Tool for Landscape Planning? An Empirical Investigation of Network Based Models of Habitat Fragmentation. *Ecography* doi: 10.1111/j.1600-0587.2008.05435.x

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Ebbesson, J., 2008, Law, Power and Language: Beware of Metaphors. *Scandinavian Studies in Law* 53:259-269.

Eklöf, J.S., de la Torre-Castro, M., Gullström, M., Uku, J., Muthiga, N., Lyimo, T., Bandeira, S.O., 2008, Sea urchin overgrazing of seagrasses: A review of current knowledge on causes, consequences, and management. *Estuarine, Coastal and Shelf Science* 79:569-580.

Elmqvist, T., 2008, Social-ecological systems in transition: Lessons from a Symposium on Society, Natural Resources and Development in Madagascar held at the University of East Anglia in March 2007. *Environmental Sciences* 5 (2), 1-3.

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**Master theses of the Stockholm Resilience Centre**

During the year both the Ecosystem, Governance and Globalization programme and the Sustainable Enterprising programme were converted to 2-year Master's programmes and the schedules was changed to start in the fall term. Therefore, neither programmes have finished any Master's theses in 2008.

**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. Presentations****Scientific presentations**

A large number of the Stockholm Resilience Centre researchers gave scientific presentations, participated as panel members or moderated panel discussions at the Resilience 2008 – International science and policy conference: “Resilience, adaptation and transformation in turbulent times - preparing for change in social-ecological systems”, held 14-17 April 2008, in Stockholm. The Stockholm Resilience Centre contributions are not included here but can be found on the conference website: [www.resilience2008.org](http://www.resilience2008.org). April

Resilience Seminar in Honour of Professor C.S. Holling, Royal Swedish Academy of Science, Stockholm. Folke, C., Galaz, V., Gordon, L., Noone, K., Petersen, G.D., Rockström, J., Schultz, L.; participated with presentations, as panel members or moderated panel discussions. November

Formas visit, Stockholm Resilience Centre. Presentations by Biggs, O., Colding, J., Crépin, A.S., Folke, C., Enfors, E., Hermansson Török, E., Humborg, C., Moberg, F., Norberg, J., Nyström, M., Olsson, P., Peterson, G.D., Rockström, J., Österblom, H. December

Barron, J. Africa Green Revolution Conference: An Alliance for Action, Oslo: Panel member in “Technologies and processes for sustainable usage of and access to water”. August

Barron, J, Enfors, E, Rytter, S., Sandahl., 9th Waternet/WARFSA /GWPSA symposium Johannesburg: “Green-blue flow dependency in rainfed agro-eco systems: livelihood analysis in Makanya watershed, NE Tanzania”. October

Barron, J., Noel, S., 9th Waternet/WARFSA/GWPSA symposium Johannesburg: “The values of agricultural water management interventions in meso-scale catchments: a synthesis of cases”. October

Bodin, Ö., Oikos conference, Lund, “Network based models of fragmented landscapes concept, applicability and predictability”. February.

Bodin, Ö., Workshop on “Ecosystem Services: Solution for problems or a problem that needs solution?” Salgau Castle, Germany, “Network based models of fragmented

landscapes assessing different scales of connectivity”. May

Crépin, A.-S., Norberg, J., Mäler, K.-G., de Zeeuw, A. European Association of Environmental and Resource Economists (EAERE) Conference, Gothenburg. June

de Zeeuw, A. Workshop by Institute GERAD, University of Montreal, Presentation, “Dynamic Games in Management Science”. May

de Zeeuw, A. Workshop by the Universities of Montreal, McGill, QECAM and Concordia, Montreal, Presentation “Natural Resources and Environmental Economics”. May

Elmqvist, T., COP9 of the CBD, Bonn, presentations on Urban Biodiversity as part of the CBD initiative “Cities and Biodiversity”. May

Elmqvist, T., Mayors Conference – Local action for biodiversity. Parallel event to the 9th Conference of the Parties of the UN Convention of Biological Diversity, Bonn, Invited expert: “Biodiversity and ecosystem services in urban landscapes: examples and role in urban planning”. May

Elmqvist, T., Meetings and coordinated efforts by the Stockholm Resilience Centre and University of Antananarivo of building an interdisciplinary research centre in Madagascar. August

Elmqvist, T., Presentation at 1st MESA International Conference organized by UNEP, UNEP Headquarters, Nairobi. Addressing the role of African Universities in meeting the challenges of climate change, with more than 48 vice-chancellors from African Universities participating.. November

Falkenmark, M., Rockström, J., IGBP scenario meeting, Lund.

Folke, C., Olsson, P., Marine meeting of the Resilience Alliance, Santiago, Chile. January

Folke, C., Falkenmark, M., Symposium in honour of Uno Svedin. February

Folke, C., Tokyo University seminar at Stockholm Resilience Centre. March

Folke, C., Persson Å., Rockström, J., Steffen, W., Sörlin, S. Tällberg Forum, Tällberg, Science workshop on planetary boundaries and tipping points. June

Folke, C., Walker, B., Galaz, V., de Zeeuw, A., Mäler, K.-G., Beijer-Askö science meeting, Askö. September

Folke, C., Blenckner, T., Crépin, A.-S., Crona, B., Nyström, M., Troell, M., Österblom, H., Worldfish meeting, Stockholm Resilience Centre. September

Folke, C., Boyd, E., Galaz, V., Olsson, P., Schultz, L., von Heland, J., Barthel, S., Lundholm, C., STEPS Centre Symposium 2008, The Freeman Centre, Sussex University. “Reframing Resilience: Transdisciplinarity, reflexivity and progressive Sustainability”. September

Folke, C., Blenckner, T., Österblom, H. ICES SRC Baltic Nest meeting. October

Folke, C., Österblom, H., IIASA meeting, Laxenburg, Vienna, Stockholm Resilience Centre, Nest and its research. November

Galaz, V., Olsson, P., Université Européenne et Internationale d'Été de Niort, Niort, Invited speakers at an international seminar on global governance beyond sustainable development. September

Gerger Swartling, Å., Nilsson, A.E., 8th Mistra-SWECIA Science Seminar, Stockholm Resilience Centre, Presentation “Social learning: strengthening the capacity to adapt”. November

Humborg, C., Workshop on models for assessing the eutrophication risk of phosphates in detergents in the Baltic Sea, Stockholm Resilience Centre. Presenter “Possible effects of banning P containing detergents on total riverine P load to the Baltic Sea”. September

Olsson, P., Smith, A., Voss, J.-P., Galaz, V., IHDP conference “Long-Term Policies: Governing Social-Ecological Change”, Berlin, Organized the session “Shaping Dynamic Systems - Diversity and Convergence Amongst Approaches to Governance in Various Research Traditions”. February

Olsson, P., Conference of the German Society for Human Ecology, Sommerhausen, Invited keynote speaker “Human/Nature Interactions in the Anthropocene: Potentials of Social-Ecological Systems Analysis”. May

Olsson, P., “Transitions in water management - Open international symposium”, Amsterdam, Invited speaker. July

Olsson, P., 11th International Coral Reef Symposium, Fort Lauderdale, Florida, Invited Speaker. July

Olsson, P., International European Summer University, Niort Invited speaker “Global Governance and New Ideal for Civilisation. The rising of a new object”. September

Petersen, G.D., “Living with climate change: are there limits to adaptation?” London, Keynote talk “Ecological Surprises: Resilience, adaptation, and collapse”. April

Petersen, G.D., Tyndall Centre, University of East Anglia, UK, “Ecological Surprises: Resilience, adaptation, and collapse”. April

Petersen, G.D., Understanding bundles of ecosystem services. Finding relevant scales for management of multiple ecosystem services in the agricultural landscape, Stensoffa. June

Petersen, G.D., Symposium Energy Climate Conflict and Bio-Fuels: A North-South Perspective, INK Stockholm University, “Will increased bio-fuel production produce ecological surprises?”. September

Rockström, J., UNEP Governing Council meeting, Monte Carlo. February.

Rockström, J., KVA, Stockholm, ”Ett hållbarhets perspektiv på biobränslen. April

Rockström, J., KSLA, “Stockholm Innovative agricultural approaches for climate resilience Agriculture, climate change and development”. April

Rockström, J., Framtidsdiskussion KSLA, Stockholm, ”Hållbar förvaltning av jord och skog i “Anthropocene””. October

Rockström, J., KSLA, Stockholm, ”Innovativa ansatser för resiliens i jordbruket ur ett klimat-perspektiv”. October

Rockström, J., European Science Foundation, Stockholm, “Global research cooperation: What are the lessons from global change research?”. November.

Savchuk, O.P., Workshop on models for assessing the eutrophication risk of phosphates in detergents in the Baltic Sea, Stockholm Resilience Centre, “Modelling effects of P reductions on the environmental status of the Baltic”. September

Troell, M., EU Sixth framework programme priority, Lisbon, Presentation “Ecological and socio-economic trade-off analysis and comparison of status quo, conventional sewage treatment, constructed mangrove wetlands for sewage remediation and strategic reforestation/ conservation”. Within PUMPSEA- Peri-urban mangrove forests as filters and potential phytoremediators of domestic sewage in East Africa. May

Troell, M., IFS/WIOMSA Workshop “Ecology, Resources and Management of Tropical Seascapes: from Theory to Practise, Zanzibar, Invited speaker. October

Österblom, H. ICES integrated assessment working group. Öregrund, “Resilience and adaptive management.” May

Österblom, H., ICES Annual Science Conference, Halifax, Canada “Adaptive management of the Baltic Sea, using Nest”. September

**Policy fora/popular presentations**

Barron, J., Hatibu, N., SIWI seminars, Stockholm, “Tradeoffs or opportunities? A think piece on biofuels, land and livelihoods in SSA”. August

Boyd, E., Commission on Climate Change and Development, Ministry of Foreign Affairs (UD), Human Dimension Expert Meeting, Stockholm, Invited expert to assess the approach and policy relevance of a draft paper entitled ‘The human dimension of climate change’ for a framework to address climate change adaptation for the Commission on Climate Change and Development. January

Boyd, E., International Commission on Land Use Change, Globe International, Westminster, London, Expert reviewer. September

Eckerberg, K., Conference on Outdoor Recreation for Youngsters (Tankesmedjan Fritt Fram för Friluftsliv), Sänga-Säby, arranged by the Swedish Environmental Protection Agency and the Swedish National Agency for Education, Learning in Local Nature Conservation projects in Sweden. March

Elmqvist, T., Folke, C., Rockström, J., Meeting with Madagascar’s government, Stockholm Resilience Centre. August

Elmqvist, T., Folke, C., Mäler, K-G., Polasky, S., Swedish Parliament, Seminar arranged by Albaeco on the “Economics of Ecosystems and Biodiversity, TEEB”. October

Folke, C., Royal Swedish Academy of Science, Presentation for the Royal families of Luxembourg and Sweden. April

Folke, C., Vermeulen A., Royal Academy of Fine Arts, Stockholm, “A science and arts dialogue”. May

Folke, C., Noone, K., Rockström, J., Sörlin, S., Scientific workshop on Planetary boundaries, Tällberg forum, Tällberg. June

Folke, C., Österblom, H., Wulff, F. Meeting on Marine Issues with Nordic Ministers of the Environment, Askö. September

Folke, C., Olsson, P., Schultz, L. Meeting on the development of Resilience Alliance-Connectors with Albaeco, Stockholm. October

Folke, C., Volvo Environment Prize ceremony, Presentation of resilience research. November

Folke, C., Rockström, J., Kunskapens Krona, SVT, Nov

Galaz, V., International Commission for Climate Change and Development, Stockholm, Presentation to the expert group. February

Gordon, L., Sida research conference Meeting Global Challenges in Research Cooperation, Uppsala, “ Making investments in dryland development work”. May

Gordon, L., Forskning and Framsteg’s (Popular science magazine) knowledge cruise, Åland, ”Grönt” vatten på en blå planet med vattenbrist. September

Hahn, T., Swedish Parliament, breakfast meeting, BNP, välfärd och hållbar utveckling, December

Humborg, C., Wulff, F., INIA-report, Brussels, Phosphorus. April

Humborg, C., Wulff, F., Johansson, S., HELCOM, Land-based Pollution Group, 13th Meeting, Presentation, Kaliningrad. May

Johansson, S., Savchuk, O., Sokolov, A., International Environmental Forum, S:t Petersburg, Baltic Sea Days,. March

Kadin, M., Österblom, H., Government assignment of a STERN like review, Swedish EPA, Stockholm, “Trends and scenarios exemplifying the future of the Baltic Sea and Skagerrak”. June

Mäler. K.-G. Danish Council of Economic Advisers, Meeting on environment and economics, Copenhagen, Invited keynote speaker. September

Mäler K.-G, First larger meeting that the French government organized after they took over the chair of EU, Paris, Presentation on management of ecological services at the. September

Nekoro, M., Svedén, J., Schultz, L, Workshop on ecosystem services, Kristianstad. Organisation of a workshop with local stakeholders in the Biosphere Reserve for presentation and feedback of results of the analyses “Ekosystemtjänster i Kristianstads Vattenrike” (Ecosystem services in Kristianstads Vattenrike). September

Rockström, J., Swedish Parliament’s Foreign Affairs Committee, “Förvaltning av klimatförändring och globala miljörisiker”. March

Rockström, J., Tällberg Conversation: Increasing interdependencies: Perspectives on Social-Ecological Resilience, Tällberg, “Do we underestimate the complexity of risk?” March

Rockström, J., Swedish Parliament, Stockholm, “Vad innebär dagens utmaning för mänskligheten? Natur, plånbok och människa i balans - nya argument och idéer för framtidens politik”. May

Rockström, J., Tällberg Forum, Tällberg, “Defining planetary boundaries and tipping points”. June

Rockström, J., COPENMIND, Copenhagen, “Building Resilience in the Anthropocene. The challenge of transforming societies in the face of abrupt planetary change”. September

Rockström, J., Presentation, House of Sweden, Washington. October

Rockström, J., Globala Miljöutmaningar, Hållbar Utveckling i Anthropocene, Naturvårdsverket, Chefsgruppsinternat, Högberga Gärd. October

Rockström, J. “Planet 2050” conference, Lund, Invited

speaker. October.

Rockström, J., “Making business in the Anthropocene. The Scientific Basis why Ecosystem Service Reviews is good for business”.

Schultz, L., Fazey, I., 3rd World Congress on Biosphere Reserves, Madrid, “Strictly for Biosphere Reserve managers: Facilitated open-space workshop for exchanging knowledge and experience of managing Biosphere Reserves”. February

Troell, M., Seminarium för erfarenhetsutbyte om utvecklings-insatser på det marina området, Lökeberg, Invited speaker, “Forskningsprogram- Sida finansierad forskning i Östafrika”. August

Wulff, F. Royal Swedish Academy of Sciences, Stockholm, Seminar on possible solutions to oxygen problems in the Baltic Sea, “The Baltic Sea Action Plan for nutrient reductions”. Jan

Wulff, F., Sjöfartsdagen, Östersjöseminarium, Stockholm, “Östersjöns ekologi med tonvikt på övergödning”. February

Wulff, F., Forum för miljöforskning 2008 – VATTEN, Panel member in “Går politiken och vattenarbetet hand i hand?” February

Wulff, F., Läkare för Miljö, Uppsala, ”Östersjöns ekologi”. Februari

Wulff, F., Finansdepartementet, BNI Stockholm, Näringslivsinitiativ. March

Wulff, F., Swedish Ministry of the Environment, Stockholm, Meeting with the Polish Environmental Minister concerning HELCOM and its Baltic Sea Action Plan, Presentation of Baltic Nest Institute and Swedish commitments within BSAP. May

Wulff, F., EU Joint Research Center, Ispra, Italy, “The Baltic Sea, yesterday, today, tomorrow”. May

Wulff, F., Naturvårdsverket, Stockholm, ”Models of BNI”. May

Wulff, F., SIDA, Stockholm, Invited panel member: Svensk Östersjödag 2008 - Grannlandssamarbete för en bättre miljö. May

Wulff, F., Federal Maritime and Hydrographic Agency, Hamburg, “Eutrophication of the Baltic Sea - Linking scientific knowledge and uncertainties with environmental management”. July

Wulff, F., 2nd informal meeting HELCOM/PLC-5/BNI/EMEP, Helsinki. October

Wulff, F., HELCOM BSAP IG, Helsinki, , “Updating BSAP with PLC5” ., December

Wulff, F., Seminar: Marine science contribution to regional seas strategies, “Science-based decision making tool NEST – practical instrument for setting targets and distributing nutrient loading quotas in the HELCOM Baltic Sea Action Plan”. December

Österblom, H., Swedish Society for Nature conservation, Stockholm, “EU:s gemensamma fiskepolitik – i ett ekosystemperspektiv”. February

Österblom, H., Högskolan på Gotland, “Torsken i Östersjön - 100 år av mänsklig påverkan”. February

Österblom, H., Polish Environmental NGO meeting, Warsaw, “Can we save the Baltic Sea?”. May

Österblom, H., European Parliament Seminar arranged by MEP Fjellner and Baltic Sea 2020 foundation, Brussels, “The role of cod in the Baltic Sea”. June

Österblom, H., IPBES, Minister meeting , UNEP Stakeholder Consultation, Kuala Lumpur. November

Österblom, H., The Swedish Liberal Party and Baltic Sea 2020 foundation, Stockholm, ”Fisk i Östersjön och torskens roll”, ”Torskfisket i Östersjön – strålande framtidsutsikter?” October

Östersjön, H., Bleckner, T. ICES. Report of the Baltic Fisheries Assessment Working Group (WGBFAS). ICES CM 2008/ACOM:06

**Appendix D. Staff**

Below are only staff members that have been employed or financed directly from the Stockholm Resilience Centre during 2008.

**Management, administration and communication**

Executive Director	Johan Rockström, Prof.
Science Director	Carl Folke, Prof.
Assistant Director	Christina Schaffer, MSc
Head of Finance and Admin.	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, MSc
HR Support	Karin Schéle
ED Assistant	Teresa Ogenstad
Office Manager	Felicity Rolf
Office Manager	Christina Leijonhuvud
Office Manager	Anna Sundbaum
Office Manager	Agneta Sundin
IT Manager	Lars Gustavsson

**Education**

Chairman of RTM	Klas Åmark, Prof
Director of Studies	Thomas Hahn, PhD
Programme Director	Lisa Deutch, PhD
Programme Director	Miriam Huitric, PhD
Course Administrator	Johan Ahlenius, MSc
Course Coordinator	Marmar Nekoro, MSc
Course Coordinator	Jennie Svedén, MSc
Course Coordinator	Johan Törnberg, MSc
Course Leader	Markus Larsson, PhD

**Research themes**

**The new economics of complex social-ecological systems**

Theme Leaders:	Aart de Zeeuw, Prof.
	Karl-Göran Mäler, Prof.
	Anne-Sophie Crepin, PhD

### Multi-level institutions and adaptive governance of social-ecological systems

Multilevel institutions:

Theme Leaders: Katarina Eckerberg, Prof.,  
Jonas Ebbesson, Prof.  
Andreas Duit, PhD

Adaptive Governance:

Theme Leaders: Per Olsson, PhD  
Emily Boyd, PhD  
Victor Galaz, PhD

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

Theme Leaders: Sverker Sörlin, Prof.  
Carl Folke, Prof., Science Director

### Governing freshwater for food and ecosystem services

Theme Leaders: Johan Rockström, Prof., ED  
Line Gordon, PhD

### Governance and ecosystem management of coastal and marine systems

Theme Leaders: Frank Thomalla, PhD  
Henrik Österblom, PhD  
Max Troell, Associate Prof

### Urban social-ecological systems and globalisation

Theme Leaders: Thomas Elmqvist, Prof.  
Johan Colding, PhD

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

Theme Leaders: Åsa Gerger Swartling, PhD  
Örjan Bodin, PhD

### Global Environmental Change

Theme Leaders: Kevin Noone, Prof  
Will Steffen, Prof

### Understanding ecosystem processes for proactive management

Theme Leaders: Magnus Nyström, Associate Prof  
Regina Lindborg, PhD

### Researchers

Jennie Barron, PhD  
Jenny Beckman, PhD  
Maria Bohn, PhD student  
Ann-Sophie Crepin, PhD  
Beatrice Crona, PhD  
Lisa Deutsch, PhD  
Elin Enfors, PhD student  
Henrik Ernstson, PhD  
Malin Falkenmark, Prof  
Jacob von Heland, PhD student  
Rebecka Henriksson, PhD student  
Louise Karlberg, PhD  
Elisabeth Lindgren, PhD

Vikrom Mathur, PhD student  
Kevin Noone, Prof  
Jon Norberg, Associate Prof  
Åsa Persson, PhD  
Garry Peterson, PhD  
Markku Pyykönen, GIS Manager  
Lisen Schultz, PhD student  
Lisa Segnestam, PhD student  
Uno Svedin, Prof

### Baltic Nest Institute

Director BNI	Fredrik Wulff, Prof (left) Christoph Humborg, Associate Prof. (new)
Research Engineer	Miguel Rodriguez-Medina, PhD
Researcher	Oleg Savchuk, PhD
Researcher	Alexander Sokolov, PhD
Researcher	Magnus Mörth, Associate Prof.
Researcher	Thorsten Blenckner, PhD
Researcher	Bo Gustafsson, PhD
Researcher	Olle Hjerne, PhD
Researcher	Jen Edgren, PhD
Researcher	Gertje Czub, PhD
Researcher	Erik Smedberg, PhD
Policy officer/Researcher	Siw Johansson, PhD
Researcher	Dennis Swaney, PhD
Policy Officer/Researcher	Henrik Österblom, PhD
Assistant	Martina Kadin, MSc
Communications/Policy	Marmar Nekoro, MSc

### PhD-forum at SRC Departments

Jenny Appelblad	Human Geography
Matilda Baraibar	Economic History
Arvid Bring	Physical Geography and Quaternary Geology
Paul Fuehrer	Sociology
Katrin Holmström	Applied Environmental Science
Adolphine Kateka	Human Geography
Hanna Kling	Meteorology
Tomas Persson	Botany
Karin Reuterswärd	Human Geography
Åsa Romson	Law
Angelina Sandersen Bellamy	Systems Ecology
Li Wang	Education
Dan Wilhelmsson	Zoology

### Post doc

Reinette Oonsie Biggs  
Jenny Grönwall  
Jagdish Krishnaswamy

### Visiting Scientists

Dag Broman	Department of Applied Environmental Science, (ITM) SU
Joshua Cinner	James Cook University, Australia
Carole Crumley	Univ of North Carolina, US
Tim Daw	Univ of East Anglia, UK
Joern Fisher	Australian National University, Australia
Erik Gómez Baggethun	Univ Autónoma de Madrid, Spain

Preeti Kapuria	Institute of Economic Growth, New Delhi, India
Steve Lansing	University of Arizona och Santa Fe Institute, US
Susan Owens	The University of Cambridge, UK
Claudia Pahl- Wostl,	University of Osnabruck, Germany
Steve Polasky	University of Minnesota, US
Ciara Raudsepp-Hearne	Mc Gill University, Canada
Will Steffen	Australian National University, Australia
Frances Westley	University of Waterloo, Canada
Brian Walker	CSIRO, Australia

### The Council For Transdisciplinary Environmental Studies RTM

Chair	Klas Åmark, Prof. History
Faculty of Law	Jonas Ebbesson, Prof. Environmental Law
Faculty of Social Sciences:	Christofer Edling, Ass. Prof. Sociology (left)
Faculty of Natural Sciences:	Margaretha Ihse, Prof. Physical Geography and Quaternary Geology (left)
	Karin Holmgren Prof. Physical Geography and Quaternary Geology (new)
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 Center, Stockholms Universitet

Erik Fellenius, Director of the Research Secretariat,  
Swedish Environment Protection Agency  
(Naturvårdsverket)





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