



# GLOBAL ECONOMIC DYNAMICS AND THE BIOSPHERE

THE ROYAL SWEDISH ACADEMY OF SCIENCES

*The Erling-Persson Family Academy Programme*

## REPORT 2013



# Introduction and background

This is the first annual report of the newly established Global Economic Dynamics and the Biosphere programme (GEDB). This five-year research programme at the Royal Swedish Academy of Sciences, which is being funded by the Erling-Persson Family Foundation, is addressing the economic dynamics of global change and its implications for a sustainable future.

Beginning at large scale with the Industrial Revolution, human influence is now affecting every aspect of the Earth and the biosphere on a scale that matches the great forces of nature. A growing number of scientists believe we have entered a new geological era – the Anthropocene. Since “the great acceleration” in the middle of the 20<sup>th</sup> century, an expansion of human wellbeing and rapid development of human knowledge have taken place. One of the great challenges in the Anthropocene is to continue such positive development in a way that enables existing and future generations, including those which still live in poverty, to benefit from this expansion. This requires recognition that in a globalised world, the economy, society, technology and the environment interact in new ways.

A core task is to manage economic development and use of natural resources so as to maximise wellbeing within the frames set by the capacity of the biosphere to sustain this development.

Knowledge about the interplay between global environmental change and human affairs, from local to global levels, is greatly in demand from governments, the business sector and international organisations such as the UN. GEDB aims to contribute to a better understanding of this interplay by combining economic studies with a range of disciplines to produce high-quality science of relevance to society. GEDB builds on the recognition that social systems are intricately and inextricably linked to natural systems and embedded in the biosphere. With that in view, any attempts to move towards sustainable futures need to recognise both the social and ecological aspects of sustainability challenges. Much of the research from which GEDB draws its vision and builds its work refers to social-ecological systems, a term we continue to use throughout the remainder of the report.

## Aims and visions

- To create a platform for interdisciplinary scientific collaboration on the challenges of global change and sustainability, with specific focus on how local-to-global, cross-scale interactions affect human wellbeing and the sustainable use of resources.
- To facilitate and promote collaboration between early career economists and scientists from other social sciences and the natural sciences.
- To combine diverse knowledge systems and experiences, and conduct research for a broader understanding about the preconditions and opportunities for sustainable societal development in the new global context.

# The development of a research program

## STAFF

Executive Director Beatrice Crona manages the programme, together with Programme Director Professor Carl Folke. Four researchers from the Early Career Academy have been recruited, along with two high-profile senior academics.

Gretchen Daily, Bing Professor of Environmental Science at Stanford and winner of the 2012 Volvo Environment Prize, is visiting professor within GEDB for two years. Professor Daily is an expert and pioneer in the field of mapping and quantifying the world's natural capital. James Wilen, Professor of Economics at the University of California Davis, is also visiting professor within GEDB. He is renowned for his work in fisheries and natural resource economics. Professor Wilen will be visiting Stockholm three times a year, during which he will actively participate in GEDB research, guide and mentor young scholars within the programme and provide senior academic expertise in the field of economics.

Communications officer Agneta Sundin and Finance & HR administrator Sofia-Kristin Kokinelis are employed part-time. Both also work for the Beijer Institute of Ecological Economics.

A number of research assistants (primarily Master's level students) are employed on short-term contracts to assist programme researchers in collecting and analysing data. This greatly facilitates and speeds up the research process, while simultaneously providing a good opportunity for young scholars to interact with senior scientists and learn from active participation in the research process. As such, it supplies an important training function within the programme.

The full profiles of staff members and their research interests and pursuits are presented further on in this report.

## ADVISORY BOARD

GEDB has as an advisory board comprising several prominent academics. The role of the advisory board is to advise on strategically important research directions and decisions, and to provide guidance, suggestions, contacts and networks for collaboration. Members of the advisory board will also be invited to participate in research activities in the form of working groups/workshops designed with a specific thematic focus.

Advisory board members:

Neil Adger, University of Exeter  
Kenneth Arrow, Stanford University  
Scott Barrett, Columbia University  
Stephen R. Carpenter, University of Wisconsin  
Jane Lubchenco, Oregon State University  
Bonnie McCay, Rutgers University  
Stephen Polasky, University of Minnesota  
Marten Scheffer, Wageningen University

## ORGANISATION OF RESEARCH

To achieve our key aims, we have created an organisational structure for GEDB which we believe is flexible enough to provide for the emergent and innovative nature of this scientific field, yet strong enough to provide the scientific rigour essential to ensure high-impact scientific work of relevance for society.

At the start of the programme, a one-day workshop was held to determine the key research strands of the programme. All researchers formally affiliated to GEDB were invited, as well as a range of scientists working on topics closely linked to the general goals of GEDB. The workshop was designed to map out the key scientific areas at the forefront of research on global dynamics and

environmental change and to identify strategically important areas of research. Three primary areas were identified and adopted as core areas of investigation for GEDB in its first two years:

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### *Macroeconomic models that explicitly consider and integrate the biosphere*

This involves promoting cutting-edge work on economic models based on the recognition that the economic system is embedded in the biosphere. The aim is to integrate the latest developments within economic theory with methods used in sustainability science, as well as creating economic models that include many more environmental factors than existing models in use today.

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### *Trade in, and consumption of, marine resources and the effects on social-ecological systems*

This research area examines how existing and emergent markets affect the functioning of marine social-ecological systems at different scales. It looks at both the social and environmental components of fisheries and aquaculture production systems, and includes studying market structures, actors and commodity chains. Work under this theme will also analyse interactions (local-regional-global) that determine the effects on systems at the different geographical and institutional levels. The fisheries and aquaculture focus is included for two key reasons. First, because trade with marine commodities is significantly less explored than trade with agricultural products, yet fish plays an important part in future global food security. Second, marine systems can be seen as a test case in which we develop relevant methods to study cross-scale links between production, trade and consumption, which can then be transferred to other social-ecological systems.

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### *Interactions between financial markets and the biosphere*

This work will explore the interconnectivity between global financial processes and food production, nutrient flows and other planetary-scale biophysical processes. The work underway at present is exploring the effects of increasingly automated trade in basic food items such as sugar, cocoa and wheat. We want to know how this affects the speed and extent of price fluctuations, and the effects of these fluctuations on local producers and consumers.

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The three core areas will provide the creative framework for all research conducted within GEDB. The Early Career Academy researchers are free to pursue any research topic under the three broad themes listed above. Collaboration among researchers, both within the programme and those in close partner organisations the Beijer Institute of Ecological Economics and Stockholm Resilience Centre (SRC) or other international research networks, is encouraged. To enable this, GEDB provides funding to develop

workshops and working groups, invite key collaborators and participate in conferences and meetings. This framed creativity as an organisational form has proven highly successful for producing excellent, high-impact science at both SRC and the Beijer Institute.

Continuous monitoring of progress and strategic decisions regarding programme focus are taken by Director Carl Folke and Executive Director Beatrice Crona, in consultation with members of the advisory board. However, day-to-day decisions on research activities and administration are taken by Executive Director Beatrice Crona, in consultation with Victor Galaz and Anne-Sophie Crépin, who are both theme leaders of the Global Dynamics theme at SRC. Anne-Sophie Crépin is also Deputy Director of the Beijer Institute. These three leaders thus form a senior management team to coordinate the work of GEDB with that of its closely linked partners. This is essential in order to strategically match research agendas and synergise research efforts.

## ACTIVITIES

### **SARAS workshop on Latin American artisanal fisheries and trade**

A workshop on Latin American artisanal shellfisheries in relation to trade and global markets was held at (and in collaboration with) the South American Institute for Resilience and Sustainability Studies – SARAS in Montevideo, Uruguay, in September.

### **Research visioning workshop**

A visioning exercise was held on the 20 September with all GEDB researchers together with invited participants from SRC and Beijer. The aim was to assess all ongoing research efforts related to the three GEDB core research areas and to outline key research topics to pursue under each core area. A visioning document was produced and will function as a steering document for research efforts and funding allocation within GEDB for the next two years.

### **Workshop on how to build coupled bioeconomic models that explicitly take market dynamics into account**

A workshop was held in Stockholm on 23 September with invited experts from Princeton University, University of British Columbia, Canada, and IRD, France. Christian Mullon (IRD) presented the concept “network economics”, a game theory approach to solving market problems. The workshop identified ways in which this approach could be used by the different groups working on marine commodity within GEDB and initiated collaborations with Princeton University and the University of Pennsylvania a model of global trade in fish-based food products and development of an evolutionary model of fish firm revenue.

## COLLABORATORS AND PARTNERS

GEDB has a wide network of collaborators, national and international. Two key national partners are SRC and the Beijer Institute of Ecological Economics. GEDB also collaborates on issues of marine fisheries and trade dynamics with the Nereus programme of which the universities of British Columbia, Princeton, Duke, and Cambridge are all partners.





Photos by Eny Buchary. Left: Sardines transported from a fishing port in the Bali Strait, Indonesia, 2006. Six years later (right) the same waters are dominated by the less lucrative jelly fish, due to overfishing of sardines used as feed for farmed shrimps exported to Europe and North America. This illustrates the interconnectedness of global markets with local communities and ecosystems.

Other international institutional collaborations include: The Natural Capital Project, The Woods Institute, The Center for Conservation Biology (all at Stanford University, USA); the Ocean Tipping Point group at The National Center for Ecological Analysis and Synthesis (NCEAS), University of California Santa Barbara, USA.

Furthermore, steps were recently taken to create a new overarching platform for research on global dynamics conducted at SRC, the Beijer Institute and the Royal Swedish Academy of Sciences. GEDB is one of the four research initiatives that form the core of this platform, alongside the Planetary Boundaries Network, the Beijer Institute Global Dynamics Programme and the SRC Global Dynamics Theme. The purpose of this platform is to enhance coordination and synergies between the research clusters.

In addition, researchers employed within GEDB collaborate with a large number of scientists at universities across the world.

## COMMUNICATION AND IMPACT

The primary communication strategies for the first two years will be geared towards broad dissemination of key research activities and ongoing research online, and targeted dissemination of scientific outputs to relevant academic communities. A page about the programme is available on the website of the Royal Swedish Academy of Sciences and a logotype and graphics have been developed.

The ambition of GEDB is to provide findings relevant to policy and broader society. Staff members regularly interact with policymakers, for example by contributing to reports, making presentations or participating in direct dialogue. As GEDB

evolves and as policy-relevant scientific results are produced, a communication strategy for GEDB in relation to policy and business will be developed.

## LOOKING AHEAD

Several very promising research efforts are now in progress. These include engagement in the development of the Sustainable Development Goals, which are an extension of the Millennium Development Goals, in collaboration with the Earth Institute at Columbia University. Furthermore, a number of different papers on trade flows in small-scale fisheries are in progress, as well as work to identify keystone actors in seafood production. Exciting and highly innovative work on the role of financial markets in shaping land use, landscapes and ecosystem services is also underway, as well as collaborations with e.g. Stanford University researchers to compile success stories in stewardship of ecosystems services in different places around the world.

A major high-level meeting on globalisation, natural capital, resilience and ecosystem services will be held in May 2015, spearheaded by Gretchen Daily. Furthermore, collaborations are being developed with the NCEAS working group on 'Ocean Tipping Points' to examine tipping points in global ocean ecosystems and the drivers behind these.

Finally, joint work has been initiated with the Stockholm EAT Forum (<http://eatforum.org/>) to explore today's food-related challenges from the combined perspective of health, sustainability and food security.



CARL FOLKE



BEATRICE CRONA

## Staff profiles

Recruitment for GEDB was initiated in spring 2013. Beatrice Crona was appointed Executive Director in May and shortly thereafter the hiring of Early Career researchers began. Short profiles of all long-term staff, outlining their research interests and pursuits, are presented below.

### CARL FOLKE

Carl Folke, Professor and Director of the programme, is founder and Science Director of the Stockholm Resilience Centre and Director of the Beijer Institute of Ecological Economics of the Royal Swedish Academy of Sciences. With a focus on global change and stewardship of ecosystem services his work emphasizes that development is part of and dependent on the resilience of the biosphere and at the same time shaping it from local to global levels. Carl explains why:

“The last decade has seen a shift in perspective toward recognition that it is time to reconnect our own development with the capacity of the Earth’s Biosphere to sustain it. Understanding the new situation of global environmental change and the role of economic dynamics in this context is critical for a prosperous future.”

### BEATRICE CRONA

Executive Director Beatrice Crona has a long interdisciplinary background. She started in marine ecology and ecotoxicology, and since her PhD she has engaged with multiple social sciences such as sociology and political sciences. She has worked both in developing and developed country contexts all over the world and is an expert on social-ecological systems and their dynamics, a concept based on the notion that there are neither pristine natural systems without people nor social systems without nature. Social and ecological systems are not just linked, but truly interconnected and co-evolving.

In her current research, Beatrice is focusing on marine trade and the consumption of marine resources. She studies the flows of resources from production to consumption to understand how wealth is

distributed among the actors in the value chains and the impacts of production on local ecosystems, communities and institutions. Even though global trade is not a new phenomenon, its speed and scale of increase in recent decades is unprecedented, and this has effects on the sustainability of food production and social equity.

“There is a limited understanding of the effects of consumption when the production takes place far away from the consumers”, says Beatrice. “This disconnection between consumers and resource managers, both when it comes to price and supply, makes us vulnerable.”

Some of the many projects Beatrice is involved in include: a study of the consumption and certification of fisheries products in Sweden; a global synthesis of case studies to understand how local cases connect with global seafood trade; and a project in Kenya and Mozambique to investigate the link between marine ecosystem services and human wellbeing, in collaboration with the University of Exeter and local and national policy actors in each country.

### GRETCHEN DAILY

Gretchen Daily, Bing Professor in Environmental Science at Stanford University, will spend two years in Stockholm within GEDB. She is deeply engaged in research around the value of ecosystem services and co-founder of The Natural Capital Project, an international partnership whose goal is to improve well-being of people and the environment by mainstreaming the values of nature into major resource decisions globally.

Taking advantage of the research cluster in Stockholm, Gretchen will spend the coming year trying to bring together and advance



GRETCHEN DAILY



JAMES WILEN



ENY BUCHARY

natural capital and resilience concepts, tools, policy and governance approaches, and apply them in real world decision making. There is great demand for this work in key decision contexts globally such as: national development planning, infrastructure investments and water security for cities. To achieve this, Gretchen will convene workshops with leading young scholars, primarily from Stanford, GEDB and partners in Stockholm, as well as key decision makers in policy and business internationally. At a planned high level research, business and policy event in Stockholm in 2015, actors in the GEDB network will join forces.

“It is easy to underrate the translation of knowledge into action. Scientists often hope that other people take the knowledge and act”, Gretchen Daily says. She explains that this translation works in some sectors, e.g. medicine, economics and technology, because there are strong governmental and business institutions for these areas. In the realm of the environment, however, there is a lack of such institutions with the resources and power to act.

“Co –development with users is important so that we are producing knowledge that is useful. This spectrum of research is also very intellectually rich and challenging”, Gretchen Daily concludes.

## JAMES WILEN

James E. (Jim) Wilen, renowned environmental and natural research economist from University of California Davis, is affiliated as guest professor.

Jim’s research interests span a range of renewable resources such as forestry and energy, but focus particularly and, in recent years on fisheries economics. With the aim of forecasting the effects of untried policy options, he constructs integrated bioeconomic models depicting both biological and economic aspects of fisheries systems. To do this, he utilises knowledge from fields such as biology, law, political science and oceanography to understand how real world fisheries operate in practice.

This means working in a transdisciplinary way with population modellers, ecologists, biologists and staff at policy-making bodies and fisheries management organisations.

Asked what research he hopes to pursue within GEDB, he says: “A number of researchers here in Stockholm are interested in the health and performance of artisanal small-scale fisheries in developing countries. I would like to explore whether what I have learned from work in developed country fisheries is applicable in developing countries.”

According to Jim, fisheries regulations such as ITQs (individually transferable quotas) and other regulatory mechanisms have led to visible successes in developed countries in terms of environmental conservation and economic returns. While these top-down systems are not likely to be easily transferred to developing countries, variants of measures that decentralise decision making to groups of users may have great potential to reduce poverty and increase food security.

## ENY BUCHARY

Eny has a background in resource management and environmental studies, with emphasis on marine ecology and fisheries science. After completing her PhD in 2010 at the University of British Columbia, Canada, she worked ‘on-the-ground’ for two years with an environmental NGO in her native country Indonesia, at the interface between science and policy to help develop fisheries and marine-related policies with stakeholders and policy makers. Eny regards this as the most challenging time so far in her career, trying to apply science in real world decisions and encountering the practical obstacles.

“But the experience helped enrich my thoughts when formulating research questions to take into account things that are considered ‘sticky issues’, such as the challenge of balancing conservation and development goals to eradicate poverty”, she explains.





JOHAN GARS

TRACY VAN HOLT

MARK SANCTUARY

Eny's main concern is the issue of food security, especially in the more vulnerable developing countries, given the rapid population increase and environmental changes. Together with researchers from SRC, she is currently investigating the shift from sardine to jellyfish domination in waters in the Bali Strait in Indonesia using a regime shifts perspective. This work is illustrating the interconnectedness of local fishers and global markets, as Bali Strait sardines are mainly used to make feed, which is exported to the aquaculture industry in South East Asian countries as feed for shrimps, in turn destined for European and North American markets.

During her PhD studies, Eny increasingly realised that studying fisheries resources meant dealing mainly with people and their multi-faceted issues and behaviours, rather than the fish itself. Yet, most fisheries resources management tools developed to date are based on the life history of fish and the utility of fish as seafood products. As Eny points out, "Looking partially at the question you risk missing the whole picture and it's a real opportunity for me in the GEDB programme to work with open-minded researchers who want to tackle problems jointly across disciplines."

## JOHAN GARS

The interaction between the global macroeconomy and environmental issues such as climate change is the focus for GEDB economist Johan Gars. Recruited from the Beijer Institute of Ecological Economics, he is currently developing a framework for a model rooted in planetary boundaries research, together with Beijer economist Gustav Engström and scientists at SRC.

"Natural sciences have identified earth system processes and boundaries crucial for the wellbeing and ultimately the survival of mankind. Several of these boundaries are becoming really relevant as they are approached or even crossed. The economic perspective is important, since many of the processes are driven or affected by economic activity", explains Johan. "The models we seek to develop can play an important part in the efforts to stay

within the boundaries or, if possible, mitigate the consequences if they are crossed."

This research is intended to become a major project in close collaboration with scientists at SRC and other research networks around the world.

In another project with Daniel Spiro of Oslo University, Johan is studying the links between poorly regulated use of renewable resources, for example fish stocks or timber, and trade, in order to understand when trade becomes a negative factor instead of a positive factor for human wellbeing.

In Johan's view, these important global questions are not sufficiently addressed from an economic perspective. He sees a great need to include many more environmental factors in economic models. Equally important, the latest developments within economic theory have not been fully taken advantage of in addressing environmental issues. Johan sees GEDB as a platform for altering that:

"Working within the GEDB programme and with its community of researchers is a unique opportunity to advance this research in close collaboration with natural scientists and social scientists outside the field of economics. The chance of doing so barely exists anywhere else."

## TRACY VAN HOLT

Tracy Van Holt, assistant professor at East Carolina University, joins the programme in January 2014. With training in both ecology and anthropology, she takes an interest in how people respond to environmental change. She looks specifically at how activities on land, such as plantations or industrial development, affect fisheries and the livelihood of fishing communities.

"Around 40% of the world's population live in coastal areas and with the ongoing environmental and climate changes we need to figure





PHOTO: AGNETA SUNDIN



PHOTO: MIKAEL AXELSSON/VAZOTE

SOFIA-KRISTIN KOKINELIS

AGNETA SUNDIN

out strategies for people to adapt”, Tracy explains. “Analysing success stories can give clues as to where it is useful to direct resources for mitigation.”

Tracy has recently looked more closely at a successful management system for fisheries in Chile to identify the factors which make it function or not, for instance when the knowledge of the individual fisherman can compensate for environmental change and when it can not. The next step is to compare this with other places in the world, to draw some general conclusions.

With GEDB director Beatrice Crona, Tracy is bringing her social science tools into a project on how markets affect small-scale fisheries. Another emergent project with GEDB colleague Eny Buchary is studying how palm oil plantations in Indonesia affect fisheries. The research platform of the GEDB network provides many opportunities to link her research to global markets and processes, which has already sparked several ideas to be developed.

## MARK SANCTUARY

Economist Mark Sanctuary joins the programme in February 2014. In September 2013, Mark defended his PhD thesis in environmental and international economics with particular focus on industrial organisation and the study of regulation and policy. He examines policies and institutions, with the aim of making them work better. According to Mark, going back to the foundations is the key to changing unsustainable systems:

“Many political and business policies are based on myths and therefore not very efficient. Good research can help clarify the underlying principles, which hopefully leads to better decisions.”

One example is understanding consumer behaviour in order to design policies leading to more sustainable consumption.

Within GEDB, Mark is looking forward to bringing the disciplines of ecology and economics closer, investigating how ecosystems and the economy interact. Potential research areas include interactions between trade policies and climate policies and how they can reinforce instead of undermine each other, as well as the industrial organisation of the fishing sector and how to increase understanding on improving its sustainability.

## SOFIA-KRISTIN KOKINELIS

Sofia-Kristin Kokinelis is employed jointly by the GEDB and the Beijer Institute of Ecological Economics as Finance and Human Relations administrator. After initiating her studies in Greece, she went on to take a Master’s degree in Business Administration and Economics at Stockholm University. Her previous work in the private sector included positions as marketing coordinator and finance assistant and, for the last six years, as lead accountant.

## AGNETA SUNDIN

Communications officer Agneta Sundin shares her time between GEDB and the Beijer Institute of Ecological Economics. She is also part of the communications team at Stockholm Resilience Centre (SRC), furthering the collaboration and synergies with these institutions at all levels of organisation. Agneta has a background in television news and has studied Sustainable Development and Science Communication at Stockholm University. Her work will include managing and developing the website, editing synthesis papers and reports, and organising seminars, workshops and other events such as the high-level business and policy meeting to be led by Gretchen Daily in May 2015.

# Research achievements

## JOURNAL ARTICLES PUBLISHED:

- Anderies, J.M., C. Folke, B.H. Walker, and E. Ostrom. 2013. Aligning key concepts for global change policy - Robustness, resilience, and sustainability. *Ecology and Society* 18(2):8. <http://dx.doi.org/10.5751/ES-05178-180208>.
- Bucaram, S., J. Wilson White, J. Sanchirico, and J. Wilen. 2013. Behavior of the Galapagos fishing fleet and its consequences for the design of spatial management alternatives for the red spiny lobster fishery. *Ocean and Coastal Management* 78:88-100.
- Manning, D., J.E. Taylor, and J. Wilen. 2013. Market integration and natural resource use in developing countries: A linked agrarian-resource economy in Northern Honduras. *Environment and Development Economics* October:1-23.
- Österblom, H. and C. Folke. 2013. Emergence of global adaptive governance for stewardship of regional marine resources. *Ecology and Society* 18(2):4. <http://dx.doi.org/10.5751/ES-05373-180204>.
- Sandström, A., B. Crona, and Ö. Bodin. 2013. Legitimacy in co-management: The impact of preexisting structures, social networks and governance strategies. *Environmental Policy and Governance* 24(1):60-76 doi: 10.1002/eet.1633.
- Thyresson, M., B. Crona, M. Nyström, M. de la Torre-Castro, and N. Jiddawi. 2013. Tracing value chains to understand effects of trade on coral reef fish in Zanzibar, Tanzania. *Marine Policy* 38:246-256. DOI 10.1016/j.marpol.2012.05.041.
- Westley, F.R., O. Tjornbo, L. Schultz, P. Olsson, C. Folke, B. Crona, and Ö. Bodin. 2013. A theory of transformative agency in linked social-ecological systems. *Ecology and Society* 18(3): 27. <http://dx.doi.org/10.5751/ES-05072-180327>.
- Wilen, J. 2013. The challenges of pro-poor fisheries reform. *Marine Resource Economics* 28:203-220.

## BOOKS:

- Daily, G.C. and C.J. Katz, Jr. 2012. *The Power of Trees*. Trinity University Press, San Antonio, TX. (revision for Japanese translation and printing by Fubaisha Press 2014).
- Liang, Y., S. Li, J. Li, M.W. Feldman, and G.C. Daily. 2014. *Sustainable Livelihoods and Development in Rural China: A Microeconomic Perspective*. Social Sciences Academic Press, Beijing (forthcoming).

## BOOK CHAPTERS:

- Folke, C. Respecting planetary boundaries and reconnecting to the biosphere. In: Prugh, T. (ed.) *State of the World 2013*. WorldWatch Institute, Washington DC, USA, pp. 19-27.
- Wilen, J. and M. Reimer. 2013. Regulated open access and regulated restricted access fisheries. In: Shogren, J. (ed.) *Encyclopedia of Energy, Natural Resource and Environmental Economics*, Elsevier, Oxford.

## ARTICLES IN PRESS:

- Bodin, Ö. C., B.I. Crona, M. Thyresson, A-L. Golz, and M. Tengö. 2013. Conservation success as a function of good alignment (fit) of social and ecological structures and processes. *Conservation Biology*.
- Gars, J. 2014. Förnybara resurser. In: Stavlöt, U. (ed.) *Nationalekonomi för miljöintresserade*. Cambridge University Press, Cambridge, UK, pp. 1-8.

- Jarvis, L.S. and J. Wilen. (forthcoming). The political economy of Chile's nearshore fisheries reform. In: Arbuckle, M and D. Leal (eds.) *Currents of Change: Rights-Based Fisheries Reform for Developing Countries*. World Bank, Washington D.C.
- Mendenhall, C.D., D.S. Karp, C.F.J. Meyer, E.A. Hadly, and G.C. Daily. (forthcoming). Predicting biodiversity change and averting collapse in agricultural landscapes. *Nature*.
- Miller, A.E., B.J. Brosi, K. Magnacca, G.C. Daily, and L. Pejchar. (forthcoming). Pollen carried by native and non-native bees in large-scale forest restoration in Hawaii: implications for pollination. *J Pacific Science*.
- Karp, D.S. and G.C. Daily. (forthcoming). Cascading effects of insectivorous birds and bats in tropical coffee plantations. *Ecology*.
- Reimer, M., J. Abbott, and J. Wilen. (forthcoming). Identifying the multiple margins of rent generation from individual transferable quotas. *Land Economics*.
- Wilen, J. (forthcoming). Tapping the potential of artisanal fisheries: Prospects for rights-based fisheries reform. In: Arbuckle, M. and D. Leal (eds.) *Currents of Change: Rights-Based Fisheries Reform for Developing Countries*. World Bank, Washington D.C.

## ARTICLES UNDER REVIEW:

- Barrett, S., T.M. Lenton, A. Millner, A. Tavoni, M. Anderies, S. Carpenter, T. Chapin, G.C. Daily, P. Ehrlich, C. Folke, V. Galaz, T. Hughes, N. Kautsky, E. Lambin, R. Naylor, K. Nyborg, S. Polasky, M. Scheffer, J. Wilen, A. Xepapadeas, and A. de Zeeuw. Climate engineering reconsidered. (*Science*).
- Betisle, M., C.D. Mendenhall, P.M. Mesén Cabezas, G.C. Daily, and T. Fukami. Tropical deforestation reduces insect-assisted dispersal and causes compositional shifts in nectar microbial communities (*Ecology*).
- Brauman, K.A., D.L. Freyberg, and G.C. Daily. Valuing land-use change for groundwater supply: An ecosystem services assessment for Kona, Hawaii. (*Water Resources Research*).
- Crona, B., T. Daw, W. Swartz, A. Norström, M. Nyström, M. Thyresson, C. Folke, J. Sundberg, H. Österblom, L. Deutsch, and M. Troell. Masked, diluted, drowned out: Global seafood trade weakens signals from marine ecosystems. (*PNAS*).
- Epanchin-Niell, R. and J. Wilen. Individual and cooperative management of invasive species in human-mediated landscapes.
- Falkenmark, M., J. Rockström, C. Folke, T. Allan, L. Gordon, A. Jägerskog, L. Karlberg, M. Kummu, J. Kuylenskierna, M. Lannerstad, J. Lundqvist, M. Meybeck, D. Molden, S. Postel, H. Savenije, U. Svedin, A. Turton, and O. Varis. The unfolding water drama of the Anthropocene – Scanning the horizon on science frontier and research needs. (*Ambio*).
- Galaz, V., H. Österblom, Ö. Bodin, and B. Crona. Global networks and global change-induced tipping points. (*International Environmental Agreements: Politics, Law and Economics*).
- Gould, R.K., N.M. Ardoin, U. Woodside, T. Satterfield, N. Hannahs, and G.C. Daily. The forest has a story: Cultural ecosystem services in Kona, Hawaii. (*Ecology and Society*).
- Gould, R.K., S. Klain, N.M. Ardoin, T. Satterfield, U. Woodside, N. Hannahs, G.C. Daily, and K.M. Chan. A protocol for eliciting nonmaterial values using a cultural services frame. (*Conservation Biology*).
- Jouffray, J.B., M. Nyström, A.V. Norström, I.D. Williams, L.M. Wedding, J.N. Kittinger, and G.J. Williams. Identifying multiple coral reefs regimes and their drivers across the Hawaiian Archipelago. (*Phil. Trans. R. Soc. B*).

- Karp, D.S., S. Judson, G.C. Daily, and E.A. Hadly. Molecular diagnosis of bird-mediated pest control in tropical farmland. (*PLoS One*).
- Kling, D., J. Sanchirico, and J. Wilen. 2014. The economics of managed species relocation.
- Li, C., S. Li, M. Feldman, J. Li, Y. Liang, and G.C. Daily. The impact of a major environment and development relocation policy on rural livelihoods: A case in Shaanxi, China. (Special Issue of *Frontiers in Ecology and the Environment*).
- Ma, S., J.M. Duggan, B. Eichelberger, B. McNally, J. Foster, E. Pepi, M. Conte, G.C. Daily, and G. Ziv. Valuation of ecosystem services to inform military base management: The case of Joint Base Lewis-McChord. (*Frontiers in Ecology and the Environment*).
- Österblom, H. and C. Folke. Globalization, marine regime shifts and the Soviet Union. (*Philosophical Transactions of the Royal Society London, Biological Sciences*).
- Pejchar, L., M. Hooten, and G.C. Daily. Using effects of large-scale forest restoration on native and exotic birds in Hawaii. (*Ecology Letters*).
- Troell, M., R. Naylor, M. Metian, M. Beveridge, P. Tyedmers, C. Folke, H. Österblom, A. de Zeeuw, M. Scheffer, K. Nyborg, S. Barrett, A-S. Crépin, P. Ehrlich, S. Lewin, T. Xepapadeas, S. Polasky, K. Arrow, Å. Gren, N. Kautsky, K-G. Mäler, S. Taylor, and B. Walker. Does aquaculture add resilience to the global food system? (*PNAS*).
- Wilen, James. 2014. Market mechanisms and the determination of crew pay under ITQs.

## IN PREPARATION:

- Crona, B., E. Buchary, T. Daw, A. Khan, K. Viswanathan, D. Squires, W. Swartz, E. Allison, V. Chomo, E. Havice, S. Gelcich, X. Basurto, and M. Troell. Unraveling the dynamics of how international seafood trade interacts with local fisheries systems.
- Crona, B.I., S. Gelcich, and Ö. Bodin. Social capital and leadership: Are they critical drivers of behind outcomes in the Chilean TURF management system.
- Crona, B., M. Petersson et al. Impact of marine trade on small-scale fisheries systems: Outcomes and mediating factors.
- Frishkoff, L.O., G.C. Daily, and E.A. Hadly. Deforestation and the reversal of genetic fortunes: Two Craugastor frogs with alternative habitat affinities show contrasting patterns of genetic structure in response to land-use change.
- Gars, J. and D. Spiro. Uninsurance through trade.
- Gars, J. and G. Engström. Optimal policy under potential regime shifts and resource scarcity in the economics of climate change.
- Karp, D.S., C.D. Mendenhall, E. Callaway, L. Frishkoff, F. Oviedo Brenes, P.R. Ehrlich, and G.C. Daily. The multiple dimensions and tradeoffs of biodiversity.
- Österblom, H., J.-B., Jouffray, B. Crona, and C. Folke. Keystone actors of global seafood production.
- Sandström, A., Ö. Bodin, and B. Crona. How to govern collaborative networks from the top: The case of ecosystem-based management in Sweden.
- Zheng, H., Z. Ouyang, H. Tallis, G.C. Daily et al. Integrating regulating ecosystem services into regional sustainable land use management: A case study in Hainan Island, China.

## SEMINARS AND SYMPOSIUMS:

Research within GEDB is regularly presented by staff members at events such as conferences, workshops and seminars. A selection, based on key note presentations, is presented below.

Daily, G. Stockholm Water Week Symposium, CGIAR, Stockholm, Sweden, 3 September. Keynote presentation: *Mainstreaming ecosystem services into decision-making*.

Daily, G. Sweden Green Building Conference, Stockholm, Sweden, 12 September. Keynote presentation: *Valuing nature in real-world decisions*.

Daily, G. Volvo Research Days, Eskilstuna, Sweden, 18 September. Keynote presentation: *Investing in natural capital for sustainable cities*.

Daily, G. Canopy seminar, Palo Alto, California, 26 September. Keynote presentation: *The power of trees*.

Daily, G. Unilever seminar, Milton Keynes, UK, 8 October. Keynote presentation: *Ecosystem services and resilience: An overview*.

Daily, G. The Humanitas Inaugural Lectureship, Cambridge University, UK, 30 October-6 November. Keynote presentations: *Mainstreaming natural capital into decision-making; Frontiers in research and policy; Nature's competing values, feeding the world and security biodiversity*.

Daily, G. Seminar on Green Economy, Kungl. Skogs- och Lantbruksakademien, Stockholm, Sweden, 7 November. Keynote presentation: *Harmonizing people and nature: A new business model*

Daily, G. US Department of Defence, Washington DC, USA, 13 November. Keynote presentation: *Mainstreaming Natural Capital into Government Agencies*.

Daily, G. Ecosystem services in the forest, how can they be valued? Naturskyddsforeningen, Stockholm, Sweden, 22 November. Keynote presentation: *Valuing Nature in real-world decisions*.

Daily, G. World Wide Fund for Nature, Ulriksdal, Sweden, 28 November. Keynote presentation: *Integrating ecosystem services into conservation*.

Folke, C. Policy dialogue: How can we create wealth within planetary boundaries in a turbulent time?, Stockholm Resilience Centre and Pontus Schultz foundation for a more humane business sector, Stockholm, Sweden, 25 May.

Folke, C. Transformations in a Changing Climate Conference, Oslo, Norway 19-21 June. Keynote speaker: *Reconnecting to the Biosphere*.


Folke, C. Sustainability Science Symposium: Promoting Integration and Cooperation, UNU, IR36, UNESCO, Paris, France, 19 September. Keynote speaker: *Sustainability science: Integrating resilience, adaptability and transformability*.

Folke, C. Our future in the Anthropocene Seminar, Royal Swedish Academy of Sciences, Sweden, 27 November. Organiser.

## OTHER:

Crona, B. and C. Folke. Social-ekologisk resiliens för mänsklig välfärd i Antropocen. One-day workshop with H.R.H Crown Princess Victoria, Stockholm Resilience Centre, Sweden, 21 November.





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