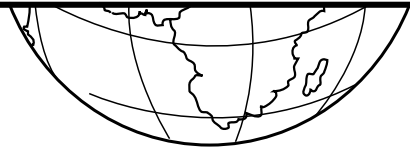


BEIJER Annual Report 2003/2004



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THE BEIJER INTERNATIONAL INSTITUTE OF ECOLOGICAL ECONOMICS

is an international research institute under the auspices of the
Royal Swedish Academy of Sciences.
Since 1991, the Beijer Institute has been an institute of ecological economics.

The major objectives of the Institute are to carry out research and to stimulate cooperation between scientists, university departments, and institutes that are working at the interface of ecology and economics.
Cooperation efforts include research and training,
both nationally as well as internationally.

Major activities of the Beijer Institute are: international research programmes;
covering a broad set of research projects,
and teaching and training in ecological economics.

Core funding is provided by the Kjell and Märta Beijer Foundation.
Funding is also provided by Swedish and international research councils,
foundations and other organizations.



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EDITORIAL

Thanks to all the contributors, who made the 2003/2004 Annual Report possible.

This report is structured as follows. The Director contributes by giving his views on the activities at Beijer this past year.

The Articles section gives insight into a number of issues related to the Institute's activities.

Finally, details about, for example, the Institute's staff, activities and publications are listed in the appendix.

ANNA SJÖSTRÖM
EDITOR

Director's Column

Karl-Göran Mäler, Director, The Beijer Institute

There are a number of international and Swedish awards that have been given to researchers associated with the Beijer Institute during the last three years. They are proofs that the Beijer Institute has been successful in the eyes of external examiners. However, to me, the more important evidence of our success is within the way our research programs have developed. I would like to briefly summarize the way these have converged so as to ultimately give us an integrated picture of the development of the environment of earth. This summary is based on a more detailed survey by Professor Sir Partha Dasgupta and I (Environmental and Resource Economics: Some Recent Developments, Beijer Discussion Papers Series 2004:186).

Environmentalists, ecologists, climatologists warn us for the serious consequences that are expected to follow from our present lifestyles. We will run out of resources (fresh water, fisheries and many ecosystem services). The continued emissions of green house gases will change the climate of earth faster than ever recorded and create havoc with peoples' efforts to achieve higher standards of living.

On the other hand, there are statistical evidence that we are much better off now than ten, twenty, or more years ago. GDP per capita is in most countries much higher now than twenty years ago, expected length of life has gone up, literacy has increased etc. In spite of more than hundreds years of dependence on minerals, their prices do not seem to have increased. (This line of arguments was carried to an absurd limit by Lomborg in *A Skeptical Environmentalist*).

This contradiction can be resolved by relying on two of Beijer Institute's research programs:

- resilience of economic and ecological systems
- inclusive wealth and accounting prices

Our resilience program originated from our biodiversity program in the first years of the Institute. One of the major findings was that biodiversity is important for the resilience of ecosystems, that is of the systems ability to cope with disturbances and eventually return to the original basin

of stability¹. The biodiversity program was continued in our resilience network (run together with University of Florida, Gainesville². The main feature of the analysis of resilience is that there most often are positive feedbacks in the dynamics of ecosystems and these positive feedbacks create thresholds (or bifurcations). If a disturbance pushes the system over a threshold, the system will eventually enter a domain with very different qualitative properties. Sometimes this change is irreversible, sometimes it is reversible but with a hysteresis, implying that it is in general difficult to return to the initial equilibrium. In both cases, the implication is that if we continue to increase the disturbances of ecological systems we will eventually reach points when the systems will flip to a different configuration with a completely different set of ecological services. We would never see any warning of such flips in official statistics such as the national accounts.

The relevant question is, of course, whether such thresholds are common in real systems or whether they just are brainchildren of abstract academic research. Any visit to the homepage of the "Resilience Alliance" (www.resalliance.org) will find a great number of empirical cases when thresholds have been identified. Furthermore, in the very recent publication from IGBP: *Global Change and the Earth System*, eds. W. Steffen et al, Springer, Berlin 2004), also a great number of cases are identified. In local cases such as eutrophication of lakes, the existence thresholds has been known for more than ten years³ and it has even earlier been known in many fisheries⁴. On a global level, the possibility that the Gulf stream will stop carrying heat to northwestern Europe is a real threat.

Thus, it seems that this kind of dynamics (that is dynamics with a positive feedback) may be pervasive. And if that is the case, existing statistics will not tell us anything about major future changes due to our actions today.

The second research program – Inclusive Wealth and Accounting Prices – can be seen an attempt to develop statistics that would reflect the impact on future well-being from actions taken today. There is a special article in this report on IWAP so I do not have to go into any detail. However, the most important aspect is the estimation of accounting prices of all assets of importance for future human well-being (the use of the term inclusive wealth indicates just that, that all important assets are included).

The accounting price of an asset is the present value of the future net benefits from a marginal increase today of the asset. Here, the asset may be the resilience of a system and the accounting price is then the expected present value of an increase in resilience today. Thus, inclusive wealth is a long run measure that reflects possible non-convex dynamics of ecosystems.

Dasgupta and Mäler⁵ showed for an arbitrary (that is not necessarily optimal) economy with constant population that the value of the change in all assets is an indicator of sustainability of the economy. Later, Arrow, Dasgupta, and Mäler⁶ showed that with changing population, the value of the changes in assets per capita (under some conditions) is an indicator of sustainability in an economy with changing population. Some preliminary and very rough estimates of the change in inclusive wealth were published by Dasgupta⁷. These estimates were based on the Hamilton and Clemens calculations of "genuine savings"⁸ Hamilton and Clemens tried to correct the SNA estimates of net gross investment by reclassifying expenditures on education to investments in human capital. By deducting the value of depletion of exhaustible resources and by making some adjustment for global warming. Each of adjustments can be criticized in many ways and of course their use of market prices is not what we would like to see. However, their work was pioneering, and has shown the importance of looking at changes in wealth. They did not consider population changes, and Dasgupta, after having assumed capital output ratios for the countries involved in his study, was able to come up with an estimate of changes in wealth per capita (which is

in all probability an overestimate). His estimates are reproduced in the table below.

Although, these estimates are very rough (they neglect most ecosystem services), the table shows the potential difference between looking at GNP per capita and wealth per capita. Although, GNP per capita is increasing for all countries, with the exception of Sub-Saharan Africa, wealth per capita is going down (with the exception of China). GNP is a measure which to a very large extent is focused on the present (about 70 percent of GNP is current consumption), wealth per capita is much more an indicator of future consumption, and the table shows clearly that the current development cannot be sustainable. The conclusion is obvious: it matters very much which indicator we choose for measuring the performance of the economy. If we are interested in the long run sustainability of the economy, wealth per capita is the right indicator and it shows that South Asia and Sub-Saharan Africa are going to have problems in the future.

Thus, two research programs, that had very few formal connections, have resulted in a new and better picture of what happens in the world. But this is not the end, these same ideas – non-convex dynamics of natural systems and IWAP – applied to rural poverty in the third world gives a new way of understanding why so many communities have been locked into a poverty trap. As rural people in the third world live directly off ecosystem services (we in the North rely as much on them but most often in a much more indirect convoluted way), flips in their ecosystems due to overuse implies a direct loss of wealth and increased poverty.

	I/Y	Population growth	GNP per capita growth	Wealth per capita growth
Bangladesh	-0.013	2.3	1.0	-2.40
India	0.080	2.1	2.3	-0.50
Nepal	-0,024	2.4	1.0	-2.60
Pakistan	0.040	2.9	2.7	-1.70
Sub-Saharan Africa	-0.028	2.7	-0.2	-2.0
China	0.100	1.7	6.7	+1.09

Table: Dasgupta's estimate of changes in wealth per capita.



Beijer Director Karl-Göran Mäler at the Volvo Environment Prize Ceremony. Photo: Volvo.

Thus it seems that our research programs have helped us considerably to understand the interrelations between the human societies and ecosystems and how one can and should measure these interrelations quantitatively. It is successes like this that make a director of a research institute happy!

KARL-GÖRAN MÄLER
DIRECTOR

Footnotes

- ¹ Biodiversity Loss, Economic and Ecological Issues, eds. Perrings, Mäler, Folke, Holling and Jansson, Cambridge University Press, Cambridge 1995. See in particular chapter 2, Biodiversity in the functioning of ecosystems: an ecological synthesis.
- ² See Gunderson and Holling eds. Panarchy – Understanding Transformations in Human and Natural Systems, Island Press, Washington 2002, and Dasgupta and Mäler eds. The Economics of Non-Convex Systems
- ³ See in particular S. Carpenter, Regime Shifts in Lake Ecosystems: Pattern and Variation, International Ecology Institute, Oldendorf/Luhe 2003
- ⁴ known under the term depensation in fishery economics literature
- ⁵ Dasgupta, and Mäler, Net National Product, Wealth, and Social Well-Being, Environment and Development Economics 5(2) 2000
- ⁶ Arrow, Dasgupta, and Mäler, Evaluating Projects and Assessing Sustainable Development in Imperfect Economies, Environmental and Resource Economics, 26(4), 647-685
- ⁷ Dasgupta, Human Well-Being and the Natural Environment, Oxford University Press, Oxford, 2001 (revised and extended edition 2004)
- ⁸ Hamilton and Clemens, Genuine Savings Rates in Developing Countries, World Bank Economic Review, 13(2), 333-356

Chairman's Report to the Board

Traps, Tipping Points and the Emergence of Variety in Social-Ecological Systems

**Steve Carpenter, Chairman, the Beijer Institute
and Professor Centre of Limnology, University of Wisconsin**

Human action often makes the world more uniform. Heterogeneous landscapes are converted to crop monocultures or urban areas. Variable flow regimes are smoothed so that groundwater, rivers and lakes are more readily used by people. A few weedy, aggressive species invade ecosystems and dominate them. Species are eliminated, especially the large and long-lived ones. All these changes simplify ecosystems, reducing the diversity of landscapes, the range of habitats available for animals and plants, and the numbers of species and genomes. Loss of these ecosystems, habitats, species and genes diminishes the variety of resources available to people, and detracts from human livelihoods. Because of the rapid loss of diversity, at every scale from genes to landscapes, scientists sometimes refer to the modern era as the "Homocene".

But does human action always create uniformity? Or do people sometimes adapt to natural variety, or even choose to create variation? And under what conditions do people tend to change ecosystems toward variety or uniformity? Interdisciplinary research on ecosystem management is beginning to suggest some of the answers.

Research on tipping points and punctuated policy change outlines conditions that can create either tips or traps in ecosystem management. Traps are locally stable configurations of social-ecological systems that are inferior with respect to a measure of inclusive, long-term human welfare.

Western Australian agriculture illustrates one kind of trap, according to a recent paper in *Ecology and Society* by Helen Allison and Richard Hobbs. Dynamics of land-use change in this region seem to follow macro-economic trends. However, the social and economic parts of the system are poorly connected to slowly-changing ecological variables such as land cover, soils and water supply. Response to ecological change within the region has involved institutional interventions and technological innovations from outside the region. These responses are associated with resource depletion, environmental pollution and population decline. So far an endogenous adaptive response has not occurred.

Under certain conditions, tipping points emerge and traps are converted to opportunities for greater human welfare. Economist William Brock has explored the conditions under which relatively small efforts can tip a social-ecological system out of a trap, using minimal models. These ideas seem to explain certain dynamics of ecosystem management, according to recent work by Brock together with sociologist Frances Westley and ecologist Marten Scheffer.

Could tipping points and local adaptation lead to diversification of ecosystem management in space and time? If so, theory could suggest pathways for increasing the heterogeneity of landscapes and ecosystems, and thereby lead to greater diversity of species and genes.

The Northern Highland Lake District (Wisconsin, USA) is an arena for exploring ideas about diversification of landscapes and management systems. More than 7,500 lakes are found there. Many of the lakes have property-owners associations which co-manage the lake with the state of Wisconsin. Other lakes are co-managed by the state and the Ojibwe Nation. Still others are managed by the state alone. The diversity of ecological conditions and co-management regimes creates the potential for highly diversified ecosystems. On the other hand, macro-economic patterns, uniform state policies, species invasions, and atmospheric deposition of pollutants could tend to homogenize the lakes on the landscapes. An interdisciplinary team of researchers is working to understand the processes that could create uniformity or variety across this lake-rich region.

Brock and I have found that the optimal management regime for lake fisheries is highly heterogeneous in space, due to the individuality of lake habitats, the spatial pattern of travel costs for fishers, and the variety of preferences among lakeshore property owners. In practice, such adaptive heterogeneity does not occur in fishery management systems for lakes. Instead there is a tendency toward "one-size-fits-all" fisheries policy. Our models have some similarities to those developed for marine fisheries by James Wilen and his colleagues.

In workshops with diverse local people, managers and scientists, we explored the sources of adaptive capacity



Economist William Brock and mathematician Don Ludwig discuss tipping points at a recent workshop.
Photo by: Steve Carpenter.

in the Northern Highlands Lake District (see <http://lakefutures.wisc.edu> and <http://limnology.wisc.edu/ecogame>). Lake Associations, the Ojibwe Nation, and various research institutions in the region are seen as sources of innovation that could build local adaptation, and thereby build ecological heterogeneity. At present, however, the Northern Highlands seems to be approaching a fork in the road. Choices over the next few years will affect the diversity of the landscape for the next few centuries.

Many regions of the world are at the same branch point we found in the remote lake district of Wisconsin. Will local adaptation maintain or build heterogeneous landscapes? Or will large-scale homogenizing processes lead to uniformity? The consequences for long-term human welfare are immense. Interdisciplinary research built on economics, ecology, and related sciences is essential for finding the better paths.

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The Economics of Non-Convex Ecosystems by Dasgupta and Mäler, Eds.

Anne-Sophie Crépin, PhD, Researcher, The Beijer Institute

In spring 2003, I had the opportunity to spend some time together with Partha Dasgupta and Karl-Göran Mäler in their office in Trieste. It was a rather special time because they spent much of it discussing the introduction to the special issue on the economics of non-convex ecosystems that was going to be published in *Environmental and Resource Economics*. The participants to this issue had just received rather positive referee reports and the two editors had the task to write an introduction that would tie the articles together and show how important this issue was.

During my years as a PhD student and later as a researcher at the Beijer Institute I have been much involved in the economics of non-convex systems. About two third of my thesis were devoted to this topic and I submitted one of my articles about multiple species boreal forests to the special issue. Thus I was at least as happy as the editors when it was finally published in vol 26 in December 2003 in *Environmental and Resource Economics*.

One of the aim of this issue was to make the important results available for teaching economists in poor countries because non-convexities in ecosystems seem much more difficult to cope with when you don't have much alternative resources. During spring 2004, Kluwer Academic Publishers reprinted the special issue as a book in the series *The economics of Non-Market Goods and Resources* edited by Ian Bateman. This book is now available at a rather competitive price, which should facilitate its spread among economists even in poor countries.

Why such a fuss about the economics of non-convex ecosystems? Well, to get a complete answer you should most certainly read the book! If you're not yet convinced, let me try to convince you...

Economists have relied on convexity assumptions for a long time because it allows the price system to be an efficient allocation mechanism. Besides some exceptions, we still do not have a clear understanding of resource allocation mechanisms in non-convex environments. In contrast to that ecologists have no specific needs to explore the structure of convex sets. They are instead interested in possible pathways in which ecosystem components interact. It turns out that many empirical studies show that

those pathways in many cases involve non-convexities that reflect positive feedbacks in Human-Nature interactions.

Price mechanism is especially problematic in economic systems with positive feedback processes because using prices only cannot help achieve an efficient decentralised allocation of resources. Efficient mechanisms would instead involve Pigovian taxes and subsidies, quantity controls, social norms, and so forth. (Starrett 1972).

Another consequence of non-convexities in ecosystems concerns the validity of the relationship called the "environmental Kuznets curve". This empirical relationship is often interpreted as a justification to resource degradation as long as they help increase GNP. The reason for that is that the richer people are, the more they seem willing to devote resource to cleaning up their living space. So if resource degradation is reversible, we would just need to get people rich enough to start caring about their environment. This view becomes problematic when nature's non-convexities involve ecological thresholds: crossing such a threshold could be irreversible and we could by no means get the pristine environment back, however rich people would be!

These aspects should be of utter importance to poor people because they do not have as many alternative resources as richer people. If a savannah becomes suddenly wood-dominated, rich people can just send their cattle to another pasture land or get them food in other ways. Poor people are much less mobile and do not have such alternatives.

These issues and many more are discussed in the "Introduction" by Dasgupta and Mäler to *Economics of Non-Convex Ecosystems*. The remaining articles deal with diverse topics all related to the issue of non convexities: In "Scale and Scaling in Ecological and Economic Systems", Chave and Levin discuss certain emergent properties of systems that are governed by processes operating at different scales of activity. Using a rich set of examples they show how natural scientists have tried to provide the micro foundations of the macro properties of natural adaptive systems.

In "Convex relationships in Ecosystems Containing Mixtures of Trees and Grass", Scholes shows how fires

can control the balance between grass and trees and result in two stable savannah configurations: thin tree cover and thick tree cover that cannot support very much grazing.

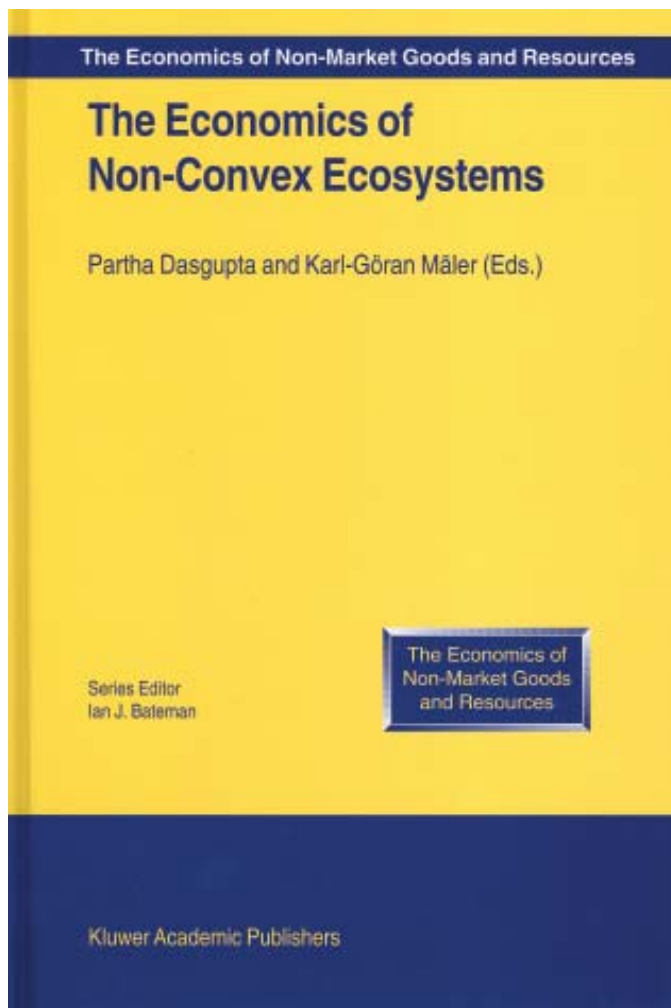
In "Managing Systems with Non-Convex Positive Feedback", Brock and Starrett study the optimal management of dynamic ecosystems exhibiting a destabilizing positive feedback. They use a shallow lake as an example to show the different patterns that can occur. Mäler, Xepapadeas and de Zeeuw go further in "The Economics of Shallow lakes". They also study the open loop Nash equilibrium for a dynamic economic analysis of a shallow lake model and study whether one can introduce optimal management by means of a tax.

In "Multiple Species Boreal Forests – What Faustmann Missed", Crépin studies a problem that is technically much more complicated than the single-variable model of the shallow lake. She shows nonetheless that forests may possess multiple basins of attraction. Thus the optimum

harvesting policy in a multi-species forest can depend on the state at which the forest is found to begin with.

"Evaluating Projects and Assessing Sustainable Development in Imperfect Economies", by Arrow, Dasgupta and Mäler extends the findings in two earlier papers by Dasgupta (2001) and Dasgupta and Mäler (2000). Without presuming that the economy is convex the authors address three related questions. (1) How should accounting prices be estimated? (2) How should policy changes in an imperfect economy be evaluated? (3) How can one check whether intertemporal social welfare will be sustained along a projected economic programme?

I hope this has convinced you that this special issue/book contains important results in economics and natural sciences so you should lose no time and read it.



The Economics of Non-Convex Ecosystems is available at Kluwer Academic Press as hardbound (ISBN 1-4020-1945-9) or paperback (ISBN 1-4020-1864-9) issues.

More information on how to obtain your own copy is available on: www.wkap.nl

Decision Modeling for Reserve Selection and Design

Simon Levin, Professor, Princeton University; Charles ReVelle, Professor, The Johns Hopkins University and Jeffrey Vincent, Professor, University of California, San Diego

In the face of stubborn and increasing threats to the maintenance of biodiversity worldwide, a new discipline, developing decision models for the conservation of biological diversity, has emerged, driven by the necessity to select (cost-effectively) parcels of habitat to preserve endangered flora and fauna. The new discipline adapts the modern mathematical sciences of economic decision-making and dynamical systems to realistic problems of preservation, creating in the process a set of specialized and innovative tools for conservation planners.

The relevant decision models address the challenges of designing nature reserves, selecting parcels to preserve as well as creating corridors between reserves. The focus has been on the important spatial problems of biological conservation, and to the development of decision models for the identification of workable solutions to conservation choices under limited resources. Within this context, the EEE program organized the first international workshop to bring the research community together, complementing the spatial dynamics workshop organized by Jim Wilen. The results were terrific, initiating a multiplicity of conversations that will be continued and developed further in the years to come.

This nascent discipline has already achieved a number of milestones in the last 20 years, including reserve design guidelines, gap analysis and recognition of the problem of complementarity and development of iterative heuristics to identify efficient reserve systems. Primarily, it has relied upon application of mathematical programming to the problem of determining the minimal set of reserves to preserve all endangered populations and to the problem of representing the greatest biodiversity in a reserve set. These approaches have led to the development of models that focus on parcel choice and the design of corridors, and that address uncertainty in species presence/absence data.

While these milestones were significant steps, much critical work remains to be accomplished. Many concepts important to preservation remain to be translated into solvable models, and efficient methods of exact and heuristic solution for these problems, beg for development. From an ecological perspective, it is essential

to extend the traditional static approaches to incorporate realistic dynamics, in order to examine the nonlinearities associated with particular interventions. More sophisticated economic approaches are essential. Better methodology is needed, but equally important is the transfer of such methodology to decision makers, and the emergence of a new generation of scientists - trained both in conservation biology and in the modern mathematics of economic decision making.

This workshop addressed current issues in the design of nature reserves, including both terrestrial and marine systems. It was the first international assembly of those who have been in the forefront of the development of mathematical methods for balancing conservation goals with economic realities. Talks highlighted the accomplishments in the field to date, the availability of mathematical tools, and open challenges (such as the development of dynamical approaches). In particular, they began from a historical perspective, assessing the state of the art, and proceeded to map directions for the future. Beyond the research challenges, attention was directed to how to establish links and communication among scientists, analysts, and decision makers.

Specific questions addressed were: What are the links between different fields, such as conservation biology, landscape ecology, biogeography, ecological modeling, operations research, geographic information science, and environmental economics? How can we enhance and utilize these linkages? What does each discipline bring to the table?

Beyond this, attention was addressed to methodology: What tools are needed? How do we train students for research in this area? How can we more effectively target our research efforts? How can we develop models that practitioners can and will utilize?

The unique mixture of researchers –from theoreticians to practitioners- at the workshop made it possible to begin to address all of these issues. We sincerely hope that this workshop will be just the start in uniting the international research community, and building new bridges between conservation biology and environmental economics. The enthusiasm generated by the workshop offers a good deal of cause for optimism.

Inclusive Wealth and Accounting Prices (IWAP)

Karl-Göran Mäler, Director, The Beijer Institute

In the mid 90's David Pearce and his collaborators (G. Atkinson and K. Hamilton) showed that in an optimal economy, changes in social well-being is measured by the value of the changes in all assets of importance for human well-being. Thus, if we define sustainable development as a development that sustains human well-being, the value of changes in all capital assets is the appropriate indicator. Another way of expressing this is that changes in inclusive wealth (at constant prices) reflect changes in social well-being. The adjective inclusive implies that all capital assets – real capital, natural capital, human capital, have been included in the wealth concept. The parenthesis –at constant prices- is there to remind us that capital gains from changes in the accounting prices should not be included. We are looking for the value of changes in assets and not in the changes in the value of assets.¹

Dasgupta and Mäler² showed that this is true, even in non-optimal economies, if the changes in assets are valued with the correct accounting prices. These accounting prices will in general be different from market prices because of the differences between an optimal and an imperfect economy. In a later publication Arrow, Dasgupta, and Mäler³ gave examples that even small imperfections could give rise to large differences between accounting prices and market prices. Furthermore, Arrow, Dasgupta, and Mäler showed that the relevant accounting prices are also those that should be used in social cost benefit analysis. They also introduced population changes and showed that, under reasonable assumptions, change in social wellbeing is equal to the change in inclusive wealth per capita at constant prices.

The IWAP project is to apply these insights to the Stockholm County. The main objective of the study is to find out the feasibility of estimating inclusive wealth per capita in a region. We are, of course, convinced that it will be feasible but it will be good to have empirical verification of that. But we are also interested to find out whether the development during the past ten years has shown to be sustainable, that is if per capita inclusive wealth at constant prices has increased monotonically.

So far we have collected information on the formation of real man made capital, valued with market prices. We are working on corrections of these estimates, taking into account at least some obvious imperfections such as capital income taxes, environmental externalities etc. We have also collected data to assess the development of human capital in the county. Basically we are following a route rather similar but not identical to the one Jorgenson and Fraumeni⁴ (Jorgenson D. Productivity Vol 1, MIT Press 1995, chapters 6-8) took almost 20 years ago. Jorgenson and Fraumeni assume implicitly that the economy is almost optimal (the only imperfection is due to taxes. Mäler has developed a theoretical model of accumulation of human capital in order to find out the importance of other kind of imperfections for estimating changes in human capital⁵. We hope that estimates of changes in human capital will be available in late fall.

We will during the fall start making an inventory of most important ecological assets in the county and identify their production of ecological services. In particular, we are interested systems with non-convex dynamics so that resilience becomes critical. We are currently developing stochastic models for such systems in order estimate the accounting price of resilience in ecological systems.

The Beijer Institute has together with ICTP taken the initiative to create an international network for researchers working with inclusive wealth – the IWAP network. This network includes a team at CSIRO working on the Goulburn-Broken catchments in South Western Australia, teams working on estimating inclusive wealth in Namibia, Botswana, South Africa, Tanzania, and Ethiopia (and possibly in Colombia). We have now created a webpage at which the different teams can post their results, problems they have experienced and questions to other teams. The webpage also includes bibliographies useful for those interested in inclusive wealth.

Footnotes

¹ This is not complete true. It is true of all resource allocation mechanisms are autonomus, that is, there are no external forces that affect the economic development. Such external forces could be changes in terms of trade or exogenous technical development. Arrow, Dasgupta and Mäler contains a discussion of changes in terms of trade and Dasgupta and Mäler argues that exogenous technical development may not be of importance. For an empirical analysis of technical progress and wealth changes, see Arrow, Dasgupta, Goulder, et.al., Are we consuming too much?, forthcoming Journal of Economic Perspectives (but also available as Beijer Discussion Paper Series 2001:151 (this paper is updated to the 2004 version).

² Dasgupta and Mäler, Net National Product, Wealth, and Social Well-Being, Environment and Development Economics, 2000, 5(2):69-93

³ Arrow, Dasgupta, and Mäler, Evaluating Projects and Assessing Deelopment in Imperfect Economies, Enviromental and Resource Economics, 2003, 26(4), 647-685

⁴ Jorgensen, D. Productivity Vol 1, MIT Press, Boston 1995 and in particular chapters 6-8.

⁵ Mäler, Human Capital, 2004, Beijer Institute



Photo of some the members of the network during the last IWAP meeting in Trieste, April 2004.
Photo: Sara Aniyar.

The IWAP Networking Platform

The Stockholm team has produced an electronic networking platform in the form of a web page. Well needed tool as the IWAP team works in parallel with other teams around the world (Australia, Namibia, Botswana, South Africa, Tanzania and Ethiopia) and we are all trying to get empirical estimations of the accounting prices av inclusive wealth using basically the same theoretical framework

The web page has an area accessible to everyone where finished work is to be announced and distributed. Information is also given on activities forthcoming.

Moreover the web site has another area designed for networking, in that area all members can

1. Post documents they have produced
2. Read and download documents written by others
3. Post comments on the others papers
4. Participate in discussions forum on topics related to our projects
5. Access via links to other information electronically available which is relevant to us
6. Send and receive email or chat
7. Access a data base of the members of the network
8. Information on background papers is also getting available

In view of the distance among us it is meant to be a great communication tool.

<http://www.webforum.com/IWAP>

Awards

The Kenneth Boulding Memorial Award

The Kenneth Boulding Memorial Award is the International Society of Ecological Economics' major award. 2004 year's winners were Partha Dasgupta and Karl-Goran Maler. They are recognised for their contribution to the development of the field of ecological economics. In 2002 Partha Dasgupta and Karl-Göran Mäler were recognised by the wider community for the same reasons when they were awarded the Volvo Environment Prize.



Karl-Göran Mäler and Partha Dasgupta receiving the Volvo Environmental Prize in 2002. Photo by: Volvo.

The Ecological Society of America Sustainability Science Award

The Sustainability Science Award of the Ecological Society of America is given annually to the authors of the peer reviewed paper published in the past five years that makes the greatest contribution to the emerging science of ecosystem and regional sustainability through the integration of ecological and social sciences. One of the most pressing challenges facing humanity is the sustainability of important ecological, social and cultural processes in the face of changes in the forces that shape ecosystems and regions.

Unprecedented directional changes in climate, human population, technology and social and economic institutions alter the structure and functioning of current ecological and social systems. The Sustainability Science Award recognizes the role that science can contribute to addressing these challenges.

The subcommittee has selected Marten Scheffer, Steve Carpenter, Jonathan Foley, Carl Folke, and Brian Walker as the 2004 Sustainability Science Award winners for their paper:

Scheffer, M., S. Carpenter, J. Foley, C. Folke, and B. Walker. 2001. Catastrophic shifts in ecosystems. *Nature*, vol. 413: 591-596.

This review paper was selected because it clearly and succinctly presented the theoretical basis for conditions that would give rise to alternative steady states in ecosystems and evidence from multiple field studies that was consistent with this theory. For each of these studies the authors describe a range of factors that led to loss of resilience prior to the shift to a new state. By focusing on the determinants of resilience rather than the specific triggers that caused the change, it is likely that the results can be generalized more broadly.



Stephen Carpenter, PhD
Beijer Chairman



Carl Folke, PhD
Beijer Research Associate



Brian Walker, Ph.D.
former Beijer Chairman

Spatial/Dynamic Models of Economic and Ecosystem Interaction

James E. Wilen, Professor, Dept of Agriculture and Resource Economics, University of California, Davis

A research program focused on understanding the dynamics of spatial processes that link economic and ecosystems is currently underway, sponsored jointly by the Beijer Institute, FEEM (Fondazione Eni Enrico Mattei), and the Environmental and Ecological Economics (EEE) program at Abdus Salam International Centre for Theoretical Physics (ICTP).

This program is designed to illuminate the spatial dimensions of environmental and resource problems and devise policies for addressing spatio-temporal externalities and market failure. Some examples of important problems that involve spatial/dynamic processes include: spread of invasive species, disease transmission, regulation of porous aquifers, invasion of forest pests, and management of marine species governed by dispersal. Each of these examples involves biophysical mechanisms that can be depicted as dispersal processes, and each example poses important questions about **where**, as well as **when** and **how much**, regulatory effort ought to be introduced. The incorporation of space and dispersal processes is a new area of inquiry for environmental and resource economists, who have traditionally focused on the intertemporal aspects of resources that are assumed to be homogeneous over space.

The program on spatial dynamic models of economic and ecosystem interaction aims to bring economists together with scientists from ecology, physics, systems theory and other disciplines in order to develop new models of human/natural system interaction over space. To launch the program, a small workshop was held in June 2003 at the Royal Swedish Academy of Sciences in Stockholm to discuss opportunities to initiate understanding between disciplines. In April 2004, a larger two and a half day workshop was held in Trieste, Italy at the Abdus Salam International Centre for Theoretical Physics (ICTP). This 2nd Workshop on Spatial Dynamic Models of Economic and Ecosystem Interaction brought together economists, ecologists, applied mathematicians, and other modelers to talk about the mathematics of integrated modeling approaches that marry spatial/dynamic processes with economic optimization and/or other policy analysis frameworks.

The Trieste workshop laid a foundation of common understanding with some overview or tutorial papers to familiarize participants with the biology, economics, and mathematics of spatial/dynamic processes. The first day's lectures began with some general observations on themes in natural resource economics, highlighting conclusions that have been derived from dynamic models that ignore spatial processes. This was followed by a paper discussing alternative mathematical depictions of spatial processes in biological systems, and a paper on boundary and edge effects in models of dispersal. An integrative bioeconomic paper presented some general and specific results on optimal control of spatial/dynamic systems. The second day moved from the general to specific, with a focus on a series of applications of spatial dynamic models, including optimal management and control of nuisance populations, management of marine harvesting in a spatially dispersing system, management of marine reserves under different dispersal mechanisms, and site selection in terrestrial reserve systems. The final half day had papers focusing on the spatial/dynamic control of invading pests in forest systems and spatial/dynamic models of epidemics, followed by a wrap up.

In addition to formal papers presented in workshop sessions, participants had ample opportunity to interact in informal discussions about spatial/dynamic modeling issues and to build potential collaborative relationships. The discussions and presentations of work in progress by leading researchers in the field led to several broad conclusions. First, it is apparent that, while there has been a considerable amount of descriptive work done with models of spatial processes in physical and ecological systems, there has been less done that embeds spatial processes in general optimization frameworks that answer questions about when and where actions should be taken from a management perspective. Second, few disciplines outside of economics depict human users in ways that illuminate how incentives and institutions influence environmental and resource misuse over space and time, and how, as a consequence, human behavior can be modified to influence spatial/dynamic systems in positive ways.

The 2nd Workshop on Spatial Dynamic Models of Economic and Ecosystem Interaction brought leading spatial modelers from ecology, mathematics, epidemiology and entomology together with environmental/natural resource economists for the first time. Common characteristics of participants were an interest in and willingness to engage in multidisciplinary research on important environmental issues, and a familiarity with mathematics necessary to describe dispersal processes and spatial/dynamic mechanisms.

All agreed, after being exposed to progress in various individual disciplines, that much opportunity exists to collaborate on integrated modeling in multidisciplinary settings. There were fruitful discussions of integrative modeling strategies to better understand spatial/dynamic environmental problems, to highlight spatial and temporal processes that affect ecosystem services, and to illuminate how various externalities that manifest themselves in spatial/dynamics processes might be mitigated.



Participants at the ICTP workshop 15-21 April 2004. Photo by: ICTP.

More Awards during the year

Dr A.H. Heineken Prize for Environmental Sciences 2004

The Royal Netherlands Academy of Arts and Sciences has awarded the Dr A.H. Heineken Prize for Environmental Sciences 2004 to Professor Simon A. Levin, Department of Ecology and Evolutionary Biology, Princeton University and former Beijer Chairman for:

"his insights into the effects of scale on ecosystems"

Sustainable Coastal Zone Management (SUCOZOMA)

Tore Söderqvist, Associated Professor and Researcher, The Beijer Institute

SUCOZOMA is a research programme funded by the Swedish Foundation for Strategic Environmental Research (MISTRA). It was launched in 1997, the first phase was completed and evaluated in 2000, and the second and last phase ends on 31 December, 2004. The Beijer Institute participates in SUCOZOMA together with Göteborg University, Kristineberg Marine Research Station, Stockholm University and the Swedish National Board of Fisheries. See www.sucozoma.tmbi.gu.se for a detailed presentation of the whole research programme.

The Beijer Institute's research work in SUCOZOMA's first phase has been presented in earlier annual reports. See also the annual report for 2002-03 for an article about the multidisciplinary scientific conference *Rights and Duties in the Coastal Zone*, organized by the Beijer Institute, SUCOZOMA and MISTRA at the Royal Swedish Academy of Sciences on 12-14 June, 2003.

The focus of the Institute's research project in the second phase of SUCOZOMA is economic valuation of coastal ecosystem services, see Beijer Discussion Paper Series No. 183 by Söderqvist et al for an overview. Its main objectives is to provide economic information that are useful for building policies and institutions for coastal zone use, and, more specifically, to improve the understanding of what trade-offs between different coastal zone uses are economically motivated, given due account to the economic significance of coastal ecosystems. The Institute's work in SUCOZOMA is coordinated with the research in MARBIPP and FISHCASE.

The research work involves the following items:

1. Economic valuation of Swedish commercial and recreational fisheries: a case study on the benefits of improved recreational fisheries in the Stockholm Archipelago. The field work for the case study was carried

out in 2002 and 2003. Data have been analyzed in 2004 and preliminary results will be available in the end of 2004.

2. Economic valuation of coastal habitats sustaining fisheries. By combining results from economic valuations of improved fisheries and ecological knowledge on how habitats support fisheries, policies/institutions affecting coastal habitats can be economically assessed to a greater extent. One case study is recreational fisheries of pike and perch and habitats sustaining pike and perch populations in parts of the Stockholm Archipelago. The data obtained in the case study mentioned in item #1 allow an estimation of the economic value of an increased catch per effort for pike and perch. This information can in turn be used for valuing changes in the recruitment capacity of habitats. Another case study concerns the effects and costs of measures for improving sea trout habitats in Swedish watercourses. Such data allow the estimation of a cost per extra sea trout produced thanks to the habitat improvements. Preliminary results are available in Beijer Discussion Paper Series No. 184 by Sara Sundberg.

3. Economic valuation of improved coastal water quality; a case study for the case of the West Coast of Sweden. This study is carried out in cooperation with the Department of Economics at Göteborg University, and will complement the results obtained in the first phase of SUCOZOMA about the benefits of an improved water quality in the Stockholm Archipelago. Results obtained so far are available in Björn Olsson's licentiate thesis "Two essays on valuation of marine resources – applications to Sweden", Department of Economics, Göteborg University.

The project team at the Beijer Institute in the period of 2003-04 was Tore Söderqvist (project leader), Åsa Soutukorva (research assistant) and Sara Sundberg (research assistant).

Marine Biodiversity, Patterns and Processes (MARBIPP)

Max Troell, Associated Professor and Researcher, The Beijer Institute

Marine biodiversity, patterns and processes (MARBIPP), a scientific program with the general objective to provide increased knowledge and end-user directed guidelines for the management of coastal marine biodiversity in Swedish waters. As a more detailed overview of the program was presented in the Beijer annual report 2002, only a summary of a recent submitted paper by the Beijer group is presented here. More information about the overall program can be obtained from the program website: www.marbipp.tmbi.gu.se

The overall objective of the work conducted by the Beijer group is to gain increased understanding of the functional properties of the biodiversity in different marine biotopes by investigating how these properties contribute to the provision of ecosystem goods and services to society. Further, by estimating the economic value of some goods and services, the economic significance of the marine biotopes and the relation to their biodiversity can be assessed. Collaborating partners in this work are Prof. Nils Kautsky and Dr. Patrik Rönnbäck, Department of Systems Ecology, Stockholm University; and Prof. Leif Pihl, Marine Ecology, Kristineberg Marine Research Station, Gothenburg University. Involved from The Beijer Institute are Dr. Max Troell, Dr. Tore Söderqvist and Sandra Lerda.

Since the 1970's there has been a doubling of nutrient input (nitrogen) to Scandinavian waters (Skagerrak, Kattegat and the Baltic Sea), resulting in eutrophication effects along the Swedish coast. Eutrophication has the potential to impact negatively on ecosystem structure and

function. Increased occurrence of filamentous algae on shallow soft bottoms along the Swedish West Coast, suggested to represent a symptom of large-scale eutrophication, is a phenomenon first reported in the late 1970s and has since escalated. Thus, soft bottoms with no or only patchy macrophyte vegetation are increasingly being transformed into systems dominated by filamentous algae. Recent findings from both terrestrial and aquatic systems suggest that ecosystems can undergo regime shifts where they suddenly change from one state into another. This can have important implications for formulation of management strategies, as undesired system characteristics (from a human perspective) with high resistance to restoration efforts may develop.

A study conducted by the Beijer group analyses ecological and economic consequences from increased filamentous algae cover on shallow soft bottoms along the Swedish West Coast. It is suggested that this emergent widespread phenomenon represents a regime shift caused by long-term increase in coastal nutrient conditions. A successive increase in the sediment nutrient pool has undermined the resilience of these shallow systems. After a regime shift, self-generation evolves as an emergent property keeping the system locked in a high-density algae state. The structural and functional characteristics of the new system state differ significantly from the original state, resulting in less valuable ecosystem goods and services being generated to the society. These include reduced capacity for mitigating further coastal eutrophication, reduced habitat quality for commercial fishery species and the loss of aesthetic and recreational values.

Abalone and seaweed farming in South Africa

Max Troell, Associated Professor and Researcher, The Beijer Institute

Researcher at the Beijer Institute is since 2001 coordinating a Sida/SAREC project in South Africa (SA). It is funded within a bilateral South Africa Programme and is a joint effort together with scientists and students from

University of Cape Town, University of the Western Cape and Marine & Coastal Management, Cape Town. The overall aim is to facilitate for integration with seaweeds in abalone farming and to analyze how the abalone industry

is interlinked with coastal ecosystem, natural kelp beds and the national seaweed harvest industry.

The animal

The abalone joins other snails, whelks and sea slugs in the class Gastropoda. Members of this class have usually one shell, as opposed to clams with two. Abalones are herbivores and feed on seaweeds and in SA the name abalone is usually associated with one species: *Haliotis midae*, (called "perlemoen"). The present abalone fishery in SA is based on subtidal stocks and since 1986, the fishery has been regulated by a strict quota system. The fishery is further managed by a minimum legal sizes and a limited fishing season. However, the combined effect of ecological changes and escalations in catches by recreational divers and intensive poaching, has in recent years contributed to a significant resource decline. It has been predicted that within the next five years the wild fishery will be commercially extinct. This trend is not only seen in SA but also in other countries with natural abalone populations.

Abalone farming

Abalone farming in SA has developed rapidly and global overexploitations of wild abalone stocks and high market price have been main drivers for its development globally. However, access to suitable coastal land and the dependence on wild harvest of kelp for feed may constitute a restriction for its further development. The large brown kelp *Eklonia maxima* has for long time been harvested along SA coasts for alginate production and the increased demand for kelp by the abalone industry has increased harvesting efforts. Now kelp harvest has reached maximum sustainable levels within many areas, implying that any further increased harvest may impact negatively on kelp ecosystem functions. This situation is not unique for SA as discussions on potential limitation of Kelp supply has emerged also in other abalone farming countries and also

in countries where the industry is anticipated to develop rapidly. Thus, if no other alternatives for feed production are being utilised to a greater extent this may constitute a bottle-neck for increased abalone production in SA. The seaweed industry and the abalone industry bring important economic benefits to SA as they both generate export earning, boost local and regional economies and provide employment among previously disadvantageous coastal communities. For a continued growth of the SA abalone industry, being sustainable both out from economic and ecological perspectives, there is a need to identify and analyze the inter-linkages between not only these two industries, but also with SA coastal ecosystems in general.

The research

The research carried out within the project has focused on seaweed cultivation in integrated systems at two Western Cape abalone farms. Parameters affecting seaweed and abalone growth has been monitored in different experimental set-ups. Besides experimental work also two types of open-ended questionnaires have been used, with the aim to gather information from both abalone farmers and seaweed concession holders. The results have shown upon possibilities for on farm seaweed production, either conducted in flow-through systems or as re-circulating systems. The seaweed benefits from nutrient enrichment in abalone effluent water and the type of seaweeds cultivated, e.g. red and green seaweeds, increase abalone growth when added as feed together with kelp. Specific benefits from re-circulation are besides seaweed production: increased abalone growth from increase in water temperature, decreased pumping costs and facilitation for closing incoming water during events with toxic algae blooms and oil spill in the sea. An overview study of SA abalone industry has identified both potential negative impacts on coastal ecosystems as well as socioeconomic benefits being generated to interlinked industries.



Abalone *H. midae* approaching commercial size ("cocktail" size) after about 2 years of tank culture. Photo by: Max Troell.



Feeding of abalone with kelp *Eklonia Maxima* (I&J abalone farm, South Africa). Photo by: Max Troell.

Not Really a Recipe for Cooking *Rödspätta*¹

Sandra Lerda, Research Assistant, The Beijer Institute

Under FISHCASE and MARBIPP projects² we are studying how changes in habitats, through their effects on fish population, affect fisheries. The FISHCASE project has an ecological part that is studying and modeling how some fish species depend on habitats at the Swedish west coast and how changes in habitats affect fish populations. The economic part of FISHCASE attempts to estimate the economic value associated to habitat change. Four fish species with different degrees of habitat dependence have been selected for analysis, namely plaice (*Pleuronectes platessa*), cod (*Gadus morhua*), eel (*Anguilla anguilla*) and sea trout (*Salmo trutta*). The first two cases we have been working with during 2003 and 2004 are the plaice and the eel cases.

Plaice is one of the most economically important flatfish. It is a fish whose stock has been harvested outside safe biological limits (according to recent estimates from the International Council for the Exploration of the Sea-ICES) and whose reproduction is seriously dependent on the habitat available for young individuals to grow and become part of the recruitment. Juvenile plaice have spatially restricted nursery grounds located in shallow soft bottom areas. Plaice larvae settle during the spring on the nursery grounds in the Swedish west coast and stay in these shallow areas until the autumn, when they move into deeper waters for spending the winter. After 2 years, these 0-group juvenile fish are recruited to the adult population. Swedish nursery grounds contribute with 77% of plaice recruitment in Kattegat and Skagerrak, but in some areas in the west coast of Sweden, algae are covering some of these nursery grounds³. Preliminary studies show that if the algae free coastal areas are reduced, plaice recruitment would decrease and that would affect plaice production.

It is often difficult to isolate and quantify the effects of a perturbation in a habitat on the fish population that depends on that particular habitat. In the particular case of plaice, Pihl, Modin and Wennhage⁴ have studied and modeled how the occurrence of filamentous green algae has affected the recruitment of plaice from shallow nurseries in the Swedish Skagerrak archipelago. They have constructed a numerical model to capture the quantitative effect of algal mats on plaice population. They found that

plaice recruitment is positively related to the size of the nursery and the settlement density, and negatively related to the amount of the area that is covered by algae.

One way to value the contribution of the ecosystem to plaice production is to calculate the change in producer and consumer surplus resulting from a change in habitat availability. That is what we are doing. We are using the Pihl/Modin/Wennhage model of how habitat deterioration affects plaice population, and then we are estimating cost functions for the plaice fishery in the West Coast of Sweden, and incorporating them into a bioeconomic model of plaice fisheries. Another step that we might take is to look at the eutrophication process and possible threshold effects.

In the case of eel, the connection between habitat quality and stock is not so clear. Eel spawns in the Sargasso Sea, to the south of Bermuda, and the Gulf Stream brings the larvae northeast. Once the larvae arrive at European coastal areas, they transform into glass eels. Glass eels gather in rivers and estuaries and swim upstream into inland waters after rivers temperatures go up (over 10°C). Glass eels transform then into yellow eels that spend between 2 and 20 years in rivers, growing up and transforming into silver eels. The silver eels return then to the Atlantic Ocean to spawn. During the 80s, the number of glass eels entering European rivers declined to 10% of the previous normal levels, and recently this number is down to 1%. There is only one single eel stock and eels spawn only once in their lifetime. Scientists suspect that exploitation and other anthropogenic factors (including habitat loss) explain the decrease in stocks to its historical minimum in recent years.

In Sweden, eel catches occur both in the east and the west coast. In this project we will attempt to value how the declining of stocks affects this traditional fishery.

Anyway, even if what we are doing in FISHCASE has little to do with cooking fish, one should not despise the nutritional value of both plaice and eel, two outstanding sources of omega-3. As an example, try marinating some plaice filets in limejuice, salt and garlic for some hours, then passing them through some wheat flour and frying them in olive oil. Just delicious!



Picture of rödspätta, Plaice (*Pleuronectes platessa*).

A model of plaice fisheries

Preliminary studies show that plaice recruitment decreases in presence of algae. Our main research questions are: a) how does this habitat quality problem affect plaice population and the fishery? and b) how to value the habitat change in terms of fish production?

In our model, the contribution of the ecosystem to plaice production is defined as the change in welfare (producer and consumer surplus) derived from the change in habitat quality.

Our problem is then to maximize the net social benefits from plaice fishery (which in this case we assume equal to the net private benefits). We have a very simple formulation for the benefits and are attempting to estimate the costs of the plaice industry.

The value of the change in habitat is finally calculated by comparing the net benefits under two different situations with different levels of habitat degradation.

Endnotes

¹ Rödspätta is the Swedish name for the flatfish plaice.

² The FISHCASE coordinator at Beijer is Tore Söderqvist (thanks for your comments, Tore!), while the ones responsible for the MARBIPP project at the Institute are Patrik Rönnbäck and Max Troell.

³ Håkan Wennhage, Leif Pihl and Johan Stål, "Distribution and quality of plaice (*Pleuronectes platessa*) nursery grounds on the Swedish west coast", manuscript, 2003.

⁴ Leif Pihl, Johan Modin and Håkan Wennhage, "Relating plaice recruitment to deteriorating habitat quality: effects of macroalgal blooms in coastal nursery grounds", manuscript, 2003.

Efficient Use of Local Natural Resources - Individual Actions and Cooperation in a Changing World

Ingela Ternström, PhD, Researcher, The Beijer Institute

The objective of this project is to improve the understanding of what makes cooperation among the users of a common-pool resource function or fail, especially in a changing world. Furthermore, I want to translate this understanding into a practically useful tool for predicting the breakdown of such cooperation. The focus of my research is on cooperation itself and on what controls the individuals' actions, rather than on the outcome of the participants' cooperative efforts. The data I use is collected in farmer managed irrigation systems in Nepal.

What makes some common-pool resources management systems able to cope with change better than others? Which disturbances are more likely to cause conflicts among users? Can characteristics be identified that make some common-pool resource management systems more sensitive to these disturbances than others? These questions have given the direction of the continued analysis of the data from the first ten irrigation systems. The questions are crucial to the understanding and furthering of local management of natural resources, especially in a time of rapid change

and globalization, and the data has given me some interesting answers to them.

By looking closely at how the users of these ten irrigation systems have adapted to different types of disturbances I was able to trace the processes they triggered and the actions that were taken by the users to counter their negative effects. The disturbances selected were the most common ones: floods and landslides, immigration or inclusion of new users, and offer and implementation of major external support. The actions they triggered turned out to consist mainly of decision-making, physical reconstruction, rule changes, conflict management and change of leadership or institutions. I also found that many of these activities were undertaken by one or a few key individuals, the leaders. The result is quite interesting, as these are actions that are regularly dealt with in other organisations of human beings, such as business enterprises, and are well studied in other literature. It is not farfetched to think that the characteristics that make common-pool resource management systems able to adapt to change are similar to those that make for example business organisations successful. My next step here will



Photo over the green fields in Nepal. Photo by: Ingela Ternström

be a more systematic comparison of common-pool resource management systems and business organisations.

Furthermore, the main threats to the sustainability of these irrigation systems were disturbances that changed the composition of individuals in the group of users, especially if it made the group more heterogeneous, and those that directly affected the institutional structure, such as a forced change of rules. The least threatening disturbance, at least in the long run, seemed to be physical damages to the irrigation system, caused by floods and landslides. The results of this analysis were presented and discussed at the "Workshop on the Workshop 3" conference organised by the Workshop in Political Theory and Policy Analysis at Indiana University. There, I also took the opportunity to, together with Per Olsson at the Stockholm University, organise a lunch meeting to discuss the issues of leaders and other key individuals with others interested in these topics. This initiative is intended to result in a new research network. The data was also studied with the purpose of finding out how changes in the property rights system, caused by for example changes in laws or government policies, have affected the institutional structure of the irrigation systems. The results of this analysis were presented at the conference "Property Rights to Land and Natural Resources: Institutions, Politics and Culture" at the Agricultural University of Norway, where I was invited to talk about institutions.

During this year, except for further analyses on previously collected data, the focus has been on collecting new data.

However, the political situation in Nepal has made data collection a challenging task. This has slowed down the process, but not stopped it and I am expecting an exciting set of new data later this year. The new data will complement the old data by giving information on various aspects of leadership and leaders in the irrigation systems previously examined. This information will make it possible to understand more of how and why leadership and individual leaders were so strongly connected to cooperation in the analysis of the old data. To collect the additional information, all old irrigation systems had to be revisited; unfortunately this area has become one of the least recommendable to visit and has periodically been totally closed to access because of the political situation.

A shortcoming not only in my data, but in much of the empirical literature on common pool resources is that there is little analysis of resource management systems that have failed. Therefore, I wanted to collect data from non-functional irrigation systems. This turned out to be an impossible task. Since irrigation is so crucial to farming in Nepal, the farmers tend to make it work, almost no matter what obstacles are in their way. Basically the only instance when irrigations systems fail completely is when the land they irrigate is totally washed away by floods or landslides. Thus, the target for the new data had to be changed to irrigation systems that function poorly. The first step is to identify 25 such systems and collect some initial information about them. Among these, the ten "worst cases" will be selected and data will be collected by using the same, but extended, questionnaire as in the original ten irrigation systems.



Photo over irrigation systems in Nepal. Photo by: Ingela Ternström.

Environment and Development Economics

Charles Perrings, Editor, EDE

The journal's performance during the last year is recorded in tables 1 to 4. In summary, however, several developments are worth noting:

The journal has moved from a four-issue to a six-issue format, so increasing the number of papers we have been able to include. This has also enabled us to reduce the backlog of accepted papers, and to begin to plan future policy fora.

The journal now has an impact factor. In the first year of listing it is not as high as I would like, but I would expect it to improve from this point on.

The appointment of Tasos Xepapadeas as editor from 2005 has been approved by Cambridge University Press.

For the first time there are more submissions from the rest of the world than we have from Europe and North America. Indeed, submissions from South Asia are currently running ahead of submissions from either Europe or North America. Submissions from Africa, China, South East Asia and Latin America are still under-represented in the pages of the journal, but are moving in the right direction. Less encouraging is the fact that submissions from Europe and Australasia are declining.

Overview

My second five-year term as editor at EDE comes to an end in 2005 and I will be stepping down. The process of creating and developing the journal has been an extremely interesting one, and I am indebted to Karl-Goran Maler and the Beijer Institute for the unwavering support they have offered from the outset. During its first ten years the journal has come to acquire a distinctive place in the array of journals reporting work in ecological, environmental and resource economics. For many authors – and especially for authors in developing countries – it is now the first-choice journal for publishing their research findings. This year, for the first time, submissions from developing countries are running ahead of submissions from developed countries. Since one of the main aims of the journal was to foster research capability in this area in developing countries, this is gratifying.

It is also a tribute to the efforts that Beijer has made in capacity building on a number of fronts. Many of the papers submitted to the journal have come through the

Beijer research seminars, through SANDEE or RANESA seminars supported by Beijer, or through the Environment and Development Conferences sponsored by Beijer. A special issue on property rights, to be published in 2005, is the product of the Beijer programme based at ICTP Trieste.

During my time as editor I have been assisted by a number of associates whose work has been essential to the running of the journal: Scott Barrett, Ed Barbier, Ramon Lopez, Germano Mwabu, Bernardo Mueller, Kanchan Chopra, Rashid Hassan, Jeff Vincent, Erwin Bulte and Bruce Larson. I am extremely indebted to all of them. All have unstintingly contributed their time and expertise, and have made huge efforts to help improve the papers for which they have been responsible. In addition, a number of guest editors have also made important contributions: among them Jeff Vincent (before he joined as an associate editor), Ujjayant Chakravorty, Tim Swanson, John McPeak and Chris Barrett.

I have also been supported by an editorial board that has frequently offered much more than anyone could reasonably ask. All members of the board have contributed at one time or another, but Karl-Goran Maler, Partha Dasgupta, Scott Barrett and Kenneth Arrow have been especially important to the development of the journal. I am indebted to them.

Editorial matters

Tasos Xepapadeas has been approved by the Syndics of Cambridge University Press as the next editor of EDE. He will take over in mid 2005, on a timetable yet to be agreed between us. Erwin Bulte and Bruce Larson joined the journal as associate editors. Jeff Vincent will not be renewing his commitment as an associate editor. His contribution to the journal during his term was very substantial and will be sorely missed. The Assistant Editor, Amy Swann, returned to London, and has been replaced by Miles Lambert.

It will be important to secure the resources to establish an editorial office in Crete to support Tasos Xepapadeas. In order to ensure a seamless transition, the editorial office at York will remain open until the Crete office is fully functional.

Regional distribution of submitted manuscripts

The cumulative distribution of submitted manuscripts is indicated in Table 1. If this is compared with the distribution of submitted manuscripts in the most recent period (Table 2) it will be seen that the current share of submissions from developing regions is ahead of the cumulative share for all regions except Africa. This is particularly marked for Asia in which the current share is 50% above the cumulative share. This trend is encouraging and I hope that it will continue in the future. See Table 1 Status of manuscripts received March 1st 1995 to July 28th 2004 by geographical area

In most cases the absolute numbers are still low. The journal is still reliant on a few regions for the bulk of submissions. In one of those regions, western Europe, the numbers of submissions are declining. It may be worth targeting this as a region from which to encourage submissions – perhaps by including development symposia in the EAERE meetings. This may be something that Tasos Xepapadeas might like to consider. See Table 2 Growth and geographical distribution of submissions

Rejection rates

Since one of the aims of the journal is capacity building it has a policy of passing more papers through a first filter than many comparable journals in the field. While the aim is to ensure that papers finally accepted for publication would be comparable to those in the best journals, it is accepted that this may involve more frequent and intensive revisions than in those journals. Rejection rates are accordingly calculated to include withdrawals/failures to complete revision. This is because the constructive review policy pursued by the journal frequently produces quite long and challenging revision requirements that authors may have such difficulty in addressing that they fail to complete. Cumulative and current rejection rates by geographical region are reported in tables 3 and 4. See Table 3 Cumulative rejection (rejection + withdrawal) rate

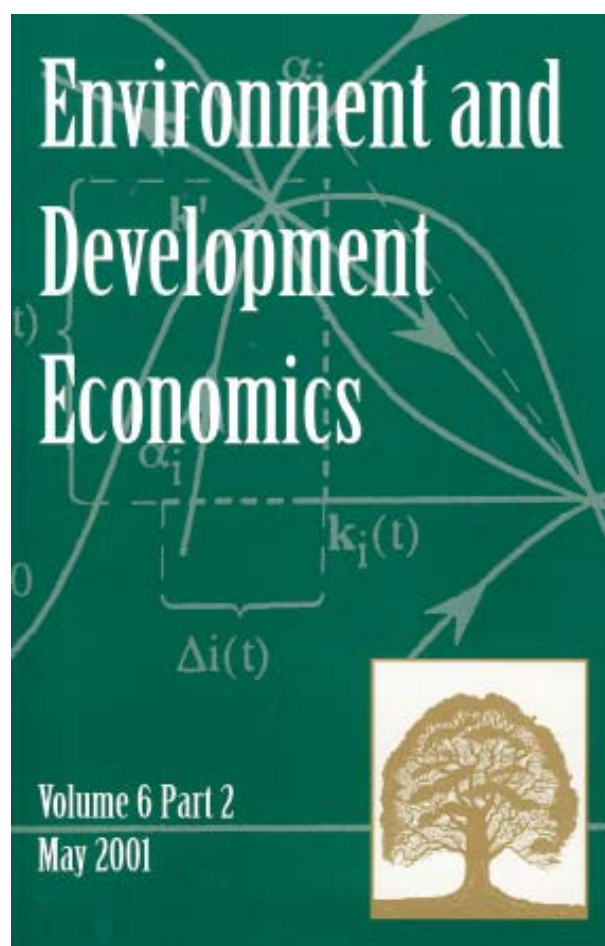
Table 4 reports rejection rates by region since 1999. These have risen over the period from 58 to 71 %. In part this is driven by the increasing number of submissions from certain regions of the world, South Asia in particular, but it also reflects the fact that as submissions have increased

the journal has had to be more selective. The expansion in the number of issues per volume from four to six will make it possible to include more papers, but it is our intention to ensure that there is no diminution in the quality of accepted papers.

See Table 4 Geographical rejection (rejection + withdrawal) rate as a % figure of total submissions less those pending at the end of the calendar year.

Notes

Data do not include policy fora contributions or book reviews.



	Africa	Asia	Latin America	UK	West Europe	East Europe	Australia and NZ	Middle East	USA and Canada	Total
Submitted	46	149	32	50	171	8	33	13	252	754
Accepted	15	40	7	16	52	1	8	2	106	247
Rejected	20	67	17	21	82	5	20	8	98	338
Withdrawn	6	17	4	8	11	1	3	1	18	69
Pending	5	25	4	5	26	1	2	2	30	100

Table 1 Status of manuscripts received March 1st 1995 to July 28th 2004 by geographical area

	Africa	Asia	South America	UK	West Europe	East Europe	Australia and NZ	Middle East	USA and Canada	Total
1995	5	11	8	6	10	0	0	0	18	58
1996	5	5	1	3	11	0	3	1	22	51
1997	3	7	1	4	19	2	4	0	35	75
1998	3	13	3	8	26	0	4	1	29	87
1999	1	7	3	5	9	2	3	1	28	59
2000	9	15	5	7	21	0	4	4	21	86
2001	1	26	4	5	19	0	3	1	28	87
2002	7	13	3	7	21	1	8	1	29	90
2003	8	24	2	4	27	1	2	1	28	97
2004*	3	20	3	1	12	2	2	3	18	64

Table 2 Growth and geographical distribution of submissions

	Africa	Asia	Latin America	UK	West Europe	East Europe	Australia and NZ	Middle East	USA and Canada	Total
Overall rejection rate	43	44	53	42	47	62	60	61	38	44

Table 3 Cumulative rejection (rejection + withdrawal) rate

	Africa	Asia	Latin America	UK	West Europe	East Europe	Australia and NZ	Middle East	USA and Canada	Total
1999	100	71	99	80	44	100	100	100	42	58
2000	22	53	40	28	66	0	25	50	42	46
2001	100	49	50	60	57	0	66	100	46	52
2002	42	53	33	56	52	100	74	0	44	50
2003	57	81	50	100	87	100	50	100	62	71

Table 4 Geographical rejection (rejection + withdrawal) rate as a % figure of total submissions less those pending at the end of the calendar year.

Members of the Royal Society

Sir Partha Dasgupta and Jane Lubchenco

Professor Sir Partha Dasgupta FBA was elected a Fellow of the Royal Society, United Kingdom on May 28th 2004. Partha is, as far as we know, the first economist, maybe even the first social scientist ever to be elected a member of the UK National Academy of Science. The motivation behind the election is partly referring to his transdisciplinary interest. He has sought cooperation with experts on nutrition and medicine, ecologists, anthropologists and others in order to enable him to make more relevant economic studies. Partha was the Chairman of the Board of the Beijer International Institute for six years and during this period he got to know a number of distinguished natural scientists and social scientists. This led to close and intensive interdisciplinary cooperation, something that has characterized the Institute ever since. Partha has been very influential in forming the research agenda of the Beijer Institute and he has been very active in the various research programmes over the years. We are of course proud and delighted that our close colleague has received this recognition. Partly we also take it as a recognition of the work of the Institute.

We are also very pleased to announce that Jane Lubchenco, Professor of Zoology at the Oregon State University, and present member of the Beijer Board was elected as a foreign member of the Royal Society on the same occasion!

Partha Sarathi Dasgupta

Professor of Economics, University of Cambridge:

*"He is an economist who has made uniquely outstanding contributions to several areas of environmental biology and ecology. He was one of the first economists to consider the role of natural resources in providing essential ecological services and his book, *The control of resources*, became a milestone in the history of environmental economics."*

Jane Lubchenco

Distinguished Professor of Zoology and Wayne and Gladys Valley Professor of Marine Biology, Oregon State University:

"She is an outstanding environmental scientist and marine ecologist with very broad interests in understanding the natural dynamics of the Earth's ecosystems and developing new approaches to understanding the functioning of ecological systems."



Prof. Jane Lubchenco and Prof. Sir Partha Dasgupta both elected Fellows of the Royal Society in 2004. Photo courtesy: Jane Lubchenco

PhD Programme in Environmental Economics

Thomas Sterner, Professor, Department of Economics, Göteborg University

The PhD program is the keystone for all our activities. It is now on its 11th year and we consider the program as one of our success stories and internationally the most well known activity. We get constant inquiries from all over the world on how to enrol and what criteria we are using for selection. Unfortunately we only have capacity to enrol five new students every other year out of approximately 160 applicants. We do however reach many more through the specialization courses, projects, networks and visiting researcher program that are all closely associated with the PhD program.

At present we have 18 PhD students from developing countries enrolled in various stages in the program. As this PhD program is a capacity building program our goal is to create a national/regional environmental economic capacity in developing countries. The aim for the environmental economists trained at the Environmental Economics Unit (EEU) is to work on solving and finding effective solutions to the environmental problems that exist in their respective country. In order for this capacity to be successful, the knowledge has to be spread out to as many influential institutions as possible in order to influence the decision makers.

The program is run in collaboration between the Environmental Economics Unit at Göteborg University and the Beijer International Institute of Ecological Economics at the Royal Academy of Sciences in Stockholm. It is designed as a type of a "sandwich programme", which means that the students do their course work here in Sweden. As for research, we encourage students to work on issues that are relevant in their home countries. If they write empirical chapters, as many of them do, we have resources that allow them to go back to their respective countries for field work.

1.1 Objective

The overall purpose of the program is to build research and teaching capacity, and policy advice in developing countries. In the long-term, we expect that the capacity will sustain itself through grants from regional networks, collaborative research arrangements and domestic resources. Our students have discussed these matters with their home affiliations and have developed strategies for their future involvement in teaching, research and

policy advice. We hope to maintain strong contacts with them in their future careers to help them in whatever way we can. There are strong links between this program and a couple of the other activities mentioned in this document, particularly the courses (activity 2) which are a part of the PhD program but also offered independently to outside participants but also to activities 3-4 (visiting researchers and book support).

1.2 Enrolment

Starting in 1997, five new students have been enrolled every other year. The purpose of running the program every other year is that we desire to have a critical mass for the very specialised and demanding PhD courses that we give. Since we have so many applicants, selection is very difficult and is always carried out in stages with a large number of people involved to make sure that the fairest and best decisions are made. We usually start with a first team of people who select a short list of maybe 30 out of the say 160 applicants. This first team always includes some graduate students from the relevant areas since they often have a good overview. In the next stage we usually ask for some assistance from professors we know in the various countries and we check references etc very carefully. In the final stage all the teachers of the EEU and Karl Göran Mäler from the Beijer go through the candidates one by one. The following criteria are always used when selecting candidates in order to choose the five best ones:

- academic performance – especially we seek excellence in technical skills in micro-economics, mathematics/statistics (and English)
- capacity building context – The relevance of the country in question from the viewpoint of development collaboration and the capacity of the home institution to make use of the competence to be developed so that the graduate efficiently can support the development of environmental economics capacity in the country through teaching, research and policy advice
- Gender – to the extent possible, women are prioritised

In 2003 five students were enrolled:

- Anabel Martinez, El Colegio de Mexico, Mexico
- Ada Jansen¹, University of Western Cape, South Africa
- Precious Zikhali, University of Zimbabwe, Zimbabwe
- Jiegen Wei, Chinese Academy of Science, China
- Qin Ping, Chinese Academy of Science, China

We also have a separate bilateral agreement with SAREC and through this agreement (which is reported separately) there is one more student who enrolled in 2003 (Innocent Kabenga from Rwanda). So in reality, the student group enrolled in 2003 consists of six persons.

1.3 Training

The training program spans over a time period of five years of which the first two years consist of intensive course work. The required course work during the first year is identical to the general PhD program in economics, i.e. mathematics, econometrics, micro-economics and macro economics. The second year includes a sequence of specialised courses in environmental economics that we have specially designed for our students: *welfare economics*, *environmental valuation*, *natural resource economics* and *policy instruments for environmental management*, together with optional courses such as advanced econometrics, development economics, public economics, industrial organization etc. There is also a course in *systems ecology* at the Department of Systems Ecology at Stockholm University (in collaboration with the Beijer Institute).



Karl-Göran Mäler giving advices to one of the PhD students from Göteborg. Photo by: Max Troell.

In addition to these courses the students have the option to choose from other graduate courses at the Department of Economics, GU, and elsewhere.

The 1997 batch of students has mostly finished their thesis work. The 1999 batch of students is generally in the process of finishing their thesis work. The 2001-batch has generally finished their course work and most of those students are preparing for the Licentiate degree at which they submit their first research article. Finally, the 2003 batch is busy doing their course work. More details on each student are given below.

1.4 Maintained links to home institution

One of the most important objectives of this program is to create research and teaching capacity at a number of institutions in developing countries. By maintaining the links to the home institution of the student we increase the potential for this objective to be met. The design of the programme, i.e. the sandwich model, facilitates this linkage. In practice this means that the student can divide some of his/her time between Göteborg University and the home institution. Now that an increasing number of our students are leaving the program we are working hard to make it possible and attractive for them to return to their home departments to contribute to capacity building at home. We have a number of instruments at our disposal – book/library support, curriculum development, teaching material etc. However, the most important of which is the promise of future, continued collaboration concerning research and teaching with the EEU.

1.5 Supervision

Each student has a main supervisor, an assistant supervisor and in many cases, external supervisors involved in specific chapters of their thesis work. The selection of main supervisor depends on the thesis topic chosen. The supervision is carried out by the following staff at Beijer and EEU: Thomas Sterner, Olof Johansson-Stenman, Karl-Göran Mäler, Gunnar Köhlin, Fredrik Carlsson, Håkan Eggert and Peter Martinsson. The following professors have also taken on long-term supervision commitments: Gardner Brown, University of Washington, Per Fredriksson, Southern Methodist University (Texas, USA), Stein Holden, Agricultural University of Norway. In addition, other external experts supervise a number of thesis chapters.

1.6 Students in the program and their theses

During 2003 there were 18 students at various stages in the program. Two students, Edwin Muchapondwa and Hala Abou-Ali obtained their PhD during the year. One student (Francisco Alpizar) finished already 2002 and has now returned to work as a teacher and researcher in environmental economics at CATIE in Costa Rica (which explains his absence from this list).

Students enrolled in 1997

- Hala Abou-Ali, Cairo University, Egypt
- Eseza Kateregga, Makerere University, Uganda
- Edwin Muchapondwa, University of Zimbabwe, Zimbabwe

Students enrolled in 1999

- Wilfred Nyangena, University of Nairobi, Kenya
- Razack Bakari Lokina, National Environment Mngmt Cuncil, Tanzania
- Mahmud Yesuf, Addis Abeba University, Ethiopia
- Minhaj Mahmud, Jahangirnagar University, Bangladesh
- Nasima Chowdhury, University of Dhaka, Bangladesh

Students enrolled in 2001

- Rahimaisa Abdula, Philippine Institute for Dev Studies, Philippines
- Wisdom Akpalu, University of Cape Coast, Ghana
- Mintewab Bezabih, Alemaya University, Ethiopia
- Jorge Garcia, Universidad de Los Andes, Colombia
- Martine Visser, University of Cape Town, South Africa

Students enrolled in 2003

- Anabel Martinez, El Colegio de Mexico, Mexico
- Ada Jansen, University of Western Cape, South Africa
- Precious Zikhali, University of Zimbabwe, Zimbabwe
- Jiegen Wei, Chinese Academy of Science, China
- Qin Ping, Chinese Academy of Science, China
- Innocent Kabenga, National University of Rwanda (SAREC, separate funding from bilateral program with Rwanda)

In the report below on student activities, students enrolled in 2003 are mainly reporting their progress in course work as well as their preliminary research ideas. Students enrolled in earlier years are reported in some more detail with a focus on the research topic, its rationale, scientific methods applied, results and output.

Footnotes

¹ Ada Jansen is actually doing a joint PhD as a collaboration with Stellenbosch University, South Africa.



Presentations by the PhD students at the Beijer Institute, September 2004. Photo by: Anna Sjöström

The Ecological and Environmental Economics – EEE Programme

Monica Eberle, The Abdus Salam Centre for Theoretical Physics, ICTP, Trieste

On the 22nd of May 2002 the The Beijer International Institute of Ecological Economics signed a Memorandum of Understanding with the Abdus Salam International Centre for Theoretical Physics (Trieste, Italy) and the Fondazione Eni Enrico Mattei (Milan, Italy), leading to the creation of the Ecological and Environmental Economics - EEE Programme.

The core aim of the EEE Programme is:

- to develop mathematical models to understand the interactions between physical, environmental and economic systems;
- to provide an economic assessment of environmental problems and to design policies to address them;
- to organise research and training activities for researchers from developing countries, with the final objective of enabling them to join the international academic network in the field of ecological and environmental economics.

The aims of the Programme are pursued through the organisation of training courses and workshops, seminars, and also through the formation of a permanent research group based in the ICTP.

The EEE Programme is hosted and supported by the Abdus Salam ICTP for three years. If the Programme proves to be successful, in terms of scientific accomplishments and financial sustainability, it will lead to the constitution of an International Centre of Ecological and Environmental Economics, which would pursue the objectives of the programme on a permanent basis.

The EEE Steering Committee has defined a coherent research and training programme, which is currently at optimum level, achieving excellent results both in terms of scientific output and in terms of impact on researchers from developing countries. In addition, the Steering Committee members are now actively seeking ways to give a permanent home to the EEE programme. A permanent International EEE Centre could offer to researchers from the South the possibility of feeling less isolated from the kind of collegial contact, encouragement and help that make academic life so creative in the North.

Research Activities

The research activities carried out by the EEE Programme concentrate in three main areas:

Dynamic ecological models. Activities will focus on indicators of genuine health, economics and dynamics of complex systems, non-market interactions and informal institutions.

Indicators of Sustainable Development. Activities will focus on the development of a theory for indicators of sustainable development for complex dynamic systems.

Integrated assessment models (IAMs). Activities will focus on the integration between global climate models, regional models of climate impacts and economic models to assess the economic consequences of climate impacts in a coherent framework.

(a) Dynamic ecological models and (b) Indicators of Sustainable Development.

The framework for the research programme, shaped at a brainstorming meeting among distinguished economists, held in June 2002 in Namibia, focuses on the following issues: economics of ecosystem resilience applied to soil and lake systems, environmental bifurcation and impacts on tourism (mainly marine), environmental indicators, spatial issues (diffusion models for fishery, cultivation, grazing behaviour etc.). The contents of the First School on Ecological Economics and of the Conference on Theoretical Topics in Ecological Economics were defined in that occasion.

The first results of the activities carried out within area (a) were seven papers authored by researchers coming from developing countries. Their works are currently under revision, with the support of the EEE Programme, and are forthcoming in a special issue of the international journal *Environmental and Development Economics* (EDE).

In particular, in 2003 the activities within these areas aimed at the preparation of a research programme on spatial dynamic models of economics and eco-systems. The idea underlying this research topic, a neglected field, is to explain both heterogeneity and modularity of the distribution of population in space. To date, such models have never included human population. However, population harvesting in one location not only has implications for the site itself, but it also has implications for the subsequent distribution of populations over the

space husbanding the resources in question. An exciting theme for research is the development of policy analysis in spatial ecosystem models. The findings would be a pre-requisite for developing management rules for those cases where the spatial dimension of resources is of particular significance. Two books on these topics, and also a special issue of an international journal, are currently under preparation.

The research efforts on these areas will also lead to a publication of a book published in Africa: on August 2004 the Addis Ababa University Press will publish a book collecting the results of a workshop organised in Ethiopia by the EEE Programme. The preliminary title of the book is "Environmental Economics for Sustainable Development: An Ethiopian Launch".

Within the activities on the Indicators of Sustainable Development, a workshop on Inclusive Wealth and Accounting Prices (IWAP) focusing on appropriate ways of designing national accounts which can make the assessment of sustainability of development possible (Trieste April 26-29, 2004).

Within these research areas, the EEE programme has been in close contact with the following regional networks: Resource Accounting Network in Southern and Eastern Africa (RANESA). The head of RANESA, Prof. Rashid Hassan (University of Pretoria, South Africa) is currently a staff associate at ICTP. Some activities organised by the EEE Programme were run in cooperation with RANESA. South Asian Network for Development Economics and Environment (SANDEE): Prof. Kanchan Chopra (Institute for Economic Growth, Delhi, India), a Board member of SANDEE, is also a staff associate at ICTP.

Latin American and Caribbean Association of Environmental and Resource Economists (ALEAR). The EEE Programme is currently involved also in the evaluation of various possible forms of co-operation on environmental economics in the Middle-East. The ICTP will host a meeting with representatives from Israel, Lebanon, Jordan, Egypt, Kuwait, Turkey, Syria and other Middle Eastern countries, with the final goal of creating a Middle East network on this research field. If the creation of this network will be successful, the EEE Programme Steering Committee has already identified a Swedish institution that might be interested in funding it.

(c) Integrated assessment models (IAMs).

An Integrated Assessment Models (IAMs) Research Group has been established at ICTP since February 2003. Currently, 8 researchers are working in this area of study, in cooperation with visiting researchers and with the support of senior associate researchers (see Annex 6)

Activities performed by this permanent research group focus on the integration between global climate models, regional models of climate impacts and economic models in order to assess the economic consequences of climate impacts in a coherent framework. They address the socio-economic dimension of climate change, mitigation and adaptation policies, and focus on the economic (welfare) assessment of climate change impacts.

IAM's research strategy is characterised by:

- focus on economic implications: development and updating of an existing data base and modelling structure (GTAP);
- a flexible, "umbrella" project: incorporation and economic evaluation of different climate change impacts structured as parallel researchs;
- co-operation with other research institutes to improve the quality of climatic information and physical impacts of climate change (University of Hamburg, ABARE-Australia, Potsdam Institute of Climate -Germany, CIRED-France, etc.) and above all with ICTP Physics of Weather and Climate Section.

Co-operation on climate policy research took place also at the national level. Together with ICTP, the EEE Programme is participating in an important bid to manage the "*Euromediterranean Center on Climate Change*", a big research effort funded by the Italian Ministries of Education and of the Environment.

In 2003, the research undertaken focussed on the study of climate change impacts to health, to the induced rising of the sea level and impacts on the world tourism industry. Next year, the group will concentrate its efforts in the study of other climate change impacts, such as land productivity (water stress), land use, energy demand, and extreme events, amongst others. A recursive dynamic model is being developed and will be tested, in order to understand its dynamic properties and whether it really produces better results. If this is the case, the next step will be to model the interaction dynamic between the economic system and the environment using a full dynamic approach.

Workshops and Training Activities

The organisation of training activities and workshops constitutes a prominent aspect of the EEE Programme, as these activities significantly contribute to the achievement of the final objective of the Programme: to enable researchers from developing countries to join the international academic network in the field of Ecological and Environmental Economics.

In 2002, the first year of activity of the Programme, 4 activities were organised within the Programme. In 2003,

following a hard work that enabled the full implementation of the Programme, 7 activities were organised. In 2004, 10 activities are scheduled. The main activities scheduled for 2004 are listed below.

- (1) Teaching workshop on Economics of Urban Pollution 5-16 January, 2004, Ethiopia
- (2) Workshop – follow up of the First School on Ecological Economics, 22-26 March, 2004 - ICTP, Trieste, Italy
- (3) Workshop on Integrated Assessment of Sustainable Development, 1-2 April 2004, ICTP, Trieste, Italy
- (4) 2nd workshop on Spatial Dynamic Models of Economics and Eco-Systems, 15-17 April, 2004 - ICTP, Trieste, Italy
- (5) Workshop on Spatial Aspects of Reserve Design Optimization under Economic Constraints, 19-21 April 2004, ICTP, Trieste, Italy
- (6) Follow-up of the teaching workshop on accounting of Urban Environment (Ethiopia, January 5-16, 2004), 22-24 April 2004, ICTP, Trieste, Italy
- (7) 1st Workshop on Inclusive Wealth and Accounting Prices, 26-29 April 2004, ICTP, Trieste, Italy
- (8) One week research visit - follow up of the First School on Ecological Economics, 4-8 October, 2004 - ICTP, Trieste, Italy
- (9) 2nd workshop on Integrated Climate Models: an interdisciplinary assessment of climate impacts and policies, 29-30 November, 2004 - ICTP, Trieste, Italy
- (10) Discussions on a possible network on Environmental Economics in the Middle-East, 1-3 December, 2004 – ICTP, Trieste, Italy

Seminars

The aims of the Programme are pursued also through the organisation of seminars. Detailed information on the seminars organised by the Programme is available in the Programme website.

The organisation of seminars has significantly contributed to the growing of the co-operation among the EEE Programme, the Weather and Climate Research group at ICTP, and other institutions of the Trieste System. Seminar meetings have been contributing to mutual acquaintance and open important communication and exchange channels, also in view of the future of the Programme.

Personnel

STEERING COMMITTEE

Prof. CARLO CARRARO - Fondazione Eni Enrico Mattei and University of Venice, Italy
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Prof. AART DE ZEEUW - Tilburg University, The Netherlands
 Prof. SIMON LEVIN - Princeton University, USA
 Prof. KARL-GÖRAN MÄLER - The Beijer Institute, Sweden

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 Prof. KANCHAN CHOPRA - University of Delhi, Institute of Economic Growth, India
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 Dr. ROBERTO ROSON, Italy
 Dr. JIAN ZHANG, China

VISITING RESEARCHERS

Ms. ROSSELLA BARGIACCHI, The Netherlands (April-July 2003)
 Dr. ANDREA BIGANO, Italy (June 2003 - March 2004)
 Mr. PRAKASH RAJ SAPKOTA, Nepal (September – November 2004)
 Dr. PICHICA D.N SRINIVASU, India (March - May 2004)
 Mr. FELIPE VAZQUEZ, Chile (July 2004)

SECRETARIAT

Ms. M. ROSA DEL RIO, The Abdus Salam ICTP

Resource Accounting Network for Eastern and Southern Africa (RANESA)

Rashid Hassan, Professor, Coordinator, RANESA

RANESA is currently in its third phase which is expected to run between 2004 and 2007. While the earlier phases of RANESA were directed towards building appropriate methodologies and applications restricted to Southern Africa, the emphasis of the third phase activities have shifted to some extent from Southern African applications towards Eastern Africa, as already anticipated in the previous interim report.

RANESA has started to apply methods and expertise developed in the earlier phases to new countries in Eastern Africa such as Ethiopia, Tanzania and Uganda. Although this work is still in its formative period, noteworthy achievements so far include:

- The appointment of Dr Eric Mungatana, formerly with University of Moi, Kenya as the full time Project Coordinator for RANESA.
- The setting up of National Natural Resource Accounting [NRA] Coordination Committees in Tanzania and Ethiopia to facilitate the involvement and contribution of agencies producing and using environmental statistics and resource accounts in the two countries.
- The signing of Memoranda of Understanding with the Economic Research Bureau [University of Dar Es Salaam] and the Ethiopian Development Research Institute [EDRI] as national executing and coordinating agencies of project activities.
- Tanzania and Ethiopia are in the process of compiling their respective background review documents, which provide a comprehensive assessment of the status of existing natural resource data collection efforts and available data on which NRA work can be based. In addition, Tanzania has started work on its water and forest accounts.
- Work has been initiated on marine fisheries accounting in Zanzibar
- Mozambique is an addition to the NRA work in the region under the Sida funding in this phase where plans are in place to initiate work next year

Although most of RANESA's activities have shifted towards Eastern Africa, RANESA is still engaged with work in Southern Africa. This work is concentrated towards expanding the monetary accounts that were developed

for Namibia, Botswana and South Africa in the earlier phases of the project. Plans for the construction of environmental indicators and for the application and use of the NRA for policy analysis and resource management in Namibia, Botswana, South Africa and other countries participating in the project have been prepared.

Over the last year, RANESA has continued its operations under the auspices of the Centre of Environmental Economics and Policy in Africa (CEEPA) at the University of Pretoria, South Africa. CEEPA has now consolidated itself as a lead centre in implementing a Collaborative Regional Masters (CRM) Degree Training Programme in Environmental and Resource Economics. In 2004, there were a total of 48 applications, with female applicants making up 23 percent of this number. Of these, 21 candidates were given scholarships funded by the Rockefeller Foundation and implemented through CEEPA.



Professor Rashid Hassan, Director of CEEPA and Coordinator for the RANESA Network. Photo: ICTP

The successful students originate from Ethiopia, South Africa, Sudan, Uganda and Zimbabwe. Overall, a total of 5 females qualified for these scholarships, which is 24 percent of total scholarships awarded and 67 percent of total female applications (an improvement compared to the previous year). The first term of this year's CRM Programme commenced on 30 June 2004 while the second term commenced on 16 August 2004 and will end on 30 September 2004. CEEPA has been fortunate again this year in having Professor David Starrett accepting appointment as its external examiner.

During the period under review, CEEPA has administered thesis support grants to students that successfully completed environmental economics specialisation coursework at CEEPA in 2003. Thus far, three of the students have successfully completed their Masters thesis while several thesis are in the pipeline.

In December 2003, in collaboration with the Beijer Institute, Stockholm University as well as other key international agencies in this field and with joint funding from the EEE programme at the Abdus Salam Centre for Theoretical Physics (ICTP), CEEPA conducted an advanced course in computable general equilibrium modelling and the environment at the ICTP headquarters in Italy. The

objective of this course was to give the participants both an improved understanding of applied general equilibrium analysis and basic skills in CGE modeling based on GAMS. There were 28 participants in this teaching workshop and 7 course instructors, with three of the instructors coming from CEEPA.

Other highlights for the year under review include:

- Visit to CEEPA for 6 weeks by Professor Sean Cash, Department of Rural Economy, University of Alberta, Canada
- Visit to CEEPA by Dr Kirk Hamilton, Environment Department of The World Bank
- One of the CEEPA staff, Dr Stefano Farolfi successfully qualified for the his HDR at the Department of Economics, University of Montpolier, France
- CEEPA participated with the University of Manitoba in the external review of the AERC (Africa Economic Research Consortium) Phase V activities
- CEEPA staff were chosen to lead environmental economics courses development for a new regional degree on agriculture and applied economics under the newly established Agricultural Economics Education Board for Africa



Presentation by Mabugu at the advanced course in computable general equilibrium modelling and the environment at the ICTP headquarters in Italy. Photo by: ICTP.



Computable general equilibrium modeling in the lab at the workshop at ICTP. Photo by: ICTP.

The South Asian Network for Development and Environmental Economics (SANDEE)

Priya Shyamsundar, Coordinator, SANDEE

SANDEE started a new phase after having been in existence for three years. At this point, it seemed appropriate to evaluate our progress and think about the future. Thus, SANDEE invited two distinguished development thinkers – A. Vaidyanathan of the Madras Institute of Development Studies and Stein Hansen of Nordic Consulting Group to evaluate our activities. We have learnt from this evaluation and are forging ahead with the second phase of our activities.

We are extremely encouraged by the positive observations and recommendations provided by our evaluators. Presenting their overall assessment, the evaluators state, *"SANDEE fills a real gap in training and research on economic aspects of environment and the complex linkages between environment, poverty and well-being in South Asia."* Recognizing the challenges of operating a regional program in South Asia, the report says, *"SANDEE has proven that it is indeed possible to establish and sustain an operational regional network focused on these issues in this tense region, and as such foster co-operation between these countries around their common development challenges."* The evaluators have recorded their conviction that SANDEE activities should be continued, consolidated and expanded.

A few words on SANDEE outputs – several colleagues have almost completed their research studies. We now have working papers from Nepal and India that are available on our website. These papers present interesting findings about community forestry in Nepal, water resources in South India and joint forest management and how it compares with other institutional mechanisms. They discuss distributional concerns and identify the nature of the impacts of changing institutions on the poor. We hope these and other research results from SANDEE will find their way into poverty reduction strategies of SANDEE member countries. We have policy briefs forthcoming based on our working papers. Several SANDEE researchers have also published their research

independently – we are heartened to see this research in peer reviewed international and national journals. Our two bi-annual newsletters continue to provide interesting and topical policy and research relevant information from the region and are very well received. SANDEE website is regularly used by researchers and practitioners alike and is becoming more and more a useful source of information for our patrons in and outside of the south Asia region.

Our training programs have grown in the last year. Our annual introductory course in Environmental Economics seeks to expose and train economists, who are researchers or practitioners in using economic tools to address environmental concerns. This three-week course has become the cornerstone of our training activities. Our strategy on theme-specific advance workshops is to make these demand-driven and organize them as specific research need becomes clear. To compliment our regional courses, we also have a policy and proposal oriented workshop that is more national and held in different countries each year. To ensure that policy concerns are incorporated into research, we bring senior practitioners and policy advocates to teach at this course.

What does the future bring? The SANDEE evaluation strongly endorsed our focus on capacity building and suggested that we slowly expand our research support to specific thematic areas. We think that by identifying policy-relevant themes, we will be able to contribute more effectively to topical discussions and debates. We have successfully created a regional network that brings together Indians, Pakistanis, Bangladeshis, Sri Lankans, Nepalese and Bhutanese in a common and exciting professional forum. We will continue to foster this professional interaction and identify new ways to build bridges across our countries and think and act together to resolve environmental problems. We truly appreciate the support and interest shown by our donors, senior colleagues from Beijer and elsewhere, and our many researchers.



More information about the SANDEE network can be found on:
www.sandeeonline.org

Appendix

BOARD OF DIRECTORS

Board members of the Beijer International Institute of Ecological Economics are appointed by the Royal Swedish Academy of Sciences for a three-year period, and should not be re-elected more than once, according to the standing instruction for Beijer Institute approved by the Royal Swedish Academy of Sciences on June 5, 1991. The first Board of Directors for the new Institute was elected on June 5, 1991. The twelfth annual board meeting was held at the Institute, September 5th, 2003.

Board of Directors 2003-2004

CHAIRMAN

STEPHEN CARPENTER

Professor, Center for Limnology, University of Wisconsin, USA

EX-OFFICIO MEMBERS

GUNNAR ÖQVIST*

Professor, Secretary General of the Royal Swedish Academy of Sciences, Sweden

KARL-GÖRAN MÄLER*

Professor, Director of the Beijer Institute, Sweden

* members of the Royal Swedish Academy of Sciences

MEMBERS

SCOTT BARRETT

Professor of Environmental Economics and International Political Economy, Paul H. Nitze School of Advanced International Studies, John Hopkins University

GEOFFREY HEAL

Professor, Program on Information and Resources, Columbia University, USA

MICHAEL HOEL

Professor, Department of Economics, University of Oslo, Norway

MICHEL LOREAU

Professor, Pierre and Marie Curie University, Paris, France

JANE LUBCHENCO

Professor, Department of Zoology, Oregon State University, USA

THOMAS ROSSWALL

Professor, Executive Director, International Council for Science (ICSU), France

DAVID STARRETT

Professor, Department of Economics, Stanford University, USA

ANASTASIOS XEPAPADEAS

Professor of Economics, Economics Department, University of Crete



The 11th Askö Meeting. Back row: Nils Kautsky, Michel Loreau, Anne-Sophie Crépin, Carl Folke, C.S. Holling, Paul Ehrlich, Ann Kinzig, B-O Jansson, Jim Wilen, Steve Carpenter, K-G Mäler, Partha Dasgupta, Tasos Xepapadeas. Front row: Kenneth Arrow, David Starrett, Anna Sjöström, Christina Leijonhufvud, Charles Perrings, A-M Jansson, Brian Walker, Sara Aniyar and Tore Söderqvist. Photo: Anna Sjöström.

STAFF MEMBERS

FOLKE, Carl, Professor, Research Fellow
 KAUTSKY, Nils, Professor, Deputy Director
 LEIJONHUFVUD, Christina, Administrator
 MÅLER, Karl-Göran, Professor, Director
 SJÖSTRÖM, Anna, Administrator
 SÖDERQVIST, Tore, Associate Professor, Research Associate
 TROELL, Max, Associated Professor, Research Associate

Project Employed Staff

ANDERSSON, Jessica, PhD, Department of Economics, Göteborg University
 ANIYAR, Sara, Professor emerita, University of Zulia, Venezuela
 COLDING, Johan, PhD, Research Associate
 CREPIN, Anne-Sophie, PhD, Research Associate
 HUITRIC, Miriam, PhD, Stockholm University
 JANSSON, Åsa, PhD, Research Associate
 LERDA, Sandra, FL, Swedish University of Agricultural Sciences, Uppsala
 RÖNNBÄCK, Patrik, PhD, Research Associate
 SCHARIN, Henrik, FL, Swedish University of Agricultural Sciences, Uppsala
 SUNDBERG, Sara, MSc, Swedish University of Agricultural Sciences, Uppsala
 SOUTUKORVA, Åsa, MSc, Research Assistant
 TERNSTRÖM, Ingela, PhD, Research Associate

VISITING SCIENTISTS
AND GRADUATE STUDENTS

BENGTSSON, Jan, Professor, Dept. of Ecology and Environmental Research, Swedish University of Agricultural Sciences, Uppsala, Sweden

MUROTA, Takeshi, Professor, Doshisha University, Kyoto, Japan

AHRNÉ, Karin, PhD student, Department of Ecology and Crop Production Science, Swedish University of Agricultural Sciences, SLU

ADMINISTRATION

Office location

The Institute is located in a wing of the early 20th century building of the Royal Swedish Academy of Sciences at Frescati, a science and university area about 2 km north of Stockholm City. The area is situated in one of Stockholm's green belts, Ekoparken, which also include some of the inlets of the Baltic Sea. Ekoparken is declared as a "national city park" by the Swedish parliament. The Institute's visiting address is Lilla Frescativägen 4, Stockholm.

Organization

The Institute's administration is partly carried out by or coordinated with the Royal Swedish Academy of Sciences, for example, accounting and maintenance of premises and computers. Other administrative routines are designed independently by the Institute.

The Deputy Director is in charge of the Institute's administration.

Christina Leijonhufvud

Christina Leijonhufvud is Administrator. During 2003/2004 she has been responsible for the administration of the Board and Askö meetings in September 2003 and the Teaching Workshop on Accounting for Urban Environment in Ethiopia in January 2004. She has been organizing the participation of the SIDA-sponsored participants at the ISEE conference in Montreal in July 2004. She is also dealing administratively with the SANDEE Network, the EDE journal, the handbook of Environmental Economics, and the EEE programme together with the ICTP and FEEM.



Administrators Anna Sjöström and Christina Leijonhufvud on a windy boat ride from the Askö Meeting. Photo by: Brian Walker

Anna Sjöström

Anna Sjöström is administrator and also handles the information about the Institute and it's work. She is the webmaster for the Beijer web page and have developed two project's websites during the year: one for the ValueBase project: www.beijer.kva.se/iwap.htm and one for the IWAP research project: www.webforum.com/iwap. She is also editor for the Annual Report and responsible for the Beijer Publication Series; Beijer Reprint Series, Beijer Discussion Series, Beijer Occasional Series, and the Beijer library. For 2003/2004 she was also involved in the planning of the Board and the Askö Meeting in September. Furthermore she is also handling administratively with the PhD programme together with Göteborg University. During January 2004 - December 2005 Anna has been working part time due to studies at the Stockholm University.

General budgetary and accounting issues for the Institute are managed by Tore Söderqvist.

Sebastian Fransson have worked part time with administrative matters.

Investments

During 2003/2004 investments have been made in computers and computer equipment, office equipment and improvements of the premises.

Apartments

The Institute rents two apartments for visiting scientists. The apartments belong to the Royal Swedish Academy of Sciences and are situated at the Academy.

FUNDING

Core funding of the Institute has been provided by the Kjell and Märta Beijer Foundation.

Funding for the Institute's activities between 1 July 2003 – 30 June 2004 has also been provided by:

- Foundation for Strategic Environmental Research (MISTRA)
- The John D. and Catherine T. MacArthur Foundation
- The Swedish Environmental Protection Agency
- The Swedish International Development Cooperation Agency (Sida)

- The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS)

In addition, many activities have been carried out jointly with the Abdus Salam International Centre for Theoretical Physics and paid by the ICTP.

A SUMMARY OF BEIJER ACTIVITIES

Research Programmes

In order to stimulate transdisciplinary work the Institute initiates and organizes international research programmes. These programmes are run as networks involving up to 50 scholars in ecology, economics and related disciplines. Graduate students also participate in the research. Each programme consists of a number of different, but related, research project. These projects are carried out by teams consisting of ecologists as well as economists and researchers from other disciplines. Each programme runs for at least one year, and participants are invited to workshops at the Institute to report on the progress being made and to discuss the results. Scholars also spend working periods at the Institute. The programmes are briefly presented in this section.

Sustainable Coastal Zone Management (SUZOZOMA)

SUZOZOMA is a research programme funded by the Swedish Foundation for Strategic Environmental Research (MISTRA). It was launched in 1997, the first phase was completed and evaluated in 2000, and the second and last phase ends on 31 December, 2004. The Beijer Institute participates in SUZOZOMA together with Göteborg University, Kristineberg Marine Research Station, Stockholm University and the Swedish National Board of Fisheries. See www.sucozoma.tmbi.gu.se for a detailed presentation of the whole research programme.

Marine Biodiversity, Patterns and Processes (MARBIPP)

Marine biodiversity, patterns and processes (MARBIPP), a scientific program with the general objective to provide

increased knowledge and end-user directed guidelines for the management of coastal marine biodiversity in Swedish waters. As a more detailed overview of the program was presented in the Beijer annual report 2002. More information about the overall program can be obtained from the program website: <http://www.marbipp.tmbi.gu.se/>

Fish in Shallow Habitats and Coastal Area Services (FISHCASE) – an Ecosystem Approach to Valuing and Managing Coastal Habitats and Fisheries in Sweden

This project is a cooperative effort between the Beijer Institute (Sandra Lerda, Patrik Rönnbäck and Tore Söderqvist) and the Kristineberg Marine Research Station (Leif Pihl, Johan Stål and Håkan Wennhage). The project is funded for the period of 2002-05 by FORMAS and is coordinated with related research carried out in SUCOZOMA and MARBIPP. The research work carried out at the Beijer Institute focuses on economic valuation of fish recruitment supported by coastal habitats situated along the West Coast of Sweden. The importance of this ecosystem service to four fish species is subject to study in the project: plaice, eel, cod and sea trout. These four species are characterized by a varying degree of dependence to particular habitats for their recruitment. For more details, see Sandra Lerda's article in this annual report.

The Resilience Alliance

After the success with the Resilience Network project the focus on the resilience has evolved into the Resilience Alliance of which the Beijer Institute is an institutional member. The Resilience Alliance is a consortium of institutions that seeks novel ways to integrate science and policy in order to discover foundations to sustainability. It includes universities, government and non-government agencies as partners in a program of research and communications aimed at the vital, but thus far largely elusive, goal of integrated social, economic and ecological sustainability. Sustainable development and management of global and regional resources is not an ecological problem, not an economic one, nor a social one. It is a combination of all three. The journal *Ecology and Society* (formerly *Conservation Biology*) is owned by the Resilience Alliance. The Beijer Institute serves as a mirror site of the journal.

For more information: www.resalliance.consecol.org

Other Research Project

Besides the projects that constitute the Institute's research programmes, the Institute's staff is involved in a number of other research projects. A selection of initiated, ongoing and terminated projects during 2003/2004 is listed below.

Ecological Services of Coral Reef Ecosystems: Values and Threats

Carl Folke, Nils Kautsky, Jessica Andersson, the Beijer Institute, and Fredrik Moberg, Magnus Nyström, Stockholm University.

Aquaculture and Fisheries

C. Folke, the Beijer Institute, N. Kautsky, the Beijer Institute, M. Troell, the Beijer Institute, R. Taylor, R. Goldberg, H. Mooney, M. Beveridge, J. Clay, J. Lubchenco, J. Primavera.

Economic Valuation of Ecosystem Services in the National City Park of Stockholm – the Case of Seed Dispersal by Jays

Cajsa Hougner, Stockholm University; Johan Colding and Tore Söderqvist, the Beijer Institute.

Economic Valuation of the Swedish Environment – a Survey

Sara Sundberg and Tore Söderqvist, the Beijer Institute.

Socio-Economic Valuation of Lighthouse Reef Atoll, Belize

Commissioned work by the Belize Audubon Society. Will incorporate a Masters Thesis: "The value of grazers for fishing and tourism at the Lighthouse Reef Atoll Belize", by Antonia Sandman (Systems Ecology, Stockholm University). Miriam Huitric, the Beijer Institute and Stockholm University; Tore Söderqvist, the Beijer Institute, Antonia Sandman, Stockholm University.

Freshwater – Ecological Services

Carl Folke, the Beijer Institute and Stockholm University, Malin Falkenmark, SIWI/NFR, Åsa Jansson, Johan Rockström, Line Gordon, Stockholm University.

National Accounting and Environmental Resources

Karl-Göran Mäler, the Beijer Institute.

The Economics of Irreversible Changes in Ecosystems

Karl-Göran Mäler, the Beijer Institute.

Human Capital in the National Accounting Systems - How Should it be Accounted for?

Sara Aniyar, the Beijer Institute.

Environmental Stresses on Coral Reefs, Implications for Ecosystem Functions

Nils Kautsky, the Beijer Institute, and Magnus Nyström.

Assessment of Mangrove Degradation and the Resilience in the Indian Subcontinent: the Cases of Godavari Estuary and South West Sri Lanka

EC project – INCO-DC. Max Troell, the Beijer Institute, Nils Kautsky, the Beijer Institute, and Patrik Rönnbäck, Dept. of Systems Ecology, SU.

Seaweed Integration in Coastal Aquaculture for Increased Production and Sustainability

Max Troell, the Beijer Institute, Nils Kautsky, the Beijer Institute, and Christina Halling, Dept. of Systems Ecology, SU.

Effects of Chemical Use in Southeast Asian Shrimp Farming

Nils Kautsky, the Beijer Institute, Sara Gräslund and Bengt-Erik Bengtsson.

Integrated Culture of Abalone and Seaweed in Landbased Systems

A bilateral programme financed by Sida. Partners: Department of Botany, Univ. Cape Town and Dep of Systems Ecology, Stockholm University. Swedish project leader: Max Troell, the Beijer Institute. Other Swedish participants: Nils Kautsky, the Beijer Institute, and Christina Halling Dep. Systems Ecology, SU.

Economic Analysis of Nonlinear Dynamics in Boreal Forests

Anne-Sophie Crepin, the Beijer Institute

Operationalising Sustainability – Social, Ecological, Economic Evaluation of Resilience

Carl Folke, The Beijer Institute and Stockholm University, Karl-Göran Mäler, The Beijer Institute, Roger Kaspersson, Stockholm Environment Institute, Thomas Elmqvist, Andres Duit, Stockholm University, Anne-Sophie Crépin The Beijer Institute.

Economic and Institutional Tools for Sustainable Management of Biodiversity

Jon Norberg, Stockholm University, Anne-Sophie Crépin, The Beijer Institute, Marco Janssen, Indiana University (USA).

Whole Reef Experimental Algal Removal Under Different Fisheries Management Regimes, Glovers Reef Atoll, Belize

Miriam Huitric, the Beijer Institute and Stockholm University, Tim McClanahan, Wildlife Conservation Society, Melanie Dotherow, University of South Florida, USA, Kajsa Bergman, Tina Elfving, Magnus Nyström, Ninni Nordemar, Stockholm University, Enric Sala, Scripps Institute of Oceanography, USA, Nya A. Muthiga, Kenya Wildlife Service, Kenya.

Efficient Use of Local Natural Resources - Individual Actions and Cooperation in a Changing World

Ingela Ternström, the Beijer Institute.

Life-cycle analysis in Aquaculture: Cod farming

M. Troell, the Beijer Institute, J. Johansson and K. Svensson, Univ. of Gävle.

TEACHING AND TRAINING

The Institute serves as a catalyst between university departments and institutions working with ecological economic issues, and PhD students are involved in both research programmes and projects.

The Institute organises training workshops and international research seminars on environment and development, and international training programmes. See the Chronology of Beijer and associated networks for details on seminars and workshops held during 2003/2004.

The Ecological and Environmental Economics - EEE Programme

The EEE Programme is a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics. The core aim of the EEE Programme is to organise research and training activities with the final objective of enabling researchers from the developing countries to join the international academic network in the field of ecological and environmental economics.

The core aim of the EEE Programme is:

- to develop mathematical models to understand the interactions between physical, environmental and economic systems;
- to provide an economic assessment of environmental problems and to design policies to address them;
- to organise research and training activities for researchers from developing countries, with the final objective of enabling them to join the international academic network in the field of ecological and environmental economics.

The aims of the Programme are pursued through the organisation of training courses and workshops, seminars, and also through the formation of a permanent research group based in the ICTP.

The EEE programme is described more detailed previously in the Annual Report.

PhD programme in Environmental Economics

The Beijer Institute and the Environmental Economics Unit at Göteborg University established a PhD programme in environmental economics in 1997. The purpose of the programme is to strengthen the capacity in developing countries and in particular the capacity to teach environmental economics at the university level and to establish a firm

basis for research that can be used for policy advice. The programme is supported by SAREC and includes one year of general economic courses, one year of specialization courses, two-three years of data collection and thesis writing. The scholarships are open for applicants from developing countries.

The PhD programme is described more detailed previously in the Annual Report.

The Stockholm Seminar:

Frontiers in Sustainability Science and Policy

'The Stockholm Seminar: Frontiers in Sustainability Science and Policy', started in August 2000. It is a series co-sponsored by the Beijer Institute, Centre for Transdisciplinary Environmental Research (CTM) at Stockholm University, the International Geosphere-Biosphere Programme (IGBP) at the Royal Swedish Academy of Sciences, the Swedish Biodiversity Centre at the The Swedish University of Agricultural Sciences and Uppsala University, (CBM) the Stockholm Environment Institute (SEI), Stockholm International Water Institute (SIWI) and The International Foundation for Science (IFS).

The series present lectures from a wide variety of perspectives on sustainability and is focused on the need for a sound scientific basis for sustainable development policy.

The arranging institutes get regular visits from acknowledged researchers from all around the world. The series is arranged to make use of the knowledge those researchers represent and to increase the interactions in the scientific community and between the scientific community and the rest of the society. In the series, the latest research will continuously be presented. The series is primarily for researchers, students, policymakers and media.

During 2003/2004 the following seminars were held at the Royal Swedish Academy of Sciences:

- 13 August 2003
Prof. Robert Costanza, "Integrated History and future of the Planet Earth (IHOPE): A proposed research activity of the Earth System Science Partnership (ESSP)"
- 14 August 2003
Prof. Terry Hughes, "Climate change, herbivory and resilience of coral reefs"
- 24 September, 2003
Dr. Joseph A. Tainter. "The Development of Social Complexity: Models of Collapse, Resiliency, and Sustainability"
- 27 April 2004
Prof. Steven N. Handel. "Can we restore natural communities to our urban lands?"

- 25 May 2004
Prof. Juan Carlos Lerda. "Public Policy Coordination: Challenges and Opportunities for a Fiscal-Environmental Agenda"
- 8 June 2004
Prof. Juan Carlos Castilla. "Rights for Benthic Fisheries and Community Fisher Quotas: Management Tools for the Future"

More information about the seminars can be found on Albaecos website: www.albaeco.com

The Askö Meeting

Since 1993 the Institute has organised an annual meeting in September for informal discussions between ecologists and economists at the Stockholm Centre for Marine Research at Askö, a Swedish island in the Baltic Sea. Each meeting has resulted in a consensus document. The theme for the Eleventh Askö Meeting (6th - 8th of September, 2003) was: "The Economics and Ecology of Spatial Heterogeneity".

The consensus document from the tenth Askö Meeting has been published in AMBIO and are also available as Beijer Reprint No. 180. "Coping With Uncertainty: A Call for a New Science-Policy Forum". Ann Kinzig, David Starrett, Kenneth Arrow, Sara Aniyar, Bert Bolin, Partha Dasgupta, Paul Ehrlich, Carl Folke, Michael Hanemann, Geoff Heal, Michael Hoel, AnnMarie Jansson, Bengt-Owe Jansson, Nils Kautsky, Simon Levin, Jane Lubchenco, Karl-Göran Mäler, Steve Pacala, Steve Schneider, Domenico Siniscalco, and Brian Walker. *Ambio* Vol 32. No 5, pp. 330-335. (2003).

The consensus document from the 2000 year's Askö Meeting "Genetic diversity and interdependent crop



Beijer Director Karl-Göran Mäler in discussion with ecologists Paul Ehrlich and Ann Kinzig at the 11th Askö Meeting. Photo: Anna Sjöström.

choices in agriculture". Geoffrey Heal, Brian Walker, Simon Levin, Kenneth Arrow, Partha Dasgupta, Gretchen Daily, Paul Ehrlich, Karl-Goran Maler, Nils Kautsky, Jane Lubchenco, Steve Schneider, and David Starrett has been published in *Resource and Energy Economics* 26 (2004) 175–184.

STAFF MEMBERS' PUBLICATIONS AND ACTIVITIES

Staff members' research activities are presented at, for example, conferences, workshops and seminars. To stimulate interaction between the staff members regularly internal presentations take place at the Institute. Below is a selection of the staff members' publications and activities during 2003/2004.

JESSICA ANDERSSON

PhD (Economics), Göteborg University

RESEARCH FOCUS

Welfare and Development Economics

AT BEIJER SINCE 1997

PAPERS AND PRESENTATIONS

Publications:

- Ph.D. thesis; Welfare Environment and Tourism in Developing Countries



Jessica Andersson defending her thesis "Welfare Environment and Tourism in Developing Countries". Photo by: Sara Aniyar.

- J. Andersson. (2003) "To Estimate Recreational Welfare Measures for International and Specialised Tourism", Beijer Discussion Paper no. 180.
- J. Andersson. (2003) "The Recreational Cost of Coral Bleaching- a Stated and Revealed Preference Study of International Tourists Beijer Discussion Paper no. 181.

Commissions:

Consultant for the Swedish donor Agency Sida.

Jessica Andersson successfully defended her thesis in June 2004. "Welfare Environment an tourism in developing countries", Economics Studies, Dept. of Economics, School of Economics and Commercial Law, Göteborg University 137.

SARA ANIYAR

Economist, Titular professor at the University of Zulia, Maracaibo, Venezuela and project employed at the Beijer Institute

RESEARCH FOCUS

Environmental Analysis of ecosystems

Green accounting

Since January 2004 member of the research team responsible for the study of:

"Accounting Prices of the Stockholm County's Inclusive Wealth"

My activities within this study up till June have included

1. Collection of statistical information and reporting on:
 - Investments in manufactured capital for the years 1995- 2001 The numbers are classified by: good, services, public and other
 - Stock of manufactured capital 1995 – 2001
 - Depreciation 1995 – 2001
2. Collection and analysis (partial, not yet completed) of background literature on:
 - Human capital
 - Depreciation of manufactured capital
 - Methodologies for capital estimations and empirical work available
 - Relevant information on the county's economy, projections and development plan
3. Internal seminar on human capital estimation methodology
4. Interviewing of information sources
5. Developing of a working platform in the web for the team and the other members of the Inclusive Wealth

Extended Network <http://www.webforum.com/iwap>
Work jointly done with Anna-Lena Falk and Anna Sjöström

AT BEIJER SINCE 1998

PAPERS AND PRESENTATIONS

Publications:

Estimating the value of Oil Capital in a Small Open Economy: The Venezuelan example FEEM Working Paper 108, 2003 Published electronically in The Social Science Research Network Electronic Library <http://papers.ssrn.com/abstract=486045>

Seminars and symposium presentations:

- Inclusive Wealth Seminar, ICTP, Trieste, April 26-29, 2004
- Teacher of a Basic Course on Environmental Economics, Graduate División, Economic Faculty, Universidad del Zulia
- Invited speaker
 - o Valor económico de los recursos naturales
 - o EDELCA, Puerto Ordaz, Venezuela, Junio 2004

Commissions

In charge of the registering of books to the Beijer's Library

JOHAN COLDING

Research Associate, PhD (Ecology)

RESEARCH FOCUS

Institutions and biological conservation; Ecosystem management; Urban ecology

AT BEIJER SINCE 1995

PAPERS AND PRESENTATIONS

Scientific publications

- Colding, J., Elmqvist, T., Lundberg, J., Ahrné, K., Andersson, E., Barthel, S., Borgström, S., Duit, A., Erntsson, H., and Tengö, M. 2003. The Stockholm Urban Assessment (SUA-Sweden). The Millennium Ecosystem Assessment; Sub-global summary report. 28 pp. <http://www.millenniumassessment.org/intranet/> Beijer Discussion Paper Series No. 182. The Beijer Institute of Ecological Economics, Royal Academy of Sciences, Stockholm, Sweden.
- Barthel, S., Colding, J., Folke, C. and Elmqvist, T. In review. Ecology and Society. Social-ecological interactions in the formation of an urban green area:

Management implications for the National Urban Park of Stockholm.

- Elmqvist, T., J. Colding, S. Barthel, A. Duit, S. Borgström, J. Lundberg, E. Andersson, K. Ahrné, H. Erntson, J. Bengtsson and C. Folke. The Dynamics of Social-Ecological Systems in Urban Landscapes: Stockholm and the National Urban Park, Sweden. *Annals of New York Academy of Sciences*, in review.
- Colding, J., Lundberg, J. and Folke, C. In manus. A new look at urban green areas: Implications for physical planning and biodiversity management.
- Duit, A., Colding, J. and Lundberg, J. In progress. Why are there urban parks and green areas? The enigma of common pool resource management in urban settings.
- Colding, J. and Lundberg, J. In progress. Sacred groves, allotment gardens and golf courses: The role of contextually preserved areas for management of biodiversity.
- Hougner, C., Colding, J., Söderqvist, T and Elmqvist, T. In manus. Economic valuation of oak seed dispersal performed by jays (*Garrulus glandarius*) in the Stockholm National Urban Park, Sweden.
- CHAPTER 9: SCENARIOS IN SUB-GLOBAL REGIONAL ASSESSMENTS. Coordinating Lead Authors: Louis Lebel, Pongmanee Thongbai, and Johan Colding. Lead Authors: Elena Benn, William Mala, John Agard, Gerhard Petcshel-Held, Kasper Kok, Louis Eramus, Tom Veldkamp, Chuck Ramsay, Yogesh Gokhale, Moneka Zureks, Colin Filer, and Sandra Velarde. Contributing Authors: Hernan Blanco, Tian Xiang Yue, and Tim Lynam. In review for The Millennium Ecosystem Assessment Sub-Global Assessment Report on Scenarios.
- Colding, J. 2003. Scenarios for the Stockholm National Urban Park and surroundings. MA Sub-global working group report. The Millennium Ecosystem Assessment. 22 pp. <http://www.millenniumassessment.org/intranet/>

Speaker at conferences

- Speaker at young fellows meeting for the Millennium Ecosystem Assessment. 30 min. presentation of the Stockholm Urban Assessment. June 25, 2003. Morgana Konferenshotell, Farsta, Stockholm.
- Co-speaker at the Millennium Ecosystem Assessment sub-global assessment workshop. 30 min. Presentation of the Stockholm Urban Assessment. June 28, 2003. Kungliga Djurgårdsförvaltningen, Stockholm.
- Speaker at conference/workshop Towards Healthy Urban Ecosystems Workshop, Sydney, Australia May 2-6, 2004. Topic: The National Urban Park of Stockholm and surroundings. Organized by Resilience Alliance and CSIRO Sustainable Ecosystems.

Book and article reviews

- Chapter review for Ocean Management National Research Network IM Node, Draft Chapter, Sept 8, 2003. Cross-scale institutions and building resilience in the Canadian North. Fikret Berkes et al.
- Serving as reviewer for the following journals:
 - Conservation Ecology
 - Conservation Biology

Teaching assignments

- Lecture for SNF Stockholms Läns utbildningskurs Storstockholms naturguider, Naturguidesutbildning 2003. June 3rd: Lecture Urban Ecology, Institution for System Ecology
- Lecture at undergraduate course "Naturen och människan" (Nature and Society), organized by the Center for natural resources and the environment, Stockholm University. Topic: "Att bygga adaptiv kapacitet i teorin och praktiken". 3 hour lecture, October 29 2003.
- Sustainable management of natural resources in tropical forests: Traditional forms of natural resource management. 3 hour lecture on January 23, 2004 for the graduate course Management of Aquatic Resources in the Tropics, Institutionen för Systemekologi. Stockholms University.
- Lecture at graduate course (10p), Natural Resources and Society: Ecosystem Dynamics and Sustainability Science Course. Spring 2003. Institutionen för Systemekologi, Stockholms Universitet i samarbete med Centrum för naturresurs och miljöforskning (CNM). April 2004, 3 hours. "Taboos and conservation of natural resources" May 2003. 3 hours lecture, "Introduction to Nationalstadsparken" and "Urban Parks and biodiversity".

Supervision

- Associate Supervisor for PhD-students in Natural Resource Management, Stockholm University
Stephan Barthel, PhD-project Management of social-ecological systems: Stockholm and the National City Park, Sweden.
Jakob Lundberg, PhD-student in Natural Resources Management. PhD-project: Creating Urban Incentives for Managing Complex Ecosystem. Licentiate thesis: September 2003.
- Supervision at graduate course (10p), Natural Resources and Society: Ecosystem Dynamics and Sustainability Science Course. 2004-05-25. Institutionen för Systemekologi, Stockholms Universitet i samarbete med Centrum för naturresurs och miljöforskning (CNM).

Project: The impact of land use, management practices and local ecological knowledge on amphibian diversity in wetlands in the Stockholm area. Malin Brandt, Eva Kylberg, Anne-Charlotte Wiman, Julia Wood, Marlene Ågerstrand, and Marie Åkesson.

ANNE-SOPHIE CRÉPIN

Research Associate, PhD (Economics)

RESEARCH FOCUS

Natural resource and ecosystem management. Complex dynamics.

AT BEIJER SINCE December 1996

PAPERS AND PRESENTATIONS

Publications:

- Crépin [2003] Multiple Species Boreal Forests - What Faustmann Missed *Environmental and Resource Economics* 26(4): 625-646.
- Elmqvist, Berkes, Folke, Angelstam, Crépin, Niemelä Forthcoming in *Ambio*.
- Crépin, [2003], Threshold Effects in Coral Reef Fisheries *Nota di Lavoro* 107.2003.
- Crépin, [2003], Management Challenges for Multiple-Species Boreal Forests, *Nota di Lavoro* 106.2003.

Seminars and symposium presentations:

- 16 Oct 2003 *Ekosystemperspektiv i Ekonomi*, Forskardagarna, Stockholm University, Sweden.
- 4th Feb 2004 *Using Fast and Slow Processes to Manage Coral Reef Fisheries with Threshold Effects* Beijer Seminar.
- 27 June 2004 *Using Fast and Slow Processes to Manage Coral Reef Fisheries with Threshold Effects*, Presentation at the EAERE 2004 conference in Budapest (Hungary).

Other:

Referee work for *Ambio*, *American Journal of Agricultural Economics*, *Ecological Bulletin*, *Ecology and Society*, *Environment and Development Economics*, *Environmental and Resource Economics*, *Journal of Economic Dynamics and Control*, *Journal of Environmental Economics and Management*.

Spring 2003-2004

Lecturer and Resource person for The First School on Ecological Economics, Abdus Salam Center for Theoretical Physics, Trieste Italy.

Fall 2003

Lecturer and course organizer of a PhD Course in Capital Theory for Economists given at the Royal Swedish Academy of Sciences together with Karl-Göran Mäler.

2003-2004

Several Introduction lectures in environmental and natural resource economics for undergraduate students.

CARL FOLKE

Research Fellow, the Beijer Institute and Professor, Dept. of Systems Ecology, Stockholm University

RESEARCH FOCUS

Resilience in social-ecological systems

AT BEIJER SINCE 1991

PAPERS AND PRESENTATIONS

Publications:

- Falkenmark, M. and C. Folke (eds.). 2003. Freshwater and Welfare Fragility: Syndromes, Vulnerabilities and Challenges. *Philosophical Transactions of the Royal Society London, Biological Sciences*. 358 no 1440 pp. 1917-2062.
- Folke, C. and L. Gunderson. 2003. An End and a Beginning. *Conservation Ecology* 7(2): 13. [online] URL: <http://www.consecol.org/vol7/iss2/art13>
- Falkenmark, M and C. Folke. 2003. Freshwater and Welfare Fragility – Introduction. *Philosophical Transactions of the Royal Society London, Biological Sciences*. 358:1917-1920.
- Folke, C. 2003. Freshwater and Resilience: A Shift in Perspective. *Philosophical Transactions of the Royal Society London, Biological Sciences*. 358:2027-2036
- McMichael, A.J., C.D. Butler and C. Folke. 2003. New Visions for Addressing Sustainability. *Science* 302:1919-1920.
- Elmqvist, T., C. Folke, M. Nyström, G. Peterson, J. Bengtsson, B. Walker and J. Norberg. 2003. Response Diversity and Ecosystem Resilience. *Frontiers in Ecology and the Environment* 1:488-494.
- Bengtsson, J., P. Angelstam, T. Elmqvist, U. Emanuelsson, C. Folke, M. Ihse, F. Moberg and M. Nyström. 2003. Reserves, Resilience, and Dynamic Landscapes. *Ambio* 32:389-396.
- Folke, C. 2003. *Reserves and Resilience – From Single Equilibrium to Complex Systems*. *Ambio* 32:379.
- Kinzig, A., D. Starrett, K. Arrow, B. Bolin, P.

Dasgupta, P. Ehrlich, C. Folke, M. Hanemann, G. Heal, M. Hoel, B.-O. Jansson, A.M. Jansson, N. Kautsky, S. Levin, J. Lubchenco, K.-G. Mäler, S. Pacala, S. Schneider, D. Siniscalco and B. Walker. 2003. Coping with Uncertainty: A Call for a New Science-Policy Forum. *Ambio* 32:330-335.

- Colding, J., C. Folke and T. Elmqvist. 2003. Social Institutions in Ecosystem Management and Biodiversity Conservation. *Tropical Ecology* 44:25-41.
- Hughes, T.P., A.H. Baird, D.R. Bellwood, M. Card, S.R. Connolly, C. Folke, R. Grosberg, O. Hoegh-Guldberg, J.B.C. Jackson, J. Kleypas, J.M. Lough, P. Marshall, M. Nyström, S.R. Palumbi, J.M. Pandolfi, B. Rosen and J. Roughgarden. 2003. Climate Change, Human Impacts, and the Resilience of Coral Reefs. *Science* 301:929-933.
- Hughes, T.P., A.H. Baird, D.R. Bellwood, S.R. Connolly, C. Folke, R. Grosberg, O. Hoegh-Guldberg, J.B.C. Jackson, J. Kleypas, J.M. Lough, P. Marshall, M. Nyström, S.R. Palumbi, J.M. Pandolfi, B. Rosen and J. Roughgarden. 2003. Response to Aronson et al. *Science*. 302: 1503-1504.
- Folke, C. 2003. Social-Ecological Resilience and Behavioural Responses. In: Biel, A, B. Hansson and M. Mårtensson (eds.). *Individual and Structural Determinants of Environmental Practice*. Ashgate Publishers, London, pp. 226-242.

Commissions:

Editor-in-Chief; Ecology and Society (formerly Conservation Ecology) (www.ecologyandsociety.org) . Advisory and editorial board for 13 journals including, *Ambio*, *Conservation Biology*, *Ecological Economics*, *Ecosystems*, *Environmental Conservation*, *Frontiers in Ecology and the Environment*, *Global Environmental Change*, *Ocean and Coastal Management*

MIRIAM HUITRIC

PhD (Ecology)

RESEARCH FOCUS

Linking socio-economic driving forces to natural resource degradation focusing on the roles of institutions and organisations.

AT BEIJER SINCE 1998

PAPERS AND PRESENTATIONS

Publications:

- Huitric M, 2004: Masking Environmental Feedback: Misfits between institutions and ecosystems in

Belize and Thailand. Doctoral Thesis in Natural Resource Management. Department of Systems Ecology, Stockholm University, Stockholm, Sweden.

- Huitric M, 2003: Lobster and conch fisheries of Belize: A history of sequential exploitation. Conservation Ecology (Nature & Society) in revision.



Miriam Huitric defending her thesis in June 2004.

Miriam Huitric successfully defended her thesis in June 2004. "Masking Environmental Feedback: Misfits between institutions and ecosystems in Belize and Thailand". Department of Systems Ecology, Stockholm University.

ÅSA JANSSON

PhD (Ecology)

RESEARCH FOCUS

Since 2004 member of the research team responsible for the study of: "Accounting Prices of the Stockholm County's Inclusive Wealth", IWAP. Maternity leave during 2004.

AT BEIJER SINCE 2004

NILS KAUTSKY

Deputy Director (1997- 2004), the Beijer Institute and Professor, Marine Ecotoxicology, Dept. of Systems Ecology, Stockholm University

RESEARCH FOCUS

Integrated Coastal area Management, Tropical Marine Ecology and Ecotoxicology, Global Fisheries and Aquaculture

AT BEIJER SINCE 1997

PAPERS AND PUBLICATIONS

Publications:

- Rönnbäck, P., I. Bryceson, N. Kautsky (2003) Coastal aquaculture development in Eastern Africa and the Western Indian Ocean: Prospects and problems for food security and local economies. *Ambio*, 31(7-8):537-542.
- Kinzig, A., D. Starrett K. Arrow, B. Bolin, P. Dasgupta, P. Ehrlich, C. Folke, M. Hanemann, H. Heal G., M. Hoel, B. O. Jansson, A. M. Jansson, N. Kautsky, S. Levin, J. Lubchenco, K-G. Mäler, S. Pascala, S. Schneider D. Siniscalco, B. Walker (2003). Managing uncertainty at the Science-Policy interface. *Ambio* 32(5):330-335
- Troell, M., C. Halling, A. Neori, A. H. Buschmann, T. Chopin, C. Yarish, and N. Kautsky (2004) Integrated Mariculture: Asking The Right Questions. *Aquaculture* 226:69-90
- Scheffer, M., S. Szabo, A. Gragnani, E. H. van Nes, S. Rinaldi, N. Kautsky, J. Norberg, R. M. Roijackers, R. Franken (2003). Floating plant dominance as a stable state. *PNAS* 100(7):4040-4045.
- Troell, M., P. Tyedmers, N. Kautsky, P. Rönnbäck 2004. Aquaculture and energy use. Pp 97-108. In: *Encyclopedia of Energy Vol 1*. Elsevier
- Eklöf, J. S. M. de la Torre Castro, L. Adelsköld, N. S. Jiddawi and N. Kautsky (2004) A comparison of macrofauna and seagrass assemblages in seagrass beds with and without seaweed farms. *Est. Coast. Shelf. Sci* (in press)

Teaching and training

Supervision of 6 Ph.D. students and 5 M.Sc students who graduated in 2003-2004. Ongoing supervision of 8 Ph.D. students.

Annual teaching of advanced courses on "Tropical aquatic resources management", "Ecotoxicology", "Marine ecology" and Marine faunistics-floristics at, Stockholm University, and on "Aquaculture and the environment" at University of Ghent, Belgium and Wageningen Agriculture University.

Commissions etc.

Member of programme committee of MASMA (Marine Science for Management in Western Indian Ocean) of

WIOMSA/Sida program involving 11 African Countries
Scientific Advisor to the International Foundation for
Science (IFS)
Scientific Adviser to the Swedish Society for Nature
Conservation

KARL-GÖRAN MÄLER

Director at the Beijer Institute

RESEARCH FOCUS

- Resource and environmental economics.
- Option values and irreversible environmental changes.
- Cost benefit analysis of the environment and in particular in relation to acid rains.
- Environment and Development.
- International Environmental Problem.

AT BEIJER SINCE 1991

PAPERS AND PRESENTATIONS

Selected Publications:

- The Genuine Savings Criterion and the Value of Population, with K. Arrow and P. Dasgupta, 2003, Economic Theory 21 pp. 217-225
- Handbook of Environmental Economics, vol 1, 2003, editor with J. Vincent, North Holland Publishing Co, Amsterdam
- Welfare Economics in Imperfect Economies, with K. Arrow and P. Dasgupta, 2003, in Economics for an Imperfect World, eds. R. Arnott, B. Greenwald, R. Kanbur, and B. Nalebuff, The MIT Press, Cambridge
- The Economics of Shallow Lakes, with A. Xepapadeas and A. de Zeeuw, 2003, Environmental and Resource Economics, 26, No. 4
- The Economics of Non-Convex Ecosystems: Introduction, with P. Dasgupta, 2003, Environmental and Resource Economics, 26, No. 4
- Evaluating Projects and Assessing Sustainable Development in Imperfect Economies, with K. Arrow and P. Dasgupta, 2003, Environmental and Resource Economics, 26, No. 4, December
- Are we consuming too much? with K. Arrow, P. Dasgupta, L. Goulder et al. forthcoming in Journal of Economic Perspectives
- Environmental and Resource Economics: Some Recent Developments, with P. Dasgupta, submitted

Awards

Volvo Environment Prize 2002
Kenneth E Boulding Prize 2004

SANDRA LERDA

Research Assistant, Fil. Lic.

RESEARCH FOCUS

Valuation of the contribution of coastal zones to fisheries

AT BEIJER SINCE fall 1999 as a PhD student from SLU; since July 2001 as a research assistant

PAPERS AND PRESENTATIONS

Publications:

- Investment in Wetlands for Pollution Abatement Under Uncertainty, Licentiatavhandling, Department of Economics, Swedish University of Agricultural Sciences, (SLU), Uppsala 2003.

Seminars and symposium presentations:

Licentiat Defense, Swedish University of Agricultural Sciences, October 8, 2003.

In October, 2003 Sandra Lerda took her fil. lic. at the Dept. of Economics, Swedish University of Agricultural Sciences, Uppsala.

PATRIK RÖNNBÄCK

Research Associate, PhD (Ecology)

RESEARCH FOCUS

The main focus of my research is on (1) ecological and socio-economic evaluation of ecosystem services and (2) sustainability analysis of mangrove-associated fisheries and shrimp aquaculture. The field of Ecological Economics has provided the conceptual framework for my research since 1996. I have in depth research experience from India, the Philippines, Mozambique and several other countries in Asia and Africa. Currently, I am also involved in research projects aimed at evaluating ecosystem services associated with biodiversity and fisheries in Swedish coastal waters.

AT BEIJER SINCE 2003

PAPERS AND PRESENTATIONS

Publications:

- Moberg, F. and P. Rönnbäck. 2003. Ecosystem Services in the Tropical Seascape: Ecosystem Interactions, Substituting Technologies, and Ecosystem Restoration. Ocean and Coastal Management, 46: 27-46.

- Troell, M., P. Tydemer, P. Rönnbäck and N. Kautsky. (2004) Aquaculture- energy use. In: Cleveland, C. (ed.): *Encyclopedia of Energy*. Elsevier Inc. pp.97-108.
- Rönnbäck, P., M. Troell, T. Zetterström and D.E. Babu. (2003). Mangrove Dependence and Socio-Economic Concerns in Shrimp Hatcheries of Andhra Pradesh, India. *Environmental Conservation* 30:344-352.
- Kautsky N., C. Folke, M. Troell and P. Rönnbäck, (2003). Odlad fisk är inte så miljövänlig och nyttig som många tror. In: B. Johansson (ed) Forskare och fiskare om fisk och fiske. 155 pp, FORMAS.
- Troell, M., L. Pihl, P. Rönnbäck, H. Wennhage, T. Söderqvist and N. Kautsky. (submitted) When resilience is undesirable: Regime shifts and ecosystem service generation in Swedish coastal soft bottom habitats. *Ecosystem and Society*.

Commissions:

- Marine biodiversity, patterns and processes (MARBIPP) – a research program aimed to increase knowledge and develop tools for the management of coastal zone biodiversity (funded by the Swedish Environmental Protection Agency, 2001-2006)
- Ecosystem services of coastal habitats for fisheries – an ecosystem approach to managing coastal habitats and fisheries in Sweden (funded by the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, FORMAS, 2002-2005)
- Continuously appointed to scientifically evaluate manuscript submitted to the journals *Ambio*; *Asian Fisheries Science*; *Contemporary Economic Policy*; *Ecological Economics*; *Estuarine, Coastal and Shelf Science*; *Government and Policy*; *Hydrobiologia*; *Journal of Environmental Management*; *Journal of Fish Biology*; *Ocean and Coastal Management*; *Wetlands Ecology and Management*
- Referee for research grant applications WIOMSA / MASMA PROGRAMME (funded by Sida).

Other:

- Lecturer in advanced courses in Ecological Economics, The Ecology of the Coastal Zone, Sustainable Development, and Fisheries Management (Gotland University) and Ecology and Management of Tropical Aquatic Resources (Stockholm University)
- Supervision of PhD and MSc candidates at the Department of Systems Ecology, Stockholm University

HENRIK SCHARIN

PhD Student, Swedish University of Agricultural Sciences

RESEARCH FOCUS

Cost-effectiveness and policy instruments under spatial heterogeneity

AT BEIJER SINCE: 1998

PAPERS AND PRESENTATIONS

Publications:

- "The use and usefulness of cost-benefit analysis in water policy and management in Sweden" Co-authored with Peter Frykblom, Tore Söderqvist and Alexandra Helgesson. Forthcoming in *Cost Benefit Analysis and Water Resources Management*, Edited by Roy Brouwer and David Pearce.
- "The Efficient Environmental State of Coastal Zones: A study of the Eutrophication in the Stockholm Archipelago", *Dissertations 32*, Swedish University of Agricultural Sciences, Department of Economics.
- "Comparing two approaches of estimating costs of uniform and spatially differentiated policy instruments", Forthcoming
- "Efficiency losses of three different types of uniform policy instruments in the presence of spatial heterogeneity of marginal abatement cost", Forthcoming

Seminars and symposium presentations:

"Values and Costs for a Reduced Nitrogen Load to the Stockholm archipelago", Lecture at "Ett Mångvetenskapligt Sikte på Östersjön", ["A multidisciplinary aim at the Baltic SEA"], Undergraduate course, Department of Environmental and Marine Biology, Åbo Akademi University, 30th October, 2003.

ÅSA SOUTUKORVA

Research assistant, MSc (Economics)

RESEARCH FOCUS

Economic valuation of environmental quality and ecosystem services.

AT BEIJER SINCE April 2000

PAPERS AND PRESENTATIONS

Publications:

- T. Söderqvist, H. Eggert, B. Olsson, Å. Soutukorva (2004), "Economic Valuation for Sustainable Development in the Swedish Coastal Zone", Beijer Discussion Paper no. 183.

Other:

June 2004 – January 2005, substitute for Anna Sjöström.

TORE SÖDERQVIST

Research Associate, Associate Professor (Economics)

RESEARCH FOCUS

Research activities are primarily within the field of applied welfare economics in an interdisciplinary setting, in particular economic valuation of environmental quality/ecosystem services. Present empirical work includes fish recruitment and other coastal ecosystem services in Sweden. Recent work on wetland creation has also involved the subject of institutional design of environmental policy.

See also <http://www.beijer.kva.se/staff/tore/tore.html>

AT BEIJER SINCE 1996

Selected publications:

- Söderqvist, T., Hammer, M., Gren, I-M., 2004. Samverkan för människa och natur – en introduktion till ekologisk ekonomi [Cooperation for Man and Nature – an Introduction to Ecological Economics]. Studentlitteratur, Lund, 293 pp. (In Swedish.)
- Söderqvist, T., Eggert, H., Olsson, B., Soutukorva, Å., 2004. Economic valuation for sustainable development in the Swedish coastal zone. Submitted.
- Sundberg, S., Söderqvist, T., 2004. The economic value of environmental change in Sweden: a survey of studies. Report 5360, Swedish Environmental Protection Agency, Stockholm.
- Sundberg, S., Söderqvist, T., 2004. ValueBase^{SWE}. A valuation study database for environmental change in Sweden. Available at www.beijer.kva.se/valuebase.htm.
- Söderqvist, T., 2003. Are farmers prosocial? Determinants of the willingness to participate in a Swedish catchment-based wetland creation programme. *Ecological Economics* 47, 105-120.
- Hökby, S., Söderqvist, T., 2003. Elasticities of demand and willingness to pay for environmental services in Sweden. *Environmental and Resource Economics* 26, 361-383.

- Söderqvist, T., Lindahl, T., 2003. Wetland creation: socio-economic and institutional conditions for collective action, pp. 223-249 in Turner, R. K., van den Bergh, J. C. J. M., Brouwer, R. (eds.), *Managing Wetlands: An Ecological Economics Approach*. Edward Elgar Publishing, Cheltenham, UK.

Teaching and training:

- Organizer and lecturer, advanced undergraduate course in Economic Valuation of Environmental Change, Department of Economics, Swedish University of Agricultural Sciences, Uppsala. September-October 2003.
- Contributing lecturer at various courses at Stockholm University, Gotland University College and University College of South Stockholm.
- Supervision of PhD and MSc students at Swedish University of Agricultural Sciences, Uppsala.

Seminars and symposium presentations:

- How ecological economics can contribute to a sustainable development, public lecture at Vetenskapsfestivalen, Göteborg University, 14 May 2004.
- Revealed preferences methods for valuing environmental change, at the seminar Methods for Valuation of Environmental Change, Swedish Environmental Protection Agency, Stockholm, 18 September 2003.

Commissions:

Discussant of the Licentiate of Economics thesis "Two Essays on Valuation of Marine Resources – Applications to Sweden" by Björn Olsson, Department of Economics, Göteborg University, 27 April 2004.

Other:

Financial controller at the Beijer Institute.

INGELA TERNSTRÖM

PhD (Economics)

RESEARCH FOCUS

Common-pool resource management, with empirical studies of cooperation in irrigation systems in Nepal. Understanding and developing methods for predicting and avoiding institutional failure in common-pool resource management. Focus on the effects of external changes, the role of individual actors and the characteristics of the management system.

AT BEIJER SINCE August 2002

PAPERS AND PRESENTATION

Publications:

- Ternström, I.; 2002, "The Management of Common-Pool Resources – Theoretical Essays and Empirical Evidence", Dissertation for the Degree of Doctor of Philosophy, Stockholm School of Economics, ISBN 91-7258-608-7.
- Ternström, I.; 2001, "Cooperation or Conflict in Common Pools", SSE/EFI Working Paper Series in Economics and Finance, No. 428.
- Ternström, I.; "Natural Resource Tenure, Market Imperfections and Environmental Effects: Land Tenure and Deforestation in Nepal", MSc thesis, Stockholm School of Economics, 1994.

Seminars and symposium presentations:

- Property Rights to Land and Natural Resources: Institutions, Politics and Culture, Conference at the Agricultural University of Norway: Invited speaker, "Property Rights: Institutions for Managing Land and Natural Resources" (Ternström, I.).
- WOW3 – Workshop on the Workshop 3, Conference arranged by the Workshop in Political Theory and Policy Analysis, Indiana University: Presentation of the paper "Disturbances and Resilience in Common-Pool Resource Management Systems" (Ternström, I.).
- The Beijer Institute Seminar: "Common-Pool Resource Management: Some Thoughts on Game Theory and Institutional Analysis versus Leadership and Organisational Theory" (Ternström, I.).
- European Association for Environmental and Resource Economists 2003 Conference: Presentation of the paper "Incentives or Coordination? Cooperation in Irrigation Systems in Nepal" (Ternström, I.).
- Center for the Study of Institutions, Population, and Environmental Change, Colloquium, March 2003, "What makes cooperation work? New evidence from irrigation systems in Nepal" (Ternström, I.).
- Institutional Analysis and Development Seminar Spring 2003 Mini-conference at the Workshop in Political Theory and Policy Analysis, Indiana University: "Causes for Conflicts In Irrigation Systems in Nepal - Using the IAD Framework to Find the Weakest Link" (Ternström, I.).
- European Economic Association 2001 Conference: "Inequality in Cooperation" (Ternström, I.).
- European Association of Environmental and Resource Economists 2000 Conference:

"Cooperation or Conflict in Common Pools" (Ternström, I.)

- WOW2 Conference, Workshop in Political Theory and Policy Analysis, Indiana University 1999: "Cooperation or Conflict in Common Pools" (Ternström, I.).
- Specialseminarium i Miljö-, Naturresurs- och Energiekonomi (Special Seminar in Environmental, Natural Resource and Energy Economics), Stockholm School of Economics, 1996: "A Model of Institutional Development Triggered by Population Growth" (Ternström, I.).
- Specialseminarium i Miljö-, Naturresurs- och Energiekonomi (Special Seminar in Environmental, Natural Resource and Energy Economics), Stockholm School of Economics, 1995: "Climate Change and Institutional Structure: The Impact on Less Developed Economies" (Ternström, I.).

MAX TROELL

Research Associate, the Beijer Institute
Associated Professor, Systems Ecology,
Stockholm University

RESEARCH FOCUS

Key words: Coastal ecosystems, ecosystem services, ecosystem functions, biodiversity, environmental impact and sustainability of aquaculture, integrated aquaculture

Main interests: investigate linkages between capture fisheries and aquaculture; identifying externalities associated with aquaculture production; estimate ecological basis for valuation of mangrove ecosystems, with special emphasis on the interaction with shrimp aquaculture; study aquaculture techniques built on ecological engineering; study linkages between biodiversity in temperate coastal habitats and the generation of ecosystem goods and services.

AT BEIJER SINCE 1998

PAPERS AND PRESENTATIONS

Publications:

- Troell, M., P. Tydemer, P. Rönnbäck and N. Kautsky. (2004) Aquaculture- energy use. In: Cleveland, C. (ed.): *Encyclopedia of Energy*. Elsevier Inc. pp.97-108.
- Troell, M., C. Halling, A. Neori, A. H. Buschmann, T. Chopin, C. Yarish, and N. Kautsky (2003) Integrated

Mariculture: Asking The Right Questions.
Aquaculture 226:69-90.

- Rönnbäck, P., M. Troell, T. Zetterström and D.E. Babu. (2003). Mangrove Dependence and Socio-Economic Concerns in Shrimp Hatcheries of Andhra Pradesh, India. *Environmental Conservation* 30:344-352.
- Kautsky N., C. Folke, M. Troell and P. Rönnbäck, (2003). Odlad fisk är inte så miljövänlig och nyttig som många tror. In: B. Johansson (ed) Forskare och fiskare om fisk och fiske. 155 pp, FORMAS.
- Neori, A., T. Chopin, M. Troell, A. Buschmann, G. P. Kraemer, C. Halling, M. Spigel and C. Yarish, (2004) Integrated aquaculture: rationale, evolution and state of the art emphasizing seaweed biofiltration in modern mariculture. *Aquaculture* 231: 361-391.
- Troell, M., L. Pihl, P. Rönnbäck, H. Wennhage, T. Söderqvist and N. Kautsky. (submitted) When resilience is undesirable: Regime shifts and ecosystem service generation in Swedish coastal soft bottom habitats. *Ecosystem and Society*.
- Halling, C., Aroca, G., Cifuentes, M., Buschmann, A.H., and Troell, M. (resubmitted). Comparison of suspended cultivation methods of *Gracilaria chilensis* in an integrated seaweed and fish cage culture. *Aquaculture International*.

Seminars and symposium presentations:

- Invited plenary speaker at the European Aquaculture Association, Trondheim, Norway. 8-12 August 2003.
- Giving an open lecture at Stockholm University to become Associate Professor: Integrated Aquaculture- possibilities and difficulties. April 2004.

Commissions:

- Referee work during the report period: Journal of Aquaculture; Environmental Management; Ambio.
- Member of the evaluation committee for grant applications for IFS (International Foundation for Science).
- Referee for research grant applications WIOMSA / MASMA PROGRAMME.
- Referee for research grant applications: California Sea Grant College Institutional Proposal

- Swedish co-ordinator for joint bilateral research programme: Integrated culture of abalone and seaweed in land-based systems. Sida/SAREC contract no: SPR-2000-052/7500714221
- Together with colleagues from Beijer and Dep. of Systems Ecology participating in a 5 years SEPA financed program, MARBIPP, aiming at increasing our knowledge about and develop management guidelines for coastal zone biodiversity. Main responsibility is to map and value goods and services produced by marine ecosystems.

Teaching and Training:

- Teaching and supervising students- 10 credit C-level graduate course (Tropical ecology; Management of aquatic resources in the tropics) Dep. of Systems Ecology, Stockholm University and Uppsala University
- Lecture at course in Ecological Economics at Institute of advanced studies, Gotland University, Autumn 2003, 3 days.
- Ongoing supervision of PhD students and Master students at Department of Systems Ecology, Stockholm University.

Other:

Responsibility for technical equipment and supporting role in network and computer issues at the institute.



In April 2004 Max Troell became Associated Professor in Ecology at the Systems Ecology, Stockholm University.

PUBLICATIONS

The Institute communicates its research to scholars, students, policymakers and the general public in several ways.

Books provide a coherent presentation of results from the Institute's research programmes and other comprehensive activities. During 2003/2004 the following book was produced:

The Economics of Non-Convex Ecosystems, Eds. Partha Dasgupta and Karl-Göran Mäler. Kluwer Academic Press. 2004.

See Anne-Sophie Crépin's article in this year's annual report about the book.

Also published during the year was:

Söderqvist, T., Hammer, M., Gren, I-M., 2004. Samverkan för människa och natur – en introduktion till ekologisk ekonomi [Cooperation for Man and Nature – an Introduction to Ecological Economics]. Studentlitteratur, Lund, 293 pp. (In Swedish.)



The Beijer Publication Series

Scientific papers published in refereed journals or in books that have undergone review are published in the BEIJER REPRINT SERIES in order to facilitate the dissemination of research results. These reprints might earlier have appeared as DISCUSSION PAPER. The total number of reprints since 1991 is at present 199, of which 20 were produced during 2003/2004.

The BEIJER DISCUSSION PAPER SERIES constitutes a forum for unpublished scientific papers whose content should be subject to discussion and comments. 186 DISCUSSION PAPERS have been produced since 1991, and 9 during 2003/2004.

BEIJER OCCASIONAL PAPERS is a forum intended for policy documents, workshops proceedings, etc. Two Occasional Papers were produced during 2003/2004.

REPRINT SERIES

180. Coping With Uncertainty: A Call for a New Science-Policy Forum
A. Kinzig, D. Starrett, K. Arrow, S. Aniyar, B. Bolin, P. Dasgupta, P. Ehrlich, C. Folke, M. Hanemann, G. Heal, M. Hoel, A-M. Jansson, B-O. Jansson, N. Kautsky, S. Levin, J. Lubchenco, K-G. Mäler, S. Pacala, S. Schneider, D. Siniscalco, and B. Walker. *Ambio* Vol 32. No 5, pp. 330-335. (2003).
181. Reserves, Resilience and Dynamic Landscapes
Janne Bengtsson, Per Angelstam, Thomas Elmqvist, Urban Emanuelsson, Carl Folke, Margareta Ihse, Fredrik Moberg and Magnus Nyström. *Ambio* Vol. 32. No.6, pp. 389-396. (2003).
182. Ecological Tax Reforms and Environmental Benefits in Italy and Sweden
I.M. Gren, M. Bussolo, M. Hill, and D. Pinelli.. *Regional Environmental Change* 3:146-153. (2003).
183. Are Farmers Prosocial? Determinants of the Willingness to Participate in a Swedish Catchment based Wetland Creation Programme
Tore Söderqvist. *Ecological Economics* 47 (2003) 105-120.
184. Cooperation with Respect to Cleaning of an International Water Body with Stochastic Environmental Damage: the Case of the Baltic Sea
Ing-Marie Gren and Henk Folmer. *Ecological Economics* 47 (2003) 33-42.

185. Social Institutions in Ecosystem Management and Biodiversity Conservation
Johan Colding, Carl Folke and Thomas Elmqvist.
Tropical Ecology 44 (1):25-41 (2003).
186. Wetland Creation: Socio-Economic and Institutional Conditions for Collective Action
Tore Söderqvist and Therese Lindahl. In:
Managing Wetlands: An Ecological Economics Approach, pp. 223-249, Edward Elgar Publishing, (2003).
187. New Visions for Addressing Sustainability
A. J. McMichael, C. D. Butler and C. Folke.
Science 302:1919-1920 (2003).
188. Genetic Diversity and Interdependent Crop Choices in Agriculture
Geoffrey Heal, Brian Walker, Simon Levin, Kenneth Arrow, Partha Dasgupta, Gretchen Daily, Paul Ehrlich, Karl-Goran Maler, Nils Kautsky, Jane Lubchenco, Steve Schneider and David Starrett.
Resource and Energy Economics 26:175-184 (2004).
189. Building a Catchment-Based Environmental Programme: A Stakeholder Analysis of Wetland Creation in Scania, Sweden
Therese Lindahl and Tore Söderqvist. *Regional Environmental Change* 4:132-144 (2004).
190. The Critical Natural Capital of Ecosystem Performance as Insurance for Human Well-being
Lisa Deutsch, Carl Folke, Kristian Skånberg.
Ecological Economics 44: 205-217 (2003).
191. Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations
Carl Folke, Steve Carpenter, Thomas Elmqvist, Lance Gunderson, CS Holling and Brian Walker.
Ambio Vol. 31No. 5, August (2002).
192. Freshwater for Resilience: a Shift in Thinking
Carl Folke. *Phil. Trans. R. Soc. Lond. B.* 358:2027-2036 (2003).
193. Adaptive Comanagement for Building Resilience in Social-Ecological Systems
Per Olsson, Carl Folke and Fikret Berkes.
Environmental Management Vol. 34, No. 1, pp. 75-90 (2004).
194. Response Diversity, Ecosystem Change, and Resilience
Thomas Elmqvist, Carl Folke, Magnus Nyström, Garry Peterson, Jan Bengtsson, Brian Walker, and Jon Norberg. *Front Ecol Environ.* 1(9):488-494 (2003).
195. The Dynamics of Social-Ecological System in Urban Landscapes - Stockholm and the National Urban Park, Sweden
T. Elmqvist, J. Colding, S- Barthel, S. Borgström, A. Druit, J. Kundberg, E. Andersson, K. Ahrné, H. Ernstson, C. Folke and J. Bengtsson
Ann. N.Y. Acad. Sci. 1023:308-322 (2004).
196. Social-Ecological Transformation for Ecosystem Management: The Development of Adaptive Co Management of a Wetland Landscape in Southern Sweden
Per Olsson, Carl Folke and Thomas Hahn. *Ecology and Society* 9(4): 2. (2004). [online] URL: <http://www.ecologyandsociety.org/vol9/iss4/art2>
197. Economic Value of Tropical Forest to Coffee Production
Taylor H. Ricketts, Gretchen C. Daily, Paul R. Ehrlich, and Charles D. Michener. *PNAS*, August 24, 101 (34):12579-12582. (2004).
198. Resilience and Vulnerability of Northern Regions to Social and Environmental Change
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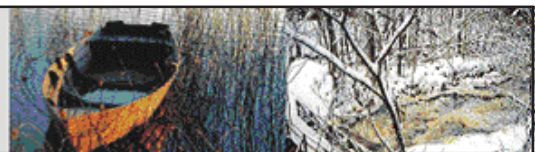
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ValueBase^{SWE}
a valuation study database



The Valuation Study Database for Environmental Change in Sweden (ValueBase^{SWE}) was developed at the Beijer International Institute of Ecological Economics within a project funded by the Swedish Environmental Protection Agency. The database is the result of a survey of empirical economic valuation studies on environmental change in Sweden.

ValueBase^{SWE} is a Microsoft Excel workbook with two spreadsheets. The first sheet contains data and the second sheet contains a list of abbreviations used in the database. Anyone is welcome to download and use the database.

Whenever the database is used for presentations or publications, please refer to:

Sundberg, Sara, Söderqvist, Tore, 2004. ValueBase^{SWE}: A valuation study database for environmental change in Sweden. Available at www.beijer.kva.se/valuebase.htm, Beijer International Institute of Ecological Economics, The Royal Swedish Academy of Sciences, Stockholm.

For more information about ValueBase^{SWE}, contact Tore Söderqvist (tore@beijer.kva.se).

Website: www.beijer.kva.se/valuebase.htm

A CHRONOLOGY OF BEIJER AND ASSOCIATED NETWORKS EVENTS 1 July 2003 - 30 June 2004

THE YEAR OF 2003

- 11-15/8 RANESA/CEEPA Workshop on Quantitative analysis of the linkages between poverty and the environment, Pretoria, South Africa
- 22/8 RANESA/CEEPA Learning Workshop on Water Reforms, Institutions' Performance, Allocation, Pricing, and Resource Accounting, Durban, South Africa
- 5/9 The Beijer Board Meeting, the Royal Swedish Academy of Sciences
- 6-8/9 The 11th Askö Meeting, Stockholm Centre for Marine Research, the Askö Laboratory
- 8-12/9 RANESA/CEEPA "The Economics of Conservation Biodiversity", University of Pretoria, South Africa
- 30/9-3/10 1st Workshop on Integrated Climate Models: an Interdisciplinary assessment of climate impacts and policies, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
- 10-13/11 RANESA/CEEPA Training workshop on quality control for country level and regional analyses and reporting, Cairo, Egypt
- 29/10-19/1 PhD course on Capital Theory with Applications on Natural Resources, the Beijer Institute, the Royal Swedish Academy of Sciences
- 30/10-16/11 SANDEE Environmental and Natural Resource Economics Course Bangkok, Thailand
- 1-12/12 2nd Advanced Course on Computable General Equilibrium Modelling (CGE) and the Environment, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

THE YEAR OF 2004

- 5-16/1 Teaching workshop on Accounting for Urban Environment, Ethiopia. Organized by the Beijer Institute and funded by the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
- 4/2 Beijer Seminar, "Using fast and slow processes to manage coral reef fisheries with threshold effects", Anne-Sophie Crépin, the Beijer Institute
- 18/2 Beijer Seminar, "Nutrients Uploading from Oceanic to Terrestrial Ecosystems - Its Implications for Fisheries and Forestry Management", Takeshi Murota, the Beijer Institute
- 23/2 Beijer Seminar, "To trickle down or to trip up! The role of bargaining power for economic development", Jessica Andersson, the Beijer Institute
- 26/2 Beijer Seminar, "Something on international environmental problems and sequential games", Ficare Zehaie, the Beijer Institute
- 17/3 Beijer Seminar, "The Stockholm Urban Assessment", Johan Colding, the Beijer Institute
- 22-26/3 Workshop - follow up of the First School on Ecological Economics, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
- 1-2/4 International workshop on Integrated Assessment of Sustainable Development, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
- 15-17/4 2nd Workshop on Spatial Dynamic Models of Economics and Eco-Systems, the Abdus Salam International Centre for Theoretical Physics, Italy
- 19-21/4 Workshop on Reserve Design, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

22-24/4 Informal follow up of the Teaching workshop on Accounting of Urban Environment (Ethiopia, January 5-

16, 2004), the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

26-29/4 Informal workshop on IWAP - Inclusive Wealth and Accounting Prices, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

12/5 Beijer Seminar, "Efficiency losses of three different types of uniform policy instruments in the presence of marginal abatement cost heterogeneity", Henrik Scharin, the Beijer Institute

13-16/5 SANDEE Policy Research and Proposal Writing Workshop in Environmental Economics, Kathmandu, Nepal

19/5 Beijer Seminar, "Common-Pool Resource Management - Some Thoughts on Game Theory and Institutional Analysis versus Leadership and Organisational Theory", Ingela Ternström, the Beijer Institute

2/6 Beijer Seminar, "Valuing Changes in Swedish coastal zone habitats through plaice production", Sandra Lerda, the Beijer Institute

8/6 Beijer Seminar, "Human Capital", Karl-Göran Mäler, the Beijer Institute

17/6-4/7 SANDEE A Basic Course in Environmental and Natural Resource Economics, Colombo, Sri Lanka



Lecture by Prof. Thomas Sterner at the Teaching workshop on Accounting for Urban Environment, Ethiopia. Organized by the Beijer Institute and funded by the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, 5-16/1 2004. Photo by: Christina Leijonhufvud.