

Sustainable Development Update

– Keeps you updated on the interactions between ecological issues and social and economic development

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Water-related ecosystem “flips” imperil poor regions

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Resilience 2008 Conference proposes new UN Panel for Ecosystem Services

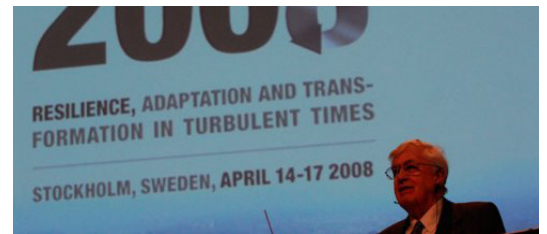
Experts of the international conference on sustainable development *Resilience 2008* propose an International Panel for Ecosystem Services (IPES).

Resilience 2008 was not only an international conference on sustainability science held in Stockholm Sweden, April 14-17th, 2008. It was also the beginning of a process where art and science bring people together and stimulate transdisciplinary science and more science-policy interactions. The conference gathered over 600 world class scientists, policy makers, and civil society members, encouraging innovation and humanness by sharing music, food, art, and of course science.

Resilience 2008 explored how we might encourage the capacity of coupled systems of humans and nature (what resilience scientists label “social-ecological systems”) toward achieving sustainable futures in times of rapid change, uncertainty and erosion of ecosystem services world-wide.

The conference brought together people from all over the world who work to integrate the natural and social sciences to better understand how to promote the capacity of our societies and life-supporting ecosystems to cope with change, to innovate and to transform when necessary.

Resilience 2008 created venues for not only information sharing but also for removing some barriers existing between policy makers and scientists. For example, a policy day, was linked to the conference inviting high profile politicians to



Buzz Holling, father of the resilience theory, was one of the speakers at Resilience 2008.

respond to the goals and challenges agreed upon during the conference and presented by scientists.

New panel

One interesting proposition put forth by the conference is the establishment of an International Panel for Ecosystem Services (IPES) with the global breadth and policy cooperation strength of the Intergovernmental Panel on Climate Change. This organization would build on the work done in the Millennium Ecosystem Assessment to assure global attention on the Earth’s ecosystem services. This is important because much of the effects of global change, including climate change, will be felt via changes in the ecosystems on which we depend.

/Kaitlyn Rathwell

More at:

<http://www.resilience2008.org>

Watch segments of the conference at:
<http://resilience.qbrick.com/>

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THE QUOTE:

“We can’t share the planet that we live on if we are living very different existences. The Most important transition is a [transition] from a world that is stubbornly divided between rich and poor.”

Professor Will Steffen of the Australian National University talks about the transitions we will have to facilitate as a global community, in a seminar presented during the Resilience 2008 Conference in Stockholm.

In the quest for sustainable use and equitable allocation of natural resources, many continue to strive for cure-all solutions, or panaceas. Maximum sustainable yields, privatisation, nationalisation, bottom-up, top-down – the list goes on with the answers that have been hailed. Yet here we are, presenting the conclusion of our latest issue of SDU: the answer has not been found. And, given the inherent complexity of social-ecological systems, we must quit expecting easy answers and quick fixes. That said, there are usually several very good approaches to choose from. The message from a group of researchers (see second Feature of this issue) was that we must move away from panaceas and look at each specific case before instigating policy. The dynamic nature of policy resulting from this approach will often require changes in governance structures and approaches.

Can we do it? Of course we can – we’ve been to the moon, The Wall fell and people want change. The artist Jon Brunberg captured this last point in a piece called 19 Years in the art exhibition Changing Matters – The Resilience Art Exhibition currently on display in Stockholm. The exhibition was inaugurated

"Given the inherent complexity of social-ecological systems, we must quit expecting easy answers and quick fixes"

in connection with the international conference Resilience 2008 which recently gathered more than 600 leading scientists, business leaders and politicians in Stockholm (read more about the Conference in a number of this issue’s articles). Brunberg’s piece is a one-minute Flash animation that captures the more than 91 million people around the world who took part in mass demonstrations between 1989 and 2007 crying out for change. For me



Artist Jon Brunberg with his flash-animation showing mass demonstrations from 1989 to 2007. Photo: Staffan Waerndt, NRM

this piece transmits the power of humans’ will and understanding of their capacity to change things, to shake their realities into new ones. Watching it is moving and somewhat overwhelming, an experience full of alarm and hope. Researchers, organisations and individuals concerned with sustainable development issues have been crying out for change, new realities.

This issue addresses some of these cries, which tend to be much quieter than those captured in 19 Years. Looking at their experiences and work I am just as full of hope – there are many good approaches. Do we need to convene in mass demonstrations to jump start the changes cried for? I do not know. But Brunberg’s piece and the work herein illustrate that Changing Matters.

/Miriam Huitric

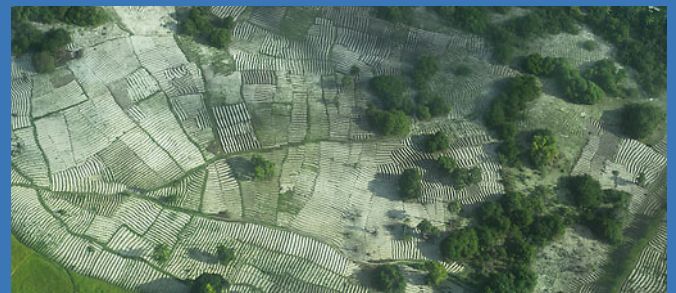
**Sustainability School:
"Ecosystem services trade-offs"**

Can we feed a growing world population without degrading other ecosystem services? Do we have to chose between fossil-fuel based high efficiency farming or protecting ecosystems by less intensive but more extensive farming? This is an example of an ecosystem services trade-off. However, there are several recent studies showing that farmers can actually both become more sustainable and increase production.

Ecosystem services describe the benefits humans receive from the environment. These services extend beyond goods that are valued in exchange markets or use for consumption and include ecosystem processes and functions such as water purification, soil regeneration, nitrogen cycling and the list goes on. The millennium ecosystem assessment developed a comprehensive review of the Earth’s ecosystem services and how people interact with them and how they are changing (<http://www.maweb.org>).

A growing number of scientists are now highlighting the importance of identifying specific ecosystem service trade offs whereby the enhancement of one service comes at the cost of another. This balancing act is especially important when the services being traded off are both important to humans and when the steady increase in one service can stimulate a sudden decrease in another.

For example, agricultural production can be enhanced by the use of fertilizers, but excess fertilizers that leach into water systems negatively influence water quality. This is complicated by freshwater systems vulnerability to sudden changes in state after a threshold of fertilizer concentration is passed (see feature article, this issue). In this case, the trade off is between the services of agricultural production



and water quality and is complicated by the vulnerability of the water system to sudden changes in state.

But there is definitely hope. Several recent studies highlight the possibility to develop an agriculture that is based more on biological diversity, particularly the rich knowledge and agrobiodiversity of the farmers, and ecosystem services (see feature in SDU 6/2007) than on fossil fuel, in order to provide a long-term secure food supply and ecologically sustainable agriculture.

/Kaitlyn Rathwell

More at

Gordon, Line, Peterson, G. and Bennett, E. 2007. Agricultural modifications of hydrological flows create ecological surprises. *Trends in Ecology and Evolution* Vol.23 No. 4.

Foley et al. 2005. Global Consequences of Land Use. *Science* Vol 309, July 22

Surprising, rapid and irreversible change in water-agricultural systems imperil poor regions

Agricultural expansion and intensification has global implications for water quality and quantity, and these effects can be in the form of surprising, rapid and irreversible change, warn researchers from Canada and Sweden.

As global demands for food and water continue to grow, human agriculture and land-use practices may lead to major disruptions of the world's hydrological flows, with potentially sudden and disruptive consequences for regions least able to cope with them. This is the message from Dr. Line Gordon of the Stockholm Resilience Centre and the Stockholm Environment Institute and Dr. Garry Peterson and Dr. Elena Bennett of McGill University in a paper recently published in *Trends in Ecology and Evolution*.

– Blue water is the part of the cycle we can see, like streams and rivers. This is as opposed to ‘green water’ in soil moisture or evapotranspiration from plants, which agriculture can impact in significant ways, explains Line Gordon.

"We risk ecosystem flips that cause rapid soil degradation with dramatic effects on yields and farmers' livelihoods"

The paper describes how agricultural practices can interact with and influence water quantity and quality in all parts of the water cycle. This includes flows between agriculture and aquatic systems, agriculture and soil moisture and agriculture and the atmosphere, labelled a,b,c in the adjoint illustration. One example of such an interaction is the addition of



Human agriculture and land-use practices may lead to major disruptions of the world's hydrological flows, with potentially sudden and disruptive consequences. Photo: Flooding in Kanikombolé, Mali, West Africa (Jerker Lokrantz, Azote images).

fertilizers to agricultural landscapes that often leak into aquatic ecosystems influencing water quality.

– Our main point is that these effects aren't necessarily going to result in gradual change. They can result in surprising, dramatic changes, what we call ‘ecosystem flips’ or ‘ecosystem regime changes,’ which can be very difficult or even impossible to reverse, says Garry Peterson.

Tipping points

Ecosystem regime changes occur when slow changing variables in a system pass a tipping point causing a reorientation of basic feedbacks maintaining system function and structure. For example, the slow accumulation of phosphorous in agricultural landscapes and surround-

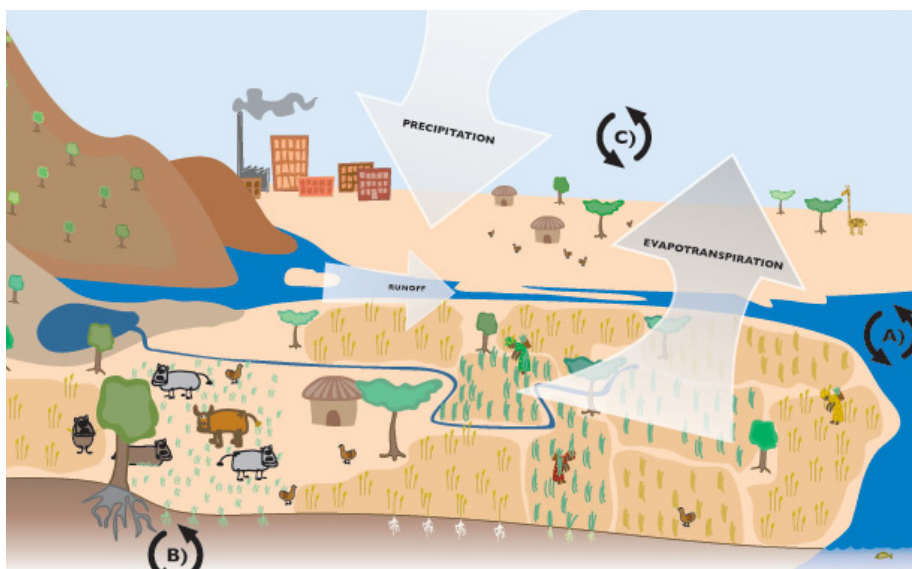
ing water can reach a critical concentration, passing a threshold where large algal blooms and an alternative dynamic in aquatic ecosystem function begins. An additional example of a regime shift follows a reduction of fallow periods in agricultural landscapes. Not having these periods of recovery after harvest causes a compacting and crusting of soil and ultimately a completely different soil structure. This, in turn, entails changes in soil moisture and nutrient retention capacity which leaves land drought prone. The paper outlines several potential examples of these sudden and sometimes irreversible shifts that can occur in each of the three types of interactions between agriculture and water referred to above.

Human well-being

– Ecosystem flips can have significant and sometimes devastating impacts on human well-being, as global populations suddenly lose resources they are dependent on. Some of the most vulnerable areas on Earth are places like the drylands of sub-Saharan Africa, Line Gordon explains.

"Many different species, varieties, crops and breeds can be part of a bet-hedging strategy in the face of large unpredictable disturbances"

Not only do these flips happen, but different types of water-agricultural interactions and shifts can act simultaneously in the same system. On top of this, pressures external to the agricultural system, such as climatic variation can add more complexity, working in combination with slow changing variables to influence the vulnerability of these systems to regime shifts.



Agricultural practices influence water quantity and quality in all parts of the water cycle. This includes flows between agriculture and aquatic systems (a); agriculture and soil moisture (b); and agriculture and the atmosphere (c). Illustration: Tove Gordon

– In some regions we risk two types of ecosystem flips, one that causes rapid soil degradation with dramatic effects on yields and farmers' livelihoods, and another that affects rainfall and therefore also vegetation growth, Gordon says.

– These are the places where populations are growing the fastest; people have the lowest amount of water per capita and are the poorest of any of the biomes of the world. They are also the regions most likely to be worst affected by climate change, Peterson adds.

The paper outlines how different types of shifts have different requirements in time and space to bring the system back to desirable functioning, if this reversal is even possible. For example, when possible, restoration of eutrophied (suffering from excess of nutrients) freshwater systems can take decades to millennia because of phosphorous accumulation in the landscape. Restoration processes for this type of agricultural-water interaction must be pursued on the landscape scale.

However, degradation of soil structure can be recovered in a few years and can be executed in areas as small as one field.

Proactive resilience-building

The researchers also offer insights to proactive approaches to management of agricultural landscapes to make agricultural-water systems more resilient to undesirable changes in state.

First, they describe the importance of monitoring slow changing variables in agriculture, often going unnoticed, such as slow build up of phosphorous in landscapes. Secondly, they outline the importance of a more systemic and dynamic approach to agricultural management. For example, this could include adapting management practices to external variables, e.g. alteration of grazing in response to rainfall patterns. Thirdly, they describe functional diversity as key to landscape resilience, whereby the inclusion of many different species, local varieties, crops and breeds can be part of a bet-hedging

strategy in the face of large unpredictable disturbances. Fourthly, heterogeneity in landscapes can maintain overall resilience, as some sites can be targeted as more or less vulnerable to regime shifts. Also some sites can be highlighted as particular contributors to unwanted dynamics and management attention focused on these.

Finally, the researchers call for governance practices that can match agricultural management with the scale at which key ecological processes occur. This requires integrated management approaches and more cooperation among ecologists, resource users and policy makers.

/Kaitlyn Rathwell

Source:

Gordon, Line, Garry Peterson and Elena Bennett. 2007. Agricultural modifications of hydrological flows create ecological surprises. *Trends in Ecology and Evolution*. Vol.23 No. 4.

New report: "High time to replace chemical-intensive agriculture with methods that work with nature not against it"

Farming all over the world must change radically to better serve the poor and hungry. We must develop agricultural systems that are less dependent on fossil fuels and favour the use of locally available resources and ecosystem services. If not, the world is unlikely to cope with both the growing population and climate change while avoiding social breakdown and environmental collapse.

The International Assessment of Agricultural Science and Technology for Development (IAASTD) is a major new report by over 400 experts. It was launched April 15 and claim that farming all over the world must change radically to better serve the poor and hungry.

– To argue, as we do, that continuing to focus on production alone will undermine our agricultural capital and leave us with an increasingly degraded and divided planet is to reiterate an old message. But it is a message that has not always had resonance in some parts of the world. If those with power are now willing to hear it, then we may hope for more equitable policies that do take the interests of the poor into account, says Professor Bob Watson, Director of IAASTD.

The new report concludes that modern agriculture has brought significant increases in food production, but also that these benefits have been spread unevenly and have come at an increasingly intolerable price. This price is too often paid by small-scale farmers, rural communities and life-supporting ecosystems. But there is still time to change course and replace destructive chemical-intensive agriculture with farming that works more with nature than against it. For example, food producers should use more "natural processes" like crop rotation and use of organic fertilisers. The distance between agricultural production and consumers should also be reduced.

– This report proves we can produce more and better food without destroying rural livelihoods and our natural resources. Modern farming solutions champion biodiversity, are labour in-



Destructive chemical-intensive agriculture must be replaced with farming that works more with nature, a new report says. (Luisiana, Laguna, Philippines. Photo: Aileen Del Rosario/IRRI/azote.se)

tensive and work with nature, not against it, says Benny Härlin of the IAASTD's governing body and Greenpeace International in a press release.

Payments for ecosystem services

Moreover, the report says genetic erosion is another concern, and that the potential for paying farmers who provide environmental services – e.g. by leaving valuable wetlands undrained or by using forests to reduce carbon emissions – should be further explored.

The Assessment also warns that premature opening of national agricultural markets in developing countries to international competition is a growing problem. If this is done before basic infrastructure and national institutions are in place it might undermine agriculture, poverty alleviation, the environment and food security.

/Fredrik Moberg

More at:

<http://www.agassessment.org>

Combating poverty and cutting emissions of carbon dioxide the best recipe to save the world's coastal ecosystems, say leading scientists

Scientists at the Resilience 2008 conference in Stockholm called for reductions in carbon emissions and combating poverty as the two most important steps in saving our coastal marine environments.

I am the walrus, goo goo g'joob. Immortalized in the 1960s by the Beatles song, the Walrus is now under extreme threat due to receding ice. Walrus are tightly intertwined with Eskimo culture, providing food as well as skin and bone for clothing, shelter, tools, and weapons.

– Young Walrus are dying in their thousands as a result of disappearing sea ice”, reports Martin Robards, a scientist working with Eskimo communities in the Bering Strait.

Martin Robard was one of the participants in a workshop dealing with coastal ecosystems during the conference “Resilience 2008 - Resilience, Adaptation and transformation in turbulent times” that took place in Stockholm, April 14-17. It involved some of the world's most distinguished scientists and policy makers who met to discuss ecology, economy and society from a Resilience perspective (see in brief article, page 1).

Poverty traps must be addressed

If carbon emissions are not curbed scientists warn that the capacity of coastal marine ecosystems such as coral reefs, mangroves, kelp forests and seagrass meadows to continue producing goods and services to communities will be jeopardized.

The group of scientists also stressed that the economic realities and lack of resources in the majority of coastal communities provides little maneuvering room for sustainable management. Current management initiatives simply do not work because they do



Scientists warn that the capacity of coastal marine ecosystems, such as coral reefs, to continue producing goods and services to communities will be jeopardized. Photo: Jerker Lokrantz, Azote.

not take into account the obvious poverty traps in many coastal communities.

– What is needed are new forms of governance and management that work with and for local communities, and that can achieve mutually beneficial outcomes, says Maricela de la Torre Castro, a scientist working with coastal socio-economic systems in East Africa.

/Albert Norström

More at:

www.resilience2008.org

New guide helps decision makers use an ecosystem services approach

A new publication from the World Resources Institute helps decision makers to better understand and mainstream ecosystem services into policy and development decisions.



Three years ago the UN-initiated global survey Millennium Ecosystem Assessment showed us convincingly how ecosystem degradation will not only impact the wild species which share this planet with us, but also our own species' and the potential for future human development.

The assessment further concluded that reversing this degradation of ecosystems while meeting increasing demands for their services is an enormous challenge. Needless to say, this challenge can

only be met by significant changes to policies, institutions, and practices. But how do we really move from theory to practice when it comes to taking ecosystem services into account in policy and development decisions?

One group working hard at mainstreaming ecosystems services is the People & Ecosystems program of the World Resources Institute. Their new publication Ecosystem Services:

A Guide for Decision Makers presents various methods and case studies that use ecosystem services to enable mayors, planning commission members, and international development officials to link ecosystems and human development. Such public sector decision makers “often overlook the connection between healthy ecosystems and the well-being of people, and, as a result, long term goals may be jeopardized for short term gain”, concludes the new report.

One example put forward is the construction of dams that could increase power supply to cities and irrigation to croplands, but this often comes at the expense of ecosystem services like the river's capacity to support fisheries or provide shoreline protection.

A must-read for all decision-makers

The new guide provides a number of methods and examples of how projects, plans and policies can benefit from incorporating ecosystem services. It is a must-read for all decision makers in the public sector, and all others interested in helping decision makers change their mind set, from the traditional approach of protecting ecosystems *from* development to protecting ecosystems *for* development.

/Fredrik Moberg

More at:

<http://www.wri.org/publication/ecosystem-services-a-guide-for-decision-makers>

“Going Beyond Panaceas” for sustainable resource use

In their work towards sustainable use, equitable allocation of resources and biodiversity conservation – researchers and managers continue to strive for cure-all solutions. Maximum sustainable yields, privatisation, nationalisation, reservation, bottom-up, top-down, co-management – the list goes on. But in real life each case needs its specific set of policies that need continuous updating, says new research.



Lessons learned in the fisheries of lobster (*Homarus americanus*) in Maine, USA, do not automatically apply in other social and ecological contexts. Photo: Alexandra Lee/azote.se

Most, if not all, of the natural resources or ecosystems to be managed share two key features: excludability and subtractability. When it is difficult to exclude users from your resource base – such as in most fisheries – then rules are needed to determine who can have access to the resource. And, when the removal of a unit of resource – such as a fish – subtracts it from the stock available to other fishers (no one else can catch that fish again), rules are needed to avoid overexploitation. Included in this is monitoring and policing. An example is the inshore lob-

“Management must be adapted to the specific context of each site or case. Policy panaceas, however, tend to be static over space and time.”

ster fishery in Maine (USA) where fishers dealt with excludability by establishing territories affiliated to harbours (2). To deal with subtractability, the fishers have developed an array of rules to protect the stock. What was the result? Very encouraging! There has been a boom in lobster in recent years. Is this then a panacea for fisheries management? No.

Research shows that while the rules have probably kept exploitation at a sustainable level, the boom is due to high water temperatures and overfishing (often by the same fishermen) of lobster predators (such as cod). This tells us two things. First, that there are certain characteristics of the lobster and its environment and/or of the structure of the lobster fishery (i.e. the local context) that have allowed these rules to succeed. Secondly, that if one does not understand the causes behind successful outcomes, a panacea may be instigated that could have no impact.

Management in the local context

As seen in the former point, management must be adapted to the specific context of each site or case. Policy panaceas, however, tend to be static over space and time. For example, the proliferation of protected areas – both marine and terrestrial – has resulted in over 100,000 pro-

tected areas globally. These are based on excluding users and/ or prohibiting extraction to varying degrees. The success of most of these has not been evaluated, yet many still hail the establishment of protected areas as the only measure for protecting biodiversity (3).

A growing number of researchers conclude that there are no panaceas. A successful project in one locality cannot be expected to succeed in other areas. Fikret Berkes, of the University of Manitoba, Canada, explains that this is because “... each case is conditioned by the context in which it developed” (4). This refers to the fact that ecosystems are characterised by cross-scale interactions (i.e. they are not isolated from their surroundings and some things happen very fast while others very slowly) and uncertainty. Needless to say, social systems are also complex. These characteristics should warn against “one-size fits all” solutions.

When do panaceas arise?

It is not only important to bring to light the potential dangers of applying panaceas, but also to identify the situations when panaceas tend to arise. The latter is particularly valuable to managers and researchers when setting out to instigate their success elsewhere or adopt someone else’s success. In the Maine lobster fishery example, the measures taken to govern the lobster fishery do not work for other fisheries in the same and surrounding waters. Most likely due to particular characteristics of those fisheries that have made it difficult to successfully manage excludability and subtractability.

The reasons for success must also be understood. The boom in lobster could have been interpreted as a result of the governance measures rather than the larger scale (beyond the inshore fisheries’ territories) processes (water temperature and foodchain changes) that are believed to be promoting this boom. Had this not been identified, the industry would have been taken by surprise by the drop in lobster abundance that can be expected when water temperatures drop.

Elinor Ostrom of Indiana University, USA, has developed a framework to avoid panaceas (5). Particularly striking is Ostrom’s realisation that policy is often based on very limited knowledge of the system targeted. This is inevitable – the transdisciplinary research needed for this kind of policy is young in itself, and data/information collection is often either lacking or not yet translated into forms that can be used by research or policy. This calls for an even humbler approach – management measures need to be evaluated and adjusted over time. For two reasons: firstly, management is an experiment, and once its outcomes are known the experiment can be fine-tuned; secondly, systems change with time – changes in user groups, market forces, ruling regimes and so on – means the local context for which the policy was established is not static.

Daunting but possible

While this complexity may be daunting, it is reality. This is what policy must be based on, and there are many success stories to learn from. This often entails rethinking our governance structures and management – but is this really a surprise given that despite massive efforts globally to protect biodiversity, extract resources sustainably and allocate resources equitably, these not only remain unsolved, but the impacts are growing in scale?

/Miriam Huitric

Sources:

(1) Going Beyond Panaceas. Special feature of the *Proceedings of the National Academy of Sciences*, USA. 2007. Vol 104, No. 139 (Articles below).

(2) J Wilson, L Yan, C Wilson: The precursors of governance in the Maine lobster fishery.

(3) E Ostrom, MA Janssen, JM Anderies: Going beyond panaceas.

(4) F Berkes: Community-based conservation in a globalised world.

(5) E Ostrom: A diagnostic approach for going beyond panaceas.

3 questions to Professor Buzz Holling about the resilience concept

Resilience has become a popular concept in the wake of the growing climate change awareness. It is the capacity of a system, be it ecological or social, to deal with change and tolerate disturbance without collapsing into a qualitatively different state. SDU got an interview with Canadian Professor C.S. "Buzz" Holling, the father of the ecological resilience theory.



"Buzz" Holling

How would you explain resilience to a ten-year-old?

If I was a ten year old I would understand resilience more than if I was a 50 year old. The essence of resilience has to do with the ebullient surprises that occur or you encounter. And what are surprises? That are the things that are not explained by the theory that you contain at the moment or the paradigm, they are the unexpected events

that nature show you, that you're learning. A learning human can classically be imagined as a ten year old because his world has matured to a certain point and much is unknown. Resilience is more of a metaphor for a 10-year old than a 50 year old. Less and less of a 50year old's world is one of surprise particularly compared to a ten year old. Resilience is for the ever youthful!

Have you seen any difference between cultures and how they relate to the concept of resilience?

The view of a theory is limited by languages. The Latin languages

are better to capture resilience than the German languages. I've talked to people with moral Muslim background and they seem to have a more intuitive feeling for the unexpected and the unknown and the richness of that, not just the fear.

There is also a culture of religion that has a growing power in many countries today. The fundamentalist religion deals with the unknown in a dominant way; they convert it to the known, in their minds. That kind of fundamentalist religion is almost the opposite of the inherent features of any of the concepts engaging resilience. Those concepts see the uncertain as an inherent part of life, and the uncontrollability being the engine for new discoveries. So, yes you get different attitudes about resilience from different cultures and you get different attitudes about knowledge and understanding, of which resilience is one part.

What do you see are the main obstacles to achieving sustainable development?

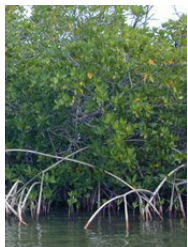
Everyone's training and everyone's experience is on a small parts of the full domain. And there is a strong tendency for people not to recognize that reality and preclude people who are in another domain from doing what they are doing. I find that offensive – to assume the knowledge generated in your paradigm is so complete as to preclude some imaginative alternative. That paradigm exclusivity, that can't be afforded today. What is happening globally today is so profoundly new to even pretend that an existing theory can completely grasp, or explain that.

/Louise Hård af Segerstad

More at:

http://en.wikipedia.org/wiki/C._S._Holling

"Destruction of mangroves increased impact of cyclone in Burma"



Mangrove forests could have reduced the damage of the cyclone Nargis in Burma, says the FAO (UN's Food and Agriculture Organization). Intact mangrove forests are good at reducing the force of waves because of the trees unique stilt roots, trunks and branches. They also trap and stabilise sediment reducing shoreline erosion. Burma's coastline has, however, lost almost half of

its mangroves to e.g. agricultural land and aquaculture ponds. Moreover, many settlements have been established closer and closer to the sea. This proximity to coastal hazards and lack of protective mangrove forests have now proven to be a lethal combination to human populations.

Mangroves are, however, not only buffers for cyclones they are key ecosystems harbouring a rich biodiversity and providing important nursery areas for fish. In the future, sea level rise and increased frequency and intensity of storms due to climate change are expected to put coastal areas at greater risk of damage. "Maintenance of coastal vegetation as buffers are important measures, but will not be enough to protect against all storms", says the FAO in a press release.

www.fao.org/newsroom/en/news/2008/1000839/index.html

"200 is a vision that we all break the sense of nation state boundaries when we govern the planet. We need to govern the planet as an earth system. My hope is that the world's 200 countries will realize that when it comes to resilience, climate, ecosystems, atmosphere and water resources, it does not matter if we are Swedish, Chinese or Indian. We are all in it together, we are in the same boat we will sail together, or tip and sink together."

This is what Professor Johan Rockstrom, Director of the Stockholm Resilience Centre, answered when he was asked to propose his most ambitious goal for ecosystem management during the Policy Day of the Resilience 2008 Conference in Stockholm, April 17. Rockström's quote above is based on the notion that nation state governance tends to work with too narrow time and space scales, which can hinder effective governance of ecosystems. A dangerous mismatch exists between the time frames of politicians for decision-making and the time scales of ecosystems functions and processes – a point that was reiterated over and over again during the Resilience 2008 Conference.

View excerpts from the Resilience 2008 Policy Day:
<http://resilience.qbrick.com/view.aspx?id=39>

SDU-numbers



The Sustainable Development Update focuses on the links between ecology, society and the economy. It is produced by Albaeco, an independent non-profit organisation, in cooperation with Stockholm Resilience Centre and the Department of Systems Ecology, both at Stockholm University; the Beijer International Institute of Ecological Economics; the Resilience Alliance; and the Stockholm Environment Institute (SEI). It is produced with support from Sida, the Swedish International Development Cooperation Agency, Environment Policy Division. **Feedback:** We welcome comments, questions, and article ideas.

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