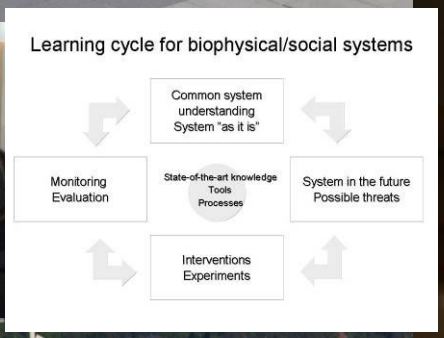
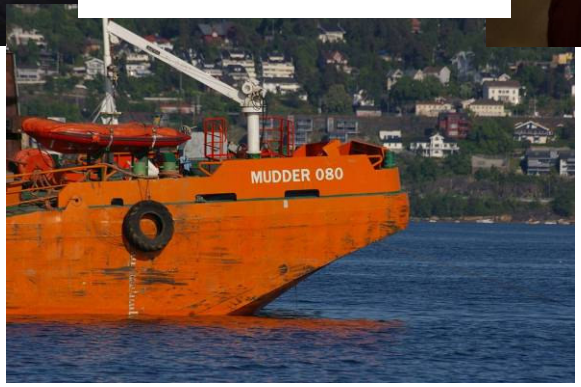
Report
of the special session
of the living with sediments project

'Sustainable Sediment management a systems approach' from a resilience point of view

30th of May 2008 at NGI, Oslo, Norway





Context: the living with sediments project

The living with sediments project started in 2006 and is sponsored by the Dutch research program on water issues, called 'Living with water'. Together with the consortium partners, TNO, the Netherlands Organisation for Applied Scientific Research, is organising the project.

The living with sediment project starts from the notion that sediment management has to be regarded as a complex issue. This complexity has different dimensions:

- The perception of sediment is generally negative. Sediment is often perceived as a waste or as a substance that poses a risk to health and environment;
- The sediment issue has an impact on the interest of multiple stakeholders (for example farmers, shipping and environmental organizations). Those stakeholders are generally not involved in the formulation of the problem, solutions or policy measures;
- Legislation in the Netherlands concerning sediment management is quite strict. Due to this legislation the perception of sediment as a waste or a 'toxic substance' is maintained and the costs of disposal of polluted dredged material are high.
- The distribution of responsibilities over the different institutions involved is complex. For instance, polluted sediment cannot always be contained in the area where it has been dredged. This means that dredged material has to be deposited in another area, causing 'the problem' to move between institutional boundaries.

With these issues in mind the 'Living with Sediments' project wants to approach the sediment issue from the concept of sustainable development. The main pillars of the philosophy behind the project are:

- A system approach that takes the natural (water, soil, sediment and environmental) and social (regulations, stakeholders, institutions, etc.) system into account. This takes the problem away from only sediments and tries to connect different policy areas, different knowledge bases and different stakeholder views. This fits in the approach of the European Water Framework Directive that requires policy makers to look at the whole system and not just at water.
- Stakeholder participation; Different stakeholder views on the sediment issue can be identified. These differences should be recognized and respected and can be used to create joint solutions. Acceptance of joint solutions will be better and stakeholders can bring their own knowledge (local, from their perspective, etc.) to the table.
- Collective knowledge gathering and development; gathering and developing knowledge based on questions from the stakeholders creates a shared knowledge base from which the problem can be both defined and addressed. The incorporation of formal stakeholders, e.g., regulatory agencies, and informal stakeholders, e.g., farmers, environmental groups, etc., leads to an increase in understanding of both the ecosystem and the socio-political system within which problems can be defined and ways to address those problems can be developed.

In the context of this project two parallel 'tracks' are organised: Track 1 is the application of a new approach to sediment management, based on the pillars described above, in two cases. Track 2 is an international exchange of knowledge and experiences about sustainable sediment management, the system approach, including stakeholder involvement. In this track people (researchers and practitioners) from the case and the national 'track' are involved and are

brought in contact with international experts and practitioners from the EU (SedNet community: www.sednet.org), Canada and the USA. The project wants to facilitate the exchange of knowledge and experiences between researchers, between practitioners and between researchers and practitioners on an international level.

The goal of the living with sediment project is to publish a book together and if possible also other, more dynamic forms of communication, such as a website or a wiki to create a shared knowledge and experiences base. For example see the websites of SEDNET at www.sednet.org and the Wikipedia of the resilience centre at http://wiki.resalliance.org/index.php/Main_Page

Impression of the session

Welcome

Adriaan Slob (TNO), project leader of the living with sediment project, starts by welcoming every body to the special session and also thanks NGI for hosting the session, the SedNet community for fitting in this special session after the SedNet conference and Marjan Euser for all her help with the organisation.

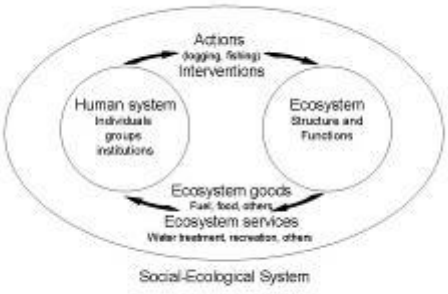
Discussion on the Resilience

Adriaan Slob also starts with a presentation as a means to discuss the concept of resilience: '**The resilience lens and sedimentary systems**'. The resilience lens is a framework on a systems level that deals with complexity and dynamical processes of change and renewal. It emerged from ecology in the 1960s and early 1970s and has linkages to other theories that describe (in)stabile and far and near-equilibrium processes in systems, like thermodynamics and complexity theory [1][1]. The resilience perspective is increasingly used as an approach for understanding the dynamics of social-ecological systems [1,2]. It sees social and ecological systems as one and not as separated. Adriaan presented the resilience lens by discussing four important elements (see resilience_handouts.ppt on www.levenmetbagger.nl):

1. the interaction between the human system and the ecosystem
2. the adaptive cycle
3. regime shifts
4. panarchy

The first element is the interaction between the Social-Ecological system and is represented by the picture below:

[1] [1] Gallopin, G.C. Linkages between vulnerability, resilience and adaptive capacity (2006). Global Environmental Change 16 253-267 [2] Folke et al., [2002], Resilience and sustainable development: Building adaptive capacity in a world of transformation. Scientific background paper on resilience for the process of the world summit on sustainable development on behalf of the environmental advisory council to the Swedish government.



Points of discussion concerning this system view were:
This schematic is too 'onesided'. The arrows point suggest that the only intervention is in the in the ecosystem and not vice versa. However the ecosystem intervenes in the human system, for example flooding, earthquakes, etc.. This also goes for the human system when it comes to providing services for the ecosystem. For example protecting nature areas and arranging water management.

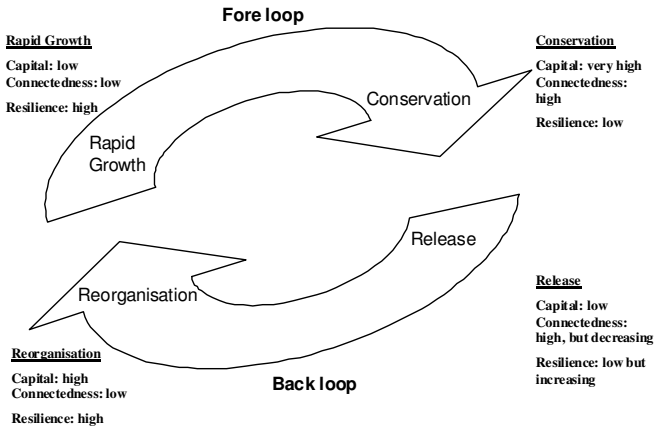
The question is raised what the link of the figure is concerning sediment? A number of reactions point out this relation:

- The link with sediments in both modified and unmodified water systems impacts human activity of all sorts: Sediments are used to make bricks, which can be used for building houses**;**
- The Waddensea (north of Netherlands/North-West Germany) were the floodplains act as a sediment trap and can be used to walk to islands during low tide is an example were sediment deposition is appreciated for its recreational use;
- A challenge is determining or developing beneficial uses for sediment. Often the citizenry has a limited understanding of the sedimentation process, an example of the interactive nature of the human-ecosystem relationship. A better educated public is essential to effective planning and problem solving and stakeholder involvement in the planning process is likely essential for an educated public. When that understanding lacking, for example, planning errors become likely. An example from Oslo shows that this is not always easy. In Oslo, for example people got the right to dredge the clean sediment from their private marinas to increase water depth. The removal of clean sediment uncovered contaminated sediment thus damaging the ecosystem. The contaminated sediment was costly to dredge and to deposit elsewhere. Dredge spoils must be deposited somewhere. In that sense, they cannot be 'gotten rid of." The relevant authorities have difficulty confronting this problem, but the failure to do so creates more severe problems. A different way of looking at the contaminated sediments is that sediment as the carrier of heavy metals provide a service in that responsible management of contaminated sediment results in ecosystem improvement. In the river the Dommel (the Netherlands) people deposited clean sediments to actually capture contaminants;
- The question of planning and remediation scale is a constant difficulty. ocal, state, regional and national boundaries are irrelevant to ecological processes, but those boundaries define who is responsible. The issue of scale both must be addressed requiring cross boundary collaboration and the area covered must still be manageable. Planning for the world is not possible; planning for a river than flows through many countries must involve all those

countries to be effective. An approach can be the EU riverbasin approach, as seen for example in the Danube commission.

- An important lesson from restoration work on the east coast of the UK is that the boundaries of the system should not be set too small. For example the dredging of waterways did not only affect ecosystems but also the sea defence system.

A *second element* presented by Adriaan Slob was the adaptive cycle (presented below)



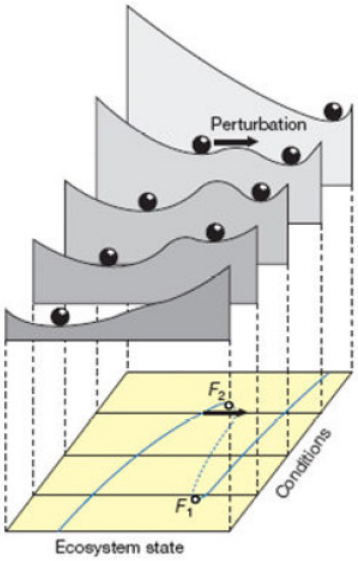
From the audience someone sees the rivers of the Ganges Delta (India and Bangladesh) as an example of the adaptive cycle. Annual flooding results in sediment deposition, i.e., new topsoil, but flooding is also very dangerous. The people have adapted to that, by building houses on poles or on higher grounds. Some one else disagrees and sees the Ganges as an example of the state described in the figure above as 'conservation'. The people are depending so much on the river that they are completely dependent of it.
Another remark is that human systems want to stay in the 'foreloop' of the figure. The release phase is very difficult for human systems.
Some examples of a situation were the adaptive cycle applies are:

- For human systems in city development;
- Cathrina and it's impact on New Orleans: both the social and a natural system;
- Bringing a foreign fish specie into lake Victoria (Africa): this changed both the ecological & the social system.

A comment is that the reorganisation phase is presented very easy, but this is usually hard work and takes time. Adriaan Slob answers that reorganisation is actually self organising, but that the point is represented a bit too easy.

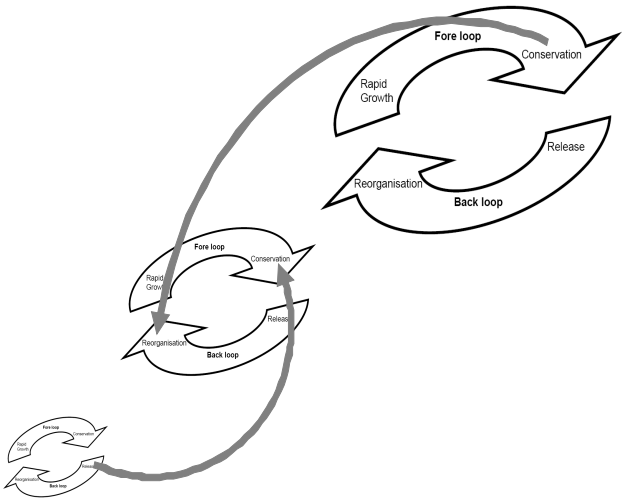
Another participant asks about the timescale. If the timeframe is too small you cannot change anything. If you take a long time, then you do not see the changes. However to understand the system you needs some limits. Adriaan explains that of course boundaries are needed, but that a different time frame will also help to change our perception on the system.

A *third element* of the resilience lens was the Regime Shift (presented below)



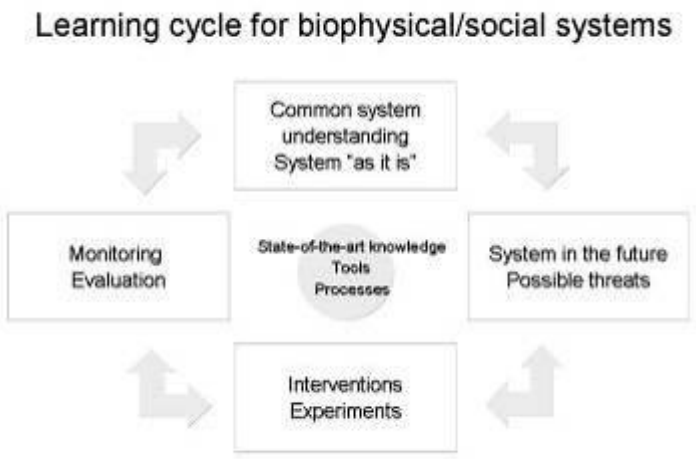
A question is: what the difference between the adaptive cycle and the regime shift? Adriaan replies that the adaptive style is internally of the system, how it deals with changes. The regime shift is more externally, what effect do changes have on the entire system? Concerning change another participant remarks that we need to get away from thinking about change as a negative thing, it can also have a positive effect to 'let go'.

A *fourth element* presented by Adriaan Slob was the concept of Panarchy (presented below)



An example of Panarchy is the SANDOS case, in which the Rhine was polluted on a local level, the pollution spread to a regional and riverbasin level. Another example is the current mortgage situation, which has impact on local, national and global scale.
A question concerning the panarchy is whether the arrows between the different levels should not be bi-directional. Adriaan points out that this could be the case.

The elements that Adriaan described in his presentation come together (and should be kept in mind) in the following figure, which represents a learning cycle for biophysical/social systems.



One of the attendants points out that the cycle reminds him of the cycle of risk assessment/management. We are living in a risk society, so if there is a low risk we do not do anything. This cycle also points out how to deal with risk: are you dealing in it with a more conventional way or are you accepting uncertainty. Of course the question is always risks applying to whom?

A suggestion to improve the figure of the cycle is to take out the word 'common' in system understanding and also take out the possible threats (because this is already in the picture when you are talking about the system).

A question is what the difference is with the concept of sustainability. Adriaan Slob answers that there is no difference. Resilience is a next step. The development part of sustainable development has not yet been made practical, resilience can do this.

Presentations

After this discussion on the concept of resilience, six presentations are given that either use a systems approach or a resilience lens on water-soil-sediment management. The presentations can be downloaded at http://www.levenmetbagger.nl

The presentations were:

Presentation 1: The Frisian story

Presentation by Wim Haalboom from the province of Fryslan (The Netherlands). Experiences with a collaborative approach to sediment management.

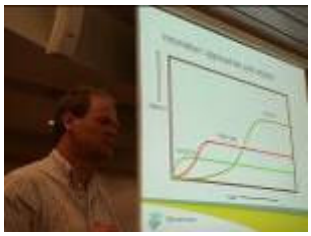
Presentation 2: Role of science & scientists in Multi-Stakeholder Planning and Problem Solving

Watermanagement does not only require different approaches but also diversity in competences of scientists and roles of scientists/science in Multi-Stakeholder Planning and problem solving. A presentation by Michael Mery from the TomalesBay Watershed Council.

Presentation 3: Scaling up resource management from local systems to the river basin

Perhaps it is possible to realise a system approach on local level, but how do we go about scaling this up to different levels (strategies) and which issues do we encounter?
A presentation by Joop Vegter (Vegteradvies), Wim Salomons (UVA-IVM) and Susanne Heise (TU Hamburg)

Presentation 4: Sediment management as an innovation process
What if we look at sediment management as an innovation process? This presentation will present theoretical and practical principles for innovation and link this to sustainable sediment management. Presented by Piet den Besten (Rijkswaterstaat), Frans Loman (Rijkswaterstaat) and Mike Duijn.



Presentation 5: Iterative innovation within a project
Presented by Mike Duijn.

Presentation 6: Systemic approaches and systems' resilience as a challenge for water and sediment management
If we want to realise a system approach what does this entail for organisations and practitioners. Mike Duijn (TNO), Gerald Jan Ellen (TNO) and Lasse Gerrits (Erasmus University Rotterdam)

Roundtable discussion
After lunch the session continued with a round table discussion on the concept of resilience and its possible use when it comes to water-soil-sediment management.

Usefulness of the concept

One of the participants believes that the concept can be useful, but that we should be careful in using it too rigidly. Resilience is not a standardized model but should support the development of good practice in sediment management. Does resilience as a concept help practitioners in developing such good practice, in order to be (more) successful in future projects? Does resilience thinking provide us with rules of thumb and reminders of success factors? In reaction to this another participant points out that resilience is a metaphor for the fish in the stream and all the challenges it faces and constituting factors that contribute to its growth. Our minds should be open for unpredictable change. Unpredictable does not mean un-intelligible. Acknowledging the limits of knowledge is the start of being a resilience thinker. The world is teaching us resilience. In this way resilience for us as human being, is to let nature do what it does and allow us, as human beings, to live how we want to live. This also means understanding what nature can do. An example from the Netherlands is the 'space for the river project'. In this project floodplain area that have been in agricultural use for many generations are recovered. By doing this, some flooding is permitted in specific areas in order to relieve pressure; in this way the resilience of the system is increased thereby reducing impact is the larger region.

Resilience in relation to daily constraints (budget, time etc.)

A participant from the UK, who is a practitioner, points out that the resilience concept is in essence worthwhile. However in daily practice you strive to take decision, but there are too many constraints (budget, political pressures, time frames, funding, natural intervention) to do it as suggested in the resilience approach. His question therefore is: how do you adapt the resilience concept to daily practice?
A reaction is that this may be the case at a local level, but river basin management is a slow process. It is not 'bim bam' take a decision and going on. Adriaan Slob points out that this is true, but it is also clear that the political system (with a 4-year cycle) does not fit with the long-term thinking of resilience.
A participant from Norway corroborates this by pointing out that in the Oslo Fjord case politics and practitioners had very different agenda's. Adriaan Slob points out that this has also to do with transparency and uncertainty; some politicians are uncomfortable with both. Joop Vegter warns for the tendency that river basin management becomes nothing more than a loose collection project. 'Slow problems' ask for 'slow processes' and not quick fixes in isolated projects. However, politics often does not allow for thinking in slow processes. Politics tends to resort to a reactive behaviour: when a problem is detected, then action must follow (immediately). This mirrors the politicians' assumptions about the (natural) system(s) involved: they can know it, they can control it and they can communicate about it. These assumptions bend back on the need for (more) transparency and trust in science-policy processes. Sediment projects usually are long term processes, whereas politicians come and go, losing interest very fast. This undermines a structured approach to these 'slow processes'. Management of drinking water suffers under the same circumstance: similar to sediment, it is not seen as an eco good.

Different types of problems should be treated differently. There is a need for remediation projects of a local level but also for managing certain developments on the river basin level of scale. This makes resilience thinking quite difficult.

Resilience is in the eye of the beholder
According to a participant from the Netherlands resilience only works when there is a sense of urgency. Look at the food crisis, the water crisis. The participant questions the sense of urgency for sediment management. Are we really ready to do it, or do we just want to implement EU legislation? Today the sense of urgency seems very low, and perhaps we need (another) crisis to get moving in right direction.
Another participant from the Netherlands sees resilience as something that can be applied taking small steps. For example by taking the elements that are resilient in our daily work and improve them. A question by a participant from the UK is whether resilience is a framework or a tool? According to a participant from the USA resilience is in the eye of the beholder. It is a cultural issue and a natural issue, therefore it is more a concept than a tool.
Resilience seems to be a positive way of thinking about organic development instead a of the next new, 'big bang' in thinking.

Communication with stakeholders and the political system
A participant from Norway points out the importance of being connected to the political process. Adriaan Slob points out that this can be done by starting to make a 'picture' (system understanding) of the system together with politicians and stakeholders. Another participant reacts that it is important to make a resilient communication concept, perhaps you can improve the process of communication. Adriaan points out that communication is not the same as understanding. Communication is usually targeted to specific target groups through specific messages, whereas understanding unfolds in collaborative processes. From a number of participants ideas to improve communication are:

- make a simulation
- start on a small scale
- the importance of transparency: connect to the people. Frame the question from their perspective.

- Approach communication from what people appreciate, for example enjoying recreational aspects of sediments;
- When it comes to sediments make something tangible. Some see appropriate visualization as solution for better communication with stakeholders.

For the Oslo Fjord case this seems no longer possible because of its history. Now professionals involved (from NGI) are aiming for 'moving targets'. The current information flows and public attention define the political discussions and therefore the role of NGI in the project.
Other case studies show however that early and elaborate communication of dredging or other sediment related issues did not change public opinion of media attention. Next to communication, the legislative system makes resilience thinking and acting difficult because of its passive and reactive nature that usually undermines proactive and long term interventions. Partly this is our own fault: sediments should be discussed in the own natural context and not as something that does not belong in a certain place or location.

Framing and reframing are important: perhaps when the Oslo Fjord case was framed a harbour redevelopment project instead of a dredging or remediation projects, public opinion and media attention would have been much more favourable (example of Bilbao's Guggenheim museum project that lifted up an entire desolate city district). The way a problem is framed tends to be very important for getting things done.

Final remarks
A participant from the US points out that science and practitioners are here together. However *applied* research is the kiss of death if you are a scientist. Because of the way scientist are valued (peer-reviewed scientific publications) in their line of work. But in the policy world applied science is good. We need to do something to get this changed. A start could be better visualized science.

Mike Duijn invites everybody to come to the 48th Congress of the European Regional Science Association August 27 - 31, 2008, Liverpool. TNO will be hosting a special session there on the concept of resilience. This session will also be used to take another step in working on the book that the living with sediment project wants to make.

Michael Mery suggest a WIKI structure for the discussion on resilience. This is a much more resilient structure than a book. It turns out that such a structure already exists at:
http://wiki.resalliance.org/index.php/Main_Page

Adriaan Slobs thanks everybody for their input in the discussion and NGI (Amy Oen and Gijs Breedveld) for hosting and helping out with the organization of the workshop.