



European Sediment Research Network

Acronym: SedNet

EC contract No.: EVK1-CT-2001-20002

Key action: 1.4.1 Abatement of water pollution from contaminated land, landfills and sediments

MINUTES OF THE WORKSHOP ON

Societal Cost Benefit Analysis and Sediments

18th-19th March 2004 in Warsaw, Poland

Hosted by:

*The Warsaw Agricultural University
Faculty of Engineering and Environmental Science
Department of Hydraulic Engineering and Environmental Recultivation (WAU)*

Organized by:

*Sediment management at the river basin scale (WP2)
And
Coordination, synthesis, dissemination and stakeholders panel (WP1)*

AUTHORS: Philip N. Owens, Adriaan Slob, Gerald Jan Ellen.

Agreed by the workshop attendees and the WP2 Core Group

DATE: May 2004

Pages: 13

Introduction

This report represents the minutes of the SedNet workshop on Societal Cost Benefit Analysis and Sediments, held on March 18th and 19th 2004 in Warsaw, Poland. This workshop was the fourth workshop of SedNet Work Package 2 and was organized by Phil Owens (WP2) from the National Soil Resources Institute, U.K., and Adriaan Slob (WP1) and Gerald Jan Ellen from TNO, the Netherlands. The workshop was hosted by Professor Banasik of the Warsaw Agricultural University, Faculty of Engineering and Environmental Science, Department of Hydraulic Engineering and Environmental Recultivation (WAU). The goal of the workshop was to discuss the "state-of-the-art" on Societal Cost-Benefit Analysis (SCBA) with respect to sediment issues and to generate new insights and research recommendations to be addressed by the European Commission.

Participants

The following people participated in the workshop:

Name	Organisation	Country
Banasik, Kazimierz	Warsaw Agricultural University	Poland
Batalla, Ramon	Departament de Medi Ambient i Ciències del Sòl, Universitat de Lleida	Spain
Barszcz, Mariusz	Warsaw Agricultural University	Poland
Bouma, Jan-Jaap	Erasmus University Rotterdam	The Netherlands
Draganova, Galina	Bulgarian Agency of Environment	Bulgaria
Eisma, Marc	Port of Rotterdam, Corporate Strategy / Shipping & Maritime Development	The Netherlands
Ellen, Gerald Jan	TNO STB	The Netherlands
Gomez, Carlos Mario	Department of Economics, Universidad de Alcala	Spain
Leszek, Hejduk	Warsaw Agricultural University	Poland
Markowska, Agnieszka	Warsaw University	Poland
Owens, Phil	NSRI, Cranfield University	UK
Popek, Zbigniew	Warsaw Agricultural University	Poland
Slob, Adriaan	TNO	The Netherlands
Taylor, Kevin	Department of Environmental and Geographical Sciences, Manchester Metropolitan University	UK
Van der Vlies, Jaap	TNO STB	The Netherlands

Structure of the workshop

Various presentations on subjects concerning Societal Cost Benefits Analysis (SCBA) and Sediments were used as input for this workshop (see Annexes document). These presentations provided an introduction to the subject of SCBA and input for the subsequent discussions. The workshop was an excellent opportunity to bring people together from various backgrounds and discuss this issue. The results of this workshop will be published in, amongst other things, a chapter in one of the SedNet books.

The programme consisted of five parts. The first day started with presentations from people from both science and practice. After these presentations the participants were divided into separate subgroups where they discussed the subject of SCBA in relation to sediment, to get acquainted with the subject and to identify possible questions and points of discussion. The second day started with presentations and in the afternoon two different river basin case studies (Ebro and Scheldt) were used to create insight into the problems that might be encountered when conducting a SCBA on sediment management options. The second day was concluded by discussing the implications of the workshop for research recommendations to be delivered to the European Commission.

Day 1: Introduction into SCBA and a first practical application

Presentations

The first part of the workshop started on the afternoon of March the 18th. The session started with a brief welcome by Professor Banazik, and was followed by an introduction by Phil Owens and Adriaan Slob explaining the programme and the goals of this meeting (as stated above).

The next two points on the programme were presentations. The first presentation was by Ramon Batalla and Phil Owens on Europe's sediment budget (see Annex I for the slides). In this presentation Ramon Batalla explained the importance of getting more information about the actual sediment budget of Europe. The reason for this is to create a better understanding of the 'problem' that Europe is facing concerning the sediment issue, which, after water, is the single most important natural resource used in the EU. The creation of a 'complete' picture is essential if the EU wants to deal with this issue, and is also necessary in order to use 'tools' such as Societal Cost Benefit Analysis for sediment management. The presentation was concluded with a request to all participants (of this workshop but also within the SedNet community) to collect available information on sediment yields and sediment budgets and to send this information to Ramon Batalla (rbatalla@macs.udl.es) or Phil Owens (philip.owens@bbsrc.ac.uk).

The second presentation was an introduction to Societal Cost Benefit Analysis by Jaap van der Vlies (see Annex II for the slides). Mr. van der Vlies started by pointing out that there are usually two initial phases to go through before one can actually start with the SCBA. The first phase is to make an inventory of the problem and to create a *problem definition* that is clear to all parties involved. The second phase is the *generation of solutions* to deal with the problem that was defined in phase one. Only after these two phases have been finished satisfactorily, can the SCBA begin.

On this point Adriaan Slob asked: But how well do we understand the system? and When have we explored the system 'enough' to go to phase II? Jaap van der Vlies replied that this is done when all the possible (available) information is assembled. Phil Owens suggested that for the sediment issue the available information may already exist within the SedNet community. Furthermore, it is also important that when we define the problem, that we do not view sediments in isolation, but in a 'continuum' with different functions. Jaap van der Vlies replied by pointing out that for the definition of the problem it is of great importance to get insight into the (economic,

social and ecological) functions that are affected by sediments. In response, Ramon Batalla stated that it is not clear to society why they should care about sediment, and that creating a list of functions/problems might help to make the sediment issue clearer to society. Ramon also pointed out that it is difficult to put this list together if we lack important data on the sediment system (e.g. the sediment budget).

In answer to the question of Mr. van der Vlies - what are the main problems concerning sediments - a number of problems were summed up by the participants:

- Due to the chemical reaction between water and sediments, a problem may arise with the consumption of drinking water;
- Due to sediment deposition, waterways have to be dredged to keep them open for shipping. If no dredging is undertaken water transport will eventually become impossible;
- Due to the dredging of waterways extra costs have to be made, not only for dredging itself but also for cleaning and storage of the sediments
- Sediments are viewed differently by all participants, but the focus should be on contaminated sediments. The quality of contaminated sediments is usually the main problem, but the quantity of the sediments that have to be dredged is also important.

The problems summed up above are often connected to costs. But sediments can also be a benefit to society, and the following examples were given:

- Sediments can be used for the prevention of flooding (dykes and dunes);
- Sediments represent an important resource for building material, and as a fertilizer for agricultural purposes;
- Sediments are important as habitats and for biodiversity;
- Sediments are of value for creating infrastructures;
- Sediments are needed as a filter for cleaning surface water.

The issue with these sediment functions is that some of them are valued while others are not. How do we choose between these functions? This is a key question. By identifying the opportunity costs of choosing certain functions, we can discern the interdependencies and conflicts between these functions. Jaap van der Vlies closed his presentation by pointing out that a good way to actually understand these difficulties is to experience and evaluate them in a case-based discussion. This discussion would take place in the subsequent subgroup sessions.

Subgroup sessions

The presentation of Jaap van der Vlies gave a theoretical insight into the subject of SCBA. The goal of the subgroup sessions was for the participants to evaluate the instrument of Societal Cost Benefit Analysis in practice. The following questions were used to discuss the subject of SCBA in two smaller groups, headed by Phil Owens and Adriaan Slob:

- Choose a policy question involving an issue around sediment: give a definition of the problem;
- Why would one need to conduct a SCBA?
- What do you expect to get from a SCBA?
- What is needed to make a SCBA for the problem definition that is described?
- How is the required information obtained and what is the time frame?

In addition to these questions, both groups were also asked to write down questions that they might have about conducting a SCBA, as well as points of discussion on the subject.

The focus of both groups was different: group 1 focused on sediment quality issues, while group 2 focused on sediment quantity issues.

Group 1: <i>Issue focused on sediment quality</i>	Group 2: <i>Issue focused on sediment quantity</i>
Eisma, Marc	Banasik, Kazimierz
Ellen, Gerald Jan	Batalla, Ramon
Leszek, Hejduk	Barszcz, Mariusz
Markowska, Agnieszka	Draganova, Galina
Owens, Phil (moderator)	Gomez, Carlos Mario
Taylor, Kevin	Popek, Zbigniew
	Slob, Adriaan (moderator)
Van der Vlies, Jaap (switching between both groups asking and answering questions)	

Group 1: Issue concerning quality of sediments

This group described a hypothetical situation concerning a hydroelectric power plant. The reservoir upstream of the dam was filling up with contaminated sediment derived from a bordering country. This sediment would eventually prevent the dam and plant from functioning properly.

The policy question therefore was: How do we keep the hydroelectric power plant functioning properly?

Why would one need to conduct a SCBA?

This question was answered by looking at the so-called zero-alternative (which consists of doing nothing): this would represent the acceptance of the situation and the eventual outcome. This would cause the reservoir to become filled with sediment, eventually causing the power plant to stop functioning (loss of power/electricity), possibly causing flooding problems in the surrounding areas and finally a negative impact on the water quality in the basin. The conclusion of the group was that this situation was not acceptable, and that something had to be done: there were implications for actions, and there were several possible options to be considered. One of the options was doing nothing (the zero-alternative). The second option was to take out all of the sediment. The third option was to keep the equilibrium (just taking out enough sediment to keep the situation stable). The fourth and final option was the alteration of the contributing upstream system.

What do you expect to get from a SCBA?

According to this group, a SCBA would enable the decision-makers to evaluate the options mentioned above. By doing this the decision-makers could choose one of the options, preferably the one which creates the optimal (win-win) situation.

What is needed to conduct a SCBA for the problem that is described?

To conduct a SCBA, the group concluded that they have to know how the system behaves and functions. This means knowing:

- where the sediments come from;
- where the contamination comes from;
- how contaminated the sediment is;
- how the contaminated sediments will affect water quality, ecology, health and fish when managed: 1) in situ; 2) by moving the sediments downstream; and 3) by moving the sediments onto the land;
- how much electricity the hydroelectric power plant produces; and
- what are the costs for a new hydroelectric power plant dam.

As an example, the option of moving the sediments out of the reservoir onto the land was explored further. This leads to the need for more data on:

- Priority: Does legislation allow for this option to be considered?
- What are the stakeholder perspectives concerning this option?
- What is the amount of sediment that has to be taken out of the reservoir?
- How bad is the contamination?
- What are the costs for removing the sediment?
- What are the fees for storage/cleaning of the sediment?
- What are possible options for the reusing of the sediments (benefits)?
- What are the environmental costs of putting the sediment onto the land?

How will this information be obtained and what is the time frame?

The time frame to gather this information needs to be at least a year. If the urgency of the problem does not allow this period of time, then a SCBA is not an option and an immediate solution has to be chosen. However, if there is enough time the information can be obtained by:

- Involvement of stakeholders in the decision process (who are the stakeholders?);
- Gathering data by conducting measurement and monitoring programmes. This also depends on the level of detail that is needed;
- By valuating certain impacts (for example, environmental costs, although this is not as easy as it seems);
- What are the environmental costs of putting the sediment onto the land?

Finally the group came up with the following discussion points and questions:

- How do we value the impact of an action/option?
- Who are the stakeholders?
- How do we involve the stakeholders?
- How much data should be gathered and at what level of detail?
- What time is available to conduct a SCBA?

Group 2: Issue concerning quantity of sediment

This group also described a hypothetical problem: a collapsing bridge caused by the erosion of sediment. The sediment management plan will be aimed at minimizing the risk of the bridge collapsing.

The group analyzed the problem with the following causal scheme.

Sediment deficit will cause:

- The bridge to collapse;
- A lower level of groundwater;
 - This will cause a decline of agricultural activities;
- Degradation of the river bed;
 - This will cause a reduced risk of flooding;
- Degradation of coastlines/deltas;
 - This will cause a decline of tourism values;
 - This will cause a decline of agricultural values;
 - This will cause a decline of biological productivity of the offshore environment; and
- Degradation of natural habitats.

But during the discussion, the problem did not become any easier to solve. The question was asked: What does a sediment deficit actually mean? Which was followed by the question: How do we know that we have a sediment deficit? A possible answer could be that we have to compare the current situation with the 'natural' situation, but what is the 'natural' situation? It became clear

to the group that the problem they are dealing with (which goes for all problems), has a temporal scale that has to be taken into account. This raised even more questions:

- Why do we have a sediment deficit?
- Is it because of a dam?
- Perhaps the sediments are not the problem but the bridge is the problem?

After this discussion the group came up with the following discussion points and questions:

- How do we organize communication between: 1) experts; and 2) experts and society (about the problem)?
- How do we deal with the temporal scale in the problem? (what temporal scale do we choose: 10 years, 100 years, 1000 years?)
- What is 'sediment balance'? We need some kind of criteria or reference. But what is stability and what about natural dynamics?
- Is quality or quantity of sediments the problem?
- Do we have enough information to make a decision?
- What is 'enough' information?

Concluding remarks after the first day

Ramon Batalla pointed to the fact that although Group 1 started from the issue of the quality of sediments and Group 2 started from the issue of quantity of sediments, both groups ended up discussing both topics. This demonstrates that sediment quantity and quality issues are interlinked and should not be discussed separately.

Day 2: Further explanation of the use of a SCBA and case studies

The second day of the workshop started with the welcoming of Professor Jan Jaap Bouma from the Erasmus University Rotterdam. In addition to his function as professor, he also is a member of the advisory board of the SCBA that is currently being conducted concerning the deepening of the River Scheld.

Presentations

Jan Jaap Bouma started the second day by giving a presentation about the use of SCBA in the past, which also meant explaining possible ways of valuating options when dealing with a (sediment) problem¹. Jan Jaap Bouma started his presentation by pointing out that SCBA is not a straight forward instrument. The process of valuating different options is easy to manipulate (by the assumptions that are used and the choices that are taken). Furthermore, a SCBA does not represent 1) an individual interest, 2) the willingness to pay or the willingness to accept of all stakeholders, and 3) does not take into account future costs and benefits. As an example, Jan Jaap Bouma discussed the Grevelingen case, where a SCBA was conducted in the Netherlands in the 1970's. One important part that was lacking in this case, in comparison to current SCBA's, was the valuing of nature/ecosystems. The valuing of nature is very difficult. For example, how can we value water supply, the life that an ecosystem provides, recreational possibilities of nature etc.? Jan Jaap Bouma described a number of methods that are used to do this (Hedonic Price Method, Contingent Valuation Method, Travel Cost Method and the Shadow Project Method). However, the valuation established by Constanza (an economist who valued ecological revenues) is often used as a standard for valuing nature. At present, NGO's are very much aware of the impact of certain options on nature and will stand up for this (eco-centric approach), while a government organisation will be focused on the actual outcome of the project (techno-centric approach).

After this presentation Phil Owens asked: how it is possible to create a level playing field for all parties involved? Jan Jaap Bouma pointed out that it is very important to explain to all stakeholders which methods are being used, what the system borders are and finally making the process of valuation transparent. Another question was: how important is the participation of stakeholders in a SCBA? Jan Jaap Bouma answered that this was very important; and SCBA could even be seen as a tool for identifying these stakeholders. It was pointed out that the stakeholders should be consulted to value the impacts of certain options on the functions and issues they deem important.

After this presentation, Carlos Gomez gave a presentation on economic analysis and river basin management in relation to the Water Framework Directive (WFD) (see Annex III for the slides used in this presentation). He explained that valuation is a very controversial issue, but also that for achieving the environmental objectives of the WFD, e.g. good water status for all waters, it is the most effective manner. The Water Framework Directive clearly integrates economic analysis into water management and policy making. However to be useful for decision-making, the different elements of the economic analysis should be integrated well in the policy decision and management cycle. The way to go about this would be to:

- Define ecological quality objectives;
- Identify and assess measures to close the gap;
- Find the most cost effective set of measures RBMP;
- Disproportionate cost analysis;
- Analyse potential derogations;
- Analyse financial viability and cost recovery;
- Analyse distributive impacts;

¹ The sheets of this presentation are available in a hard-copy version. If you would like to receive a copy, please send an e-mail to ellen@stb.tno.nl

- Analyse institutional constraints

Ramon Batalla asked how the WFD deals with sediments? Carlos Gomez answered that only in article 16 is the 'word' sediment mentioned. There is very little mention of sediment in the WFD and it's guidelines.

Phil Owens asked if the lack of attention concerning sediment in the WFD may result in the failure of the WFD to achieve its objectives. According to Carlos the WFD is indeed likely to fail because of the lack of attention to sediment.

Subgroup sessions

The presentations of Jan Jaap Bouma and Carlos Gomez gave more insight into the use of a SCBA and also the problems that may arise when valuing the impact of certain options. The goal of the subgroup sessions was to let the participants apply the instrument of Societal Cost Benefit Analysis in a case study situation. The cases were the River Scheld (The Netherlands/Belgium) and the River Ebro (Spain). The participants were asked to discuss the following questions in two smaller groups, headed by Phil Owens and Adriaan Slob:

- Choose a policy question involving sediment: give a definition of the problem;
- What kind of options (solutions) are available?
- What effects do these options have?
- How can the effects be valued?
- Where in the process will the stakeholders be involved?
- What information is needed?
- What information is lacking?

Group 1 discussed the Scheld case and Group 2 discussed the Ebro case. For both cases, short outlines of the main facts were used to give the participants an overview of the situation.

Group 1: Scheld case	Group 2: Ebro case
Eisma, Marc	Banasik, Kazimierz
Ellen, Gerald Jan	Batalla, Ramon
Leszek, Hejduk	Barszcz, Mariusz
Bouma, Jan Jaap	Draganova, Galina
Owens, Phil (moderator)	Gomez, Carlos Mario
Taylor, Kevin	Popek, Zbigniew
	Slob, Adriaan (moderator)
Van der Vlies, Jaap (switching between both groups asking and answering questions)	

Group 1: Scheld case

The group started by defining the problem concerning the Scheld. The issue in this case is that the harbour of Antwerp wants to make sure that it can still develop economically in the future. To do so would mean that bigger ships would have to be able to reach the harbour. The current depth of the Scheld however does not make this possible. Therefore the Scheld would need to be dredged to make it deeper. The problem definition is: How to keep the port of Antwerp available for 'big' ships in the future?

After some discussion, five options were selected:

1. Zero alternative (doing nothing);
2. Status Quo (continue dredging, but keeping the river at the current depth);
3. Deepening the channel to the required depth;
4. Build another port, or relocate the current port;
5. Dig another channel to the port of Antwerp;

These five options would have different effects on the problem that was defined.

Option 1 would mean that the shipping capacity of the port of Antwerp would become smaller. It would also mean that an old treaty between the Netherlands and Belgium, guaranteeing good passage of ships towards the port of Antwerp, would be broken, which would have great (negative) political impacts. Finally, this first option would make the ecosystem within the Scheld change.

Option 2 would mean an environmental status quo, it would limit the economic growth of the port of Antwerp, which would mean an increased flow of transport on the road and finally it would also increase political tension between the two countries.

Option 3 would deal with the sediments by dredging. It would enable the port of Antwerp to grow, but it would possibly also mean a decrease in the growth of the port of Rotterdam (which is located not far away). Finally, this option would also have a great ecological impact (the salt-level in the water, but also the flooding of certain parts of the estuary).

Option 4 would be very expensive due to infrastructure, relocation and a mismatch between supply and demand. This option would also create a disturbance on the land, and would also mean an increase in employment in the building sector.

Option 5 would be almost impossible to implement. This option would have a large impact on the environment and would also create very high maintenance costs.

After the effects of the options were summarized, the group turned to the subject of stakeholders, as they were regarded as necessary for valuing the effects of the options. According to the group a list of stakeholders should be made. Due to the limited time a first draft was made (which is not complete). The stakeholders would be:

- Residents (of the city of Antwerp, but also of cities and villages that would be affected by possible actions);
- Port authorities (both of Antwerp and other ports in the area);
- Environmental organisations; and
- All other bodies/persons that would be affected by the option.

After identifying the stakeholders the participants also concluded that the possible options should have been identified together with the stakeholders, not only to involve them in the process, but also to come to options that would otherwise not have been considered.

To explore the case in more detail, option 3 (deepening the channel to the required depth) was selected. The information needed focussed on how deep the channel should be (this also means conducting some kind of forecast on future ship development) and how much sediments need to be removed. While discussing the need for information, the group decided that they first wanted to identify what costs and benefits there would be if option 3 were chosen. The outcome of this discussion is displayed below.

Costs	Benefits
Engineering costs	Net economic growth
Construction costs	Environmental benefits (compensation)
Disposal of sediments	Shipping income
Environmental costs	Economic activities (industry and trade)
Costs of compliance to safety	Safety benefits (less flooding)
Liability	
Costs of calamities/disasters	
Compensation for welfare losses (in the port of Rotterdam)	

In the plenary presentation Ramon Batalla asked whether the outcome of research can also be considered as a benefit? Jaap van der Vlies answered that this is not possible, because of double counting of benefits, and also because the research would cost money as well.

Group 2: Ebro case

The group started by defining the problem concerning the River Ebro. The problem is that there is a sediment deficit in the River Ebro, which is not sustainable and causes undesirable effects. There is now a discussion going on about the creation of a canal downstream, which will probably increase the undesirable effects, thus making the problem bigger.

1. No canal: create alternative measures to navigate, or create an artificial lake;
2. Sediment injections downstream of the dams;
3. Make a more stable canal;
4. Remove the dams/partially open the dams;

The group discussed these four options and quantified the effect that they could have on the problem. They used a scale from 1 to 4, where 1 means: low/negative effect and 4 means a positive effect. The outcome of the discussion is displayed below.

Options	Effects		Biodiversity	Economic production	Safety	Agriculture in the delta	Costs for maintenance dredging
	Recreation						
	Sports	Tourism	Existing values	Employment			
No canal	3	2	4	1	3	2	These options will be investigated further: 1) cost research 2) involving the stakeholders (make it discussable)
Sediment injections	2	3	3	3	2	4	
A more stable canal	4	4	3	4	4	3	
Remove, or open dams	1	2	1	2	1	1	We should not do this

Based on the presentation of this outcome to all participants, some questions arose. Marc Eisma remarked that it might be better to first involve the stakeholders and after that research the costs of the various options, as the stakeholders will also have something to say about how to value the options. Jaap van der Vlies stressed that it is very important in this case to keep asking questions, if things are not clear or the valuation is not clear do not hesitate to point this out. Finally Adriaan Slob asked whether a SCBA should be conducted in this case? The group answered him positively, especially because this will make the process more transparent and open to discussion.

Research and policy recommendations

After the cases had been discussed, a plenary discussion took place about the output of the past two days. The outcome of this discussion was research and policy recommendations for the EC, and these are listed below.

Policy Recommendations

1. If society ignores sediments it risks failing to implement soil and water policy (e.g. the WFD) because sediments are a fundamental constituent of soil and water ecosystems;
2. We need to recognize and understand the economic pressures on sediment (especially sediment balances) and the impact of those pressures on the ecosystem;
3. We should apply SCBA to sediment issues because sediment management has to be based on technical and societal elements;
4. Stakeholders hold key knowledge and information about sediments. Thus in order to increase the transparency, communication and participation of stakeholders, they should be involved at an early stage in the policy- and decision-making process. The procedure of conducting a SCBA should acknowledge this;
5. The government needs to provide the means to make more information available, so as to make well informed decisions concerning sediment management and thus improving the quality of the decision-making process.

Research Recommendations

1. We need to extend (in a geographical sense) and standardize measurements of sediment related processes. This is needed in order to reach comprehensive reference values related to the definition of good chemical and ecological status of water bodies.
2. We cannot assess the benefits and costs of alternative sediment management options unless we define a good ecological status in relation to sediments. This means taking into account spatial and temporal variations. Furthermore, we need to develop integrated methods to define in a precise way what a good ecological status means with respect to sediment issues and sediment balances;
3. There is a need to model stocks and flows of sediments and their economic values, in order to increase the effectiveness and sustainability of river basin management.

Finally, Phil Owens and Adriaan Slob closed the workshop by thanking all the participants for their contribution to the workshop and especially the Warsaw Agricultural University for their kind hospitality.