International Workshop: Creating decision Support for water managers and policy makers

nofdp

Results of the workshop for IDSS end-users

Organised by the INTERREG III B project nofdp

11 – 13 October 2005 Vught / The Netherlands

NWE ENO INTERREG III B NORTH WEST EUROPE

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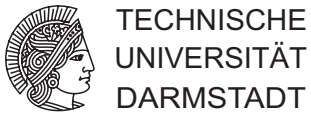
Hessian Ministry of Environment, Rural Development and Consumer Protection

Darmstadt University of Technology



Provincie Noord-Brabant

German Federal Institute of Hydrology

Water board Aa en Maas

Water board Brabantse Delta

Water board de Dommel

Water board Mümling

The nofdp project is embedded in the Interreg III B programme, an initiative of the European Commission aiming at the promotion of interregional co-operation within Europe. It is a four-year trans-national project with partners from The Netherlands and Germany launched in spring 2004. This project has received European Regional Development Funding (ERDF) through the INTERREG III B Community Initiative

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1 The nofdp project

Water, ecological and human issues in combination determine the complex functionality of river basins. Hence, all administrative measures have to take into account all three issues. European and national policies as well as legislation reflect an increasing awareness of this necessity. Thus, it is the aim of the nofdp project to provide a balanced view on the issue of nature-oriented flood damage prevention. Still technical measures are often considered to be the only way to achieve flood damage prevention, while impacts on ecology often are largely neglected in riverine management and spatial planning.

Here we provide a more detailed description of what we understand by nature-oriented flood damage prevention measures. These are:

- all measures to reduce flood damage, which use or restore natural elements (e.g. forests, scrubs, sand bars) of the entire catchment area to achieve a (more) natural floodplain (with retention, storage, and discharge function) of brooks and rivers,
- all technical measures which include or generate elements and/or functionalities that mitigate negative anthropogenic effects on nature (e.g. fish passages in dams),
- all measures that develop or restore a (more) natural environment (e.g. river banks with natural vegetation succession, new or re-meandering of rivers, allowing flow dynamics to work, secondary channels, fish or amphibian spawning zones, land-use changes) aiming to get a natural and sustainable floodplain function,
- all measures (also political and planning measures), which provide and ensure a sustainable and nature-friendly land-use of floodplains, and which are taking into account the demands of natural river and flood dynamics.

One major project goal is to develop an Information & Decision Support System (IDSS). Planned task of this computer-based IDSS is to support project managers, decision makers and policy makers in their

- pre-planning of measures related to flood damage prevention and nature development along rivers,
- internal communication within their own water boards or governmental organisations,
- external communication with stakeholders and politicians
- testing of strategic planning options and

Further deliverable is a knowledge base, which provides the user nofdp relevant information and best-practise examples on flood protection, nature development and spatial

planning. The knowledge base will be realised as web-based information system under www.nofdp.net. Finally, printed guidelines will provide additional support.

The emphasis of the IDSS is not the exact prognosis of sectoral impacts (i.e. change in water level but no information regarding impact on vegetation). The IDSS concept is designed to be able to

- process a large amount of data and information, which cover the issues of flood protection, nature development and spatial planning,
- address possible conflicts caused by a certain measure or strategy,
- provide a general information base regarding the impact of measures, which on the other hand covers the most relevant aspects regarding flood protection, nature development and spatial planning and
- provide the user an information base (e.g. best-practise examples, relevant EU-Directives as well as national laws) that can be used in discussions with high level decision makers, policy makers, local politicians and affected stakeholders.

2 Aim of the workshop

In the field of integrated river basin management many Decision Support Systems (DSS) are available such as WADBOS (Engelen et al. 2000), Large Rivers (Schielen et al. 2001) or the Elbe-DSS (Berlekamp et al. 2005). Many approaches still have to take the step from a prototype to a software system which is used in real world decision making. One of the criticisms most frequently made refers to the mismatch between functionality supplied and requested within the specific organisational context, which is caused by the lack of the integration of potential end-users in the development and testing phases.
Being aware of this deficit the nofdp project organised this international workshop. The aim of the workshop was to communicate and test our ideas mentioned above, to receive end-user feedback, and to integrate practical knowledge in flood management and nature development into the IDSS development process.

3 Structure of the workshop

Application-oriented discussions in small groups should result in a catalogue of requirements for the functionality of the IDSS software.
The workshop was supplemented by lectures on results of the recently performed nofdp questionnaire on the interrelation of flood protection and ecology in the North-West European territory, on already existing decision-support systems in riverine management, as well as on spatial planning instruments being used in the North-West-European region.

The contribution received by water managers and spatial planners invited was an important element in getting feasible future solutions for providing effective decision-support to those people who are capable to prevent future flood-borne damage as well

as to initiate sustainable river development.
This report summarises the results and conclusions of the workshop. All given presentations and ongoing information concerning the nofdp project are published under www.nofdp.net.

Table 1: Original schedule of the workshop

11 October	
9:00 – 10:00	Registration
10:00 – 11:00	Opening • Mr Seif (State Secretary, Hessian Ministry of Environment, Rural Development and Consumer Protection) • Mr Keijzer (Member of the Executive Committee of Water Board Aa en Maas) • Mr Löw (Project Manager nofdp, Hessian Ministry of Environment, Rural Development and Consumer Protection)
11:00 – 11:20	Coffee break
11:20 – 12:30	• nofdp project presentation (Mr Ostrowski, Darmstadt University of Technology) • nofdp questionnaire (Mr Horchler, German Federal Institute of Hydrology)
12:30 – 13:30	Lunch break
13:30 – 14:30	• Presentation of the nofdp IDSS (Mr Hübner, Darmstadt University of Technology) • European floods directive (Ms Scholtes, Association of Water Boards)
14:30 – 14:50	Coffee break
14:50 – 16:30 16:30 – 17:00	Group discussion on the topic: • EU directives and flood damage prevention Summary and final discussion
17:30 20:00	Boat trip Conference dinner at Huize Bergen

12 October	
9:00 – 9:30	Opening • Ms Moons (Member of the Board for Environment, Water, Nature, Province North Brabant) • Mr Glas (Chairman of the Water Board De Dommel) • Mr Ostrowski (Project Co-ordinator, Darmstadt University of Technology)
9:30 – 11:00	• Trans-national study (Ms Reichard, HydroLogic) • Planning systems in NWE (Mr Vogelij, Ms Steinhauer, Royal Haskoning) • 20 years of Spatial Decision Support Systems (Mr Hahn, RIKS)
11:00 – 11:20	Coffee break
11:20 – 12:30	• Ecology and floods (Mr Wachendörfer, Deutsche Bundesstiftung Umwelt) • Introduction to the group discussion – Goals and objectives (Mr Hare, Seecon)
12:30 – 13:30	Lunch break
13:30 – 14:45	Group discussions on the topics: • Participative decision-making and possible contribution by the IDSS • Management in the conflict area spatial planning, flood damage prevention and environmental protection
14:45 – 15:45	Coffee break and poster presentation of the INTERREG IIIB projects
15:45 – 17:00	Continuation group discussions
19:00	Dinner at Huize Bergen

13 October	
9:00 – 10:00	Summary of the main results from the group discussions
10:00 – 11:00	Discussion IDSS
11:00 – 11:20	Coffee break
11:20 – 12:30	The future of INTERREG (Ms Ernst, IRMA office)
12:30 – 13:30	Lunch break
13:30 – 16:00 16:00	Excursion to the Aa project / organised by the Water Board Aa en Maas Closure of the workshop

A discussion paper (brochure, see chapter 6!) was designed to get a personal opinion and advice regarding our IDSS concept. It was handed out to each participant begging for their answers and comments. The brochure includes a selection of seven exemplary screenshots of the so called "Click model" demonstrating a preliminary development stage of the IDSS. We designed the "Click model" as a working and discussion tool for getting advice on how the IDSS should look like and work like. For getting to know and playing with the "Click Model" we had it installed on some laptops in the lecture hall. The brochures were finally collected after the second part of the group discussions. During the Thursday morning session a compiled evaluation of the end-user suggestions was presented and discussed in the context of summarising all workshop results (see chapter 6!).

4 Results of the discussion on EU directives and flood damage prevention (11.10.2005)

On behalf of Mr Seif, State Secretary of the Hessian Ministry of Environment, Rural Development and Consumer Protection, Mr Löw (nofdp project manager) gave a welcome and an overall introduction to the workshop. He stressed the importance of the EU Water Framework Directive and the need of a trans-national co-operation for the project nofdp. As a good example he mentioned the four real-world nofdp investment projects and the role they will play for the development of the IDSS. Mr Löw believes that the expected EU Flood Action Programme can use the insights obtained by nofdp. Finally he called for an active co-operation during this workshop to ensure high-quality results.

Photo 1: Mr Löw, Ms Scholtes and Mr Keijzer

The EU Flood Action Programme has the aim to reduce flood risks across Europe. The talk of Ms Scholtes from the Dutch Association of water boards introduced the first group discussion. Flooding is an issue that deserves European attention. In recent years Europe suffered over 100 major damaging floods, including the catastrophic floods along the Danube and Elbe in 2002. Floods are natural phenomena which cannot be prevented. However, human activity is contributing to an increase in the likelihood and adverse impacts of extreme flood events, like clearing of forests in the upper catchment area, straightening of rivers and suppression of natural flood plains, inadequate drain-

age practices. The origins and impacts are in many cases of trans-boundary, sometimes of trans-catchment nature. EU involvement in this issue is a necessary step, whereas European basis for water quality management is provided by the Water Framework Directive (EG 2000/64). The main area of action is the river basin level, where national, regional and local governments (inter)act.

The Commission Services are currently developing an EU Flood Action Programme (also known as the initiative on flood prevention, protection and mitigation), which is a package of three distinct but closely interlinked components:

- Research and information: improvement of the exchange of information and knowledge, sharing experiences and increasing awareness
- EU funding tools: targeted approach to the best use of funding tools and
- Proposal for a legal instrument: proposal for a EU Floods Directive

The intention is that the EU Flood Action Programme would build on the Commission Communication of 2004 and the stakeholder consultations held so far. In the Communication “Flood risk management: prevention, protection, mitigation” of 12 July 2004, the Commission set out its initial analysis and approach to flood events and the threat they pose to human life, health, infrastructure, public and private property and, last but not least, to the environment. It reviewed experiences in particular from flood events in past years and proposed concerted action at European as well as catchment level.

The Communication was welcomed by the Environment Council and the Commission was requested to come forward with appropriate proposals.

The objective of the EU Floods Directive will be to create obligations for the Member States of the European Union to manage risks of floods to people, property and environment by concerted, coordinated action at river basin level and in coastal zones in order to reduce the risks of floods to people, property and environment.

During the discussions with the Council the need for flexibility in identifying priorities has been underlined. This has been confirmed during the stakeholder consultation process in 2005. Further, there is a need for taking into account work already done in the field of flood risk management. To achieve this preliminary risk assessments will be carried out to identify those areas where mapping and plans need to be developed, and those where there is either no significant risk or those where some or all parts of the management cycle under the Directive are already implemented.

The talk by Ms Scholtes was followed by a speech of Mr Keijzer, member of the Executive Board of the Water Board de Dommel. His words shed light on the view of landowners and practitioners regarding flood problems and the EU policy. He concluded that the EU policy sometimes is hindering new and innovative ideas such as the green-blue services applied in The Netherlands. He stressed the importance of stakeholder participation during the development of the IDSS, and that it should most of all become a good communication tool. He said: "We should not solve the problems in court but during meetings with the stakeholders".

After these introducing talks the theme EU directives was discussed in smaller groups. The participants were divided into three groups (Table 2). The discussion had the aim to identify conflicts and benefits of measures aiming at “good ecological status” versus “flood damage prevention / flood risk management”. The main arguments of the groups are listed in table 3.

Table 2: Participants of the discussion on EU directives and flood damage prevention

Group A	Group B	Group C
Hüsing	Scholtes	Ostrowski
Balduck	Löw	Schüler, A.
Fontenoy	Devocht	Wüstenberg
Marchal	Stiller-Ludwig	Petrusch
Schüler, G.	Möhrle	Hahn
Schröder	Kolen	van Erp
Schaub	Rosenzweig	Hübner
Hoogendoorn	van Iersel	Fuchs
Horchler	Tanner	Slikker
Hettrich	van Loenen	Sottong
Keijzers		de Louw

Photo 2 & 3: Results of the group discussion EU directives and flood damage prevention

Table 3: Arguments of the discussion on EU directives and flood damage prevention

Group A **Benefits** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"	**Conflicts** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"
• Management by catchment area (ecological, flood management) • Bigger influence on spatial planning • Step from water bodies as a linear structure to land-use (spatial dimension) • Work on sediment pollution • Trans-national co-ordination of management plans • Consideration of remote effects e.g.: Measures upstream, benefits downstream • Cost covering of flood protection measures • Cost recovering (art. 9 WFD) • The good ecological status (WFD) is a demand for the coming Flood Directive • Management plans for all water bodies • Improvement to identify problem areas	• Identification and development of more wetland vice versa the demand of controlled inundation areas • Good ecological state vs. flood protection • Many plans and planning • Budget (who pays for?) • Active involvement, municipalities, local implementation, local interest vs. overriding public interest • Vocabulary, there is no common glossary for specific termini

Group B **Benefits** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"	**Conflicts** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"
• Same scale, same definitions, same time frame, same stakeholders • Common standards • Same scales and almost same stakeholders • Trans-national, one uniform "language" • EU-guidelines = everybody B, NL, D, ... • Measures with relative low costs • Integrated approach: a re-development take both directives into account • Integrated planning of measures • Chance for sustainable urban development • Discover the correlation between decision makers • Water as a high spatial planning • Set up of precautionary actions • FRMP(flood risk management plans) + FRM(flood risk management) provide information about flood threatened areas • Opportunity to raise public profile of	• No funding for WFD projects because they are financed by water boards • FD may result in delays in taking flood control measures • Release of "old" waste because of flood measures • Bureaucracy • FD could be seen as an unessential directive • Relevant restriction of the communal self-administration • No spatial planning instruments in both directives • Dredging measures to give the river more space can influence the water quality negatively • Nature as now vs. city-expansion • Water discharge and agricultural retention areas give water quality problems • No optimized use of resources • Funds, guidelines vs. shipping,.. on field • Who sets the guidelines? Different countries with different types of problem • Consultation fatigued

Group B **Benefits** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"	**Conflicts** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"
flood risk management and ecology education • Global change included in both --> more public information • Acceptance of Floods Directive higher --> easier for WFD to implement • Prediction, pro-active • Opportunities for flood plain restoration 'natural cleaning' of water • Storage/ retention of water = cleaning of water • Ecological approach will give benefits to nature, flora and fauna • Meandering rivers • More space for water --> more space for nature • Cooperation possibilities of different partners	• Everybody can take part at planning measures, lot of conflicts! • Who has to pay the measures? The government says and the water board has to do?! • Trial for political decision at a communal level • Costs: first goods, second ecology • Costs, efforts for FRMP + FRM • Good ecological state vs. protection of goods • Ecology before high water protection? • Conflict meeting good ecological status and requirements for 'hard' defences(?) • Risks are of different level, human/fauna <--> safety

Group C **Benefits** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"	**Conflicts** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"
• More attention for water issues • More standard approaches over Europe (scale definition...) • Reduction of damage potential combines with environmental improvement • More integrated approaches • Better trans-national cooperation (trans-national models) • More/higher conflicts better solutions • More money for water issues • Integrated approach has better chances of long-term success • Creation of one non-redundant data base, analysis tools, DSS? • Adjusting the flood prevention theme to the water management, ecological and non-bordering cooperation targets in the WFD • Same aim: integrated approach of spatial planning and water management • Synergy effects, both are dealing with measures	• Work capacity for the directives is limited • Difficult to agree on same effort between member states • What has priority: damage (€) or ecology • Different objectives • No one will spend as much time to work on FD then on WFD • Conflicts not between the WFD and FD, but for both in EU - bureaucracy • Sectoral organisation of water management; economy (measures that are effective in both areas are often expensive) • The scale that must be set in the FD --> what will be promoted • Pollution

Group C **Benefits** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"	**Conflicts** of measures aiming at "good ecological status" versus "flood damage prevention / flood risk management"
• Existing system for implementing the WFD can be used for FD • Better (higher) water levels • Actors are used to refer to river catchments • Cooperation and integrated approach is already in practise • More natural discharge (flooding is natural and the ecological system will follow the water system)	

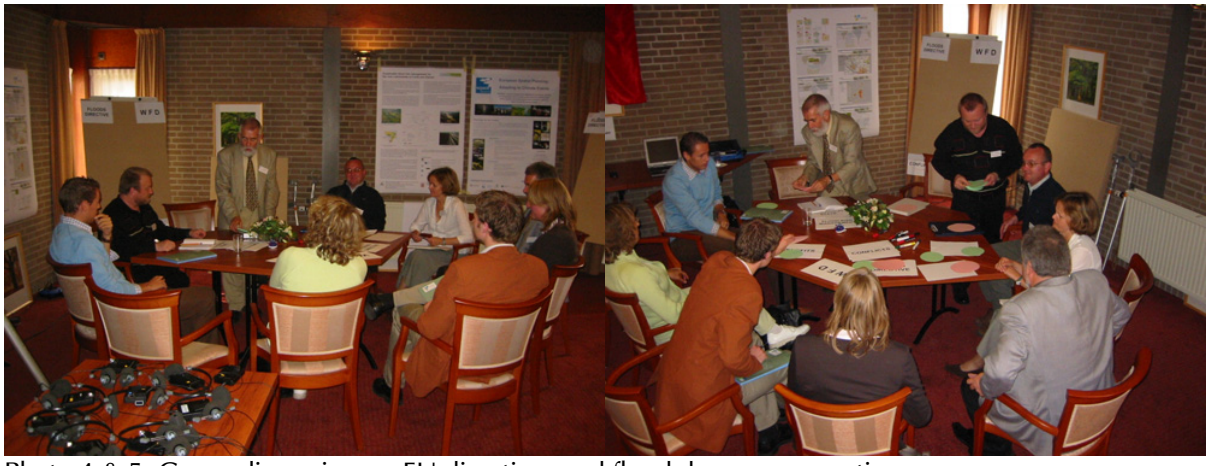

Photo 4 & 5: Group discussion on EU directives and flood damage prevention

Summary of the discussion on EU directives and flood damage prevention

The overall aim of the EU Water Framework Directive (WFD) is to work within catchment areas of rivers. This guides to a trans-national work with common uniform standards. These integrated approaches are important for a long-term success.
The problem behind this idea is that different member states are taking part in the planning.
The EU WFD is supporting a good ecological state of water bodies. More space for water, flood plain and meandering rivers means more space for nature, benefits for flora and fauna and improves the self purification of the water. But to have more wetland stands in conflict with controlled inundation area. It is also the question, if ecology is more important than high water protection and protection of human assets. What has priority: ecology or economy? In some countries there is no funding for the EU WFD projects, the measures have to be financed by the water board, municipality or the state. However most measures are with relative low costs and article 9 is regulating the polluter-pays-principle.

By the EU WFD there is a bigger influence on spatial planning, the flood risk management plan provides information about flood threatened areas. But there are no spatial planning instruments in the directives. Furthermore, the sectoral organisation of water

management is seen as a disadvantage as well as the EU bureaucracy.

There is a demand for the coming flood directive, but the work capacity for the directive is limited. The EU Floods Directive may result in delays in taking flood control measures.

5 Results of the discussion on the IDSS

This discussion was structured under two main topics:

- Participative decision-making and possible contribution by the IDSS
- Management in the conflict area spatial planning, flood damage

This discussion (12 October) and the resulting end discussion on 13 October were moderated by Matt Hare and Sophie Rotter from Seecon Deutschland GmbH (www.seecon.org). The following pages (pages 9 to 27) are partly taken from their minutes of the End-User Requirements for the nofdp IDSS.

5.1 Agenda of the discussion on IDSS

Photo 6: Plenary session

Table 5, below, describes the day-and-a-half agenda of IDSS discussion part of the Workshop.

Table 5: Agenda of the discussion on IDSS

Session	***Activity***	***Output***	***Table summarising output***
12.10.05			
1st Morning Session Presentations	Introduction and workshop goal setting	Common understanding of workshop goals and methods to be used	
	Keynote speakers	Ideas and requirements to be taken into consideration when defining requirements	Table 8

Session	*Activity*	*Output*	*Table summarising output*
		for the IDSS.	
Afternoon Session Group discussion	Small break-out group work to identify requirements for IDSS to carry out spatial planning and participatory roles	End-user requirements collected on requirements matrix posters	Tables 9a-h Tables 10a-h
Evening Session	nofdp team review of end-user requirements to determine what can, may and cannot be implemented in IDSS.	Categorisation table of end-user requirements according to what can be done, what may be done and what cannot.	Table 12
13.10.05			
2nd Morning Session Summary of the main results from the group discussions	End-users present their most important requirements	A table of important end-user requirements	Table 11
Discussion IDSS	nofdp team present their response, in form of their review	Clear understanding on the part of the end-users as to what can and cannot be done by the nofdp team.	
	End-users add to Table 8 and prioritise what needs to be done	An augmented, categorised and prioritised table of requirements	Table 12

Morning Session 12.10.05 Presentations

Photo 7: Ms Moons and Mr Glas

The goal of the morning session was to elicit requirements and ideas from the keynote speakers to frame the identification of requirements for an IDSS that could be used to support managers in flood damage prevention.

Ms Moons, Member of the executive board of the Provincial council Portfolio milieu, water and nature, said that she is convinced of the necessity of integral planning and communication supporting instruments in order to address todays and future challenges in flood damage prevention. She added that Europe tells us: We need interactive processes with stakeholders and citizens! She presented elements of the nofdp project and her vision of the outcome.

Few weeks before the workshop Mr Glas, as Chairman of the Water Board de Dommel, has launched the Tongelreep project, one of the nofdp investment projects. He expressed his confidence that the nofdp project will highlight the importance of even such small projects like the Tongelreep for the overall goal of flood damage prevention. He stressed the advantage to take nature into account when realising flood management projects. But, in a world of global change, he recommended refraining form a static view of nature conservation. He expects the nofdp project to identify practical and sustainable solutions.

The requirements and ideas were collected from each speaker and categorised according to the categories of requirements listed above (agreed upon before the workshop by the nofdp team):

- Role or use of IDSS – what role should the IDSS have in the management process?
- Issues or measures – what issues or measures should the tool address?
- Outputs or indicators – what indicators or outputs should it produce?
- Communication – how can it be made into a tool for communication?
- Usability – how can it be made usable?
- Trust – how can it be made trustworthy?
- Costs – what constraints, in terms of development or use costs, are there to be taken into account?

The results can be seen in tables below.

Afternoon Session 12.10.05 (Group discussion) Summary of the group discussion and discussion IDSS

The participants were then divided, in the afternoon, into five small break-out groups (predefined by the nofdp team – see Table 2) to consider and agree upon specific requirements for an IDSS when used in one of two roles:

- role a: support for spatial planning by managers and
- role b: communicative support for participative decision making.

Table 6: The membership of the small break-out groups to discuss requirements

Group 1	Group 2	Group 3	Group 4	Group 5
Vogelij	Ostrowski	Wachendörfer	Steinhauer	Hahn
Fuchs	Hübner	van Irsel	Rosenzweig	Horchler
Balduck	Slikker	van Betuw	Hüsing	Hettrich
Schüler, A.	Devocht	Lambregts	Tanner	Fontenoy
Schüler, G.	Wüstenberg	Sottong	Stiller-Ludwig	Marchal
Möhrle	Petrusch	Löw	Schröder	Hellebrand
Span	Kolen		Schaub	van Loenen
	Reichard			

The assumption was that requirements would be different according to these two basic roles of the IDSS. Each group was given a matrix in which to fill out their requirements (see Table 7).

Table 7: The "matrix" given to each small break-out group in which requirements were to be identified and categorised.

Criteria	Must	Recommended	Bonus	Not
Role/use of IDSS				
Issues to address				
Outputs/Indicators				
Communication				
Usability				
Trust				
Costs				

In this matrix, for each of the criteria identified in the morning session, the group had to agree upon requirements and then categorise them according to whether they must be in the IDSS, are recommended to be in the IDSS (but could be left out) or are not necessary to the IDSS but would be a bonus if they were included. They were also asked to specify what should not be included in the IDSS. Each group was given an empty matrix for each of the two main roles of the IDSS (spatial planning and participation). The combined requirements taken from all 5 groups for each role are presented in Tables 9a-g and Tables 10a-g.

Evening session 12.10.05 (first evaluation by the nofdp team)

In the evening of the first day, the nofdp team were asked to review the requirements generated by the small break-out groups and to identify which requirements they can, may and cannot meet in the future development of IDSS.

Morning session (13.10.05)

In the morning of the next day, representatives of the small break-out groups presented their most important requirements. These requirements were recorded in a table (see Table 8).
In response to the results of the small break-out groups, the nofdp team were invited to specify, in a table (see Table 12), the results of their evening review, i.e. to present what requirements they can, may, and cannot meet for both the Spatial Planning and Participation roles of the tool. Once the team had presented what they believed they could deliver, the end-users were asked to take extra requirements from their tables (Tables 8, 9, 10) and add them to the nofdp table (Table 12) with the message that these requirements should also be considered for inclusion in the IDSS.

5.2 Results

Morning session (12.10.05)

Table 8: The ideas and requirements arising from the keynote speakers in the 1st morning session

Speaker	Criteria	Ideas/Requirements
Leanne Reichard	Issues to address	Local and European directives
		Trans-boundary issues
	Indicators	Opportunities & threats
	Communications	GIS interface
		Interactive website
Jan Vogelij	Role of IDSS	Which scale level of governance should the IDSS address? And can the tool be generic to all partner countries' governance structures?
		It should support informal planning approaches for reaching consensus
	Issues to address	Socio-economics
		Demographics and climate change
	Communications	The tool should provide a common language and glossary for partner countries.
Bernhard Hahn	Costs	IDSS should not be technology driven
		Post development maintenance and support of tool will be needed
		Tool must be flexible and not too complex
	Issues to address	Tool should diagnose the past and also allow exploration of future scenarios
		Team must decide whether or not tool is management- or policy-oriented and which phase of the planning process it supports
	Trust	Visualisation of uncertainty levels

Speaker	Criteria	Ideas/Requirements
Volker Wachendörfer	Role/use of IDSS	Supporting participation and e-participation
	Issues to address	How to finance measures; the identification of innovative financing instruments
	Communication	3-D visualisation

The issues that arose from discussions prompted by the talks included:

Who is the user? - it was suggested that it would be naive to assume that the user of the IDSS would be the water manager him or herself. It would be more realistically used by the support staff of the manager who would then present the manager with the results of their use of the tool.

How generic can the tool be? - since the tool has to be able to work in a number of different countries, each with its own governance structure, how will the developers make sure that the tool is generic enough that it can be used? There were two types of genericity identified: technical and scientific. The first should make sure that the tool can, in practice, be assembled to be used in different countries. The second should make sure that the tool can be parameterised and validated for use in different countries. The former should be comparatively easy to achieve, the latter is very difficult and will cost the end-user a lot of resources if they have to do it themselves.

For which countries' governance structures will the IDSS be prototyped?
This question was raised by the spatial planners and also referred to some kind of genericity namely concerning the suitability or flexibility of the IDSS being able to fit in or take into account different administrative structures in different countries.

Afternoon Session (12.10.05)

5.2.1 Spatial planning

The requirements for the spatial planning role of the IDSS were collected from each small break-out group and combined in the following tables (Tables 9a-h).

Photo 8: Results of group 1

Requirements for the **role of the IDSS**

Table 9a: Requirements for spatial planning – Role/use of IDSS (original wording of the participants)

Must	**Recommended**	**Bonus**	**Not**
Use: water managers	Use: spatial planners	Tool for mediation between different stakeholder	Do not make decisions
Project leaders, Planners, Advising People	All stakeholders can access the IDSS in a well-guided way	Proposal about the spreading of financial subsidies	Generalising decisions
Used by: Policy Makers, Spatial Planners, Researcher, Water Managers, Schools, Universities,... How: Decision Tool, Background Information, Discussion tool	Simulate, investigate access future policy interventions	Incorporate scenarios when the system fails (this is a must)	Take over decision-making by presenting the optimum decision
Technicians and Scientifics make the advice/variants on which the manager decides	No measurements without support of the IDSS	Tool to present the history of the river	Give a hard value concerning flood parameters
Temporal Scale in Planning	Run scenarios that include climate change , urban growth and measures (in less than 5 sec)		Tool for special organisation
Pre-Planning Tool	Provide insight in cost-benefit relations		See as the solution
Help tool in decision project; "bridge" between water managers and spatial	Provide output suitable for reports and public discussion		

Must	Recommended	Bonus	Not
planners (facts, approaches, tasks, ...) Tool for flood damage prevention on large catchment area Computerized model, decision makers (concerning the financial support of the state authority)			
Assessment of the effectiveness of a considered measure			
Big area analyse from effects of measurements and show the potential area in the field for land-use or measurement The IDSS should be used on sub-regional scale, so effects on land-use can become clear			
Provide insight in complex system of interwoven processes			
Showing ecological, social and economical consequences			
Have the effects of flood damage prevention also effect on land-use?			
Simulate possible actions and autonomous developments in systems (land-use change and climate change)			
Show how the cumulative effect of a number of small scale 'nature'-oriented pro-ject can reduce flood risk			

Photo 9 & 10: Results of groups 3 and 5

Requirements for **issues to be addressed**

Table 9b: Requirements for spatial planning – Issues to address (original wording of the participants)

Must	**Recommended**	**Bonus**	**Not**
Multi-functional land-use must be a measure in the IDSS; so: agriculture + retention, nature + retention, recreation + retention	Re-naturalisation effects, Retention basin management		No local scale (measure - effects) The local scale is the most interesting for the inhabitants
Precautionary land-use measures, reduction of line-structures, urbanisation, retention basins, flood plain re-naturalisation	All kinds of flood control measures (technical and non-technical)		Don't build a DSS as a large container of pre-calculated results (Why not?)
Policy as well as technical measures	Life cycle of measure (5-10/.../100 years)		
All the measures of 1 topic (water), also political or technical	Decide for scale: micro-scale (little catchment), meso-scale (river basin unit)		
Measures: storage attenuation, removal of dykes, pumping, changing land-use	For the inhabitants as detailed as possible data (discharge events (risks), 1:10, 1:100, 1:1500)		
Also spatial measures like buildings, villages, urban area must be a part of the measures			
Store information on effects of measures and changes as a result of measures			
Land-use, socio- economics, ecology, climate change			

Must	Recommended	Bonus	Not
Awareness that the IDSS operates in a dynamic environment			
Land exchange, land-use, recreation, different genetic types (adapted to environment), dam failure, link to other rivers			
Water level flood duration vs. effects on agricultural use, nature type, pointed out in			
Take into account: corresponding ground water level			
Re-naturalisation, ground water changes			
Re-naturalisation, retention areas, land-use regulation, dikes...			
Reactivation of old meanders and former river beds			
Protection of open areas, reactivation of historical floodplains, construction of dyke variants			
Flooding in catchment area, in open area, building area ⇒ consequences			
Very important: flood damage always possible behind dykes			
Take into account actual: land-use planning, flood risk maps, binding land-use plans			
Temporal scale appropriate to planning requirement			
Temporal scale, 3 steps: 1/2 year, 5 years, 20 years; spatial scales: 1:50.000, 1:25.000, 1:1.000, 1:10.000			
Detailed scale measures: water retention etc., no high values in flooding areas			
It should be usable for all actions with the participation of the public			

Requirements for **outputs and indicators**

Table 9c: Requirements for spatial planning – Outputs/Indicators (original wording of the participants)

Must	Recommended	Bonus	Not
Areas at flood risk (amount of houses/people)	The set of output indicators must include: sustainability criteria, be related to the planning horizon, indicate relevance for long-term spatial planning	Land-use, spatial planning	
Risks of flooding (frequency)	Cost/benefit analysis of measures		
Sealed surfaces (m^2)			
Reduction of run-offs, mitigating discharge (cost)			
Effectiveness of measures			
Effects of measure scenarios on a global scale for optimal measures			
Cost-benefit criteria (ratio), impact on land-use and environment			
Cost-effects of the variants, effects on nature and land-use			
Clearance about the chance of land-use			

Requirements for **promoting communication**

Table 9d: Requirements for spatial planning – Communication (original wording of the participants)

Must	Recommended	Bonus	Not
Results of IDSS give spatial planners information for implementation water at spatial planning (sub-regional scale)	Give arguments for selected areas	There must be an "interface" between spatial planning and water management - planning and communication in all stages of process	
Show different variants in maps (GIS), transparent way of decision making	Flowchart communication with inhabitants, rescue-squads/ operative flood damage prevention in times of flood or drought		
Transparent communication with decision makers, NGO's, civilians	Communication must be bi-directional and allow an active participation of all stakeholders, e.g. definition of scenarios,		

Must	Recommended	Bonus	Not
	setting evaluation criteria, voting		
A link between politicians, experts and citizens, link between different experts			
Change of goals of nature area			
Provide information for scenarios			
Link of spatial and temporal scale			
A map function with links to more detailed data, such as costs			
Zoom function maps, cost overview			
3D visualisation			

Requirements for **enhancing usability**

Table 9e: Requirements for spatial planning – Usability (original wording of the participants)

Must	Recommended	Bonus	Not
Summarized results	Don't expect the manager to use the tool he will be provided, the advice/variant by the specialist		The IDSS is too complex for managers. They need support
Interactive Websites			
Modularity: strict separation of model and presentation logic			
Flexibility, genericity, use of open standards			

Requirements for **enhancing user trust in the tool**

Table 9f: Requirements for spatial planning – Trust (original wording of the participants)

Must	Recommended	Bonus	Not
Objective neutral organisation	IDSS should be based on proved models	To prevent the answer is not the only truth	Must not pretend to be accurate
Use of scientific and legal accepted rules/models etc.; legal responsibility of spatial planners		What will be the consequences for the decision maker when he takes the wrong decision	Incompreh ensible outcomes of models

Must	Recommended	Bonus	Not
Correct methods for assessing the different values		Incorporate new scientific results	
GIS, scenario, fulfil demands of users			
Identify the IDSS's opportunities and constraints, it should carry a 'health warning'			
The source of the data must be clear			
A summary of data sources and models used to be easily accessible			
Realistic input data, sensible results			
Importance of meta data			
Use of uncertainty in water management --> deterministic approach is not the answer for flooding. Uncertainty has to be defined			
Uncertainty assessment			
Transparency in process influence result; level of accuracy: legislation, no numbers, not too much details			
Transparency, accuracy (the more accurate the less reliable)			
Scientific accuracy			
Accuracy must fit to scale			
Using accounts to log in, 'conservative' design			

Requirements for **costs**

Table 9g: Requirements for spatial planning – Costs (original wording of the participants)

Must	Recommended	Bonus	Not
Responsibility, development and maintenance must be clear from the beginning		System + maintenance/ update etc. < troubles by flood	Must not cost more than it saves
Cost-effectiveness			

5.2.2 Participation

Requirements for the participation role of the IDSS were collated from each small break-out group and combined in the following tables (Tables 10 a-h).

Requirements for the **role of the IDSS**

Table 10a: Requirements for participation – Role/use of IDSS (original wording of the participants)

Must	Recommended	Bonus	Not
Planners / water management	Politicians	Interest groups, concerned public	Not make decisions, but deliver information
The IDSS must be a policy support system, it must support the discussion with the stakeholders and inhabitants	Stakeholders and limited community	Could be used by teachers - geography, citizenship	Not: taking decision
Workshops with stakeholders, problem identification and planning sessions with stakeholders, presenting scenarios to the general public	Mediation between various stakeholders	Voting facilities forum	Not everybody should have the possibility to change scenarios
Help decision makers to understand complex situations (especially planning)	Providing information about measures and prioritisation		Public should not be misled into thinking they are going to lead decision making
Be a communication tool between the different stakeholders	Show clearly why measures need to be taken		Exclude human thinking during detailing plan
Used as discussion platform	Visualisation of diff. scenarios, interactive access		
Discussion about interests 1. Step: It must show the principle goals of a measure, 2. Step: it must be possible to show effects of a new "parameter"	Lookup per zip code plans and the changes in situations: advantages as well as disadvantages		
Different information at different moments	Preliminary study, not used by public, they do not decide, only inform		
Information about all used measures	Proposals of measures by the public		
Prioritisation of measures Assessment of measures Workshop to explain objective role, function and restriction	General information to inhabitants		

Must	Recommended	Bonus	Not
Public consultation on flood risk management proposals			
Frequently updated information to the general public about the status quo situation			
Public are all			

Requirements for **issues to be addressed**

Table 10b: Requirements for participation – Issues to address (original wording of the participants)

Must	Recommended	Bonus	Not
The IDSS must work for a whole catchment area (also trans-boundary) to see the effects of measures on different locations			No local scale (measure - effects) The local scale is the most interesting for the inhabitants
Showing scenarios, selecting sites, e.g. retention volume			
All the measures of 1 topic (water), also political or technical			
Effects of measures must be communicated			
Financial, social, economic; cost effective, land-use, nature usage			

Requirements for **outputs and indicators**

Table 10c: Requirements for participation – Indicators/Outputs (original wording of the participants)

Must	Recommended	Bonus	Not
Map of flood extension	Map + text + evaluation + costs + suggestions; Combination (interactive feedback)	Nature targets: rare species, Flora & Fauna species that increase	
Flooding depths	The set of output indicators must include: sustainability criteria, be related to the planning horizon, indicate relevance for long-term spatial planning	Maps (with high resolution that one can find his own house or property)	
Water velocity, water depth, length of inundation	Indicators: sustainable development (open area vs. built-up areas), qualitative +		

Must	Recommended	Bonus	Not
	quantitative		
Give information about the ground water levels expected			
Flood extent: damages - economic, damages - environmental	Indicators: recreation area, public area (river basin), ...		
Reduce risks in: life, flooded area/depth, other benefits (nature development), costs/effects measurements	It should explain effects of the measures		
Number of species, coming back to flood area (biodiversity)	Cost/benefit analysis of measures		
Show effects on land-use change			
Effects of measure scenarios on a global scale for optimal measures			
Costs of the measures should be explained			
Expected damage in costs			
Function: calculating costs in case of flooding			

Requirements for **promoting communication**

Table 10d: Requirements for participation – Communication (original wording of the participants)

Must	Recommended	Bonus	Not
Information: clearly separated the status quo and the planned future?	Communication must be bi-directional and allow an active participation of all stakeholders, e.g. definition of scenarios, setting evaluation criteria, voting	There must be an "interface" between spatial planning and water management - planning and communication in all stages of process	
Present results of model calculation	Flowchart communication with inhabitants, rescue-squads/ operative flood damage prevention in times of flood or drought	No complex models which need detailed data or information	
Visualisation of effects of measures	Hearing within the official planning approval	No reports	
IDSS use needs professional mediation	The process of the measure should be shown		

Must	Recommended	Bonus	Not
Several languages (mother tongue), language for spatial planners and water managers (decision makers), not: only English and French	Make effects of measurements for all public visible		
Glossary	Using internet to show general public the progress and intermediate results of decision progress		
E-mail platform			
Map server			
Locator for maps			
Map easy to understand			
The IDSS should support opinion-making by the stakeholders/ inhabitants; scale: not too large, project area of max 10km			
Transparent communication with decision makers, NGO's, civilians			
Interest group, concerned public			

Requirements for **enhancing usability**

Table 10e: Requirements for participation – Usability (original wording of the participants)

Must	Recommended	Bonus	Not
The system should be usable for all stakeholders involved in the decision making process. The use should be related to all or single components of the DSS. It should have different levels of access.	Flood risk (very simple symbols: traffic light [green: no worry, red: watch out, danger of risk])	No long calculation (max. 5-10min)	It must not be an expert system (but it can have a link to it)
Easy access to the system	Access via internet		
Easy and comprehensive access to different data/maps (GIS)	TV and PC		
Linear decision way (easy guidance)	Like a ticket automat of German Railway		
Intuitive navigation + user guidance (self explaining button etc.)	Pictures like photos		
Understandable symbols (buttons etc.)			
Fast to run - results on the click of a mouse max. 5 sec.			
Online www.			

Requirements for **enhancing user trust in the tool**

Table 10f: Requirements for participation – Trust (original wording of the participants)

Must	Recommended	Bonus	Not
Independence of users	All used data should be accessible (?)	To prevent the answer is not the only truth	Must not pretend to be accurate
Use of uncertainty in water management --> deterministic approach is not the answer for flooding. Uncertainty has to be defined			
To allow the comparison of different scenarios; to show socio-economic impacts			
Show methodology and assumptions (made accessible for general public --> transparency)			
Maximum transparency: which models are used? Limits of these models			
Transparency and understanding for public			
The results have to be clear to non-experts			

Requirements for **costs**

Table 10g: Requirements for participation – Costs (original wording of the participants)

Must	Recommended	Bonus	Not
Responsibility, development and maintenance must be clear from the beginning		System + maintenance/update etc. < troubles by flood	Must not cost more than it saves
Cost-effectiveness		Overview of subsidies EU - Prov - National	

Evening session (12.10.05)

At the evening the nofdp team sorted and evaluated the contributions to present a first feedback on what is possible to implement in the IDSS. This work was done by four persons checking all the contributions of the participants, which were put at the posters and classifying them into more general terms. The frequency (= times mentioned) of those terms was counted and ranked. A summary of the results was presented the next morning (see Table 12 in the next section).


Photo 11: Part of the nofdp team evaluating the contributions

Morning session (13.10.05)

Table 11 (below) indicates a summary of the requirements that the representatives of the small break-out groups considered as important outcomes of their groups.
In terms of management support, the time scales that the tool should provide advice for is a) 1-5 years and b) up to 50-100 years. What is also important is to consider the life cycle of measures and their costs, benefits and effectiveness over this period. Not only costs of the implementation of measures but also their maintenance and the economic costs of nature (e.g. damage to environmental goods) should be included in such an analysis.
The tool should also avoid overly considering the iterative nature of management; the end-users need step-by-step guidance through what, to them, is a very linear decision process.
There were 3 areas of possible controversy identified during the group work that might cause the nofdp project team a few problems: (1) End-users wanted the tool to be able to support them in court if they had to defend their decisions legally. That means that the tool has to be accurate enough so that the end-users could rely on it for support of their decisions. (2) It became clear that this purpose of the tool was not a fact shared by all – is it supposed to only be a pre-planning tool, as the nofdp team suggest (see table 12), or should it support political measures analysis, policy making and the actual planning process? (3) Linked to this issue is the question of the spatial scale of the tool. Some end-users wanted it to allow them to investigate the use of broad groupings of measures over a large scale (regional, river basin, trans-boundary), suggesting it should not be used for local scale (detailed) planning. Others however, wanted not only to work at the regional scale, but also at “other scales”, lower scales? How compatible is adopting a 10 km^2 scale unit when working at regional, river basin or trans-boundary scales?
In terms of issues to be taken into account by the tool, many were requested, including

social economics. The most novel issue arising was that of including information about emergency situations and how to deal with them.
Technical requirements included the request for 3-D landscapes, because "planners think in 3-D". The use of GIS as well as AutoCAD was requested, as should an e-mail communication platform supporting bi-directional communication between public users and policy makers.
Communication should be supported in the tool by making sure that the tool responds quickly to inputs (in minutes); that the maps used are easy to use and to understand and that the transparency of the planning process so far undertaken (what has been done) is maintained.
In terms of output indicators, sustainability criteria were deemed important as well as the ability for the tool to explain costs of measures, not just producing bare statistics. The traffic light principle for indicators is encouraged: a simple, colour-based iconic system.
Whilst functional requirements are important to build into a tool, such as requesting that the tool includes 3-D graphics or that it can model dam breaks, it is often the non-functional requirements that determine whether the tool is ever used. The end-users requested, among other things, that the source of all data used in the tool should be clear to the user and that the question of who maintains the tool after development be considered. The latter is very important to end-users as also illustrated by results coming from the Harmoni-CA FP5 project (www.harmoni-ca.info).

Table 11: Selected end-users' requirements arising from the small break-out groups. Bold text indicates requirements mentioned in Table 12. Colours in first column simply separate different management option themes

Management Support	Issues	Technical	Communication	Output Indicators	Other non-functional requirements
two scales: 1-5 years and 10-25 years	dam break	**3-D realism landscape**	**represent uncertainty**	**Sustainability criteria**	neither public nor IDSS making decisions
Long-term planning -> 2050?	roads reduction of...	**GIS** and importing AutoCAD	**quick working (minutes)**	Explaining cost of measures	not making the decisions
life cycle of measures (5-100 years)	land exchange	**scenarios**		Traffic light principle – simplicity	Source of data clear to public
cost-benefit analysis	**land-use**	**help attached to buttons**	transparency of process – what has happened		Who maintains IDSS?
costs of maintenance of measures & **costs of nature** & **different magnitudes of damage in Euros**	housing	Glossary (common)	**Bi-directional communication**		No hard values, no optima
effectiveness of measures	biodiversity	e-mail platform	Communication role vs. public		No pre-calculated re-

Management Support	Issues	Technical	Communication	Output Indicators	Other non-functional requirements
			consultation role		sults (not quick)
linear progression of decisions not iterative	endurance of flooding		easy access to comprehensible maps		
Controversial: support legal responsibility of planners	**social economics**				
Controversial area: **Pre-planning tool only** *(this requirement was from a break-out group without any end-users)*	agriculture				
Political Measures/ **policy change**	emergency situations				
Policy or Management Support					
Controversial area: Allows grouping of measures over global scale					
Not working at local scale (**no detailed planning**)					
River Basin and Trans-boundary					
Scale units 10 km² project area…					
Regional and other scales					

The black text in Table 12 specifies the response of the nofdp team in terms of which requirements they can, may, and cannot meet for both the Spatial Planning and Participation aspects of the tool[1].

[1] *Note: The requirements mentioned in the two tables are all important to the end-users. Their absence from Table 12 therefore does not indicate a lack of importance. Similarly requirements mentioned in Tables 9 and 10, but not included in Tables 11 and 12, should also, although to a lesser degree, be considered as important. Table 8 does not represent promises made by the nofdp team, simply a quick assessment of what is possible and what will probably not be. The parts of Table 12 filled in by the nofdp*

Finally, the end-users were asked to assign points to those requirements that were especially important to them (Table 12). If the points fall on requirements that may or cannot be done, then the message is "please try and deliver these requirements, they are important to us". If the points fall on requirements that can be done, then the message is "do not forget to do this".

Photo 12: feedback to the participants

Table 12: The nofdp team's categorisation of requirements according to what can, may and cannot be done (black text) and the additional requirements requested by the end-users for consideration by the team (blue text). The number of stars (*) corresponds to the degree of importance given by the end-users.

Spatial Planning			**Participation**		
can	**may**	**cannot**	**can**	**may**	**cannot**
Various spatial scales *	Socio-economics	Make decision	Active feedback	Multilingual *****	Public believes to take the decision
Water managers, policy makers, planners	Uncertainty. *****	Groundwater damage	Bi-directional communication. ****		Detailed planning
Future scenarios (based on GIS visualisation, 3D and integrative aspects)	Communication between water managers and spatial planners ***	Policy change	Communication between stakeholders ****		Professional mediation

team were developed without prior knowledge of the contents of Table 11, rather they were developed from the raw results of the small break out groups (Tables 9 & 10).

Spatial Planning			Participation		
can	**may**	**cannot**	**can**	**may**	**cannot**
********					
GIS visualisations *****	Cost-benefit analysis *******	Costs and feasibility for nature ***	Glossary		Calculation of economic damages *****
Transparency *****	Sustainability and effectiveness of measures **		Intuitive user guidance		
Clear documentation	Effects of human assets		Transparency and understanding		
Use of widely adapted rules ****	3D visualisation **********		Help attached to buttons		
Summarised results	Scale unit 10 km^2 project area *		Help attached to buttons		
Clear and easy	Sustainability criteria ***				
Interactive webpage	Different magnitudes of damage in Euros				
Quick calculation times	Costs of nature				
Various temporal scales					
Pre-planning tool					
Take land-use into account ****					
Retention areas **					
Dyke relocation, dyke heightening					
Ongoing information exchange					
Quantitative hydrological parameters (e.g. m^3/s)					
Biodiversity					

Spatial Planning			Participation		
can	**may**	**cannot**	**can**	**may**	**cannot**
******					
Effects of measures ****					

The highly ranked items are shown in table 13 below.

Table 13: Important items from table 12 according to the participant's judgement. The degree of importance is visualised by the number of stars. The colour codes can be read from table 12.

Spatial Planning items	Scores
3D visualisation	**********
Future scenarios (based on GIS visualisation, 3D and integrative aspects)	********
Cost-benefit analysis	*******
Biodiversity	******
GIS visualisations	*****
Transparency	*****
Uncertainty.	*****
Use of widely adapted rules	****
Take land-use into account	****
Effects of measures	****
Communication between water managers and spatial planners	***
Sustainability criteria	***
Costs and feasibility for nature	***
Retention areas	**
Sustainability and effectiveness of measures	**
Various spatial scales	*
Scale unit 10 km^2 project area	*

Participation items	Scores
Multilingual	*****
Calculation of economic damages	*****
Bi-directional communication.	****
Communication between stakeholders	****

The major concern from end-users, with respect to the response of the nofdp team, was on hearing that the calculation of economic damages cannot be done. It appeared from their reaction that it is very important for them that the tool can show the different magnitudes of damage, in Euros, which can occur given different flood damage prevention scenarios. Additionally, a way of implementing 3-D graphics and of including socio-economic factors in the calculation of scenarios will be important to the end-users.

5.3 Conclusions of the discussion on IDSS

As identified in previous EU projects (e.g. Harmoni-CA, www.harmoni-ca.info), if tools are to be used by end-users, then their involvement at an early stage in their design and development is necessary. The nofdp team has reacted properly and well to this chal-

lenge by organising the workshop in Vught to elicit end-user requirements. From the above results, it can be seen that the needs of the end-users can be met in many places. The **main areas of concern** for the project may lie in the area of deciding the **exact role of the tool** (management or policy support), its **scale of resolution** (trans-boundary, regional or local) and whether it can provide a **financial assessment** of measures' costs and benefits over the life cycle of those measures. The latter is particularly important to the end-users. Finally, although the workshop was set up to elicit functional requirements of the IDSS, non-functional requirements are equally important to meet if the tool is ever to be used. An issue that is recommended to be addressed is **how the tool will be maintained after completion**, by **whom** and **for what cost** to the end-user.

6 Results of the discussion paper (brochure)

To get a more detailed and more technical feedback by the participants, a discussion paper was handed out at the beginning of the workshop. It can be found on our homepage (www.nofdp.net). The participants were asked to fill in this paper. We got back eight brochures. Based on screenshots (click model) and questions, the following answers and suggestions for the IDSS development were made by the participants:

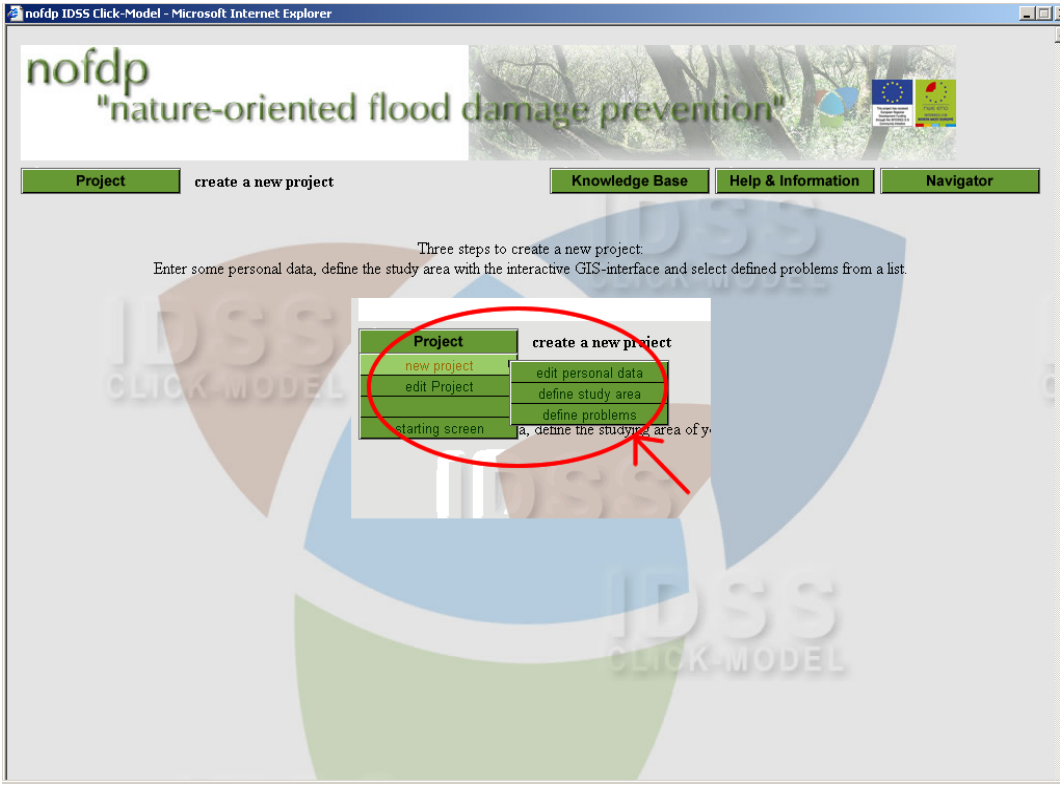

Figure 1: **Step 1** Starting screen: Here you start and set up a new project.

The following questions were addressed to the participants:

- *How do you like the layout? Do you prefer menus or icons?*
- *Do you like this simple graphical user interface or do you want to see the complex hierarchy of the IDSS?*
- *Would an assistant (wizard), guiding through the IDSS, be a helpful option?*

Most of the participants would prefer to work with **menus** instead of icons and having an **assistant** guiding through the system is seen as a **helpful** option. The majority would like to have a **simple graphical user interface**; few would prefer a complex hierarchy to check were they are while working with the system.

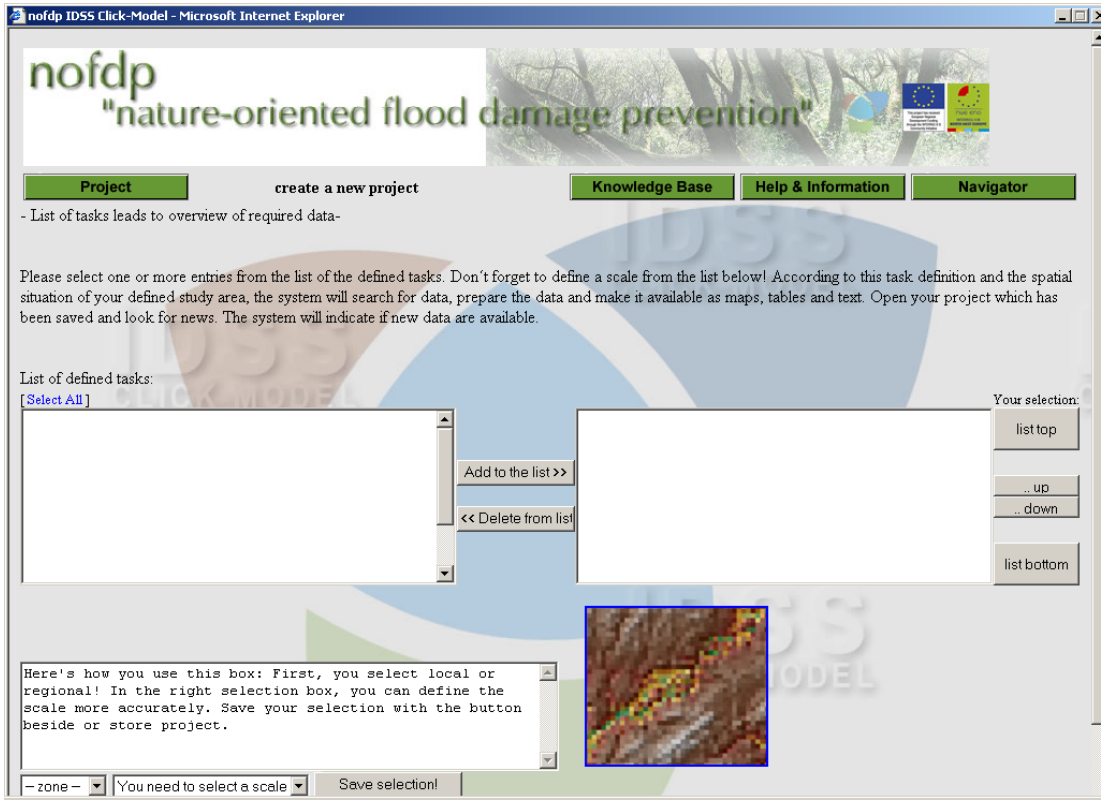

Figure 2: **Step 2** Specification of tasks and choice of scale: Here you select the tasks and the scale of your project to be handled by the IDSS. Based on your selection, the system will identify data required for later use.

The participants were asked to:

- *Fill in your typical tasks when carrying out your flood management project.*

The following tasks should be handled by the IDSS: land-use change, weirs for higher groundwater level and balancing ground water levels, realisation of retention areas, delimitation of flood risk areas, identification of conflict areas, flood plain lowering, dyke removal and dyke shifting, re-naturalisation.

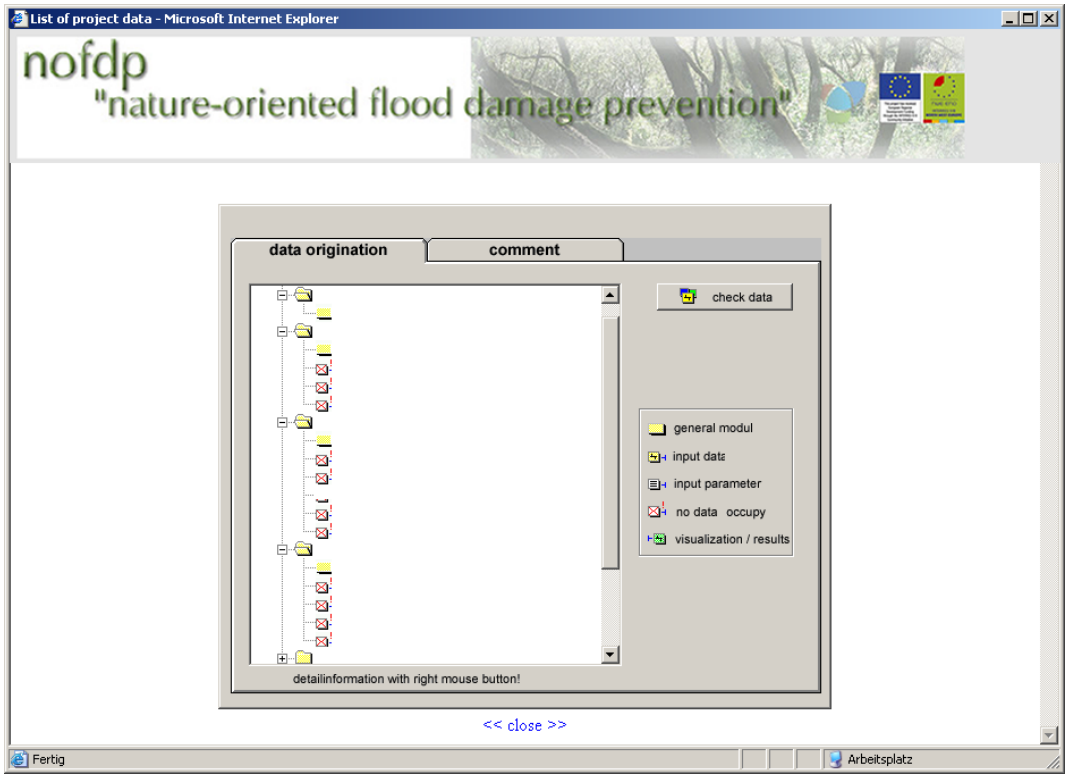

Figure 3: **Step 3** Data import: Here you check the existence and the need of data according to your choice of tasks.

The following questions were addressed to the participants:

- *Which data do you typically use when carrying out your flood management project (hydrological data, ecological data, spatial planning data, socio-economic data, others)?*

Hydrological data are used by all participants, e.g. discharge, ground water level, climate data and flood events. 7 of 8 are also working with ecological data like vegetation cover, vegetation structure, number of species, PNV area, water quality and nature target types. Spatial planning data are used for land-use change, soil, urban area, infrastructure, closed dumping areas, agriculture and official regional planning. Just 3 of 8 are including socio-economic data like demography in their project. Further data are swop (=exchange) of land and damage data.

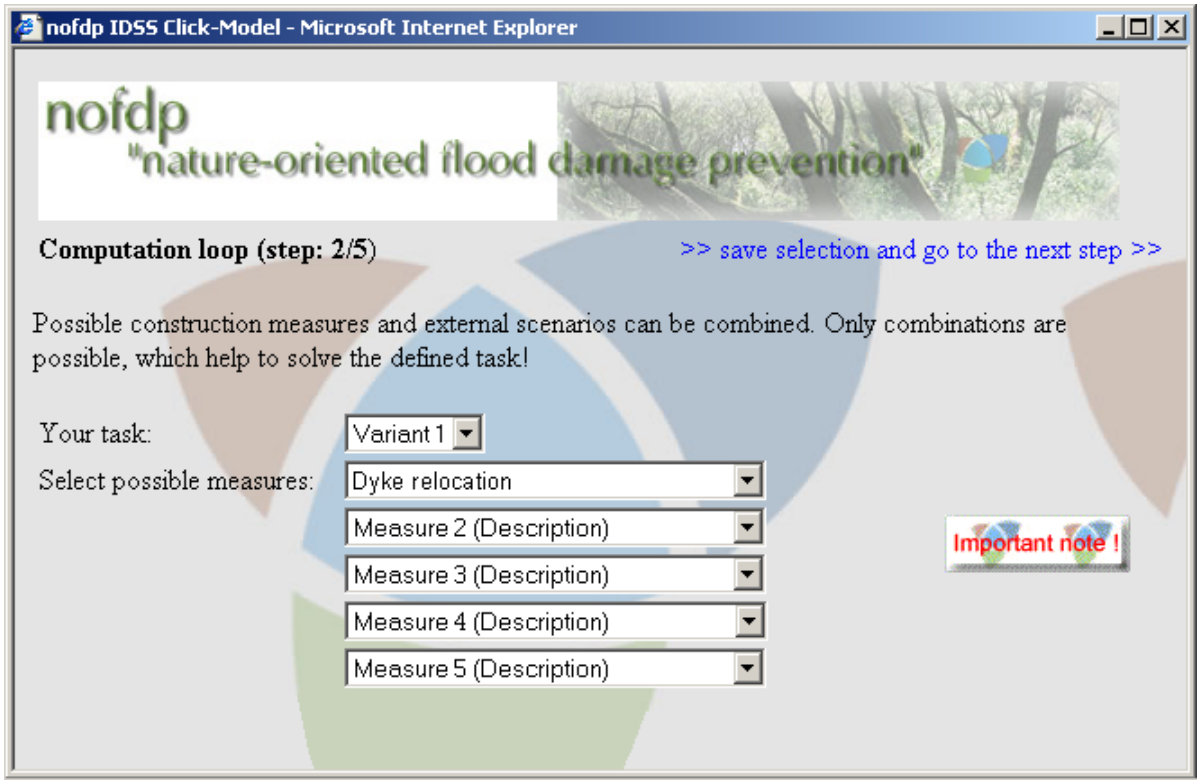

Figure 4: **Step 4** Define measures: This page gives you the possibility to define different measures according to your already chosen task.

The following questions were addressed to the participants:

- *Which measures would you like to test in your pre-planning process with the IDSS?*

Answers: upstream storage and retarding basin, dike relocation, forestation, higher groundwater level against drought, adding and removal of pumps are measures which the participants would like to test with the IDSS.

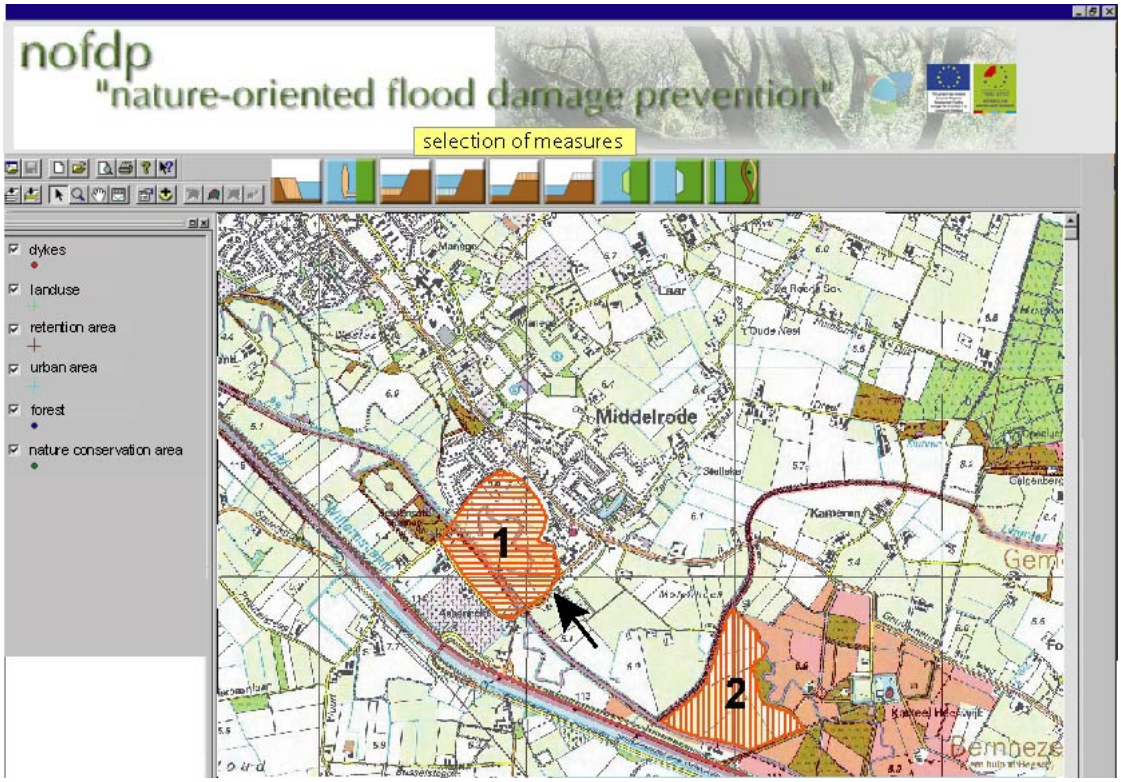

Figure 5: **Step 5** Interactive construction of measures: This page shows an example, how the spatial interactive construction of your measures can be realised with principles of drag-and-drop.

The following questions were addressed to the participants:

- *What advantages or disadvantages do you see when applying this drag-and-drop-tool in pre-planning your project?*
- *Which background information do you need to be presented on your map to find optimum location for your measures?*

Answers: spatial interactive construction of measures can be realised by the IDSS. The advantages of applying this tool in pre-planning of a project are that it is easy to use, visible in maps and calculate the cumulative effect of a number of small effects, while the simplification is seen as the only disadvantage.
To find the optimum location for the measures, land-use, ownership of land/buildings, topography, elevation, location of drainage systems, dykes, nature areas and flood zones should be presented on the map as background information.
The results generated by the IDSS are shown in step 6. Different kinds of spatial and temporal information and resolution are needed. For the communication with the public more detailed information and local (10 km) and regional (1:50 000) scales are preferred, while for the communication with the decision makers large scale data, local and sub-regional project area (500 km) and also local scale (1:10 000) is needed.

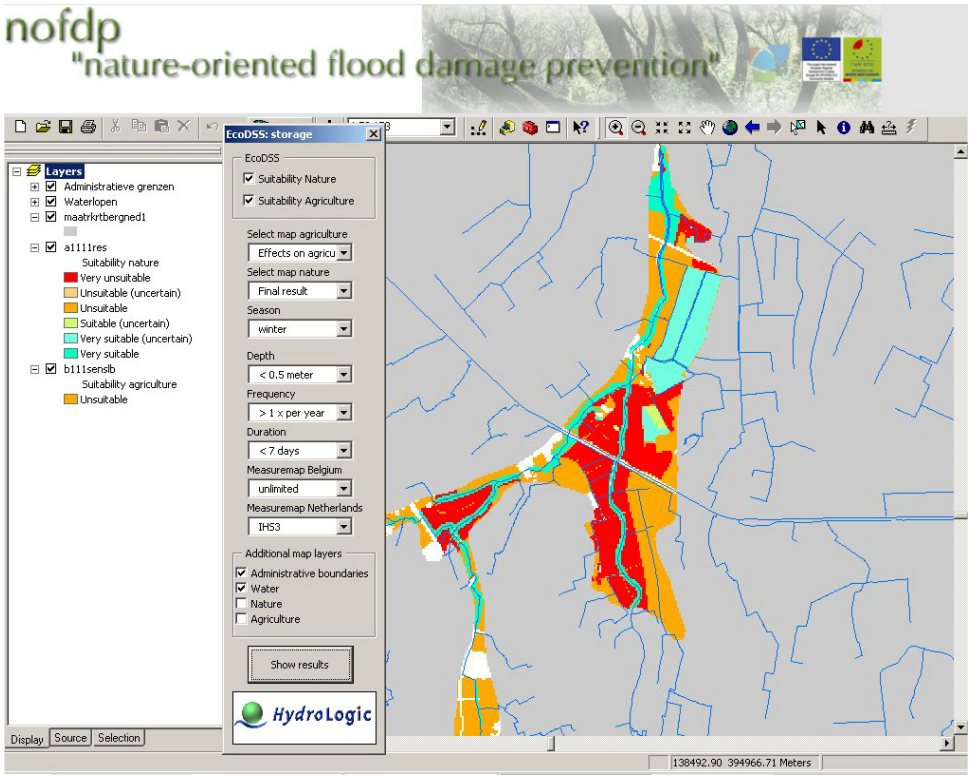

Figure 6: **Step 6** Results generated by the IDSS: Having applied the IDSS, spatial results are displayed in a map similar to this.

The following questions were addressed to the participants:

- *What kind of spatial and temporal information and resolution do you need for communication with the public / decision makers?*

Answers: costs, ecology, damages, cost-benefit, effectiveness of protection and reducing run offs are the evaluation criteria used by the participants for making their decision.
To communicate the decision to the public, costs, ecology, cost-benefit, damages and effectiveness of protection are suggested as evaluation criteria.
The same criteria are used to communicate the proposals to the decision makers, but there is a difference between weighting the criteria: here costs play a decisive role while ecology is less important.
The presentation of the evaluation should be classified in high, medium and low.

7 Overall conclusions of the workshop

The aim of the workshop was to identify and clarify end-user demands for the IDSS. For this purpose we organised different discussion groups in which the participants discussed the themes:

- EU directives and flood damage prevention
- Participative decision-making and possible contribution by the IDSS
- Management in the conflict area spatial planning, flood damage

All persons participated very actively in the discussions, so we finally have got 199 specified and written contributions, which we categorised for better interpretability. The most frequent ones are summarised in Figure 7.

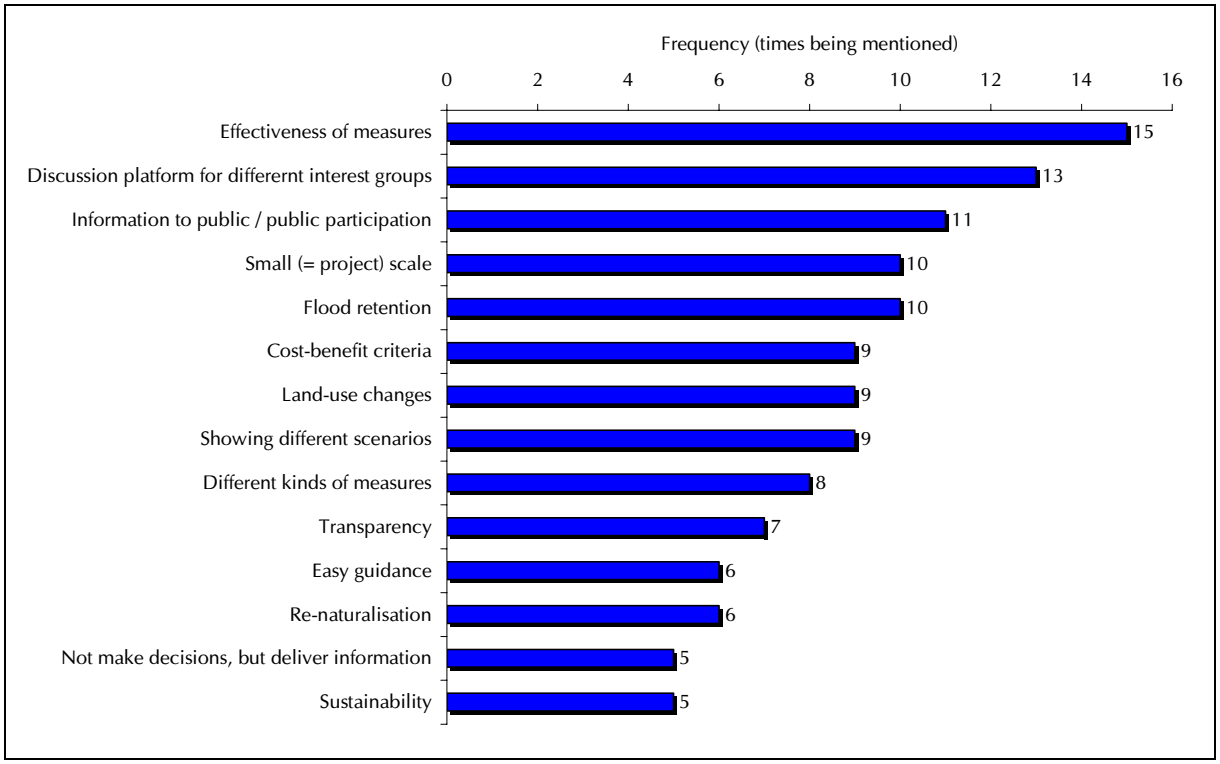

Figure 7: Most frequently mentioned items to be part of the IDSS functionality

The complete list is shown in Table 14.

Table 14: Complete list of all mentioned items during the discussion on IDSS. Most frequent in bold.

Topic	Item	Frequ.	%
Communication	**Discussion platform for different interest groups**	**13**	**7%**
	E-mail platform	1	1%
	Voting facilities forum	1	1%
Economic aspects	**Cost-benefit criteria**	**9**	**5%**
	Expected damage in costs	4	2%
	Cost overview	1	1%
	Overview of subsidies	2	1%
Environmental aspects	**Re-naturalisation**	**6**	**3%**
	Effects on nature	4	2%
	Increasing biodiversity	2	1%
Flood scenario	**Flood retention**	**10**	**5%**
	Showing different scenarios	**9**	**5%**
Measures	**Effectiveness of measures**	**15**	**8%**
	Different kinds of measures	**8**	**4%**
	Life cycle of measures (5-10/.../100years)	1	1%
Technical requirements of the IDSS	**Easy guidance**	**6**	**3%**
	No decision making, but deliver information	**5**	**3%**
	Easy access to the system	4	2%
	Identify the IDSS's opportunities and constraints	4	2%
	Fast to run	3	2%
	Online access	3	2%
	Provide insight in complex situations	3	2%
	Map Server	2	1%
	Maps easy to understand	2	1%
	Zoom function in maps	2	1%
	Understandable symbols (buttons etc.)	2	1%
	Summarised results	2	1%
	Must not be an expert system	2	1%
	Using accounts to log in, "conservative" design	1	1%
	3D visualisation	1	1%
	Several languages	1	1%
	Glossary	1	1%
	Different information at different moments	1	1%
Scales	**Detailed spatial scale**	**10**	**5%**
	Temporal scale	4	2%
	Work for a whole catchment area	2	1%
Spatial planning	**Land-use changes**	**9**	**5%**
	Sustainability	**5**	**3%**
	Hearing within the official planning approval	1	1%
Tool	Pre-planning tool	1	1%
	Help tool in decision project	1	1%
	Tool for special organisation	1	1%
Transparency / Public	**Information to public/ public participation**	**11**	**6%**
	Transparency	**7**	**4%**
Users	Stakeholders	4	2%
	Water managers	4	2%
	Spatial planners	3	2%
	Politicians	2	1%
	Interest groups	2	1%
	Independence of users	1	1%
Total		**199**	**100%**

As a conclusion of the whole workshop we summarise the most important arguments of the participants. The following points are based on sorted and counted arguments of the raw data from the pin-up posters as well as the evaluated arguments from the discussion of the last day. The most important requirements for the IDSS are:

- **Communication** was identified to be of utmost importance for the IDSS. The system should provide an internet-based discussion platform for different users and stakeholders. The IDSS shall also serve as a bridge between water managers and spatial planners. Thus, the participants want the IDSS to provide the user with

    - An appropriate design
    - Easy guidance
    - Visualisation of maps via GIS
    - 3D-visualisation of the planned measures and calculation results
    - Common language with glossary
    - Multilingual menus

- **Enhancing trust** in the IDSS should be done by the

    - Use of widely accepted rules and methods
    - Transparency of the modelling process
    - Uncertainty analysis
    - Clear documentation and metadata

- The IDSS should provide the user with **different kinds of measures**. The user should be able to "play" with different options. All these measures have to have a high effectiveness regarding flood prevention or reduction and should be sustainable. Measures most often mentioned are

    - Flood retention in retention areas
    - Shifting of dikes
    - Re-naturalisation of rivers
    - Land-use regulations and changes

- There has to be a possibility of taking into account **future scenarios**. This includes land-use and climate change as well as future changes in policy.

- **Different spatial and temporal scales** should be addressed by the IDSS. For these spatial and temporal scales the effects of different planning options should be shown.

    - Spatial scales will be
        - Project (local) scale and
        - Regional (catchment) scale

    - Temporal scales can be e.g.
        - Up to five years
        - Five to twenty years and
        - Twenty to a hundred years

- The expected output of the IDSS should include the following issues:

    - Effect of measures and scenarios on biodiversity should be explained
    - Effects on agricultural land-use, nature and housing areas should be identified and clarified
    - The cost-benefit ratio (incl. expected damage) of measures should be clear

The nofdp development team will try to take into account as many of the contributions as possible. Some ideas will fail because of technical requirements, some because of lack of information. Nevertheless, the output of the workshop will be the main input for the development of the IDSS.

8 Acknowledgement and outlook

Again we want to thank all participants for their contributions!

This workshop was financially supported by the European Commission.

For those who have indicated an interest in the future development of the IDSS, we encourage you to visit our webpage www.nofdp.net to get further information regarding the ongoing process. You are also very welcome to contact the nofdp team for more details.
Those who have indicated to be involved in the development process will be contacted and asked to test the software as soon as the first version is available.

9 Literature cited

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10 Appendix

- List of participants
- Abstracts of some talks
- PowerPoint presentations of some talks

Table 15: List of participants

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Abstracts of the talks of

- B. Hahn
- V. Wachendörfer

20 years SDSS for policy support — lessons learned

Bernhard Hahn

Integrated water resource management (IWRM) is an explicitly spatio-temporal domain. Managers, planners and policy makers need a good overview on, as well as in depth in-sight in interacting processes at diverse spatial and temporal scales. The domain is multi-disciplinary, multi-sectoral and involves multiple spatial agents. Planners need to intervene in a complex dynamic system with many closely interwoven natural and anthropogenic processes. Policy interventions in such a system often cause irreversible change. Planners therefore want to simulate the effects of their policy interventions, prior to taking action. Policy interventions often require huge resources therefore planners need to be able to evaluate and rank alternative policies according to multiple criteria and set priori-ties.

Managers, planners and policy makers involved with IRWM operate in a decision context that (1) involves multiple disciplines and multiple resources, (2) is based on incomplete knowledge, information and data and is determined by various degrees of agreement / disagreement on facts and values among stakeholders, domain experts and the general public.

The domain characteristics and decision context described above constitute what is called an 'ill- or semi-structured problem', which is characterized by (1) uncertainty and incompleteness relative to the knowledge for solving the problem and/or (2) conflicting views on values, goals and measures relative to the solution of the problem. Despite the fact that DSS are specifically designed to deal with these kinds of problems, their acceptance as a support tool for policy design is still very limited. This presentation will discuss some success and failure factors we observed as a developer of several large spatial decision support systems for policy support. Furthermore the presentation argues that we need a science of knowledge integration in order to improve on the quality of our decision and policy support tools and poses some research questions in that direction.

Flood Prevention and Nature Conservation – a programme of the Deutsche Bundesstiftung Umwelt (German Environment Foundation)

Volker Wachendörfer

The Deutsche Bundesstiftung Umwelt (DBU) is a non profit organisation and a foundation established according to civil law in 1990. The goal of the foundation is to promote innovative projects in the field of environmental protection with particular focus on small and medium sized enterprises. The promotional activities include environmental technology and communication as well as environmental research and - last not least - nature conservation.
After the flood-catastrophe in August 2002 in Germany the advisory board of the DBU decided a special programme for projects concerning Flood Prevention combined with Nature Conservation directives. At first a symposium was organised with the aim to identify deficiencies in recent and ongoing concepts and projects of Flood prevention. One important result was, that it is well known which measures are appropriate for sustainable flood prevention with special regard to nature conservation. So the following projects promoted by the DBU focussed the realisation of comprehensible concepts at different sites in Germany. Until now 9 projects has been supported with round about 4 Mio €. These projects will be presented with a selection of all their positive results and with special regard to the problems occurred during different project phases.

Overview of PowerPoint presentations of

- B. Hahn
- J. Scholtes
- L. Reichard
- S. Ernst
- P. Horchler