Strategic Alliance for integrated Water management Actions

SAWA Capacity Building

Capacity building concept and methods for flood risk management

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Abstract

The realization that absolute flood protection is never attainable, and that structural flood protection measures, such as dams, dikes and levees cannot be the only solution to flood management – has moved the general thinking in flood management from *flood protection* towards *flood risk management* (FRM). The European Flood Directive is focusing on the three pillars prevention, protection and mitigation. At the same time it demands also for taking responsibility by residents for their own potential flood risk. Against this background capacity building in flood risk management seems to be more than crucial to perceive. But what is CB and how can we achieve CB in FRM.
This report is describing a concept for CB in FRM, developed within the SAWA project. It also describes a concept – the 7-i-concept, developed by SAWA members - for higher education, which comprises important didactic criteria to be regarded in Bachelor or Master courses and programs in FRM. Examples for the implementation of this concept are given by illustrating SAWA course offers against these criteria.
Furthermore this report illustrates a range of methods on CB in FRM which can be used for CB. An inventory was conducted by analyzing FRM projects by using a matrix, which was developed based on the SAWA CB concept.

I. Capacity building concept and definition

(The text of part I is mainly based on reports written by T.R. Geißler)

I.1 Background

The term Capacity Building – or Capacity Development – has in the past largely been used with reference to developing countries. It describes the fostering and educational aid provided by entities from the outside, to raise "a society's ability to identify and solve [a certain type of] problems (Weidner et al. 2002), in this case environmental ones.
Besides this, capacity building services are and have been provided for peace keeping activities, for economic and medical development and in the course of democratisation, hitherto mainly in developing countries. But Capacity Building is, however, not limited to international aid work. More recently, capacity building is being used by government to transform community and industry approaches to social and environmental problems.
Different sources agree, that capacity building is an "on-going process" (Catholic Relief Services 2009) in which "all stakeholders participate" (UNDP 2009). The aim is to strengthen "individuals, groups, organizations and societies, enhance their ability to identify and meet […] challenges" (Catholic Relief Services 2009) and "build independence" (New South Wales Government Health Department 2009).
The Global Development Research Centre (GDRC) sees the process of capacity building on three levels (GDRC 2009):

- at the individual or group levels (covering skills and knowledge requirements),
- at the institutional or organizational levels (covering operational and administrative aspects), and
- at the strategic or systemic level (covering legal political, economic frameworks).

In the sense, in which sometimes NGOs are recipients of capacity building service, local authorities and experts must be included in the capacity building process, in the way of becoming learning organisations.

Leaflets and brochures for damage mitigation and adaptation, governmental action plans, national and transnational research into causes of damage and lately the aim of raising hazard awareness can all be identified as an ongoing endeavour to enhance the capacity of precautionary action. Or at least endeavours were undertaken to inform the people on flood risk and potential ways to cope with. What has been the success so far?

It is a hopeless endeavour to accomplish any provision for flood hazard, let alone sustainability. We have provided so much information and over and over conducted information sessions and road shows to raise awareness. But when it comes to change and action every hedge in anyone's garden is more important than the least provisional measure.

Many incidents in recent years provide a multitude of examples, what can happen, but people tend to act against better knowledge. Even if we find accordance with our warnings and suggestions in the first place, people do not act accordingly in the end.

Admittedly constructed, this statement on the value of flood management and activities to cultivate hazard provision depicts its dilemma and some of the factors that cause it. The situation tends to develop into a dead end, as the parties involved act within their realms of possibility and understanding – without reaching the goals.

Two basic principles appear causal for situations of this kind and the lack of success in encouraging flood hazard provision:

- Contrary to general belief, judgement and choice in most cases do not follow the lines of rational arguments and deliberate reasoning but are based on intuition and emotions instead. Hence seemingly objective and persuasive information and facts generally do not – cannot, due to the psychological causes – serve as guidance in dealing with flood hazard.
- Flooding as an infrequent natural hazard to most people is a rather unknown situation, leading to substantial shortcomings in intuitional judgement and choice. The intuitive valuation is quick and reliable in acquainted situations and surroundings but is easily – and reliably – biased in uncommon situations and by uncommon questions.

Taking a look at the resulting biases and the underlying judgemental heuristics can contribute quite a bit to understanding the difficulties in sustainable flood management and seeing their origins. Combined with resulting effects in learning and communication this knowledge can path the way to deliberate capacity building. Accessibility and representativeness of arguments as well as Narrow Framing in judgement are central mechanisms in defining the field of biases in providing for and handling unfamiliar hazards while learning from experience leads to misguided safety confidence regarding infrequent events.

Flooding does not necessarily have to occur unexpectedly and it does not have to cause (unexpected) damage. As such, understanding its genesis to influence and change the circumstances that led to its occurrence is a task in dealing with cognition, as "learning and acting depends on processes of cognitive judgement" and "people act knowledge-consistently". To enhance handling of floods by learning, the influences of cognition and judgement as well as the effects of negative reinforcements have to be taken into account – and kept in mind.

But what is the goal in capacity building towards sustainable flood risk management? Is it the obviously desirable state of reduced or minimised damage potential, as leaflets and brochures proclaim by their guidance on how to adapt to possible impacts? Who judges the value of damages? From an economic perspective, flood damage is the cost of land use with the significant dimension in this perspective not being the cost but the difference between cost and benefit. Then, who defines the benefit? There is no simple or general rational monetary solution to this problem. It is a question of individual evaluation. "To know the time, a watch is needed. A 'Swatch' would do but nevertheless some people buy Rolex. The cost of acquisition is not solely deciding" (Catholic Relief Services 2009).

The outcome of an evaluation may differ depending on who does the assessment. But there is a common base: there has to be an assessment.
Looking at capacity building in this way reveals its foremost duty: **enable anyone concerned to accomplish this evaluation. That is: facilitate the recognition of costs and benefits – or in other words: the amenity as well as the burden.**
The result may be improved flood adaptation and minimised damage potential but it can also be no change at all – at least on this level: This approach awards individual freedom and it implies individual responsibility. Making and accepting a choice equals a contract with society that grants the amenities and on the other hand demands to bear the consequential burden.
Often, the unexpected flooding and the even more unexpected consequences bring about a far shift in evaluation, as it reveals the burdens and causes the amenities to become somewhat shaded, distant and small. In this sense capacity building must make the bargain visible, lead to a clear understanding of it and provide for the capability to handle it, no matter which way is chosen.

I.2 Definition for Capacity Building in FRM

A definition of capacity building in flood risk management naturally includes a definition of capacity in flood management. Its building or development again requires the capacity to do so, the capacity to build capacity.

"Capacity in flood management is the capability of individuals, groups, institutions, authorities, and of local societies as a whole, to live with and adapt to a locally specific situation of flood hazard in a sustainable way, thus lowering damage potential, raising resilience with respect to floods and minimising the interference with waters and associated ecological values.
In this sense, capacity building in flood management, as aimed for in the SAWA project, comprises tasks, strategies and methods that enable local societies and their individuals to develop this capability.
And while capacity building is widely recognised as an ongoing process, *ongoing activity is regarded crucial for the development of capacity in flood management due to the psychological mechanisms in hazard cognition and their requirements in education and training.*
In accordance with GDRC (2009), capacity building in flood management goes beyond training individuals, but includes

- Development of human resources, "equipping individuals with the understanding, skills and access to information, knowledge and training that enables them to perform" accordingly.
- Development of organisations, elaborating "management structures, processes and procedures, not only within organisations but also the management of relationships between the different organisations and sectors (public, private and community)".
- "Institutional and legal framework development, making legal and regulatory changes to enable organisations, institutions and agencies at all levels and in all sectors to enhance their capacities."

Although the latter is no planned part of SAWA-activities, recommendations for changes or enhancement of legal framework could result from research into suitable methods in capacity building. The definition of capacity building states, what capacity building is, what its aims are. However, it does not state, how these aims are to be reached.

I.3 Obstacles and general approaches on the way

Capacity building must aim to enhance the cognition of potential hazard from flooding or rather establish it in the first place to provide the best conditions in comprehension and perception for adaptation.
One central challenge is that most aspects for encouragement of an adequate perception and handling of the hazard from flooding depend on the reference to experience. The authentic cognition and perception depends on just as authentic methods.

- Communication
- Illustrative information
- Possibilities of experience

Working the judgemental heuristics
Representativeness poses the general problem of understanding probability. Thus probability assumptions should be avoided in any case – if they are not necessary for dimensioning purposes and economic consideration. Papers, news, information brochures are no medium for probability illustrations. The "hundred year flood" is a bad idea from the perspective of capacity building. Focus should be on possibilities instead. Not just for the "ordinary resident" but for the expert and for the individuals in authorities, behaviour is influenced by the perception of relevance of the flood hazard they are disputing. Every one makes considerations as the bases for acting and priorities in planning and administrative processes are as "coloured" by these considerations as is the hazard- or precautionary behaviour of the resident of a flood prone area.
Also representativeness serves as filter – the likeness-filter – segregating every information that is too far off the relevant reality and conserving the inner images or the paradigm of ones situation from change. Thus the new information needs an implicit confirmation. Experience is an inevitable one – at least for the particular event – but not a feasible means for capacity building purposes, it sets the bar though for the respective activities.
Goals are

- clearness in the sense of directly accessible signs of hazard and
- a direct reference to and thus accessible relevance for the respective individual situation measured by the unambiguousness of a real event.

A key to building perception and supporting provident behaviour is to be found in accessibility and availability and the connected judgemental heuristics that are guided by imageability: the more vivid an impression, the higher the availability. To experience the flooding of a house, a village is more effective than to read about it, to hear about it or see it on television. While it is even more effective, if it is the own house in the own area of responsibility that is affected. It is essential to facilitate vivid images in this way, that must be straight to the point of the specific and individual situation, relation or concern as to prevent wrong or inapplicable comparisons being drawn, avoid a hazard to be judged not relevant simply because it is difficult to imagine or obviate simplification to put weight to the wrong aspects But so called expert views might easily get in the way of changes to paradigm and self conception.
Anchoring effects cause the "professional" expert to stick to his expertise and perhaps the long-time experience, filtered by the trained view; and in the same way it causes the longstanding resident as the "experiential" expert, to stick to the trusted expertise.
Even more persistent, a group based expertise, has to be addressed on its collective bases, as its anchor is a standard set by the group, thus being rather inaccessible on an individual bases. An alternative may pioneer type individuals, who could serve as disseminator into a group or commune. Still this type is not so likely to abide by a group opinion. Anyhow the network

and social context must be taken into account, when addressing individuals with capacity building activities.
It is worthwhile though, as the group can develop a particular power in favour of precaution and adaptation, once it takes over the new paradigm. All the same to avoid new anchoring effects to a specific event or situation, every activity must aim to extend knowledge and comprehension to wider view, enabling the individual to think forward and adapt to and provide for formerly unknown situations and constellations: **develop capacity to act and adapt!**

Perceived control – I can handle it
Different studies have revealed the important role of perceived control for hazard behaviour and provisional action. It is rated as a key factor for hazard behaviour: perceived control supports a proactive hazard approach. The conviction of a favourable result of protective, preventive or adaptive actions supports the motivation for this action.
In accordance with the affect heuristic it has been observed, that voluntariness in hazard taking enhances the perceived control and the thus supports behavioural capacity. Hence, **communication on hazard and potential damage always has to be accompanied by provision of methods and means for handling the hazard**. A case-study revealed that people were only willing to attend activities on flood hazard in their area, after this promise had been given. At best though, flood hazard should be perceived as a natural condition of a favoured good, thus being accepted, freely taken and accordingly perceived as controllable. But: the perceived control must be accompanied by a real individual capability to act according to need. Otherwise perceived hazard and actual hazard do not match, the hazard is underestimated, providing the condition for damage. Also, if the "favoured" situation at the water and its potential of flooding becomes too familiar without really ever experiencing this latter downside, the perceived control leads to diminished perceived hazard – with the before mentioned consequence – also due to the outlined heuristic effects in judgement and perception.
Ideal is a familiar and freely chosen situation with an accepted potential hazard from flooding, which accordingly is perceived as controllable but still is seen with appropriate respect.
The latter should be achieved by education, information and possibly activation, that is

- as close to reality as possible,
- designed to the individual situation,
- dominated by experiential approach and
- always accompanied by guidance on provisional adaptive and protective means and methods.

Activities in this field should be repeated regularly but should never aim to raise the respect for the hazard by exaggeration or fear as both ways lead to decreasing activity, either due to the effect of negative reinforcement or a change in emotional representation, from freely chosen to unwanted, thus uncontrollable. In between too much familiarity on the one side and exaggeration, resp. fear on the other side lies a constellation of perceived control paired with relatively high motivation for own provident activity.

Hazard indicators – recognising a threat
People direct their behaviour in accordance with the subjective danger, which constitutes their respective reality. Hence every support, education and development must provide the condition that the subjective danger will best match the objective danger. In this way, situation based behaviour will become possible.
An important dimension for the subjective danger, i.e. the dangerousness perceived in a certain situation is its descriptive clearness that immediately makes the possible consequences

understood. Easy and direct perceptibility is characterised by not coded appearance and a simple if-then-relatedness of cause end consequence. Indicators of this type may serve as implicit evidence for the causes of awareness- and capacity raising activities, clearing the way for further and farther reaching information and education. For the target group of residents, such indicators that give a direct and doubtless answer to the "what if" question can be generated in life illustrations on site – i.e. vivid simulations of flood levels and the consequences of flooding: experiencing a water level in front of the house easily conveys the pictures of the water inside the house

Table 1: Psychological influence on perception and handling of infrequent hazards

	Negative reinforcement	Affect heuristic	Anchoring effects	Heuristics of availability	Heuristics of representativeness
Interferences by psychological effects	Due to likeness-filter the prognosis of a flood event that – never happened before – lies outside a certain area of analogy to know incidents will be disregarded or rated as not relevant in the judgment underlying all action. Beyond that, the difficulty in handling probability may cause people to not expect a similarly extreme event after a recent experience.	If there is no experiential or emotional connection to certain flooding events or scenarios, or is it difficult to imagine due to a different paradigm of the own living, working, planning or administrative situation, those events will be perceived as being a minor relevance. Thus they might not gain the appropriate guiding influence	Behavioral judgment tends to be framed by a status quo. Actions and behavior are based in and ruled by the present situation and its convictions. On the one side learning effects from an experienced (extreme) event may become distorted by the effect of the post-hoc adapted prognosis capability: the retro perspective perception suggests a "it could have been foreseen" impression, reducing the alertness and generating an unjustified position of confidence devoid of any real changes.	Affective relevance increases salience thus better the accessibility of respective aspects an accompanying factors in general. And while adverse affects creates fear and the perception of uncontrollability, the opposite is true as well: affectionate response and familiarity make for the notion of manageability, whereas too much familiarity without realistic is likely to cause negligence, underestimation and overconfidence. If adverse sensation dominates, there appears no necessity for intervention. And: today it is difficult to assess an uncertain future loss in contrast to current comforts.	Due to their seldom occurrence and the heuristic effects in perception and cognition, the approach to extreme natural hazards is likely to be guided by a negative learning effect: rarely experienceable, the images conveyed in warnings, notification and advice are not verified and bear a perception of immunity: The farther off the images used in hazard communication, the stronger this learning effect.

Table 2: Scales of outside factors for perceptibility of hazard indicators

		Descriptive	Accessible	Codification	Time relation	Causal relation
Continuum scales of perceptibility	**From…**	Immediate perceptibility of a sign or signal of hazard.	Permanent accessibility not requiring any intention of the observer.	The hazard is directly perceivable, immediately in "substantial identity": water directly at the house.	Periodical signals (permanently present) and short time span to occurrence.	Sporadic signals (appearing suddenly) and long time-shift to occurrence.
	…to	Non-descriptiveness of a merely abstract sign of hazard.	Disclosure of the sign for hazard by a special cognitive process or by a technical or other means.	Symbolic warning cues, need to be decoded. Fallacious "safety indicators" must be translate: rise of groundwater, seepage signs.	Simple cause-effect relatedness (water around the house: can cause water inside the house)	Complex cause-effect connection not spontaneously perceiveable, (e.g. loss of stability due to buoyancy, possibly only due to rising groundwater, not observable).

Direct hazard indicators of this kind may prepare the ground for skill- and knowledge-reliant indicators, which can only be seen and understood on the background of an extended comprehension. Continuative guidance and education must aim at a broad experiential understanding of flooding, its causes and consequences as well as its very specific manifestations and steering and administrative procedures. In this way real flood handling

capacity can be generated, as people are enabled to identify and comprehend the hazard in any given situation.

Experience based water culture

Experience has an important role for flood handling capacity – and the motivation to act – due to perceived control: Familiarity and its positive effects as opposed to the strange, unknown and adverse incident, which generally appears as less manageable. Own experience is often the cause, that natural hazards are perceived as controllable and at the same time raises the perception of ones own vulnerability! It even teaches better prediction of future occurrences: experience sensibleness and at the same time teaches manageability and it even enhances the handling of the probability, thus weakening the misguiding effects of the judgemental heuristics. Experience based skill must be see as a central dimension for handling natural hazards and thus should be taken as benchmark for the quality of the action capacity that can possibly be generated by a measure of capacity building.

This despite or even due to the also existing scepticism towards the effect and worthiness of experience:

Even though direct experience is identified as one of the strongest stimuli for damage mitigation measures, this perspective is opposed by the virtue of experience diminishing over time and by adaptation.

Hence, experience must be regarded on the background of motivation and teaching psychology and mainly the concept of negative reinforcement must be taken as guidance for a targeted application of experience in capacity building. Abating motivation and significance from this perspective do not contradict the potential of experience but must be understood as characteristic and treated accordingly: What does not occur is of no relevance!

Therefore experience based capacity building must aim beyond a merely situational comprehension and capability that will vanish over time, towards an integrated approach of a cultural implementation, facilitating a permanent presence of the issue as an understood aspect of place and society and the frequent renewal of experiential encounter.

Positive perspectives on the gains – integration towards sustainability

To cultivate the ‘water integrating society’, the perspective must not be towards potential hazards and losses but headed for the gains the amenities of it. The reason for flood plain use is not the search of hazard exposition but a however named advantage or convenience.

This advantage can be of economic nature in many cases but just as well can have its origin in intangible values, e.g. directed to the beauty of the surrounding.

And from the background of perception and cognition the value- and advantage-perspective is worthwhile, positively contributing to capacity development. Emotional salience raises the accessibility, not only of the salient aspect but of connected features as well, thus bringing forward the flood related topics for the intuitive judgement.

- “If […] feelings toward an activity are favourable, they [lead to] judging the risks as low and the benefit as high”, the activity or event as controllable
- And: “affect comes prior to, and directs, judgments of risk and benefit”. Before reason can take over, affective stimuli have already set the direction of further judgement and consequential action.
- The negative-reinforcement-effect of *even though I neglect provision, I have no problems*, that accounts for decaying awareness and dwindling motivation, because provisional action for a far-off hazard is no ones intention and might even cause constraints. It is unwanted and readily abandoned, if sensation of needlessness occurs. But if the dominant perception is a favourable gain or value, this effect loses ground: favourable inherent motivation.

Now here lies a point, where sustainable flood management and sustainable water management meet and can serve each other. The goal of sustainable water management can contribute to the positive gains in flood management culture: the appreciation of the value of water, an intact nature, the beauty of the amphibious surrounding and altogether a wonderful place to be in. This mainly refers to the target group of residents in flood prone areas and other aspects must be found for economical presence in flood prone areas.

I.4 Conditions and challenges

While the main and overall challenge has already been named, the following very short digest from the wide domain of hampering influences to the aims of capacity building for sustainable flood plain use and management shall serve as entrance to the idea of education e.g. via Sustainability Education Centres (SEC) (for more information please see the report "SAWA education - sustainability education centres, master education and student exchange").

Table 3: Situations and consequences of not represented or not accessible information on flood risk

	Situation	Consequences
Not represented	Flooding and the accompanying hazard and consequences are not present in every day life. Thus they are mentally not well represented in active paradigms, providing poor and even misleading background and frames for respective intuitive behavioural decisions.	▸ Misjudgement of own concern, involvement and consequences. ▸ Misunderstanding or ineffectiveness of "information" on flood hazard. ▸ Unadapted or even counterproductive behaviour and activities, in residential and economic land use as well as land use planning and administration. ▸ Lack or neglect of provisional measures, ▸ Neglect, avoidance or negation of a hazard caused by unfamiliarity.
Not accessible	Due to the infrequent occurrence and poor mental representation of floods and related consequences the indicators, signs and cues are poorly to not accessible, remain unnoticed and unavailable for intuitive judgement and deliberate reasoning.	▸ The "flood mode" of thinking is not available. ▸ The respective comprehension and judging and can not be adopted. ▸ The appropriate paradigm, that would support comprehension and perception is not accessible. ▸ The right paradigm and perception can not be enabled by information and warnings. ▸ Illustrations and descriptions of the hazard and vulnerability are ineffective. ▸ Depictions of other places and people support a conviction of safety and invulnerability, because they contradict own experience and accessibility.

Methods

On the background of poor representation and lacking accessibility the following requirements shall outline the scope and character of activities and material to be integrated into the design and layout of CB and education in FRM.

- Base all activities on experiential approaches to develop the mental representation of floods and thereby enhance the accessibility and judgement in this domain.
- Adopt and convey wide and integrative perspective and understanding to avoid framing and restriction to a limited sector and to enhance the ability to transfer and extend comprehension.

- Locally based approach to overcome the “does not concern me” - barrier.
- Authentic problem based and in situ-approach using real local problems and projects and activities rather than artificial, imitated or simulated “learning environments”, to deliver real experience and overcome the “does not happen here” - barrier.
- Encourage collaboration between different groups of stakeholders, e.g. residents and local water boards, residents and politicians, pupils and local admin on authentic questions, problems and tasks to encourage an integrative perspective and trans-group comprehension of values and points of view for and from all parties involved, to overcome barriers of misunderstanding and generate trust and familiarity.
- Extend collaboration into lasting networks with regular and reoccurring activities, aiming to develop a local culture that knows and integrates water and flooding, thereby overcoming the barriers of the rare occurrence, unfamiliarity and fear.
- Take a value-based approach rather than the hazard- or threat-related perspective to support the cultural integration of the “place worth living in and cultivating its uniqueness”, thereby overcoming barriers of adverse feelings, fear and unfamiliarity.
- Take positive approaches to shift the focus on adverse effects to a focus on aspired aspects that can be integrated into a “living with water” - culture, thereby raising the overall accessibility of all water- and flood-related aspects and signs.
- Give strong preference to direct and authentic face-to-face communication over unidirectional “information” or media-based demonstrations, to build trust and understanding.
- Take local, personal and authentic approaches. Rely on authentic experience, on people telling their own ordinary stories of flooding, on activating role play and change of positions between groups of stakeholders.
- Avoid generalised illustrations and statements. Avoid seemingly impressive multi-media installations or film coverage and all together mind exaggeration to prevent abetting the conviction of invulnerability.

I.5 Target groups

Different target groups for capacity building in flood management can be identified by the kind of relation to floods and flood management.

Residents
Flooding poses a threat to people, living in flood-prone areas. Accordingly, the required capacity for residents is to save themselves and their property from harm by flooding.
To mitigate the hazard from actual flooding, residents need to fully understand the potential of it, have the ability to foresee a coming situation, estimate its possible impact and have knowledge of adequate adaptation and the capability to adapt and apply it.
Thus, capacity building for residents aims at improving this knowledge and capabilities in order to provide every one with

- the highest possible control over their situation,
- the capability to realistically asses it against other values and
- a strong motivation for adaptation and mitigation of damage potential.

Residents can be subdivided with respect to age when it comes to appropriate methods of capacity building. Certainly, different approaches must be taken for adults and for children.

Planners

Land use planning is the first source for the development of flood damage potential where it applies use and values to flood-prone areas. Hence, the capacity of planners in flood management must be to accomplish planning that serves best for flood adaptation and hazard mitigation, minimises damage potential and enables users to deal with the flooding potential in the same manner.

Therefore it is necessary, that planners from different fields – e.g. land use planning, water management, traffic, environment – understand each others specialised approaches and their interactions as well as the intended user's understanding and approach and possible modes of use – and even not intended modes of use.

This applies to working planners as well as students, who by their expert views and understanding might be blocked from seeing the problems and restraints their planning can pose to users.

Authorities

Administrative and legislative institutions are the sources of land use regulations and thus the collectors, generators and providers of information on administered stretches of land. Hence arise the two responsibilities to

- ensure the knowledge of flooding possibilities, their extent and resulting hazards in land use and
- provide relevant information in an understandable form, ensure that it is received, understood by and usable to every one involved.

This necessitates the ability to understand the recipients' points of view and possibilities of cognition so as to convey information in the respectively appropriate manner. And it can demand rules and regulations to be formed in a way supportive to understanding of and adapting to flood hazards. The responsibility for ensuring the recipients' comprehension of hazard information and their ability to act accordingly requires appropriate activities to cultivate and encourage these capabilities. Capacity building for authorities on this field therefore requires the development of an all-embracing understanding of the hazards, the possibilities for adaptation, other stakeholders' capabilities and hindrances in understanding and adjusting and the possibilities to provide support. It demands for the capacity for capacity building (see above).

Yet another field of capacity development for authorities can be described as strategic administration and legislation in favour of flood adaptation. It refers to the ability to design and maintain administrative guidelines and procedures in a way, supportive to sustainable flood management. Aspects of this are

- inward and outward communication
- collaboration across departments and scopes of competence
- procedures as well as internal and external rules and directives

Service providers

Many service providers contribute to the adaptive and protective quality and capacity of use in a flood prone situation – construction works, building services engineering, architectural services, consultants in general, to name just a few. Though providing these services is widely guided by regulations, specialised requirements will demand extended knowledge and skills with respect to the situation, possible impacts and specialised material as well as required modes of construction.

Consultancy in particular will require a far reaching understanding of a flood prone situation in general as well as of special local aspects, to provide for adequate consulting services.

Students

Right from the beginning of the studies it is a good basis for developing an integrative view on issues and problems and possible solutions or ways to cope with. By interdisciplinary education the students' perspective can be widened.

Also for practitioners as students, e.g. attending a Master Course, integrating knowledge from different fields and concepts of evaluation methods and perspectives, measures, and processes can assist to overcome silo-thinking and support more sustainable trans-sectoral solutions. Therefore this group is an important target group to address, especially because some of them will become future decision makers.

II. Capacity building on flood risk management in higher education

II. 1 The didactic concept for capacity building in FRM – the 7I`s

For a real integrated approach in FRM barriers have to be overcome and an interdisciplinary education and CB is needed. The most important barriers for achieving established systems for integrated FRM are silo thinking, poor or difficulties in communication and the lack of a strategic approach to capacity building in integrated and coherent planning and management.
These needs and approaches go in line with the requirements for sustainable development and thus, with the principles of education for sustainability, promoted by the UN Decade of Education for Sustainable Development (DESD). The principles are:

- Interdisciplinary and holistic learning
- Value-based learning
- Critical thinking
- Multi-method approach (word, art, drama, debate…)
- Participatory decision-making
- Locally rather than nationally relevant information

Four key objectives of the decade are:

1. facilitating networking, and collaboration among stakeholders in ESD;
2. fostering greater quality of teaching and learning of environmental topics;
3. supporting countries in achieving their millennium development goals through ESD efforts; and,
4. providing countries with new opportunities and tools to reform education.

The SAWA approach focuses primarily on the first two DESD objectives: By establishing Centres for Sustainability Education in flood risk we foster the collaboration amongst stakeholders and support the development and facilitation of networks for knowledge exchange and collaborative learning processes. Greater quality of teaching and education of environmental topics, such as the SAWA focus on integrated flood risk management, we try to support by special educational programmes in Higher Education at several European Universities.
The aim of capacity activities within SAWA is to pave the way for a sustainable approach to the multi-level management and use of flood risk areas and river basins – from the local residents to planning, and administration. This approach will therefore facilitate flood risk reduction in line with the ecological requirements of the Water Framework Directive and enable the optimal implementation and lasting operational capability of the Flood Directive.

Based on the DESD principles, didactics and findings in learning theory in risk awareness we figured out that the following elements are crucial to be included and be respected for CB in FRM: Information, Internationality, Interdisciplinary, Interactivity, Identification, Interconnection, and Internalising. In the following a brief description of these elements will be given.

I. Information & knowledge

As a basis for learning processes, valid and relevant information is needed. Particularly in the field of flood risk awareness and management, target-specific information which is

understandable and reliable is considered as crucial. As well as expert knowledge, local knowledge from residents and stakeholders should be included in the information and knowledge pool.

II. Internationality

Floods and (transboundary) waters are global and international issues. Therefore, the scope of thinking must be global and international – however, the frame for action is local. An international exchange can "broaden the mind". If we look at other countries and regions we should regard different intercultural worldviews, practises and knowledge systems.

III. Interdisciplinary

Water management is an integrated issue which has to consider inter alia a river basin approach, natural sciences, governance, social context, economics. Therefore, an interdisciplinary approach with transectoral work and collaboration is needed. This is relevant for all fields such as inter-, multi- and trans-disciplinary and applied research but also for daily life work processes in administration and elsewhere.

IV. Interactivity

Interactivity has to be regarded with both elements, didactics and processes. Concerning didactics, interactive learning is better than one-way learning. The process of learning and learning methods are very much important for effective learning (e.g. Webler 1991). This includes active learning, case studies, action research and so forth. Possible methods can be role play, blended learning, multi-media-tools, case studies, student-centred-learning, problem-based-learning etc. Interactive processes in flood risk and water management are immanent. Especially (learning) methods for participation and collaborative decision-making are crucial for social learning and capacity building (Pahl-Wostl 2006). This approach helps to prepare citizens to engage in participatory democracy.

V. Identification

For effective learning, it is crucial to apply the new knowledge and to identify that a given issue, such as flooding, is or can be a relevant theme to the learner (Webler 2002). Our reactions and actions are mainly based on intuitive judgements. By a process of identification, the lexical knowledge can lead towards action capacity. Identification processes are a first step towards internalising (see point VII). It is therefore important to reveal practical relevance to local and community needs.

VI. Interconnection

FRM is a "wicked" problem (Lazarus 2009). It has to be identified the interconnections between different systems such as natural and social systems (defining what how flood effect risk awareness and social implications such as fear, traumatic experiences or the flood probability and insurance systems, etc.). However, different working and management systems such as water management, nature conservation, spatial planning also play an important role in capacity building. In order to enhance the enabling environment for interdisciplinary problem solving capacity, we should enhance the understanding and respect each other to see thematic and structural linkages.

VII. Internalising

Without internalising information it does not become knowledge and no action capacity (Webler 1991, 2002). Internalising has to be realised:

- at the individual or group levels (covering skills and knowledge requirements);
- at the institutional or organizational levels (covering operational and administrative aspects); and,
- at the strategic or systemic level (covering legal political, economic frameworks).

We cannot change legal structures and institutions, but we can change the minds of those involved.

II. 2 Course offers at SAWA universities

In the following an illustration of how the 7i-concept is included and regarded in study programmes of higher education, given by SAWA universities, is given.
The SAWA Master course on Integrated Flood Risk management was explicitly developed within the SAWA project and conducted two times during the SAWA project lifetime. For more information please see the report "SAWA education – sustainability education centres, master education and student exchange".

a) Course Karlstad University /Sweden

Using a university course for capacity building at the local and regional scales – Climate change consequences and flood risk management for Lake Vänern, Sweden

To support capacity building in municipalities and counties around Lake Vänern, Sweden, a university course was started in autumn 2008 at Karlstad University. One objective of the course is to increase the knowledge about climate change consequences on ecosystems, and the effects for different societal sectors or interests that use or are dependent upon the water system. Another important objective is to build networks among students, local and national experts, decision-makers and academics. A series of day-long educational meetings in cities located around the lake create arenas for capacity building, including elements of social learning, trust-building and stakeholder participation. The group of students is dominated by persons with a present occupation within planning, environment protection, safety management, teaching, NGOs, etc, at local or regional level. The part-time pace (25% during a year) and distance course mode open up the course for participation of persons with an employment.

The topic for the course is a large water system in south-western Sweden – Lake Vänern and the Göta älv River. Lake Vänern with its area of 5,500 km^2 is the largest lake in Sweden and also in the European Union. The Göta älv River runs from the lake outlet, 90 km down to the sea at Gothenburg. Vänern and Göta älv are used for hydropower production, shipping, tourism, fishing, drinking water supply, as waste water recipient, etc. Each of these sectors is addressed during at least half a day during the course, including adaptation and risk management aspects. The entire risk system is complex with flood risks in the lake and in Gothenburg, which are connected to landslide risks and industrial risks in the river valley. The drinking water supply for 700,000 persons in the Gothenburg region is also at stake. Substantial increases in precipitation during the 21st century, according to IPCC, will give a corresponding increase in flood risks.

b) Environmental project study at Leuphana University of Lüneburg/Germany

Another activity is the development and implementation of an Environmental project study which is implemented in the Bachelor programme "Environmental sciences" at Leuphana University of Lüneburg in Germany. This project study implies eight modules in a period of 4 semesters (40 ECTS). The subject is on sustainable flood risk management. The concept is based on a transdisciplinary teaching approach and inter- and transnational perspective and implementation.

In the first and second semester basics of integrated water resources management (IWRM), flood risk management, sustainable regional development, GIS analysis modelling, remote sensing and regional excursions are the main subjects. In the third and fourth semester students will do an international excursion to SAWA partner universities with the focus on sustainable flood risk management. Furthermore they will develop flood risk scenarios, build up a collaborative modelling platform and will do collaborative modelling with the partner student group in Netherlands, Sweden, Norway or United Kingdom via a web-platform. By doing so they can develop adaptive measures, discuss these concerning sustainability and effectiveness and other aspects and will trade off possible measures for certain test-sites online or in direct discourses.

c) Heriot-Watt University/Scotland

Formal MSc Education in Sustainable River Catchment Flood Management

Internationally, the need for graduates in this field is likely to increase as the Floods Directive is implemented in the EU. What makes this course unique is the holistic view it takes of Sustainable Flood Management. It considers everything from how the planning process should work in areas with potential flood risk, to catchment hydrology, flood hazard, environmental protection and the conceptual design of flood protection schemes. Key subject areas include: (1) Planning Process, (2) Catchment Hydrology, (3) Urban Drainage System Performance, (4) Urban Drainage System Performance, (5) River Flood Flow Routing, (6) Flood Inundation Modelling (2D), (7) Coastal and Estuary Flood Risk management, (8) River Processes, and (9) River Processes.

One of the activities in this course is developing the interactive exhibition "In deep water: urban flooding in the 21st century".

Building of the didactic concept, the main aim of the project is to develop an interactive exhibition to help understand how best to explain to stakeholders how storm water is managed within urban environments, with particular reference to the adaptations that are necessary to mitigate against the effects of climate change and urban creep and the integrated interdisciplinary nature of the problem. The project methodology is based on the principle that you learn more by doing rather than by listening and watching (Kolb 1984); hence, interactive physical models form the centrepiece for transferring information and knowledge. As an example, the main elements of one of the three models are shown in Figure 1 and include:

- A realistic section of urban landscape drained by a sewer system and a river.
- A rainfall generator to introduce water into the model.
- Interchangeable system elements (both traditional and SuDS).

Figure 1: ***Schematic of a model (1.8m x 1.5m built at 1:220 'Z-gauge')***

Target audiences include: the general public at science centres/festivals, school children at organised internal/external events and relevant professional organisations (e.g. the planning community). Conservative estimates show a projected audience of almost 9000 people for the first year of the exhibition, which is the proposed period for project evaluation purposes; over the estimated working life of 5 years, this figure is expected to increase to at least 16000. The process of project evaluation will be significantly more involved than that of monitoring, and will seek to gauge what participants have learnt.

d) SAWA Master Course

A Masters course of 15 credits was developed and was given first time during spring semester 2011 (for more information please have a look at the report "SAWA education – sustainability education centres, master education and student exchange"). Six of the seven SAWA universities have contributed, and Karlstad University in Sweden is hosting the course. The scope for the course is flood risk management principles and practices. The relation to neighbouring management perspectives, like water quality and land-use, is elucidated. There is a need for an integrated approach which has to consider economic, social and ecological aspects of vulnerability and potential risk-reducing measures. Interdisciplinary and trans-sectoral work as well as collaboration among stakeholders is needed. The EU Flood Directive and its requirements is central in the course content, as well as the interface between the Flood Directive and the Water Framework

The course content is structured into four areas:

Governance and legal framework • Floods directive (& WFD) • Risk governance	Flood Risk Assessment • Hydrological/hydraulic modelling • Vulnerability analysis
Integrative planning • Flood risk management plans • DSS/PSS	Adaptive measures • Structural/non-structural • Relation to sust. development

The course is both offered to students in masters programs and to professionals that need wider and deeper knowledge about the Flood Directive and flood risk management. Suitable disciplinary background for the participants are for example water management, risk

management, environmental science, physical planning, geography, ecology, technical infrastructure, contingency planning and education.

With a unique SAWA profile the course is based on the broad and wide expertise that can be found at the SAWA universities, and also with contributions from all SAWA partners. The SAWA specialities are:

- Trans-European and inter- and trans-disciplinary learning in order to develop capacity for integrated flood risk management
- Synergies between and coherence of Floods Directive (FD) and Water Framework Directive (WFD)
- Development and application of instruments for integration and implementation such as integrative planning
- Identification and implementation of measures which are regionally and temporally adaptive (e.g. adapted to local conditions or flexible for future adjustments)
- Development, implementation and testing of governance approaches in order to include stakeholders and citizens in decision processes
- 22 SAWA partners from five countries contribute case studies and examples for good practise for different measures and methods.

Table 4: Activity matrix for elements of CB in SFRWM in programmes for Higher Education (exemplified)

Element of CB concept	**Course Vänern Karlstad University/Sweden**	**Bachelors course Leuphana University Lüneburg/Germany**	**Joint Master thesis and research / Heriot-Watt University/Scotland**	**SAWA Master Course on Integrated Flood Risk management**
Information & knowledge	Experts from local, regional and national levels contribute during each education day. On-site information on flood risks is integrated via excursions.	Detailed and valid information and data, recent research results are integrated. Data validation, interviews with experts and residents/stakeholders will be conducted.	Students will learn how to communicate complex model output to stakeholders using simple graphics and simple models.	Detailed and valid information and data, recent research results are integrated from various field of FRM. The lectures are provided as e-learning modules with videos, ppt and literature. A one week excursion in two countries (Germany/Netherlands or Sweden/Norway) is integrated.
International	The case study of Lake Vänern is integrated in courses for international students.	Exchange with students in Sweden and the Netherlands, evaluation of case studies from different places in Europe will be realised.	Students will have the option of undertaking the research component of their MSc overseas at one of the SAWA SECs.	Students from Europe and worldwide are attending this course. Lectures from 5 countries are involved. International material is used as case studies.
Interdisciplinary & Integration	A holistic perspective is chosen regarding societal and ecological consequences of climate change, disciplines	Analysis of different sectors such as natural sciences, spatial planning and nature conservation, and discourse with different experts is integrated.	Interdisciplinary approaches will be fostered by recruiting students from a wide range of backgrounds (e.g. engineering & geography) and	Subjects from four areas are integrated: governance and legal framework, impact assessment, integrative planning and adaptive measures (see above).

Element of CB concept	Course Vänern Karlstad University/Sweden	Bachelors course Leuphana University Lüneburg/Germany	Joint Master thesis and research / Heriot-Watt University/Scotland	SAWA Master Course on Integrated Flood Risk management
	involved in teaching and represented stakeholders		including modules such as urban planning as core course content.	
Interactivity	Participation among students and involved experts causes an active and interactive learning environment.	Excursions, discussions experts, interactive web-based platform, development of scenarios are didactic elements.	Interactivity is key to the deployment of the physical model.	The course included web seminars and interactive group work which requires intensive interaction. During the excursion a lot of interaction amongst the students and with lectures and experts is realised. Seminars are also included during the excursion.
Identification	Geographically distributed educational meetings around the lake connect the participants to local knowledge and local experts.	Identification of local relevance, analysis of regional/local impacts of events or measures, scenario building is included.	This will be supported by designing a series of relevant real-world case studies.	Identification will be supported by designing concrete tasks for investigation and relevant real-world case studies for the group work.
Interconnection	A series of educational meetings in different cities promote the creation of a network of professionals, stakeholders and students	Cooperation of local, regional, national and international bodies and societal groups, thematic interconnection (flood risk and risk awareness, risk discourse) is realised.	To help understand the “wicked” nature of SFRWM students and those using the physical model will undertake role-playing exercises.	Meeting and exchange of local, regional, national and international bodies and societal groups, thematic interconnection (flood risk and risk awareness, risk discourse, potential conflicts) is realised by learning material, with different background of the students and meeting experts and practitioners during excursion.
Internalising	Common learning situations among students and local stakeholders put information and knowledge into a local context and stimulates reflexions.	Role games, web scenarios, presentation and discussion of student’s results with regional experts and stakeholders foster the internalisation process.	Role-playing exercises will also be used to help students internalise information and help transform it into knowledge.	By working in groups on a specific case study the knowledge will be reflected, applied and internalised by the students. Feedback is given by course leaders during a web seminar and comments on the task.

III. Inventory on capacity building methods for flood risk management

Within this chapter different types of methods useful for CB on FRM are described.
First the results from a SAWA workshop are described and expert views on what types of capacity do we need to build/strengthen are illustrated.
The second part describes the results of an inventory on CB methods developed and tested within different FRM research projects. The inventory was conducted and organized by using a matrix which was developed within the SAWA project and which was based on the theoretical CB concept.

III.1 Expert views on capacity building / results from a SAWA workshop

SAWA Workshop on capacity building / results from the working groups

From 7th-8th October 2009 the workshop on "Approaches and methods in governance and capacity building in integrated water and flood risk management (IWFRM) & what can we take out of it for SAWA" took place in Lüneburg/Germany, organised by SAWA members of Leuphana University of Lüneburg.
The workshop was structured into three parts. First part was an introduction and input into the subject by several external and internal (SAWA) experts. The following presentations were given:

- *Governance in water management* (Jens Newig)
- *"Learning and Action Alliance"-approach accomplished at the river Wandse by the SAWA - Hamburg Team* (Natasa Manojlovic)
- *Capacity building in sustainable flood management, understanding for the SAWA-project* (Timm Ruben Geißler)
- *Hindrances in hazard cognition and for adapted behaviour* (Hans-Peter Musahl)

The second part we had a feedback on lessons learnt on CB with regard to the WFD processes from all SAWA countries. The third part was based on workshop sessions on the two questions:
What types of capacity do we need to build/strengthen?
What type of model for participation do you recommend for SAWA?
The results of theses sessions are described in chapter 3 of this report.
The last part of the 2-days workshop we identified synergies and linkages between the different SAWA sub-projects and working phases.

Picture of the participants of the SAWA workshop on Capacity Building in Lüneburg, 7th-8th October 2009

The following aspects were worked out by the four groups, which were mixed with regard to the partner countries and professional background.

Group 1 (Rick Heikoop (NL), Natasa Manojlovic (D), Magnus Johansson (SWE), Daniela Müller (D), Philipp Arndt (D), Leonie Lange (D)

What types of capacity do we need to build/strengthen?

- Different capacities for different stakeholders
- Awareness of hazard/risk
- Understanding of the system
- Common understanding
- Changing attitude towards flood management (mental change)
- Acceptance of paradigm shift of approaches
- Acceptance of changing role of different partners
- Capacity to 'react pro-actively'
- Focus on young people/children

What type of model for participation do you recommend for SAWA?

- Bottom-up approach
- Flexible in terms of timeframe and context
- Transparent model, interest should be clear
- What is the influence on decision makers?
- Clarification of the problem (clear business case)

Group 2 (Jan den Besten (NL), Tim Ruben Geißler (D), Lars Nyberg (SWE), Susanna Hogdin (SWE), Darren Unwin (UK))

What types of capacity do we need to build/strengthen?
First selection
Starting point: (1) setting rules and boundaries
How much freedom?
Decision process
End result
(2) Ask for everybody's interests and visions

(3) Who wants to participate (still)

Training (LAA, but “learner”(?))
Why do you want participation (what do you want to reach?)
What type of model for participation do you recommend for SAWA?

Group 3 (Scott Arthur (UK), Max Hansson (SWE), Monika von Haaren (D), Tobias Ernst (D), Jeff Marengwa (D), Hans-Peter Musahl (D), Julia Mußbach (D))

What types of capacity do we need to build/strengthen?

- Build up awareness of being stakeholder (show personal relevance)
- Clear up goals, strategy
- Build up knowledge how to deal with flood risk information
- No fake participation
- How can stakeholders contribute?
- Learning from WFD participation process

What type of model for participation do you recommend for SAWA?
This question was not discussed during the work group session.

As we can see a range of capacities are regarded as important. Apparently certain (target group specific) knowledge, understanding of the system and strategies are considered as needed but also – to start with – that stakeholders are actually stakeholders. At the same time (on-going) processes on CB have to be deliberated.
Hence a range of different methods of CB are needed for different target groups, phases and contexts. Therefore we conducted an inventory on CB methods within the SAWA project which were developed and tested in several FRM research groups. The results are presented in section III.2.

III.2 Inventory of methods for CB from relevant projects

In order to compile relevant state-of-the-art methods for CB in FRM an inventory was conducted based on a document analysis.
The following working steps were undertaken for this study.

1. Research on potential projects on FRM
2. Analysis of selected projects and research on relevant documents
3. Analysis of the documents
4. Development of an evaluation matrix
5. Compiling results along the matrix structure

Following projects were chosen for the document analysis:

1 Freude am Fluss
2 Harmoni-Ca
3 NeWater
4 IMRA
5 CapHaz-Net
6 Floodsite
7 FLOWS

The projects can be briefly characterised as follows:

Freude am Fluss

Project duration:	July 2003 – June 2008
Funding:	financially supported by the European Union (Interreg IIIB North West Europe Programme)
Consortium:	12 partners from 3 countries (NL, DE, FR)

The Freude am Fluss project is an initiative by Dutch, French and German government authorities, river managers, natural and social scientists in response to transnational sharing of experience, knowledge and ideas for the new river management policy - '*Room for the river'*. Jointly developed planning, design and *innovation of policies should help* to avoid the NIMBY (Not In My Back Yard) effect and foster mutual Freude am Fluss understanding between authorities and communities. Typically, in the approach room-for-the-river measures are part of larger packages that are meant to also enhance the many cultural and economic advantages and opportunities ('*Freude'*) of living with the river. In this way communities and other local stakeholders become involved in a policy planning method that guarantees local voices a say. Identification of economic opportunities is one further approach. Special attention is given to how to turn these opportunities into economic drivers for public and

private partnerships, as this can give economic backing to the room-for-river policies and so significantly reduce public funding.

- *Objective 1.* Learning from practical cases: a transnational evaluation of the factors that determine success or failure of current room-for-the-river measures in the three countries, with special attention for issues as communication strategies, community-based design, joint planning and floodplain rejuvenation.
- *Objective 2.* Development of a joint planning method: inventory and evaluation of existing methods, survey of the views of experts, local authorities and other local stakeholders on problems, solutions and procedures; joint planning should result in an internationally applicable, innovative planning method.
- *Objective 3.* Implementation of the planning method in two regional cases: joint definition of design specifications, joint inventory of options, joint development of draft plans, assessment of hydraulic effectiveness (modelling), costs, economic opportunities, effects on cultural and natural heritage.
- *Objective 4.* Implementation of plans in three municipalities: selection of sites in consultation with 10 municipalities, revision of zoning plans in approximately 6, impact assessment in about 4 and implementation in 3 municipalities.
- *Objective 5.* Communication: the Freude am Fluss project is unique in that it draws local communities in to the shaping of their living environment, and in that it identifies new economic drivers that can contribute to the wider objective of making more room for the river. The project has an extensive communication component that focuses on the affected communities, on the authorities and on the public at large.

Harmoni-CA (Harmonised Modelling Tools for Integrated River Basins Management)

Project duration:	October 2002 – September 2007
Funding:	integrated in the 5th EU framework programme (supported by the EC under Contract No. EVK1-CT-2002-20003)
Consortium:	5 partners from 4 countries (NL, DE, BE, DK)

Harmonizing modeling tools at catchment scale – developing guidance for the implementation of the European Water Framework Directive. Harmoni-CA is a large-scale concerted action to syntheses available knowledge with the help of knowledge providers such as researchers,

model developers etc. The overall objective of Harmoni-CA is to create a forum for unambiguous communication, information exchange and harmonization of the use and development of ICT-tools relevant to integrated river basin management, and the implementation of the WFD. Harmoni-CA is a large-scale concerted action, meaning that it does not carry out a research project, but synthesized available knowledge with the help of knowledge providers such as researchers. Typical actions of Harmoni-CA are meetings and workshops, leading to synthesis reports and guidance's.

- *Objective 1*. Establishing a communication forum / Harmoni-CA Management
- *Objective 2* Developing the Harmoni-CA toolbox
- *Objective 3.* Generalized methodological framework for the harmonization of model supported Integrated River basin management.
- *Objective 4.* Joint use of monitoring and modeling
- *Objective 5.* Integrated assessment and the science policy interface
- *Objective 6*. Co-ordination of ongoing & future projects
- *Objective 7*. Decision Support Systems for water resources management: current state and guidelines for tool development
- *Objective 8*. Economic methods, models and instruments for the Water Framework Directive
- *Objective 9*. Model-supported implementation of the Water Framework Directive. A Water Manager's Guide
- *Objective 10.* DAA Synthesis report - Data availability and accessibility

NeWater (New approaches to adaptive water management under uncertainty)

Project duration:	January 2005 – February 2009,
Funding:	integrated in the 6th EU framework programme (supported by the EC under Contract No. 511179 (GOCE))
Consortium:	39 partners from 15 countries (NL, DE, ES, UK, SE, CZ, UA, PT, IT, ZA, BE, ZU, UK, AT, DK, FR)

NeWater studied and focused on Adaptive Integrated Water Resources Management (AWM) as a concept guiding theory and practice in order to understand and promote transitions to

enhanced adaptive strategies for integrated water resource management. NeWater identified key elements of current water management regimes and investigates their interdependence. Seven river basins (Amudarya, Elbe, Guadiana, Nile, Orange, Rhine and Tisza) were selected as case study areas wherein the stakeholders' goals and requirements were carefully considered in collaboration with scientific partners and other experts. The aims of NeWater are the following 17:

- *Objective 1.* To develop a conceptual framework for research and adaptive management of river basins that integrates natural science, engineering and social science concepts and methodologies.
- *Objective 2.* To apply the NeWater knowledge and tools in transboundary river basins, with special emphasis on EU Water Framework Directive and Water Initiative implementation areas.
- *Objective 3.*To develop protocols and tools for stakeholder engagement and analysis in participatory research and management of IWRM.
- *Objective 4.* To analyse the role of key factors including governance, participation and spatial planning for the transition to adaptive management of river basins.
- *Objective 5.* To develop approaches that integrate poverty alleviation, gender awareness and health planning in the adaptive management of river basins.
- *Objective 6.* To develop a range of tools to assess and manage the transition to adaptive management tailored to the institutional, cultural, environmental, technological settings of river basins.
- *Objective 7.* To compile a baseline of present vulnerability and adaptive capacity of river basins that integrates exposure to present socio-institutional, economic and environmental stresses and shocks
- *Objective 8.* To assess current practice in IWRM and draw lessons for the transfer of new scientific methodologies for IWRM practitioners.
- *Objective 9.* To analyse and classify major sources of uncertainty in IWRM and their implications for management.
- *Objective 10.* To develop a sound scientific foundation for managing uncertainties, interactions across scales, integration across sectors and exposure to future stresses for climate resources, conflicts between water quantity, water quality and ecosystem services.
- *Objective 11.* To develop a range of tools to assess vulnerability and adaptive capacity that supports transitions to effective adaptive management of river basins

- *Objective 12.* To explore the influence of system structure and external shocks, stresses, and trends on adaptive capacity, resilience, and vulnerability
- *Objective 13.* To analyse scenarios of future vulnerability and adaptive capacity of river basins in order to provide end points of transitions to adaptive management strategy
- *Objective 14.* To deliver a comprehensive methodology and protocol for its use that demonstrates best practice in using innovative tools for adaptive management drawn from the NeWater case studies
- *Objective 15.* To develop an innovative toolkit and guidance for practitioners in applying methods for the adaptive water management of river basins.
- *Objective 16.* To share experience and innovations in dialogues, publications and action, to further the European Research Area and to support the implementation of the Water Framework Directive and EU Water Initiative.
- *Objective 17.* To initiate an world-wide research to application platform for effective scientific and cross-policy cooperation in dealing with the high complexity and limited predictability of integrated water resources management on a river basin scale that contributes to constructive dialogues with the Global Water Partnership (GWP), World Water Council (WWC), International Union for the Conservation of Nature (IUCN) and other efforts.

IMRA ***(****Integrative flood risk governance approach for improvement of risk awareness and increased public participation)*

Project duration:	September 2009 – August 2011
Funding:	2nd ERA-Net CRUE Research Funding Initiative
Consortium:	7 partners from 3 countries (IT, DE, AT)

The IMRA project aims to integrate, consolidate and disseminate European Flood Risk Management Research. The project designs a risk governance approach, which aims at enhancing the disaster resilience of a society (or a region, city, municipality). It includes all relevant actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analyzed and communicated and management decisions are taken as prescribed in Article 10 of the Flood Risk Management Directive. The elements of this risk governance approach that are relevant for risk management practice are compiled in a handbook consisting of a 12-step approach to flood risk governance and a toolbox of methods for designing a flood risk communication and participation process.

- *Objective 1.* To influence and change risk perception and the real decision-making in the addressed case study areas actively involving stakeholders and citizens.
- *Objective 2.* Producing best practice examples, this could serve as references for other authorities dealing with flood risk management plans in Europe.
- *Objective 3.* To develop a methodology for an integrative concept for participatory flood risk management, and to apply it on the three case studies (three different basins with different risk culture).
- *Objective 4.* The concept will be validated and discussed with scientific experts and disseminated to policy and decision-makers, as well as to a wider public.
- *Objective 5.* The whole process of assessing and managing flood risks will be reorganized by following the IMRA risk governance concept for participatory flood risk management aiming at the improvement of risk awareness and increased public participation.

CapHaz-Net (Social Capacity Building for Natural Hazards - Toward More Resilient Societies)

Project duration:	June 2009 – May 2012
Funding:	funded by the European Commission (FP7), Contract No. 227073
Consortium:	8 partners (DE, UK, IT, CH, SL, ES)

CapHaz-Net aims at improving the resilience of European societies to natural hazards. It suggests ways of how to do this and pays particular attention to social capacities. CapHaz-Net establishes a growing network of scholars, stakeholders and practitioners interested in reducing the negative impacts of natural hazards. Thereby the focus is on the social dimensions of natural hazards as well as on regional practices of risk prevention and management. It strongly endeavors to contextualize natural hazards. CapHaz-Net will organize regional hazard workshops in Southern and Central Europe in order to make scientific expertise meet local and regional knowledge.

- *Objective 1.* To overcome the present fragmentation of these research approaches and related practices and to come to an integrative perspective.
- *Objective 2.* A concerted, multidisciplinary examination of social capacity building toward more resilient societies in Europe.

- *Objective 3.* Sharing knowledge and experience and bringing together different perspectives (social sciences, practitioners, policy-makers, natural scientists) within an integrated framework that promotes social learning.
- *Objective 4.* A state-of-the-art overview of natural hazard research in the social sciences.
- *Objective 5.* Recommendations for and prioritization of future research needs by identifying gaps of knowledge and open questions.
- *Objective 6.* A network of scholars and stakeholders from across Europe committed to this subject.
- *Objective 7.* Recommendations and practical examples on how to enhance social capacities to natural hazards and increase social resilience.
- *Objective 8.* Recommendations for: Social capacity building - Risk governance - Risk perception - Social vulnerability - Risk communication - Risk education in relation to natural hazards
- *Objective 9*. Three Regional Hazard Workshops in Europe.
- *Objective 10*. A knowledge inventory.

FLOODsite (Integrated Flood Risk Analysis and Management Methodologies)

Project duration:	March 2004 – December 2009
Funding:	integrated in the 6th EU framework programme (supported by the EC under Contract No. GOCE-CT-2004-505420)
Consortium:	37 partners from 13 countries (NL, DE, ES, HU, PL, GR, SE, CZ, PT, IT, BE, FR, UK)

FLOODsite is the largest EC research project on floods. FLOODsite covers the physical, environmental, ecological and socio-economic aspects of floods from rivers, estuaries and the sea. It considers flood risk as a combination of hazard sources, pathways and the consequences of flooding on the "receptors" – people, property and the environment. The FLOODsite consortium includes leading institutes and universities and involves managers, researchers and practitioners from a range of government, commercial and research organizations, specializing in aspects of flood risk management. FLOODsite is considering the whole flood risk system; this comprises the natural hazard, the socio-economic and ecological vulnerability as well as societal interventions by physical measures and policy instruments. Specific flood processes and mechanisms ranging from the high level of risk at a river-basin, estuary and coastal-process-cell scale down to the detailed site specific conditions are

being investigated. Of special interest are simulations of comprehensive risks of river floods including multiple areas of vulnerability, flash floods and flash flood forecasting, coastal extremes and coastal morphodynamics. The research according to flood risk management is being integrated through decision support technologies, uncertainty estimation and pilot applications for river, estuary and coastal sites in Belgium, the Czech Republic, France, Germany, Hungary, Italy, the Netherlands, Spain, and the UK. New technologies for flash flood forecasting are aimed at in the flash flood basins. In terms of integration, FLOODsite will also develop decision support systems (DSS) for long-term planning and operational flood risk management.

- *Objective 1.* A preliminary flood risk assessment
- *Objective 2.* The preparation of flood risk maps.
- *Objective 3.* The preparation (and implementation) of flood risk management plans.
- *Objective 4.* To provide an integrated framework for flood risk management from operational to strategic planning time horizons.
- *Objective 5.* The development of a European methodology for a consistent approach to risk analysis, risk assessment and risk reduction.
- *Objective 6.* The project seeks to identify technologies and strategies for sustainable flood mitigation and defense, recognizing the complex interaction between natural bio-physical systems and socio-economic systems, to support spatial and policy planning in the context of global change and societal advance.
- *Objective 7.* The project outcomes will provide guidance and tools for dissemination and communication, and professional training packages.
- *Objective 8.* Consistency of approach to the causes, control and impacts of flooding from rivers, estuaries and the sea.
- *Objective 9.* Sustainable “pre-flood” measures (spatial planning, flood defense infrastructure and measures to reduce vulnerability).
- *Objective 10.* Flood event management (early warning, evacuation and emergency response).
- *Objective 11.* Post-event activities (review and regeneration).
- *Objective 12.* Networking and integration with other EC national and international research.

FLOWS (Flood Plain Land Use Optimizing Workable Sustainability)

Project duration:	September 2002 – June 2006
Funding:	integrated in the INTERREG IIIB North-Sea Programme
Consortium:	12 partners from 5 countries (NL, DE, UK, SE, N)

FLOWS aim was to provide a tool box of techniques that planners, water managers and decision makers can use for decision support systems in areas facing increased flood risk from climate change. Therefore the project's requirement was to offer good practice examples for sustainable development and demonstrated practical low cost measures; including infrastructure for reducing flood damage to property and land. In addition improvements in integrating information from areas at flood risk into a decision support system for spatial planning and water management were developed. A further crucial achievement was the investigation and development of best practice for living with flood risk in a changing climate. FLOWS has clearly demonstrated how improvements can be made immediately for residents living in flood risk areas with its approach of Flood Proofing Retrofits to existing properties. An important lesson of the project was that social context, the hydrological context and spatial planning need to be seen as combined elements in finding solutions for flood problems.

- *Objective 1.* The sustainable development of river basins and flood-prone areas in the North Sea Region by improved integration of flood-related information in all relevant decision-making processes.
- *Objective 2.* Strategic, application-oriented projects should foster innovative approaches and solutions for spatial planning and flood prevention.
- *Objective 3.* Inventory of models and systems for flood risk assessment.
- *Objective 4.* To analyze social aspects, such as flood-risk perception of people in flood-prone areas.
- *Objective 5.* Recording of planning procedures in the respective countries.
- *Objective 6.* Concept development to better integrate flood-related information in the urban- and land-use planning.
- *Objective 7.* To identify and develop principles for Decision Support Systems (DSS).
- *Objective 8.* Development of a web-based DSS.
- *Objective 9.* Work out good practice directives for the development of Modell- and GIS-techniques for the development of flood information for spatial planners, water managers and affected citizens.
- *Objective10.* Good practice for communicating flood relevant information (inter alia flood hazard) of citizens and municipalities in order to support spatial decision processes. Based

on a societal/social approach the development of planning and management systems for change in perception and behavior is investigated.

- *Objective 11*. Good practice for the set-up of advanced spatial decision support systems for a sustainable development in areas at flood risk.
- *Objective 12*. Knowledge transfer and information dissemination of results of the FLOWS project in the partner countries and other EU/EEA nations through internet, a TV production and an interactive learn- and information system.

Based on the theoretical concept on capacity building on flood risk management (see part one of this report) we developed a matrix with two types of criteria:

1. General capacity building and
2. Special capacity building for rare events

Table 5 shows the different criteria which were used for the document analysis of CB methods in the projects presented above.

Table 5: Criteria for the document analysis of CB methods in relevant flood risk management projects

	Criteria
General capacity building	Ongoing process (sustainable regarding time)
	Build trust
	Allow for integration, cooperation
	Integrating the individual perspective and experiences
	Integrating individual, institutional and systemic levels
	Build skills
	Build comprehension
	Facilitate participation and shared decision making
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)
	Develop a culture of living with water
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"
	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events

The results of the inventory are compiled in the following table 6.

Table 6: Capacity Building Inventory – document analysis

Freude am Fluss			
Category	**Criteria**	**yes/no**	**Examples for methods/approaches (short description)**
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ Discrepancies between already approved Space for the River measures and these new regional plans (of Kampen and Zutphen). Focus will be on regional planning processes, the coordination between spatial planning and water management, the interpretation of assumptions and preconditions in the new regional plans, and which solutions are possible.
	Build trust	No	▪ Not found
	Allow for integration, cooperation	No	▪ Not found
	Integrating the individual perspective and experiences	Yes	▪ Some papers refer to workshops, interviews and stakeholder involvement in analyzed processes (no papers of single workshops, meetings etc.)
	Integrating individual, institutional and systemic levels	Yes	▪ Implementations of spatial measures for flood reduction are explored in more detail through the examination of several Dutch projects. ▪ Within cases of Venlo (NL), Cologne (D) and Tours (F), responsible decision-makers will be interviewed to perceive their considerations and valuations on quality and safety aspects of urban developments in floodplains ▪ Integrating costs and benefits in decision-making
	Build skills	Yes	▪ Learning in a collaborative process by analyzing a series of scenario workshops in which policymakers, technical experts and societal stakeholders from Germany and the Netherlands collaborated to explore future flood management in the Rhine basin. Cognitive learning was measured by conducting a Q sorting questionnaire to measure individual perspectives before and after the series of workshops. Furthermore, the context and process characteristics that are mentioned in literature as supportive to learning were assessed, based on detailed observations of the workshops and participants' evaluations. Finally, the observed cognitive learning was linked to the observed characteristics of the collaborative process and its context. The results contribute to insights in whether learning occurs in socio-ecosystem management practice, and how collaboration can contribute to this. ▪ A spatial planning perspective on the implementation of water management measures.

			▪ Analysis of the evolution of Dutch river management using the conceptual models of Spiral Dynamics (SD) and Integral Theory. ▪ An updated scenario development framework consisting of qualitative and semi-quantitative methods has been developed. Among those are conceptual modelling techniques, which are new to the scenario development field, that form an integrated part of the whole scenario development framework. The framework is highly participatory, and is executed in a series of workshops. The use of semi-quantitative and conceptual methods helps to structure the workshops outputs, which facilitates an easier link between qualitative storylines and quantitative models. ▪ Social Cost-Benefit Analysis in river basin management in The Netherlands.
	Build comprehension	Yes	▪ Based on a comparative analysis of water policy changes in 16 countries across the globe, to ask which of those strategies have in practice been used by change agents, to what effect and which lessons for managing water transitions can be drawn from this. Main focus on: government structures, retention areas, participation, spatial planning in flood prone areas, collaboration of stakeholders and institutions. ▪ Large Areas for Temporary Emergency Retention (LATER) are a new technology. It is an application of "Space for the Rivers" for extreme floods. The intervention must achieve a technological change from a threshold-based flood-defence by embankments to a spatial risk management by LATER. Thus, a polyrational land policy for extreme floods is needed.
	Facilitate participation and shared decision making	Yes	▪ Analyzed different stakeholder meetings (for the area between the Kromme Rijn and the Amsterdam-Rijn canal in The Netherlands) participatory process and compared the interaction setting and the interactional framing processes. Based on meeting recordings, transcripts, field notes and documents, they identified levels of participation (information, consultation, active involvement) and analyzed the ongoing interactional process of framing through discourse analysis.
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	Yes	▪ Restoring the naturalness of rivers is considered important. A comparative analysis by using a p 4 i 3 matrix in assessing the governance styles prevailing in France, Germany and the Netherlands. By linking insights on institutionalized actor participation to the environmental achievements of the projects, the impacts of governance styles on integrate driver management. Planning was evaluated in terms of the connectedness of actors and issues, financial resources, policy learning and the societal background, including the Zeitgeist. ▪ Evaluate decisions on their considerations and their impact on the landscape (D, F, and NL).

			Valuate decisions with the use of terms associated with the Dutch approach towards 'spatial quality'. By comparing the decisions on municipality level with relevant policy, the expectation exist that there is a judgment to be made on the way considerations have been made by decision-makers.
	Develop a culture of living with water	Yes	▪ Describe the example of Ooijen Wanssum on the River Meuse in the Dutch province of Limburg. Here, the strategy of creating a new river was part of a bottom-up process aimed at finding a workable solution for local and regional water problems. ▪ A survey among French, German and Dutch riverside residents. The results show a high potential support for the Room for River approach and a rejection of dike reinforcements. Yet, the link between this popular approach and certain concrete Room for River measures like a spillway or the removal of trees is not clear to the respondents. Further, both river management styles poorly represent the respondents' ethics on the human/nature relationship in the sense that they are too anthropocentric. ▪ Best practice examples for projects where innovative planning and process management have been or are adopted (Room for the Rivers, Netherland).
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	No	▪ Not found
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	Yes	▪ Flood risk perception and place attachment: a case study in Poland Twenty in-depth, semi-structured interviews were conducted with respondents who experienced either the Polish flood of 1997 or 2001 ▪ Uncertainties in controlled flood storage: the Ooij polder case Ooijpolder became the centre of protests against the plans for calamity polders
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	Yes	▪ Discusses the ways in which hydrological and hydraulic expertise input was understood and used in this assessment process (Rijkswaterstaat's regional office in Limburg-Dutch Meuse). ▪ The role of shock events in policy change: overview of different perspectives to show that they indeed often emphasize different parts of the suggested chain of relations and show that there are a few central and maybe opposing hypothesis to detect in connecting 'events' and 'change'

	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind	Yes	▪ An analytical framework to understand why some policy makers succeed in achieving public support and others don't (media involvement)
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	Yes	▪ Surveys and compares the legal systems of flood damage compensation in both France and the Netherlands and draw lessons for the Dutch situation ▪ Based on the experiences from Watertekens, in this contribution some of the main pitfalls in participatory planning are presented as are suggestions on how to avoid them.
Target groups	Residents		
	Planners	Yes	
	Flood risk authorities	Yes	
	Service providers		
	Others (students, researchers, public, educational etc.)	Yes	

Harmoni-CA			
Category	**Criteria**	**Yes/no**	**Examples for methods/approaches (short description)**
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ Cross-disciplinary research collaboration: Based on interviews, participants' evaluations, and observations during meetings, analyze three aspects of frame diversity in a large-scale research project (Newater): (1) identify dimensions of difference in the way project members frame the central concept of adaptive water management, (2) challenges provoked by the multiple framings of concepts, (3) analyze how a number of interventions (interactive workshops, facilitation, group model building, and concrete case contexts) contribute to the connection and integration of different frames through a process of joint learning and knowledge construction. ▪ Dialogue between tool/model developers and policy makers to improve the use of tools/models in management processes. The workshop gave 30 agricultural and water managers from European, national and regional authorities the chance to get their hands on tools/models which may be supporting their management activities during the implementation of the European Water Framework Directive and the Common Agricultural Policy. ▪ The role of social learning in the transition toward the adaptive management of floodplains and rivers that is required to restore and maintain multifunctional riverine landscapes. In addition to the uncertainties resulting from our limited knowledge about the complex spatiotemporal dynamics of floodplains, we have to take into account the ambiguities that arise as a result of the different perceptions of stakeholders. ▪ The case studies (10 case studies of participatory river-basin management that were conducted as part of the European HarmoniCOP project) show that social learning in river-basin management is not an unrealistic ideal. Moreover, 71 factors fostering or hindering social learning were identified; these could be grouped into eight themes: the role of stakeholder involvement, politics and institutions, opportunities for interaction, motivation and skills of leaders and facilitators, openness and transparency, representativeness, framing and reframing, and adequate resources. Promising topics for further research include the facilitation of the social learning processes, the role of power, and interactions in political and institutional contexts
	Build trust	Yes	▪ An analysis how learning can be supported during the implementation of the WFD. The aim is to improve the understanding of social learning in river basin management by analyzing both

			participatory processes and collaborative management processes. Based on this, recommendations have been developed to improve social learning in practical river basin management.
	Allow for integration, cooperation	Yes	▪ Analysis and recommendations of HarmoniCa for social learning etc. are useful for integration e.g. “Social Learning Pool of Questions”
	Integrating the individual perspective and experiences	Yes	▪ Many case studies integrate the individual perspective and experience f. i. from planners or local and regional authorities
	Integrating individual, institutional and systemic levels	Yes	▪ An overview, focused on transboundary river basin management. It inventories the features that have been claimed to be central to effective transboundary river basin management and refines them using adaptive management literature. It then collates these features into a framework describing actor networks, policy processes, information management, and legal and financial aspects. Subsequently, this framework is applied to the Orange and Rhine basins.
	Build skills	Yes	▪ Develop portfolios of flood management activities that generate the highest return under an acceptable risk for an area in the central part of the Netherlands. The paper shows a method based on Modern Portfolio Theory (MPT) that contributes to developing flood management strategies. MPT aims at finding sets of investments that diversify risks thereby reducing the overall risk of the total portfolio of investments. ▪ Designing Agent-based Models of Water Management Regimes using the IAD Framework. The agent-based modelling framework allows a comparison of water management regimes regarding their impact on the adaptive capacity (Berkes et al. [2003]) of the managed resource system. The idea is to compare and contrast simulated regimes, which are modelled based on the same conceptual framework. Thus they can be compared to each other by comparing their different parts. ▪ Artificial Intelligence Techniques for Integrated Resource Management, Evolutionary Computing Methods for Environmental Modelling and Software Development, Human Behaviour and Agent-Based Modelling, Participatory and Group Model Building for Natural Resource Management, Information Management in Complex Interactions, Uncertainty in Life-Cycle-Assessment, Model Integration and Development of Modular Modelling Systems, ERCIM: Information Technologies for Integrated Resource Management

			▪ A theoretical integrative framework intended to underlie the main components and interrelations of what learning is required for social learning to become sustainability learning. The concept of sustainability learning and the SEIC social-ecological framework can be useful to assess and communicate the effectiveness of multiple agents to halt or reverse the destructive trends affecting the life-support systems upon which all humans depend. ▪ "Social Learning Pool of Questions" in European River Basin Management. The Pool of Questions (PoQ) is intended to serve as a guide when preparing to interview stakeholders, to observe meetings, to consult archives or to evaluate Information and Communication (IC)-tools. Researchers should select a number of questions and adapt these according to the characteristics of their case and their case study.
	Build comprehension	Yes	▪ The economic aspects of the WFD pose significant challenges for water administrations at different institutional levels. This concerns both the policy side (since in most countries, the integration of economic considerations has not been systematically conducted so far when taking water management decisions), but also the methodological requirements concerning the use of economic methods and tools. How, are results of academic/scientific projects are being considered in practical implementation and how this link of science and policy can be improved? (Study area F, ES, DE; NL). ▪ Overview is given of expected climate change and existing coping strategies for floods and droughts in seven case study basins. Four of the basins, namely the Elbe, Guadiana, Rhine, and Tisza, are located in Europe; the Nile and the Orange are in Africa; and the Amudarya is in Central Asia.
	Facilitate participation and shared decision making	Yes	▪ Area co-operations as an instrument of public participation for implementing the EU Water Framework Directive: networking and social learning. In order to investigate the role and potentials of the participatory process according to the WFD in Lower Saxony (Germany). Focussing on the view of stakeholders involved in the co-operations, the paper analyses the process along different criteria regarding the improvement of networking and social learning within the process of public participation. ▪ National approach and background study, which examined and evaluated both historical and recent experiences that exist across Europe in relation to public participation and water management as it is today. Use of the HarmoniCOP national reports to identify common features and cultural differences. Depart from the traditional ideational concept of culture as a

			long-lasting system of perceptions, beliefs, norms, and values to provide a detailed discussion of the practices in four countries.
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	Yes	▪ An important approach of waste releases and discharge can be managed to reduce ecological and sanitary problems that might arise from inappropriate combinations of flow variation and physicochemical characteristics of water. Reviewed knowledge in this field, provide examples on how the flow regime and the water quality can impact ecosystem processes, and conclude that most problems are associated with low-flow conditions. Given that reduced flows represent an escalating problem in an increasing number of rivers worldwide, managers are facing enormous challenges.
	Develop a culture of living with water	Yes	▪ Collaboration in the case studies with different stakeholders, different approaches in dealing with river management and tools
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	Yes	▪ Report on how international scientists joined one dialogue, applying system dynamics modelling tools to explore barriers and bridges to transformation of the current river management regime and develop the capacity for participatory science to expand the range of perspectives that inform, monitor, and revise learning, policy, and the practice of river management for Tisza River Basin (Hungary).
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	No	▪ Not found
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	Yes	▪ A workshop was set up to better understand the current opportunities and challenges at the science-policy interface, how existing research can be better utilized and what needs to be done in the future for achieving a stronger input of research into water policy making related to economics. Using Economic Methods and Models for the Implementation of the Water Framework Directive: Status, Options and Challenges for a better integration of water economic research into policy implementation.
	Increase accessibility by affect: raise the potential for positive effects, use the	No	▪ Not found

	salience of positively arousing aspects to open the mind		
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	No	▪ Not found
Target groups	Residents		
	Planners	Yes	
	Flood risk authorities	Yes	
	Service providers	Yes	
	Others (students, researchers, public, educational etc.)	Yes	

NeWater			
Category	**Criteria**	**Yes/no**	**Examples for methods/approaches (short description)**
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ GWP-toolbox is a portal that offers a variety of tools and case experiences to water managers for their day-to-day work. As spin-off can be considered that the website is also heavily used by students and stakeholders for easy access to relevant water issues. GWP aims to collect resources and to include tools and concepts on water management in the toolbox. Case study experiences are directly included in the toolbox. Further results are made available via a new partner section which shows the complete view of the NeWater message supported by the relevant tools and concepts. ▪ Summer School Training and Education in Adaptive Water Management (2006): The goal is thus to train a generation of young researchers in the integration of theory and practice through instruction from leading-edge scientists and practitioners mainly involved in the NeWater

			project who apply the latest ideas from a wide range of disciplines and organizations in their teaching. ▪ NeWater web-portal for knowledge transfer with regard to adaptive water management as an integrated section in WISE-RTD opens up promising opportunities for the dissemination of AWM resources in general and NeWater results in particular.
	Build trust	Yes	▪ Important in setting up a participatory process. The 'core' team of initiators should be confident about the objectives and skills of the organisers. Preparatory steps in the organisation and design of the different events are important elements in building trust and should be considered an important joint task in the process. A rather informal approach can be helpful in building the trust needed and further the exchange of ideas. However, at a certain point, the process must feed into the formal process to be really influential (case study Rhine).
	Allow for integration, cooperation	Yes	▪ Synthesis product of NeWater allowing European water policy makers to get access to project's results of highest relevance for their work. It presents the main questions of EU water policy identified to which NeWater can contribute significantly. ▪ Training and Guidance Booklet for Adaptive Integrated Water Resources Management (AWM): Explicitly addressing today's challenges. Results from NeWater. ▪ This deliverable summarizes the data requirements for analysis with the MTF using relational data bases. Data requirements for analysing transition in water management regimes are diverse ranging from public accessible (static) data to highly research context dependent data elicited through social scientific methods. In the Management and Transition Framework these different kinds of data are combined.
	Integrating the individual perspective and experiences	Yes	▪ By questionnaires, workshops, conferences, meetings and working groups etc.
	Integrating individual, institutional and systemic levels	Yes	▪ Questionnaire survey on the State-of-the-art of River Basin Management in dealing with climate-related extreme events (Huntjens, 2008) for the Ohre river basin (sub basin of the Elbe), preliminary results of the Questionnaire on climate change adaptation In the Elbe basin, ICPE Report "Action plan for flood protection in the Elbe", and the reports on strategy of protection against floods in Germany and in Czech Republic. Tools were tested in the Elbe basins: the ecohydrological model SWIM (Krysanova et al., 1998 & 2000), and the

			decision support tool Waterwise (van Walsum, 2007; van Walsum et al., 2008) for spatial land use planning.
	Build skills	Yes	▪ Qualitative field research methods were scientists were trained on how to conduct interviews for a field survey about water user associations and an assessment of barriers for changes to the adaptive water management in the river basin and sub-basin officials. ▪ State-of-the-Art Report on IWRM Tools: (1) Review of existing IWRM tools – Summary, (2) Classification of tool characteristics, (3) GWP Toolbox: A tool for sustainable water management, (4) Products from the EC Catchment Modelling Cluster (CatchMod), (5) Uncertainty assessment and communication, (6) Comparison of economic evaluation tools, (7) Tools to support public participation in Adaptive Water Management., (8) Decision Support Systems for Integrated Water Resource Management ▪ How to publish research results in the web-portal WISE-RTD (Guidance for the Section about Adaptive Water Management (AWM)). This document describes how to record water-related resources (guidance's, tools and case experiences) in the WISE-RTD web portal.
	Build comprehension	Yes	▪ Uncertainty and Adaptive Water Management - Concepts and Guidelines- guidelines (or better, meta-guidelines) link up those documents in a manner that will be particularly useful for those interested in adaptive management. This document introduces selected uncertainty topics and point to additional reading for deeper exploration. It explains the concepts of uncertainty: types, sources and ways to characterize the different levels of 'incertitude', of how uncertainty is manifested in practical water management and how existing guidelines documents can help to handle these uncertainties. Further for policy and decision making, and what regulatory and others instruments are available when addressing uncertainty. ▪ Uncertainty dialogues and workshops on the role of uncertainties in water management: connecting theory and practice ▪ Newater Rhine Conference (2008): New Approaches to Adaptive Water Management under Uncertainty. ▪ The role of adaptive and integrated water management (AIWM) in developing climate change adaptation strategies for dealing with floods or droughts - A formal comparative analysis of eight water management regimes in Europe, Asia, and Africa. (formal comparative analysis) ▪ The Adaptive Water Resource Management Handbook of the NeWater project and its case studies ▪ Integrated Transition Framework and Evaluation of Tools

			▪ Document of the relationship between IWRM and Adaptive Water Management to inform the discussions in the NeWater international platforms. The goal is to develop a joint view on the expected contributions of the NeWater project to improving the conceptual foundations and the practical implementation of the IWRM principle. ▪ Formal Comparative Analysis of Adaptive Capacity of Water Management Regimes in Four European Sub Basins
	Facilitate participation and shared decision making	Yes	▪ Participative Methods: Train the Trainers-These methods allow bringing new knowledge and views into the planning process, building networks and generating acceptance and commitment to the implementation of measures. ▪ Questionnaires, workshops, modelling and collaboration with stakeholders in the different catchments
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	No	▪ Not found
	Develop a culture of living with water	No	▪ Not found
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	Yes	▪ Stakeholder exchange to initiate a practical and scientific exchange between European and non-European river basins. To share experience and innovations beyond the European Research Area and to support the transfer of experience and methods from the implementation of WFD to non-European case studies. To assess current practice in IWRM and draw lessons for the transfer of new scientific methodologies for IWRM practitioners. ▪ Group-work in sub-cases gave the participants the opportunity to discuss each other's cases. This was done in accordance with a particular method in which individuals that are part of a team could formulate positive points, questions for elaboration and recommendations for improvements. Each team was provided with color cards. (Evaluation and Assessment of Research Done in the Context of the Case Study Rhine) completed by Plenary discussion on follow-up, of group work and future ideas ▪ Mapping hotspots of vulnerability in the Orange Basin, an attempt to demonstrate the value of composite indices as a tool for vulnerability assessment. Integrating dynamic vulnerability into

			local water management: the case of the Lesotho Highlands. Understanding of flood vulnerability. The Role and elicitation of local knowledge on flood information, preparedness and risk at community and household level
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	Yes	▪ Market places at stakeholder meetings where individual workpackages presented their results or tools to an interested audience in a more informal setting. The market places created much interest and active participation. They were carried out in three workshops at the national, regional and local levels. ▪ Training activities (localized) have been carried out in the Amudarya Case Study on very diverse topics and methods, from research knowledge elicitation methods (cognitive mapping, group model building as well as role play games) to supporting techniques for workshops and field surveys (moderation exercises, training of numerators and field assistants) to computer-operated tools for water resources assessment, planning and monitoring. The target groups depended on the kind of training and its expected outcome. ▪ "Questionnaire on major water-related problems and research needs in the basin" was distributed to stakeholders both in German and Czech parts of the basin. All major groups of stakeholders were involved in the action: policymakers at the federal and state levels in Germany and at the ministry level in the Czech Republic; water managers; people working at the water supply and sewage water treatment enterprises; representatives of agriculture enterprises and farms, mining and water transport; people involved in spatial planning and nature protection, representatives of NGOs and scientists involved in water resources research. (used for statistical analysis)
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	Yes	▪ Presentations and Posters at stakeholder meetings at the national, regional and local levels to (a) familiarize relevant stakeholders with NeWater ideas at the beginning of the project and to elicit their views on the most pressing issues in the river basin, (b) to discuss ongoing research and present methods and tools as they were developed and (c) elicit feedback on NeWater results in the Amudarya case study and jointly discuss potential measures to address the issues identified. Presentations served as input for following work in breakout groups on designated themes afterwards, where the issues were discussed interactively among NeWater scientists and the stakeholders. In some cases we additionally presented posters and handouts to provide more detailed information. ▪ Working in focus groups on the conceptual flood preparedness model using local experience and expert knowledge

	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind	Yes	▪ Flyers (localized): At the beginning of the project a flyer describing the objectives and approach of the NeWater project and distributed among all relevant stakeholders that participate in the initial scoping stakeholder workshops. Additional flyers were given to them to distribute in the respective organizations and institutes. At the end of the project a flyer describing the main overall NeWater results and synthesis products was distributed to policymakers and other stakeholders at the final case study workshop.
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	No	▪ Not found
Target groups	Residents		
	Planners	Yes	
	Flood risk authorities	Yes	
	Service providers	Yes	
	Others (students, researchers, public, educational etc.)	Yes	

IMRA			
Category	**Criteria**	**Yes/no**	**Examples for methods/approaches (short description)**
General	Ongoing process (sustainable regarding time)	No	▪ Not found
	Build trust	No	▪ Not found
	Allow for integration,	Yes	▪ Handbook: Step-by-step guide of communication and participation process; Innovative and well-proven communication and participation methods

capacity (building	cooperation		
	Integrating the individual perspective and experiences	Yes	▪ Interviews and workshops were carried out with stakeholders in order to identify shortcomings of existing maps and the specific needs of different stakeholder groups. Improved maps were created based on these needs and tested by means of eye-tracking tests, i.e. the reading behaviour of stakeholders was recorded and analysed. Maps were further adjusted according to the findings of these tests and were discussed again with stakeholders in order to come to case-study specific but also overall recommendation for flood mapping. Furthermore, a risk mapping software tool has been developed which facilitates an integration of stakeholder knowledge and preferences into the final map product.
	Integrating individual, institutional and systemic levels	No	▪ Not found
	Build skills	Yes	▪ Develope indicators to evaluate the performance of a public participation process. ▪ Methods for risk communication and participation: General methodological approaches Stakeholder analysis tool, Social milieu approach, Risk governance assessment tool
	Build comprehension	Yes	▪ Handbook: Info boxes for specific terms, Glossary ▪ Handbook: Online communication, Public stand with small exhibition, Public exhibition, Media coverage Educational information, School competition, Consultation, Online chat, Virtual social network, Survey: interviews or questionnaires, School project, World Café, Common decision-making, Stakeholder workshop, Public workshop
	Facilitate participation and shared decision making	Yes	▪ Participation in mapping enables and facilitates a two-way learning process, network building and improved understanding of maps and their interpretation both on the side of produces as well as users. The main user-groups considered in RISK MAP are members from the group of strategic planners, emergency managers and the public. ▪ Handbook: Step-by-step guide of communication and participation process; Innovative and well-proven communication and participation methods ▪ Handbook: Practical recommendations when planning and implementing a communication and participation process
	Strengthen an enabling environment (e.g.	No	▪ Not found

	structures, legislation, financial conditions)		
	Develop a culture of living with water	Yes	▪ In the case study areas the methods of the Handbook were developed together with the participates: Online communication, Public stand with small exhibition, Public exhibition, Media coverage Educational information, School competition, Consultation, Online chat, Virtual social network, Survey: interviews or questionnaires, School project, World Café, Common decision-making, Stakeholder workshop, Public workshop all together with a high resonance
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	No	▪ Not found
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	No	▪ Not found
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	No	▪ Not found
	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to	No	▪ Not found

	open the mind		
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	No	▪ Not found
Target groups	Residents		
	Planners	Yes	
	Flood risk authorities	Yes	
	Service providers	Yes	
	Others (students, researchers, public, educational etc.)	Yes	

CapHaz-Net			
Category	**Criteria**	**Yes/no**	**Examples for methods/approaches (short description)**
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ Focus on Social Capacity Building, (an interactive website), aims at stimulating discussion among the natural hazards community at large and providing state-of-the-art knowledge of social science research on natural hazards
	Build trust	No	▪ Not found
	Allow for integration, cooperation	Yes	▪ Build a network of scholars and stakeholders committed to this subject- Regional hazard workshops across Europe
	Integrating the individual perspective and experiences	Yes	▪ Workshops give interested researchers, practitioners and stakeholders from across Europe the opportunity to contribute with their expertise, experiences and opinions.
	Integrating	No	▪ Not found

	individual, institutional and systemic levels		
	Build skills	No	▪ Not found
	Build comprehension	Yes	▪ **State-of-the-art overview** of natural hazard as follows for: research in the social sciences Risk-maps: How to come to user-friendly flood maps, to compile risk maps, including improved content with respect to the requirements of the Flood Directive, and a target-oriented design that is adjusted to individual stakeholders' needs (e.g. citizens affected and/or professional users). Furthermore, guidelines and recommendation are presented on how organize legitimate participation processes during risk assessment and mapping. Overview of the implementation of Flood Mapping Practices and development of hazard and risk maps. A Checklist should provide an overview about status of and ideas for the implementation of the EU Floods Directive for Bavaria, Saxony, F, GB,A, ▪ A comparative study of Legal Framework for Public Participation in Flood Risk Mapping of different European Member States to some requirements of the Floods Directive. ▪ "Knowledge Inventory" which summarises the main findings of the literature reviews with regard to social capacity building, risk governance, risk perception, social vulnerability, risk communication and risk education in the broad field of natural hazards ▪ Lessons learnt and challenges with regard to social capacity building: Heat-related hazards – droughts, forest fires and heat waves in Southern Europe. ▪ Review of risk education practices and Natural Hazards ▪ Social vulnerability to natural hazards ▪ Risk perception and natural hazards ▪ Risk governance and natural hazards ▪ Social capacity building for natural hazards: A conceptual frame.
	Facilitate participation and shared decision making	Yes	▪ Build a network of scholars and stakeholders committed to this subject- Regional hazard workshops across Europe ▪ Overview of participation processes which are currently taking place within the context of flood risk management (FRM) activities in Central Europe. A workshop focused on bringing together professional actors, who work in FRM, from different countries in Europe and summarize "Lessons learnt" from the Workshop. ▪ Regional Hazard Workshop: Social Capacity Building for Alpine Hazards

	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	No	▪ Not found
	Develop a culture of living with water	No	▪ Not found
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	No	▪ Not found
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	No	▪ Not found
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	No	▪ Not found
	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind	No	▪ Not found

	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	No	▪ Not found
Target groups	Residents		
	Planners		
	Flood risk authorities	Yes	
	Service providers		
	Others (students, researchers, public, educational etc.)	Yes	

FLOODsite			
Category	**Criteria**	**Yes/no**	**Examples for methods/approaches (short description)**
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ Identify the methodological diversity regarding the practical application of flood damage evaluation methods in EU countries, which are known to have a leading position in this field. It indicates that there is still a lack in transboundary cooperation in flood policy decision making in the EU. ▪ The Face-to-Face Knowledge Transfer Task focuses on under and post-graduate training and education of (future) experts and on production of materials (course-ware) for knowledge transfer and dissemination of the information to the general public and professional involved into the flood risk assessment and mitigation process. (i) training of post-graduate students through the FLOODsite European Master (FEM) educational platform; (ii) development of a Continuing Professional Development (CPD) module, targeted to for postgraduates and all professionals, involved with integrated flood risk management, incorporating natural science, technical, planning and socio-economic aspects. ▪ E-FLOOD-Web-based interactive platform to support the communication of the findings of

			the whole FLOODsite project and to promote uptake of the FLOODsite framework and methodologies by the three main target groups: public, professional and educational. E-FLOOD on which the project outcome, team expertise, findings are disseminated through a number of components that are defined into two groups: (1) Knowledge Map which provides a Web GIS interface for user to access descriptors of people, organisations, projects, training courses and documents related to FLOODsite; (2) Modelling Facility supplies web access to the tools and modelling systems with suitable web-enabling interfaces developed in Themes 1 to 3 and demonstrated/tested in Theme 4. ▪ Methodology (conceptual, methodological and technological) for a DSS to support long-term Flood Risk Management Planning. It enables the integration of information on flood risks and management options to be integrated in a structured manner to help identify the preferred management strategy (that is both robust and flexible to future change). The framework is enacted within a prototype decision support tool that enables the decision maker to integrate multiple and complex relationships between natural hazards, social and economic vulnerability, the impact of measures and instruments for risk mitigation in support of flood risk management planning in the long term.
	Build trust	Yes	▪ Evacuation and traffic management: Test and develop tools that could assist with formulating emergency management plans for lowland rivers and flash flood catchments. For lowland river floods the work mainly focused on the problems involved in evacuating people from areas at risk, whilst in the flash flood catchments a prototype system was developed to forecast which parts of the road network would become inundated. The testing of the tools encompassed not only their validation but also their functionality and the usefulness of the results that they provide to emergency responders and flood event mangers
	Allow for integration, cooperation	Yes	▪ Guidelines to give guidance for practitioners of governmental authorities and executing bodies dealing with ex-ante flood damage evaluation in order to appraise public flood defence projects or strategies on different spatial scales. With these guidelines we want to address a large community. Guidance to countries just starting with flood damage evaluation studies. For this group we want to demonstrate how to proceed step by step in flood damage evaluations (especially chapters 3-4). On the other hand, we want to address flood damage evaluators in countries which already possess some experience in this field and we offer our guidelines to them as a checklist and want to inspire them to improve their evaluation methodology, e.g., by including methods for damage types which have been neglected hitherto in their work

			(especially chapters 5-9) ▪ Communication and Dissemination (C&D) Plan, explains why a Communication and Dissemination Plan is needed for EC research projects and, in particular, how this requirement was interpreted by the FLOODsite project ▪ Guideline for a tool box for the ex-post evaluation of risk reduction implemented in the past. Ex-post evaluation can close the knowledge gap between past / current practice and future decisions in flood risk reduction. With the application of the methodology, stakeholders of flood risk reduction will be enabled to derive the maximum advantage from their previous action for the improvement of future activities. The methodology described by the guideline will enable the interested parties to learn about the intended and unintended effects, effectiveness, efficiency and other aspects of risk reduction. ▪ Worksheet water storage ▪ Writing exercises for students for flood risk-opinions and debate ▪ Evacuation Board Game
	Integrating the individual perspective and experiences	Yes	▪ Risk to life model application: The Gard River case study focuses on human behaviour and casualties during the September 8-9, 2002 flash floods in order to provide estimates of the potential loss of life for this type of flood and elements for a calibration of the proposed model.
	Integrating individual, institutional and systemic levels	Yes	Integrating practitioners and policy makers by trying to procedure with scenario analysis etc. the methodological framework/ general procedure to the study areas
	Build skills	Yes	▪ A GIS-based multicriteria flood risk assessment and mapping approach. This approach has the ability a) to consider also flood risks which are not measured in monetary terms, b) to show the spatial distribution of these multiple risks and c) to deal with uncertainties in criteria values and to show their influence on the overall assessment. It can furthermore be used to show the spatial distribution of the effects of risk reduction measures (FloodCalc). ▪ Evacuation Support System (ESS) to support decision makers who may need to on evacuation. The Schelde ESS was developed as a prototype for the regional and local authorities in the flood-prone area along the Westerschelde Estuary.The ESS provides weather information, information on expected flooding and on vulnerable objects in the flood-prone area. It can also

			show the effect of various evacuation schemes. The ESS includes an on-line linkage with providers of weather forecasts, of information on the current weather situation, and of radar information on precipitation, as well as with providers of water level forecasts and current water level measurements at sea and in the estuary. ▪ A review and assessment of evacuation and traffic management models for use in flood emergency planning ▪ A software framework for flood risk calculation and computational decision support ▪ UNEEC (Uncertainty Estimation based on local Errors and Clustering) – an innovative methodology for modelling errors in forecasting situations; ▪ Info-gap analysis – new methods for robust decision-making under severe uncertainty ▪ Models for predicting wave induced breach initiation processes, and improved science in the established predictive breach models BRES and HR BREACH ▪ Hydrodynamic modelling of flood emergency storage areas in the Elbe River ▪ RELIABLE – A software tool that calculates the annual probability of defence failure and fragility curves for specific coastal and fluvial flood defence structures. ▪ Modelling and Decision Support Framework (MDSF) is a software tool set for a range of fluvial and coastal flood risk and decision support applications ▪ Risk to People model (combines hazard and exposure thresholds and mitigating factors) ▪ Ten guiding principles for Communication and Dissemination. These principles should be applied to all deliverables produced by every task within a research project. ▪ A list of stakeholder groups and types of activity. You need to understand which stakeholder groups you are targeting with each deliverable. Activities and actions identified for the FLOODsite project are provided as examples. ▪ Post Flash-flood Investigations. This report is a first attempt to formalize a post-flood field investigation procedure ▪ Scenario analysis for the Impact of Extreme Precipitation Patterns on the Flood Peaks along the Tisza River ▪ Development of framework for the influence and impact of Uncertainty ▪ Strategies for Flood Risk Management. Strategies and strategy development for long-term Flood Risk Management (FRM) from a social science viewpoint, a strategy research viewpoint in particular. Highlights challenges of strategy-making as linear and adaptive process of

			politicians and officials (key decision-makers). ▪ Strategies for Pre-Flood Risk Management CASE STUDIES AND RECOMMENDATIONS. A theoretical framework to analyse the content, process, and context of strategies for reducing flood risk within catchments. (2) Three case studies illustrate why researchers and practitioners alike can benefit from using the framework to better understand the process dimension of strategies for pre-flood risk management (which is, in this report, mainly long-term planning of combinations of structural and non-structural measures). (3) The report formulates six recommendations to practitioners how to improve flood risk management through shifting attention. ▪ Building models to estimate loss of life for: (1)flood events Building a model to estimate Risk to Life for European flood events (project document T10-07-10), (2) Modelling the damage-reducing effects of flood warnings (project document T10-07-12), (3) Toxic Stress: the development and use of the OMEGA modelling framework in a case study (project document T10-07-14), (4) GIS-based Multicriteria Analysis as Decision Support in Flood Risk Management (project document T10-07-06). ▪ Building a model to estimate Risk to Life for European flood events
	Build comprehension	Yes	▪ The study identify all uncertainties that influence the reliability of dike ring systems, to determine which uncertainties contribute most to the probability of failure and how can be dealt with uncertainties. ▪ Study: Breaching of coastal dikes: state of the art ▪ Effect of hydrodynamic processes associated with the beach morphology on the long-term distribution of waves. ▪ New insights into the benefits of flood warnings: Results from a household survey in England and Wales ▪ Social Indicator Set: characterise the social resilience of different communities for the formulation of preparedness strategies ▪ Reliability Analysis of Flood Defence Systems; Pilot site German Bight' ▪ Predicting morphological changes in rivers, estuaries and coasts ▪ Grass Erosion on Embankments. Laboratory Tests on the Erosion of Clay Revetment of Sea Dike with and without a Grass Cover Induced by Breaking Wave Impact ▪ Reliability analysis of grass turf holes in dike slopes ▪ Failure mechanisms for generic flood defence structures or assets. Provides a definitive listing

			of reliability equations for failure mechanisms of flood defence assets for use in flow system modelling. ▪ Guidelines on Coastal Flood Hazard Mapping ▪ Review of Flood Hazard Mapping ▪ Report on best suitable models for a statistical analysis of joint probabilities of extreme event data ▪ Understanding and predicting failure modes for revetments ▪ Review report of operational flood management methods and models ▪ Flood Risk Analysis for the River Scheldt Estuary ▪ Pilot Study Flash Flood Basins evaluate flash flood risk management strategies in close collaboration with operational organisations, stakeholders and local communities in four pilot areas: i) the Cévennes-Vivarais Region (France); ii) the Adige River (Italy); iii) the Besos River and the Barcelona Area (Spain); iv) the Ardennes Area (transnational). ▪ Requirements for Flash Flood Hydrometeorological Monitoring. The report is to describe the requirements for the coherent monitoring of rainfall and discharge data for flash-flood events. Three hydrometeorological observatories are described. ▪ Analysis of effects of pollution due to flooding (heavy metal, cyanides) for river Szamos and Tisza ▪ Frameworks for flood event management (DSS) ▪ Summary of Radar and satellite observation of storm rainfall for flash-flood forecasting (RADAR STRUCTURED ALGORITHM SYSTEM (SAS) and SATELLITE STRUCTURED ALGORITHM SYSTEM (SAS) ▪ Scenario –Analysis for futures for the flood risk system of the Elbe River. Firstly, it allows for conceptualisation of the flood risk system in a comprehensive manner. Secondly, the scenario planning approach stresses the requirement for coupled modelling of the entire risk system. Thirdly, the formulation and parameterisation of scenarios, strategic alternatives and random conditions from narrative assumptions as storylines, guiding principles and others proofed to be an important prerequisite for consistency of the futures. Fourthly, the targeted composition of futures based on guiding questions led to a specific and efficient selection of interesting cases for scenario analysis and evaluation. Finally, evaluation not only encompasses ‘traditional’ criteria such as effectiveness and efficiency, but also more recent ones such as sustainability and robustness.

			▪ Towards sustainable flood risk management: on methods for design and assessment of strategic alternatives exemplified on the Schelde estuary. ▪ Executive Summary for Developing models to estimate the benefits from flood warnings ▪ Flood risk assessment and flood risk management. An introduction and guidance based on experiences and findings of FLOODsite.
	Facilitate participation and shared decision making	Yes	▪ Mainly in the case study areas as well for co-operation between researchers, authorities and the public, but it seems not to be one of the main targets of FLOODsite in the documentation
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	Yes	▪ Flood induced pollution with the OMEGA methodology for quantifying effects on ecosystems ▪ Pilot area Stropnice-Moldawa river basin. Analysis of the flooding and assessment of the ecological vulnerability. More than 15 organizations were contacted, close cooperation with local municipal and governmental organizations were established
	Develop a culture of living with water	Yes	▪ Mainly in the case study areas ▪ Documentations of FLOODsite have the category “Relevance to practice” ▪ many models and evaluations support a living in flood prone areas (see build skills and comprehension)
Special capacity building for rare events	Give representativeness a bait: Overcoming the “it’s always been like this”	Yes	▪ If dikes soften - Moving? Why relocations are hardly possible in Germany.
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	Yes	▪ Junior FLOODsite. A website for secondary schools. Designed to make scientific knowledge available to secondary school children. This is currently available in English and Dutch. ▪ Writing Essays, Evacuation Board Game, Roleplays
	Overcoming bias anchoring: allay the professional fixed	Yes	▪ Three in-depth analyses at the regional level in the river catchments Vereinigte Mulde , Adige/Sarca and Tagliamento and at the national level in England and Wales. In this work, we mainly focused on a bottom-up perspective from the residents of

	perspective of the educated and the experienced "professionals"		flood-prone and, in most cases, recently flood-affected areas. Their points of view in many respects differ from so-called experts' evaluations with regard to the way flood risk management should work on several scales. We explored social vulnerability, community resilience, risk constructions and their implications for flood risk management with a broad range of social-science methods by applying the methodological principle of triangulation of standard and non-standard. Standardised questionnaire surveys (the main method of data gathering) were prepared by interviewing decision-makers and focus groups. After having elaborated first research results, we discussed them with members of the communities and/or with authorities in charge of flood risk management.
	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind	No	▪ Not found
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	Yes	▪ The paper of Parker, Dennis et al (2008): Understanding and enhancing the publics behavioural response to flood warning information. (T10-08-17) investigates why some members of the public fail to act appropriately, or most effectively, to flood warning information, touching on ideas of a lack of understanding, mistrust in authority and a lack of ownership of flood reducing actions. The paper examines the styles of public learning about flood warning response which might be most appropriate and effective, and how recent positive steps to increase the public's understanding of effective response might be further enhanced in the UK. ▪ The research focuses on methodologies to determine damages, losses and benefits to receptors, that is: people, buildings and the environment. The overall combined results from the research should lead to a better understanding and quantification of flood impacts and therefore the provision of evaluation methodologies, techniques and approaches to guide end-users in decisions on levels of investment, preparedness planning and emergency response strategies in future flood risk management across Europe. ▪ Summarises the findings of a questionnaire survey and Face-to-face interviews.(semi-structured interviews with decision-makers, in-depth interviews with affected residents)

			carried out in five research locations of the Mulde catchment (Germany) in 2005. All these settlements were heavily affected and, in part, completely inundated by the 2002 August flood. While focussing on social vulnerability, the report applies both an event- and a phase-sensitive approach with regard to the 2002 flood from a bottom-up perspective of the people affected.
Target groups	Residents	Yes	
	Planners		
	Flood risk authorities	Yes	
	Service providers		
	Others (students, researchers, public, educational etc.)	Yes	

FLOWS			
Category	**Criteria**	**Yes/no**	
General capacity building	Ongoing process (sustainable regarding time)	Yes	▪ Overview of existing flood information: A description of possible ways to collect information is another example that will be useful to experts and decision makers. In many areas flood hazard maps are not yet available for local planners and decision makers. In such cases historical information may be useful (e.g. information on historical flood events, water level marks). Such information is found more and more often on the internet. There is a need to collect all available information in databases assuring easy access. A prototype of a flood database was assessed as part of the FLOWS Project
	Build trust	Yes	▪ The collaboration between university and administration authorities has proven a structure to be workable and beneficial for both sides. Due to the personnel and substantive cooperation the solutions of the project have best chances of being implemented.
	Allow for integration, cooperation	Yes	▪ It was carried out a data structure analysis to determine, in what extent and in what quality usable information and data are available for the development of a German concept to integrate DSS into spatial planning processes (pilot studies Hamburg).
	Integrating the individual perspective and	Yes	▪ Key questions-supported expert interviews with planners, hydraulic engineers, IT-experts, diverse administration authorities and certain experts for relevant topics in order to identify weaknesses in the planning process

	experiences		▪ The identified problems were presented to the interviewees and a wider circle of experts in June 2005 in the form of a workshop and checked for validity. The workshop results - the specific needs of practitioners - were recorded and translated into concepts in the following months. ▪ To get insight into the actual perception of flood hazard by citizens and decision makers, focus groups and expert panels have been set up and polling carried out in all the five participating countries (Norway, United Kingdom, The Netherlands, Sweden and Germany).
	Integrating individual, institutional and systemic levels	Yes	The participating authorities (town and country planning, water management) of that river (catchment area) shall jointly develop a spatial framework for river basin due regard to their knowledge, attitudes and interests. For this, the actors involved in a number of workshops to identify jointly the physical characteristics (hydrology, soil, etc.) and existing guiding principles (political, planning) for a river basin and set on the basis of graphically defined areas, and propose actions (e.g.: soil with high infiltration capacity unseal the area if possible). ▪
	Build skills	Yes	▪ A planning tool for local and regional area development at the level of catchment areas, the aquatic-related field development plan (eGEP). ▪ Inventory, classification and analysis of flood-related DSS. ▪ Establishment of the state of the art (modeling, GDI, standards OpenGIS, ESRI)
	Build comprehension	Yes	▪ Process analysis to determine how the integration of water management issues in planning processes took place. ▪ Based on the interviews, a procedural analysis was conducted for the planning process, which showed that in particular the communication between the departments (mainly civil engineering and urban planning), but also between local and state authorities in the same field was very limited. ▪ Legal and technical requirements for flood protection in Germany ▪ Integration of water management issues into planning procedures ▪ Water body related area developement plan (gewässerbezogener Gebietsentwicklungsplan) (gGEP). The aim must be, however, keep the installation phase with respect to the use phase of the plan at a minimum. The preparation of eGEP is complex; the interactions are not conclusive and the physical observation room is ultimately only partially clear, that means limited. Consequently the approach to deal with that is to use the methodology of perspective

			incrementalism. ▪ Geo-data infrastructure analysis for Germany ▪ Requirements of a DSS for preventative flood protection ▪ An inventory of the mapping and modelling techniques and knowledge available to manage flood risk in the North Sea region. The mapping and modelling inventory included two workshops and a questionnaire. For each participating country several resource persons were requested to fill out the questionnaire with respect to the subjects of their individual specialization: hydrological/hydrodynamical models, GIS and data, flood risk policy or insurance regulations. ▪ Methods for flood risk assessments in UK, SE, NO, NL ▪ Several mapping and modelling techniques have been applied in Norway, Sweden, The United Kingdom, Germany and The Netherlands. The results of these projects are collected and evaluated. During this project all project leaders and several experts of the cooperating countries were interviewed. Furthermore an international workshop was organized to draw conclusions, share all valuable knowledge and to define recommendations.
	Facilitate participation and shared decision making	Yes	▪ Using a trans-disciplinary approach for the Development of a Decision Support System (DSS). Representatives of urban and regional planning, environmental planning and resource management, hydraulic engineers of two universities and water management authorities act jointly ▪ Intensive involvement of future users for DSS through workshops and interviews ▪ During the modelling inventory and best practise evaluation important experiences have been shared. All participants agree that this knowledge is of great importance because a lot can be learned from each other.
	Strengthen an enabling environment (e.g. structures, legislation, financial conditions)	No	▪ A concept for integrative land use planning was developed
	Develop a culture of living with water	Yes	The Hamburg-DSS includes in the design three different applications that are tailored to different target groups: experts, planners and citizens. Interested participants in flood-related data and analysis / decision support systems with different knowledge and skills have the opportunity to get

			easily access to the DSS in order to receive information.
Special capacity building for rare events	Give representativeness a bait: Overcoming the "it's always been like this"	No	▪ Not found
	Raise accessibility: bring it nearer (time, space…), make it memorisable and/or individually relevant	Yes	▪ POLL-STUDY: To get insight into how the flood hazard is perceived by the general public, polling was carried out by means of telephone interviews (conducted as CATI (Computer Assisted Telephone Interviews) in each country and each interview took about 10 minutes) and involved totally 4,000 people living in flood prone areas in five countries viz. Germany, the Netherlands, Norway, Sweden and the UK. The main topics taken up during the polls were (Krasovskaia, 2005a): general awareness and concerns about flood hazard; previous experiences from floods; reasons for living in a flood prone area; knowledge about flood assessment in their region; preferable channels of information; confidence in the ways public authorities handle flood hazard; and willingness to take responsibility for strengthening resilience. Interviews. ▪ The same questionnaire consisting of 32 questions on the focus topics and 10 questions on personal background was used in all countries. The original language was English (master questionnaire) and the questions were translated to the local languages with some slight local adaptation of text. ▪ SCHOOL PROJECTS: Various school projects have been initiated in Norway, the Netherlands and the UK. These projects have a special emphasis on activities for school children, e.g. art work development (sandstone carving), flood symbols, flood newspaper and various events. These activities help children within the local community to understand what a flood means and accepting it as a natural phase of river flow regimes. It was considered to be important to teach about floods together with environmental issues and water management in general. The school projects got much attention in local and regional mass media and thereby propagated flood information to many more people than the school children and families directly involved. ▪ VISUALISING WATER LEVEL AND FLOOD EVENT: "Flood columns" is a new concept of visualising flood risk in residence areas that has been developed in the frame of the FLOWS Project. A set of vertical Plexiglas pipes is set up in front of flood prone buildings and filled with water up to the predicted flood level. These columns are meant to give residents a better

			understanding of the impact of flooding when flood protection measures are absent or fail. A demonstration of a small-scale model of a one-storey home will show people the true effects of flood waters on a home, which includes flood-waters coming up through the toilet and the floor-boards. Various flood protection methods will also be fitted to the house and people can see how effective or not the various methods can be.
	Overcoming bias anchoring: allay the professional fixed perspective of the educated and the experienced "professionals"	Yes	▪ The FLOWS Project aims to improve the links between experts, decision makers and the public by investigating and demonstrating different techniques of disseminating flood information in the participating countries. Effective flood risk management depends both on the input of usable technical information from experts to decision makers and the communication of a clear message from decision makers to and from members of the public. ▪ Experts and decision-makers received questionnaires with questions similar to those posed to laymen during polls. The objective was to obtain a representative sample with respect to the existing national practices in flood assessment in the context of spatial planning. The main tasks were: to get an insight into the perception of flood hazard by the experts and decision makers in the partner countries; identifying similarities and differences in the answers between the experts from different countries; identifying similarities and differences in the opinions of experts and laymen about similar topics, and the important topics for discussion at national and international expert panel meetings (Krasovskaia, 2005b). The opinions about flood hazard revealed during the poll study were presented to the experts and decision-makers encouraging them to discuss the discrepancies between the groups in search for a consensus. At the concluding international panel which gathered experts and decision-makers from five participating countries and representatives of NGOs, the discussions continued. The expert panels offered an effective platform for exchanging experiences and opinions promoting national and international networks of experts and decision-makers in flood management.
	Increase accessibility by affect: raise the potential for positive effects, use the salience of positively arousing aspects to open the mind	Yes	▪ Qualitative studies by means of focus groups were undertaken in two partner countries. The overall aim was to elucidate laymen's views on floods in more depth– what they think and why. Two focus groups meetings were organised in Norway and two in the UK. Each focus group, consisting of 15 to 25 people, had an open discussion around topics related to the flood hazard and flooding led by a professional facilitator. People usually started with talking about practical considerations, such as the structural effects of floods, to continue with feelings of stress and frustration (e.g. about difficulties to get economic compensation) and finally more emotional concerns, such as their own safety and safety of their families (Rosslyn Research,

			2004; TNS Gallup, 2004).
	Learning from experiences: allay the misleading and conviction of safety created by – or lack of – experience of rare events	Yes	▪ The developed eGEP (basin related planning instrument) provides information and coordinated measures on two different scales which may help reduce the risk of flooding and enable a highly water-neutral construction. ▪ INFORMATION CAMPAIGNS AND DESKS: Various flood awareness campaigns performed may serve as examples of information to the general public is, like for example mobile information points placed on a community vehicle. Different types of information display related to retrofit of a heritage building are under development by a university. Practical information about what residents can do themselves before a flood occurs have also been distributed together with the responsible authorities. Leaflets describing what can be done when a flood occurs are also under development by the local municipalities. ▪ LOCAL FLOOD WARNING: Improvement of local flood warning system is another activity in the FLOWS Project. In some areas, the flood situation develops very quickly and sometimes the flood is declining already when the national warnings reach the local community. In one municipality, water level transmitters have been installed sending an alarm to a mobile phone of the local duty watch who coordinates the flood warning with national authorities. The flood warning is then distributed to the police and the inhabitants living in flood prone areas by transmitting collectively by UMS (Unified messaging system) to registered stationary or mobile phones in the actual area.
Target groups	Residents	Yes	
	Planners	Yes	
	Flood risk authorities	Yes	
	Service providers		
	Others (students, researchers, public, educational etc.)	Yes	

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