

Towards risk-based management of European river basins: key-messages of the EC FP6 project RISKBASE

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1 Introduction

In the EC FP6 Coordination Action project RISKBASE, leading European scientists and representatives of major European stakeholder groups reviewed and synthesised the outcome of EC RTD Framework Program projects, and other major initiatives, in relation to integrated risk-assessment based management of the water-sediment-soil system at the river basin scale. In this paper you will find a brief summary of the resulting key-findings and recommendations. All involved in RISKBASE sincerely hope that these will inspire and thus leave traces in the first update (2015) of the Water Framework Directive river basin management plans.

At the RISKBASE website (www.riskbase.info) a booklet (Brils & Harris, 2009) is available that provides a more detailed summary. Furthermore, in the second part of 2010 you may expect a scientific book (Brils *et al.*, in prep.), providing an in depth, state-of-the-art description and review of all main topics addressed by RISKBASE.

2 River basins at risk

The health of river basins throughout the world is under pressure from economic activities and a changing climate. Water is necessary for life, agriculture and many industrial production processes but is also a receptor for our waste products. In Europe, diffuse pollution from agriculture and our industrial legacy, together with hydraulic engineering for navigation, water supply, hydroelectricity or flood control, are seen as the main factors adversely influencing the quality and ecology of European freshwaters and estuaries (Menedez *et al.*, 2006). Economic activities affect the chemical and ecological status of our rivers, lakes and groundwater and deplete available soil-sediment-water resources. The wide range of economic activities and the eco-hydrological complexity of river basins, in terms of the functioning of the soil-sediment-water system and the links between water quantity, quality and economic activities, make a more integrated management approach to river basins complex and challenging (Chapman *et al.*, 2007).

3 Risk-based management

As the pressures from both anthropogenic and natural causes on environmental systems increase, it is no longer effective or efficient to deal with one issue at a time, since solving a singular problem often causes damaging impacts on other environmental compartments or in other places. We must consider the consequences of our actions on all parts of the environment in an integrated way and configure these

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actions to cope with an uncertain future. These challenges demand a different approach in order to achieve actual improvement of the ecological quality of our river basins, and thus sustain the goods and services they provide for the well-being of society. Risk-based management is this new approach. It involves the integrated application of three key-principles (figure 1): be well informed, manage adaptively and take a participatory approach (Brils & Harris, 2009).

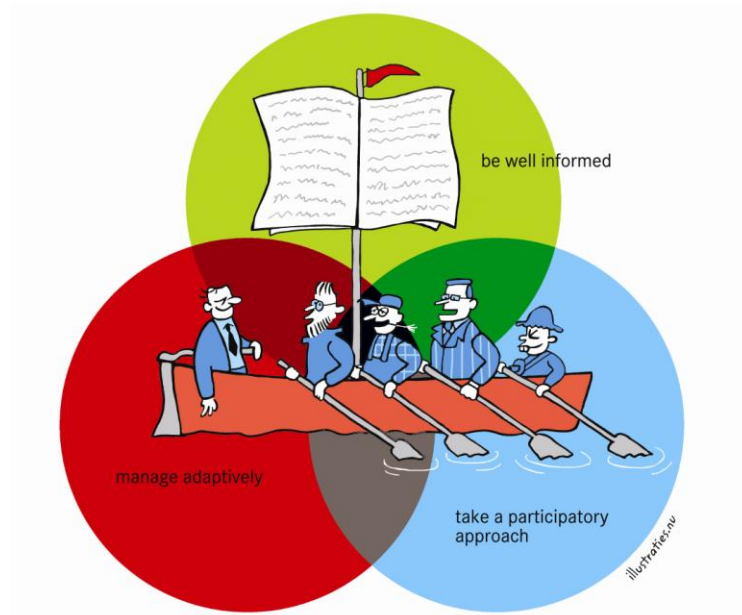


Figure 1. Risk-based management involves the integrated application of three key-principles: be well informed, manage adaptively and take a participatory approach (Brils & Harris, 2009).

The 1st key principle to risk-based management: be well informed

This implies that a sound understanding of the functioning of the soil-sediment-water system (ecosystem) and its interaction with the social system (figure 2) is the basis to river basin management.

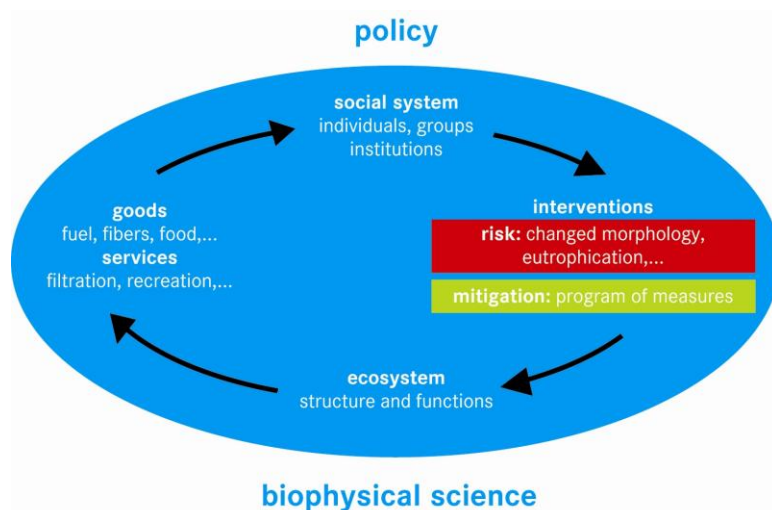


Figure 2. The understanding of functioning of river soil-sediment-water ecosystems and its interaction with the social system is the basis to river basin management. Starting point in the circle is the ecosystem. Science plays a key-role

to improve that understanding and improved understanding should lead to improved policymaking or implementation (figure modified after www.resalliance.org).

A range of EC Framework Programme projects, like AQUATERRA (www.eu-aquaterra.de) and MODELKEY (www.MODELKEY.org), have helped deliver, through a range of applied tools, new ecosystem understanding at the site specific, catchment and river basin scales. For instance, they produced evidence that ecosystem functioning is threatened by contaminants, such as pesticides, nutrients and heavy metals, that are propagated via groundwater pathways from the land surface to rivers, lakes and the sea. Furthermore, there is also evidence that this functioning is threatened by historic contamination (e.g. solid waste disposals) mobilised by extreme floods from sediments within rivers, on river banks, or in floodplain soils. The first generation of river basin management plans has only rarely included targeted measures to mitigate these risks. However, the Water Framework Directive (Annex IV) demands that such system understanding should be integrated in the first or subsequent updates of these plans.

The 2nd key principle to risk-based management: manage adaptively

Using our best available understanding on how river ecosystems function, will certainly improve river basin management. However, when using scenarios, models or other tools such as visioning workshops, simulation games and scenario planning (see e.g.: www.psiconnect.eu) to frame plausible trajectories of change, uncertainties will always remain. This is intrinsic to social as well as ecological systems. Systems, especially at larger scales, are extremely complex and dynamic and can respond in non-linear and unexpected ways. We may be able to cope with these uncertainties by applying the concept of adaptive management, characterised as ‘learning-by-doing’ or “learning to manage by managing to learn” (Pahl-Wostl, 2007). In addressing changes in climate and hydrology, the EC Framework Programme project NEWATER (www.newater.info) delivered guidance to apply the concept in practice.

The 3rd key-principle to risk-based management: take a participatory approach

Participatory processes involve stakeholders in management and aim to enable them to exchange their views and opinions on problems and bring their knowledge to the table. By learning together to understand the land-water system in a better way, better solutions can be found. This process of social learning requires a common language (Slob *et al.*, 2007). The developing ecosystem services approach (European Commission, 2006; van der Meulen & Brils, 2008) may provide that language. A common understanding of the value of the goods and services that a healthy ecosystem can provide, and how their present poor status due to our actions can be improved, is the key to a new approach to river basin management (Brils & Harris, 2009).

4 Towards practice

The Water Framework Directive recognises several of these aspects. It is both risk-based and ecologically centred. It also recognises the need to balance improvements to water and ecosystem quality with economic benefits including the need to supply water for human requirements. Increasingly governments also see the need to grow and supply food as part of the balancing act we have to make.

Some examples from practice are already available where integration of these three key-principles is attempted. They show very encouraging results and may inspire others. However, it is our conviction that well-designed, coordinated and monitored ‘learning catchments’ (i.e. aimed at stepwise improvement of the effectiveness of measures) are needed to transform our general framing and develop best practice. The International Risk Governance Council’s (IRGC, 2008) risk governance framework is recommended as a source of inspiration for the design and execution of such learning catchments (figure 3).

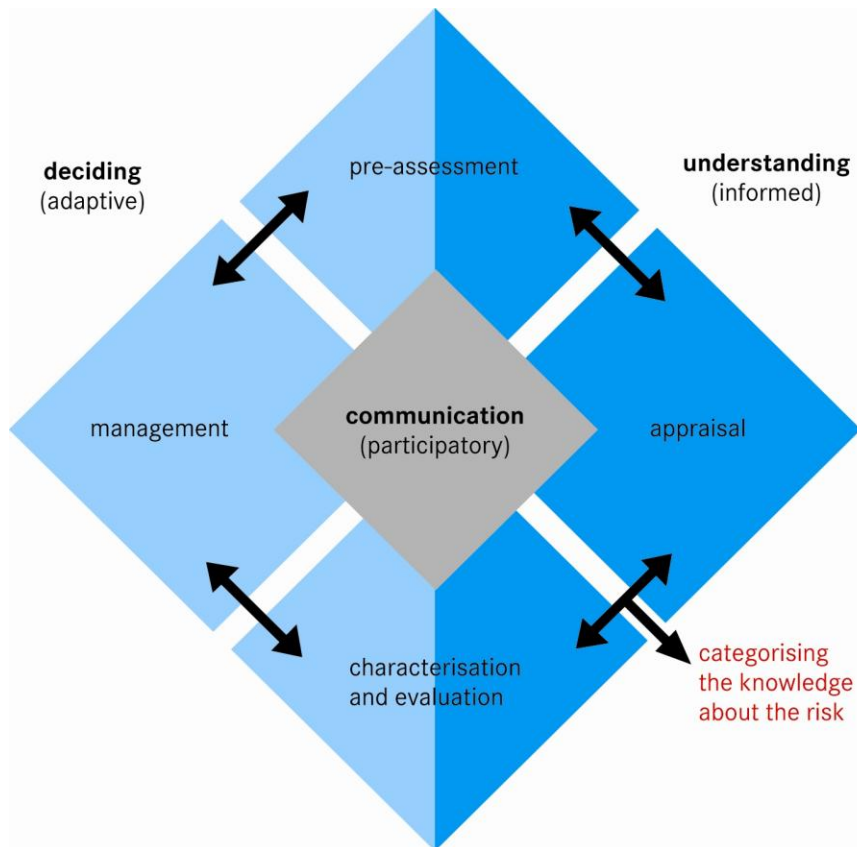


Figure 3. The IRGC risk governance framework (IRGC, 2008). In between brackets the key-principles to risk-based management are positioned.

5 Recommendations

Recommendations for river basin managers:

- Develop a network of more well designed, coordinated and monitored 'learning catchments', that are, amongst others, aimed at a stepwise improvement of the effectiveness of measures. Apply in these catchments – following the IRGC's risk governance framework – the three key-principles to risk-based management: be well informed, manage adaptively and take a participatory approach. This is needed to transform our general framing and develop best practice.
- Award incentives (e.g. prizes) for the most effective measure in river-basin management. Creating a prize for the most effective measure or tool used in the implementation of the WFD would increase the visibility of best practices, stimulate managers to innovate and provide positive attention for river basin management.

Recommendation for river basin management related EU policy makers:

- RISKBASE would welcome an EU policy initiative that encourages Member states and river basin managers to consider the ecosystem goods and services provided by river basins in addition to ecological status *per se*. This broadening of the scope opens up possibilities for more stakeholder involvement and more scientific input in decision making. A common understanding of the value of the goods and services that healthy river basin ecosystems can provide, and the diminution of these values by our actions, is the key to a new approach to river basin management.

More recommendations, i.e. recommendations for research funders and scientists are available in the RISKBASE booklet (Brils & Harris, 2009).

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