

Implementation of sustainable river basin management – Lessons learned in the Watersketch project

The management of river basins is a particularly complicated process as shown in previous chapters. In most countries of the Baltic Sea Region water related legislation covers most of the problems, however, protection and restoration of watercourses is suffering from inadequate funding and lack of scientific knowledge. In addition to different water management legislation profiles, there are also differences in institutional structures, which are in charge of practical management action. Another problem has to do with the fact that the monitoring of technical elements and scientific data and the monitoring of the implementation of legislation often work sub-optimally. This is frequently due to a lack of communication between the scientists, those designing and implementing monitoring activities, and policy makers as the users of the resulting environmental information. The diverse set of both national and international legislation including commitments by international bodies also affects practical management work.

The ultimate goal of the Watersketch project was to demonstrate all major environmental problems of the Baltic Sea Region river basins including a large variety of tools utilised in implementing the European Water Framework Directive. Lessons learned are collected and collated in this book.

Part 1 of this Handbook includes an overview of legislation relating to river basin planning and a number of national practices and adaptations. European legislation including directives and also international commitments with national laws forms a good basis for sustainable development. However, there are some clear contradictions where for example loading is on the one hand caused by land use practices, which are supported by European funds, and on the other hand limited by directives promoting nature protection values. Some watercourse utilisation procedures, e.g. hydropower, are also taken into account and much lower environmental objectives are allowed. Many directives also include a number of goals which are almost impossible to achieve. The WFD sets the ultimate goal of reaching good ecological status with limited number of derogations although it is generally known that restoration of highly polluted watercourses is difficult and very costly including significant reductions of human activities.

In both the "old" 15 and "new" EU countries, the need to involve the general public in water management planning processes outlined in the first section of this Handbook is stressed in several national legislative acts, guidance documents etc., but its actual implementation has not always been so successful. Regional and local authorities in many Baltic Sea Region States for example often lack the experience and knowledge regarding methods and strategies for public involvement, its practical organisation and the use of constructive public comments and recommendations in the policy-making process. Governmental officials and experts often complain that local people have a lack of interest in participating in water management planning and that they possess a low awareness level, but this is not always so.

The relatively long tradition of river basin management has created several tools helping authorities to apply principles of sustainable river basin management in a proper manner. Some of these tools are collected within the case studies and presented in the second section of this Handbook. A set of tools includes tools for water course loading calculations (RiverLifeGIS), calculations of hydrological changes (DHRAM, REGCEL) and even decision making (WebHIPRE). Also, useful means for gathering public opinions (Public Hearing Database) and personal priorities

(Priority Game Generator) are demonstrated in a separate chapter. Most of these tools are also presented on the web based toolbox (toolbox.watersketch.net) and in the handbook to allow further use when applying the WFD and other relevant directives.

The main focal point of this handbook is formed by the third section, which presents several problems occurring in river basin management through the use of case studies in Finland, Lithuania, Poland, Germany and Denmark. The Polish Jeziorsko reservoir is still suffering from non-purified wastewaters, whereas the status of the Danish Limfjorden is clearly disturbed by nutrient loading from intensive agriculture. The mouth of the River Elbe shows huge environmental problems due to contaminated sediments originating mainly from upstream of this transboundary river basin. The Lithuanian Minija river is a typical example of a highly valuable salmon river, where migratory routes and spawning grounds are cut by dams and other obstacles obstructing the free movement of fauna. Finnish case studies from the River Oulujoki demonstrate the importance of the difference in land use practices on the status of rivers and lakes; diffusive loading is difficult to combat and especially harmful for sensitive shallow lakes and small streams.

Water bodies are suffering from point source and non-point source of loading causing eutrophication both in lakes, rivers and coastal areas. Also, large structural modifications occur especially in rivers due to flood protection measures, water borne traffic and hydropower production. It is especially highlighted that the demand of good ecological status for water courses is almost impossible to reach within the time frame of the Programme of Measures of the WFD. Combating diffuse pollution from agricultural areas includes a strict demand for reducing fertilisation and even changing farmlands to natural grasslands or constructed wetlands. Hazardous substances from drainage basins are also largely concentrated in sediments near river mouths and estuaries.

Key findings of the Watersketch case studies

Some issues of relevance in river basin management, which were identified in the countries taking part in the Watersketch project and outlined in this handbook are: sediment management, non-point source pollution, and issues related to sustainability. Due to their importance, these will be reviewed as follows.

A) Sediment management

Sediments are the storage compartments of aquatic ecosystems. Moreover, water bodies are the ultimate sinks for the products of human activity, from settlements (including cities) up to industry. Sediment quality is a barometer of human impact on the atmosphere, on the land and on water. The evidence for many long-term environmental trends is often reflected in stratified sediments.

Sediments are analysed for a wide variety of purposes, e.g. to understand lake/river history through paleolimnology, to determine their roles as nutrient or contaminant sinks or sources, to assess the quality of dredged material, or to monitor the responses of aquatic systems to remediation or natural recovery.

Almost all sediment studies require physical and chemical characterisation. Particle size distribution, water content, total organic matter or carbon content, nitrogen, and phosphorus are commonly determined. Although sediment contamination can in some contexts be a financial liability, clean sediments have no direct commercial value. Cost of environmental monitoring is funded publicly at variable levels over time.

Analytical methods that are inexpensive, easy to operate, rapid, and, if possible, portable, could enhance environ-

mental monitoring capability, including the collection of long-term records that are so important to discerning subtle, regional and global human impacts from the variability due to natural, long-term background cycles.

The Watersketch case studies highlight several properties of sediments. The case study from the River Elbe showed problems related to contaminated sediments and their management. Cleaning of sediments is often extremely expensive. On the other hand, delocalisation of sediments requires a lot of space, which is difficult to find in densely populated areas. The case study of Limfjorden demonstrated huge internal loading originating from sediments, which have received down dwelling nutrients and organic matter for decades. Once spoiled, sediments act as a source of nutrients especially during times of low oxygen content of the hypolimnetic water layer. The Oulujoki case study of small forest lakes showed the importance of sediments for environmental information. The reference condition of small lakes was very difficult to determine due to human activities in the drainage area; sampled sediment cores with diatom analysis showed their status relatively well and even demonstrated eutrophic status of one reference lake.

The Watersketch project did not provide any tools for sediment management, but the Web-HIPRE decision aiding system provides assistance for local water managers when comparing different options for sediment management.

B) Non-point source pollution

It is a common fact that the activities taking place in watersheds affect water quality. Over the past 20 years industries and municipalities across the Baltic Sea Region have carried out extensive work in preparing large numbers of purification plants for industrial and municipal waste waters especially in old member states. The Polish Jeziorsko lake case study demonstrated problems related to non-purified wastewaters entering a relatively small water body and causing significant problems in water quality. Today, an important contribution to water pollution comes from non-point sources such as agriculture and forestry. Also, stormwater from urban areas includes a huge amount of harmful substances when it flushes paved surfaces such as roads and parking lots. In addition to land originated loading airborne loading also contributes to the status of a water body due to its high content of sulphur substances, as well as nitrogen in rain water.

The Watersketch case study of Limfjorden demonstrated the essential role of diffusive source pollution from agricultural areas, e.g. fields and farms with a large number of livestock. Soil of arable land contains a large amount of phosphorous, which means that it can act as a source of nutrients even in cases when the fertilisation of fields is reduced. The water quality of the River Minija in Lithuania is also affected by leaching from agricultural areas, whereas forestry plays an important role in eutrophication of small rivers and lakes in headwaters of the River Oulujoki, Finland. Combating diffuse pollution is especially demanding and the loading estimation tool RiverLifeGIS was further developed in several case studies of Watersketch. This tool utilises land use data in combination with hydrological models and can be used in planning water protection measures and structures.

C) Issues related to sustainability

Sustainability is often seen as a theoretical concept. Therefore, sustainability issues are often ignored although they are vital for river management. If river basin management is to succeed, a shift in current ways of dealing with rivers issues is necessary. Sustainable river basin management means:

- national and international co-ordination in fluvial environmental management between neighbouring countries;
- assessments of problems, conflicts and constraints in water management, water quality, biodiversity and environmental protection;
- legislative and institutional framework, including the identification of areas where legislative enforcement needs to be strengthened and harmonised;
- identification of resource management options, including basin scale scenarios, water demand management, water quality management, nature and environmental protection;
- a long term management framework, i.e. institutional measures and capacity building, public participation, monitoring and evaluation of the international components of the water resource environment.

This is the only way to preserve our river landscapes as functioning integral systems, or rather to restore them and to successfully use their potential as waterways, ecological habitats or as tools for flood protection.

Key solutions

A) Importance of appropriate management structures

Perhaps one of the elements related to the implementation of the WFD is the fact that it involves decision-making at various levels, from the national to the local one. Over and over again, national legislation collides with or is not 100% in line with the reality at the local level causing problems in the implementation.

Although there is no ideal scenario, it is important to follow a structure, which allows more interaction between the various agencies and caters for feed-back in case difficulties arise.

Each country may decide which management and control system is the most adequate in its own context. Germany for example has a Federal system, while in Denmark substantial power is devoted to local authorities. It has been shown in parts 1 and 3 but also in other parts of this handbook that different approaches have been employed and have sometimes been combined to identify targets and indicators for river management including handling problems such as those created by pollution, economic pressures and sediments among others. Some of the successful approaches seen in this field share one important element, also outlined in part 1: public participation. As seen in Table I there are many different stakeholders whose views, opinions and inputs are of assistance in the implementation of the WFD.

<ul style="list-style-type: none"> • academic researchers • staff at universities • school teachers • youth groups • fishermen • business, industry, trade • national administrations • regional and local administrations • environmental non-governmental organisations 	<ul style="list-style-type: none"> • farmers and farmers organisations • journalists • politicians • international organisations • transport and traffic authorities • tourism authorities • Church and religious groups
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Tab. I: Stakeholders to be involved in WFD implementation

“Participation” means different things to different people and different interest groups. All in all, there are five levels of participation:

1. participation by being “passive beneficiaries”;
2. participation by carrying out tasks and functions defined by others;
3. participation through active consultation;
4. active participation in planning, implementation, monitoring and evaluation;
5. autonomous decision making.

It should be noted that the forms of participation currently implemented mostly refer to the first three levels. Participation through active consultation is still developing, while participation at levels 4) and 5) is still extremely rare.

As seen in part 3, which assesses the needs and possibilities for ICT tools in integrated river basin management, there are many options available to encourage, upkeep and support the participation of stakeholders. Whether one chooses to use Web-HIPRE, RiverLifeGIS, Public Hearing Database, Priority Game, REGCEL or DHRAM, there is no doubt that the stakeholders outlined in Table I (a list which is by no means comprehensive), may contribute towards the implementation of the WFD in a number of ways. For example:

1. by providing technical information relevant to the implementation (scientists);
2. by considering the impact on people (politicians, planners);
3. by discussing the economic impacts (e.g. industry, trade sector, tourism)
4. by describing the implications of the implementation to the public (Church, NGOs).

The experience gathered here proves that a multi-stakeholder approach is necessary in implementing the WFD, from early states of consultation right up to decision-making. In this context, consultation should not only be held with and between local, national and other authorities, but also with the other stakeholders outlined above.

The Driver-Pressure-State-Impact-Response Framework (DPSIR) approach is confronted by the root and branch approaches. The latter approaches primarily address policy aspects of management with the drawback that there is a lack of policy elements (i.e. the Drivers and Pressures are addressed only in a simplified manner).

B) Integrated river basin management is a complex task and the implementation of the WFD needs to be carried out in an integrated way.

In the literature but also in “real life” in some countries, integrated water management (IWM) or in some cases integrated water resource management (IWRM) is defined and interpreted differently. Some define the integrated approach to watershed management rather vaguely, e.g. “consideration of all sources and uses of water in a particular river basin”. IWM is sometimes replaced by adjectives like ‘comprehensive’, ‘environmentally conscientious’, ‘incentive-oriented’ and ‘participatory’, which water and water resources activities need to be associated with in order to be sustainable. Others are somewhat more precise and define IWM as the interaction between three pillars:

1. environment (i.e. ecology),
2. economy (e.g. cost-effective criteria, polluter pays principle, water pricing), and
3. social performance (e.g. increased welfare), all including an overall frame covering legal aspects.

As seen in Table II, the main issues surrounding the implementation of the WFD vary in each area, but they do have one common element: there is a need to seek integrated holistic solutions to the problems in order to allow the WFD to be fully implemented. It is not appropriate to try tackling one problem (e.g. pollution) on its own. In order to succeed, issues related to the WFD need to be seen in a holistic way giving due consideration to their political, economic and environmental dimensions.

Area	Main issue	Measures
Hamburg (D)	Sediments	Sediment Management Programme
Limfjord (DK)	Eutrophication	Measures to reduce the loads from land
Lodz (PL)	Water and sewage management	Use of GIS for monitoring
Kokemäenjoki (FIN)	Multi-criteria decision-making	Involvement of government agencies and stakeholders
Minija (LT)	Impact of dams and recreational activities	Integrated management methods for surface waters
Oulujoki (FIN)	Diffusive source pollution and hydromorphological change	Recommendations with a sustainable development dimension

Tab. II: Some of the main issues surrounding the implementation of the WFD based on the case studies

One aim of the Watersketch Project and embodied in the case studies was to act as a facilitator or framework for integrated river-basin approaches, which also consist of three pillars in ‘harmony’:

- public participation, such as involvement of water users and other interest groups and dissemination/exchange of information,
- political will and decisions, to ensure e.g. coherence with legal systems and resolving conflicts/water regime, and
- technical appraisal and advice concerning problems and their solution including the proper understanding of dynamics of the physical and natural science dimensions of water issues. Yet other authors talk about integration in terms of natural scientific models.

Such ‘integrated models’ normally make a clear distinction between research models and models to support policy making. Natural scientific research models are strongly process oriented in search for new scientific knowledge. On the opposite, models to support policy making (e.g. DSS-tools) utilised in case studies are foremost problem-oriented since they in theory should deliver usable results.

In terms of the Water Framework Directive, the river basin approach is regarded as integrative, since e.g. the river basin management plans should cover all aspects of ecologically sound management including all participants and stakeholders and stimulate public participation in the decision-making process. Therefore, if it is to be implemented in full and if it is to succeed in reaching its goals, it is important that the complexity of the WFD is acknowledged and that a “whole approach” as opposed to a partial one, is used.

C) Transnational co-operation is important

The process of enlarging the scope of the water management authority has been dictated by the growing complexity of water-related problems, i.e. flooding, dryness, water quality, shrinking of land due to drainage, but also

increases in population and related urbanisation. In Finland for example, multipurpose river restoration (improving leisure, wildlife and the watercourses) is facilitated through strong community-technical connection, involving local partnerships between local authorities, businesses and community groups. Disciplinary input to river management, which has historically mirrored the progression in stream management values, nowadays involves engineers, landscape architects, geomorphologists, ecologists and others.

In most of the new EU member countries, the responsibilities and resources of regional/local authorities are at present too limited to effectively contribute to successful water management at a river basin level. Moreover, as legislation and decisions applying to freshwater are often approved at a central level, they do not necessarily match the specific river basin situation, which limits the effectiveness of measures and laws. In the transboundary river basins, agreements and institutional relationships between countries are normally managed through national authorities, although there are often informal contacts and data exchanges between water authorities at lower administrative levels. If we consider the Baltic Sea Region as a whole region, as schematically demonstrated in Figure 1, which illustrates the contribution of European countries to sulphur deposition to the Baltic Sea nearly 10 years ago (baseline data of 1998), it is clear that efforts towards searching for 'in-country' solutions, need to be complemented by transnational cooperation.

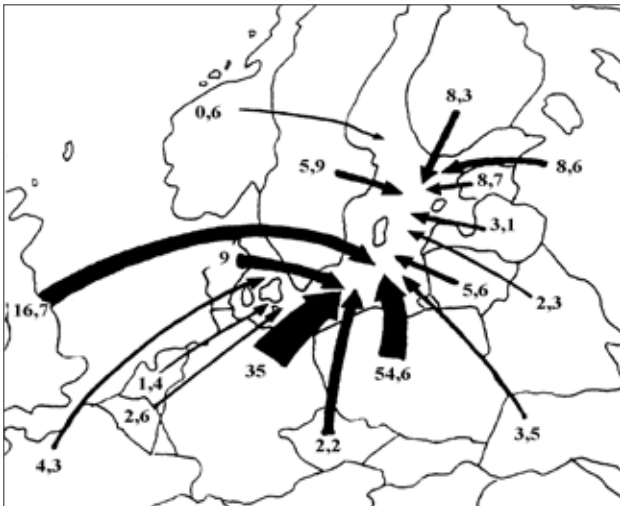


Fig. 1: The contribution of European countries to sulphur deposition to the Baltic Sea

Over the past ten years or more, useful knowledge has been gained through EC Framework Programmes, EU Member States bilateral/multilateral programmes, partner countries' programmes, communities and from efforts undertaken in the private sector. Therefore, the creation of complementary river basin management measures that combine input from various countries (especially those sharing borders and common rivers) may be an interesting element to add value to on-going and future efforts in respect of sustainable river management in the Baltic Sea Region.

Conclusions

The main aim of the WFD and of the on-going efforts taking place across the Baltic Sea Region is to enhance the integrated and sustainable development and use of water resources in the Baltic, allowing (national) rivers, transboundary rivers, as well as inland lakes to realise their potential as healthy ecosystems, while at the same time not ignoring their relevance to leisure activities and as sources of economic growth. It also aims to:

- a) promote the improvement of the water- and environmental monitoring systems, so as to be able to prevent the occurrence of accidental water pollution events and to launch timely emergency actions, should such events happen;
- b) identify the most important basin-scale water resource management and water quality control options that could help overcome pollution issues.

Although there is no doubt that the responsibility for the implementation of the WFD resides with each Member State, it is evident that by means of a common strategy, nationally-led efforts may be complemented by international cooperation. The reasons for this are two-fold:

1. each EU-Member State faces specific questions and challenges in the implementation process of the WFD, be it linked to national, regional or local conditions. Although it is true that such local problems can only be fully resolved by that particular Member State, it has been realised that international exchanges pave the way for the implementation of solutions, which may have been successfully tested elsewhere;
2. the joint execution of the measures enlisted by the WFD means that European implementation strategies will be developed in a more coherent way and hence limit the scope for deviations or the need for "opt-outs" or even the extensions of deadlines.

Moreover, most of the challenges and difficulties, which arise in the implementation of the WFD are common to all Member States, and many of the European river basins are shared, crossing administrative (and sometimes territorial) borders. In such cases, a common understanding and approach is crucial if a successful and effective implementation is to be reached. It is common experience that joint strategies do limit the risks of bad applications of the WFD and possible future problems.

As to the items that are needed in order to allow a full implementation of the WFD, this Handbook has identified the following ones:

- a) the need to more efficiently share information at the national level and at a transnational level between Member States and the European Commission;
- b) the need to establish clear boundaries between institutional and administrative arrangements as well as local and competences;
- c) the need to truly inform and authentically involve the public and the relevant stakeholders;
- d) the need to raise public awareness of the WFD and its usefulness and to train public officials in charge of the implementation (capacity building);
- e) the need to ensure the integration of the WFD with other mainstream environmental policies, especially other water-related Directives;
- f) the need to prepare, publish and disseminate guiding and supporting documents on key aspects of the implementation of the WFD.

All in all, the WFD as a whole and its implementation elements in particular, are aimed at allowing the sustainable river basin management process to move away from being a mere theoretical approach, towards being established as good practice across the Baltic Sea Region and beyond. Despite a number of negative aspects in river basin development, several positive issues have been brought up in the course of Watersketch. The WFD is going to be implemented in a proper and honest way in all case study countries. Due to increased actions to remove both point and non-point loading, the status of several water courses can achieve the demanding tasks of the WFD. In other words, Europe is also on the way to reach global goals of sustainable development

Information

More information is available at

www.watersketch.net
toolbox.watersketch.net

Finnish Environment Institute SYKE

Dr. Seppo Hellsten
Teemu Ulvi

P.O.Box 413
FIN-90014 University of Oulu
Phone: +358 20 490-2961
Fax: +358 20 490-2985
E-Mail: seppo.hellsten@ymparisto.fi or
teemu.ulvi@ymparisto.fi

www.environment.fi

TuTech Innovation GmbH

Prof. Dr. Walter Leal
Dörte Krahn
Veronika Schulte

Harburger Schloßstrasse 6-12
D-21079 Hamburg
Phone: +49 40 76629-6346
Fax: +49 40 76629-6349
E-Mail: watersketch@tutech.de

www.tutech.de

The project is part-financed by the European Union (European Regional Development Fund) within the BSR INTERREG III B Neighbourhood Programme. This programme gives countries bordering the Baltic Sea the opportunity to work together in spatial development projects. The project period is July 2004 – June 2007.



www.watersketch.net