

INVENTORY

of Best Practices and Tools in Water Governance

from Case Study Basins and Twinning Projects

ANNEX 8.5

of Deliverable 3.3

About this Inventory

This inventory format was developed within the scope of the Twin2Go project, WP3. It served to record case study data about the implementation of water governance regimes in river basins. It provides examples from river basins/twinning projects about the *application* of Best Practices and Tools (BP&T) in water governance, the *context* affecting their use, and *performance* outcomes. The BP&T examples concentrate on three major foci: 1) Application of national water frameworks in river basins; 2) Engagement and coordination among actors and forms of interaction/partnerships; 3) Enabling learning and building adaptive capacity in water governance. The ultimate goal is to identify BP&T that lead to, or otherwise enhance, adaptive water governance. Possible options and constraints for transfer and adaptation of BP&T across river basins will be further assessed.

This document contains an inventory of 15 BP&T examples provided by Twin2Go partners. The BP&T examples are based on case studies from twinning projects that were addressed by Twin2Go. The BP&T inventory below was assembled as a preparatory exercise to provide input to the Twin2Go regional best practices workshops. Further BP&T examples were collected during these workshops and can be found in the annex of Deliverable 3.2.

Inventory of best practices by partners from case study basins and twinning projects

No.	BP&T	River basin/Country	Region	Twin Project
Focus 1: Application of national water frameworks in river basins				
1	Increase flood safety in the Hungarian Part of Tisza River Basin, "New Vasarhelyi Plan"	Tisza/Hungary	Europe	Twin2Go
2	Water quality improvement in the Hungarian Part of Tisza River Basin	Tisza/Hungary	Europe	Twin2Go
3	Delivering sustainable water management in a changing climate	Thames/England	Europe	TwinBas
4	Volga Revival federal program, 1998-2004	Volga/Russia	Europe	CABRI-Volga
5	Implementation of Environmental Code in Sweden	Norrstrom/Sweden	Europe	TwinBas
6	Red River Basin Planning Management Board, RBPMB	Red River/Vietnam	SE Asia	ASEMWaterNet
7	Kosi River Basin Management Strategy, 2007	Brahmaputra/Nepal	SE Asia	BrahmaTwin
Focus 2: Engagement and coordination among actors, forms of interaction/partnerships				
8	Lukoil corporate strategy on environmental security	Volga/Russia	Europe	CABRI-Volga
9	Stakeholder involvement beyond level required by law, Wuppertalverband	Dhenn (Rhine basin)/Germany	Europe	NeWater
10	Stakeholders inspire river management, "New Vasarhelyi Plan"	Tisza/Hungary	Europe	NeWater
11	Bottom-up learning: Stakeholder assemble knowledge about water management options	Tisza/Hungary	Europe	NeWater
12	Participatory water allocation in Bang Pakong, "Stimulating participatory process for water allocation in Bang Pakong River Basin " program	Bang Pakong/Thailand	SE Asia	ASEMWaterNet
13	Tala Hydroelectric Project, 1998-2007	Brahmaputra/Bhutan	SE Asia	BrahmaTwin
Focus 3: Enabling learning and building adaptive capacity in water governance				
14	Scenario analysis of hydrology and water resources of the Okavango Delta	Okavango/Botswana	Africa	TwinBas
15	Development/implementation of National Environmental Education Strategy	Brahmaputra/Bhutan	SE Asia	BrahmaTwin

EXAMPLE 1: “The New Vásárhelyi Plan” – Increase of flood safety in the Hungarian Part of Tisza River Basin

Name of the River Basin: Tisza

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

Prompted by the results of extensive, careful preparatory studies, the government has adopted on the 15 of October, 2003 a decision on the most ambitious rural development program of past decades. According thereto, in Stage I of the new Vásárhelyi Plan (abbreviated in Hungarian as VTT), six emergency reservoirs would be built along the Upstream- and Middle Tisza sections to enhance the level of flood safety in the region. The program reflects a new government philosophy, in that it takes as far as possible into consideration the interests of environmental protection and nature conservation. Implementation of Stage I have been shown to be less expensive and more effective than the traditional emergency measures of flood fighting.

A governmental program – the New Vásárhelyi Plan – has been started in 2004 on the enhancement of flood safety and the related regional and rural development in the Tisza Valley. The Plan comprises a complex program which covers beyond the creation of a higher level of flood safety, the improvement of the living standards of the rural and urban population of the region, the formulation and introduction of new types of agro-ecological land use in the area of the emergency flood retention reservoirs and the modernisation of the infrastructure in the settlements along the River Tisza.

2. With what purpose and reason of its application?

Following a long spell of arid years, several dangerous flood waves have passed down the Tisza between 1998 and 2006. Flood fighting, emergency measures and reconstruction have depleted the central budget by some HUF 120 billion over these years, though without succeeding to create a feeling of complete safety.

Solutions guaranteeing the safety of over one million people in the endangered flood plains were urgently needed. The improvement over the present state consists of diverting to, and storing on, part(s) of the flood plain the excess flow conveyed by the especially dangerous floods. Appropriate use of this water would open new perspectives of development along the river and provide opportunity to introduce a new type of agro-ecological farming and environment management.

Elements of the complex New Vásárhelyi Plan are: (a) cleaning the flood bed from obstacle; (b) construction of emergency reservoirs in Hungary; (c) international flood control measures along the Upstream Tisza section.

Beyond raising the level of safety to the life and property of the population, the government financed project creates also opportunities for changing to more rational land uses. In the surroundings of the reservoirs, which serve also landscape-upgrading purposes, new methods of land use are encouraged. The new, water-based cultivation techniques would be profitable and ensure higher income levels, regardless of the recurring inundations, which support them.

3. How was the best practice or tool applied?

The basic concept of the New Vásárhelyi Plan (VTT) is to convey the 1 in 100 years floods between the dikes and protect the land against higher floods by storing the water in excess of 1 in 100 year flood in flood retention reservoirs. The use of these reservoirs is expected to reduce the level of 1 in 1000 year flood by about 1 m along the Hungarian Tisza. To achieve this goal:

1) The existing dikes have to build up to the present design conditions (e.g. the level of 1 in 100 year flood level plus 1 m freeboard). At present 40% of the dike system do not meet of the design condition in the Hungarian part of the Tisza River Valley.

2) The flood conveyance capacity of the flood plans has to be restored by removing obstacles from the floodplains. The floodplains of the Tisza in the Hungarian section is wide (e.g. 1 - 5 km), in most of the cases the ‘removal of obstacles’ means opening a 300-600 m wide shortcut (hydraulic corridor) on the floodplain.

3) The extreme floods have to be reduced by storing some of the flood volumes in flood retention reservoirs.

4) The VTT has to be implemented in co-ordination with ecological requirements, land use planning and agricultural programmes.

As regards the economic development in the Tisza Region and the living standards of the population influenced, the program aimed at the harmless conveyance of even the abnormal floods means not only enhanced safety to life and property, but provides also an initiative and opportunity for introducing rational land uses. The importance of these latter is emphasized also by the agrarian policy of the European Union and the Hungarian National Agro-Environmental Program alike. Field crops are grown in the majority of the designated reservoir areas. Flood exposure of these areas would be changed relative to the actual situation, that in the event of an abnormal flood the reservoirs would be partly or totally inundated.

4. *Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?*

The tasks and actions related to the construction, preparation and implementation of VTT have been included in the National Development Plan and National Rural Development Plan since 2007.

The financial sources of VTT are (i) the Operational Programmes of the National Development Plan; (ii) also in the framework of the National Rural Development Plan, which implements the National Rural Development Strategic Plan; (iii) the financial instruments from the European Union's funding scheme that can be obtained by applying for tenders. Furthermore, there is the national co-financing rate of the European Union funds and in case of already set up investments the budgetary subsidy which is guaranteed from the central budget by the government.

The construction and re-construction of the detention basins in the Tisza-valley and some primary flood protection dams are being implemented in the framework of those projects that were selected to be financed from EU related development budgets available for the period of 2007-2013.

The stakeholders involved in the implementation are: Ministry of Rural Development; Development Directorate of the Ministry of Rural Development; Central Directorate for Water and Environment; National Inspectorate for Environment, Nature and Water; 5 Regional Inspectorates for Environment, Nature and Water; 6 Environmental and Water Management Directorates; 5 National Park Directorates; Municipality Self-Governments; NGOs; Regional Development Agencies; Economic Sector Associations; Population.

5. *Were any regulatory enforcement and incentive mechanisms used to support BP&T application?*

Several laws, governmental decrees and ministerial orders have been issued in connection with the regulatory enforcement of the implementation of the VTT and related supporting programmes, such as:

- Act LVII of 1995. on water management.
- Governmental Order 232/1996. (XII. 26.) on the regulations of protection against water damages.
- Governmental Decree 234/1996. (XII. 26.) on the sphere of tasks and competences of the National Water Authority (OVF) and further the district water authorities.
- Ministerial Order 10/1997. (VII. 17.) KHVM on flood and excess water control.
- Ministerial Order 15/1997. (IX.19.) KHVM on standard flood levels of rivers
- Directive 2007/60/EC on the assessment and management of flood risks
- Act LXXI. of 2001 on water management modifying Act LVII of 1995.
- Governmental Decree 221/2004. (VII.21.) on certain rules of river basin management.
- Governmental Decree 379/2007. (XII.23.) on rules of activities and establishments of water utilization, water protection and prevention against water damages.
- Ministerial Order 30/2008. (XII. 31.) KvVM on technical rules of activities and establishments of water utilization, water protection and prevention against water damages.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. *What were the major socio-economic or political constraints for BP&T application?*

The major socio-economic constraints of the application of VTT were first the lack of sufficient financial resources, and second the conflict of interest among significant stakeholders, such as land users and governmental sector (water management, agricultural sector) in finding the best locations for the planned reservoirs.

7. *What barriers did BP&T face? Who opposed BP&T use?*

First, dispossession of land alongside with the dikes of the newly built reservoirs implied conflict of interest between the developer (governmental water management) and the land owners/users. The other

conflict was that land inside the reservoirs became subject of use restriction as the land could be inundated during high flood events. That restriction was noted in the proprietorship of land register and this devaluated in some way the land. Consequently land owners/users were strongly against the construction of reservoirs.

In case of designing and constructing hydraulic corridor in flood plains use restriction or use change was also applied. The restriction or use change was also noted in the proprietorship of land register.

8. *How were barriers overcome?*

Realizing that land would be subject of devaluation the state paid a onetime compensation for such a loss. The state also regulated the method of compensation for the land owners/users for their loss in agricultural production in case the reservoir is inundated for flood level mitigation.

9. *What opportunities and drivers for BP&T application existed?*

The increase of flood safety in the Tisza River Valley is a national interest. Major investment projects were initiated by the VTT in those regions of the country where the economic development level is one of the lowest, thus creating significant new temporally jobs and in lower extend permanent ones, as well.

10. *Who supported the use of BP&T? Did they take advantage of them?*

The governmental water management sector, regional governments, environmental and nature protection agencies, touristic sector and local municipalities supported the use of VTT. The advantage of the construction of the reservoirs was assessed in the design phase of the programme.

Section III. PERFORMANCE and EFFECTIVENESS

11. *What was the degree of success, or failure in BP&T application in the river basin?*

Two major reservoirs have already been completed and put into operation. The first one has helped the flood protection field actions during the last major flood. This is a definitive success part of the programme.

As failure it should be mentioned that the speed of implementation had been significantly kept back due to the economic crises, and thus the finalization of the entire VTT had been postponed by many years. Among the failures should be mentioned that more complex utilization of reservoirs (harmonization with rural development, touristic purposes, wetland development, and alternative agricultural production) have not been achieved.

12. *What were the major reasons for success, or failure?*

Among the major reasons of success were 1) open planning process (stakeholders were involved in the process from the very beginning), 2) utilization of the resources of New Hungarian Development Programme 2007-2013, which allowed covering the projects 85% EU funds and 15% national budget.

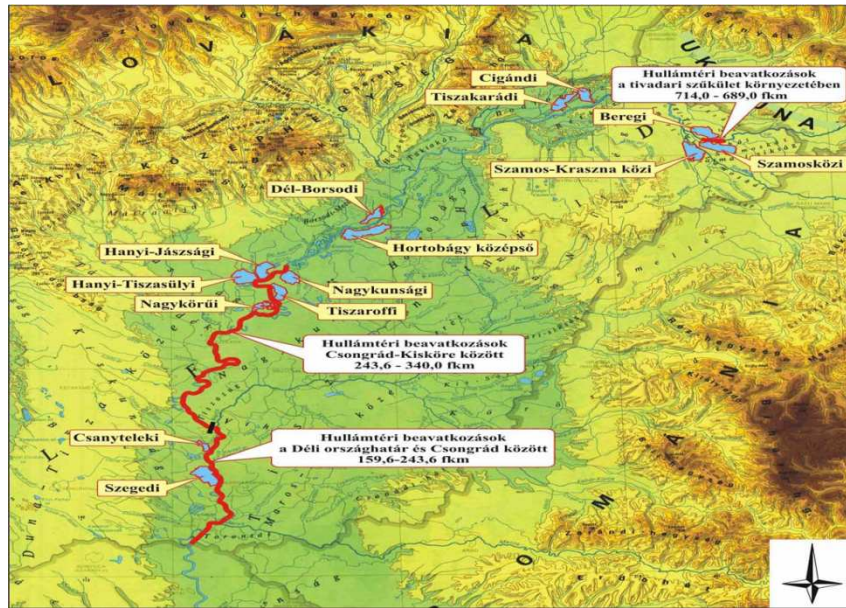
The programme could not overcome of economic sector separation, and counter-interest to achieve more complex utilization of the VTT, so far.

13. *Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?*

The VTT is one of the major programmes of measures in the Hungarian Tisza River Basin. The investments contributed and will further contribute to developments in the Tisza Valley.

Projects under realisation:

- Hany-Tisaszüly reservoir: 247 million m³. Expected to be completed in 2011.
- Nagykunság reservoir: 99 million m³. Expected to be completed in 2011.
- Reservoir between the Szamos and the Kraszna rivers: 126 million m³. Expected to be completed in 2012.
- The Bereg reservoir: 60 million m³. Expected to be completed in 2013.



14. Did application of BP&T result in changes towards more adaptive behaviour of stakeholders?

The main philosophy of the VTT is adaptive, as it changed the traditional flood protection strategy from raising the height of protection dikes to flood level mitigation using side reservoirs as main means of protection capacities.

As the time horizon of the implementation of the entire of VTT is fairly long (20-25 years), thus application of more adaptive solutions can be achieved.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation?

Since the first two reservoirs had been completed the flood safety had been increased significantly in the Hungarian upper Tisza section.

EXAMPLE 2: Water quality improvement in the Hungarian part of the Tisza River Basin

Name of the River Basin: Tisza

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

In a continuation of the National Municipal Wastewater Collection and Treatment Program, Hungary aims to construct wastewater collection and treatment systems and facilities, including works for the treatment of liquid waste; extend and modernize existing wastewater treatment and wastewater collection systems; develop wastewater sludge treatment and recycling; and, in the framework of diverse and comprehensive technical projects, begin "semi-natural" and "unique" wastewater treatment where sewerage is not justified by environmental or economic reasons.

2. With what purpose and reason of its application?

The main purposes of the application of the programme are (1) to close the utility gap; (2) to improve surface and subsurface water quality by reducing nutrient, organic and heavy metal loads into surface and subsurface water resources.

In 2004, the public utility gap - that is, sewer length per one kilometre of water supply pipe - was still over 30 percent; only 44.3 percent of settlements were connected to wastewater collection systems; and only 66.5 percent of collected wastewater was biologically treated. At the same time, the utilization rate of the treatment capacity of plants is very low, with only 32 percent going through level III cleaning (nutrient removal). In parallel with sewage collection, alternative wastewater treatment solutions - e.g., close-to-nature wastewater treatment, individual wastewater disposal - have not widely spread.

In addition, at settlements or part of settlements in highly vulnerable areas without a sewer system, where professional, individual wastewater disposal is not an option, the Government of Hungary aims to ensure the transportation of adequate liquid waste (on road), treatment and development of utilization. Hungary also aims to reduce the generation of municipal liquid waste and improve and expand sludge treatment and utilization.

The development of the wastewater collection and treatment systems has to be in harmony with other infrastructure development investments (for example, development of rainwater collection systems), to avoid extra costs caused by repeated operations in the same area (for example, re-pavement). Selection among options - as long as they comply with legal regulations - is based on long-term cost efficiency.

3. How was the best practice or tool applied?

The EU has set to provide 22.4 billion Euros (USD 32.7 billion) to Hungary, from 2007-13, to finance infrastructure upgrades, as part of the New Hungary Development Plan. Water and wastewater-related projects are among the areas of focus. These include: wastewater treatment, water quality, waste management, remediation, re-cultivation, Water Framework Directive, nature protection (NATURA 2000 areas, habitat protection, and bird protection), renewable energy, energy efficiency, sustainable consumption and environmental protection. About 200 billion HUF (USD 1.2 billion) and 1,000 billion HUF (USD 5.8 billion) is projected to be spent on water and wastewater, respectively.

Once contracting authorities have agreed to support a particular action with the help of EU funds, this project needs to be tendered according to the EU Public Procurement Directives. The type of the project and its total cost will determine whether it falls under the scope of the EU public procurement directives or, if under the agreed thresholds, it is subject to national legislation on public contracts.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

- Ministry of Rural Development (VM) since may 2010, as successor of Ministry of Environment and Water (KvVM) and Ministry of Agriculture and Rural development(FVM)
- Development Directorate of the Ministry of Rural Development; (VM FI)
- National Inspectorate for Environment, Nature and Water (OKTVF);
- Regional Inspectorates for Environment, Nature and Water (5 KÖTEVIFE)
- Environmental and Water Management Directorates (6 KÖVIZIG)
- National Park Directorates (5 NPI)

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

Several laws, governmental decrees and ministerial orders have been issued in connection with the regulatory enforcement of the implementation of the National Municipal Wastewater Collection and Treatment Program and related supporting programmes.

- Act No. LVII of 1995. about water management
- Governmental Decree No. 240 of 2000. (XII. 23.) on designation of sensitive surface water body areas from the point of view of municipal wastewater treatment
- Governmental Decree No. 50 of 2001. (IV. 3.) on rules of agricultural use and handling of treated wastewater and sludge
- Governmental Decree No. 219 of 2004. (VII. 21.) on protection of subsurface waters
- Governmental Decree No. 220 of 2004. (VII. 21.) on protection of surface water quality.
- Ministerial Decree No. 27 of 2005. (XII. 6.) KvVM on detailed controlling rules of used and wastewater discharges

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic or political constraints for BP&T application?

The National Municipal Wastewater Collection and Treatment Program considers the administrative areas of 2 436 settlements, which are obliged for providing waste water treatment services for their population. 1 023 waste water treatment agglomerations were determined in the programme, and thus in average, 2.4 settlements are in agglomerations. One of the major economic socio-economic challenge is to establish cooperation among the settlements and how the cooperating settlements are able to cover the own resources.

7. What barriers did BP&T face? Who opposed BP&T use?

The major barrier of the implementation of this BP&T was to find the own financial resources for the involved municipalities. Usually municipalities were and still are underfinanced, consequently mobilizing own resources – even only at the 15% level – is a major challenge for most of them.

Another barrier sometime is in the public procurement process, which requires selecting in all cases the lowest prized projects had to be selected, which is some cases could not cover all eligible costs of the projects thus endangering the successful completion of them.

8. How were barriers overcome?

Some of the municipalities had to sell some own properties or take up significant amount of credits from investment banks to come up with the required own recourses. These solutions heavily undermined the long term financial stability of such municipalities.

9. What opportunities and drivers for BP&T application existed?

On 1 August 2007, the European Commission approved a Regional Operational Programme for Hungary for the 2007-13 period. The Operational Programme falls within the Convergence Objective framework and has a total budget of around €4.9 billion. Community assistance through the European Regional Development Fund (ERDF) amounts to some €4.2 billion, which represents approximately 16.5% of the total EU investment for Hungary under the Cohesion Policy for 2007-13.

The Environment and Energy Operational Programme is structured along priority axes. The Priority axis 1: Healthy and clean settlements [approximately 53,1% of total funding] axis aims to improve environmental conditions of sustainable settlement development and to ensure a satisfactory quality of life, a healthy environment and better life circumstances. To achieve these objectives, intervention is foreseen among others in wastewater treatment: The implementation of the National Settlement Wastewater Collection and Treatment Programme; construction, modernisation and extension of wastewater collection and treatment systems and sludge treatment facilities; the application of environmentally-friendly small-scale technologies;

10. Who supported the use of BP&T? Did they take advantage of them?

As the programme is a national one, primarily the national government through parliamentary legislation. The programme has also received strong support from regions, agglomerations, water management and the related industrial sector as the programme made it possible to decrease the utility gaps in large extend.

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

The area covered by waste water collection systems is continuously increasing in Hungary. While in year 2002 some 56 per cents of the homes were connected to the waste water collection network, in year 2007 this figure was close to 70 per cent. This programme enabled to implement in Hungary the provisions of the EU's urban waste water directive. Due to waste water treatment plants development 14 per cent more waste water was treated in 2007 than in year 2002. Biological waste water treatment amounted to 75 per cent. The entire programme is the largest investment of Hungary in infrastructure.

As the result of the programme significant improvement of water quality was observed during the last decade at most of the rivers and lakes, especially in nutrient, BOD₅, COD and oxygen household content.

Hungary has accepted to reduce nutrient content of treated wastewater by 75 % of N and P respectively till 2019. At the end 2008 the overall reduction efficiency was 70,5 % for N and 77,8 % for P.

12. What were the major reasons for success, or failure?

The major reason of the success of the BP&T is that most of the planned investments have been completed according to the plan. In the Tisza River Basin practically all town have built either new wastewater treatment plant or in case of existing old ones these were upgraded to at least biological treatment level.

In some cases the built in capacity was higher than the technically or financially need level, thus wasting resources for the towns in question. In addition to that in some cases the selected and built in treatment technology was also not the most economic one.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

The National Municipal Wastewater Collection and Treatment Program will continue until 2013 generating further development actions in the Tisza River Basin. The National Environmental Protection Programme and the WFD related River Basin Management Plans also require additional development actions in regard to wastewater treatment. The RBMPs pointed out that by 2015 not all necessary improvement projects could be finished in the field of urban and industrial wastewater treatment.

14. Did application of BP&T result in changes towards more adaptive behaviour of stakeholders?

The national wastewater treatment programme is successful in national scale. Currently there are examples when stakeholders are still not complying with the relevant regulations and not connect to the newly built sewer system, because sewerage tariff are too high for them. Consequently paying for wastewater collection from individual septic tanks is still cheaper for them than paying for sewerage usage.

Within the National Municipal Wastewater Collection and Treatment Program (NMWCTP) bidding for projects dealing with sustainable lifestyle and campaign promoting behaviour models corresponding to the main goals of the NMWCTP.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation?

The application of this BP&T significantly contributed to the decreasing of the utility gap. It also significantly contributed to the improvement of surface subsurface water quality in the basin.

Region Name	Number of domiciles	31.12. 2004		31. 12. 2006.		31. 12. 2008.		Plan: 31. 12. 2015.	
		No of domiciles connected to sewer system	%	No of domiciles connected to sewer system	%	No of domiciles connected to sewer system	%	No of domiciles connected to sewer system	%
South-Great Plain	594 452	241 362	40,8	260 188	44,0	311 392	52,4	490 075	82,4
North-Great Plain	615 717	274 937	45,5	299 131	49,5	359 812	58,4	522 223	84,8
North-Hungary	510 562	275 165	54,2	296 628	58,5	327 199	64,1	454 742	89,1

EXAMPLE 3: Delivering sustainable water management in a changing climate

Name of the River Basin: Thames Basin
Name of the Twin-Project: TwinBas

Section I. BP&T APPLIED

1. *What exactly was the best practice or tool?*

The Environment Agency has assessed the impacts of climate change in its first Thames River Basin Management Plan. The assessment analyses the following aspects:

- Consider the change in risk, due to climate change, of not achieving the Water Framework Directive default objectives (for example no-deterioration, good status) as a consequence of the identified Water Framework Directive pressures (for example abstraction);
- Consider the impacts of climate change when identifying and appraising actions and propose appropriate adaptation of actions where necessary;
- Look for opportunities in the monitoring programme to improve the understanding of climate change trend;
- Consider the likely contribution of actions to future climate change through their impact on emissions of greenhouse gases, and propose appropriate mitigation where necessary.

2. *With what purpose and reason of its application?*

Projections of future climate from the UK Climate Impacts Programme identify that UK can expect climate changes to intensify, with the following key changes:

- All areas of the UK get warmer, and the warming is greater in summer than in winter.
- There is little change in the amount of precipitation that falls annually, but it is likely that more of it will fall in the winter, with drier summers, for much of the UK.
- Sea levels rise, with this rise being greater in the south of the UK than the north.

It is likely that the risk to not achieving Water Framework Directive objectives from a number of man-made pressures will increase as a result of climate change. The Thames is particularly vulnerable to the effects of climate change. It is already under pressure from abstraction for public supply. At times of drought approximately 80 per cent of the river flow is abstracted; climate change is likely to reduce summer flows so the need to manage abstraction will increase. Research shows that peak flood flows could increase by about 40 per cent by 2080; this could alter the current sediment regime and influence habitat and fish populations. Whilst extensive engineering solutions to flood risk are not envisaged any schemes will need to take account of the effect on ecological status. Increases in temperature and the flow regime of the Thames will mean that the natural flora and fauna will change with time.

Climate change will inevitable affect the conditions and pressures that the Water Framework Directive seeks to manage in the water environment. Further, climate change could affect the predicted effectiveness in meeting Water Framework directive objectives. In 2009 an EU white Paper described the framework to reduce the EU's vulnerability to the impact of climate change and specifically highlight the need to take climate change into account in developing the River Basin Management Plans. The European commission expects a response to climate change to include, in the first cycle, screening of the likely effects of climate change on the pressures identified under the characterization step of the river basin management process. It is also recommended that member states carry out a climate impact sensitivity analysis of 'climate check' on the programme of actions. The European commission also states that, 'in the second planning cycle, climate change impacts should be taken fully into account.

3. *How was the best practice or tool applied?*

In the first cycle of implementing the Water Framework Directive the assessment included the potential impacts of climate change on the individual pressures. These are:

- Abstraction and other artificial flow pressures
- Biological pressures (fisheries management and invasive non-native species)
- Microbiological pressures (including faecal indicator organisms)
- Organic pollution (sanitary determinand) pressure
- Nutrients pressure (nitrogen and phosphate)
- Priority hazardous substance, priority substance and specific pollutant pressure
- Hazardous substances pressure

- Acidification pressure
- Salinity pressure
- Temperature pressure
- Physical modification pressure
- Sediment pressure¹

For each of the individual pressures the assessment included a summary of how the current or proposed actions are likely to be able to deal with the changes to the pressures due to climate change (that is, how well this River Basin Management Plan is adapted to climate change). The Environment Agency has carried out a systematic screening (or 'climate check') for most of the actions which make a contribution to achieving Water Framework Directive objectives to determine if and how they are likely to perform under future climate conditions – or where we need further adaptation, to seek alternatives or to develop additional actions.

The screening helps ensure any increased risk due to climate change does not compromise the benefit of the actions in terms of achieving Water Framework Directive objectives. Because of the uncertainties concerning the impacts of climate change on the water environment there is a need to choose actions that can cope with a range of future climate conditions. There are a number of viable cost-effective adaptation approaches to apply. Applying these approaches will minimise risks associated with implementing actions whose cost-effectiveness at achieving Water Framework Directive objectives could be compromised by climate change even in the face of high uncertainties. These adaptation options are normally referred to as win-win, no-regrets, low-regrets, and flexible/adaptive management. Actions may include more than one of these approaches.

4. *Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?*

The BP&T was applied by the Environment Agency

5. *Were any regulatory enforcement and incentive mechanisms used to support BP&T application?*

No.

However, the European Commission has emphasised that member states should take climate change into account when implementing the Water Framework Directive. The EU White Paper 'Adapting to climate change: Towards a European framework for action' describes the kind of action that can be best delivered at EU level to deal with the impacts of climate change. The White Paper sets out a framework to reduce the EU's vulnerability to the impact of climate change and specifically highlights the need to take climate change into account in developing the River Basin Management Plans and the role the river basin management process can play in delivering sustainable water management in a changing climate. A policy paper on the need for, and approach to, climate change adaptation through implementation of the Water Framework Directive has been endorsed by the EU Water Directors.

6. *What were the outcomes of the BP&T?*

Based on the assessment the majority of the actions proposed within the Thames River Basin Management Plan are identified as no regrets approaches. These are actions that are proposed and justified in the river basin management planning process due to current pressures. They will also bring benefits under future climatic conditions, and should, therefore, rightly be a favoured option. In several cases the actions proposed are highlighted as flexible adaptation – this means that as the climate changes the action can be adapted to cope with these changes. In terms of looking at future cycles of the river basin management process it is recommended that these actions in particular are revisited to assess whether adjustment is needed to cope with new climatic conditions. Few actions were identified as regrets actions. However one area of potential regrets is in the citing and performance of infrastructure within floodplains. Under climate change the frequency and severity of flooding is likely to increase, and it is important that any infrastructure (for example waste water treatment) is located or designed to provide business continuity with this in mind.

¹ The assessments are only qualitative and give no indication of the severity and timescale over which changes may occur.

Figure 1. summaries the ability of actions to perform under future climate change:

Summary of ability of actions to perform under future climate for abstraction and other artificial flow	Mechanism	How is action able to cope with climate change?
Name of action		
Preventing damage to the environment from new development, which helps to achieve good status for surface and groundwater and reduce the effects of flooding.	The Environmental Impact Assessment Directive (85/337/EEC) Town and Country Planning (Environmental Impact Assessment) Regulations 1999 (SI 1999 No. 293) Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999	Regrets – potentially development may add to risks of flooding and drought under climate change if not adequately adapted. Currently there is low confidence that all new developments will be properly adapted to future climate. No regrets options (for example sustainable drainage systems or high levels of water efficiency should be sought).
Prevent unauthorised abstraction.	Abstraction of water prohibited without a licence with certain exemptions ¹ under Water Resources Act 1991 s24.	No regrets – preventing unauthorised abstraction helps us manage water resources now and under future climate.
Managing abstraction such that it is sustainable, efficient and within environmental limits.	Conditional licences for water abstraction and conditional licences for impoundment under Water Resources Act 1991, Chapter II of Part II (as amended by Water Act 2003) Time limited abstraction licences	No regrets – managing abstraction improves our ability to manage water resources now and under future climate. Flexible adaptation – a flexible licensing system means that abstraction can be modified as necessary as the climate changes through review of licenses.
Reduce unacceptable abstraction impact.	Amend or revoke abstraction licences often requiring compensation.	No regrets – reducing abstraction improves our ability to manage water resources now and under future climate. Flexible adaptation – a flexible licensing system means that abstraction can be modified as necessary as the climate changes through review of licences.
Reduce unacceptable abstraction impact through operational arrangements for example for river support schemes.	Agreements under Water Resources Act 1991 s20, 20A and 158.	No regrets – reducing abstraction improves our ability to manage water resources now and under future climate. Flexible adaptation – operational arrangements can be amended further as necessary as the climate changes.
Tighten controls in times of drought.	Drought orders and permits under Water Resources Act 1991, Chapter III of Part II.	No regrets – controls help us manage droughts now and under future climate Low regrets – action may also be needed to highlight increased risk of drought under climate change (and the higher natural probability of drought than that which we currently plan for) and prepare abstractors.
Mitigation work.	Direct action to maintain, improve/ increase flows. Will depend on natural flow conditions.	Flexible adaptation – approach may not be able to withstand future climatic conditions and will therefore need to be reviewed from time to

Section II. CONTEXT FOR BP&T IMPLEMENTATION

7. *What were the major socio-economic or political constraints for BP&T application?*
8. *What barriers did BP&T face? Who opposed BP&T use?*
9. *How were barriers overcome?*
10. *What opportunities and drivers for BP&T application existed?*

Drivers for the application were the scenarios for future climate: Change in precipitation and temperature leading to a decrease in water resources combined with increased water abstraction for domestic industry agricultural sectors.

The assessment revealed that a number of adaption to climate change actions were estimated as a) win-win options, i.e. cost-effective actions that have desired results in terms of minimizing the climate risks or exploiting potential opportunities but also have other social, environmental or economic benefits; b) No-regrets option, i.e. cost-effective adaptation actions that are worthwhile whatever the extent of future climate change; c) Low-regrets option, i.e. adaptive actions where the associated costs are relatively low and where the benefits, although mainly met under projected future climate change, may be relatively large.

11. *Who supported the use of BP&T? Did they take advantage of them?*

Section III. PERFORMANCE and EFFECTIVENESS

12. *What was the degree of success, or failure in BP&T application in the river basin?*
13. *What were the major reasons for success, or failure?*
14. *Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?*
15. *Did application of BP&T result in changes towards more adaptive behavior of stakeholders?*
16. *Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?*

References:

Environment Agency (2009): *River Basin Management Plan, Thames River Basin District. Annex H Adapting to climate change*. London.

Example 4: “Volga Revival” Federal Programme

Volga River Basin, Russia
CABRI-Volga Project

Section I. BP&T APPLIED

1. *What exactly was the best practice or tool?*

The “Volga Revival” (VR) federal target program² was implemented in the Volga river basin during the period 1998-2004. It was enacted by the special decree of the federal government. It was terminated earlier than planned, i.e. in 2010; many experts are concerned about its termination and suggest the program to be renewed. It is based on integrated water resource management approaches, on the principles of cross-sectoral and multi-scale coordination of water management within the entire river basin.

2. *What was the purpose and reason of its application?*

VR federal program has been among the most important national programs aimed at environmental amelioration and sustainable development at the basin level. Its major goal has been in ‘improvement of ecological situation and conservation of natural complexes of the Volga Basin in order to create favorable conditions for its population’; the priority was given to its measures aimed at improvements in human health, well-being and quality of life.

VR has been a quintessence of the preceding multiple efforts undertaken from the beginning of the nineties by various stakeholders at different levels towards environmental amelioration in the Volga Basin. A number of regional and local projects, programmes and actions plans such as “Oka – Clean River”, “Volga Delta”, “Socio-cultural development of the Tver oblast – the Great Watershed”, “Development of economic complexes of the Great Volga region” and others had been executed. Several civil society initiatives had been undertaken as well. For example, the public committee ‘Save the Volga’ was involved in broad dissemination of information about the alarming ecological situation in the basin and in promotion of public awareness. The Ecological Parliament for the Volga Basin and the Northern Caspian established in 1990 committed itself to finding practical means to ecological problem solving and to support of the local public rights for ‘good’ environment; it was closely involved in development of the Volga Revival Program. In 1993, the project of Volga Basin Agreement was developed.

3. *How was the best practice or tool applied?*

The development of VR program had several pilot and preparatory phases during 1994-1998. It was implemented in all Volga sub-basins – Upper Volga, Middle Volga, and Lower Volga and Delta. Corresponding regional programs had been introduced by the federation subjects located in the Volga basin.

VR was realized according 10 major directions organized in the following sub-programs: 1) protection and conservation of water bodies; 2) enhancing fisheries productivity in reservoirs; 3) development of basin wide environmental monitoring and GIS systems; 4) improvement of human health, reduction of water quality depended deceases; 5) environmentally benign industrial development; 6) environmentally benign development of agriculture; 7) municipal development, including municipal water, heating, sewage management; 8) forest and biodiversity conservation and natural protected areas; 9) continuous ecological education, awareness and information; 10) legal, scientific and technological infrastructure.

The set of perspective quantitative VR targets for environmental amelioration in the Volga basin was developed. They include: 1) termination of untreated wastewater discharge into natural water bodies; 2) reduction of sewage water discharges by 30 percent; 3) provision of safe drinking water supply; 4) reduction of drinking water use by industries by 35 to 40 percent; 5) increase productivity of fisheries in Volga-Kama reservoirs by 2; 6) promote migrating and semi-migrating fish reproduction by 30 to 40 percent; 7) realise optimum operation regimes on the reservoirs of the Volga-Kama cascade; 8) form the network of special nature protected areas in the Volga Basin accounting up to 3 percent of its total area; 9) upgrade and construct storm water collection systems in towns and big industrial sites; 10) reduce air pollution from stationary sources by 1.9 times; 11) reduce auto-transport air pollution by 1.7 times.

² The full title of VR: “Rehabilitation of ecological situation in the Volga river and its tributaries, their restoration and prevention of degradation of natural sites of the Volga basin for the period up to 2010”.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

The participants of VR Program include: 1) administrations of 39 federation subjects which are entirely or partially located in the Volga basin; 2) 11 ministries and agencies; 3) about 60 research institutes and organizations; 4) NGOs. It was coordinated by the RF Ministry for natural resources; its Directorate was located in Nizhny Novgorod.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

VR is a voluntary programme for participation, and thus no enforcement mechanisms were applied. Allocation of additional funding for its implementation is an incentive for its participants.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

1) Low public awareness and participation; 2) poverty; 3) social problems, high mortality rate and lower life expectancy than in the EU; 4) problems during political system transition to democratic society; 5) corruption; 6) a number of institutional problems relating to interactions between federation-regions-locals; 7) deficiencies in law enforcement; 8) pricing distortions due to subsidies; 9) insufficient coordination and partnerships among actor groups; 10) deficiencies in strategic planning and implementation; 11) poor investment opportunities; 12) financial shortages; 13) violation of financial discipline and delays in funds transfers against planned targets; 14) national financial crisis of second half of 1990s

7. What barriers did BP&T face? Who opposed BP&T use?

1) Loopholes in information management: lack of reliable data and user-friendly information; 2) problems in environmental standard setting; 3) gaps in water governance at basin level; 4) coordination problems at the basin level; 5) overlaps in water management functions between government authorities; 6) uncertainties in domestic legal framework regulating adaptation to climate change, and lack of clear adaptation strategies; 7) ineffective use and management of natural resources; 8) deficiencies in environmental monitoring at the basin level; 9) low level of innovations and technological modernization in water sector; 10) insufficient incentives for installation of water treatment facilities; 11) insufficient incentives for water savings in households; 12) insufficient economic instruments to mobilize and allocate funds to water sector

No direct opposition is identified.

8. How were barriers overcome?

Many problems and constraints remained unsolved, but VR contributed to the process of further enhancement towards: 1) compilation and processing of vast data on the Volga; 2) providing knowledge base for modernization of environmental standards; 3) testing models for better coordination (vertical and horizontal) at the basin level; 4) application of IWRM; 5) knowledge about positive and negative impacts of climate change and adaptation to climate change; 6) renovation of river basin monitoring system; 7) installation of new water treatment facilities and upgrade of the existing ones; 8) testing the system of financial allocation national-regional-local for environmental programs implementation; 9) mobilization of funding from various sources.

9. What opportunities and drivers for BP&T application existed?

1) economic development in the Volga regions; 2) transition to new political systems and democratization in Russia; 3) institutional reforms in water sector; 4) decentralization and new role of the regions; 5) technological change; 6) globalization; 7) schemes of complex use of water resources are established (but still there are certain loopholes in their development).

10. Who supported the use of BP&T? Did they take advantage of them?

All major stakeholder groups supported the VR program.

Section III. PERFORMANCE and EFFECTIVENESS

11. *What was the degree of success, or failure in BP&T application in the river basin?*

Despite early termination of the Volga Revival, a number of its sub-programs demonstrated good results and certain improvements in ecological situation and in environmental problem solving in the Volga basin. This program is assessed by experts as a unique example of institutional coordination based on strong scientific background and inputs from research community. But, it faced a number of implementation problems caused by a complex of financial and institutional reasons. Its effectiveness can be assessed as a combination of success and failures. At the same time it is regarded as an important practical lesson for future planning and coordination of water management at the river basin level, and for enhancing bottom-up initiatives in environmental amelioration. It created common approaches and perceptions of existing problems and means for solving them.

12. *What were the major reasons for success, or failure?*

Among the major reasons for success were: 1) strong scientific basis; 2) strategic programming experiences accumulated during the Soviet system planning which were widely applied; 3) earlier experiences in IWRM application at the river basin level

Among the major reasons for failures were: 1) shortages in funding; 2) failures in resource mobilization; 3) corruption; 4) low accountability before the public changes in approaches of the RF government to national programming which resulted in reducing the overall numbers of national programs, and VR has been among them; 5) VR program early termination; 6) many goals set by the VR were too ambitious, and, thus, unrealistic to achieve. According to expert assessments the overall design of the program and its targets were good as general objectives. There was certainly a kind of vision behind this initiative, but it was not clearly formulated and therefore it was not always clear what socio-economic purpose or result of the proposed measures was.

13. *Did application of BP&T result in further development of capacity (regulatory, administrative, human) for adaptive water governance in river basins?*

Yes. It resulted in strengthening in practice the coordination and cooperation among multiple stakeholders towards ecological amelioration in the Volga. Especially important results were in: a) development of interaction between scientific community and decision-making; b) coordination of actions between various federation subjects located in the basin; c) lessons in application of strategic planning and programming activities based on IWRM for large river basins were learned; d) testing the application of diversified coordination tools in water management within the river basin, and it is regarded as a considerable success in programming experiences.

VR main environmental goals were achieved through: 1) integrated water management approaches; 2) application of basin management principles to the entire Volga; 3) attempts to combine environmental problem solving with socio-economic development within the river basin; 4) application of vertical scaling and coordination of actions at federal, regional (republics, *oblasts*, *kray*), local and municipal levels, and corresponding territorial programmes were developed and coordinated in most federation subjects in the Volga Basin using the same conceptual basis; 5) cross-sectoral coordination; 6) VR's coordinating status towards other government science and technology programmes and action plans in effect within the basin area; 7) coordination of resource allocation mechanisms and vertical coordination of financial transfers³ (the federal budget was responsible to cover 8 percent of VR total budget, the regional and local administration - 57 percent, and other sources - 35 percent).

13. *Did application of BP&T result in changes towards more adaptive behavior of stakeholders?*

Yes. As a result of VR implementation discharges of polluted waters by *industrial sources* declined. For example, emission of untreated wastewaters into the Oka river by GAZ automobile plant, the largest polluter in Nizhny Novgorod, were considerably reduced. Before the VR program the GAZ share in water pollution of the Oka and the Volga had been up to 50-90 percent, while after modernization it declined lower than 50 percent. Its renovation has been a part of VR program financed by GAZ. New corporate programs of water savings had been introduced at a number of large industrial enterprises and reductions of water consumption through installation of closed-cycle water supply systems were reported.

Municipal sources: About 54 waste water treatment plants (in total, VR commissioned the construction of 80 plants), mainly for municipal waters purification, were put into operation in Ufa, Kazan,

³ The Volga Revival was budgeted by its concrete objectives and by ministries, or administrations.

Saratov, Perm, Togliatti, Vladimir, Yaroslavl and Kaluga. In 13 regional centers of the Nizhny Novgorod oblast new municipal treatment plant were put into operation or renovated. For example, new modern plants were built in Gorodets (17 thousand cubic m./day), in Pervomaisk (7 thousand cubic m./day), while in Arzamas the treatment facility had been modernized (150 thousand cubic m./day). A number of small towns had put an end to direct untreated waste water discharge into the Volga. In general, during this period the construction and upgrading of waste water treatment facilities in the basin contributed to daily waste water discharge reduction up to 3.52 million cubic m.

14. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Yes. A number of Volga Revival sub-programs demonstrated good results in environmental amelioration. For example, in 1995-2002 waste water discharges in the Volga basin were reduced by 15 percent.

Example 5: Implementation of Environmental Code in Sweden

Name of the River Basins: Norrstrom
Name of the Twin-Project: Twinbasin

Section I. BP&T APPLIED

1. **What exactly was the best practice or tool?**
Implementation of the Environmental Code in Sweden 1999
2. **With what purpose and reason of its application?**
To integrate and enhance the environmental responsibility for every company and private person
3. **How was the best practice or tool applied?**
By law in Sweden
4. **Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?**
Includes all parts and are a responsibility for all, and were implemented after a approximately 5 year long process involving all stakeholders
5. **Were any regulatory enforcement and incentive mechanisms used to support BP&T application?**
The Environmental Code is a regulatory framework for both authorities, companies, organizations and private persons

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. **What were the major socio-economic, or political constraints for BP&T application?**
There are no general constraints for the responsibility according to the Environmental Code, it is the impact on the environment that is defining the constraints
7. **What barriers did BP&T face? Who opposed BP&T use?**
Many companies etc were afraid that their responsibility should have effect on their production
8. **How were barriers overcome?**
Consensus and majority for the implementation in the Parliament.
9. **What opportunities and drivers for BP&T application existed?**
General consensus in Sweden that environmental responsibility should follow all activities.
10. **Who supported the use of BP&T? Did they take advantage of them?**
All environmental authorities and environmental organizations.

Section III. PERFORMANCE and EFFECTIVENESS

11. **What was the degree of success, or failure in BP&T application in the river basin?**
An ambitious environmental law which states the full responsibility for the operators environmental impact is fundamental for all environmental work and integration in different activities.
12. **What were the major reasons for success, or failure?**
The major success is increased care and control of environmental impact
13. **Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?**
Yes, particularly among the operators with the highest risk or impact on the environment
14. **Did application of BP&T result in changes towards more adaptive behavior of stakeholders?**
Yes, the adaption to full responsibility for environmental impact is much more implemented today.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Rather has the full responsibility for environmental impact contributed to more problem-solving today.

Example 6: Red River Basin Planning Management Board, RBPMB: Introduction of the Red River Basin Organization

Name of the River Basins: Red River
Name of the Twin-Project: ASEMWaterNet

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

River basins have long been perceived as an appropriate unit of planning and management (Molle 2009). Integrated Water Resources Management (IWRM) implemented through River Basin Organizations (RBOs) despite ambiguities is often considered a set of 'best practices' (Biswas et al. 2005).

This example looks at the latest incarnation of a basin organization for the Red River in Vietnam. The Red River Basin Planning Management Board (RRPMB) was established in April 2001; its mandate was clarified a few years later in 2004 (Molle and Hoanh 2007).

2. With what purpose and reason of its application?

RBOs in Vietnam were justified as a way to implement the set of best practices promoted under IWRM banner. According to the Ministry of Natural Resources and Environment (MONRE) declaration in 2006:

"Water resources exploitation and use should be made in an integrated and multi-purpose manner, harmoniously incorporating interests of individual sectors, localities and communities in a global inter-relationship between upstream and downstream regions and between different sectors, to ensure balanced, focused, high socio-economic efficiencies and environmental protection". (MONRE 2006 cited in: Bach Tan Sinh et al. 2010)

3. How was the best practice or tool applied?

The history of establishment of the RBO was complex and most of the 'application' so far has been in sorting out institutional problems. After few years at full basin level it was still unclear what issue should the organization should be addressing: *"At this stage the risk arose that IWRM might appear as a solution looking for a problem"* (Molle and Hoanh 2007).

This led to questioning whether or not 'best practices' as promoted by international agencies had paid sufficient attention to problems, needs and interests of actors within Vietnam. Molle and Hoanh warn that—

"Although there are incentives for national decision-makers, as well as for international consultants, to rely heavily on these general concepts, they run the risk to generate proposals that will later – if implemented – find themselves at odds with reality" (Molle and Hoanh 2007)

Subsequent developments shifted focusing to sub-basin issues and creation of river sub-basin committees. These applications appear more promising.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

Initial establishment of the RBO was supported by Technical Assistance packages from the Asian Development Bank (ADB) to Ministry of Agriculture and Rural Development (MARD). Initial steps were slow suggesting MARD was not very committed to the idea and reflecting modest resources allocated to the RBO. It was only in second half of 2003 the RBO ran 25 workshops with agencies in the 26 provinces with territory in the basin to prioritize issues.

In later years certain planning and management functions were redistributed to the new Ministry of Natural Resources and the Environment (MONRE).

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

The recent round of policy reforms in water sector began with the 1998 Law on Water Resources and the creation of an apex body (National Water Resources Council) in 2000 and the first 3 river basin organizations – including one in Red River – in 2001. Article 20 of the 1998 Water Law states:

"The regulation and distribution of water resource for use purposes must be based on the planning of the river basin and the real potential of the water source and must ensure the principle of fairness, reasonability and priority in the quantity and quality of water for living." (Molle and Hoanh 2007)

River basin management in MARD was initially assigned to its Institute of Water Resources Planning which oversaw initial establishment of the RBOs. Most operational work, however, was under the Department of Water Resources and Hydraulic Work Management (DWRHWM).

These reforms occurred prior to the creation of the MONRE in 2002 after which a history of turf wars between MONRE and MARD including competing decrees got in way of rather than supported application. Consequent legal tangle requires several laws to be revised and is taking time to be resolved.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. *What were the major socio-economic, or political constraints for BP&T application?*

Main political constraint was that RBOs sub-basin RBO structures became pawns in inter-ministerial competition: between the long established Ministry of Agriculture and Rural Development (MARD) and the newly created MONRE. MARD continued to be responsible for operation, construction and exploitation of water resources while MONRE took over most regulation and management functions – though the split was not functionally perfect. A 2003 decision by MONRE defined its Department of Water Resources Management (DWRM) as responsible for *"function to assist the Minister in implementing state management of water resources including rain water, surface water, groundwater, sea water in river basins, in land and sea territory of the Socialist Republic of Vietnam"* with major overlaps with MARD's DWRHWM.

IN 2006 MONRE released its *"National Water Resources Strategy towards the year 2020"* emphasize river basin planning and management which they controlled claiming that the Law on Water Resources has not been properly applied and is no longer suitable. MARD responded with its own *"Strategy for sustainable national water resources development and management"*

Thus for several years each Ministry issued series of contradictory decrees and parallel structures attempting to maintain or expand authority and power. These were important political constraints on BP&T application.

7. *What barriers did BP&T face? Who opposed BP&T use?*

As discussed above the key initial barriers included inter-Ministerial competition and lack of clear relevance of the 'whole-of-the-basin' approach promoted by the initial Technical Assistance Packages from ADB to Vietnamese government agencies in the basin.

When donors exit always risk activities ceased because lack of real ownership or commitment within Vietnam to changes driven largely from outside.

8. *How were barriers overcome?*

Some weren't; others were by shifting scale to sub-basins and paying more attention to necessary negotiation between with and among pre-existing powerful organizations. In 2004 pilot activities began in the Cau and Day-Nhue sub-basins, the delta and some upland provinces. The Day sub-basin organization was officially set up in December 2005 and the Cau sub-basin organization in May 2006. In effect the RRBO became a parent organization that was supposed to support more local activities.

The politics did not end here. After further negotiations and changes in policy direction donor funded activities in the Day sub-basin activities were carried out by MONRE independently of the sub-basin organization chaired by MARD – the exact opposite of 'integration' as espoused by key actors and legislation (Molle and Hoanh 2007).

The projects making up this BP&T were re-designed and re-negotiated several times overcoming some barriers and recreating others.

9. *What opportunities and drivers for BP&T application existed?*

Technical assistance packages were important initial drivers. They were backed a global discourse on IWRM, RBOs and water law reforms which had its adherents within the bureaucracy in Vietnam as well as various foreign cooperation agencies.

10. *Who supported the use of BP&T? Did they take advantage of them?*

The Asian Development Bank was the main initial proponent of IWRM reforms and introduction of RBOs. MONRE supported the reforms as a way to legitimize its role. As idea become more operational with shift to more local sub-basin activities number of actors showing interest expanded (Bach Tan Sinh et al. 2010).

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

Largely a failure.

12. What were the major reasons for success, or failure?

Failure of those pushing for reforms from outside country to consider existing bureaucratic structures and interests as well as actual basin needs and integration issues leading to inter-agency competition and irrelevance of activities. As Molle & Hoan note:

“Some Vietnamese officials feel that TAs were prepared by international consultants without taking into account the complexity of Vietnamese institutional structure and its weak legislation.”

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

Not much, mostly a distraction, at least until sub-basin activities began to be implemented.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

Not much. One adaptive bit might be the refinement of scale to levels more appropriate for provincial planning agencies.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Not so far.

A key, cautionary, message from this example is that what are ‘commonly perceived as BP&T’ like ‘introduce RBOs to implement IWRM’ may turn out to be a far cry from ‘best practice’, when they are pushed in by external actors with inadequate attention to real needs, capabilities and interests of existing organizations in a place.

Example 7: Kosi River Basin Management Strategy (2007), Nepal

Name of the River Basins: Brahmaputra-Ganges in Nepal, Assam, Bhutan
Name of the Twin-Project: BRAHMATWINN

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

The practice is the implementation of a pilot program, which has an integrated water resource and river basin management approach guided by the National Water Plan. The strategy plan aim at improving people's livelihoods significantly in sustainable manner by ensuring people's rights' over water and related resources, promoting socio-economic development for the benefit of all people while maintaining the ecological balance in the Kosi River Basin. Main objective was to explore partnerships and the formulation of a vision for Kosi River Basin Management (KBRM).

2. With what purpose and reason of its application?

Integrated water resource management (IWRM) acknowledges that freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment. It proposes that each river basin system shall be managed holistically and in a systematic manner so that freshwater utilization is sustainable to ensure conservation of resources and protection of the environment. This is the first initiative of its kind and the main objective was to explore partnerships and the formulation of a vision for Kosi River Basin Management (KBRM). Participants of the workshop included representatives from the government, NGOs, the private sector, and experts working in development, water resources, and conservation.

3. How was the best practice or tool applied?

The conceptualization of IWRM in WWF Nepal initiated with the participation in the "Network of Asian River Basin Organizations (NARBO)" training in Sri Lanka in April 2005.

A series of meetings were held with the Water and Energy Commission Secretariat (WECS) in Kathmandu to formalize the effort to work together in river basin management, which finally resulted in a formal meeting with stakeholders on January 2007, where the commitment of the initiative has been agreed. In 2010 a national level stakeholders' consultation workshop on Kosi River Basin Management Strategy Plan to gather all stakeholders, and ensure the effective implementation of the plan took place. At the workshop, Government authorities, representatives of NGOs, INGSs, UN agencies, think tanks and academics expressed their suggestions on the draft strategic plan.

The plan has been prepared with the concept of three pillars of integrated Water Resource Management namely: economic efficiency, environmental sustainability and social equity with 10 years vision, from 2011-2021.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

The program is initiated by Water and Energy Commission Secretariat of the government of Nepal (WECS), a Government Apex body for water resources and WWF Nepal.

The program will be implemented with active involvement of local governmental and non-governmental organizations in a decentralized system as envisaged under the National Water Plan 2005.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

For the first time in Nepal, field piloting of National Water Plan was initiated to translate the policy into practice.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

One of the challenging tasks of the National Water Plan, Nepal (2005) is the integration of all crosscutting sectors as well as individual water-related traditional subsectors.

7. What barriers did BP&T face? Who opposed BP&T use?

Unknown

8. How were barriers overcome?

Integration of different sectors could be achieved due to meetings and involving various actors in the development of the strategy.

9. What opportunities and drivers for BP&T application existed?

The participants of the workshop welcomed this innovative and joint initiative of WECS and WWF Nepal. They also provided valuable suggestions to move ahead in managing the Kosi River basin. WECS and WWF Nepal expressed their commitment to work with other partners and stakeholders in its management.

10. Who supported the use of BP&T? Did they take advantage of them?

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

In 2010 a major milestone has been achieved– the Kosi River Basin Management Program, the first field piloting of the National Water Plan 2005.

State of 2010:

- Two sub basin offices established and functional for field Implementation
- KRBM Strategic Plan prepared in wider consultation with stakeholders
- KRBM Cell established in WECS
- Fund raised for three year field implementation to showcase first field pilot of IWRM as prioritized by NWP 2005 in Kosi.

12. What were the major reasons for success, or failure?

Good monitoring, the document “From Policy to Practice” is a process documentation of WECS and WWF’s joint initiative to first field piloting of IWRM approach as prioritized by the NWP 2005. This document explains the effort to translate policy into practice by showcasing Koshi River Basin Management Program as a model for conservation and wise use of water and its resources to secure life and livelihoods of generations to come.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

This initiation on KRBM will generate the necessary knowledge base on resources within the Kosi River Basin to ensure its wise use.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

- Cannot be assessed now, but KRBM includes Awareness Materials and trainings:
- Water conservation and multiple use methods were introduced to the local Communities.
 - Prepared more than 3000 Eco Club students as young water leaders to raise awareness on river basin and environmental management
 - Field demonstration site was established as a learning center for the local communities to learn and share experiences on water conservation and multiple use.
 - Introduced Non Timber Forest Product/High Value Crop (NTFP/HVC) based livelihood alternatives and promoted market linkage in Siku Catchment to improve the livelihood of local communities.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

The ten year KRBM strategic plan is being prepared by WECS in consultation with wider stakeholders to operate the IWRM principle as prioritized by NWP 2005.

http://assets.panda.org/downloads/final_policy_practice.pdf

Example 8: Lukoil Energy Company: Implementation of corporate Environmental Security Programme in the Volga Basin, 2004-2008

Volga River Basin, Russia
CABRI-Volga Project

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

From the beginning of the 2000s large companies in Russia started to actively incorporate “environment” into their strategic corporate planning and sustainable development policies. One of the examples of such approach is the LukOil Environmental Security Programme 2004-2008. It is applied in the major four regions of its activities in Russia, including the Volga region. The next strategic environmental program by LukOil was adopted for the period 2009-2013.

2. What was the purpose and reason of its application?

This program had three major purposes: a) implementation of measures at company’s facilities aimed at reduction of negative impacts on environment, including water use and polluted water discharges; b) producing the environmental-benign products; c) prevention and mitigation of accidental oil pollution of water bodies.

Among the important reasons – consolidation of LukOil ‘green image’ which was especially important for enhancing its market competitiveness and exports; contribution to green economies was important for the company; changes in corporate behavior were introduced in response to new national and regional environmental regulations.

3. How was the best practice or tool applied?

Lukoil Environmental Security Programme 2004-2008 was applied in the Volga basin - in the middle Volga, Lower Volga and Delta areas, and in the coastal regions of the Caspian Sea. This program integrated six basic elements, including ‘*clean water*’, *air and climate*, *wastes*, *land re-cultivation*, *eco-management* and *environmental monitoring*. Corporate environmental management system was introduced by LukOil, and it is constantly upgraded. Step by step strategy and cross-cutting top-down ecological planning for all facilities was enacted. Ecological verification and reporting within each of LukOil industrial projects was applied. Internal ecological control of its operations and development of environmental monitoring was innovative tools.

Application of zero-discharge principles was enforced at its offshore operations. Special attention in the Lower Volga with its unique and fragile ecosystems was paid to biodiversity conservation. During the last decade the company realized the project for sturgeon reproduction in the Lower Volga with application of biotechnology methods.

Enhancing the ecological awareness, education and culture was among key LukOil priorities in the Volga region. Under its environmental program the ecological education in schools was underway, and competitions for ecological, social, and cultural projects were organized. The company provided grants for high education. Organization of eco-tourism was among tools. Urban planning and campaigns for planting trees and territories rehabilitation in the Volga cities were widely supported: for the 450-year anniversary of the Astrakhan city the new landscape designing was initiated by LukOil.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

a) The major actor applying this BP&T is the LukOil energy company: All its facilities in major sectors implement this program.

b) LukOil maintained interactions with the local public in the regions of its activities. Civil society was involved in discussion of its both environmental programmes. Public debates were held with participation of the local public, experts, NGOs, executive and legislative authorities, other water-users. As a result, among issues suggested to be incorporated in the last environmental programme were recommendations to introduce: a) preventive approach to environmental management, b) risk assessment and risk management practices; and c) envisage greater flexibility and adaptability of the programme in response to major environmental and socio-economic changes and trends. In total about 78 recommendations from the public were received and processed.

c) LukOil developed partnerships with the local environmental authorities and municipalities in the regions of its operation; lobbying with the regional authorities in the Volga regions – Privolzhsky Federal District, and Southern federal District was widely spread.

15. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

The domestic regulatory practice in Russia envisages direct enforcement mechanisms: environmental penalties in the form of environmental fines for polluted waters discharges above the allowable norms that are fixed for particular companies and its facilities. Strict control over meeting the norms and reporting procedures are required from business; it stimulates compliance with the norms and pollution reduction.

New regulatory provisions presupposing environmentally benign behavior of business companies were introduced recently. In the water sector they include: new rules for concluding the water-use agreements between river basin regulatory authorities and business companies; new format for calculating the level of payments for negative environmental impact, including negative impact on water resources. The increased levels of payments for water-use stimulate introduction of water recycling technologies, reductions in water-use and in water losses.

Such instrument as polluter pay principle (PPP) was introduced in the beginning of 1990s; however, its application in practice is not effective enough to provide real incentives for polluters for installation of new purification facilities and modern equipment.

Norms for greenhouse gases emission discharges by enterprises during 2008-2012 were introduced; in response to the latter the climate change strategy was developed by LukOil, and it was incorporated into its corporate sustainable development vision. The priority has been on GHG emission reductions, but later it was supplemented by climate change adaptation measures.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

16. What were the major socio-economic, or political constraints for BP&T application?

1) Low public awareness; 2) corruption; 3) political lobbying with constituencies; 4) loopholes in information management; 5) pricing distortions due to subsidies; 6) deficiencies in strategic planning and implementation; 7) insufficient coordination and partnerships among actor groups; 9) overlaps in water management between government authorities; 10) shortages in systematic multihazard risk management; 11) uncertainties related to domestic legal framework regulating adaptation to climate change; 12) not enough incentives for applications of new tools in water management; 13) numerous administrative barriers

17. What barriers did BP&T face? Who opposed BP&T use?

1) low public participation 2) administrative barriers 3) loopholes in water governance and institutional settings at basin level; 4) corruption
No direct opposition is identified so far; however competitiveness among businesses is strong

18. How were barriers overcome?

LukOil put a great deal of efforts to enhance local public awareness. It adopted the corporate principle of transparency for environmental information based on obligatory dissemination of ecological data. Its environmental programmes were a subject of a dialogue with the public: in the Volga Basin the public hearings of its last environmental programme were held in Volgograd and in Astrakhan. In its local environmental campaigns it targets active public participation.

19. What opportunities and drivers for BP&T application existed?

Recent drivers external to water sector included: 1) new investment opportunities; 2) national economic modernization; 3) globalization and new markets; 4) rapid formation of middle class in Russia

New and progressive water governance frameworks were recently introduced in Russia, and they were applied in the Volga regions.

Development of domestic institutional capacity for wider participation and coordination among actors, including businesses was among recent trends. New national legal framework under the RF Water Code was introduced: it presupposed incentives in river basins for wider business involvement in green economies. It also envisaged stronger interactions and coordination among end-users, establishing partnerships between the government authorities and business, among business and local communities. Government-business partnerships are enhanced.

Environmentally benign behavior of business contributed to consolidating business competitiveness; especially it refers to large energy export oriented companies, such as LukOil.

20. Who supported the use of BP&T? Did they take advantage of them?

Interactions and cooperation with the RF Ministry for Emergencies were established in oil spills prevention and mitigation. Joint training courses and emergency prevention field tests are regularly organized. Regular contacts were maintained with the RF Ministry for Natural Resources.

Astrakhan and Volgograd oblast authorities in the Volga basin developed strategic partnerships with LukOil.

Partnerships with Gazprom and Rosneft in the Caspian Sea oil and gas developments, and environmental amelioration in the coastal areas were among other examples.

Section III. PERFORMANCE and EFFECTIVENESS

21. What was the degree of success, or failure in BP&T application in the river basin?

The LukOil Environmental Security Programme 2004-2008 implementation in the Volga basin was quite a success.

22. What were the major reasons for success, or failure?

Among the major reasons for success were 1) wider application of corporate principles of environmental responsibility; 2) increase in LukOil environmental expenditures – more than by two-fold during 2004-2008. Total environmental expenditure during this period was about 1 billion USD. Water protection accounted for 11.2% of total environmental expenditures, while the major part of funds were spent in emergencies prevention and management – 43,4% and in air emission control – 31.9%; 3) much attention was given to further development of public relations, and taking part in various domestic and international partnerships (Global Compact, networking within the professional unions, international conferences).

23. Did application of BP&T result in further development of capacity (regulatory, administrative, human) for adaptive water governance in river basins?

Yes. It resulted in further strengthening the corporate capacity towards more adaptive water governance in the Volga basin.

The corporate management system for emergency oil spills prevention in the Volga Delta and coastal areas was seriously upgraded; the system of technical emergency training, including rescue and rehabilitation during extreme weather events, was adopted. LukOil was a partner in the joint international project aimed at organization of the Training Center (about 2.5 thousand trainees annually) for offshore oil and gas developments which is located in Iliinka, Astrakhan oblast in the vicinity of the company's Caspian fields.

Internal corporate standard "System of ecological control at production facilities. Normative rules for development phase" was introduced.

Other directions in corporate capacity building included introduction of voluntary ecological control, and voluntary ecological monitoring of the most fragile ecosystems in the vicinity of LukOil developments – in the Volga Delta and at the Caspian Sea, near the offshore production sites; there were plans to introduce satellite environmental monitoring.

24. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

Yes. As a result of this corporate program implementation 2 major objectives were met:

1) LukOil has reduced its *water use* (per production unit) in all production sectors, while net volumes of water-use increased. Water use by LukOil from water bodies was within the allowable limits set up by the government authorities. The volume of water recycling has increased (from 285 million cubic m in 2004 up to 404 million cubic m in 2008); it is considered as one of the effective tool for water conservation and protection.

2) LukOil has reduced sewage *water discharges* into surface waters from its facilities in oil and gas development and in petrochemicals. Oil refineries completely ceased the polluted water discharges into surface waters and underground water bodies in the Volga basin. Total LukOil reduction in water discharges during 2004-2008 period accounted for about 33%.

25. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Yes. Contribution to biodiversity protection in the Volga Delta is among key inputs into environmental problem-solving. Due to success of LukOil project for sturgeon reproduction in the lower Volga through

application of biotechnology methods, its experiences and practices were to be applied by other fishery reproduction plants. Results of offshore environmental monitoring in the coastal areas of the Caspian Sea indicate at ecological amelioration. The company supported the Inventory for marine bio-resources in the Caspian basin, thus contributing to support for biodiversity conservation and knowledge dissemination.

Example 9: Involvement of Stakeholders beyond the level required by law (German Rhine catchment: Dhuenn river)

Name of the basin: Rhine, Germany
Name of the Twin-Project: NeWater

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

The Wupperverband, a public body for water management in a small Rhine sub-catchment, implemented a voluntary (i.e. not mandatory by law) participative process from late 2005 to mid-2008. Various stakeholders were involved in order to look for ways to improve the ecological state of the Dhuenn River. The participation process was accompanied by the ACER and NeWater research projects, which had expertise in adaptive water management and participation methods.

2. With what purpose and reason of its application?

According to the European Water Framework Directive, the good ecological status has to be achieved until 2015. The responsible authority for WFD implementation in the concerned area is the Bezirksregierung (regional government) Duesseldorf. The Wupperverband, having the right to suggest measures, decided to involve local and regional stakeholders in a participative process. The objective was to design a non-binding action plan that addressed major river problems in the area and should be proposed to the Bezirksregierung Duesseldorf as part of the WFD implementation.

3. How was the best practice or tool applied?

NeWater approached the Wupperverband, which was looking for ways to influence WFD implementation. Both agreed to design a participative process in which stakeholders should get the opportunity to contribute to the development of a non-binding action plan. After the Wupperverband's problem perception had been clarified, NeWater/ACER identified stakeholders and found out about their problem perspectives in an interview series. The process design was adjusted according to the wishes of the stakeholders, wherever this was possible. The participation process was then publicly announced by the Wupperverband at a regional symposium for the first time. Three workshops for stakeholders took place to create the action plan for the Dhuenn River. The Bezirksregierung Duesseldorf was involved as well. NeWater and ACER helped to organize the participation process and facilitated the workshop series. The aim of the first workshop was to discuss the current state of the Dhuenn river and to create ideas for potential management measures. At the second workshop, the suggested measures were prioritised (a selection was made). At the third workshop, the participants agreed on several potential measures that were expected to improve the state of the Dhuenn. A concrete time and action plan was only created to a limited extent, because this is a task of the formal management process. The Wupperverband presented the results of the participatory process to the Bezirksregierung Duesseldorf at a Round Table, which represented a regular event for discussions between the Bezirksregierung and stakeholders in the Dhuenn catchment. The Bezirksregierung Duesseldorf promised to implement the measures that had been elaborated in the participative process.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

Participants were the catchment's public body for water management (Wupperverband), various local and regional stakeholders (e.g. from agriculture, nature conservation, fishery, water supply, sports), the responsible water authority (Bezirksregierung Duesseldorf) and scientists with expertise in adaptive water management (NeWater, ACER).

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

There was no regulatory enforcement mechanism. The Wupperverband, which led the participation process, did not have the formal mandate for WFD implementation. However it had the right to propose measures to the responsible authority (Bezirksregierung Duesseldorf). The Bezirksregierung signaled its willingness to adopt results of the participatory process. This willingness was an incentive for the Wupperverband. The opportunity to influence water management was an incentive for the stakeholders to participate.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

A political constraint was the fact that the Wupperverband had no formal mandate to decide on measures for WFD implementation. However, the Bezirksregierung Duesseldorf, which is the responsible organization for WFD implementation, signaled that it supported the voluntary participation process and wanted to get a document out of the workshop series as a basis for its own development of measures.

7. What barriers did BP&T face? Who opposed BP&T use?

At the beginning, the Wupperverband feared that a failure of the voluntary stakeholder process could be interpreted as lack of its management capacity. Apart from this, no major barriers or opposition to the participative process were reported.

8. How were barriers overcome?

The stakeholder process was declared a research project. In this way, a failure would not have been a water management failure by the Wupperverband.

9. What opportunities and drivers for BP&T application existed?

Stakeholder involvement is customary in the region. Moreover, the participation process benefited from a high degree of freedom. It took place in a niche outside of the formal (= binding) management process and allowed to involve various actors with a stake in the issue to discuss alternative approaches.

10. Who supported the use of BP&T? Did they take advantage of them?

The Bezirksregierung Duesseldorf, which has the formal mandate for WFD implementation, supported the participation process. It aimed to adopt the results in its water management activities, even though this was not mandatory according to law. Moreover, the participatory process was supported by the research projects NeWater and ACER, which had expertise in adaptive water management and participation techniques. NeWater and ACER helped to design the participation process and took advantage of it in such that they gained further knowledge about learning processes.

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

The actors successfully managed to create an action plan that proposed measures to improve the ecological state of the Dhuenn River. Even though this plan was not binding, the responsible authority promised to integrate the proposed measures in the official management of the Dhuenn catchment.

12. What were the major reasons for success, or failure?

The participation process was professionally organized and managed to include perspectives by various stakeholders. Both the Wupperverband and the Bezirksregierung Duesseldorf were willing to collaborate with each other and to take the stakeholders' perspectives into account.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

Yes. The Bezirksregierung Duesseldorf received a proposal for water management measures, which had been jointly created by the stakeholders and the Wupperverband. The Bezirksregierung aimed to integrate the suggested measures in the accordant regulatory plan for the Dhuenn catchment.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

Yes. The capability of the Wupperverband, the stakeholders and the Bezirksregierung to cooperate with each other was strengthened.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation?

The product of the participatory process was an action document that proposed measures to solve or mitigate problems of the Dhuenn River. When the case study ended, these measures were not yet implemented, but the Bezirksregierung promised to do so in the future. The promise was not binding, because the final decision had to be made by the regional parliament.

Example 10:
Stakeholders inspire river management: An informal initiative's expertise is transferred to the official management cycle in a participatory process (Hungarian Tisza)

Name of the basin: Tisza, Hungary
 Name of the Twin-Project: NeWater

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

After an informal initiative of stakeholders had managed to assemble knowledge about adaptive management practices (see example 3), members of the initiative were involved in the creation of a water management plan for the Hungarian Tisza, the so-called 'New Váasarhelyi Plan'. Through this way of participation, the conventional management cycle was enriched by innovative adaptive and sustainable approaches.

2. With what purpose and reason of its application?

The purpose was to add adaptive elements to a previous version of the New Váasarhelyi Plan and to broaden its focus from a dominant flood protection perspective to a stronger consideration of ecological needs, rural development and agriculture.

3. How was the best practice or tool applied?

Stakeholders from the Tisza region had assembled knowledge about adaptive and sustainable practices for river landscape management (e.g. shallow flooding, landscape rehabilitation). NGOs and further actors from this learning arena joined an informal alliance to promote alternative, adaptive ideas of river landscape management. Their expertise was not taken into account in a first version of the New Váasarhelyi Plan, which was developed from 2000 to 2002. In November 2002, a Round Table for NGOs took place, which gave alliance members the opportunity to present their alternative approaches. The presentation was convincing to the chief experts among the planners. As a consequence, members of the alliance were actively involved in reshaping the New Váasarhelyi Plan. In this way, the alliance could contribute its expertise and add adaptive measures to an updated version of the plan.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

Three groups of actors played a role in this process. The first group consisted of members from the official water management hierarchy, e.g. the Ministry of Environment and Water, the Central Tisza Water Authority, the Central Water Management Agency as well as companies responsible for special planning tasks. Stakeholders with expertise in adaptive approaches were the second group. These were the informal stakeholder alliance (several NGOs and individuals) and an association of municipalities from the area concerned. The third group comprised scientists from universities in Budapest, who supported the alternative approaches suggested by the stakeholders.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

The stakeholders were not forced to participate. The opportunity to integrate innovative adaptive approaches into the New Váasarhelyi Plan represented an incentive to them.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

A constraint was the fact that the Hungarian Tisza had faced a long past of authoritarian governments, in which water managers had preferred technical river regulation to adaptive landscape management. The Tisza basin had been massively reconfigured since the 18th century, which resulted in unsustainable land use patterns that depend on technical regulation of the river.

7. What barriers did BP&T face? Who opposed BP&T use?

The alliance of stakeholders, which promoted adaptive practices, had no formal power to integrate their ideas into management plans. The Central Tisza Authority partly resisted against their ideas. Many water managers were not convinced of the adaptive management approach.

8. How were barriers overcome?

The stakeholders found allies in the formal management hierarchy and from academics, who supported their ideas of more adaptive landscape management approaches. This allowed the stakeholder alliance to bring in their ideas during the planning process

9. What opportunities and drivers for BP&T application existed?

The driver for the involvement of members from the informal alliance was their high expertise in adaptive river landscape management. This expertise originated from previous activities in a learning arena, which had assembled traditional regionally-based knowledge and innovative approaches from abroad (see example 3). Moreover, a series of pollution and flood events had raised awareness for the weaknesses of conventional management approaches. The fact that Hungary as an accession country considered EU institutions like the Water Framework Directive and Natura 2000 was conducive to the adoption of adaptive and sustainable practices.

10. Who supported the use of BP&T? Did they take advantage of them?

The stakeholders had an important intercessor in the Ministry of Environment and Water. This person was very much convinced that alternative adaptive approaches, as promoted by the informal alliance, should be integrated as measures in the official water management. Moreover, several scientists supported the ideas of the alliance.

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

The stakeholder alliance successfully managed to convince key actors from water management of their ideas and to add adaptive and sustainable approaches to the New Váasarhelyi Plan. However, these approaches were implemented to a lower degree than intended.

12. What were the major reasons for success, or failure?

The reason why the stakeholder alliance managed to add adaptive approaches to the New Váasarhelyi Plan was their high expertise in adaptive management as well as the openness by key actors from official management and academics. The implementation was hampered, because the stakeholder alliance lost its main supporter in the Ministry of Environment and Water when this person changed the job, and water managers who implemented the New Váasarhelyi Plan reinterpreted the plan in such that the measures became less adaptive. This shows that even though support by key actors had been strong during the planning process, there was not sufficient support for adaptive approaches among water managers at the more operational level.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

Yes. The stakeholder alliance managed to spread ideas of adaptive management in the formal water management hierarchy. The scientific foundation of the New Váasarhelyi Plan was further developed and several adaptive approaches were adopted in this regulatory instrument.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

The stakeholders were given the opportunity to spread their ideas about adaptive management approaches. This enabled them to further develop and specify their ideas.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Due to the reinterpretation of the New Váasarhelyi Plan by water managers, less adaptive measures were actually implemented than intended. One example for an implemented adaptive measure is the Cigánd polder in the Bodrog region, which was built from 2004 to 2008. The polder contrasts with conventional dike-based flood protection. It stimulated a debate about potential polder construction in the Bereg region. Even though less adaptive measures were implemented than intended during the planning process, the idea of adaptive management has been spread and inspires the debate about alternative management options.

Example 11:
A bottom-up learning arena: Stakeholders assemble knowledge about adaptive management options (Hungarian Tisza)

Name of the basin: Tisza, Hungary
 Name of the Twin-Project: NeWater

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

From the early 1990's to the mid 2000's, numerous stakeholders participated in regional platforms to assemble knowledge about adaptive management options for the Hungarian Tisza. They discussed traditional regionally-based knowledge, which allows a more sustainable management of the river landscape and found out about innovative adaptive management practices from the Netherlands and Germany. Moreover, they raised public awareness for adaptive approaches.

2. With what purpose and reason of its application?

The goal was to find and promote sustainable and adaptive ways for rural development and river landscape management (e.g. flood protection). These options represented alternatives to conventional management practices that favored river regulation and dike construction to optimize the river landscape for monoculture crop production and technical flood protection.

3. How was the best practice or tool applied?

Three regional platforms (*the 'Cötkény – South Borsod Region Rural Development Initiative'*, the *'WWF – Kubik Nagykörű project'* and the *'Last Straw Programme Bodrogköz'*) facilitated debates among numerous stakeholders about traditional river landscape knowledge and innovative management approaches from abroad. Local discussions and field experiments reinforced each other and generated new insights into alternative, more adaptive management practices for the Hungarian part of the Tisza catchment.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

Local and regional stakeholders were the driving force in the initiation of the discussion platforms. They got support by municipalities and a national park administration from the region. Individual experts were involved and contributed their knowledge on certain aspects. Actors from higher levels were the WWF Hungary and the Central Tisza Water Authority, even though the latter did not play a major role in the process. Actors from civil society and municipalities were dominant in the knowledge generation process.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

Since the learning arena was an informal, non-governmental bottom-up movement, it did not have regulatory enforcement power. The discussion platforms partly made use of EU-related funding and support mechanisms (LIFE, SAPARD).

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

A major political constraint was the fact that many water managers favored the traditional management paradigm, which relies on massive technical infrastructure to control the Tisza River. An economic constraint was poverty in the region making it challenging to mobilize resources.

7. What barriers did BP&T face? Who opposed BP&T use?

As a non-governmental movement, the learning arena did not have the formal power to translate the knowledge, which it had assembled, into binding law or water management plans. The formal river management authorities did not have to adopt alternative water management options that were promoted by the learning arena.

8. How were barriers overcome?

Several members of the learning platform joined an informal association that managed to influence policy-making processes and to include adaptive measures into a management plan for the Tisza (the so-called 'New Vásárhelyi Plan', see example 2). The informal association was institutionalized at a later stage.

9. What opportunities and drivers for BP&T application existed?

Several flood and pollution events increased public awareness with regard to the weaknesses of conventional river management approaches and strengthened the willingness to adopt new, more adaptive practices. EU frameworks (WFD, Natura 2000) promoted such practices as well.

10. Who supported the use of BP&T? Did they take advantage of them?

The informal association had an important intercessor in the Ministry of Water and the Environment, who was enthusiastic about the new approaches and helped to integrate them in the official water management.

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

The informal learning arena successfully managed to assemble and generate expertise on adaptive management practices based on traditional knowledge, on innovative approaches from abroad and on field experiments.

12. What were the major reasons for success, or failure?

The members of the learning arena created a niche in which constraints from conventional management were not dominant. As the discussion and experimentation processes were not part of the formalized water management structure, the degree of freedom to discover and discuss management alternatives was high.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

Yes. Insights into adaptive management approaches, which had been assembled and promoted by participants of the informal learning arena, were adopted in the official management of the Tisza River. A new polder was created in the Bodrog region. However, water managers who favor conventional practices, still resist against the new approaches.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

Yes. The knowledge gained has encouraged members of the learning arena to lobby for adaptive management approaches, to build further capacity and to further develop alternative approaches.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Up to now, several small-scale measures for rural development and adaptive river landscape management have been implemented. The activities of the learning arena have encouraged further activities like market creation for local products. Sustainable practices have been promoted at the local and regional level. However, a fundamental transformation towards adaptive and sustainable management of the river landscape has not been achieved yet.

Example 12: Water allocation in Bang Pakong

Name of the basin: Bang Pakong, Thailand
Name of the Twin-Project: ASEM WaterNet

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

Two year project (2009-2010) "Stimulating Participatory Processes for Water Allocation in the Bang Pakong River Basin". Technical foundations are the HECK 3 model and Water Evaluation and Planning (WEAP) system. These are combined with 'participatory' consultation process with government stakeholders and water users.

2. With what purpose and reason of its application?

The objectives of the project and introduction of tool included: (1) To test the allocation process on the ground; (2) To establish a good and smooth collaboration between multi-stakeholders (3) To help RSBOs carry out their responsibilities; (4) To decrease conflict of water uses; (5) to demonstrate uses for other river basins (Akeraj 2010b).

Another key objectives is to establish 'a permanent unit for water allocation in DWR Regional Office' (DWR 2009). This is an institutionalization goal consistent with DWR's role, but not necessarily accepted by all other stakeholders.

3. How was the best practice or tool applied?

Through a series of activities not yet completed including: data collection on water use; stakeholder engagement and forming of committees or working groups; sharing initial scenario and modeling findings. A significant element of 'participation' was in providing and sharing information on water use to technical working group on water allocation.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

Emphasis on cooperation between DWR staff stationed regionally and centrally as well as with Royal Irrigation Department (RID) and Local Government or Tambon Administrative Organizations (TAO) as well as water users.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

Significantly activity proceeded without backing of legal framework as in a national water law.

Two sub-basin committees – Prachinburi and Bang Pakong – under DWR have 'assigned' roles in allocation of water efficiently and fairly and to resolve conflicts.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. What were the major socio-economic, or political constraints for BP&T application?

Complex set of water users and government stakeholders without a clear legal framework for allocation to be negotiated or for binding agreements to be secured.

7. What barriers did BP&T face? Who opposed BP&T use?

The RSBOs do not have direct authority in water allocation. Lack of information on water use in agriculture and industry was another barrier (DWR 2009). Finally an implementation challenge was that there was no process in place for negotiating in agreement (Akeraj 2010c).

8. How were barriers overcome?

Barriers were overcome by dialogue, awareness building, joint data gathering and negotiation as follows:

"It is necessary to have a negotiation, social regulations and a network to establish an agreement and follow up water use in the basin. The founded network is responsible for data collection and water

use report..... To be successful, the process must create an awareness among stakeholders and involve all stakeholders in water allocation. " (Aekeraj 2010c)

Previous experience under the Bang Pakong dialogue Activities were important:

"People participation is key to the operation of the Committee. Coordinators are identified within each sub-basin, and they provide the bridge that allows the government and communities to design and implement appropriate solutions. At the grassroots level, the Committee challenges the people to find solutions to the issues. At the regional level, the Committee submits the river basin's projects for funding by the government or external sources. This process still needs to iron out some chinks but at the very least, the flow of funds from the central level to the river basin has started."(Sukontha Aekaraj interviewed in: Duenas 2007)

9. What opportunities and drivers for BP&T application existed?

The allocation system was a follow-up to two earlier studies, the Bang Pakong Dialogue Initiative (2003-6) carried out by ADB and DWR and a water allocation study by DWR (2006-7) (Aekeraj 2010a, 2010b).

This meant the a coordinating body was in place, data for modeling had been assembled, and that stakeholder consultation processes were in place (Aekeraj 2010c). There was also recognition of the need in the basin that 'something had to be done'.

10. Who supported the use of BP&T? Did they take advantage of them?

DWR very much led the activity, but with financial support from ADB Technical Assistance package. Used the WEAP modeling system developed by Stockholm Environment Institute. Technical expert from Khon Kaen University hired to help with modeling activities.

Section III. PERFORMANCE and EFFECTIVENESS

11. What was the degree of success, or failure in BP&T application in the river basin?

Process has been moderately successful. Project is not yet complete and whether it will lead to allocations that are followed and/or processes that can solve conflicts and be renegotiated as circumstances change remains to be seen.

12. What were the major reasons for success, or failure?

Modest success so far can be attributed to combination of technical evidence-based support with participatory approach – a combination of two BP&T themes.

13. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

In two ways. First, data gathering, validation and wider understanding of uses and limits of scenarios and modeling. Second, appreciation of the plausibility of multi-stakeholder processes and their value in creating shared understanding.

14. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

Basis for cooperation and some trust that should be useful for learning and future 'adaptive' steps, although this has not yet been tested.

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

On process side, yes; actual flow allocations remains to be seen.

A key message from this example is that BP&T can be effectively combined – in this case a technical modeling tool with more participatory styles of engagement with multiple stakeholders – to improve shared understanding. Moreover this happened in the context of no legal framework and arguably this was a reason for the innovative use of the BP&Ts.

Example 13: Tala Hydroelectric Project 1998-2007, Bhutan

Name of the Twin-Project: BrahmaTwin

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

The project aims the construction of a hydropower plant to use the high hydropower potential of the Himalayan Mountains in Bhutan and provide surplus energy to meet increasing energy demands in India.

2. With what purpose and reason of its application?

The Himalayan Kingdom of Bhutan with an area of 38,934 square kilometers has hydropower resources estimated at 30,000 MW. Only a fraction of its identified techno-commercially feasible potential (estimated at 23,760 MW) is exploited by the construction of projects with a total installed capacity of 1488 MW. The bulk of the power is presently generated by 1020 MW Tala, 336 MW Chhukha & 60MW Kurichu Hydroelectric Projects implemented jointly by a Royal Government of Bhutan and the Government of India and 64 MW Basochu Hydroelectric Project (Upper and Lower Stage) financed by the Austrian Government. Following the successful completion and commissioning of Chhukha Hydroelectric Project in 1986, an agreement was signed by the two Governments for the construction and operation of Tala Hydroelectric Project on 05 March, 1996.

3. How was the best practice or tool applied?

Starting the project implementation from a scratch in October 1997 its first unit was commissioned on 31 July 2006 and the sixth and the last unit was commissioned on 30 March 2007 in spite of extra time taken in construction of more than 100 km length of access roads in precipitous terrain, extremely difficult geological situations encountered at numerous locations in tunnels and shafts and heavy damages inflicted by unprecedented rainfall of Monsoon 2000.

Following an accelerated construction model the infrastructural development and main works of the proposal were executed simultaneously to optimize construction time. Some state-of-the-art equipment, site facilities, telephones, construction power supply and access roads were made available by the Project to the main civil contractors. This action before the award of contracts has saved at least six precious months of construction time.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

The Tala Hydroelectric Project Authority (THPA), set up for the implementation of the Project, has a Chairman, four Directors from the Royal Government of Bhutan (RGoB) and three Directors from the Government of India (GoI). The Ambassador of Bhutan to India and the Ambassador of India to Bhutan are permanent invitees to THPA meetings. Twenty three meetings of the Authority have been held during which timely decisions were taken to expedite execution of Project works. The head of the Project Management is a Managing Director who is assisted by a Deputy Managing Director, a Director (Technical) and a Director (Finance). Senior Project officials were drawn on deputation from various organizations of Royal Government of Bhutan and Government of India. The Project organization was kept lean for efficiency and cost-effectiveness during the construction phase. As on 01 April, 2007 the total staff strength of the project was 1034 (824 Bhutanese and 210 Indian nationals for Operation & Maintenance as well as balance capital works. There were over 3000 staff and workers engaged by the THPA contractors at various work sites. At the peak construction stage the total number of persons employed by the THPA and the contracting agencies crossed 17,000.

The transmission line connecting Bhutan's Tala hydro project to North India was the region's first successful public-private partnership of its type.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

India has been involved in most hydropower projects in Bhutan, from planning, to funding, to construction and the purchase of power.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. *What were the major socio-economic, or political constraints for BP&T application?*

The plant is run-of-the river schemes with no impact or minimal impact to the environment. Constraints from population are unknown.

7. *What barriers did BP&T face? Who opposed BP&T use?*

Commissioning of the plant was planned for 2005 (instead 2007) but was delayed by what geologists have described as the worst conditions for tunneling that have been encountered anywhere in the world.

8. *How were barriers overcome?*

Drilling of both the upstream and downstream tunnels hit soft spots which were difficult to stabilize in 2003. Around 80% of the strata was judged to be poor or very poor which caused considerable tunneling delays; while blockages in inclined and vertical pressure shafts delayed completion even more.

A master control network and component-wise networks for the Project were prepared and used as an effective management tool. These were updated regularly after progress review meetings (PRMs) which were held every month unfailingly. The project Management also held regular meetings and reported physical & financial progress to the Authority (THPA) on a quarterly basis.

9. *What opportunities and drivers for BP&T application existed?*

The Tala Hydroelectric Project will bring about significant socio-economic development in Bhutan. The neighboring States in India have started receiving reliable power from the project. The project is yet another significant milestone of enduring goodwill, friendship and cooperation between Bhutan and India.

The project contributes to Bhutan's current target to achieve "electricity for all" by 2020.

10. *Who supported the use of BP&T? Did they take advantage of them?*

The 1020 MW Tala Hydroelectric Project has been implemented with a highly motivated and dedicated team of Bhutanese and Indian nationals and by enabling the use of a combination of latest machinery & equipment suitable for tunneling in the Himalayas. The Project received expeditiously all the necessary support and cooperation from both the Royal Government of Bhutan and Government of India agencies. The relationship developed in the hydro power sector has been a win-win situation for both the countries.

Section III. PERFORMANCE and EFFECTIVENESS

11. *What was the degree of success, or failure in BP&T application in the river basin?*

The Tala Hydropower Project in Bhutan has almost totally dried up a 30 kilometer-long stretch of the Wangchu River, and adversely impacted the rich biodiversity of a much larger region. The project is located in a geologically fragile area, and suffered extensive damages from flooding in 2000. Considering the anticipated commissioning schedule of the generating units, a target had been set out for generation of 1938 million units during the period from 31st July 2006 to 30th June 2007. The actual generation of 1179 million units up to 31st March 2007 has exceeded the target of 1118 million units by 61 million units.

12. *What were the major reasons for success, or failure?*

Benefits for Bhutan and India

13. *Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?*

Agreements on four further projects – the 620MW Amochhu reservoir, the 1800MW Kuri Gongri, 670MW Chamkharchhu-I and 486MW Kholongchhu – were signed following meetings between the Indian Prime Minister Manmohan Singh and King Jigme Khesar Namgyel Wangchuck of Bhutan in December 2009. Power generated from the projects will be used by Bhutan, with surplus energy exported to India.

14. *Did application of BP&T result in changes towards more adaptive behavior of stakeholders?*

15. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

Yes, it contributes to supply the Bhutanese population with energy. Only about 40% of the total Bhutanese population and about 30% of the rural people had access to electricity in 2003. Considering this development state energy production is an important topic.

http://saarcpublications.org.np/saarc_country/bhutan/index.php?fh=tata_hydroelectric_links&fb=tata_hydroelectric_profile

http://www.un.org/esa/sustdev/sdissues/energy/op/hydro_tsheringbhutan.pdf

Example 14: Scenarios analysis of the hydrology and water resources of the Okavango delta

Name of the River Basins: Okavango Basin
Name of the Twin-Project: TwinBas

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

A scenario analysis of the hydrology and water resources of the Okavango Delta to test different scenarios potential impact on the hydrology of the delta, using the Integrated Hydrologic Model.

2. With what purpose and reason of its application?

To test the potential impact of water resources use, mainly irrigation, hydropower and climate change, on the hydrology of the Okavango delta.

The key processes governing the hydrologic behavior of the delta may be summarized as:

- Seasonal flow patterns through channels, and flood plains and swamps
- Numerous bifurcations in the channels forming the delta
- Extensive spills from the channels to the flood plains and swamps
- Evaporation from open water and transpiration from vegetation
- Infiltration from surface to ground water, and exfiltration from ground to surface water
- Combined role of sediment transport and vegetation
- Salt balance and precipitation on islands

3. How was the best practice or tool applied?

The scenario analyses present the hydrology and water resources of the Okavango Delta, as the delta and the sources basin upstream exist today, and as it may be twenty years hence. There are no firm published water resources development plans for the basin upstream, though the bases of such developments, mainly irrigation and hydropower, have been laid. The available information has been reviewed and simplified scenarios derived to test their potential impact on the hydrology of the delta, using the Integrated Hydrologic Model.

The Integrated Hydrologic Model has been run to simulate natural undeveloped conditions in the basin and delta, present development conditions, and development conditions as they may be given a range of water resources development scenarios in the delta and the basin upstream:

- Upstream water resources developments: dams and irrigation schemes in Angola and Namibia
- Deforestations in Angola and Namibia
- Surface and ground water abstractions from the delta
- Clearing major blocked channels in the delta
- Regional climate changes
- Combinations of the above scenarios

The scenarios represent possible future conditions in the basin, notionally in the year 2025. Each scenario is compared against the present conditions which serve as a baseline.

The impacts are expressed in terms of:

- The overall water balance among rainfall, evapotranspiration, upstream inflow, downstream outflow, and surface and subsurface storage changes from one year to the next
- The minimum and maximum depth of flooding
- The soil moisture and the ground water depth
- The minimum and maximum area flooded

The flooded area is the most sensitive parameter to water resources developments, showing the impact of declining inflows, revealing delays in the timing of the upstream flood wave and individual rainstorms.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

DHI and national water authorities.

5. Were any regulatory enforcement and incentive mechanisms used to support BP&T application?

6. What were the outcomes of the BP&T?

The impacts arising from the eight scenarios are briefly summarized as follows.

1. The basin and delta are presently in a near natural state. To date, land use changes and abstractions from the basin upstream and the delta have a minimal impact on the delta as whole, though local impacts may be significant.
2. With environmentally sensitive operation, the potential dams in Angola with a combined storage approximately equal to the annual delta inflow do not have a major impact on the waters of the delta. There is no net water consumption, and little water is stored in dry years, with correspondingly small releases in the dry period. The sediment transport implications could be significant, and have not been analysed.
3. Upstream irrigation in Namibia and especially Angola has a significant impact. The lower envelope of flooding, i.e. the area that remains flooded throughout, is reduced by 40% in dry years.
4. Present and future surface and ground water abstractions from the delta are minimally significant, amounting to 0.3% and 0.5% of the inflow respectively. Under future conditions, the upper envelope of flooding, i.e. the area that may be flooded at some time is decreased by around 70 km², or 0.6%.
5. Projected climate change has the most severe impact, reducing both inflows from upstream and rainfall over the delta, and increasing temperature and the rate of evapotranspiration. The lower envelope of flooding is reduced by 68%, from 2,770 km² to 900 km².
6. The combined water resources developments with climate change have the most severe impacts on the delta. The flooded area declines from a maximum of 14,424 km² to 4,685 km², and the minimum from 2,770 km² to 145 km².

Potential climate change will have an impact on the delta in respect of inflows from the basin upstream and the climate over the delta. Climate Change is the most severe scenario in terms of the reduction of inflows to and precipitation over the delta. The average maximum depth of flow over the entire delta is reduced by 0.07m and in the normally flooded areas by 0.18m

The lower envelope for the flooded area over the five normal years is reduced from 1,780 km² for the Baseline conditions to 711 km², a reduction of 60%. The corresponding reduction in the upper envelope is 4,754 km², or 38%.

The subsurface water of the delta are also severely affected by the climate change scenario, with both the root zone soil moisture deficit and the depth to ground water increasing by an average of 0.04m and 0.07, over the entire delta respectively. Concerning the water balance, total inputs are reduced relative to baseline from an average of 729 to 527mm/annum.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

7. What were the major socio-economic or political constraints for BP&T application?

8. What barriers did BP&T face? Who opposed BP&T use?

9. How were barriers overcome?

10. What opportunities and drivers for BP&T application existed?

11. Who supported the use of BP&T? Did they take advantage of them?

Section III. PERFORMANCE and EFFECTIVENESS

12. What was the degree of success, or failure in BP&T application in the river basin?

13. What were the major reasons for success, or failure?

14. Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?

15. Did application of BP&T result in changes towards more adaptive behavior of stakeholders?

16. Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?

References:

TWINBAS WP7. 2007. Change effects and vulnerability assessment.

Example 15: Development and implementation of a National Environmental Education Strategy, Bhutan (under preparation)

Name of the Twin-Project: BrahmaTwin

Section I. BP&T APPLIED

1. What exactly was the best practice or tool?

The initiation of several environmental education projects within the program: Development and implementation of a National Environmental Education Strategy.

2. With what purpose and reason of its application?

Bhutan has entered the new millennium with its natural inheritance largely intact. But the Kingdom cannot afford to be complacent. As tensions between development aspirations and conservation goals grow it is vital that people throughout the society are able to mitigate and minimize the harmful side-effects of important development activities.

Environmental education (EE) already forms a part of the national school curriculum for younger children, and there is an Environmental Education Unit within the Department of Education. WWF Bhutan itself has been supporting EE for a number of years and many projects have been implemented by WWF's national partner, the Royal Society for the Protection of Nature (RSPN). Activities have included the establishment of a network of Nature Clubs in schools throughout Bhutan - designed to complement curricular activities and to promote "a whole school approach" to EE. There is a need, however, to improve co-ordination between the various partners concerned with EE in Bhutan including WWF, RSPN, EE unit of the Department of Education, and the National Environment Commission (NEC). There is agreement about the need to develop a holistic National Environmental Education Strategy (NEES), with components focusing on each of the formal, co-curricular and non-formal education sectors. Additionally there is a need for better co-ordinate and more sustained public awareness raising activity.

The National Environment Strategy for Bhutan outlines three main avenues of sustainable economic development: expanding hydropower, increasing agricultural self-sufficiency and expanding the industrial base.

3. How was the best practice or tool applied?

Realization is aimed to achieve with different projects:

- [BT0014 Environmental Studies Program at Sherubtse College](#)
- [BT0858 Developing the Nature Study Center in Black Mountain NP](#)
- [BT0004 Conservation Education](#)
- [BT0003 Conservation fellowship Program](#)
- [BT0009 Bhutan: Conservation Action Grants](#)

Training workshops attended by participants from all the protected areas of Bhutan, all the staff of NRED, UWICE, Wildlife Conservation Division (WCD) and RSPN. Objectives of the training workshops are; to develop the skills and knowledge on various environmental education themes, enhance the participant's capacity to undertake various environmental programs in their respective parks, and work towards developing a national environmental education strategy for protected areas.

4. Who applied it (i.e. authorities, water-users, civil society, international agencies), and what stakeholders were involved?

WWF and Royal Society for the Protection of Nature (RSPN), a non-profit environmental organization in Bhutan established in 1986.

NEC is coordinating in drafting a National Environmental Education Strategy for the national environmental education in the country. NEC has formed a core group comprising of key stakeholders to lead in drafting the strategy. The main objective is to streamline EE activities of different stakeholders to mitigate duplication of efforts, and more importantly to have positive impact on the environment conservation.

5. *Were any regulatory enforcement and incentive mechanisms used to support BP&T application?*
Bhutan has placed environmental conservation at the core of its development strategy.

Section II. CONTEXT FOR BP&T IMPLEMENTATION

6. *What were the major socio-economic, or political constraints for BP&T application?*
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7. *What barriers did BP&T face? Who opposed BP&T use?*
8. *How were barriers overcome?*
9. *What opportunities and drivers for BP&T application existed?*

The country is recognized as one of the few countries in the world with specific constitutional obligation to preserve the environment and maintain at least 60 per cent of its geographical area under forest cover for all times. Bhutan's enviable reputation in environment conservation thus far is testimony of its commitment of pursuing sustainable development based on the philosophy of Gross National Happiness, which underscores that development cannot be pursued on the premise of economic growth alone but has to take place in combination with the emotional and spiritual well-being of the people.

10. *Who supported the use of BP&T? Did they take advantage of them?*
Governmental and NGOs supported the strategy.

Section III. PERFORMANCE and EFFECTIVENESS

11. *What was the degree of success, or failure in BP&T application in the river basin?*
Cannot be assessed so far, Strategy is still under preparation.

12. *What were the major reasons for success, or failure?*

An important reason for the success is participation of several organizations, which support the entire program, e.g. in form of training workshops.

13. *Did application of BP&T result in further development of capacity (regulatory, administrative, human, etc.) for adaptive water governance in river basins?*

Yes training programs, workshops, environmental studies programs etc. enforce capacity.

14. *Did application of BP&T result in changes towards more adaptive behavior of stakeholders?*

Workshops within the education program enhance the participant's capacity to undertake various environmental programs in their protected areas.

15. *Did application of BP&T contribute (and to what possible extent) to problem-solving, or its mitigation)?*

Due to education and public awareness rising stakeholders are taught to develop own programs for nature conservation.

Sources:

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http://www.wfbhutan.org.bt/pdf%20files/sherubtse_college.pdf