INTEGRATED RIVER BASIN PLANNING

Replicable Model based on the Pamba River Basin Pilot Project

EU-INDIA ACTION PLAN SUPPORT FACILITY - ENVIRONMENT

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INTEGRATED RIVER BASIN PLANNING:
India and the EU share experience on policy and practice

Authors: Mr Nick Ahrensberg, Mr Narayan Bhat (DHI), Ms Annemieke Alberts (Euroconsult Mott MacDonald), with contributions from Mr George Chackacherry (CWRDM)
Reviewed and edited by: Mr Wandert Benthem, Dr Johan Bentinck, Mr Surit Das

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1. George Chakkacherry, Scientist, CWRDM
2. N K Sukumaran Nair, Pamba Parirakshaka Samithi
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List of Abbreviations

asl	Above sea level
APSF	Action Plan Support Facility
bgl	Below ground level
BIS	Bureau of Indian Standards
CBO	Community Based Organization
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CWC	Central Water Commission
CWRDM	Centre for Water Resources Development and Management
ELV	Emission Limit Value
EU	European Union
GAP	Ganga Action Plan
GOK	Government of Kerala
GOI	Government of India
GP	Gram Panchayat
GWD	Groundwater Department
GWP	Global Water Partnership
HIS	Hydrology Information System
INR	Indian Rupee
IWRM	Integrated Water Resources Management
JAP	(EU-India) Joint Action Plan
KRWSA	Kerala Rural Water Supply Agency
KSPCB	Kerala State Pollution Control Board
KWA	Kerala Water Authority
LSG	Local Self Government
MCM	Million cubic metre
MDGs	Millennium Development Goals
MoEF	Ministry of Environment and Forests
MoWR	Ministry of Water Resources
NGO	Non-Governmental Organization
NLCP	National Lake Conservation Plan
NRCD	National Rivers Conservation Directorate
NRCP	National Rivers Conservation Plan
NWCP	National Wetlands Conservation Plan
O&M	Operation & Maintenance
PRBA	Pamba River Basin Authority
RBO	River Basin Organization
SIP	Stakeholder Involvement Plan
SPV	Special Purpose Vehicle
STP	Sewage Treatment Plant
SWOT	Strengths, Weaknesses, Opportunities and Threats
TA	Technical Assistance
UN	United Nations
UNEP	United Nations Environmental Program
ULB	Urban Local Body
USD	United States Dollar
WFD	Water Framework Directive (in EU)
WIS	Water Information System
WQO	Water Quality Objective
WRIAM	Water Resources Issues Assessment Method
WRM	Water Resources Management
YAP	Yamuna Action Plan

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SUMMARY

Background

The proposed IWRM Roadmap for the Pamba River Basin has been developed under the APSF (Action Plan Support Facility) Project financed by the European Union. The Pamba Pilot Project's aim was to deliver "Policy Support to Integrated River Basin Management" and to contribute to the continuing EU-India policy dialogue in the water sector.

The Water Resources Department of the Government of Kerala has shown commitment towards a more integrated approach to water management planning. It has initiated the adoption of IWRM principles in its Water Policy as well as approved the establishment of a Pamba River Basin Authority represented by various governmental sectors, responsible for the management of the Pamba River, both being signs of strong political will to bring water management into line with international best practice. By agreement between the Government of India and the European Union it was decided that the present project should provide assistance to the Government of Kerala by piloting Integrated Water Resources Management (IWRM) in the Pamba River Basin. As a result, one of the activities that has been implemented under the water sector component of the APSF-Environment technical assistance is the development of a pilot study on IWRM in the Pamba River Basin, State of Kerala.

The implementation on this activity resulted in the organization of a number of targeted workshops comprising:

- Sharing EU experience and practices
- IWRM training and use of IWRM planning tools
- Stakeholder consultations on water resources issues
- Management constraints faced within the present water management framework
- Possible actions to improve management constraints

The Pamba Basin IWRM pilot project has been implemented through targeted training/working sessions, consultations, a broad stakeholder forum as well as a final dialogue on the *IWRM Roadmap for the Pamba River Basin.* Moreover the press were invited at several occasions assuring that the process towards IWRM in the Pamba Basin reached an even broader group of stakeholders. The end result was a so-called IWRM Roadmap for the Pamba River Basin that was presented in a stakeholder dialogue by the Government of Kerala in December 2010. The Pamba Pilot Project has been seeking assurance that these authorities have access to current international best practice on integrated river basin management. The present document aims at providing relevant background information on global experiences in IWRM approaches as well as experience gained in river management planning in Kerala State that may be replicable in other parts of India.

Integrated Principles and Planning Processes

The basic premise of IWRM is that different uses of water are interdependent. Good water governance, the implicit objective of IWRM, ensures wise water use that contributes to economic development, social equity and environmental sustainability. The IWRM Roadmap developed by the European Union and the Government of Kerala for the Pamba River Basin enables the government to transit from 'sector restricted' outlook to 'sector integrated' water resources management. The IWRM Roadmap implies that water sector requirements for domestic supply and sanitation (water for people), for irrigation and fisheries (water for food) and for nature conservation (water for nature) etc. are weighed against each other in their water allocations and potential impacts. Therefore, the Roadmap that has been developed visualizes a conceptual framework and a vision for a long-term process of introduction of a number of water management reforms and practices.

Water and Environmental Policies in India

A move towards an integrated approach in India is evident in the formulation of national and state water policies by the Ministry of Water Resources and the Water Resource Department of the state, respectively, and River Action Plans by the Ministry of Environment and Forests (MoEF) and the enactment of numerous regulations in support of water resource and quality improvement policies and directives. However, in most cases a significant gap remains with respect to the ability of present institutional frameworks to implement IWRM effectively.

The Pamba River Basin Pilot Project

IWRM is still in its embryonic stage in Kerala but important steps towards a commitment have been taken by the Government through the Water Policy, and the Pamba Basin Authority Act provides the enabling environment to establish an operational River Basin Authority. The Pamba River Basin was selected for the pilot project as a result of a focus group discussion held at the Central level. This basin was identified as a suitable location for a pilot as the Pamba River is relatively small and as it flows in one state only. The Government of Kerala (GOK) showed its commitment towards IWRM by enacting the Pamba River Basin

Authority in 2009. This Pilot Project has developed a Roadmap for the development of an IWRM Roadmap for the Pamba River and, at the same time, to support the newly set up Pamba River Basing Authority in devising a management plan for future priority actions. The Roadmap has been developed in collaboration with stakeholders from various sectors of the Government of Kerala, the Centre for Water Resources Development and Management and civil society represented by non-governmental organisations (NGOs) active in the Basin. A 'Roadmap' is the transition to a sustainable water resources management practice which is cross-sectoral, decentralized, and considers the entire catchment of a river basin as a single management unit. The current project has provided first of all, a framework for exploring the following questions:

1. Where is the state (Kerala) in the IWRM planning process in the Pamba River Basin?
2. What are the constraints in the state to the planning process?
3. Which actions should be taken to prepare the IWRM plan for the Pamba River Basin?
4. What will the actions require?

The Pamba Pilot Project analyzed water resources management practices currently being applied in the state according to the three IWRM pillars: (1) the existence of appropriate policies, strategies and legislation for sustainable water resources development and management; (2) putting in place the institutional framework through which to implement the policies, strategies and legislation; and (3) setting up the management instruments required by these institutions to do their job.

A first attempt to integrate public participation in the creation of an Action Plan for the Pamba River was carried out by the Kerala State Pollution Control Board in 2002. A comprehensive Action Plan was developed for pollution abatement for the River Pamba. The document is an attempt towards solving water pollution issues in the River Basin but, according to IWRM principles, this is a piecemeal approach. In order to come to an integrated management plan for the Pamba River, various factors need to be considered. Those issues in need of attention have been explored in this document.

IWRM in Kerala is more advanced than in other states in India. Kerala already has a vision which is encapsulated in the Water Policy of 2008 and in the enactment of the Pamba River Basin Authority which is represented by stakeholders from 11 different governmental sectors as well as autonomous research institutes. However, water management is still sectoral and inclined towards service delivery with a bias towards the strong irrigation sector. Stakeholder participation is starting to exist with the recent resurrection of the Pamba River Basin Authority that has been called back into existence in the past year.

Water related issues identified were accounted to the increase of pilgrims travelling to the area during the Sabarimala annual pilgrimage, to which an estimated 45–50 million devotees come every year, lack of awareness, continuous increase of contamination due to urban waste, sand mining, encroachment and sedimentation. On the other hand, management problems were identified to ranging from legislations and policies not being enacted, lack of enforcement of existing legal framework, adjustment of existing legal water framework for Kerala state, setting-up

a sustainable monitoring and evaluation system for water resources management and establishment of an information system on water resources.

This Roadmap constitutes a blueprint for action that moves Kerala closer to its IWRM vision, starting with immediate suggested actions to develop an IWRM plan and thus towards adaption of IWRM principles. The IWRM Roadmap aims at identifying interventions, milestones and indicators for development of an action plan based on IWRM principles. The main actions identified in the Roadmap are the immediate need for operationalization of the Pamba River Basin Authority followed by adequate and thorough capacity building at state and local level in IWRM practices and the development of a full IWRM Action Plan for the Pamba River.

A fair amount of work is needed to align Pamba's River Basin Authority and its working structure to support the development and implementation of IWRM plans in the future as well as its constraints to water resources development. Another limitation is the insufficient enforcement of defined institutional roles and responsibilities with respect to the Pamba River Basin Authority. Another identified weakness is the lack of sharing of data and coordination between departments to constitute baseline data required for planning and decision-making..

Water and Environmental Policies in the European Union

In Annex 3 to this document, background information is provided on river basin management in the European Union, i.e. since the early 1970s when the first water legislation was enacted, which resulted in 2000 in the adoption of the Water Framework Directive. It provides a framework for the protection of all water bodies and applies a combined approach of standardised methodologies (e.g. for setting Water Quality Objectives and Emission Limit Values) plus the adoption of overarching principles determining current water policies of the EU. The key requirements of the WFD are outlined as well. Further information on experience gained and challenges for achieving IWRM in Europe can be accessed on the website of the European Union, particularly at http://ec.europa.eu/environment/water/water-framework/index_en.html.

IWRM and the EU Water Framework Directive are largely based on the same principles, but the issues they deal with are very different. IWRM focuses on people-centred management, sectors and economy,
poverty, lowest appropriate level, gender sensitivity, public participation and decentralization. All these elements are of great importance to India, but less so to the EU WFD, which uses keywords such as protection, good status of waters, river basin management, water pricing, emission limits, streamlining legislation, and citizen involvement in planning. This supported the choice to base the Pamba pilot on IWRM principles and not on the EU Water Framework Directive. Nevertheless, there is still potential for India to review the EU WFD for elements that have proven their merit, such as a trans-boundary policy framework, institutional arrangements, and integration of sector-based interests. For purpose of reference, a summary of the EU WFD is provided in Annex 3.

1 INTRODUCTION

1.1 EU-INDIA JOINT ACTION PLAN

The EU-India Action Plan Support Facility (APSF) Programme has been designed to implement the EU-India Joint Action Plan (JAP) as adopted at the EU-India 2005 Summit. The JAP outlines concrete cooperation initiatives in the field of environment/climate change in particular, to develop a dialogue on global environmental issues with a view to building mutual understanding on Multilateral Environmental Agreements (e.g. the UN Framework Convention on Climate Change and the Kyoto Protocol), hold regular meetings of the EU-India Joint Working Group on Environment and develop high-level visits. The 2005 Summit also produced an agreement to launch the EU-India Initiative on Clean Development and Climate Change as part of the JAP, linking the actions undertaken in the Environment and Energy sectors in a coherent manner and building on the work of the EU-India Energy Panel, the Joint Working Group on Environment and the newly created Environment Forum.

The Action Plan Support Facility-Environment Technical Assistance, which is being implemented between December 2007 and June 2011, aims to improve policy analysis and knowledge, cooperation, regulation and civil society dialogue in relation to the environment in India. The APSF-Environment Component of the Joint Action Plan focuses on five sectors, i.e. water, waste, chemicals, air pollution and climate change, whereby technical assistance is provided by a consortium led by Euroconsult Mott MacDonald.

One of the activities that have been implemented under the Water Sector of the APSF-Environment TA is the development and implementation of a pilot on Integrated River Basin Planning, i.e. for Pamba River in Kerala State. This resulted in the organization of a number of workshops on the identification of constraints and possible management interventions for Pamba River, and finally the preparation of

the so-called Roadmap for Pamba River that was delivered to the Government of Kerala in December 2010. The aim of the Pamba Pilot Project was to deliver policy support to integrated river basin management which contributes to the continuing EU-India policy dialogue in the water sector. Although the Roadmap for Pamba River was produced in a format allowing replication in other states within India, it was felt that a separate and more generalized document on Integrated River Basin Planning, using the Pamba River Pilot as a case study, would be appropriate. The present document is the result thereof. The following themes have been addressed.

- Principles of Integrated Water Resources Management (IWRM) and planning processes
- Existing water and environmental policies in India, with relevance to IWRM
- The Pamba River Pilot in which problems and solutions for river basin management were identified and converted into decisions and actions leading to the preparation of the Roadmap, and lessons learned
- Finally, linkages are being outlined to relevant legislation and experience built in the European Union

1.2 THE PAMBA RIVER IWRM PILOT

Integrated Water Resources Management is recognised as a set of principles for achieving the Millennium Development Goals (MDGs). The Plan of Implementation adopted at the World Summit on Sustainable Development in Johannesburg in 2002 called for countries to develop Integrated Water Resources Management and Water Efficiency Plans by 2005. These plans are milestones in recurring and long-term national water strategy processes.

The implementation of a policy on integrated management of water resources is now a universally recognized goal. It is in this context that the Government of Kerala developed *"an Act to provide for the constitution of an Authority in the State for the conservation of water resources of the Pampa River and its basins as an integral unit and for the management of allied activities and matters connected therewith or incidental thereto."*[1]

The Pampa River Basin Authority Act of 2009 goes further by recognizing the need for a *"Pampa Action Plan"* by the Government of Kerala *"for the conservation of the Pampa River and its reservoirs by averting pollution through the projects undertaking integrated planning, monitoring, management and development of water sources".*

The establishment of the Pampa River Basin Authority is supported by an ambitious Water Policy that identifies the need to "create greater social awareness about the rights and responsibilities in the use of water and to put in place better management practices in the utilization of this invaluable resource. It is also necessary to ensure people's participation in water sector within the framework of decentralized democratic institutions and to evolve suitable frameworks and strategies for the continual up-gradation of water environment".

1 The name of the river concerned is in documents spelled as either *Pamba* River or *Pampa* River. In accordance with the spelling used in "the Roadmap", the present document uses the wording Pamba River as well.

IWRM provides the means of balancing and meeting the needs for use of water resources to ensure equitable and sustainable use of the water resource. It is based on the principle that, in order to maximise the benefits of the water resource and to ensure equitable use of water, all water use and discharges in the catchment need to be balanced. In achieving this, the following results were aimed at:

- increased awareness on the importance of an environmental approach and considerations in IWRM;
- increased access to relevant IWRM information and tools;
- targeted training for key managers and decision makers in the water sector;
- development of a Roadmap for the implementation of IWRM concepts in future planning processes;
- guide the Pamba River Basin Authority to spearhead the implementation of IWRM plans and inclusion of IWRM in decision making;
- prospect for implementation of a baseline study for the development of an IWRM Action Plan by local specialized organisations; and
- documentation on best practices, case studies and guidelines to enhance replication.

The Pamba Pilot Project strived to promote and support this process by guiding and giving support to the development and implementation of an IWRM plan for the Pamba River Basin by developing a Roadmap towards this purpose. The project respected the widely acknowledged approach that IWRM, based on effective stakeholder engagement, provides a direct link to MDGs, addressing poverty, hunger, gender equality, health, education and environmental degradation.

The pilot project has encouraged and used a participative approach to develop identification of issues and outcomes to formulate and establish consensus on visions, strategies, outputs, activities and external factors for the different components of the project, as well as formulating and identifying the various factors influencing the long-term sustainability of the programme. Workshop facilitation was provided by APSF-TA team members and qualified water management experts. To promote joint ownership of this work, stakeholders were motivated to act upon the conclusions and recommendations during a final event organized by the APSF team to expose and discuss identified actions and recommendations based on analysis of outcomes assembled throughout the Pilot Project.

At the beginning of the project, the Consultant developed an overall Stakeholder Involvement Plan (SIP), which started with a stakeholder mapping exercise. The SIP tackled involvement of stakeholders on the regional and local level for the duration of the project. The SIP was produced with the aim to including specific objectives for stakeholder participation at the different project stages; assure appropriate levels of participation for the various target groups (information provision, consultation, or active involvement); and establish needs and characteristics of each working session.

The Pamba Pilot Project has been implemented through six workshops guiding the participants through a process of identifying the main issues related to water as well as the main issues related to the management of water resources by different institutions. Analysis was conducted taking the Pamba River Basin as one single

entity. The sessions conducted ensured wide participation from different government sectors as well as the public sector represented by NGOs.

The objective of the different sessions held over a period of 10 months was to identify and engage main stakeholders, provide the participants increased insight into IWRM, and share the use of relevant IWRM tools for action planning. Findings of the workshops were used to compile the Roadmap. The Roadmap sets out clear and coherent objectives as well as a timetable for implementation of priority actions and identified responsible bodies for implementation. The Roadmap indicates implementation responsibility and activities prioritised on clear short-, medium- and long-term goals. As well as the governmental authorities and institutions, the Roadmap ensures the means for public participation and engagement in civil society in the prioritization of actions.

In general, the IWRM Roadmap serves as a tool to stay oriented and avoid obstacles while moving toward identifiable landmarks/milestones. In this regard, the IWRM Roadmap represents a key document when mobilising funds for managing the transition and monitoring implementation of the future IWRM Action Plan identified under the Roadmap. The State Governments could use the Roadmap to update, fine-tune and target their technical and financial support to water sector reforms.

1.3 IWRM IN THE EUROPEAN UNION

Water quality, pollution and management have been priorities in substantial parts of the European Union for decades. The first EU water legislation dates to the early 1970s. Since then, European water legislation has been innovative in the design of national water policies in many (new) EU Member States. In the late 1970s, this resulted in a large number of Directives and Decisions that lay down specific water quality objectives for different types of water bodies and emission limit values for specific water uses. Later, in the 1980s, additional Directives were introduced that aim at controlling discharges of pollutants to the water environment. However, due to the large number of Directives, which were often in conflict, the outcome was less successful than anticipated and desired. The need for a more coordinated approach was recognized, and a major EU water policy was launched, finally resulting in the adoption of the Water Framework Directive. This WFD aims at the protection of all water bodies, and its overall objective is to achieve ‘good status’ for all surface and groundwater by 2015. Further information on IWRM and the WFD can be found in Annex 3, while the website of the European Union provides ample information on experience gained and challenges for achieving IWRM in Europe (see, for example, http://ec.europa.eu/environment/water/water-framework/index_en.html)

1.4 THE PRESENT REPORT

Chapter 2 outlines the general principles of IWRM and the required planning processes. Chapter 3 provides a brief update on the current relevant legislation and institutional setting for IWRM in India. The remaining chapters of the present report, i.e. Chapter 4 to Chapter 11, deal with the Pamba River Pilot Project and stem from the Pamba River Roadmap report (December 2010). These have been left largely unchanged in order to inform non-Kerala State readers and users of the present report about the level of detail that might be needed for Roadmaps for other river basins. Chapter 4 provides general data on geography, water resources, demographics, economy, climate and social development. Chapter 5 outlines relevant policies, legislation, and the institutional framework in Kerala State. Chapters 6, 7 and 8 summarize the information emerging from the various workshops that was used to compile the Roadmap. Progress made on IWRM in Pamba River Basin is reflected in Chapter 9, while Chapter 10 presents the operational options for Pamba River Basin Organisation. Finally, Chapter 11 concludes with lessons learned and recommendations.

2 IWRM PRINCIPLES AND PLANNING PROCESSES

According to the Global Water Partnership (GWP) and other sources, many countries are experiencing water-related problems that are proving intractable to conventional, single-sector approaches. Some possible examples are drought, flooding, groundwater overdraft, water-borne diseases, land and water degradation, ongoing damage to ecosystems, chronic poverty in rural areas, and escalating conflicts over water. The solutions to such problems may fall outside of the normal purview of the agencies tasked with addressing them, and usually require cooperation from multiple sectors. In such cases, an Integrated Water Resources Management approach makes identifying and implanting effective solutions much easier. It also avoids the all-too-common situation where solving one problem creates another.

The basis of IWRM is that different uses of water are interdependent. Additional benefits can be derived when different user groups are consulted in the planning and oversight of water management programmes, as such users are likely to apply local self-regulation in relation to issues such as water conservation and catchment protection, which is far more effective than central regulation and surveillance.

IWRM is an important instrument to address poverty reduction. Good water governance, the objective of IWRM in general and of any "IWRM plan", is to ensure wise water governance which contributes to economic development, social equity and environmental sustainability of the society (the "three Es, or, the three pillars").

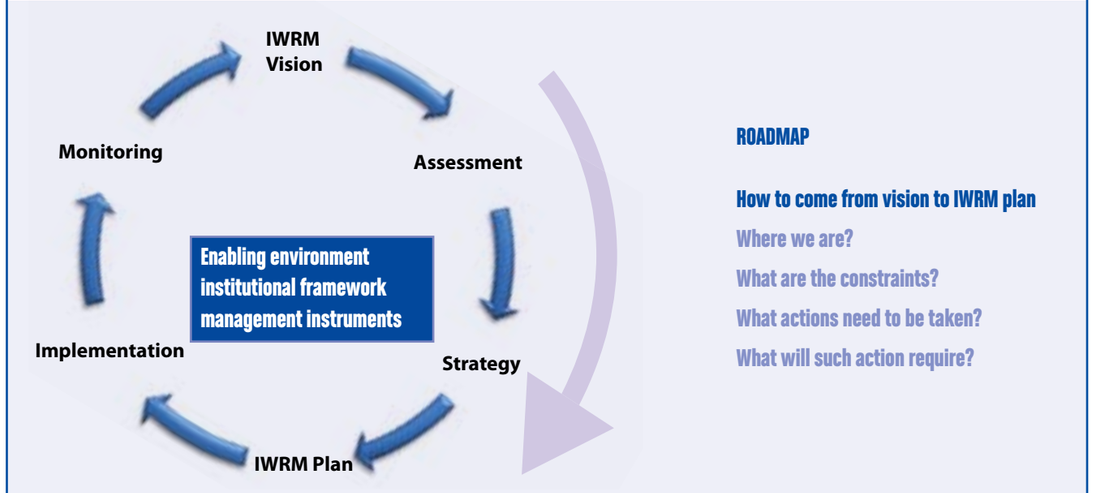
Implementing an IWRM process is a question of getting the "three pillars" right: (1) moving towards an enabling environment of appropriate policies, strategies and legislation for sustainable water resources development and management; (2) putting in place the institutional framework through which to implement the policies, strategies and legislation; and (3) setting up the management instruments required by these institutions to do their job.

A roadmap for IWRM is a process leading from a vision about future development related to water resource use, conservation and protection to an actual IWRM plan. Roadmaps are concerned with the process that includes building commitment, analyzing gaps and preparing a strategy and action plan.

A country's roadmap contributes to improved water resources management and aims at providing its people access to water supply and sanitation services. The IWRM approach facilitates mainstreaming water issues in the political economy, as it focuses on better allocation of water to different water user groups and, in so doing, stresses the importance of involving all stakeholders in the decision-making process. In the process to move from an IWRM vision to the IWRM plan, it is useful at the outset to establish a roadmap with specific goals and milestones. This is particularly important for countries at the very beginning of the IWRM cycle, so that their achievement of the IWRM 2005 target can be reached through an orderly and well-structured process.

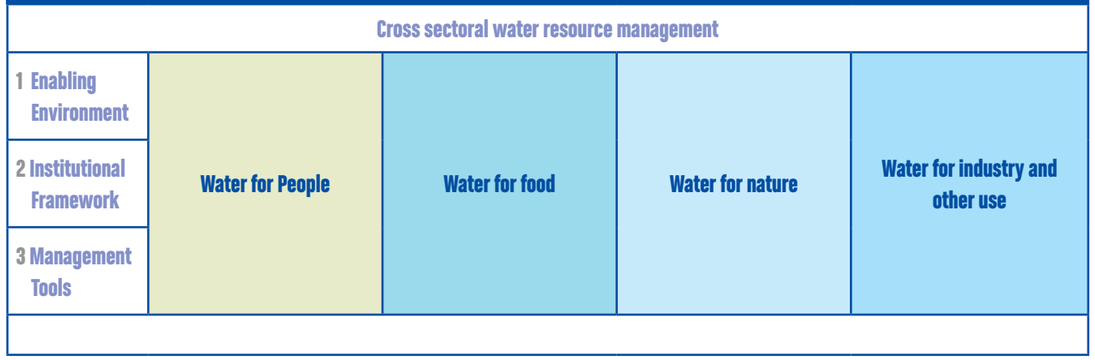
If a country is well advanced in the IWRM cycle, the IWRM Roadmap may address present weaknesses in the existing assessments, policies, strategies and plans and map a road forward for addressing these weaknesses. The roadmap "maps" the road, but does not travel to the actual "milestones".

Figure 1 IWRM planning cycle



In the context of international development co-operation, IWRM is increasingly being recognised as a suitable approach to achieve water security for people and

Figure 2 Cross sectoral water resource management



the environment and thus as an important step on the road towards integrating water into overall sustainable socio-economic development.

IWRM is the "integrating handle" leading from sub-sectoral towards cross-sectoral water resources management and at the same time providing a framework for provision of water services.

The following definition by GWP has proven to be a useful definition of IWRM widely supported in an international context:

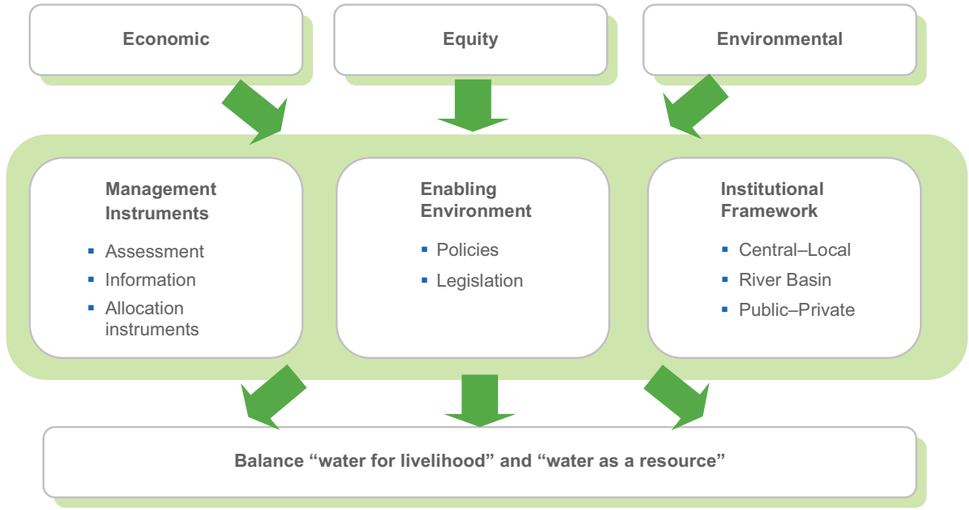
IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

An important aspect of IWRM is to enhance cross-sectoral water resources management in order to replace what is considered to be inefficient sub-sectoral management within the different individual water use sectors.

IWRM is not a goal in itself. The specific goals, interests and challenges will vary from place to place depending on the specific ecological, social and economic situation. IWRM is the process of balancing and making trade-offs, in a practical, scientifically sound way, between economic efficiency in water use; social justice and equity concerns; and environmental and ecological sustainability. The specific details of these goals will have to be balanced in the IWRM process. Implementing IWRM is a political process that involves allocating resources between competing uses and users. Sometimes, it is possible to come up with win-win solutions. However, more often, compromises and trade-offs have to be negotiated. Agreeing to social, economic and ecosystem sustainability goals and finding the right balance between them lie at the heart of this process.

As illustrated in Figure 3, concurrent development and strengthening of three elements is needed in order to pursue IWRM: an enabling environment, an appropriate institutional framework, and practical management instruments.

Figure 3 The three IWRM pillars



The enabling environment sets the rules; the institutional roles and functions define the players who make use of the management instruments.

IWRM must not be interpreted as a universal blueprint for water resources management worldwide. Certain basic principles underlying IWRM may be commonly applicable, but they must be seen in the specific context and stage of economic or social development. The nature, character and severity of water problems, human resources, institutional capacities, and the relative strengths and characteristics of the public and private sectors, the cultural setting, natural conditions, and many other factors differ greatly between countries and regions. Practical implementation must reflect such variations in local conditions and should, consequently, take a variety of forms. The most appropriate mix of IWRM elements will change over time for a specific country and region due to internal or external developments.

IWRM involves managing water resources at the basin or watershed scale, managing demand and optimizing supply including assessments of available surface and groundwater supplies and evaluating the environmental impacts of distribution and use options. IWRM principles are based on equitable access to water resources, broad stakeholder participation, an inter-sectoral approach to decision making based on sound science, and usually require establishment of adequate regulatory and institutional frameworks. The planning process should result in an IWRM plan endorsed and implemented by the government, more or less detailed depending on the situation and needs of the country.

The institutional arrangements needed to bring IWRM into effect include:

- water resources management based on hydrological boundaries;
- a gender-balanced consortium of decision-makers representing all

stakeholders, reflecting society's responsibility for water management;

- organizational structures at basin and sub-basin levels to enable decision making at the lowest appropriate level, rather than a centralized decision-making model; and
- the government coordinating the national management of water resources across water use sectors.

3 WATER AND ENVIRONMENTAL POLICIES IN INDIA

3.1 POLICIES AND INSTITUTIONS

Given the federal structure of governance in India, it is the national (federal) government that lays down broad guidelines on policies and programmes and enacts national laws. The National Water Policy (2002) and National Environment Policy (2006) are typical examples of national policies. It is the respective state legislature that announces state-specific policies and programs and enacts state-specific laws. The states are free to adopt the national policies or announce completely new laws. However, by and large, states define their policies generally in line with national policies. For example, Kerala has announced its state water policy in 2008 following broad principles that are laid down in the national policy.

The resource management related institutions at the national level and state level are broadly described in Table 1.

Table 1 Relevant national level institutions	
Institutions	Functions
Ministry of Water Resources (MoWR) and Ministry of Environment and forests (MoEF)	National policies, guidelines, stimulate inter-ministerial coordination
Inter-ministerial Committees	Political priorities, public engagement
Central Water Commission (CWC) Central Groundwater Board (CGWB) Central Pollution Control Board (CPCB)	Policy papers, implementation guidelines, setting function-specific national level norms and standards; mainly technical role extending support to state level organizations
High Level Technical Groups	Technical Advisories, Technical Guidelines which are inter-ministerial or inter-state in nature

3.2 INSTITUTIONAL FRAMEWORK VIS-À-VIS IWRM

A move towards an integrated approach in India is evident in the formulation of national and state water policies by the Ministry of Water Resources and the Water Resource Department of states, respectively, and River Action Plans by the Ministry of Environment and Forests (MoEF), and the enactment of numerous regulations in support of water resource and quality improvement policies and directives. However, in most cases, a significant gap remains with respect to the ability of present institutional frameworks to implement IWRM effectively.

This difference between the intent and implementation is because of the existing water resources management culture and its associated institutional arrangements, legislation and instruments. They all take a sector-based approach, which is inadequate to achieve integrated, multi-sector and participatory management. Governance systems for IWRM thus require integration of social, economic and environmental policy planning, natural resource preservation, as well as public participation. Reforms in this direction are culturally and politically sensitive.

Institutional reforms should be carried out for the successful implementation of the IWRM plans. These reforms include restructuring the role of water institutions, decentralization that provides more water management authority to water users, and stimulating coordination among water sector stakeholders through joint activities and shared investments. There is an urgent need for policy-makers to mobilize all water stakeholders to adopt a common and realistic vision on how reforms are to be implemented, including a clear description of roles and functions of the organizations involved in the implementation process, time schedule and level of responsibilities.

India is encouraging all its stakeholders to move from the traditional supply-side orientation towards proactive demand management, under the broad framework of IWRM. However, at the operational level, there are gaps due to lack of an enabling environment, management instruments and improperly defined institutional roles. The main elements of IWRM are (but not limited to) the following.

- A national water policy
- A water law and regulatory framework

- The recognition of the river basin as the appropriate unit of water and land resources planning and management
- Treatment of water as an economic good
- Participatory water resource management

3.3 NATIONAL RIVER CONSERVATION PLAN

The National River Conservation Plan (NRCP) covering 38 rivers over 20 states is a centrally sponsored scheme to assist the states in improving the water quality of rivers. The objective of the NRCP is to improve water quality through implementation of pollution abatement works. Interception and diversion of sewage and setting up of sewage treatment plants are the main components of pollution abatement schemes. The programme at the central level is coordinated by the MoEF, and at the state level a state agency is designated as the Nodal Agency. For example, in Kerala, the Kerala Water Authority (KWA) discharges this function. Other two major central schemes that promote IWRM are the National Lake Conservation Plan (NLCP) and the National Wetlands Conservation Programme (NWCP). The National River Conservation Directorate (NRCD) is the operational wing of NRCP that facilitates all technical, financial and capacity development inputs channelled to the states through the above schemes.

The NRCP is actively involved in the transition from the traditional supply-side orientation towards proactive demand management under the broad framework of IWRM. The philosophical and operational context of the NRCP includes some of the main IWRM elements:

- A national water policy
- A water law and regulatory framework
- The recognition of the river basin as the appropriate unit of water and land resources planning and management
- Treatment of water as an economic good
- Participatory water resource management

Several NRCP components mark a significant shift from current paradigms, and making this transition is proving to be difficult. Drafting new water laws is easy; enforcing them is not. Renaming regional water departments as basin organizations is easy, but managing water resources at basin level is not. Declaring water an economic good is simple, but using price mechanisms to direct water to high-value uses is proving complex. As a consequence, the so-called IWRM initiatives have proved to be ineffective.

The NRCP does not cover four major rivers i.e. the Ganga, Yamuna, Gomti and Damodar in North and Eastern India. They are covered separately by other major river-specific schemes. Two of the most important river conservation plans that have been implemented in India recently are the Ganga Action Plan (GAP) and the Yamuna Action Plan (YAP). Both have pollution load reduction as their core programme interventions. and they are not truly IWRM initiatives. However, they are the pioneer river management programmes, distinctly different in their

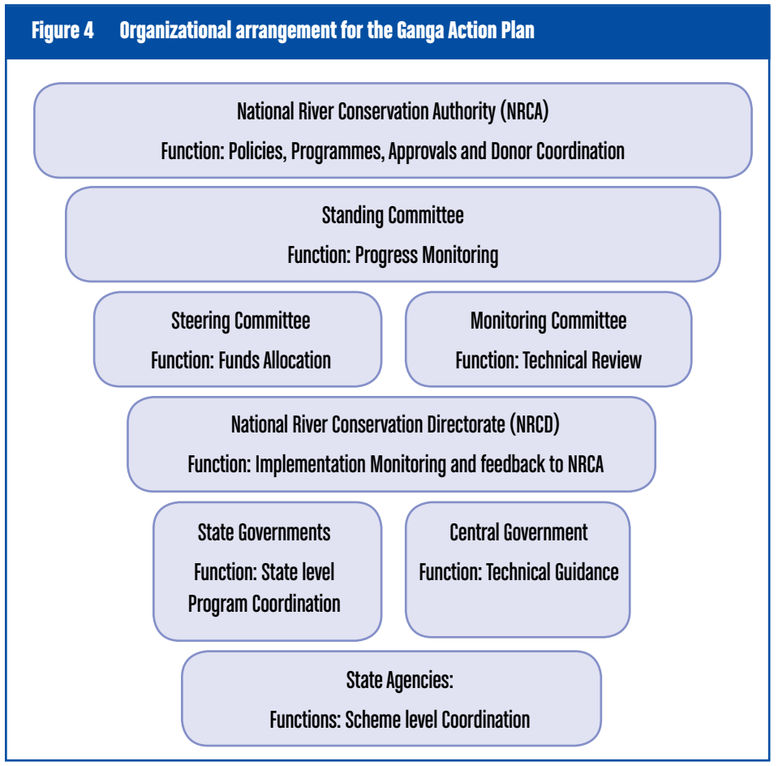
characterization as compared to conventional irrigation development programmes.

Ganga Action Plan (GAP)

The GAP was approved in April 1985 as a centrally sponsored scheme, with 100 percent of the funds flowing from the federal government. To lay down policies and programmes, the Government of India constituted the Central Ganga Authority (CGA) and renamed this as the National River Conservation Authority in September 1995. The GAP-I envisaged the interception, diversion and treatment of over 65 percent of the wastewater in three states falling in the Ganga Basin. While the GAP-I was still in progress, the CGA decided in February 1991 to take up the GAP-II, undertaking additional work in the tributaries of the Ganga River, i.e. Yamuna, Damodar and Gomati. The GAP has incurred a total expenditure of INR 9.02 billion (about Euro 143 million) over a period of 15 years.

The organizational arrangement of GAP is structured as set out in Figure 4.

Figure 4 Organizational arrangement for the Ganga Action Plan



Yamuna Action Plan (YAP)

The Yamuna Action Plan was implemented in two phases envisaging the protection and preservation of Yamuna River from pollution. The Yamuna runs a length of 1,375 km, spreading across three states (almost six times longer than, for example, Pamba River, involving an equally larger population base). The key objective of the YAP is to stop wastewater from drains being dumped into the river and to intercept and divert sewage. It was conceived in 1990 with a loan from the Government of Japan and implementation commenced in 1993. It covers eight towns in Uttar Pradesh, 12 towns in Haryana and the National Capital Region, involving schemes such as construction of Sewage Treatment Plants (STP), bathing ghats, improving drainage, erecting low cost sanitation facilities, etc.

Phase 1 has already been completed, and activities of Phase 2 have reached the final stages of implementation. Various studies conducted on the impact of the YAP indicate that the success is only partial. Wastewater from some drains is not intercepted and continues to be dumped into the Yamuna, and some new pollution points have come up. Installed STPs are functioning inefficiently and erratically, as the wastewater to be treated does not reach it. Some details of the YAP are presented below.

- Project Cost of Phase 1: INR 7 billion (about Euro 111 million); Phase 2 is in the advanced stage of implementation
- Project Duration: 1993 to 2003
- National Coordinating Agency: National River Conservation Directorate (NRCD), Government of India
- State Implementing Agencies: Uttar Pradesh Jal Nigam (UPJN)
- Public Health Engineering Department (PHED) in Haryana, Delhi Jal Board (DJB) and Municipal Corporation of Delhi (MCD)
- Towns covered: Delhi, Saharanpur, Muzaffarnagar, Ghaziabad, Noida, Vrindavan, Mathura, Agra and Etawah, Yamunanagar: Jagadhri, Karnal, Panipat, Sonepat, Gurgaon and Faridabad

3.4 RIVER BASIN ORGANIZATIONS

There has been the policy recognition in India that comprehensive management of river basins can be promoted through River Basin Organizations (RBO). These RBOs were initially expected to take up projects and later promote river basin development. However, none has emerged truly as a river basin development organization. They were either subject-oriented or project-oriented organizations. Organizations that were confined to construct and operationalize a specific engineering project were the Damodar Valley Corporation (DVC), Bhakra Beas Management Board (BBMB), Tungabhadra Board, Narmada Control Authority, Betwa River Board and Bansagar Control Board. Organizations that have been set up for specific subjects were the Brahmaputra River Board and Ganga Flood Control Commission. The Boards were created to construct and operationalize large dam projects or for a specific project, and they were guided with an engineering perspective of river management, ignoring community involvement. This perspective lacked comprehensive understanding of the river system for evolving various options to manage the river. So far, no RBO has been empowered to take up integrated development of water management. Some river boards that have been set up are described below.

Brahmaputra Board: The Brahmaputra Board was set up in 1980 to prepare a master plan for flood control in the Brahmaputra Valley, taking into account the overall development and utilisation of water resources of the valley for irrigation, hydropower, navigation and other beneficial purposes. The Board is headed by a

chairman appointed by the GoI and has members from governments of the basin states. The main functions include

(i) preparation of plans for flood control and utilisation of water resources for various uses;

(ii) preparation of detailed designs and cost estimates for proposed projects; and

(iii) construction, maintenance and operations of multipurpose projects with the approval of the Government of India.

Bhakra-Beas Management Board: The Bhakra-Beas Management Board (BBMB) was constituted through an executive order in accordance with Section 79 of the Punjab Reorganisation Act 1966 to regulate the supply of the Sutlej, Ravi and Beas Rivers to the states of Punjab, Haryana, Rajasthan and the National Capital Territory of Delhi. The Board is headed by a chairman appointed by the GoI and has members from basin states. The BBMB is responsible for the operation and maintenance of the projects under its jurisdiction and to allocate water for irrigation based on inflows to reservoirs. In addition, it distributes power in consultation with beneficiary states. The BBMB, like the DVC, functions under the control of the Union Power Ministry, and not the Water Resources Ministry.

Upper Yamuna River Board: The Upper Yamuna River Board (UYRB) was constituted for the

(i) regulation and supply of water from all storages and barrages up to and including Okhla Barrage;

(ii) maintenance of minimum flows;

(iii) monitoring of return flow quantities from Delhi after allowing for consumptive use; and

(iv) coordination for the maintenance of water quality, conservation, etc.

The Board is headed by the Member, Water Planning and Projects of the CWC and has members from the basin states.

Ganga Flood Control Board (GFCB) and Ganga Flood Control Commission (GFCC): The Ganga Flood Control Board was set up in 1972 by a GoI Resolution. The Ganga Flood Control Commission was set up as per Clause 5 of the Resolution to undertake specific works in the Ganga Basin and for assisting the Ganga Flood Control Board. The GFCC is expected to prepare a master plan of the basin to deal with problems emerging from flood erosion and waterlogging in the region. The implementation of these will be carried out by the appropriate riparian state. A chairman appointed by the GoI heads the Commission. The GoI also appoints two full time members. Basin states appoint part-time members to the Commission.

Other organisations: **Betwa River Board** was constituted under the Betwa River Board Act (1976) for efficient, economical and early execution of the Rajghat Dam Project. The **Bansagar Control Board** was constituted in January 1976 for efficient, economical and early execution of Bansagar Dam and connected works across the Sone River. **Mahi Control Board** was constituted for Mahi Bajajsagar Project across Mahi River.

Narmada Control Authority is in charge of overseeing the implementation of the award of the Narmada Water Dispute Tribunal for planning and management and sharing of benefits from the Sardar Sarovar Project (World Bank, 1998, Union Ministry of Water Resources website, 1999). What is clear from the origin, functions and constitution of these RBOs is that they are all structured for planning, design and implementation of large projects. It is also clear that they do not even intend to be participation-oriented or open bodies. Proper river basin organisation encompassing the needs, resources and priorities of whole river basin or even for most of a river basin has not been done in the case of a single river basin in India.

The origin, functions and constitution of RBOs in India show that they are all structured for planning, design and implementation of large projects and remain techno-centric. They do not yet factor in the need to be community participation-oriented. The emergence of various community-based initiatives has been witnessed despite the above-described limitation. The approach of RBO management must become process-oriented and context-specific. The RBOs involved in managing the river systems should provide an 'enabling environment' for understanding the dynamic and complex river system through an 'interactive approach' to scaling up and participatory management. This requires the government institutions to restructure with a view to devolve powers to community institutions for evolving options for river basin development.

The institutional structure for river basin management is relevant as water resources development in India has been centred on large dams. However, the RBOs in India do not truly reflect the characteristics of integrated river basin management. By and large, they have attempted to address issues in isolation, and have been centred mainly on pollution abatement (e.g. earlier Ganga Action Plan, Yamuna Action Plan and more recently the Pamba Action Plan of the State Pollution Control Board). The techno-centric approaches have been largely guided with an engineering perspective and have several operational and institutional drawbacks.

4 PAMBA RIVER BASIN

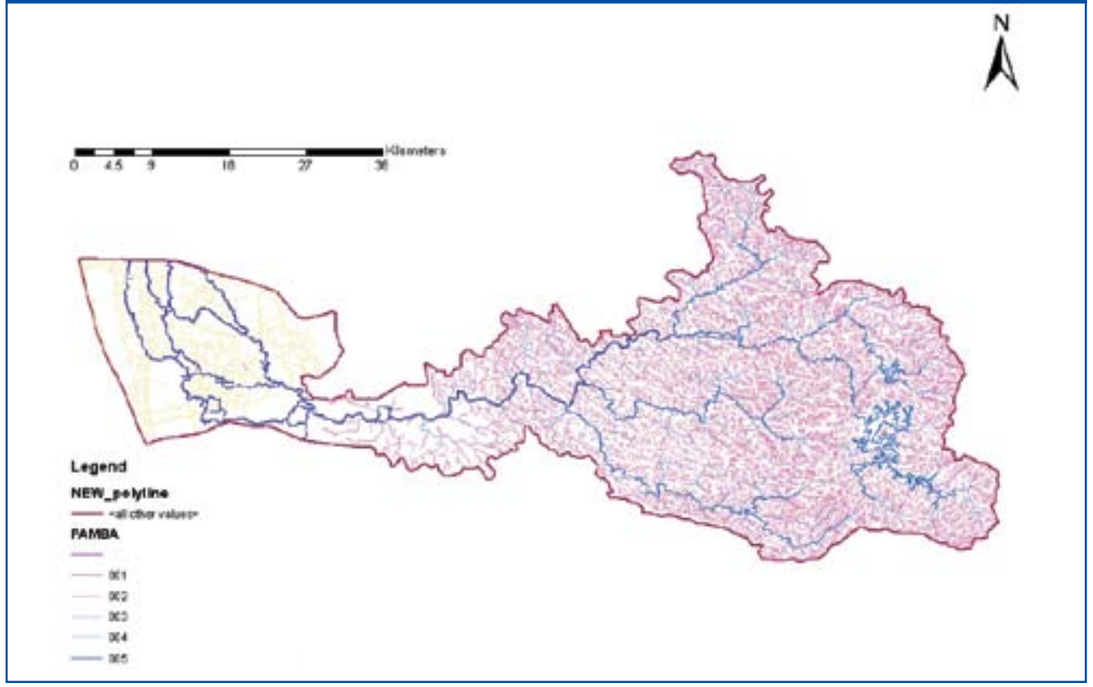
4.1 PHYSICAL CONTEXT

Pamba River is the third largest river in Kerala. It has a length of about 176 km and a catchment area of about 2,235 sq km. The river has its origin in Pulachimala in the Western Ghats at an altitude of about 1,650 m above sea level (masl) and flows through highly varied geologic and geomorphic provinces of the state. At its upper reaches, the Pamba River is charged by 288 rivulets and streams. Figure 5 shows the extent of the Pamba River Basin.

Kerala is blessed with a pleasant and equable climate throughout the year, despite being in close proximity to the Equator. This is because of its location at the coast and the Western Ghats provide protection on the east from hot winds blowing in. Kerala receives good rainfall, i.e. average 3,000 mm annually. Temperature normally ranges from 28-32 °C on the plains but drops to about 20 °C in the upper reaches.

Kerala is experiencing a paradoxical situation — despite abundant rainfall, there is significant variation and shortage of safe drinking water in many places in the state. Average rainfall in the low land region ranges from 900 mm in the south to 3,500 mm in the north; in the middle region it ranges from 1,400 mm in the south to 4,000 mm in the north; and in the high lands from 2,500 mm in the south to 5,500 mm in the north.

Figure 5 Drainage map for Pamba River Basin



Over 90 percent of the annual rainfall is received during the south-west monsoon, which sets in by June and extends up to September, and also from the north-east monsoons during October to December. However, because of the terrain condition in Kerala, rainfall runoff is very high. Over 60 percent of the geographical area of the state is covered by laterites and lateritic soil, allowing little infiltration (Agarwal and Narain 1997). Therefore, the state experiences severe summer conditions from January to May when rainfall is at a minimum. As rainfall is the main source of water availability in the state, any failure in the southwest or northeast monsoon affects the availability of drinking water, electricity production and agriculture and, hence, the livelihood of the population. Owing to its diversity in geographical features, the climatic condition in Kerala is diverse and divided into four seasons, i.e. winter, summer, south-west monsoon and north-east monsoon.

4.2 SOCIOECONOMIC CONTEXT

Kerala lies in the south-western coastal region and is one of the smaller states, corresponding to less than 1 percent of the land area of India. At an average of 819 persons per sq km, it is three times more densely populated than the rest of India. With a population of about 32 million, Kerala is home to 3.4 percent of India's total population. However, the population growth rate of Kerala is lower than the national average of 2.1 percent. The density of population ranges from as low of 250 persons per sq km in Pathanamthitta (which lies in the Pamba River Basin) and Idukkki districts to as high of 1,500 persons per sq km in Trivandrum and Alappuza districts (the Pamba River drains into the sea in this district).

Economists estimate that the per capita income of Kerala is less than USD 300 per year, which is lower than some other more industrialized states in India. Nevertheless, Kerala stands at the top of the pyramid in India with respect to social development indices such as primary education, maternal mortality, infant mortality, life expectancy and healthcare. The life expectancy of the population in Kerala is estimated to be 73 years. These figures compare favourably with developed countries. Because of these unique social achievements, despite sub-optimal economic growth, Kerala is tagged as 'unusual India' by development analysts.

Table 2 indicates how Kerala differs from the national average in all aspects of social development. In the 1991-2001 period, the all-India average decadal growth rate logged at a high of 21 percent, whereas Kerala recorded 9 percent, close to the developed world. Similarly, the sex ratio in Kerala stands clearly in favour of women at 1.058. At 91 percent, the literacy rate of Kerala is the highest in the country.

Table 2 Social development indices for Kerala State

	Population 2001	Decadal growth (1991-2001)	Sex ratio	Density	Literacy
All India	1,027,015,247	21.34	933	324	65.38
Kerala	31,838,619	9.42	1058	819	90.92

4.3 STATUS OF WATER RESOURCES

It is generally observed that Kerala suffers fewer environmental problems, such as groundwater depletion, than most other regions in the country (WRI 1994; CSE 1985). However, recently, environmental problems have become more apparent and have started to affect sustainability. For example, water conservation was the most neglected part of water resource development, but nowadays it has gathered attraction in both administrative and academic policy frames.

4.4 WATER USES

Pamba is one of the most important rivers in the South Western Hills of Kerala. The famous shrine of Sabarimala is situated in the hills of Pamba plateau. It is one of the most popular pilgrim centres in South India and millions of pilgrims visit the shrine especially during the winter season, starting in mid-November and ending in mid-January. The gathering of very large crowds over a short period of time every year in an ecologically sensitive area has given rise to various environmental problems.

The Pamba River originates from the Western Ghat and drains into Vembanad Lake. A survey conducted by the Central Pollution Control Board in collaboration with Kerala State Pollution Control Board revealed that solid waste and sewage generated at Pamba during the festival season causes severe pollution of the Pamba River. Lack of sanitary latrines, lack of facilities for sewage collection and treatment and the accumulation of wastes discharged from hotels and commercial

establishments located at Sabarimala are the major sources for the pollution of Pamba River. To overcome this, the construction of a series of check dams upstream on the two branches of the river has been taken up. The purpose is to store sufficient water and release it during the summer months, especially during the Sabarimala festival, and provide more sanitary and water supply facilities to the pilgrims during the festival season (CPCB, Annual Report 2000).

Various studies have recorded considerable changes in the land use, especially around Sabarimala shrine, during the past two decades. Considerable degradation has also been observed around the Pamba and Kakki reservoirs. The changes were mainly in the form of conversion and degradation of forests into forest plantations and other non-forest activities due to human activities. Remarkable differences were also noted in three major zones mainly based on the level of human intervention. In the first zone, major changes are from forest-to-forest plantations whereas in Zone II considerable amount of degradation has been noticed. The third zone is more or less unaffected compared to other zones. It has been recorded in the past two decades that the actual forest area has been reduced considerably, the percentage of reduction in forest cover being around 10.5 percent. The plantation area has also increased considerably during this period and rubber plantation shows about 51 percent increase.

Although no formal water use studies are available, a general assessment by experts in the field indicates that, measured by volume, close to 50 percent of water is utilized for irrigation and domestic water (including drinking) stands approximately at 10 to 25 percent. Water use for power generation and other use (commercial) are estimated to be about 30 to 35 percent and 10 to 15 percent respectively. It is also estimated that water for domestic purposes and commercial purposes records substantial increase during the peak pilgrim season (mid-November to mid-January).

Sabarimala base camp, December 2009

The Pamba River, from immediately upstream of Sabarimala to its lower reaches, is highly polluted, especially during the festival season. This is due to the huge quantity of waste generated by millions of pilgrims visiting the area. The pollution is mainly due to human excreta and biodegradable waste like used leaves, vegetable wastes, discarded clothes, food wastes etc. Indiscriminate disposal of used plastic bottles forms the major portion of the non-biodegradable waste.

4.5 DOMESTIC WATER USE

The drinking water system in Kerala can be classified into two broad categories: (1) schemes owned and operated by the state government and (2) family-managed drinking water supply, which includes individual families creating their own drinking water resources by constructing wells on their house compounds and managing the water supply source by themselves. The family-managed drinking water supply system in Kerala has a substantial role in the water supply scenario, especially in rural areas.

The provision of piped water supply in rural areas is the responsibility of the state government, and funds have been provided in the state budgets right from the commencement of the first Five Year Plan. A National Water Supply and Sanitation Programme was introduced in the social welfare sector in 1954. The states gradually built up the Public Health Engineering Departments to address the problems of water supply and sanitation. In 1972-1973, the Government of India introduced the Accelerated Rural Water Supply Programme to assist the states and union territories with 100 percent grants-in-aid to implement schemes in problem villages. As a part of it, in the 1970s, more than 450 piped rural systems were launched in Kerala. During the 1980s, as part of the Drinking Water Supply and Sanitation Decade Programme, several projects were launched with the support of bilateral and multilateral agencies.

Kerala has a conventionally 'water safe' economy. However, despite heavy annual rainfall, high well density and numerous rivers and ponds, the state of Kerala is paradoxically situated among the country's lowest per capita groundwater states. A few numbers of site-specific studies explained the 'scarcity in the midst of plenty' by several reasons, such as high rainwater runoff, loss of forest cover, sand mining, reclamation of paddy fields, etc. (State Planning Board 2002). It was observed that cities in the low land areas experience severe floods more often than earlier even under normal rainfall conditions. Also, many household wells in Kerala were drying up and need to be dug deeper to obtain water. Thus, even with abundant availability of water in the state, its beneficial use is constrained by many factors.

There are variations in water quality between coastal, midland and highland areas of Kerala, with chloride and iron concentration being the major problems in many pockets. Wells near the coastal belt of Kollam, Trivandrum, and Alappuzha districts, some parts of Ernakulam district, and the entire Malappurum region, are rich in iron. The Indian standards on drinking water prescribe a desirable limit of 0.3 mg/l and, in the absence of alternate source, a permissible limit of 1.0 mg/l.

There are many isolated pockets in Kerala with iron concentration above 1 mg/l, which affects the taste and appearance of water, has adverse effects on domestic use and water supply structures, and promotes iron bacteria. Besides metallic contamination, surface water in rivers is polluted by municipal and industrial discharges. Widespread biological and bacterial contamination as well as application of pesticides largely affects the water quality.

With almost all the rivers in Kerala being rain-fed, any reduction in rainfall affects the water level. Declining water levels in turn affect the availability of piped water supply. Most households depend on open wells for drinking water. So, a declining water table has consequences on the family-managed drinking water supply.

Table 3 provides the breakdown of source dependency of rural households for drinking water, and how Kerala ranks against the all-India average. At 58.8 percent, well dependency is very high in Kerala and stands in total contrast to the all-India average of 21.3 percent. This has significant implications for IWRM in terms of water use, accessibility and equity.

Table 3 Source dependency for drinking water in rural households

Principal Source	All India (%)	Kerala (%)
Tap	14.8	7.6
Tube well/Hand Pump	46.5	1.2
Well	21.3	58.8
Tank/Pond restricted for drinking	0.9	1.1
Other Tank/Pond	0.5	0.4
River/Canal/Lake	1.0	< 0.1
Spring	1.6	0.2
Tanker	0.2	-
Others	0.2	0.2

Source: NSSO, 54th Round

The percentage of households having sufficient drinking water throughout the year is also low in Kerala compared to other major Indian states. If sufficiency of drinking water throughout the year also taken into consideration, the coverage of piped water supply in Kerala is merely 9 percent (taps and tube wells). The majority of households in Kerala traditionally depended on open wells for their household water supply needs. It has been estimated that Kerala has the highest percentage (30.4 percent) of households suffering from insufficiency of drinking water in some part of the year (NSSO). They had to find alternative sources of water supply for their domestic water needs. This seasonality of water availability is an important dimension of the water supply problem in Kerala and has major implications for IWRM.

4.6 WATER FOR AGRICULTURE

The agro-climatic conditions suit the cultivation of a variety of seasonal and perennial crops. The net area sown in Kerala is estimated to be about 2 million hectares (ha). Fifteen principal crops (rice, pulses, coconut, rubber, tea, coffee, pepper, cardamom, areca nut, ginger, nutmeg, cinnamon, paddy, tapioca and other plantations) are cultivated in the state, mainly by marginal or small farmers.

The key agricultural crop of Kerala is paddy. In fact, the Kuttanad region that falls in the Pamba River Basin is known as the 'rice bowl of the state'. While paddy is grown mainly for their own consumption by many households, widespread cultivation of coconut and rubber production constitutes the principal source of agricultural income. The state has a substantial share in the four plantation crops, i.e. rubber, tea, coffee and cardamom. These four crops together occupy 600,000 ha, accounting for 31.4 percent of the net cropped area in the state. Kerala accounts for 92 percent of the total production of rubber, 76 percent of cardamom, 21 percent of coffee and 6 percent of tea in the country. The changes in cropping pattern during the past two decades were in favour of these crops.

The major spices exported from Kerala are pepper, ginger and nutmeg. Kerala continues to enjoy a near monopoly in the cultivation area and production of pepper accounting for 98 percent in the country. The productivity of pepper

had achieved its peak of 376 kg/ha during 1998-1999. But in 2006-2007 it had declined to about 286 kg/ha.

Table 4 presents the gross agricultural income and its percentage share of the gross income. It is evident from the table that, although the overall agricultural income has recorded about 18 percent increase between 2002 and 2007 (with the exception of 2003-2004), the share of agriculture income to the gross income has shown a steady declining trend i.e. from 16.4 percent in 2002-2003 to 14.6 percent in 2006-2007.

Table 4 Contribution of agricultural income to gross income in Kerala

Year	Agricultural income (in million INR)	Percentage of gross income
2002-2003	131,320	16.4
2003-2004	128,190	15.1
2004-2005	137,620	14.9
2005-2006	146,730	14.8
2006-2007	155,390	14.6

Source: Directorate of Economics and Statistics

4.7 WATER FOR IRRIGATION

Kerala has a wide network of river, rivulets and springs spread over its entire geographical area. Out of the net cropped area of the state, only 18 percent is irrigated. The net area irrigated declined from 399,000 ha during 2005-2006 to 385,000 ha in the year 2006-2007 (about 4 percent). The major source of irrigation is from wells (30 percent), government canals (26 percent), tanks (11 percent) and private canals (1.1 percent), respectively. The peculiarity of the rivers flowing across Kerala is the short length of the rivers and the elevation difference between the high and the low land, leading to quick flow of water collected from the river basin and quickly discharged into the sea, a feature typical of the Pamba River. The major portion of the runoff through the rivers occurs during the monsoon seasons. Some 67 percent of the surface water area of 361,000 ha is constituted by brackish water lakes, backwaters and estuaries.

Irrigation development in Kerala is mainly centred on the development of surface water resources, i.e. development of major and minor irrigation projects. About 60 to 70 percent of the investment in each plan of the state was earmarked for major and medium irrigation. During the tenth Plan period (2002-2007), an amount of INR 9.3 billion (about Euro 147 million) was set apart for the irrigation sector. In the preceding ninth Plan, the outlay was INR 10.28 billion (about Euro 163 million). This decline was mainly due to the transfer of minor irrigation schemes to the local bodies and limited scope for the development of major projects. This has clear implications for IWRM planning, i.e. in the recognition of expanding roles of local bodies in water resource management and in decreasing space for conventional irrigation development projects.

Irrigation in Kerala mainly uses surface water resources. The development approach of water resources and its management aims to conserve natural resources including rainwater through appropriate intervention and to ensure their

optimal utilization. It also envisages optimum utilization of the potential already created by introducing appropriate participatory management suitable to the systems and social groups. The Irrigation Department has completed 18 major projects for water resource development and management such as Mangalam, Peechi, Neyyar, Pamba, Periyar Valley, Kanjirapujha Project, etc. The engineering activities undertaken by the department are construction of field channels and farm channels, introduction of the warabandhi system, construction of drainage channels, construction of farm roads and improvements of existing tanks.

4.8 GROUNDWATER

Groundwater has been the mainstay for meeting the domestic needs of more than 80 percent of the rural population and 50 percent of the urban population, besides fulfilling the irrigation needs of around 50 percent. The ease and simplicity of its extraction has played an important role in its development. However, the problems of decline in the water table, contamination of groundwater, seawater intrusion, etc. are being increasingly reported at many places.

Along the hill ranges, the crystalline rocks are covered by a thin weathered zone. Thick zones of weathered crystalline are seen along midland region. The depth-to-water level in the weathered crystalline in the midland area ranges from 3 to 16 m below ground level (bgl). The midland area sustains medium-capacity dug wells for irrigation. Mostly, dug wells that can cater to domestic needs are feasible along topographic lows. Bore wells tapping deeper fractured aquifers are feasible along potential fractures in the midland and hill ranges. Potential fractures are seen down at 240 m, and the most productive zone is between 60 and 175 m. The discharge of bore wells ranges between 36,000 l/h and 125,000 l/h. The aquifers are largely developed in and around Alleppey and in Kuttanad area, which mainly fall in the Pamba River Basin.

The groundwater potential of Kerala is very low as compared to that of many other states in the country. The estimated groundwater balance is 5,590 MCM. Dug wells are the major groundwater extraction structure in Kerala. The dug wells have a maximum depth of about 10 to 15 m. They have a diameter of about 1-2 m in the coastal region and of about 2-6 m in the midland and highland, including the Pamba River Basin. The open well density in Kerala, at an average of 70 to 200 wells per sq km, is perhaps the highest in the country. The groundwater withdrawal is estimated at 980 MCM and the State Groundwater Department calculated the effective recharge as 8,134 cubic metres. The groundwater level is receding drastically during the summer months and wells commonly dry up in many parts, including the Pamba River Basin. The depth of the water level in Kerala State varies from a few centimetres below ground level (bgl) to 56 m bgl and most of the area is in the range of 0-20 m bgl. The depth of the water level in the weathered crystalline of midland areas in Kerala varies from 3-16 m bgl. The midland area sustains medium capacity dug wells. Along the coastal plains, the groundwater occurs at depths ranging from less than 1 m bgl to 6 m bgl.

4.9 TRENDS

Traditionally, water has been revered and treated in India as an equitable community resource, which is deeply embedded in the Indian socio-cultural milieu. The practice of community ownership of water is traditional and provided equal access to all. Water was allocated equally among community members and distribution was community-managed. There is enough empirical evidence to show that the model had worked well and the demand-supply situation was well balanced. As documented in many studies, the water economy in many states, including Kerala, is largely informal, with little interface with any public institution. Reform efforts were focussed mainly on direct regulation and management on the assumption that there exists a capacity within the government to influence water use patterns. On the contrary, ground realities indicate that water use and water management in the state is mainly informal in nature and the influence of the government in stimulating change in use patterns is marginal.

In Kerala, water users, mainly domestic users in the rural and peri-urban communities, depend on self-provision and local community institutions that are not under the direct influence of formal public institutions (IWRM Challenges in Developing Countries, Lessons from India and Elsewhere, International Water Management Institute, Colombo).

With the increased pressure on water demand, the spirit of community management was ‘watered’ down. As villages turned into semi-urban and urban hubs, the transformation became more prominent. The rights of water management (domestic and non-domestic) were ‘taken over’ by the elected governments. Several distinguishing characteristics that were integral to community ownership slowly degenerated; access quickly became unequal. Need-based turned out be supply-based, the community-managed system deteriorated into a government-controlled system, and the new system failed to cope with the demands. Efficiency improvement through an induction of new irrigation technology and infusion of finances in large quantities became the norm. Consequently, the degeneration started manifesting in

(i) access becoming increasingly restricted;

(ii) need-based management clearly deteriorated into supply-based control; and

(iii) an increased emphasis on institutionalized sector management and legislation.

The formal institutionalization of water management in India thus commenced about five to six decades ago and Kerala was not excluded from this change. With the increased ‘control’ by the government, proclamation of policies and enactment of acts, rules and regulations became necessary. Given the federal structure of governance in India, water is in the ‘state list’, in the sense that enacting water laws falls in the domain of state governments, with some in-built safeguards to address inter-state river disputes by the elected government at the centre. Pamba River Basin flows entirely in the state of Kerala and does not transcend the state boundaries. Therefore, the onus on making laws, rules and regulations related to Pamba River Basin lies entirely with the Government of Kerala, with the Central government playing only facilitation and funding support roles. This sets the

institutional context and governance reference for water management, policies, legislation and institutions for the Pamba River Basin in Kerala.

Pilgrims bathing at the banks of the Pamba, Sabarimala, December 2009

5 WATER POLICY, LEGISLATION, MANAGEMENT AND INSTITUTIONS IN KERALA

5.1 KERALA WATER POLICY AND LEGISLATION

The IWRM initiatives in Kerala are primarily guided by the existing Water Policy. Kerala enacted its State Water Policy in 2008 along the lines of National Water Policy 2002. Both the policies have set priorities of water allocation in unambiguous terms. Figure 6 compares the two policies

Figure 6 Comparative water policy priorities at national and state levels

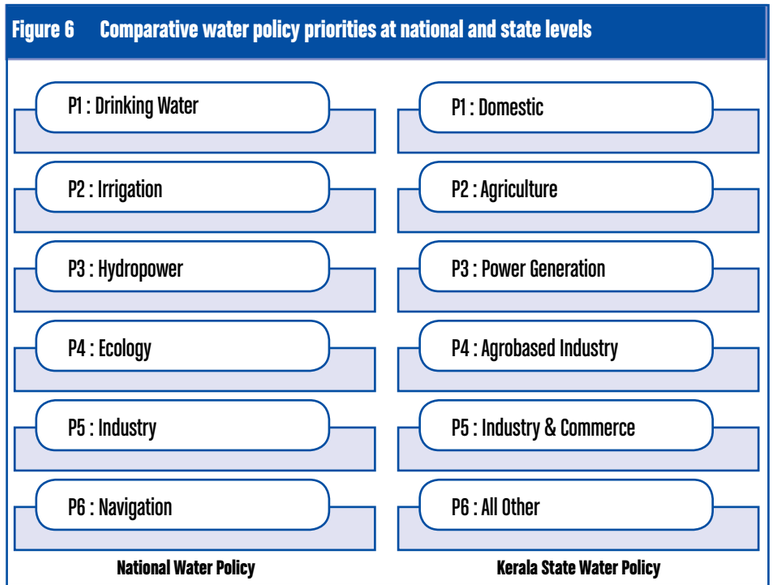


Table 5 Kerala State level institutions managing water resources

Institutions	Functions
Ministry of Water Resources (MoWR), Ministry of Forests, Ministry of Agriculture, Ministry of Local Self Government	State level policies, guidelines, proposing legislation
Irrigation Department (ID), Kerala Rural Water Supply Agency (KRWSA), Department of Forests, Department of Local Self Government	Defining procedures, setting priorities, implementation of schemes and programs
Kerala Water Authority (KWA), State Pollution Control Board (SPCB), Urban Local Bodies (ULBs), Gram Panchayats (GPs)	Defining state-specific norms, monitoring, ensuring compliance

The national policy and the state policy are broadly comparable in their priority setting, with drinking water getting the top order priority and industry and other uses getting lower order priorities. However, the Kerala State Water Policy is defined broadly under Priority 1 to bracket drinking water within domestic needs. The National Water Policy defines meeting irrigation needs as Priority 2, whereas the corresponding priority in the Kerala's State Water Policy is broader, and includes all agricultural needs e.g. household agro-processing industry or animal husbandry. The existing irrigation act (Kerala Irrigation and Water Conservation Act, 2003) is limited in its scope to provide for construction, maintenance, distribution of water and levy of taxes. Therefore, the scope of IWRM in Pamba River Basin and the functions of the Pamba River Basin Organization would have to extend beyond the application of the existing irrigation act alone.

In a departure from the national water policy, the state water policy does not make any specific reference to ecological needs or navigational needs (Priority 4 and 6 respectively under the national water policy). They are set as an agro-based industry and all other needs. The priorities thus set differently have different implications at both levels. The state water policy places emphasis on creating social awareness on rights and responsibilities and gives specific reference to the institutional mechanism of decentralized system of governance in Kerala. Some of the unique features of the state policy that have far-reaching implications to Pamba River Basin planning are listed below.

- Micro-watersheds have been considered as a basic unit for managing water with river basins as integrated units of micro-water sheds
- Enabling appropriate institutional mechanisms and legal measures for sustainable water resource development and management
- Participation of local self governments in perspective planning and implementation; given the advanced level of local self government institutions in Kerala, this gives specific meaning to the Pamba River Basin Authority
- The state will establish a well-defined and transparent system for water entitlements and commercial exploitation and use and transaction of water by private establishments will be regulated. Again, this empowers the Pamba River Basin Authority to propose appropriate laws to ensure the principles of IWRM are adhered to.

Some other national level policy documents, acts and institutional set ups that are relevant to the Pamba River Basin initiative are

(i) the National Water Mission under the National Action Plan on Climate Change;

(ii) the Irrigation Act;

(iii) the Central Groundwater Authority; and

(iv) water pollution norms set by the Central Pollution Control Board.

Constitutionally, water is a state subject in the sense that individual states are directly mandated to define policies, discharge service delivery functions and enforce legislation. However, because of fragmented responsibilities at the state level and beyond, there are significant overlaps and gaps in water management and service delivery. Water regulation is determined by state departments. Functions of state level regulatory bodies include allocation of water, water use balance and environmental management, water quality, land use planning, tariff determination, etc. Local bodies (such as ULBs and GPs) are responsible for direct programme implementation.

In addition, technical bodies such as the Kerala Water Authority (KWA) and the Kerala Rural Water Supply Agency (KRWSA) provide technical solutions to ULBs and GPs as well as take up Operation and Maintenance work. The Constitutional Amendments made in 1986 (73rd and 74th Amendment) empower the ULBs and GPs to undertake water service delivery. This arrangement is yet to evolve fully, although Kerala is a pioneer in this regard. In the Pamba River Basin, for example, urban drinking water service delivery and waste management are managed by the respective ULBs and rural drinking water services is the responsibility of the respective GPs, with technical and O&M support from the KWA and KRWSA. The irrigation services in the basin are managed by the irrigation wing of the Water Resources Department.

Similar to other states, water regulation in Kerala is characterized by the absence of an umbrella framework. A large number of different principles, rules and acts adopted over many decades coexist and overlap with each other. In terms of statutory development, irrigation laws constitute, historically, the most developed part of water law. This is due to the promotion of government-owned irrigation infrastructure. As a result, some of the basic principles of water law applicable today in India derive from irrigation acts. The Government of India Act (1935) has in principle given power to the states to legislate water related provisions. For example, Kerala has enacted legislation to regulate water supplies, irrigation and canals, water supply, groundwater use, rainwater harvesting, protection of riverbanks, etc. The key features of some of the important pieces of legislation in Kerala and their significance to IWRM are described in Table 6.

Table 6 Kerala State level acts and their relevance to IWRM

Acts	Key Features	Importance to IWRM and the Pamba River Basin Authority
Kerala Municipal Buildings Rules, 1999 (Rain Water Harvesting)	This is one of the pioneering Acts in the country with regulations for roof water harvesting in residential, industrial and office buildings for the purpose of groundwater recharge. The capacity of the storage tank is well defined in the Act and it applies to all towns in the state.	The concerned municipality is the authority to ensure compliance. There are several small and medium sized towns in the Pamba River Basin. Quantitative reduction of groundwater resources has been ranked as one of the problematic issues during this study tool and therefore, it has direct implication to IWRM in Pamba. The groundwater component of the Pamba River Basin Authority will have coordinating responsibilities with the state groundwater department and urban local bodies in this context.

Cotnd...

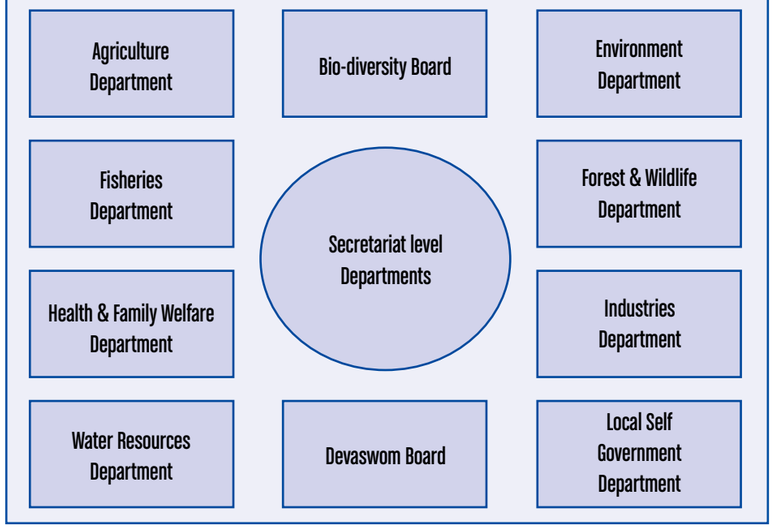
Table 6 Kerala State level acts and their relevance to IWRM *(Contd.)*

Acts	Key Features	Importance to IWRM and the Pamba River Basin Authority
Kerala Protection of River Banks and Regulation of Removal of Sand Act, 2001	This Act provides provisions for protecting river banks and river beds from large scale dredging of river sand and to protect their biophysical environment system and regulate indiscriminate mining of river sand. The District Collector and the concerned local governments have the power to regulate sand mining.	Unregulated sand mining in Pamba River Basin has been repeatedly mentioned by many participants during this study as a major reason for reduced flow in Pamba river, although it did not figure prominently in the applied WRIAM tool applied in this pilot project (Chapter 5). Nevertheless, this has an implication to IWRM in Pamba. The provisions of the Act can be leveraged by the Pamba River Basin Authority to ensure mining is regulated.
The Kerala Irrigation and Water Conservation Act, 2003	This Act provides legal provisions to construct irrigation works, conserve and distribute water for the purpose of irrigation and levy water taxes on lands benefited by irrigation works in the state and to provide for involvement of farmers in water utilization system	Stimulating farmer participation in water management is one of the most important implications of this Act to IWRM in Pamba. Ensuring water equity through balanced water allocation rights is another implication.
Kerala State Water Policy, 2008	Promulgated in 2008, along the lines of the National Water Policy. Kerala has been a late starter in this regard. The key features include well defined rationale, emphasis on micro water shed approach leading to river basin approach, promotion of integrated water management practices, developing systems for transparent system for water entitlements etc.	This sets the context for introducing IWRM in Kerala. The Pamba River Basin Authority can take pioneering initiatives by leveraging specific policy promulgations laid out in the state water policy.
The Kerala Groundwater (Control and Regulation) Act, 2002	This Act provides for the conservation of groundwater and for the regulation and control of its extraction and use. The State Groundwater Authority, along the lines of Central Groundwater Authority has been set up for this purpose. The Authority comprises members drawn from various government departments and nominated members. All those desiring to dig a well or to convert the existing well into pumping well, in the notified area are required to obtain permission from the Authority. Permission will be granted subject to certain provision specified in the Act. The Act also specifies the requirement of registration of existing wells.	This is particularly relevant to the control and management of groundwater in the Pamba River Basin. It is possible for the Pamba River Basin to regulate groundwater extraction in the basin using provisions under Act.
The Kerala Forests (Vesting and Management of Ecologically Fragile Lands) Act, 2003	This Act provides the power to control the exploitation of ecologically fragile lands and for the management of such lands with a view to maintaining ecological balance and conserving the biodiversity.	Damage to biodiversity in the Pamba River Basin due to various factors such as sand mining, deforestation etc. has been expressed as one of the important concerns by the participants during stakeholder consultation workshops under this pilot project. Water demand for eco systems has been ranked very high (a score of 72) in WRIAM tool. Therefore, the relevance of this Act to IWRM in Pamba cannot be undermined.
The Kerala Conservation of Paddy Land and Wet Land Act, 2008	This is an Act that aims to conserve the paddy land and wetland and to restrict the conversion or reclamation in order to promote growth in the agricultural sector and to sustain the ecological system.	In Kuttanad area, paddy is grown extensively and it falls in the Pamba River Basin. In the past decade or so, Kuttanad has witnessed extensive decline in paddy cultivation, inadequate flow of water in the river being one of the contributing factors. This Act, therefore, holds high significance to IWRM in the Pamba basin.
The Pamba River Basin Authority Act, 2009	This is the first of its kind that has been constituted in Kerala. The Act provides arrangements for the management of activities connected with the conservation of water resources in the Pamba River Basin.	This has very specific relevance to IWRM in Pamba. The Authority has been set up at the state level. As a next logical step of institutionalizing IWRM, Pamba River Basin Organization (RBO) needs to be established with all operational responsibilities vested in it at basin level. The RBO then becomes the operational body that manages river basin planning and management.

5.2 WATER MANAGEMENT AND INSTITUTIONS IN KERALA

Water resources management is presently operated at two administrative levels as illustrated in Figure 7 and Figure 8, respectively. One is the secretariat level, which assists respective ministers, and secondly at the field level, which generally operates at the districts. A description of the major institutions and agencies within the Water Resources Department involved in water resource management and their role is given below.

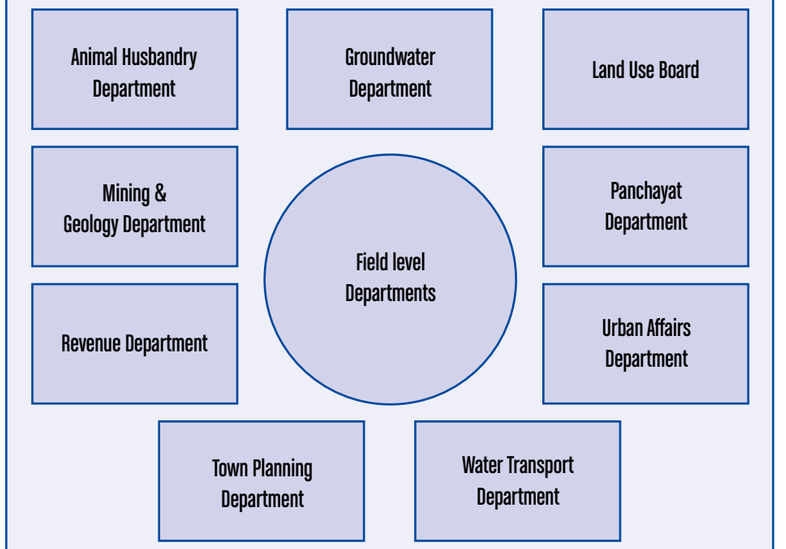
Figure 7 Water Resources Management at Secretariat level



5.2.1 Kerala Water Authority

The Kerala Water Authority (KWA) was established in 1984 as an autonomous body of the Government of Kerala. It has been developed from the Public Health Engineering Department, its parent institution, for the development and regulation of water supply and wastewater collection and disposal in the state of Kerala. Though community-managed traditional water supplies in the form of open dug wells and ponds have been in existence for generations, the first form of protected water supply in Kerala started at Ernakulum in 1914. Another protected pipe water system for Thiruvananthapuram started in the 1930s by the erstwhile Travancore State. After the formation of the present Kerala State, various urban and rural piped water supply schemes were initiated. In tune with the national thinking, Kerala has adopted a comprehensive State Water Policy. The State Government has set a target of expanding water supply coverage to all districts. The Authority works for design, execution, promotion, operation, maintenance and financing of schemes for the supply of water and for the collection and disposal of the wastewater. It renders the necessary services to the Government in relating to water supply and collection and disposal of wastewater in the State of Kerala. Kerala Water Authority is also responsible for the collection of wastewater and disposal in the State of Kerala.

Figure 8 Water Resources Management at District level



5.2.2 Groundwater Department

The Groundwater Department (GWD) is the nodal department in the state for the monitoring and management of the groundwater. This department collects and processes monthly data at the State Data Centre for 871 stations. These data are computerized and processed. Under the Hydrology II Project funded by the World Bank, these data are being processed at river basin scale. Data are collected for baseline and trend status analysis. Groundwater quality meets the BIS standards for drinking purpose in most stations except a few locations (Palaghat, Aleppey).

The GWD has three water quality testing laboratories, i.e. at Thiruvananthapuram, Ernakulum and Calicut. The department provides training to staff from time to time for data management practices. In the Hydrology Project-I, training was provided extensively. The department also helps in public awareness raising. They educate school children on rainwater harvesting and water quality testing. The Groundwater Department collects groundwater samples for testing parameters such as pH, electrical conductivity, total dissolved solids, carbonate, bicarbonate, alkalinity, total hardness, calcium, magnesium, potassium, silica, chloride, fluoride and arsenic at few locations. From 1997 water quantity and quality data at district and taluka (lower administrative unit) level are being collected. Water quality data are collected four times a year and water level is collected monthly.

5.2.3 Irrigation Department

The Irrigation Department aims at providing a most efficient Irrigation system to the state of Kerala, which functions as the backbone for the improvement of agriculture in the state. Canals provide safe drinking water as well as water for irrigation and navigation. In order to improve the irrigation potential, innovative minor irrigation schemes have also been implemented in almost all parts of the

state in the form of lift irrigation schemes, improvement of existing lakes and ponds, diversion schemes for natural streams, prevention of salinity intrusion in rivers, drainage works to paddy fields, construction of check dams, vented cross bars and sluices. Construction of sea walls, flood damage control works including side protection works of natural streams and channels, etc. are other major areas of activities under the Irrigation Department. River water comes under the jurisdiction of the Irrigation Department as well.

5.2.4 Kerala State Pollution Control Board

The Kerala State Pollution Control Board is entrusted with the responsibility of controlling pollution, restoring and maintaining the wholesomeness of the environment and implementation of statutes aimed at protecting the environment in the State. It also advises the State Government on all matters concerning prevention, control or abatement of pollution. Regarding water quality monitoring, the Kerala SPCB is carrying out two major schemes: the National Ambient Water Quality Programme (NWMP) at 64 stations and the State Ambient Water Quality Programme at 119 stations in 21 rivers. Digitization of data has started. The department also keeps geo-referenced records of data. They provide data to the CPCB for environmental management.

For the Pamba River, data is being collected mainly in the downstream area. The Pamba River flows through Pathanamthitta, Thiruvalla, Kuttanadu and Ambalappuzha and finally falls into Vembanad Lake. The monitoring stations are located at Parumala, Chenganoor and Thakazhy for trend analysis. Monitoring frequency is done quarterly for these locations.

5.2.5 Pamba River Basin Authority

On the basis of the water quality data of the State Pollution Control Board and the severity of environmental problems in the Pamba Basin, an Action Plan was prepared by the State and approved by the MoEF for reducing the level of pollution in Pamba River. However, this document does not address other issues affecting the Pamba River. The Ministry of Water Resources took the initiative for the formation of the Pamba River Basin Authority (PRBA) for the implementation of the Action Plan. PRBA has 15 members and is chaired by the chief minister. The water resources minister is its vice-chairman. The water resources secretary is member secretary. Other members include secretaries of various departments such as revenue, forest, local self-government, health, science and technology and environment, finance, power and Devaswom. The chairman of the Kerala State Pollution Control Board is also a member. Two water sector experts have been nominated by the government to the Authority.

The Pamba River Basin Authority Bill (2009) established an authority in the state as a statutory body for the conservation of water resources in the Pamba River and its basin as an integral unit. According to the Bill's Preamble,

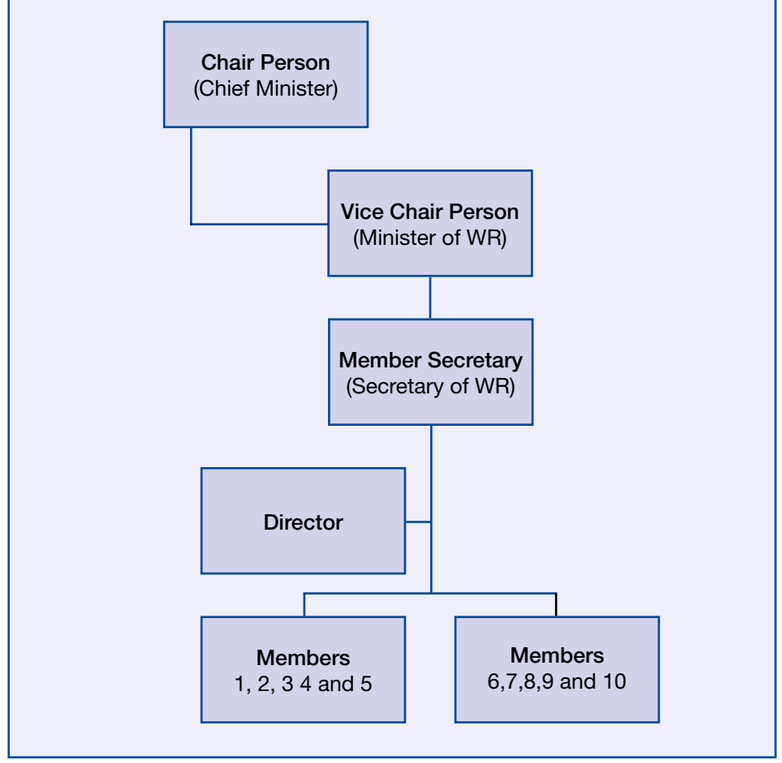
> *the government is bound to ensure the quality of water in the river and to take measures to prevent pollution and to undertake integrated planning, monitoring, management and development of water resources in the river with the river basins as an integral unit.*

The intention is that the Authority will formulate policies and projects for sustainable development of water resources and river basins of the Pamba River, and for scientific management to protect the area's ecosystems and its genetic variety and biodiversity. It has the power to impose control or restrictions over the exploitation of natural resources or encroachment that have an impact on the water resources and the basin of the Pamba River.

At present, the Irrigation Department is the main functionary for the Pamba River Basin Authority.

The members represented in the Authority represent various sectors of the GOK, ranging from the irrigation department, to forestry, health, sanitation, as well as the local self government. A simplified organogram of the PRBA is provided in Figure 9.

Figure 9 Organogram of the Pamba River Basin Authority



6 PRIORITISATION OF ISSUES

6.1 METHODOLOGY

The general philosophy in the process towards Integrated Water Resources Management is, under the given conditions, to establish a balance between the requirements relating to water, of the economic/social environment and of the effects of human activities on the water resource.

This balance will be established through a system of management functions targeted to solve the identified problems of the resource with respect to their importance. With a technical description of the current situation of the resources and their exploitation (availability/quality/demand/pollution), a general analysis of the current problems of the various management levels as well as a systematic analysis of the importance of the basic problems, it will be possible to identify the relevant measures for establishment/improvement of the management functions that will form the contents of an action plan.

In short: *«Knowing where you are in order to find out where you are going or where you can go».*

In order to prioritise the water resources issues for the Pamba Basin, the Water Resources Assessment Method (WRIAM) was applied during a stakeholder working session conducted in May 2010. The WRIAM method was developed as part of a project concerning IWRM in Burkina Faso and has since been applied in more than 20 countries as part of their IWRM process. The method has been conceived to allow the attribution of reasonably qualified quantitative values to more or less subjective judgements, thus offering at the same time a monitoring

system that can be reused to reexamine the problems and, importantly, to measure the effects of actions taken to address the problems.

The state is subdivided into hydrographical basins, but the method can also be used to assess the issues at the national level as a whole. Relevant issues are then assessed and ranked (prioritised) against a set of predefined criteria used to assess the importance of a given situation. In order to structure the issues, the method operates with impact issues relating to quantity and quality of the resource, user requirement issues and risks imposed by the resource.

This tool was used in the Pamba River Basin to reach a consensus on the priority issues through extended dialogue and discussions. Representatives drawn from the water resource department (irrigation, groundwater), agriculture department, forestry, pollution control board, water service delivery agencies (Kerala Water Authority), electricity department, local self government departments, district collectors, other technical departments, bio-diversity board, NGOs and CBOs across the basin discussed various issues that are relevant to IWRM and ranked them based on their experience. The participants were taken through the key issues described in the tool and asked to consider the cause of the problem based on their first-hand experience and collectively rank them on a five-step scale (light problem, problem, important problem, very important problem and major problem). The open debate and collective ranking process neutralized the probability of individual biases influencing the ranking. A total of 104 water resources issues were ranked and thereby prioritised as part of a participatory consultation session performed in May 2010. Out of the 104 issues ranked 51 issues were assessed to be of different degree of importance. The results are given in the following sections and a full list of the 104 issues ranked is given in Annex 2

6.2 IMPACT ISSUES AFFECTING QUANTITY AND QUALITY OF THE PAMBA WATER RESOURCES

Table 7 below shows the identified and ranked impact issues to be of importance in the Pamba River Basin. With respect to surface water, it appears that issues of major problems in the basin consist of reduced availability, water loss, turbidity, pathogenic contamination and organic pollution caused by sand mining, encroachment, sedimentation of reservoirs and excreta. Impact issues of importance for groundwater consist of reduced availability due to climate change and contamination of the quality of the resource due to excreta.

Table 7 Water resource issues and causes

Water Resource Issues	Causes
Reduced availability and loss of the water resource	Sand mining
Turbidity	Encroachment
Pathogenic and organic pollution	Sedimentation of reservoirs
Resource availability and quality do not meet the demand for ecosystems and pilgrims	Contamination from excreta
	Climate change
Soil erosion and loss of crops	Floods and intensive pluviometry

6.3 USER REQUIREMENT ISSUES IN THE PAMBA RIVER BASIN

A clear picture was seen with respect to whether the resource can meet the user demand in terms of quantity and quality. The highest ranked issues were seen to be that the surface water resource could not meet demands for the ecosystem, pilgrims, or the urban and rural water supply. The groundwater was assessed to be sufficient to meet the quantity requirements of users and the quality needed for different users was an issue of minor importance.

6.4 RISKS

Besides the two types of issue above, the resource itself can cause a risk. The ranked issues of this type were soil erosion, loss of crops and risk of accidents (e.g. drowning and dam breaks) mainly due to the heavy monsoon.

6.5 SYNTHESIS OF WATER RESOURCES ISSUES IN THE PAMBA BASIN

The most urgent identified and prioritised water resources issues that must be addressed by management in the Pamba Basin are summarised in Tables 8, 9 and 10.

To ensure that the above-identified issues are those that urgently need attention, a broader stakeholder consultation was held in Chengannur in September 2010. Approximately 80 participants representing a broad range of local stakeholders were consulted on the water resources issues and a working session conducted to allow them to identify and rank the issues they face in the Pamba Basin. The outcome from this consultation showed an overall agreement with the prioritised issues from the WRIAM session. Moreover, the stakeholders concluded that water resources issues of importance also include impacts on the quality of the resource due to chemicals and pesticide pollution as well as solid waste, such as plastics.

Pamba Pilot Project Inauguration, February 2010

Pamba Pilot Project, Public Consultation, Chengannur, September 2010

Table 8 Ranked impact issues affecting the quantity and quality of water

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important problem	Major problem
A - SURFACE WATER RESOURCES - Pamba Basin							
Quantitative reduction of surface water resources - Pamba Basin							
Reduced availability	Impact from sandmining	81	■	■	■	■	■
Reduced availability	Encroachment	72	■	■	■	■	■
Water loss	Sedimentation of reservoirs	72	■	■	■	■	■
Reduced availability	Abstraction for urban water supply	42	■	■	■	■	
Reduced availability	Long term climatic changes	30	■	■	■		
Reduced availability	Abstraction for rural water supply	28	■	■	■		
Pertubation of runoff	Infrastructures	27	■	■	■		
Reduced availability	Impact from upstream dams	18	■	■			
Reduced availability	Abstraction for irrigation	14	■	■			
Pertubation of runoff	Urbanisation	14	■	■			
Reduced availability	Short term variability of precipitation	14	■	■			
Water loss	Excessive evaporation	14	■	■			
Pertubation of runoff	Modification of soils	5	■				
Reduced availability	Abstraction for livestock	3	■				
Qualitative degradation of water quality resources - Pamba Basin							
Turbidity	Sandmining	72	■	■	■	■	■
Pathogenic contamination	Excreta	63	■	■	■	■	
Organic pollution	Excreta	63	■	■	■	■	
Organic pollution	Urban waste	63	■	■	■	■	
Other pollution	Waste - plastic	54	■	■	■	■	
Pesticide pollution	Agricultural cropping	42	■	■	■	■	
Other chemical pollution	Urban waste	24	■	■	■		
Eutrophication	Agricultural cropping	12	■	■			
Turbidity	Erosion	12	■	■			
Organic pollution	Livestock	6	■				
Eutrophication	Excreta	6	■				
Other chemical pollution	Energy/transport	6	■				
B - GROUNDWATER RESOURCES - Pamba Basin							
Quantitative reduction of groundwater resources - Pamba Basin							
Reduced availability	Long term climatic changes	48	■	■	■	■	
Pertubation of infiltration	Urbanisation	18	■	■			
Reduced availability	Short term variability of precipitation	8	■				
Reduced availability	Abstraction for rural water supply	4	■				
Qualitative degradation of geoundwater resources - Pamba Basin							
Pathogenic contamination	Excreta	81	■	■	■	■	■
Organic pollution	Excreta	81	■	■	■	■	■
Pesticide pollution	Agricultural cropping	7	■				

Table 9 Ranked user requirement issues

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important proble	Major problem
A - SURFACE WATER RESOURCES - Pamba Basin							
Match between demand and availability of surface water resources - Pamba Basin							
Demand for ecosystems	Insufficient water availability	72	■	■	■	■	■
Pilgrims & Tourism	Insufficient water availability	36	■	■	■	■	
Tot. demand/exploitable res.	Insufficient water availability	36	■	■	■	■	
Demand for urban water supply	Insufficient water availability	24	■	■	■		
Demand for rural water supply	Insufficient water availability	24	■	■	■		
Demand for hydropower	Insufficient water availability	18	■	■			
Fisheries	Insufficient water availability	18	■	■			
Demand for terrestial wildlife	Insufficient water availability	12	■	■			
Match between water quality needs and the available water quality of surface water resources - Pamba Basin							
Demand for urban water supply	Insufficient water quality	48	■	■	■	■	
Demand for rural water supply	Insufficient water quality	48	■	■	■	■	
Demand for environment	Insufficient water quality	24	■	■	■		
Demand from fisheries	Insufficient water quality	24	■	■	■		
Demand for hydropower	Insufficient water quality	6	■				
B - GROUNDWATER RESOURCES - Pamba Basin							
Match between water quantity needs and available quantity of groundwater resources - Pamba Basin							
Demand for urban water supply	Insufficient groundwater resources	0					
Match between quality needs and available water quality of groundwater resources - Pamba Basin							
Demand for rural water supply	Insufficient groundwater quality	5	■				

Table 10 Ranked risk issues imposed by the resource

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important problem	Major problem
C - RISKS - Pamba Basin							
Risks imposed through water resources - Pamba Basin							
Soil erosion	Floods, intensive pluviometry	63	■	■	■	■	
Loss of crops	Floods	28	■	■	■		
Accidents (dam breaks, etc)	Reservoirs	21	■	■	■		

7 SWOT ANALYSIS

Part of the stakeholder sessions in July and September 2010 included an assessment of management constraints and possible solutions to the issues described in the previous chapter. Based on these findings, first-hand experience and observations in the field, a SWOT analysis was conducted to capture the current strengths, weaknesses, opportunities and threats in the process towards addressing high priority water resources issues and introducing water resources management based on IWRM principles in the Pamba River Basin. The results of the SWOT analysis are given in Table 11.

Table 11 SWOT analysis for implementation of IWRM principles in Pamba River Basin

STRENGTH	WEAKNESS
■ The Water Policy adopted in 2008 supports IWRM principles ■ Legal framework is presently found sufficient to regulate some of the important issues that need to be addressed in the Pamba basin ■ Political will to adopt IWRM as future water management guidance principles and clarity of vision at the top political and administrative level ■ The Pamba Basin Authority Act, 2009 in place and the Authority has appointed a director and opened a bank account, which signal long-term commitment of the state government. ■ High technical capacity at centralized level ■ Water being a state subject, GoK has full autonomy in implementing IWRM (Pamba has no trans-boundary implications) ■ Ongoing capacity development/ training programmes on IWRM instituted by research institute on water in the State (CWRDM)	■ Present legal framework does not fully support the new water policy ■ Water policy does not address ecological needs ■ Existing legal framework is not enforced fully in order to address the water resources issues faced in the Pamba Basin, e.g. issues caused by uncontrolled sand mining ■ Fragmented and centralized management of the water resources and poor inter departmental coordination ■ Lack of a communication strategy to assure participatory approach towards IWRM - lack of a stakeholder platform. ■ Technocentric approach towards management of water resources issues ■ Lack of data sharing among the numerous governmental institutions collecting and assessing data concerning the water resource ■ Existing Pamba Action Plan focuses only on pollution abatement and as so only deals with technical solutions, not addressing reform processes needed to manage the resource ■ Translation of existing Acts into rules and practices has been weak ■ The Pamba Basin Authority exists through the Pamba Basin Authority Act, but an operational body is not yet in place ■ Relatively low human capacity in IWRM principles at centralized and de-centralized level ■ Ecosystem needs not represented in the current water policy
OPPORTUNITIES	**THREATS**
■ The Water Policy and the Pamba Basin Authority Act provides the enabling environment to establish an operational River Basin Authority ■ Skilled technical capacity present and capacity in IWRM is available at CWRMD ■ Data on water quality and quantity exist, though scattered in different government organizations; thus, a full assessment on the actual water resources situation can be conducted ■ The Government of Kerala has indicated willingness to provide funds for supporting the continuous implementation of IWRM in the Pamba Basin ■ GoI support to Pamba IWRM approach (e.g. SPCB Action Plan) ■ Experiences gained from piloting IWRM in the Pamba Basin can provide valuable guidance for other basins of India ■ Interest from multilateral donors to support future actions in the process towards adaption of IWRM principles in the Pamba River Basin	■ The continuous change at Political and Administrative level can result in lack of institutional memory and focus may shift ■ Undue bureaucratic delays causing implications for keeping momentum in the initiated IWRM process and addressing high priority water resources issues in the Pamba Basin ■ Funding limitations to prepare and implement elements identified in the IWRM Roadmap for the Pamba Basin ■ Lack of awareness

8 ROADMAP: NEXT STEPS, MILESTONES AND INDICATORS

In the process of movement from the IWRM Vision to the IWRM Plan, it is useful at the outset to establish a Roadmap with specific goals and milestones. The IWRM Roadmap describes how a country may proceed from making an IWRM Vision from the situation assessment, policy and strategy to make the IWRM Plan in accordance with the IWRM 2005 target. So, the Roadmap “maps” the road, but does not travel to the actual “milestones”. Based on the outcomes from the different sessions conducted, given in the chapters above, an IWRM Roadmap was developed and a final dialogue was conducted in October 2010.

The final IWRM Roadmap for the Pamba River Basin is shown in Table 12. A set of 12 priority actions, considered necessary to make the transition from current management practices to develop and implement an IWRM Action Plan, is shown below. The more detailed Roadmap – including objectives, responsible institutions and expected source of support/financing – can be found in Annex 1.

Table 12 IWRM Roadmap for the Pamba River Basin

Next steps	Milestones	Indicators
Form an operational body for water resources management in the Pamba River Basin	June 2011	Pamba River Authority operational - offices, staff, work plans and budgets identified
Capacity building in IWRM	December 2011	Capacity need assessment conducted, IWRM training conducted at central and de-centralised level
Development of communication strategy	September 2011	Communication strategy formulated and being implemented ensuring stakeholder involvement
Enforcement of existing legal framework	Immediately	Identified priority issues addressed e.g. illegal sand mining
Adjustment of existing legal water framework for the Kerala state	January 2012	Enactment of primary water legislation
Full assessment of the water resources situation (quantity and quality) in the Pamba Basin	March 2011	The quantity and quality of the resource assessed based on data from the numerous intuitions involved in monitoring
Setting-up a sustainable monitoring and evaluation system for water resources management & establishment of an information system on water resources	August 2011	MIS operational - databases, GIS and modelling tools Collaboration with the World Bank supported Hydrology II project for developing Hydrology Information System (HIS)
Initiation of elaboration and adoption of an IWRM Action Plan for the Pamba Basin	August 2011	IWRM action elaborated and endorsed by the government
Elaboration of DPRs (Detailed Project Reports) for implementation of different actions identified	December 2012	Detailed project reports prepared for the actions identified in the IWRM plan
Elaboration of financing plan and investment strategies	December 2011	Financing strategies and development plans adopted
Implementation of the IWRM Action Plan for the Pamba River Basin	January 2012 - December 2015	Identified actions implemented.
Development of IWRM indicators to monitor the effects from implementing the IWRM plan	June 2012	Set of indicators developed to monitor that the desired effect from the reform process is being achieved. Regular evaluation reports.

9 IWRM PROGRESS IN KERALA'S PAMBA BASIN

9.1 EXISTING SITUATION

The transition process crystallised by an IWRM Roadmap for the Pamba River indicates how to go from an IWRM Vision to an IWRM Action Plan in an orderly, well-structured process. The Pilot Project applied a method developed by DHI in collaboration with the United Nations Environmental Programme (UNEP), the 10 Steps/Results of the IWRM planning process (Figure 10). This approach clearly distinguishes the different stages the process is tied to and highlights the responsibilities and external factors needed for support to the process.

The status of the IWRM progress in Kerala and the Pamba River Basin is reflected in Table 13, with its 10 rows corresponding to the 10 steps/results referred to above. The table represents a synthesis of where Kerala can be found in the IWRM planning process for the Pamba River Basin. Moreover, the comments indicate how the present Pilot Project has contributed in piloting IWRM in the Pamba River Basin. The current Roadmap has been developed to serve as a guiding document for the newly set-up Pamba River Basin Authority to direct its planning according to actions identified by the stakeholders and proposed means of implementation connected to specific timelines agreed during the workshops held during this pilot project.

Figure 10 The ten steps in the IWRM planning process

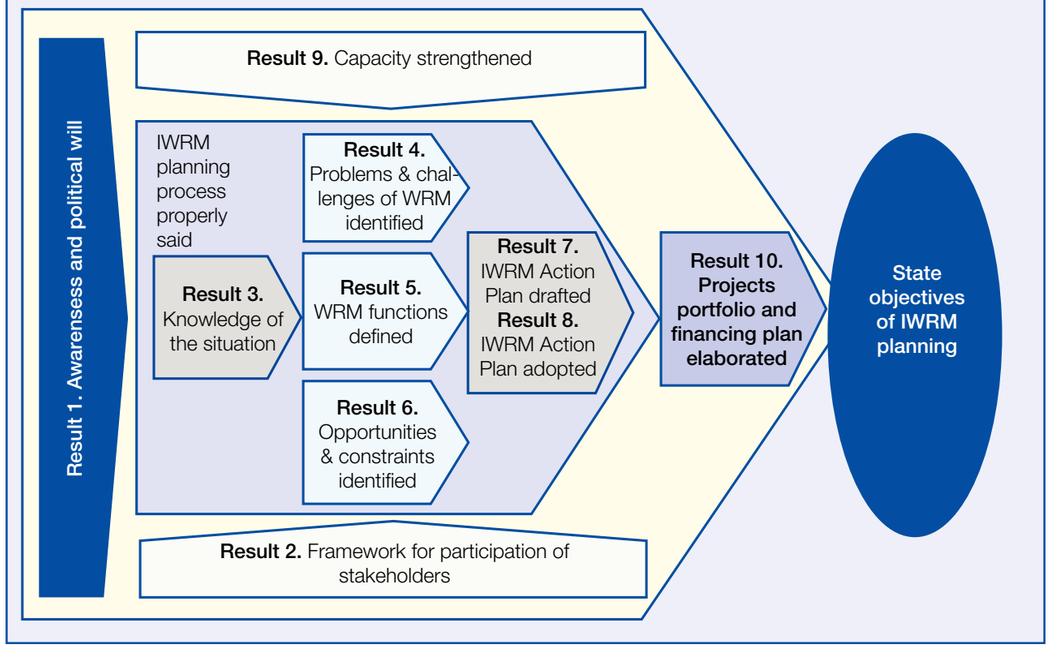


Table 13 Status on the IWRM planning process for the Pamba River Basin

Step/ Result	Description	Present Situation	Comments and suggestions for the Pamba River Basin Authority
1.	Awareness and political will	Awareness of IWRM concept and principles relatively limited. Moderate to strong political will to bring water management into line with international best practices.	Conduct targeted awareness raising of policy-makers, water sector managers, local councils, NGOs and CBOs. Present project has through involvement of stakeholders throughout the project created increased awareness. Involving the media at several occasions created awareness to a larger group of stakeholders.
2.	Framework for participation of stakeholders	Presently non-existent	Take necessary steps to establish legal and regulatory framework for stakeholder participation. Development of communication strategy to help solve problems in a participatory manner and to explore opportunities for improvements in the water sector. Stakeholder involvement has been an essential part the Pamba Pilot Project implementation.
3.	Knowledge of the situation	Data scattered between different institutions monitoring quantity and quantity. Knowledge gaps e.g. environmental flows	Establish common databases and information systems so that a situation analysis can be conducted based on existing data. The on-going WB funded Hydrology Project II has already assembled an integrated Hydrology Information System (HIS). This information system will eventually be upgraded to provide a comprehensive Water Information System (WIS) at the state level and national level. Pamba River Basin Authority can benefit from this. Priority water related issues assessed (WRIAM) during the Pamba Pilot Project, provided essential input to a future comprehensive situation analysis. The identification of issues was carried out with full participation of stakeholders, those prioritized issues should be addressed first.

Cotnd...

Table 13 Status on the IWRM planning process for the Pamba River Basin *(Contd...)*

Step/ Result	Description	Present Situation	Comments and suggestions for the Pamba River Basin Authority
4.	Problems and challenges of IWRM identified	Problems and challenges identified	In general well known. One of the outcomes of present pilot addressed this step by assessing water related issues and management constraints. Future planning towards a full IWRM Action Plan can benefit from the data and findings of the current pilot project, especially the identified water resources issues and management issues as defined by the stakeholders.
5.	WRM functions defined	Present WRM functions defined, including the Pamba Basin Authority	Continued support required for reform process within IWRM paradigm Short-term focus should be given to setting up and operationalize the Pamba River Basin Authority
6.	Opportunities and constraints identified	Done under present Pamba Pilot Project	A future situation analysis should benefit from this project output.
7.	IWRM Action Plan drafted	Pollution abatement plan exists. No IWRM plan drafted	IWRM plan to be developed as part of implementing the Roadmap
8.	IWRM Action Plan adopted	No IWRM plan adopted	Future action plan to be adopted
9.	Capacity strengthened	Ongoing capacity building but accumulation rates quite low.	Capacity needs assessment and capacity building at all levels required Capacity building in IWRM has been conducted as part of all sessions in present project
10.	Projects portfolio and financing plan elaborated	To be developed	Part of implementing the Roadmap

The pilot project has attempted to draw the attention of a vast group of stakeholders at different levels to IWRM. It has provided a framework for participation of a core group of actors directly and indirectly involved with water matters. River basin stakeholders' greater involvement and co-management of water issues promotes good governance and sustainability by improving accountability, encouraging support for decisions taken, improving the quality of those decisions, assisting with monitoring and early warning of potential challenges.

Participatory approaches enhance project quality, ownership and sustainability, with stakeholders becoming active contributors to basin development and management. In order to guarantee stakeholders' participation, institutional mechanisms need to be designed. Basin Forums can be a good means to ensure they have a say in decision-making, planning and sustainable co-management of Pamba River.

Another very important aspect is the communication channels chosen to reach the public. A communication strategy needs to be made that is open and effective horizontally and vertically between and among the structures off the government and basin stakeholders via the development of accessible, timely and good quality information and dissemination mechanisms to build trust.

The Authority has no capacity to implement such a communication strategy. Other organizations outside the government may be better placed to provide the services. The PRBA remains the overall facilitator. A focused strategy is needed here, which needs to include, over time, the minimum required level of stakeholder involvement and guidelines to achieve it.

Meaningful participation of stakeholders in the management of the basin requires effective communication and information exchange between all relevant role players at state and at basin level. A website with information on activities in the basin can serve as a water information portal as well as a platform for information exchange between stakeholders.

Effective stakeholder participation also requires that all stakeholders have the necessary capacity to meaningfully interact and contribute to decision-making on matters relating to the management of the basin. This requires the strengthening of the PRBA's future members' capacity to interact with stakeholders and include them in decision-making. Capacity can be developed through the suggested regular basin forums.

9.2 STRENGTHS AND CONSTRAINTS IN THE MANAGEMENT FRAMEWORK

As noted earlier, the universally accepted three pillars of IWRM are (i) Enabling Environment; (ii) Institutional Framework; and (iii) Management Instruments. An enabling environment stimulates desirable work practices of IWRM and forms an essential pre-condition.

Examples of an enabling environment include nurturing of integrated policy perspective, holistic legal provisions and a culture of collaborative working across sectors. This enabling environment pre-condition will have to be supported by the other two pillars, i.e. establishment of an appropriate institutional framework and the development and operationalization of required management instruments.

The current management constraints in institutionalizing IWRM in the Pamba River Basin are described below along with appropriate responses. These constraints and suggested responses were essentially a compilation of articulation by the participants of the stakeholder consultation workshops held in the past 10 months over 2010.

The essence of each of the constraints indicated and their implications across three IWRM pillars in the new RBO regime are explained in Table 14.

Table 14 Management constraints and suggested responses *(Contd...)*

Management Constraint	Enabling Environment	Institutional Framework	Management Instruments	Responsibility
Weak staff capacity both in number and Expertise in IWRM		Identify a nodal department to coordinate all staff capacity development activities	Identify ways and means of promoting community involvement	RBO, LSG
Management Constraint	Enabling Environment	Institutional Framework	Management Instruments	Responsibility
Weak linkages of WR department with important catchment organizations, resulting in fragmented responsibilities at the field level (e.g. forestry and revenue departments)	The culture of integrated working of various departments at the cutting edge level needs to be promoted	PRBA to take a lead role in catchment area treatment and ensure integrated working, thus avoiding overlaps and gaps in working	Develop, promote and institutionalize technical competence in IWRM working (e.g. silt management, bio-fencing, community participation in basin management etc)	PRBA, LSG, Department of Forestry
Lack of scientific method and systems to assess demand for eco-system management		PRBA to play a nodal agency role and institutionalize required scientific systems in participating departments	Standardize assessment methods to understand demand-supply situation. Develop models for ensuring minimum flow in the river. Institutionalize capacity development	PRBA and related departments
Weak policy framework	Defining clear policies Making multiple technology choices available for on-site and off-site sanitation	Enacting laws and enforcing regulations	STP systems, decentralized sewage management	PRBA, LSG, KWA, SPCB
Inadequate sewage and waste management systems and methods	Defining waste management policy and tuning it to meet area specific needs	Institutionalizing decentralized waste management solutions (defining norms and practices)	Supportive systems at local level Public education	PRBA, LSG, District Administration
Absence of policy framework to prevent reclamation of productive wetland for non-farming activities, resulting in man-made disasters	Enacting laws, rules and regulations		Capacity development systems	Capacity development systems

9.2.1 Enabling environment

Weak policy framework

Generally, policies and programmes are promulgated and regulations are laid down at the state level, whereas the implementation vests with field level organizations. This system is generally observed to be weak, with poor feed forward and feedback loop. For example, sanitation during peak pilgrimage is a major concern in the basin. However, this issue is hardly reflected in the policy or regulation mechanism. This needs urgent and immediate resolution. In addition, lead-time from programme announcement to actual implementation is inordinately long, as seen in the instance of the recent Action Plan of the State Pollution Control Board. Despite good intentions, there have been long delays in installing STPs at the identified locations. With the greater autonomy of decision-making vesting with the PRBA, such issues can be resolved in a more efficient manner with the built-in concurrence of all sectors of government. For example, project implementation can be fast tracked and the PRBA will have complete monitoring role, making it easy for taking corrective actions. In addition, the PRBA being closer to stakeholders, their concerns can be addressed and expectations can be managed more effectively.

Absence of policy framework to prevent reclamation of productive wetland for non-farming activities, resulting in man-made disasters

With rapid urbanization in and around many towns in the basin, reclamation of productive wetland for non-farming and commercial activities has become a widespread practice. Illegal sand mining to meet the civil construction industry demands and intense building activity along the river banks are some examples of this. This has resulted in reduced flow in the river as well as floods during monsoons. The existing laws are inadequate to tackle this problem and the systems to ensure transparency and more rigid methods to enforce compliance are required.

9.2.2 Institutional framework

Weak linkages of WRD with important catchment organizations, resulting in fragmented responsibilities at the field level

Most departments work independently, although there is an immediate need for them to work in tandem. For example, treatment of catchment areas along Pamba River is mainly entrusted to the Department of Forests, which receives limited inputs from the irrigation department. Similarly, groundwater management in the basin is regulated by the groundwater department, largely independent of the irrigation department. For effective management of water resources in the basin (e.g. use bore wells for irrigation), there is an obvious need for the two departments to work synergistically. To an extent, this collaboration is seen at the state level, but this is inadequate at the field level. In the absence of collaborative working, water resource management gets fragmented, especially at the field level. Some of these key issues can be addressed by the proposed PRBA, by rearranging institutional responsibilities and developing appropriate management

instruments. As explained in the roles and responsibilities in the following chapter, the project director will be responsible for all project level implementation activities and coordination with all other departments. This will ensure improved field level coordination resulting in fast-paced project implementation.

9.2.3 Management instruments

Lack of scientific method and systems to assess demand for ecosystem management

The actual demand-supply situation for water in the basin is poorly understood in its totality by the stakeholders. Most water resource development projects are taken up depending on urgency (i.e. drinking water needs in summer, river flushing during the pilgrimage season, irrigation etc). To manage water resources more scientifically, a framework to assess the demand for ecosystem needs to be institutionalized and it needs to be done on an ongoing basis. Transiting from immediate, one-time solution to view the issue more strategically from IWRM perspective can be institutionalized by the proposed Pamba River Basin Authority, by developing appropriate systems and by undertaking capacity development efforts. This task of the PRBA will ensure more balanced approach to manage the ecosystem. For example, the demand for water during the peak pilgrimage season and during the agriculture season can be studied by undertaking purpose driven studies (demand side) and it can be matched with resource availability estimates (supply side, using Hydrology Information System (HIS) data and corrective action as needed can be taken up by the Pamba River Basin Authority .

Inadequate sewage and solid waste management systems and methods

Treatment of solid and liquid waste generated in the basin has received very poor attention. Domestic as well as commercial waste is discharged directly into the river in their raw form. Because of this, river pollution reaches its peak during the high pilgrimage season. Plastic and other waste discarded indiscriminately by the pilgrims as well as residents along the basin amplifies this problem. While on the one hand, sewage and waste management systems needs strengthening, on the other public education has become increasingly critical. This can be effectively carried out only with active people's participation at the local level. The PRBA has an important role to play in this.

9.2.4 Human capacity

Weak staff capacity both in number and expertise in IWRM

Most water resource development organizations in India are new to IWRM and Kerala is no exception to this. They are typically irrigation development organizations with their main focus on constructing and operating large-scale, medium-scale or small-scale irrigation schemes. Consequently, the staff skill development has been centred on construction and operation and maintenance of irrigation schemes. While adequate staffing of irrigation departments with conventional irrigation specialists has never been a problem, what needs strengthening is 'hands on' skill development in IWRM. To achieve this, it is essential that a nodal

department is mandated to coordinate this responsibility. As described earlier, the existing practice of allocating responsibilities across several departments (see weak linkages of WRD above) runs the risk of diluted IWRM implementation. By nominating a central coordinating agency to impart IWRM skills, this problem can be overcome. This will also ensure long-term institutionalization of IWRM practices. This responsibility can be ideally housed in the PRBA.

9.2.5 Economic and financial instruments

While the macro-assessment of economics at the state level is strong and understood well, the understanding of the situation at the basin level is poor, mainly because the relevant economic data is unavailable. For example, data on livelihood issues, opportunity costs of wetland agriculture and non-farm based activities, subsistence agriculture vis-à-vis large scale commercial farming etc are either not available or not dependable. Similarly, project management-related financial aspects such as cost benefit analysis of large-scale STPs vis-à-vis decentralized waste management systems need to be properly assessed and understood in the context of the Pamba River Basin. The RBO will have to develop such technology-related financial instruments and integrate them in the basin-wide planning process.

10 PROPOSED PAMBA RIVER BASIN ORGANISATION

As River Basin Organisations (RBOs) are designed to help bring about IWRM and improve water governance, their responsibilities are becoming increasingly complex. For an RBO to become a well-functioning agency, it should extend itself beyond the mere discharge of technical functions. In many river basins in India, use of water through investment in water infrastructure for urban, industrial, and agricultural growth is far more than the extent of its renewability. Such overexploitation of water resources is caused by a disregard for environmental considerations, incomplete hydrological knowledge, undefined or poorly understood water rights, etc. The challenge for water management is to view it from an integrated perspective to provide much stricter scrutiny by decision makers to avoid over-commitment of water resources. In addition, river basins are experiencing multiple constraints such as contamination of freshwater, reduced flow due to sand mining, overdraft of aquifers, etc. On the demand side, requirement increases as population grows, irrigation often expands, and more water needs to be allocated. A typical response is too often to seek supply-side approaches for capturing more water.

The organizational structure of an RBO is of great importance to its performance in managing the river basin. Three different domains can be identified for its performance: the institutional set up, its sources of financing, and its formal links to other organizations.

The decision-making process and procedures of the members of the Authority that develops its general policies and strategies as well as intermediate bodies translating those policies into strategies, programmes and projects are of great

importance for managing the river basin on the ground. Those processes and procedures need to be established early on.

The roles and responsibilities of the PRBA need to be defined, especially its project implementation tasks. A top priority should be to form and operationalize the executive committee by assigning them on a full-time basis. The efficiency and effectiveness of an RBO also depends on interactions with different bodies. Elaborating on work descriptions of the executive committee representatives of the PRBA should be high on the agenda. The long-term sustainability of the PRBA depends on the operation of the executive committees' skills and capabilities. Ensuring they have the human, financial and technical capacity to fulfil tasks is imperative. Capacity building at this level should be considered a priority.

With regard to the decentralization of river basin management tasks within an RBO, clear roles and responsibilities need to be assigned to LSGs for performing functions that need to be implemented locally. Again, their capacity to implement tasks needs to be assessed and proper training given to build such capacity. In order to increase ownership at the local level, working groups can be established for different sectors such as fisheries, dams, water quality, pilgrims, data management, etc.

If decentralized river basin management is to function well, the capacity of the different bodies to fulfil newly gained responsibilities needs to be ensured. The Authority therefore needs to make sure that all bodies possess the sufficient human, technical and financial capacity to successfully perform the functions assigned to them.

It is important to note that the executive committee is the basin level planning and management organization and that its existence is an extension of the PRBA members at the state level. The Pamba River Basin Authority Act endorsed in 2009.

According to the Act,

> *subject to the general supervision and control of the Authority, the management of the affairs of the Authority shall vest in the Executive Committee, which shall assist the Authority, as the Authority may require.*

And

> *the Executive Committee shall coordinate the working of the implementing agencies such as Water Resources Department, Kerala Water Authority, Travancore Devaswom Board, Local-self Government and other Local Institutions and other Agencies and initiate the construction works to be undertaken and facilitate timely release of fund.*

The key functions, responsibilities and powers of the members of the Authority at the state level, as described in the Act, are listed below.

1. Formulate policies and projects for enabling the sustainable development of water resources, reservoirs and water resources of the Pamba River and the scientific management for protecting the ecosystem containing various species and the environment with its genetic diversity
2. Coordinate the activities of different departments and agencies of the projects under the plan for implementation
3. Take decisions relating to the matters in the Pamba Action Plan and implement the projects coming under the plan
4. Impose control or restriction over exploitation of natural resources or encroachments which may have impact on water resources and reservoirs of the Pamba River
5. Receive grants, contributions and funds for the Authority
6. Undertake the project work in case of failure by the departments and other agencies
7. Appoint committees from among the Authority's members for the disposal of any business or for tendering advice in any matter pertaining to its functions
8. To control the disposal of wastes or discharge of any industrial effluent or domestic effluent to the Pampa River in accordance with the provisions of the Water (/Prevention and Control of Pollution) Act, 1974 (Central Act 6 of 1974) without proper treatment
9. To bring the contravention of laws to the notice of the Authority concerned and to monitor the follow-up action
10. To control and take steps including prohibition in accordance with the existing laws on any activity which may pollute the Pamba River and the river basins
11. To do other things directly or indirectly connected with or incidental or conducive to the efficient administration for the protection of water sources and river basins of the Pamba River
12. To implement appropriate campaigns and awareness programmes for conserving and making the holy Pamba River pollution-free

The Pamba River Basin Authority is a state-level policy making and regulatory institution that envisages project implementation through a coordination mechanism (refer item 2, above) amongst a multiple set of organizations. The multi-layered institutional set up (secretariat level and field level) in water resource management is described in Section 5.2. The Pamba River Basin Authority retains the role of policy-making, acts as a receptacle of funds and grants, sets out rules and regulations and discharges overall monitoring function at the highest level. It proposes to take up direct implementation work only in exigencies such as failures by the responsible departments and agencies. In the given scenario of multiple departments and agencies (over 18 of them) involved in water resource management in the state, the risks of delays, cost overruns, conflict of interests and failures are endemic.

It is in this context the need emerges for establishing the Authority at the basin level that will be mandated with project implementation tasks. Thus, the PRBA at the local level needs to be viewed as a project implementing organization with strong autonomous institutional characteristics. The organization design of the Authority is based on the philosophy that it needs to have a new-generation work approach which responds to the needs of all stakeholders in a more efficient and

equitable manner. The model suggested below is futuristic in its positioning and the envisaged relationships between and across departments is more organic.

Arising out of this institutional arrangement, the Pamba River Basin Authority at the state and local level will be vested with some key functions such as policy and strategy development, funding and finance, water use regulation, physical implementation of programmes (thus making judicious supply of water on an equitable basis), basin-level institutional support, information management, and carrying out water audits. The key areas suggested below are derived from successful IWRM implementation experience in other countries including European countries as well as other developing countries. The key functional areas to be shared between the PRBA at the state and local levels are presented in Table 15.

Keeping the above distinctions of functions in focus, it is envisaged that the Pamba River Basin Authority will also be set up at the local level. In this regard, two options exist. One option is to set it up as an extension of the water resources department and the second is to set it up as a separate, independent entity. By setting it up as an extension of the water resources department, it is likely that most of the management constraints described will be transferred to the new entity and collaborative working with other departments may be jeopardised. Therefore, it is recommended that the local Authority be set up with the status of a Special Purpose Vehicle (SPV).

The Pamba River Basin Authority Act is very clear in providing the Authority with a project director as well as the employment of a number of officers and employees as it deems necessary for the efficient discharge of its duties under the Act. In order to manage a team of experts representing the different sectors as well as to operate at state as well as at local level, it is imperative the project director is entrusted with the full decision-making power in order to implement activities. As the executive committee is to coordinate the implementing agencies, the functions of the members of the Authority and the executive committee (chaired by the water resources secretary) are proposed to be as is outlined in Table 15.

If it is decided to implement an SPV, the organization needs to be set up as a distinct entity under an appropriate Act (e.g. the Companies Act 1956 or Society Act, 1962) with complete operational freedom to ensure timely completion of all project activities within the overall budgetary limits.

Table 15 Key functions of the Pamba River Basin Authority

Pamba River Basin Authority (PRBA) State level Members		Pamba River Basin Authority Executive Committee managed by the Project Director	
Policy and Program Facilitation	■ Develop legislation, internal policy in line with state water policy ■ Develop catchment management strategies ■ Develop or support other statutes, strategies, plans and IWRM-related bodies	Physical Implementation and decision making	■ Develop water resource infrastructure ■ Operate and maintain water resource management system ■ Implement water conservation and manage demand ■ Manage flood and drought ■ Emergency response
Funding and Finance	■ Provide funding support ■ Decide on water tariffs ■ Decide on budgetary allocations ■ Explore public-private-participation (PPP)	Water Use	■ Establish user connectivity ■ Register water users ■ Authorize water use ■ Collect water use charges ■ Enforce compliance ■ Regulate dam safety ■ Ensure supply equity and uniform accessibility
Regulation and Control	■ Develop and maintain pricing policy and water tariff ■ Develop and announce norms and standards (e.g. WQ)	Basin Planning	■ Assess demand-supply situation ■ Involve stakeholders in basin planning ■ Assess peak (pilgrimage) and seasonal requirements and adjust supply situation
Inter-departmental Coordination	■ Coordination with various state level departments ■ Identify policy gaps and recommend solutions ■ Facilitate state level inter-departmental coordination	Information Management	■ Data acquisition ■ Data and information storage and management ■ Information generation and dissemination ■ Support for complex knowledge products ■ Information Management Research
Institutional Support	■ Establish statutory water management institutions ■ Facilitate establishment of non-statutory participatory bodies (stake holder involvement) ■ Build IWRM-related capacity ■ Coordinate activities of various water management agencies and institutions	Water Resource Audit	■ Water Resource Audit strategies and their outcomes ■ Audit water use regulation and its efficacy ■ Conduct periodical water audits and develop feedback loop with water use regulations
Monitoring & Evaluation	■ Define Monitoring & Evaluation (M&E) Systems ■ Build capacities in M&E ■ Carry out impact evaluation	Monitoring & Evaluation	■ Set up baseline data ■ Carry out basin-level Monitoring and Evaluation surveys ■ Report on physical and financial progress ■ Assess benefits derived from IWRM

11 CONCLUSION AND RECOMMENDATIONS

11.1 CONCLUSIONS

The Water Resources Department of the Government of Kerala has shown commitment towards a more integrated approach to water management planning. It has initiated the adoption of IWRM principles in its water policy and has approved the establishment of a River Basin Authority represented by various governmental sectors that is responsible for the management of the Pamba River, both signs of strong political will to bring water management in line with international best practice. By agreement between the Government of India and the EU, it was decided that the present project should provide assistance to the Government of Kerala by piloting IWRM in the Pamba River Basin.

The Pamba River Pilot Project has been implemented through targeted training/ workshop sessions, consultations, a broad stakeholder forum as well as a final dialogue on the IWRM Roadmap. Moreover, the press were invited at several occasions, ensuring that the process towards IWRM in the Pamba River Basin reached an even broader group of stakeholders. The focus of the sessions included

- sharing EU experience and practices;
- IWRM training and use of IWRM planning tools;
- stakeholder consultations on water resources issues;
- management constraints faced within the present water management framework; and
- deciding upon possible actions to improve management constraints.

The outcomes from these sessions have been given in the previous Chapters of this report, while session reports are annexed to the original Roadmap report of December 2010. It may be noted that by request from the Government of Kerala

special focus was given on operationalizing the Pamba River Basin Authority. The achievements from the conducted sessions and consultations are summarised below.

- Experiences from the EU and elsewhere and capacity built in IWRM were shared
- A representative group of stakeholders was identified and involved in the IWRM Roadmap process;
- Water resources issues were identified and ranked by importance
- Water management constraints and possible solutions were identified
- An IWRM Roadmap was prepared
- Decisions and actions were taken to execute the Roadmap process
- Lessons were learnt that will be of value to others in similar situations
- Assessment of strengths, weakness, opportunities and threats (SWOT analysis) was conducted in implementing IWRM principles in the Pamba River Basin
- Final IWRM Roadmap identifying actions, timeline, responsible organisation and indicators developed to establish the IWRM plan

The responsibility for various aspects of water resources management is shared among several government institutions. Overall, the main tasks associated with water resources management are carried out by one institution or another, but the newly established Pamba River Basin Authority has not yet been granted the official responsibility for catchment management of the river. The operationalization of the Authority should be considered a top priority, especially the appointment of full-time members at the local level for the implementation of water management tasks and coordination with the different sectors and stakeholders that have a stake in water.

This Roadmap provides guidance to the process for continuing on the IWRM path. Actions that need to be addressed immediately are the full operationalization of the Pamba River Basin Authority and its definition of institutional roles and responsibilities. Another bottleneck that needs attention is the lack of sharing of data and coordination between departments to constitute baseline data required for future planning and decision-making.

The technical skills required for basin management are widely available at the state level. However, there is still a need for targeted capacity building at all levels, especially at the basin level where the Pamba River Basin Authority is to be established. The decentralization process envisaged for the operationalization of the Authority will have to be accompanied by extensive capacity building at the local self governance (LSG) level to adequately manage and administer the interests of the different water users at the basin level. A proposal has already been approved to establish the Pamba River Basin Authority in Chengannur in the catchment area of the Pamba River. Once this decision has been taken officially, it will be appropriate to assess the capacity of the LSG groups to undertake the management of the river and to identify areas where it may be necessary to strengthen technical, administrative and financial capacity.

This study has brought together the experiences obtained from various projects conducted abroad. A clear methodology was used to develop the Roadmap and is suitable for replication in other states. First of all, a participatory assessment of the water resources situations was conducted using the WRIAM tool. This tool has been developed to assess, in a participatory manner, the physical problems of the river basin. Based on the physical problems identified, management issues within the sectors governing water and sectors affected with water quality and quantity problems were identified and outlined. The data gathered in those participatory workshops allowed the experts to conduct a SWOT analysis which led to the recommended actions in the Roadmap. The approach used to develop this Roadmap has been positively received in a number of countries, but the momentum and continued commitment towards the implementation of actions will depend entirely on the commitment and willingness of the sectors involved to engage in further reforms.

The actions for implementation identified in the current IWRM Roadmap will assist decision-makers with an agenda for future prioritization of activities. Stakeholder engagement was assured throughout the project. The identified water related issues were ranked by representatives of a selection of different sectoral government representatives as well as NGOs.

An important management issue encountered is the enforcement of existing legislation. It was perceived that while there is no lack of proper legislation addressing water, its enactment and enforcement is poor. The inter-sectoral silos may prove to be difficult to demolish but, with the implementation and operationalization of the Authority, a platform for inter-sectoral coordination of different interests can be brought on the table. However, it is imperative to ascertain the Authority's proper mandate. Follow-up and proper attention to the IWRM Roadmap process, and a willingness to embark upon reforms within the enabling environment, institutional framework and management instruments, will be decisive for its long-term success.

Several legal and institutional challenges exist in the creation of an inter-sectoral mechanism dealing with pollution control and reduced availability of water. Those mechanisms are needed as part of the basin-wide control measures that need to be taken with reference to the

(i) lack of adequate enforcement of environmental legislation;

(ii) fragmentation of responsibilities among the water, environmental and agricultural authorities; and

(iii) limited integration of environmental requirements into economic development policies.

An additional urgent need is for the elaboration of a full assessment of the water quantity and quality based on integration of available data from the numerous departments involved in monitoring of the resource, for which sharing of data is imperative.

IWRM and the EU Water Framework Directive (WFD) are largely based on the same principles, but the issues they deal with are very different. IWRM focuses on people-centered management, sectors and economy, poverty, lowest appropriate level,

Pamba Pilot Project, Final Dialogue on IWRM, 29th October 2010

gender sensitivity, public participation and decentralization. All these elements are of great importance to India, but less so to the EU WFD, which uses keywords such as protection, good status of waters, river basin management, water pricing, emission limits, streamlining legislation, and citizen involvement in planning [1]. This supports the choice to base the Pamba pilot on IWRM principles and not on the EU WFD. Nevertheless, there is still potential for India to review the EU WFD for elements that have proven their merit, such as a trans-boundary policy framework, institutional arrangements, and integration of sector-based interests. For purpose of reference, a summary of the EU WFD is provided in Annex 3.

11.2 RECOMMENDATIONS

Obviously, the actions identified in the Roadmap must be initiated, which for a start should be supported by a detailed budget estimate to conduct these actions and financing sources and specifics on who will implement the Roadmap elements. It is of high importance that the implementation of actions identified in the current roadmap commences immediately to ensure that the momentum created is kept up. It is unfortunately often seen that the momentum created as part of a given IWRM project slowly ends after the project has been finalized. As indicated in the Roadmap, some of the identified actions will need external funding and may require technical assistance. A way to ensure that funds are allocated for the continuous IWRM process is for the Government of Kerala to call, in the near future, for a roundtable meeting involving state and national actors to discuss funding possibilities with potential external partners.

A key factor of further progress is the continual involvement of relevant stakeholders. A starting point may be to invite the stakeholder forum already established as part of the present project and perform regular consultations whenever major achievements or decisions concerning the IWRM implementation process in the Pamba River Basin are in place. In order to reach a broader stakeholder forum, the involvement of the press should also be considered in the future, which could be combined with IWRM capacity building of the media to ensure a better understanding and, thereby, coverage of the IWRM process in Kerala as such and in the Pamba River Basin.

Of special importance is the effort needed towards operationalizing the Pamba River Basin Authority, especially at the basin level. Suggestions for organizational set-up, staffing and areas of responsibility have been provided as part of the present project. However, as stated in the Act, the Authority shall prepare implementation plans, budgets, financing plans, etc., which presently are absent. Setting up the PRBA should be in line with the preparation of the IWRM Action Plan; a proposal for the structure of this Plan has been provided as part of this project. The IWRM Plan should include a full situational analysis, a strategy on how to obtain the vision stated in the water policy and a portfolio of actions with

1 As explained in: EU Water Framework Directive versus international principles concerning IWRM: the seven mismatches, Muhammad M. Rahaman, Olli Varis and Tommi Kajander: http://www.euwi.net/files/euwi/niki_tmpphp23UK4Y.pdf.

detailed responsibilities, costs and implementation plans for each action identified. Outcomes from present project can be used especially in the situation analysis, where prioritized issues, management constraints etc. will provide valuable input. Moreover, actions identified in the Roadmap can be part of the foreseen portfolio of actions in the IWRM Plan.

The IWRM approach strives to ensure coordination of all sector uses so that the impacts of one particular user are accounted for by all other affected users. This implies that water sector plans for water supply and sanitation (Water for People), for irrigation and fisheries (Water for Food) and for nature conservation (Water for Nature), etc. are weighed against each other in their particular water allocations and impacts. It is important to realize that IWRM is not a product to be achieved overnight. Rather, it should be seen as a conceptual framework and a vision for a long-term process of introduction of a number of national – and sometimes regional and international – water management reforms.

This reform process contains six steps in a continuous circular flow to gradually improve the actual IWRM status to reach a future ideal vision for IWRM in the country.

- What is the current achievement compared to the vision for the full implementation of IWRM?
- What is the present assessment of water issues? How well is the present water management system coping with challenges?
- What are the basic water policy rules? Which strategy do we apply to achieve full IWRM implementation?
- What is the next step to be taken (and in some cases the first) in the IWRM implementation process, to be determined in the IWRM implementation plan?
- How should we execute specific implementation programmes, projects and actions?
- How are we monitoring progress towards the achievement of the national IWRM vision?

The implementation of the IWRM approach will differ in nature from country to country and its basins, depending on where a given country is in the IWRM planning process, the issues and constraints faced, the presence of regional or international reforms and issues that should be addressed, etc. Hence, no specific blueprint exists on how to implement the IWRM approach. However, the approach used in piloting IWRM in the Pamba River Basin and creating a IWRM roadmap has been successfully applied in more than 20 countries in Africa, Central Asia, South East Asia and Latin America, providing valuable support in accelerating the process towards developing action plans and adapting IWRM principles (more information can be found at: www.gwp.org and www.unepdhi.org).

Thus, the approach and experience gained from piloting IWRM in the Pamba River Basin is considered adequate and could in the future be applied in other states and basins of India in order to progress towards achieving the vision stated in India's National Water Policy.

ANNEX 1

ROADMAP FOR PAMBA RIVER BASIN

Annex 1 Roadmap for Pamba River Basin

No	Scope of Work	Objectives	Milestones	Responsible Executors	Expected Source of Financing
1.	Form an operational body for water resources management in the Pamba River Basin	To establish a de-centralised operational body for management of the Water Resources in the Pamba Basin to assure fulfilment of the objectives stated in the Pamba Basin Authority Act.	Started - June 2011	Government / Pamba Basin Authority	Government, development partners
2.	Capacity building in IWRM	To strengthen the human capacity at all levels (central and de-central) to assure adequate implementation of integrated water resources management in the Pamba River Basin.	Jan 2011 - Dec 2011	Pamba Basin Authority, CWRDM, regional/ international experts	GOI MOEF/NRCD, development partners
3.	Development of a communication strategy	To establish and maintain clear and regular channels of communication between stakeholders to support the objectives of IWRM, thus providing a platform for stakeholder participation.	Jan 2011 - Sep 2011	Pamba Basin Authority	Government
4.	Enforcement of existing legal framework	Enforcement of existing legal framework to mitigate to present water resources issues in the Pamba Basin	Immedi-ately	Government	Government
5.	Adjustment of existing legal water framework for Kerala state	Updating existing legal framework to assure compliance with IWRM principles and the Water Policy from 2008.	June 2011 - Jan 2012	Government, Ministry of Law/Ministry of Revenue/ Ministry of Water Resources	Government
6.	Setting up a sustainable monitoring and evaluation system for water resources management Establishment of an information system on water resources	Improvement of quality of measurements and reliability of forecasts of water resources availability and quality and develop an information and database system supported by GIS	January 2011 - Jan 2013	Pamba Basin Authority/ relevant government institutions (Water Resources Department/KWA/ Groundwater Department /SPCB/ Kerala State Remote Sensing Agency), consultant	Government, development partners
7.	Full assessment of the water resources situation (quantity and quality) in the Pamba Basin	Elaborate a full assessment of the water quantity and quality based on integration of available data from the numerous departments involved in monitoring of the resource.	March 2011	Pamba Basin Authority / consultant	Government, development partners
8.	Initiation of elaboration and adoption of an IWRM Action Plan for the Pamba Basin	Development and adoption of an IWRM Action Plan based on stakeholders participation	Jan 2011 - Aug 2011	Government and consultant	Government, development Partners

Annex 1 Roadmap for Pamba River Basin *(Contd...)*

9.	Elaboration of DPRs (Detailed Project Reports) for implementation of different actions identified	Development of detailed DPRs by corresponding governmental sectors and coordinated by the Pamba River Basin Authority to ensure collaboration and communication between departments	December 2012	Corresponding government bodies and Pamba Basin Authority	Government / GOI
No	Scope of Work	Objectives	Milestones	Responsible Executors	Expected Source of Financing
10.	Elaboration of financing plan and investment strategies	Develop a financing plan for prioritized actions	December 2011	Government, Pamba Basin Authority	Government
11.	Implementation of the IWRM Action Plan for the Pamba River Basin	To implement prioritized actions in the IWRM plan	January 2012 - December 2015	Pamba Basin Authority	Government, development partners
12.	Development of IWRM indicators to monitor the effects from implementing the IWRM plan	To monitor that the effects from implementing the action plan comply with the vision stated in the Water Policy	June 2012	Pamba Basin Authority	Government, development partners

ANNEX 2

RANKED WATER RESOURCE ISSUES FOR PAMBA RIVER BASIN USING THE WRIAM METHOD

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important problem	Major problem
A - SURFACE WATER RESOURCES - Pamba Basin							
Quantitative reduction of surface water resources - Pamba Basin							
Reduced availability	Impact from sandmining	81	■	■	■	■	■
Reduced availability	Encroachment	72	■	■	■	■	■
Water loss	Sedimentation of reservoirs	72	■	■	■	■	■
Reduced availability	Abstraction for urban water supply	42	■	■	■	■	
Reduced availability	Long term climatic changes	30	■	■	■		
Reduced availability	Abstraction for rural water supply	28	■	■	■		
Pertubation of runoff	Infrastructures	27	■	■	■		
Reduced availability	Impact from upstream dams	18	■	■			
Reduced availability	Abstraction for irrigation	14	■	■			
Pertubation of runoff	Urbanisation	14	■	■			
Reduced availability	Short term variability of precipitation	14	■	■			
Water loss	Excessive evaporation	14	■	■			
Pertubation of runoff	Modification of soils	5	■				
Reduced availability	Abstraction for livestock	3	■				
Reduced availability	Abstraction for industries	0					
Reduced availability	Abstraction from mining	0					
Pertubation of runoff	Deforestation	0					
Pertubation of runoff	Irrigation schemes	0					
Match between demand and availability of surface water resources - Pamba Basin							
Demand for ecosystems	Insufficient water availability	72	■	■	■	■	■
Pilgrims & Tourism	Insufficient water availability	36	■	■	■	■	
Tot. demand/exploitable res.	Insufficient water availability	36	■	■	■	■	
Demand for urban water supply	Insufficient water availability	24	■	■	■		
Demand for rural water supply	Insufficient water availability	24	■	■	■		
Demand for hydropower	Insufficient water availability	18	■	■			
Fisheries	Insufficient water availability	18	■	■			
Demand for terrestial wildlife	Insufficient water availability	12	■	■			
Demand for irrigation	Insufficient water availability	0					
Demand from industries	Insufficient water availability	0					
Demand for mining	Insufficient water availability	0					
Demand from neighbour countries	Insufficient water availability	0					

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important problem	Major problem
A - SURFACE WATER RESOURCES - Pamba Basin							
Qualitative degradation of water quality resources - Pamba Basin							
Turbidity	Sandmining	72	■	■	■	■	■
Pathogenic contamination	Excreta	63	■	■	■	■	
Organic pollution	Excreta	63	■	■	■	■	
Organic pollution	Urban waste	63	■	■	■	■	
Other pollution	Waste - plastic	54	■	■	■	■	
Pesticide pollution	Agricultural cropping	42	■	■	■	■	
Other chemical pollution	Urban waste	24	■	■	■		
Eutrophication	Agricultural cropping	12	■	■			
Turbidity	Erosion	12	■	■			
Organic pollution	Livestock	6	■				
Eutrophication	Excreta	6	■				
Other chemical pollution	Energy/transport	6	■				
Organic pollution	Outlets from food industries	0					
Eutrophication	Livestock	0					
Eutrophication	Outlets from food industries	0					
Eutrophication	Aquaculture	0					
Pesticide pollution	Livestock	0					
Pesticide pollution	Combat of disease vectors	0					
Other chemical pollution	Mines	0					
Other chemical pollution	Outlets from industries	0					
Match between water quality needs and the available water quality of surface water resources - Pamba Basin							
Demand for urban water supply	Insufficient water quality	48	■	■	■	■	
Demand for rural water supply	Insufficient water quality	48	■	■	■	■	
Demand for environment	Insufficient water quality	24	■	■	■		
Demand from fisheries	Insufficient water quality	24	■	■	■		
Demand for hydropower	Insufficient water quality	6	■				
Demand for livestock	Insufficient water quality	0					
Demand for irrigation	Insufficient water quality	0					
Demand from industries	Insufficient water quality	0					
Demand for mining	Insufficient water quality	0					
B - GROUNDWATER RESOURCES - Pamba Basin							
Quantitative reduction of groundwater resources - Pamba Basin							
Reduced availability	Long term climatic changes	48	■	■	■	■	
Pertubation of infiltration	Urbanisation	18	■	■			
Reduced availability	Short term variability of precipitation	8	■				
Reduced availability	Abstraction for rural water supply	4	■				
Reduced availability	Abstraction for urban water supply	0					
Reduced availability	Abstraction for irrigation	0					
Reduced availability	Abstraction for livestock	0					
Reduced availability	Abstraction for industries	0					
Pertubation of infiltration	Deforestation	0					
Pertubation of infiltration	Modification of soils	0					
Pertubation of infiltration	Irrigation schemes	0					
Match between water quantity needs and available quantity of groundwater resources - Pamba Basin							
Demand for urban water supply	Insufficient groundwater resources	0					
Demand for rural water supply	Insufficient groundwater resources	0					
Demand for livestock	Insufficient groundwater resources	0					
Demand for irrigation	Insufficient groundwater resources	0					
Demand from industries	Insufficient groundwater resources	0					
Demand for mining	Insufficient groundwater resources	0					
Demand for tourism	Insufficient groundwater resources	0					
Demand from ecosystems	Insufficient groundwater resources	0					
Total demand/renewable res.	Insufficient groundwater resources	0					

Nature of issue	Cause	ES	Light problem	Problem	Important problem	Very important problem	Major problem
Qualitative degradation of geoundwater resources - Pamba Basin							
Pathogenic contamination	Excreta	81	■	■	■	■	■
Organic pollution	Excreta	81	■	■	■	■	■
Pesticide pollution	Agricultural cropping	7	■				
Organic pollution	Urban waste	0					
Organic pollution	Livestock	0					
Organic pollution	Outlets from food industries	0					
Organic pollution	Aquaculture	0					
Pesticide pollution	Livestock	0					
Pesticide pollution	Combat of disease vectors	0					
Other chemical pollution	Mines	0					
Other chemical pollution	Industrial outlets	0					
Other chemical pollution	Energy/transport	0					
Other chemical pollution	Wastes	0					
Match between quality needs and available water quality of groundwater resources - Pamba Basin							
Demand for rural water supply	Insufficient groundwater quality	5	■				
Demand for urban water supply	Insufficient groundwater quality	0					
Demand for livestock	Insufficient groundwater quality	0					
Demand for irrigation	Insufficient groundwater quality	0					
Demand from industries	Insufficient groundwater quality	0					
Demand for mining	Insufficient groundwater quality	0					
Demand from ecosystems	Insufficient groundwater quality	0					
C - RISKS - Pamba Basin							
Risks imposed through water resources - Pamba Basin							
Soil erosion	Floods, intensive pluviometry	63	■	■	■	■	
Loss of crops	Floods	28	■	■	■		
Accidents (dam breaks, etc)	Reservoirs	21	■	■	■		
Damage of infrastructure	Floods, intensive pluviometry	18	■	■			
Increase of waterborne diseases	Physical structures	0					

ANNEX 3

WATER AND ENVIRONMENT POLICIES IN THE EUROPEAN UNION

The following two European cases illustrate how proper management of water data can assist in forming the basis for better decision making so that priority issues can be addressed.

A3.1 Relevance of the EU context to India

The European Union presently consists of 27 sovereign countries with a total population of nearly 500 million people. The EU's member states cover an area of 4.4 million square kilometres. In comparison, India consists of 28 states and three Union Territories with a total population of approximately 1.2 billion people (2.4 times the EU). India covers an area of 3.3 million square kilometres (0.75 times the EU).

A3.2 EU context

The European Union (Figure 11), tracing its origins to the European Coal and Steel Community formed among six countries in 1951 and the Treaty of Rome in 1957, was established in 1993 by the Maastricht Treaty, adding new areas of policy to the existing European Community. The EU generates an estimated 30 percent share of the world's nominal gross domestic product (USD16.8 trillion in 2007).

The EU has developed a single market through a standardised system of laws which apply in all member states, guaranteeing the freedom of movement of people, goods, services and capital. It maintains a common trade policy, agricultural and fisheries policies, environmental policies and a regional development policy. The EU has grown in size through the accession of new member states and has increased its powers by the addition of new policy areas to its remit.

The original Treaty of Rome did not provide for the environment as a joint policy area. In the 1970s, governments realised the increasing importance of joint policies and action on the environment. In this period, the major driver for environmental policy was environmental and public health. The mandate for introducing environmental policy at the European level was for many years found in the first treaty's objective of establishing a common market and removing trade barriers and distortion of competition in the economic domain.

As long as there was no such basis, the EU was required to base its environmental decisions on articles of the treaty that were not designed to be used as a basis for environmental policy making. As the EU's environmental policy activity increased, so too did the need to have a proper framework within the treaty. This was achieved with the Maastricht Treaty of 1992 that changed the objective of EU

Figure 11 The European Union (in 2008)

to promote throughout the community a harmonious and balanced development of economic activities, sustainable and non-inflationary growth, respecting the environment ….

The treaty also stated that

Community policy on the environment should aim at a high level of protection taking into account the diversity of situations in the various regions of the community.

The later 1997 treaty goes a step further referring to

a high level of protection and improvement of the quality of the environment.

Water is now the sector with the most comprehensive coverage in EU environmental legislation.

A3.3 Overview of EU Water Policy and Legislation

Water and water pollution were among the first environmental concerns in the EU. The first pieces of EU water legislation were accepted by the European Council as early as 1973. Since then, European water legislation has taken a leading and innovative role in the design of national water policy in many EU Member States. There have been two important periods of EU water legislation. The first period occurred between 1975 and 1980, resulting in a number of Directives and Decisions that either lay down water quality objectives for specific types of water (e.g. the

Surface Water, Fish Water, Shellfish Water, Bathing Water and Drinking Water Directives) or establish emission limit values for specific water uses (e.g. Dangerous Substances Directive and the old Groundwater Directive).

The second major period of EU water legislation, between 1980 and 1991, introduced additional Directives controlling discharges of pollutants to the water environment, including the Nitrates Directive, the Urban Waste Water Treatment Directive, the Integrated Pollution Prevention and Control (IPPC) Directive, as well as several sub-Directives implementing the Dangerous Substances Directive. These second-period Directives mainly followed the Emission Limit Value (ELV) approach with respect to water pollution control at the source, both from point and diffuse sources. However, this piecemeal evolution on a case-by-case basis had led to a complex picture of Water Directives with differing and often conflicting methodologies, definitions and aims.

Furthermore, the Water Directives were often less successful in environmental outcome than expected. The need for new and more coordinated EU water legislation was recognised, and a major revision of EU water policy was launched, finally resulting in the adoption of the **Water Framework Directive (WFD)** 2000/60/EC. The WFD provides a framework for the protection of all water bodies and applies a combined approach of WQOs and ELVs plus a number of overarching principles determining current EU water policies, as illustrated in Text Box 1 below.

Text Box 1 Important principles determining current EU water policy

High level of protection: Taking into account the diversity of situations in the various regions of the Community

Precautionary principle: Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation

Preventive principle: Allows action to be taken to protect the environment at an early stage, before actual damage has occurred

Rectification of pollution at source: Specifies that environmental damage should preferably be prevented at the source rather than by using 'end-of-pipe technology' (implies a preference for ELV rather than WQO approach)

Polluter pays principle: Those who cause pollution should meet the costs to which it gives rise

User pays principle: Calls upon the user of water to pay for the full cost, including capital, operation, maintenance, environmental costs and other externalities

Integration of environmental protection into other sector policies; e.g. agriculture, transport and energy

Subsidiarity principle: Encourages decisions and actions to be made at the lowest appropriate level. "Objectives at central level - plans and measures at local level".

All these principles are reflected in the WFD. Placing these principles at the centre of water policy has major implications for further policy development and implementation, as they support the following policy objectives and elements of the WFD:

- The development of integrated policies for the long-term sustainable use of water, and its application in accordance with the principle of subsidiarity;
- Expanding the scope of water protection to all water: surface water, including coastal water, and groundwater;
- Achieving "good status" for all water by a certain deadline, and preserving such a status where it already exists;

- Water management based on river basins, with appropriate co-ordination provisions for international river basin districts;
- Setting prices for water use, taking into account the principle of cost recovery and in accordance with the polluter pays principle;
- Encouraging greater participation by citizens; and
- Streamlining legislation.

An overview of existing water-related legislation is provided in Text Box 2.

Text Box 2 EU water related legislation

The Framework Legislation

- Water Framework Directive (WFD) (2000/60/EC).

Water Quality Objective oriented

- Bathing Water Directive (76/160/EEC; to be repealed and replaced by the new Bathing Directive 2006/7/EC at the latest by 2014).
- Drinking Water Directive (98/83/EC).
- Directive on Surface for Drinking Water Abstraction (75/440/EEC; Integrated into the WFD, to be repealed under the WFD 2000/60/EC as from 22.12.07).
- Freshwater Fish Directive (78/659/EEC); integrated into the WFD, to be repealed under the WFD 2000/60/EC as from 22.12.13).
- Shelfish Water Directive (79/923/EEC; integrated into the WFD, to be repealed under the WFD 2000/60/EC as from 22.12.13).

Emission-Control oriented

- Urban Waste Water Treatment Directive (91/271/EEC) and related Decision 93/481/EEC.
- Nitrates Directive (91/676/EEC).
- Ground Water Directive (80/68/EEC; integrated into the WFD, to be repealed under the WFD 2000/60/EC as from 22.12.13; after 2013 the protection regime should be continued through the WFD and the new Groundwater Daughter Directive (2006/118/EC) adopted on 12/12/2006).
- Dangerous Substances Directive (76/464/EEF; to be repealed under the WFD 2000/60/EC as from 22.12.2013; proposal for a new Directive setting limites for 41 substances was adopted on 17/07/2006 (COM(2006)397 final)).
- Daughter Directives of the Dangerous Substances Directive (to be replaced and repealed under the Directive proposed 17/07/2006).
- Integrated Pollution Prevention and Control Directive (96/61/EC).

Diffuse source emission controls

- Plant Protection Products (91/414/EC).
- Marketing and Use of Dangerous Substances and Preparations (76/769/EEC).
- Biocides (98/8/EC).

Monitoring and Reporting

- Directive on the Measurement of Surface (Drinking) Water (79/869/EEC; to be repealed under the WFD 2000/60/EC as from 22.12.07).
- Common Procedures for Exchange of Information (Decision 77/795/EEC).

Source: Handbook on the Implementation of EC Environmental Legislation; Guide on Convergence with EU Environmental Legislation in Eastern Europe, Caucasus and Central Asia.

A3.4 Water Framework Directive 2000/60/EC

The overall purpose of the Water Framework Directive is to establish a framework for the protection of European inland surface waters, transitional waters, coastal waters and groundwater. The environmental objective of the WFD is to achieve 'good status' for all groundwater and surface water by 2015 at the latest.

"Good status" is a concept that on the one hand ensures protection of all water bodies in a holistic way, and on the other hand integrates quality objectives for specific bodies of water derived from other legislation, e.g. the Drinking Water and the Bathing Water Directives. For surface water it consists of a general requirement for ecological protection ("good ecological status") and a general minimum chemical standard ("good chemical status"). Good ecological status is defined in terms of the quality of the biological community, the hydro-morphological characteristics and the chemical characteristics. The controls are specified as allowing only a slight departure from the biological community that would be expected in conditions of minimal anthropogenic impact, thus accounting for ecological variability between different waters. Good chemical status is defined in terms of compliance with all the quality standards established for chemical substances at the European level.

For groundwater, the WFD takes a precautionary approach, and defines 'good status' both in terms of chemical purity and of balance between abstractions and natural recharge. Direct discharges to groundwater are generally prohibited. To control pollution from indirect discharges, there is a requirement to monitor groundwater bodies in order to detect changes in chemical composition and reverse pollution trends. In addition, the Directive also deals with groundwater quantity. There is only a certain amount of recharge back into groundwater each year; of this recharge, some is needed to support connected ecosystems (whether they be surface water bodies or terrestrial systems such as wetlands).

The key requirements of the WFD related to its implementation are described below.

River Basin Management

The new approach to water management requires water to be managed at the river basin level rather than according to administrative, geographical or political boundaries. This enables assessment of all activities that may affect the water and its control by measures which may be specific to the conditions of the river basin. River Basin Management Plans must be drawn up for each river basin; however, large river basins may be sub-divided into smaller units. The adoption of suitable institutional structures to achieve river basin management is one of the major challenges for the implementation. Some options are described below.

- Utilising existing regional structures, but organised and adapted to ensure co-ordination of functions related to the river basin
- Appointing a central supervisory body with river basin-based subsidiary departments or institutions to organise and undertake day-to-day work in the river basins
- Appointing individual river basin institutions with direct control over the activities of each river basin
- International coordination is also required for those river basins that cross international boundaries.

Programme of Measures

Central to each River Basin Management Plan is a Programme of Measures to ensure that all water achieves good ecological status. This requires, at least, the full implementation of all national and EU legislation on water and related issues. If this basic set of measures is not sufficient to reach the goal of good ecological status, then the programmes must be supplemented by additional measures, such as stricter controls on pollution from industry or agriculture or from urban waste sources. This may also require consideration of land use planning measures.

Combined Approach

Pollution control should take a combined approach. Water Quality Objectives (WQO) and Emission Limit Values (ELV) must be established, with the stricter approach applying in any given situation. WQOs and/or ELVs already set in EU legislation have to be taken into account, such as the IPPC Directive, the Urban Wastewater Treatment Directive and the Directive on Discharges of Dangerous Substances to Water. Water used for the abstraction of drinking water is subject to greater protection.

The WFD addresses water quantity insofar as it is relevant to water quality. Any abstraction of surface water or groundwater, except minor abstractions, has to be subject to a permitting procedure.

Monitoring

The monitoring of all water in terms of quantity and quality, especially surface water and groundwater, is an essential feature of the WFD. This requires surveillance monitoring, operational monitoring, investigative monitoring and compliance monitoring. Data on monitoring must be made available to the public.

Water Pricing and Cost Recovery

The Directive requires member states to apply the principle of cost recovery for providing water services, including environmental and resource costs, based on economic analysis and in accordance with the polluter pays principle. Costs must therefore be considered for the consumer/user of water, whether domestic, industry or agriculture. These costs should include construction, financing and maintenance of such measures as drinking water treatment and supply, the collection, treatment and discharge of waste water and water used for irrigation purposes.

Public Consultation and Information

An important aspect of the River Basin Management Plans is the need to involve the public. The authorities must inform the public of the proposals contained in the plans and obtain the opinions of the public and relevant stakeholders such as local communities, industry, other water users, water utilities, and relevant government departments and institutions. The authorities must ensure public access to draft River Basin Management Plans, finalised River Basin Management Plans, results

of monitoring and permit conditions and state of the environment reports, so that stakeholders and NGOs are enabled to participate actively in the discussion process.

Implementation Process and Common Implementation Strategy

The WFD sets deadlines for individual requirements. For instance, River Basin Districts and authorities had to be identified by 2003; in 2006 the monitoring network had to be established and public consultation to be started; first draft River Basin Management Plans had to be presented in 2008; pricing policies needed to be implemented by 2010; and Programmes of Measures are to be made operational by 2012.

The implementation of the WFD raises a number of shared technical challenges for member states. In addition, many of the European river basins are international, crossing administrative and territorial borders; therefore, a common understanding and approach is crucial to successful and effective implementation of the Directive. For this reason, member states, Norway and the Commission agreed on a Common Implementation Strategy (CIS) for the WFD only five months after the Directive entered into force. The main aim of the CIS is to allow a coherent and harmonious implementation of the WFD. The focus is on methodological questions related to a common understanding of the technical and scientific implications of the WFD.

Costs of Implementing the WFD

The main costs, apart from administrative costs, for implementing the WFD include costs for an appropriate monitoring system, wastewater treatment beyond the provisions of the Urban Waste Water Treatment Directive, compliance with the IPPC Directive and compliance with new standards and requirements on the priority substances list. Moreover, the real cost impact of the WFD depends on the extent to which a country has already embarked on the charging of water costs closely aligned to financial costs, or even taking into account true environmental and resource costs.

A3.5 EU Water Framework Directive vis-à-vis IWRM

As seen above, there is no doubt that the EU Water Framework Directive ascribes the highest priority in water resources management to environmental sustainability and a somewhat lower priority to social and economic development. These sectors actually seem to be seen more as those that “must be responsible for solving environmental problems”, first of all by providing the necessary financing through cost recovery mechanisms. In fact, the WFD is a genuine piece of environmental legislation, rather than comprehensive water sector legislation targeted towards both protection and development of the water resources. This situation is probably a true reflection of the political realities in the EC taking its present social, economic and environmental situation into consideration.

As for IWRM, promoted in the international context, this concept emphasizes the need for cross-sectoral water resources management taking into due consideration all water uses, whether for people, food production, industry, or the environment.

The most significant difference between the WFD, on the one hand, and on the other hand the international development co-operation founded efforts to operationalise the widely accepted concept of IWRM, is the difference in preferences ascribed to environmental sustainability and socio-economic development, and the importance ascribed to cross-sectoral management of the water resources.

Considering all the resources and efforts that have been invested into the development of the WFD, it would of course be obvious and tempting to look into the possibility of using the WFD as a model of best practice for the implementation of IWRM also outside the EU. The above analysis as well as the identified differences between the WFD and the present thinking about IWRM seems, however, to indicate that due to the significant differences in the social, economic and environmental situation between the EU and most other countries, a certain amount of caution may be warranted in doing so. In conclusion, rather than exporting the Directive as a package solution, it might be more useful and advantageous to India to identify those elements that are universally beneficial and not very dependent on context, such as:

- Securing public participation in WRM
- Forming river basin councils
- Making river basin plans
- Setting time-bound, measurable targets
- Establishing appropriate monitoring and enforcement
- Introducing cost recovery mechanisms
- Introducing a common knowledge and information platform

EU-INDIA ACTION PLAN SUPPORT FACILITY – ENVIRONMENT

This project is funded by the European Union and implemented by a consortium led by Euroconsult Mott MacDonald, Arnhem, the Netherlands. The activity on Integrated River Basin Planning has been implemented in collaboration with DHI.

The Ministry of Environment and Forests represents the Government of India as counterpart to the EU for the implementation of the project.

The project implementation period is from December 2007 until June 2011.

The objectives are:

- Improved sector policy analysis and knowledge
- Enhanced mutual understanding and cooperational links and dialogue
- Enhanced regulatory function and improved technical and institutional capacity of the Indian administration
- Enhanced dialogue, information exchange and awareness among civil society's organisations

The areas covered by the project are waste, chemicals, water, air, and climate change.

Project activities to develop the policy dialogue between India and the EU include advisory services, workshops, seminars, training, studies, and capacity building.

Contact Information:
2nd Floor, 46 National Park, Lajpat Nagar IV
New Delhi 110024 India
e-mail: info@APSFenvironment.in
Phone: +91 (0)11 46501446

Website: www.APSFenvironment.in

European Union
Delegation of the European Union to India
65 Golf Links, New Delhi - 110003 India
Phone: +91-11-24629237, 24629238 Fax: +91-11-24629206
Website: http://eeas.europa.eu/delegations/india/index_en.htm