

**THE UNITED REPUBLIC OF TANZANIA  
MINISTRY OF WATER**



**WATER SECTOR DEVELOPMENT PROGRAMME (WSDP)  
PROGRAMME IMPLEMENTATION MANUAL**

**ANNEX 1**

**Water Resources Management Programme Operational Manual**

**JANUARY, 2006**

## **General Guidelines for River/Lake Basin Management**

# TABLE OF CONTENTS

<b>ACRONYMS AND ABBREVIATIONS .....</b>	<b>III</b>
<b>1. SCOPE OF RIVER/LAKE BASIN MANAGEMENT.....</b>	<b>1-1</b>
1.1 Initially, basin management should be targeted to specific hydrological units, focusing on a few existing or perceived water-related issues with more issues being included later once experience and success is achieved .....	1-1
1.2 Basin management should address all components of the water resource and all elements of the hydrological cycle, which relate to each issue.....	1-2
1.3 The units for basin management should be sub-catchments within the basin and should be based on the socio-economic, land use and water environmental resource character of the catchment .....	1-2
1.4 Aspire for holistic inclusiveness, with growing integration of relevant issues and elements affecting water resources in a basin or catchment, as a prerequisite for sustainable development.....	1-2
1.5 District governments and local authorities should have an effective role and responsibilities in water resources management.....	1-2
<b>2. STAKEHOLDER AND PUBLIC PARTICIPATION IN WATER RESOURCES MANAGEMENT .....</b>	<b>2-1</b>
2.1 Establish mechanisms for stakeholder and public participation and consultation processes that are appropriate, inclusive, representative and sustainable .....	2-1
2.2 Clearly define roles for stakeholders' participation in WRM .....	2-1
2.3 Distinguish between stakeholder participation and public consultation.....	2-2
2.4 Support capacity building of community-based organisations and NGOs to develop skills for management of resources within river basins, using existing representation organisations .....	2-2
2.5 Foster continuity in stakeholder participation.....	2-2
2.6 Facilitate dialogues and conflict management .....	2-2
<b>3. WATER RESOURCES MONITORING .....</b>	<b>3-1</b>
3.1 Monitoring networks.....	3-1
3.2 It is critical to review the various networks of water resources monitoring in their individual relevancy to water resources management and development.....	3-1
3.3 In designing the various networks, consider all relevant networks including those operated by other agencies.....	3-2
3.4 Identify an optimum basic hydrological network for water resources .....	3-2
3.5 Install weather and rain-gauge stations to fill gaps in the network, otherwise get/purchase data from other data collectors .....	3-2
3.6 Design groundwater-monitoring network considering areas with heavy water use or expected groundwater exploitation.....	3-2
3.7 Tune the water quality monitoring efforts with the information needs for water resources management based on large aquifers.....	3-2
3.8 Undertake sediment monitoring in the framework of project feasibility studies and water assessment studies.....	3-3
3.9 Develop/procure a dynamic Water Resources Information System in which data can be captured and analysed and stored to support further decision-making.....	3-3
<b>4. WATER RESOURCES ASSESSMENT .....</b>	<b>4-1</b>
4.1 Cost-effective assessment should be performed at the level of detail required to address information needs about relevant water resources management issues.....	4-1
4.2 Conduct the assessment in stages, starting with a rapid (initial) water resource assessment that focuses on causal factors and effects.....	4-1
4.3 The stakeholders should be involved throughout the assessment process, so that they gain a sound understanding of the basin with which to make effective decisions.....	4-2
4.4 Conduct environmental flows assessment.....	4-2
4.5 Conduct socio-economic assessment .....	4-2
4.6 Identify areas requiring research .....	4-2
<b>5. WATER RESOURCES PLANNING .....</b>	<b>5-1</b>

5.1	Establish mechanisms to identify and involve all relevant stakeholders and the general public essential for the implementation and success of the WR plan.....	5-2
5.2	Liaise with other respective sectors on the status of their respective resources in the basin ...	5-2
5.3	Planning should be done within identified hydrological units to start with, based on these plans a basin plan can be drawn .....	5-2
5.4	Prepare management strategies that are agreeable to the stakeholders .....	5-2
5.5	In the planning process provision should be made to influence or prevent land-use planning decisions that could lead to unacceptable impacts on the water resource .....	5-3
5.6	Plan with multi-objective water use in mind.....	5-3
5.7	Formalise the basin vision and mission.....	5-3
5.8	Periodically review and update the WR plan to reflect changing priorities and circumstances .....	5-3
5.9	Prepare a programme of actions to implement the plan.....	5-3
5.10	The WR plan should be monitored and audited at specified time-periods to determine the need for its revision.....	5-4
5.11	Prepare a procedural framework for implementation, administration and review of the water resources management plan.....	5-4
5.12	The water resources plan and its regulatory framework should be communicated to stakeholders and the general public.....	5-4
<b>6.</b>	<b>WATER ALLOCATION.....</b>	<b>6-1</b>
6.1	Water allocation required for the basic human needs and environmental requirements, must be quantified during water resources assessment.....	6-1
6.2	Determine and allocated trans-boundary water requirements .....	6-1
6.3	Determine highest value uses .....	6-1
6.4	Before allocating more water seek strategies to improve water use efficiency in existing schemes .....	6-1
6.5	Plan for conjunctive use of groundwater and surface water .....	6-1
6.6	Use regulatory instruments as an allocation tool .....	6-2
<b>7.</b>	<b>WATER RESOURCES PROTECTION.....</b>	<b>7-1</b>
7.1	Rivers in the basin should be classified according to their desired protection levels and objectives.....	7-1
7.2	Evaluate site specific and implement site-specific measures to protect sensitive ecosystem..	7-1
7.3	Prepare strategies to control pollution .....	7-1
7.4	Distinguish between point source pollution and non-point source pollution.....	7-1
7.5	Water quality monitoring for compliance .....	7-2
<b>8.</b>	<b>BASIN OFFICE MANAGEMENT AND ADMINISTRATION.....</b>	<b>8-1</b>
8.1	Establish water user and water rights information system.....	8-1
8.2	Plan human resources development (HRD) with the understanding that IWRM requires a multidisciplinary team .....	8-1
8.3	Set priorities for funding.....	8-1
8.4	Solicit funding for water resources management by means of comprehensive business plans.....	8-1
8.5	Set up an achievable annual work plan and budget .....	8-2
8.6	Criteria for charging water use fees.....	8-2
8.7	Develop mechanisms for coordination of government departments and agencies, for IWRM.....	8-2
8.8	Establish Water User Associations.....	8-2

## ACRONYMS AND ABBREVIATIONS

BWB	Basin Water Board
BWOs	Basin Water Offices
DWR	Director of Water Resources
EF	Environmental flow
GIS	Geographic Information System
HRD	Human Resources Development
IWRM	Integrated Water Resources Management
NAWAPO	National Water Policy
NGO	Non-government Organisation
NWSDS	National Water Sector Development Strategy
O&M	Operation and Maintenance
WR	Water Resources
WRA	Water Resources Assessment
WRM	Water Resources Management
WUAs	Water User Associations

## 1. SCOPE OF RIVER/LAKE BASIN MANAGEMENT

Integrated water resources management is based on the concept of water being an integral part of an ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its use (Agenda 21, United Nations, 1992). Water scarcity, gradual deterioration, aggravated pollution and infrastructure development has increasingly created conflicts over the different uses of this resource. The river basin management approach is an example of an incentive-based participatory mechanism for solving conflicts and allocating water between competing users, including natural ecosystems.

A critical requirement for integrated river basin management is the introduction of land use and water planning and management mechanisms, which focus at the river basin scale. There is also a need to include consideration of the ecological requirements of marine and coastal systems that are influenced by basin discharges. There are many steps involved in promoting the integrated approach of water resources management. It is important to realise that water resource planning and management is a multidisciplinary process and therefore has to be promoted as a collaborative framework among all the relevant agencies operating nationally and those involved within the river basin itself, as well as local communities.

Lack of awareness of the cross-sectoral nature of water problems impedes the development of the new paradigm towards integrating the technical, economic, environmental, social and legal aspects of water management. The development of administrative units in water resource management has to coincide with river basins' boundaries instead of political boundaries. The lack, or inadequacy, of water legislation and policies is another stumbling block to integrated management of river basin and optimal use of water resources.

Basin management, therefore, provides the opportunity for communities and stakeholders to develop an integrated management process, which takes cognizance of their spiritual, ethical, social, economic and environmental value systems, and addresses their desires and needs, within the context of sustainable water resource management and use.

### **1.1 Initially, basin management should be targeted to specific hydrological units, focusing on a few existing or perceived water-related issues with more issues being included later once experience and success is achieved**

The complex nature of catchments and the limited capacity of BWOs – both in terms of personnel and equipment and the general lack of capacity among stakeholders – require that efforts in water resources management are targeted focusing on the high priority water-environment-related issues or concerns. These issues are existing, potential or perceived problems, which have significant direct social, economic or environmental implications for the stakeholders, thereby inducing them to participate in the process. The experience gained can be used to expand to other areas.

## **1.2 Basin management should address all components of the water resource and all elements of the hydrological cycle, which relate to each issue**

Effective management of a water resource problem requires that all aspects of the water resource be addressed, including: water quantity and quality; the physical hydrological processes, such as rainfall, surface runoff, stream flow, groundwater yields, aquatic ecosystems; and coastal and estuarine waters. All of these issues should be incorporated in the management process.

## **1.3 The units for basin management should be sub-catchments within the basin and should be based on the socio-economic, land use and water environmental resource character of the catchment**

River basins in Tanzania are large geographical areas whose water management problems and issues differ greatly from one area to another within the basin. Units for IWRM should be chosen at sub-catchment level whose size is determined by similarity of issues and problems in the sub-catchment, making it possible to develop a common vision, agreed measurable objectives and priority issues. The units should be large enough to include a range of stakeholders' sectors (both impactor and impacted) with differential access to resources, to ensure inter-sectoral communication and multi-perspective solutions to problems. The socio-economic, land use and environmental resources will indicate the opportunities and constraints for their management. The management at the sub-catchment level must be appropriately coordinated at the basin level. Coordination at the basin level is required to enable integration across the sub-basin and to assess downstream/upstream impacts; it is also to enable basin strategic development priorities and national water resource policy to be represented at sub-basin WRM.

## **1.4 Aspire for holistic inclusiveness, with growing integration of relevant issues and elements affecting water resources in a basin or catchment, as a prerequisite for sustainable development**

Basin management is IWRM for effective use and management of water resources at the basin level. It is primarily focused on water, but it is helpful to remember that integration means management of administrative, human, economic, land use, infrastructural and natural resources in the basin as they relate to water. Although only a few priority issues from specific areas of the basin may be tackled at first, because of limited resources and manpower, the interconnections of the various elements will inevitably result into additional issues being addressed. Ultimately integrated management of the natural, physical, socio-economic and environmental resources in the basin will provide the most effective mechanism for sustainable development of water resources.

## **1.5 District governments and local authorities should have an effective role and responsibilities in water resources management**

As many land and environmental resource management functions fall wholly or partially under district governments and local authorities, these agencies should have effective roles and responsibilities in basin management, to ensure both horizontal and vertical integration.

## 2. STAKEHOLDER AND PUBLIC PARTICIPATION IN WATER RESOURCES MANAGEMENT

Water is a resource of the common good; consequently, participation of water users in the management of these resources results in more efficient use and effective conservation of water. This is because participation creates a sense of ownership of the resource and accountability in the decisions made. Reasons for stakeholder involvement include:

1. Greater acceptance of regulations for allocating basin resources if stakeholders are involved in their formation and implementation;
2. Increased local knowledge is brought into the decision-making process, improving the likelihood that technically good decisions will be made while remaining sensitive to local cultural norms;
3. Reduced cost of enforcing the regulations;
4. Greater likelihood of political engagement;
5. Public involvement can also contribute to the long-term viability of management processes, partly because local populations do not change, and partly because the experience of participation provide communities with the skills and confidence to tackle problems themselves;
6. Promotes wider participation by disadvantaged groups in social decisions;
7. Stakeholders that are omitted from the decision-making process become disengaged and could be actively hostile to management decisions, especially where the political influence of water using sectors is not harmonised;
8. Local people would support interventions that will improve their livelihood security;
9. Local people have a wealth of traditional knowledge and experience and a key stake in the sustainable use of basin resources;
10. Stakeholder participation reduces monitoring and administrative costs; and
11. More effective means of such participation is for water users in any area to organise themselves into groups known as Water Users Associations.

### **2.1 Establish mechanisms for stakeholder and public participation and consultation processes that are appropriate, inclusive, representative and sustainable**

The active involvement of the relevant stakeholders in the water resources management is vital to its success and sustainability. Stakeholders may be basin residents or non-residents. They may include: domestic, industrial, mining and agricultural water users; recreational and ecological interests; urban and agricultural land use managers; effluent dischargers; residential communities; statutory and regulatory authorities; district and local authorities; and sector ministries.

### **2.2 Clearly define roles for stakeholders' participation in WRM**

The four levels of participation, in ascending order of influence, are (i) information-sharing (one-way communication); (ii) consultation (two-way communication); (iii) collaboration (shared control over decisions and resources); and (iv) empowerment (transfer of control over decisions and resources). A higher level of participation is not



automatically better; this depends on local circumstances and how well the participation is carried out. The role of stakeholder involvement can vary depending on circumstances, but it is important to have it clearly spelt out and plan for each separately.

### **2.3 Distinguish between stakeholder participation and public consultation**

Stakeholders' involvement directly in water resources management should be seen as the framework for water resources management. Public consultation is not structured in the water management process, though still absolutely necessary. Public consultations must be carefully planned in order to allow for input of public concerns in the management processes. Understanding issues of concern by the public is an important part of public participation. If the perceived issues or solutions shown by scientific investigation are not to be of concern, they still need to be addressed through public education programmes.

### **2.4 Support capacity building of community-based organisations and NGOs to develop skills for management of resources within river basins, using existing representation organisations**

Capacity building of stakeholder representatives is of paramount importance to IWRM, because informed participation will lead to understanding and informed decision-making, which results in effective implementation and administration of management plans. Capacity building and achievement of consensus on IWRM may take considerable time and effort, which might slow the process. Existing representation organisations can expedite stakeholder participation because they are close to the people.

### **2.5 Foster continuity in stakeholder participation**

Frequent changes in stakeholders or their individual representatives lead to discontinuity of the commitments to implement particular water resources management actions. It also causes contradictory feedback to the wider stakeholder constituency and the general public.

### **2.6 Facilitate dialogues and conflict management**

Water demand is ever increasing while the quantity remains the same or reduces. This situation brings about a competition in use of water and sometimes conflicts. Water use conflicts are on the rise in some of the basins in the country due to reduced dry season flows. The water use conflicts are mainly between:

- irrigators and livestock keepers;
- upstream and downstream users;
- irrigation and hydro power; and
- economic users and environmental users.

Properly conducted dialogues are a means for mitigating conflict; find root causes of conflicts in the areas concerned and address the causes effectively and efficiently

through a dialogue processes; and build capacity of the basin and water user entities in conflict management and dialogue processes.

### 3. WATER RESOURCES MONITORING

Information that is reliable, widely understood, and accepted underpins effective water resources management. IWRM management not based on scientific information leads to misdirected policy, wastage of resources and institutional inefficiency. Derived rules and resource allocations can be unfair and ineffective; livelihoods can be disturbed or affected. Lack of reliable scientific data impedes planning and proper management of water resources. Inadequate scientific studies and lack of knowledge increases pressure for application of the precautionary principle and thus reducing development opportunities. Data on which information should be derived is gathered from good data gathering networks and from traditional and observational knowledge.

#### 3.1 Monitoring networks

A basic requirement for the Basin Water Offices to manage the water resources adequately is a functioning and representative information system for water availability and water use in the basin. The information systems comprise surface and groundwater, quantity and quality monitoring network, data processing and storage systems, and qualified staff to operate the systems. Monitoring stations are classified into four areas of water resources monitoring as follows:

- water quality and water quantity baseline network (or primary network);
- project and specific water monitoring stations;
- project stations; and
- applied research stations.

**The baseline network** is a long-term stable source of high quality data that provides a baseline upon which long-term changes/trends can be measured. Long-term monitoring of data will help in understanding and adapting to impacts from climate change.

**A specific monitoring network** is designed to obtain information required to address particular issues or community concerns about environmental assessment and water pollution or depletion in rivers. These stations are designed to improve understanding of water resources in order to predict water development in the basin and to assess the effectiveness of management interventions and measure impacts of management actions. The knowledge thus gained can be used in the planning of the baseline network and evaluation of the management actions. The project stations are used to determine the feasibility and assess the impacts of projects.

**Stations for applied research** are part of a study programme that advances knowledge about water resources.

#### 3.2 It is critical to review the various networks of water resources monitoring in their individual relevancy to water resources management and development

Water resources monitoring may consume substantial financial resources; it is therefore important to plan the networks with water resources management in mind. The operation and maintenance of hydro-meteorological stations is an expensive exercise and requires careful logistical planning. The large size of the basins is such that routine operation and maintenance of the stations from a central location would be expensive.

Thus, devolve O&M to designated field offices, which will result in reduced travel time and getting more work done effectively and efficiently.

### **3.3 In designing the various networks, consider all relevant networks including those operated by other agencies**

The water resources management networks are hydrometric, sediment, weather and rainfall, groundwater and water quality. Several institutions and individuals operate data gathering stations. All those stations should be integrated in the basin networks of observation stations.

### **3.4 Identify an optimum basic hydrological network for water resources**

Identify a basic network for water resources hydrometric monitoring, after which additional stations can be made for purposes like definition of water rights and for project-related monitoring. Operation of the basic network should receive the highest consideration. Explore co-financing of operating costs of project-related monitoring (e.g. assessment of hydropower potential) and research stations. Large water users should be encouraged to operate hydrometric, rainfall and weather stations near the water abstraction sites. Otherwise monitoring by the water user should be specified in the water right.

### **3.5 Install weather and rain-gauge stations to fill gaps in the network, otherwise get/purchase data from other data collectors**

Several organisations and individuals collect rainfall and weather data. There is no need to run data collection stations where the same data is already collected nearby. Facilitate those individuals who collect data by procuring equipment for them. Use schools and District and Ward Offices.

### **3.6 Design groundwater-monitoring network considering areas with heavy water use or expected groundwater exploitation or vulnerability to pollution**

Design the groundwater monitoring network with water resources management in mind. Upgrade the network to cover other important groundwater aquifers or basins.

### **3.7 Tune the water quality monitoring efforts with the information needs for water resources management based on large aquifers**

Water quality monitoring may easily consume substantial financial resources if not properly planned. Site the surface water quality monitoring station at the hydrometric station and the same team that services the hydrometric station should be trained to service the water quality station; likewise the borehole used for monitoring groundwater should be also used for water quality monitoring and the same team that services the groundwater station should be trained to service the water quality station.

### **3.8 Undertake sediment monitoring in the framework of project feasibility studies and water assessment studies**

Sediment monitoring is important for studies of land degradation; it is also important for impact assessments of planned reservoirs and for reservoir management. Proper collection, analysis and interpretation of sediment samples are tasks that are not to be underestimated. However, this type of data collection has a much more project-related character than general water resources monitoring. Therefore, consider undertaking sediment monitoring only in the framework of project feasibility and assessment studies, i.e. with a clear objective in mind, rather than as a component of a basic water resources monitoring network.

### **3.9 Develop/procure a dynamic Water Resources Information System in which data can be captured and analysed and stored to support further decision-making**

Spatial and temporal data on the socio-economic and physical catchment must be collected and compiled in such a way that the information required for effective decision-making can be easily accessed. A Geographic Information System (GIS) should provide the basis for analysis of spatially referenced data. Procedures for processing and capturing of monitored data are developed as part of the information system. Various analytical tools may be incorporated in the information system. Hydrological models that are configured to allow water balance calculations and water quality and quantity impact assessments for all major natural components of the basin, as well as all major human impacts on the hydrological cycle should be considered as a natural part of such an information system.

## 4. WATER RESOURCES ASSESSMENT

An essential component of river basin management is knowledge of both current and future supply and demand on water resources in a river basin. Holistic management of water resources addresses specific water resources issues in the basin, including the social, economic, land use, infrastructure and natural resource conditions, pressures and processes. Understanding of current and future human uses of water (such as irrigation, hydro- electricity and domestic or industrial water supply) as well as the ecological needs for water within different parts of a river basin is essential for present and future holistic water resources management. Water Resources Assessment (WRA) provides the required understanding of the different water resources management elements and their interrelations, on which management decisions during planning, implementation and operation may be based.

### **4.1 Cost-effective assessment should be performed at the level of detail required to address information needs about relevant water resources management issues**

Water Resources Assessment may require substantial financial resources, thus it is crucial that the assessment is focused in a specific geographical area and on the issues at hand. It is impossible to know everything in the basin with the limited resources and time normally available. Thus the available time and resources should be used to address those issues, which are critical to understanding the key water management problems in the basin or sub-catchment at an appropriate level of understanding.

### **4.2 Conduct the assessment in stages, starting with a rapid (initial) water resource assessment that focuses on causal factors and effects**

Initial water resources assessment should be based on analysis of existing data and information through which gaps in information critical to the understanding of the issues for management can be determined. The costs of data collection are very high, and in most cases adequate understanding may be gained through analysis of available data. On the basis of the rapid assessment, cost-effective programmes for collection of critical data should be designed and a more detailed water resources assessment done.

The main causal factors and their effect on the key management issues are determined in order that they may be prioritised for management during the planning process. The causal factors relate to natural catchment processes as well as from human activities, which result in flooding, reduced water availability (e.g. afforestation), excessive demand (e.g. inefficient irrigation), water quality deterioration (e.g. dense settlements or effluent discharge) and/or destruction of the aquatic environment (e.g. in-stream activities). It is unwise to attempt to address too many issues at once, because the process of assessment could be overwhelming and unmanageable. It is important to remember that issues, which are not addressed, can always be included at a later stage. WRA is a continuous process.

### **4.3 The stakeholders should be involved throughout the assessment process, so that they gain a sound understanding of the basin with which to make effective decisions**

Stakeholders who have a sound understanding of the issues in the basin will better understand the rules and consensus among the stakeholders and the BWO. A central feature of understanding and consensus is trust. Stakeholder participation in water resources assessment is a way of building trust and understanding among the stakeholders themselves and the Basin Water Officer.

### **4.4 Conduct environmental flows assessment**

Environmental flow (EF) is defined as: the flow in a river or into a wetland or coastal zone (which may be ground water) that maintains the ecosystem in a negotiated ecological condition. This condition is decided by the society and is normally a compromise between social, economic and ecological values of the water for various uses (World Bank Environmental Flow Window). The National Water Policy 2002 directs that EFs must be determined on the best scientific information available and accords allocation of water for environmental requirements second priority after water for human basic needs.

### **4.5 Conduct socio-economic assessment**

Social economic data plays an important role in water resources planning. Social assessment requires that data needed in the planning process be identified and collected. Collaboration with the stakeholders and other sectors to carry out the socio-economic assessment is critical.

### **4.6 Identify areas requiring research**

IWRM is a complex process which takes into account environmental, ecological and socio-economic concerns in the planning and management of the resource, aimed at solving the problems of supply, demand and control. It involves research, technical works and administrative and legal controls for the purpose of preserving and allocating the available water resources to the needs of society and increase efficiency and cost effectiveness. Research provides new knowledge, application of technology and performance of instruments and equipment. In order to effectively practice IWRM in the basins, some issues will require being studied/researched so that the findings may be used for better management of water resource. Development of hydrological models, assessment of the functions and benefits of wetlands, determining water saving irrigation systems are all part of research. Research costs money and therefore should be demand driven.

## 5. WATER RESOURCES PLANNING

The National Water Policy 2002 directs that planning of water resources development and management shall be participatory, multi-sectoral, inter-disciplinary, and based on river basins. This planning integrates the linkage between land use and water use, water quality and quantity, and the important role ecosystems play in the sustainable development and management of water resources. The activities in this planning process include:

- defining related macro economic considerations - political, environmental, social and economic - to address poverty and growth and the linkage with water resources;
- determining environmental, economic and social considerations based on the principle of sustainability;
- setting criteria for differing water resources priorities at different levels;
- determining and prioritizing requirements of all users;
- establishing participatory planning procedures for use at the different levels; and
- balancing water utilisation planning between the various socio-economic-environmental needs (e.g. food security, domestic supply and sanitation, generation of hydropower, industry and mining, livestock and wildlife, sustenance of ecosystems and fisheries resources, recreation and tourism, and navigation), in an integrated and holistic manner.

The river basin plan is an action plan, a tool that describes the framework for management of the water and related land resources in the basin. Contents of the plan include:

### *A. Determined by water resources assessment*

- physical description of the basin;
- land use inventories;
- current water availability and demands;
- pollution source inventories;
- aquatic including wetlands and terrestrial ecosystem needs;
- vulnerability to floods or extreme meteorological events;
- identification of stakeholders;
- implications of changing land use; and
- identification of priority issues (impact issues or user requirement issues).

### *B. Determined during planning process*

- short- and long-term goals for the river basin;
- water related development scenarios, future water demands;
- water allocation and water quality objectives;
- strategy, measures and action plan for achievement of goals;
- financing of water use and management;
- responsibility and schedule for implementation; and
- mechanisms for monitoring and updating.



### **5.1 Establish mechanisms to identify and involve all relevant stakeholders and the general public essential for the implementation and success of the WR plan**

Integrated water resources planning should involve all stakeholders in the basin. The stakeholders in land, water and other natural resources plan how to commonly develop and manage their resources in order to maximise the resultant economic and societal benefits in an equitable manner without compromising the sustainability of vital ecosystems.

### **5.2 Liaise with other respective sectors on the status of their respective resources in the basin**

Consideration of other natural resources is vital when planning for IWRM. The other resources are dealt with by different sectors. Coordinate the information from different sectors in order to get the basin wide status for each resource.

### **5.3 Planning should be done within identified hydrological units to start with, based on these plans a basin plan can be drawn**

In accordance with the principle of demand-driven development, river basin planning should only be established in response to a perceived and expressed demand within hydrological units. The identification and definition of management units should be based on the understanding of physical, socio-economic and administrative characteristics of different catchment areas gained during the assessment process, taking account the interests of relevant stakeholders. Representative stakeholder sub-committees representing each of these management units will need to be constituted to guide the planning, implementation and administration of water resources management within these areas. The elements of the planning process should be oriented around these management units, taking account of inter-connections and relationships between units.

### **5.4 Prepare management strategies that are agreeable to the stakeholders**

The water resources management strategies outline the measures which need to be taken to alter people's behaviour, activities and actions to address the significant causes of the priority issues in the catchment. Management strategies should be detailed enough to ensure that the intended positive impact will be realised but should not directly impinge on people's livelihoods, and should allow enough flexibility to encourage adoption of the most cost-effective response given the site-specific conditions. The specification of management strategies should also take consideration of:

- criteria (guidelines) for selection of associated management actions;
- responsibility for implementation of the strategy (and associated actions);
- time frame for selecting and implementing the associated actions;
- responsibility and resources for administration and auditing the implementation;
- expected positive impact on the priority water resource issue(s);
- performance criteria against which implementation will be audited (this must include items such as quality of communication between participants; barriers to

- communication; levels of trust; “interests”-based rather than “rights”-based negotiations); and
- possible catchment-specific regulations, which should be legislation to enforce the strategy.

### **5.5 In the planning process provision should be made to influence or prevent land-use planning decisions that could lead to unacceptable impacts on the water resource**

Such influence may be based on the expected environmental hazard posed by the proposed land-use, or the existing intensity of land-use in the basin. Effective and holistic management of the basin must make provision for water sources protection from land use practices that lead to unacceptable impacts on the water resources. Land-use planning should be integrated in the basin water resources management plan.

### **5.6 Plan with multi-objective water use in mind**

IWRM implies planning and building projects for multipurpose use in order to minimise financial resources needed to build infrastructure and maximise benefits. In planning for water developments projects, multi-objective use of the resource should be given priority. Potential water development areas are determined during the assessment process.

### **5.7 Formalise the basin vision and mission**

The water resources management plan has a specific role within the context of IWRM. It formalises the basin vision, the mission of water resources management and the understanding of the management objectives and issues. These should be addressed through agreed management strategies within a specified time frame in the individual management units of the basin. Such agreements should be the outcome of “interests-focused” negotiations as opposed to “rights-focused” negotiations. The plan allocates roles, responsibilities and accountabilities to stakeholders and outlines an associated legislative and procedural framework for implementation.

### **5.8 Periodically review and update the WR plan to reflect changing priorities and circumstances**

The formulation of a WR plan should reflect the decisions made during the planning process, based on the understanding developed during the assessment process. Reviews of water resources assessment of the assessment or planning should not stop the implementation of an earlier plan. The ongoing nature of water resources management requires that all of these elements continue, at a greater or lesser intensity, and that the WR plan may be adapted and reformulated as basin conditions change.

### **5.9 Prepare a programme of actions to implement the plan**

The strategies outlined in the WR Plan need to be translated into implementable actions. The final set of actions associated with all the management strategies will form a programme of action for implementation. The procedures, time frame and

responsibilities for this programme need to be outlined in the plan to facilitate the effective and transparent implementation and administration of the plan.

#### **5.10 The WR plan should be monitored and audited at specified time-periods to determine the need for its revision**

The effectiveness of implementing the WR plan to achieve specified objectives, given foreseen and unforeseen impacts and new development, should be reviewed, as well as the adequacy of the objectives in meeting the goals and vision of the basin management process. External reviewers should make the audit.

#### **5.11 Prepare a procedural framework for implementation, administration and review of the water resources management plan**

The WR plan should outline the procedures for ongoing management of the basin by the Basin Water Office. Mechanisms to ensure consultation, transparency, information dissemination and appeal for administrative decisions must be developed and specified within the WR plan. The responsibilities of the various players, resource allocations, financing and legal ramifications should also be outlined in this procedural framework. Issues addressed in this framework may include:

- the administration and auditing of the programme of actions;
- flood management and control;
- surface and ground water allocation and permits;
- water conservation and demand management;
- water quality management, and discharge permits;
- water environmental protection of the aquatic ecology;
- development, operation and maintenance of basin and reservoir systems;
- the registration and control of land-use and evaluation of development permits;
- an integrated waste management strategy (including accidents);
- monitoring;
- emergency response/ disaster management (including floods, droughts, contaminant spills);
- training, capacity building and public communication;
- auditing of implementation of the WR plan by an independent organisation; and
- the review and revision of the WR plan.

#### **5.12 The water resources plan and its regulatory framework should be communicated to stakeholders and the general public**

The outcome of the basin planning and the roles and the responsibilities of stakeholders, communities and their representatives should be communicated with the broader public. Emphasis needs to be laid on suitable communication channels and formats which will make it easier to communicate complex technical issues.

## 6. WATER ALLOCATION

Water allocation is one of the core functions of the Basin Water Board where water is apportioned to different users. The apportionment should be fair, transparent and consider the principle of equity and should support efforts for poverty reduction.

### **6.1 Water allocation required for the basic human needs and environmental requirements, must be quantified during water resources assessment**

The National Water Policy makes provision for reserving sufficient water to meet basic human needs and the environmental requirements, which should get priority of allocation. One of the first steps in allocating water in the basin is to quantify the water required for those requirements. The quantity of water required to meet basic human needs will have to be based on census figures and local knowledge, and take into consideration the expected population growth in the area. The environmental water requirements are established during the environmental flow assessment.

### **6.2 Determine and allocate trans-boundary water resources requirements**

Tanzania is bound, as are all countries, to the requirements of the Helsinki Rules. In addition, Tanzania is signatory to various regional protocols for management of shared water resources. Obligations in terms of these agreements will have to be met prior to allocating water to other users.

### **6.3 Determine highest value uses**

The available water resources in a basin must be quantified, after providing for allocations to the basic human needs and the environment and international obligations. This water should be allocated on the basis of highest value uses, but taking into account social and economic considerations that focus on poverty reduction.

### **6.4 Before allocating more water seek strategies to improve water use efficiency in existing schemes**

In some areas of the country, water scarcity is very evident and water is nearly over-allocated. In these areas – and even in more water-abundant areas – seek opportunities to use water more efficiently. This will avoid or postpone developing more sources that bring more management problems. Water use efficiency is achieved through changes in the behaviour of the users through information campaigns and demand management, i.e. the application of economic incentives and technological means (such as metering and retrofitting). Promote recycling and re-use. Conduct studies on the economic value of water where applicable for appropriate setting of water user fees and tariffs.

### **6.5 Plan for conjunctive use of groundwater and surface water**

Surface water availability is critical in some of the basins in Tanzania. In such areas groundwater can play a vital role as a source of water to augment the inadequate surface water resources. Integrate surface water and groundwater planning for allocation of water in an area. These water sources should be determined at the assessment stage.

## **6.6 Use regulatory instruments as an allocation tool**

Regulation specified in Water Resources Act or WR plan will prescribe allocation and water use limits. Use these regulations or rules in water allocation to avoid conflict and over-allocation. Regulations are key to implementing WR plans and policies and can fruitfully be combined with economic instruments.

## 7. WATER RESOURCES PROTECTION

The water resources in the basins are vulnerable to pollution or depletion because of poor land use practices, and encroachment of land for agriculture, urbanisation and industrial development. Environmental degradation and pollution of water sources from increasing human activities has led to: (i) increased scarcity and vulnerability of water resources; and (ii) deterioration of the integrity of ecosystems, which perform valuable services to society, including moderating floods and droughts, purifying water and sustaining fisheries and other aquatic resources.

### **7.1 Rivers in the basin should be classified according to their desired protection levels and objectives**

Pollution and degradation of water quality may interfere with vital and legitimate uses of water. Water resource protection must be based on the needs of society and the aquatic ecosystem. The objective of the river classification process is to arrive at numerical objectives, which will be required to maintain the resource within some desired state, reflecting the local communities' interests, as well as national priorities for the protection of the water resources. These water quality objectives must be based both on the requirements of water users, and on the need for the healthy functioning of whole aquatic and associated ecosystems.

### **7.2 Evaluate site specific and implement site-specific measures to protect sensitive ecosystem**

Water resource protection will be based on measures that set clear objectives for the desired state of the resource. Actions to protect water are effected through discharge permits, and standards. The standards are set in the Water Resources Act. It may be that stringent standards are required to ensure the water environmental objectives in a river system. The water resources management planning process must make provision for the formulation of such standards. Because of long retention time and bioaccumulation, lake basin plans need greater focus on prevention of nutrient and toxic pollution, and careful assessment of the shoreline functions, including prevention and control of exotic species, inventory of biodiversity and fisheries management issues.

### **7.3 Prepare strategies to control pollution**

Pollution control is a process to maintain the water quality in its natural good state. Pollution and degradation of water quality may interfere with vital and legitimate uses of water. An effective water quality monitoring programme and a way of evaluating the results is needed for all river systems and large aquifers. A river classification system to provide baseline data needs to be established so that changes in water quality can be tracked.

### **7.4 Distinguish between point source pollution and non-point source pollution**

Both point and non-point source water pollution is responsible for water quality deterioration, and makes water unusable and its treatment very costly. Point source pollution is pollution of water sources at a point such as that coming from industries or

sewers. Non-point source is dispersed pollution over the catchment due to activities in the catchment such as farming activities or mining. These two types of pollution require different strategies for their management. Point source pollution can be managed through applying the polluter pays principle or by issuing discharge permits. Non-point source pollution is managed through awareness creation campaigns about good practices of land use and the use of appropriate chemical and equipment.

### **7.5 Water quality monitoring for compliance**

Discharge permits should be monitored through an effective but less costly monitoring system. A water quality-monitoring programme should be designed around the water quality-monitoring network. A classification system for surface water first needs to be established so that changes in water quality can be tracked. The objectives of the network are: (i) to obtain a general knowledge of the current water quality in the river basins, and (ii) to assess water pollution caused by various activities in order to be able to implement the necessary pollution control measures. Arrange for large point sources polluters to install and maintain effluent-monitoring system for self monitoring.

## **8. BASIN OFFICE MANAGEMENT AND ADMINISTRATION**

### **8.1 Establish water user and water rights/permits information system**

Thorough inventory of water users (and the quantity utilised) is required for the establishment of water user information. The systems are vital for water rights management and water user billing as well as for overall basin management and water allocations. The database can serve as input to hydrological modeling and for aiding in decision-making.

### **8.2 Plan human resources development (HRD) with the understanding that IWRM requires a multidisciplinary team**

The core to successful water resources management lies on building the knowledge and skills base at the national, basin and local level to utilise the relatively new and multidisciplinary tools of integrated water resources management. Technical capacity specialist will be required to implement the various scientific and technical functions, both at the central government and basin levels and also in the districts. The focus of knowledge and skills now goes beyond the traditional skills of hydrology and engineering. To do their jobs adequately, technical specialists need to be supported by managers and administrators to ensure that institutions are run effectively and in a business-like manner, so that they can perform their tasks as required. Capacity building and the development of expertise in non-engineering areas like financial management, water law, water resources and environmental economics, environmental management and sociology will more ably address conflict resolution processes, trans-boundary water issues, the social assessment of water resources, water conservation and water-demand management, stakeholder analysis, as well as strategies for communicating and engaging with communities and stakeholders.

However, it does not mean that all these professionals must be employed by the BWO, which could create a very inefficient organisation. Some expertise is needed just for short periods of time and can be sourced elsewhere. Studies and research can be contracted to universities and research institutions. A hydrology technician should be trained to service more than one network (e.g. a hydrology technician could be trained to undertake O&M of hydrometry, water quality and groundwater networks). Technical staff should be trained in negotiation and communication skills, with the need to employ people with those skills.

### **8.3 Set priorities for funding**

In IWRM, different issues and challenges are always encountered and have to be addressed. However the resources available to meet the challenges and address the issues are not adequate. It is therefore important to set priorities in addressing the issues.

### **8.4 Solicit funding for water resources management by means of comprehensive business plans**

Water resources management entails a variety of technical, administrative and legal activities that cost money to implement and that must be funded. Thus, one of the vital



activities of the basin water officer is to solicit funding for basin management. Sources for funding include, government allocations, water user fees and direct donor funding. In order to attract funding from the donors, stakeholder and the government it is imperative that *Basin Water Office Business Plans* are meticulously prepared and presented to the stakeholders. The purpose of the business plans is to ensure transparent and effective operation of BWOs and to solicit funding.

### **8.5 Set up an achievable annual work plan and budget**

Set up an achievable annual work plan from the integrated water resources plan and translate the planned activities into financial requirements and prepare annual budgets. The plans should be prepared by mid-financial year and budgets should be ready for approval by BWBs, which in turn should submit the budgets to the Director of Water Resources early enough for processing and inclusion in the government budget. The budget must show all the sources of funding and the amount required from government subvention. Establish an effective billing and fee collection mechanism. Solicit funding from donors and stakeholders for specific studies and research.

### **8.6 Criteria for charging water use fees**

Care should be taken so that charging for water user fees does not appear cynical. It will be very costly to charge very small water users such as home gardening, watering of cattle, single house water supply or even rural poor water supply schemes. Set criteria during the assessment processes for charging for water. Fees will not be charged for water which was not abstracted (water not available). Consider metering large abstractions as a demand management measure. Expand charging to new area such as fish levies, etc as advised During WSDP Appraisal.

### **8.7 Develop mechanisms for coordination of government departments and agencies, for IWRM**

In IWRM, inter sector coordination is vital for the success of the process. There is an on-going problem of communication and the efficient sharing of responsibilities for sustainable water management in the basin. The BWO needs to take an active role to further improve information sharing, networking, inter-agency coordination, the mainstreaming of activities, and reducing the duplication of effort. Thus: (a) establish an information exchange through established BWO website; (b) develop procedures to facilitate more effective coordination of WRM initiatives by various actors within the basin; and (c) development an “open-door” communication strategy with all WRM-related agencies, stakeholders, and clients in their basins.

### **8.8 Establish Water User Associations**

Facilitate the formation and strengthening of Catchment Committees and Water User Associations. The formation of these entities should be on the demand basis because substantial financial resources will be required.

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