THE STATE OF ERITREA
MINISTRY OF LAND, WATER AND ENVIRONMENT
WATER RESOURCES DEPARTMENT

Action Plan for Integrated Water Resource Management (IWRM) in Eritrea

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List of Acronyms and Abbreviations

CBOs	Community Based Organizations
CWP	Country Water Partnership
DHS	Demographic and Health Survey
DPMP	Disaster Preparedness and Mitigation Plan
ERI-CWP	Eritrea Country Water Partnership
ESI	Eritrean Standard Institute
EWRIC	Eritrean Water Information Center
FAO	Food and Agriculture Organization
FSS	Food Security Strategy
GSE	Government of the State of Eritrea
GWA	Gender and Water Alliance
I-PRSP	Interim-Poverty Reduction Strategy Paper
IWRM	Integrated Water Resources Management
MAHFR	Ministry of Agriculture, Hydraulics and Fishing Resources
MDG	Millennium Development Goal
MND	Ministry of National Development
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoEM	Ministry of Energy and Mines
MoF	Ministry of Finance
MoFI	Ministry of Fisheries
MoH	Ministry of Health
MoJ	Ministry of Justice
MoLWE	Ministry of Land Water and Environment
MoPW	Ministry of Public Works
MoT	Ministry of Tourism
MoTC	Ministry of Transport and Communication
MTI	Ministry of Trade and Industry
NAP	National Action Program
NARI	National Agricultural Research Institute
NDPMB	National Disaster Preparedness and Mitigation Body
NEAPG	National Environmental Impact Assessment Procedures and Guidelines
NEMP-E	National Environnemental Management Plan – Eritrea
NGO	Non Governmental Organization
NUEYS	National Union of Eritrean Youth and Student
NUEW	National Union of Eritrean Women
NWSSA	National Water Supply and Sanitation Authority
PERA	Proclamation for the Establishment of Regional Administrations
SOPAC	South Pacific Applied Geosciences Commission
TEC	Technical Committee
UNCCD	United Nations Conventions to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDP	United Nation Development Program
WRD	Water Resources Department
WRM	Water Resources Management

Foreword

The Government of the State of Eritrea, in its national development policy and strategy, has recognized and addressed the importance of sustainable water resources management and increasing water use efficiency for livelihoods and sustainable development of the country aimed at promoting rapid economic growth and poverty reduction.

Eritrea faces a number of serious challenges related to water resources management. Climate variability, increasing in demand for water as a result of development and population growth, low level of investment on improving the supply and efficiency of water use, inadequate regulatory and enforcement mechanism for proper water allocation and use, high level of environmental degradations, low level of knowledge on the resources base are some of the key factors with adversely impacting the management of water resources sector.

Bearing in mind the above challenges in water resource management, development and use and their urgency of addressing them the Water Resource Department of the Ministry of Land, Water and Environment has developed this Integrated Water Resource Management Action Plans. This will serve as a road map and allow the nation to start implementation of needed projects/actions to help focus efforts towards Integrated Water Resources Management that will lead to economic efficiency, equity and environmental sustainability.

The Government of the State of Eritrea perceives this Integrated Water Resource Management Action Plan as a flexible and dynamic process. The Ministry of Land, Water and Environment will be in the forefront of making sure that the Integrated Water Resource Management Action Plan becomes a framework and an important mechanism for sustainable use and development.

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Weldemicael Gebremariam
Minister for Land, Water & Environment

Preface

Since the World Submit on Sustainable Development in Johannesburg in 2002, by governments including Eritrea, water was seen as the underline element of reaching the Millennium Development Goals, which resulted in the establishments of targets. Accordingly, several countries have started the process of putting in place elements or substantial amounts of the Integrated Water Resources Management Process envisaged during the World Submit on Sustainable Development.

The Eritrean Government has responded to the World Submit on Sustainable Development all for action and has started Integrated Water Resources Management Planning Process. Consequently, Eritrean Country Water Partnership has formally launched on January 2003. The launching was attended by different stakeholders from government institutions, international organizations, national and international Non Government Organizations, community based organizations and the private sectors. As a result, in January 2004 a proposal on an Integrated Water Resource Management action program was prepared by the Water Resource Department of, Ministry of Land Water and Environment.

This document - ***Action Plan for Integrated Water Resources Management in Eritrea***- is the result of the Plan phase of the Integrated Water Resources Management Process. The Action plan for Integrated Water Resources Management document was developed through a participatory approach. A series of meetings and workshops were (more than 35 events and with more than 2,000 Participants) held to look for views of all stakeholders. Consultations and dialogue between the key national and regional stakeholders involved in water resources management, development and use were bases for the development of the action plan. Seven thematic areas with sub topics were selected for assessment and analysis to develop this action plan document. Groups were established to carry out the management and writing of the different thematic topics, drawn from Government Ministries (MoLWE, MoA, MoH, MoND, MoTI, MoJ, MoLG, MoE, UoA, MoEM, MoF, MoFI, MoPW, MoT, MoTC, MoLHW etc) Zobas, NUEW, NUEYS, UN organizations, and Non Government Organizations. Practical and participatory systems that enable the group members to do their work effectively were put in place. These institutions and water policy, water law and the reformed institutional arrangements will lead the implementation of the Country Water Resources Management Strategy and Action Plan.

The Action Plan for Integrated Water Resources Management document comprises eight Chapters:

Chapter 1 provides overview of the Action Plan background. It also presents the conceptual framework of Integrated Water Resource Management; Definitions; Who is managing the water resources; who are water resources users; who is developing the water

resources; why integrated water resources management; and Integrated Water Resources Management as a Rolling Process. The Overview concludes with guiding principles of the Action Plan to help establish a multi stakes thinking in the planning phase process.

Chapter 2 presents the Action plan development process. The approached and methodology employed – These include: The methodologies (literature reviews, secondary data, discussions and consultations with key stakes in regional administrative centers and at national level); Considerations taken in preparing the action plan; and the Four basic steps in developing the action plan (preparing lists, identify high priority actions, develop criteria for priority ranking, and rack actions in order of priority).

Chapter 3 addresses the Water Resource of Eritrean Situation. It starts with the Policy, Legal and Institutional Frameworks existing in the country used as working documents. These include the National Policies and Strategies (macro policy, Eritrean Water Resources Policy (2004 & 2007), interim poverty reduction strategy (2004), food security strategy paper (2004), agricultural policy, national environmental management plan, national action program under UNCCD, national environmental impact assessment and guidelines, and coastal policy and guidance document); and Institutional framework. This chapter ends by presenting the water resources potentials (the physical setting and climate, surface water & ground water resources potentials); water quality of the country, and the water resources management problems and challenges.

Chapter 4 presents in summary the Eritrean Water Vision and Mission.

Chapter 5 presents and discusses in brief the overall and specific objectives of the action plan.

Chapter 6 & 7 these two chapters introduce the main body of the Action Plan. Chapter 6 presents the proposed action plans focusing on seven thematic/action areas identified during the previous stages of the Integrated Water Resource Management process that is the situation analysis and strategy document for reformation of water resources management framework of Eritrea in the future. These are: ***Water resources assessment, development and protection; Water resources allocation and water use; Disaster management; Enabling environment; Implementation and financing mechanism; Research and information exchange; and Basin Management Plan.*** The action plan has defined a serious of objectives, strategies and accompanying actions for key areas of action that enable equity,

efficiency and environmentally sustainable management of water resources by the implementation of Integrated Water Resources Management in Eritrea. Goals for each key area of actions have been set in order to streamline and focus on the action plan development process. For all actions/programs an indicative activities that is believed to provide more information on the type and extent of programs interventions are included.

Chapter 7 presents the Action Plan Cost. The action plan is categorized into a one year 2009 short term, medium term 2009-2011, and a long term 2009-2016. The total cost to implement the Integrated Water Resource Management Action Plan is about US$19.8 million and of these about 58.6 percent is allocated for actions that support water resources assessment, development and protection (Action Area-1), 14.2 percent for basin management (Action Area-6) and 10.3 percent for research and information exchange (Action Area-5). Summarized cost by action area (seven) and detailed costs break down by actions or project portfolios (ninety five) are discussed in this chapter. The costs given are only indicative and they are based on experiences of similar project costs implemented in this country.

Chapter 8 presents the proposed measures to implement the Action Plan. The requirement of institutional set up and Coordination; the proposed fund raising strategies; and conditions and terms for successful implementation of the Action Plan has been discussed briefly in this chapter.

Annexes Annex A contains ninety five proposed actions in the form of Logical Strategic Framework for Action Plan. **Annex-B** presents the Integrated Water Resource Management Action Plans Ranking Matrix that is multi-criteria analysis. **Annex-C** presents the list of Persons Met during the Action Plan Development Process.

In conclusion, The Ministry of Land, Water and Environment perceives this Integrated Water Resources Management Action Plan as a flexible and dynamic process. The action plans will be revised regularly, and will be upgraded in light of new developments and understanding. The development and implementation of these actions/project portfolios will complement Government present actions and its policies, strategies and action plans to reduce poverty, food security and sustainable economic development.

On behalf of the Ministry of Land, Water and Environment I wish to express my gratitude to:

- The Global Water Partnership and Regional Water partnership for their support and guidance in capacity building and on technical matters in developing and preparation of this document;

- The Government of the Netherlands for financial support;
- All stakeholders at regional administrations and national level for their warm participation, commitments and support throughout the process in formulating and producing this document;
- Core team Committee, Steering Committee, Water Resource Department staff, and Integrated Water Resources Management Project office for the facilitation and provision of inputs and valuable analysis at various levels of the strategy and action plan formulation; and
- The Host Institution (Toker Integrated Community Development) for managing the required funds appropriately and efficiently.
- All other people and institutions for their significant contribution.

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Mebrahtu Iyassu
Director General
MOLWE, Department of Water Resources
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Executive Summary

The Government of the State of Eritrea (GSE), in its national development policy and strategy, has recognized and addressed the importance of sustainable water resources management and increasing water use efficiency for sustainable development of the country aimed at promoting rapid economic growth and reducing poverty. It is also recognized that it is the poor who suffer most from the lack of water service delivery and the environmental degradation arising from mismanagement of water.

Eritrea is a country facing a number of serious challenges related to water resources management. A number of these challenges arise from various factors both within and outside the water sector. Climate variability, increasing in demand for water as a result of development and population growth, low level of investment on improving the supply and efficiency of water use, weak regulatory and enforcement mechanism for proper water allocation and use, high level of environmental degradations, low level of knowledge on the resources base are some of the key factors with negatively impacting the management of water resources sector.

Pursuant to its international commitments, Eritrea has started the process of putting in place elements of substantial amount of the Integrated Water Resources Management Process envisaged by the international community during the World Summit on Sustainable Development (WSSD) in Johannesburg 2002.

Considering the present challenges in water resources management, development and use and their urgency of addressing them the country has reviewed and redrafted the water resources policy, water resources proclamation and drafted a proclamation for the establishment of new water resources authority/commission that improve the enabling environment for the Integrated WRM. The draft policy and legal frameworks synergized with the country national development strategies, sectoral policies and management plans like, Interim-Poverty Strategy Paper, land proclamation, environmental management plan, agricultural policy and operational procedures and guidelines.

Other regulatory instruments like "*regulations for the issuance of permits for water use and construction of hydraulic works"* and *"regulation for the issuance of waste discharge permit"* are also drafted to check the unregulated use of the water resources and waste discharge.

To continue the process, Water Resources Department has started developing this action plans that will serve as a road map and allow the nation to start implementation of needed projects/actions to help focus efforts towards IWRM that will lead to economic efficiency, equity and environmental sustainability.

The main aim of the Action plan is:

- To enhance the creation of an appropriate enabling environment for water resources management, development and use.
- To facilitate the creation of institutional frameworks for water resources management, development and use at national, regional, sub regional and community levels;

- To improve the knowledge base on which rational water resources decisions will be made;
- To improve the water resources assessment capabilities of the water sector through the introduction of appropriate analytical tools and upgrading the institutional and human resources capacity.
- Facilitate the implementation of the future framework of water resources management of the country; and
- To prioritize and classify action plans in terms of short, medium and long term.

The action plans elaborate these approaches and set out specific objectives, strategies, actions and activities that would be taken to support integrated water resources management for sustainable economic development of the country. The development and implementation of these actions/project portfolios will complement government present actions and its policies, strategies and action plans to reduce poverty, food security and sustainable economic development.

The action plans proposed in this document have focused on seven thematic/action area identified during the previous stages for the country IWRM process and these are:

- Water resources assessment, development and protection;
- Water resources allocation and water use;
- Disaster management;
- Enabling environment;
- Implementation and financing mechanism;
- Research and information exchange; and
- Basin Management Plan.

This 2009-2016 action plan is categorized in to a one year short term (2009), medium term (2009-2011) and a long term (2009-2016). The action plans will be revised regularly, and will be upgraded in light of new developments and understanding. The total cost of implementing all the project portfolios is about US$ 19.8 million.

To implement the proposed action plan it is very crucial to secure endorsement by all stakeholders, secure political commitment, establish or strengthen coordination office and develop funding strategy.

1.0 INTRODUCTION

1.1 Background of the Action Plan

Since water has a direct or indirect relationship with poverty, governance, environment, climate, power, agriculture, flood, education and culture etc., society can not sustain life without managing water wisely and judiciously.

Therefore, the Government of the State of Eritrea (GSE), in its national development policy and strategy, has recognized and addressed the importance of sustainable water resources management and increased water use efficiency for sustainable development of the country so as to promote rapid economic growth and reduce poverty. In Eritrea, over-exploitation in specific areas and poor water management are serious threats to national economic growth. It is also recognized that it is the poor who suffer most from the lack and/or inadequate water services and the environmental degradation arising from mismanagement of water.

Integrated Water Resources Management (IWRM) offers an opportunity to create a paradigm shift in water resources management. The global environmental crisis, growing poverty in urban and rural areas and continued gender inequalities all point to the need for a different approach to governance of water use and management.

In line with its international commitments, Eritrea has started the process of putting in place elements of substantial amount of the Integrated Water Resources Management Process envisaged by the international community during the World Summit on Sustainable Development in Johannesburg 2002. The country has also started the process towards IWRM in 2005, by the formation of a Country Water Partnership (CWP) where all stakeholders are members. The Water Resources Department of the Ministry of Land, Water and Environment, in collaboration with pertinent stakeholders has already drafted a new water resources policy, new water intuitional framework for the water sector, country strategy document on water resources management, a situation analysis report, a proclamation for the establishment of new water resources commission, human resources need and development strategy for the water sector, the water resources proclamation, regulations for the issuance of permits for water use and construction of hydraulic works and regulation for the issuance of waste discharge permit.

In a nutshell, Water Resources Department has made significant effort to establish status of the nation's water resources and its management, overall goal of the IWRM, to secure commitments on the reform process, analyze gap and develop over all strategy towards the objective of IWRM.

To continue the process, WRD has initiated the preparation of action plans that will allow the nation to start implementation of needed projects/actions that could be commenced at an early stage for the most obvious high priority projects/actions and "hot spots."

A strategy and action plan promoting IWRM approach can help to provide pro-poor solutions that support the nation towards achieving the Millennium Development Goal (MDG) of reducing the number of people suffering from absolute poverty by half in the year 2015.

In the Eritrean context where water is a scarce commodity the need for sustainable management is paramount important.

1.2 Conceptual Framework of IWRM

1.2.1 Definitions

Action Plan: is usually an internal document setting out in detail how the organization will go about achieving the policy commitments, specifying activities, resources allocation, and expected achievements over a defined period (UNDP, November 2006). In this case, action plan encompass specific projects and defined to include project identification, ranking or financing for the identified key action areas

Appropriate Task: Appropriate tasks are those defined by necessity, history, or situation in specific contexts. This means that for operational purposes the concept for research, the task for which capacity is needed must be specified and assessed for its appropriateness within a given context.

Capacity: The ability to perform appropriate tasks effectively, efficiently, and in a sustainable manner.

Capacity building is the process of development and strengthening of the abilities of people, institutions and societies to perform functions, solve problems, and set and achieve objectives. In this way, a community equips itself to undertake the necessary functions (appropriate tasks) of governance and service provision in a sustainable fashion.

Ecosystem: a complex system formed by interaction of a community of organisms with its environment.

Environment: is the totality of things (the physical, chemical, biological, social, economic and biosphere) which affect all life supporting system.

Gender: Gender refers to the different roles, rights and responsibilities of men and women and the relations between them. Gender does not simply refer to women or men, but the way their qualities, behaviors, and identities are determined through the process of socialization. Gender is generally associated with unequal power and access to choices and resources. The different positions of women and men are influenced by historical, religious, economic, and cultural realities. These relations and responsibilities can and do change over time.

Gender mainstreaming: is the process of assessing the implications for women and men of any planed action, including legislation, polices and programs in all areas and at all levels. It can also assist in bringing about institutional and organizational changes necessary to ensure gender equity. IWRM action plan should incorporate the gender mainstreaming and social disparity issues in terms of equitable access to and control over resources, benefits and decision making between men and women.

Human Resources Capacity: is a capacity to the training, recruitment, utilization, and retention of managerial, professional, and technical talent that contribute to Integrated Water Resources Management at the organizational level.

Integrated Water Resources Management (IWRM) is defined as 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. (GWP technical Committee (TEC) background paper No 4). The IWRM Training Manual, 2005 has also defined as "a systematic process for the sustainable development, allocation and monitoring of water resources use in the context of social, economic & environmental objectives".

Policy: A declared intention and course of action adopted by government, party, etc., for the achievement of goals. Policy is a powerful instrument essential to achieve goals and objectives. A policy remains a statement of wishes and unimplemented unless accompanied by relevant strategies.

Stakeholders: An organization or individual that is concerned with or has an interest in water resources and that would be affected by decisions about water resources management. (FAO, 1995)

Strategy: A set of chosen short-, medium- and long-term actions to support the achievement of development goals and to implement water-related policies. Strategy defines goals and agrees on how goals can be pursued. This definition of strategy does not necessarily include project identification, ranking or financing (FAO, 1995)

Use of Water: shall include withdrawing, pumping, extracting, taking, storing or diversion of water for the purpose of using or re-using that water. (As per the water resources proclamation -Final Draft)

"Water" shall include: -

a) Water flowing or situated upon the surface of any land;
b) Water flowing or contained in:-
    i. Any river, stream, watercourse or other natural course for water,
    ii. Any lake, pan, swamp, marsh, or spring, whether or not it has been altered or artificially improved;
c) Ground water;
d) Atmospheric water.

Water Governance: Describes the political, economic, administrative, social processes and institutions by which public authorities, communities and the private sector take decisions on how best to develop and manage water resources.

Water Resources Assessment: It involves a holistic view of the water resources in a given country related to its use by society. It looks at both the quantity and quality of surface and groundwater. It identifies the pertinent parameters of the hydrological cycle, and evaluates the water requirements of different development alternatives. The assessment pinpoints the major water resources issues and potential conflicts, their severity and social implications, as well as risks and hazards. The understanding of the terrestrial and aquatic ecosystems is an essential element of resource assessment.

Water Resources Development: Addresses all the activities for the utilization of water resources like water supply and sanitation, agriculture, hydropower development, navigation, etc.

Water Resources Management: Water resources management comprises the whole set of human interventions in water resources. It consists of all activities for the study, planning, development, protection, conservation and control of water resources. It can also be defined as the decision making, manipulation, and non manipulative processes by which water is protected, allocated or developed.

1.2.2 Who is managing the Water Resources?

Water resources of the nation is managed by a government body (ministry) which has exclusive power and duties by law to monitor, allocate, control, protect and conserve the national water resources. As per the law establishing the ministries and the decentralization policy, the Ministry of Land, Water and Environment is mandated to monitor, allocate, control, protect and conserve the nation's water resources.

However, there are ministries and national institutes whose mandates and responsibilities are more complimentary for sustainable and efficient management of water resources. For example, Ministry of Public Works is mandated to develop policies, regulations standards for infrastructures including water works, while Ministry of Health is responsible for public health, hygiene and sanitation, regulatory service department of the Ministry of Agriculture, Eritrean institute of standards an so on are key support institutions in the management of water resources of the country.

1.2.3 Who are Water Resources Users?

Water users include institutions, companies, municipalities, individuals and others which in one way or another have impacted the water resources i.e. on the amount of water or quality of water or the resources surrounding environment. Agriculture, Urban and semi urban water supply departments and their national coordinating authority or body; rural water service units, tourism, Energy, Mines, industries and agro industries and so on are categorized as the main water users of the nation.

1.2.4 Who is developing the Water Resources?

All government and semi government institutions, companies, water user associations etc. in which their legal activities are to plan, design, construct, operate and maintain water supply schemes, such as dams, diversions, canals, tunnels and so on that are used to store or supply water. All licensed and registered construction companies like Segen, Gedem, Bdho, Roadup, all Defense Companies water well drilling companies, and other private water works construction companies are considered as water resources developers.

1.2.5 Water as Valuable Resources

The recognition of the basic right for human beings to have access to clean water and sanitation at affordable price is derived from the fact that water is life. But water is not considered as a free good and it is a valuable resource that has to be used in the best national interest to promote social welfare. It is a scarce resource and its use for one specific purpose means that other opportunities will be lost and thus there is opportunity cost for water. This implies that first priority should be given to the most desirable use yielding the largest socio-economic benefit. As a scarce resource water has to be optimally utilized on the basis of national strategic priorities.

In general water as an economic good justifies the payment for water use and pricing mechanisms to promote efficient use of resources and avoid wasteful use of water and undesirable environmental impact. It is also important to note that there is a difference between estimating the true value of water resource and what consumers/users are charged. This is because social welfare considerations may imply subsidization of water use.

1.2.6 Why Integrated Water Resources Management (IWRM)?

Integrated water resource management is the practice of making decisions and taking action while considering multiple viewpoints of how water should be managed. The basis for IWRM is that different uses of water are interdependent.

At its simplest IWRM is a logical and intuitively appealing concept. Its fundamental principle and concept is that many different uses of finite water resource are interdependent; that is evident to us all. High irrigation demands and polluted drainage flow from agriculture mean less fresh water for drinking or industrial use; contaminated municipal and industrial wastewater pollutes rivers and threatens ecosystem; if water has to be left in a river to protect fisheries or maintain the ecosystem, less will be diverted to grow crops. There are plenty of examples of the basic theme that verify unregulated use of scarce water resource is wasteful and inherently unsustainable.

An IWRM approach includes more coordinated development and management of:

- Land and water;
- Surface water and groundwater;
- The river basin and its adjacent costal and marine environment
- Up stream and down stream interests; and
- Fragile ecosystems

It is important to note that IWRM is not just about managing physical resources; but it is also about reforming human systems to enable people- men and women as well as animals to benefit from those resources. For policy making and planning, taking an IWRM approach requires that:

- Policies and priorities take implications of water resources into account, including the two-way relationship between policies at the macro level and water development, management and use;
- There is cross- sectoral integration in policy development;
- Stakeholders are given a voice in water planning and management, with particular attention to securing the participation of women and the poor;
- Water related decisions made at local and river basin levels are in-line with, the achievement of broader national objectives; and
- Water planning and strategies are integrated into broader social, economic and environmental goals.

In practice, this means giving water an appropriate place on national agenda; creating greater 'water awareness' among decision-makers responsible for economic policy in water- related sectors; creating more effective channels of communication and encouraging informed and shared decision-making process between government agencies, partner organizations, interest groups and communities.

In general, IWRM approach has the following advantages:

1. Solving water related problems that are proving intractable to single-sector approaches such as: drought, flooding, groundwater over draft, water borne diseases, land and water degradation, ongoing damage to ecosystems, chronic poverty in rural areas and urban areas;
2. Avoiding wrong investments and costly mistakes in terms of unattainable gains, unforeseen consequences, and lost opportunities;
3. Getting the most benefit and best value for money from investments in infrastructure; and
4. Allocating water strategically.

1.2.7 IWRM as a Rolling Process

IWRM is a cyclical process that starts with the planning process and continues into the implementation frameworks of the action plans and monitoring of progress made. At this stage or indeed at any point in time, it can be decided whether new reform needs have emerged or whether the reform process has led to the expected improvements. If the latter is not the case, then the entire process must be repeated. Figure 1 presents the integrated water resources management cycle as presented by *By Torkil Jonch – Clausen 2004. As* shown in the cycle Eritrea is at Preparing Strategy and Action Plan Stage

In the Eritrean context, the strategy document has been finalized and action has also been taken in the drafting of various documents such as new water policy, new water law, proclamation for the establishment of new institute and the drafting of new regulations. All of these are awaiting for adoption and approval by the government. Thus, the IWRM process has reached to the development of action plan.

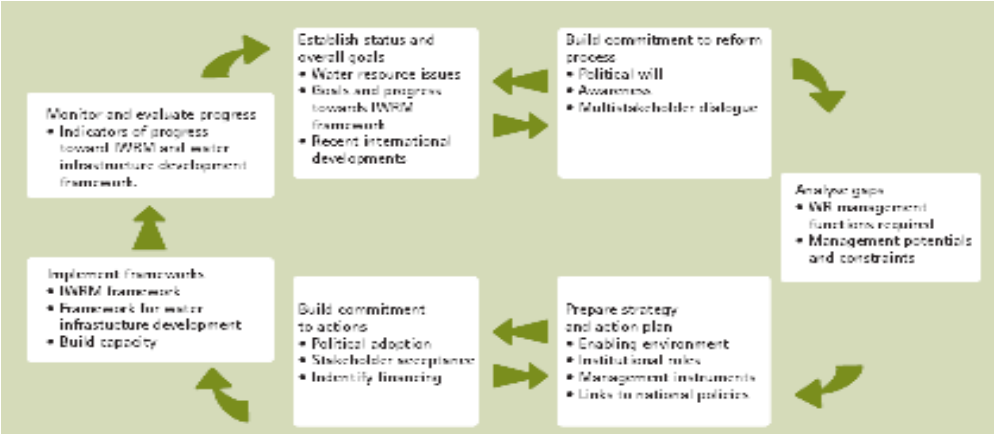


Figure 1. The Integrated Water Resources Management Cycle

1.3 Guiding principle of the Action Plan

The preparation of the Action Plan for Integrated Water Resources Management in Eritrea recognized the guiding principles emerging from discussions at the international conferences and adapted to the objective conditions in the country as presented in the country strategy document on IWRM. These are:

- Water is a prime natural resource, a basic human need and a precious national asset;
- Water is finite and vulnerable, essential to sustain life, development and environment;
- Water development and management should be based on participatory approach, involving users, planners and policymakers;
- Every citizen has a right to clean and safe water and is entitled to a fair share of the national water resources (equitable distribution);
- Women should play a major role in the provision, management and safeguarding of water;
- Water has an economic value in all its competing uses and should be recognized as an economic good;
- water and land use management should be integrated;
- land and water resources should be managed at the lowest appropriate levels;
- the government has an essential role as an enabler in a participatory, demand-driven approach to development; and
- the private sector has an important role in water resources development and management.

Integrated Water Resources Management (IWRM) offers an opportunity to create a paradigm shift in water resources management. The global environmental crisis, growing poverty in urban and rural areas, increase in prevalence of diseases etc. all point to the need for a different governance approach of water use and management.

In line with this approach the action plan for IWRM for Eritrea recognizes the need for cohesion among the different institutions, policy and regulator framework and deliberate measures that take account, equity, efficiency and environmentally sustainable management of water resources.

2.0 ACTION PLAN DEVELOPMENT PROCESS

2.1 Approach and methodology

The basic approach employed in the development of the action plan for Integrated Water Resources Management for Eritrea was participatory, consultative with consensus building and based on the understanding of the key water issues having impact on integrated water resources management. Consultations and dialogue between the key national and regional stakeholders involved in water resources management, development and use and appreciating and using the findings of the previous work accomplished by Water Resources Department especially by identifying the gaps were bases for the development of the action plan.

All efforts were made for a genuine and unfailing involvement of the interested groups and beneficiaries right from the outset of the action plan formulation process. This will ensure the success during the implementation of the action plans by clarifying the role and responsibilities of water sector institutions, addressing the gaps in the legal and institutional frameworks, institutional and human resource capacity and water management instruments.

Identification of ministries, departments, institutions and water supply services, creating dialogue between stakeholder and institutions having conflicting interests was employed as an approach as a means of clarifying issues relevant to integrated water resources management and developing strategy to be followed in the action plan development process.

2.1.1 Methodology

Using the approach stated above the following basic methodologies were applied to develop strategy and action plan that facilitate the planning and implementation of Integrated Water Resources Management.

Literature review and secondary data collection

At the initial stage of the development of strategy and action plan, all relevant documents were identified, collected and reviewed. Special emphasis was given to the draft documents entitled as Country Strategy for IWRM, Situation Analysis Report, Eritrean Water Resources Policy, Eritrean Water Resources Proclamation, Eritrean Customary Law, and Institutional Framework for the Water Sector and Water Sector Human Resources Need.

By reviewing the existing documents and summarizing the findings and drawbacks of these documents, it was possible to clearly analyze and present the gaps and their relevance in the preparation of the action plan.

In addition, all documents relevant to the situation of the resources base, national and sectoral policy documents, strategy papers, action plans, regional development plans and other relevant documents were reviewed and used in the preparation of this action plan. Lesson from other countries such as Kenya, Uganda, Burkina Faso, South Africa and others were also considered in the preparation of IWRM strategy and action plan.

Discussions and consultations with relevant stakeholders in regional administrative centers and at national level

Once gaps are identified from review of documents and focus area for proposed action plans were developed, consensus with ERI-CWP and IWRM core committee members on the detailed work plan, key stakeholders and action areas presented in the inception report was agreed and the development of action plans initiated. These action plans were initial discussion with IWRM core committee members and regional stakeholder to validate the proposed actions and strategies. In the regional validation workshop (six regions) all actions/programs were reviewed and gaps and actions relevant to the region were identified, time frame for each action were estimated, regional prioritization criteria were developed and lead and support institution to implement the actions/programs were identified.

2.1.2 Consideration in preparing the action plan

The process of action plan preparation for IWRM in Eritrea considers the need to produce an action plan which is operationally realistic in the present Eritrean context and that is sustainable in the future.

The functions, structures, procedures and proposed actions are designed to be pragmatic and take into account the resources constraints existing in Eritrea in particular in water resources management, development and use, existing institutional structures and the management capacity available for implementation. The actions will also be flexible as much as possible to meet the immediate needs and leave the possibility open for further improvement whenever deemed necessary and appropriate.

Regarding institutional and capacity building, the action plan considers the proposed institutional reform and corresponding capacity needs as a long term process which require, more discussion, revision and reaching consensus with key stakeholders. Moreover, basic but necessary sequences need to be followed prior to developing any action plan to facilitate its implementation.

However, action plans necessary to improving the existing institutional and human capacity which are supportive for the planning and implementation of IWRM and act as a spring board for any eventual institutional reform are developed.

2.1.3 Steps in the Development of the Action Plan

The development of the action plans followed four basic steps: 1) preparing list of possible actions/programs for the main theme/action area; 2) identification of relevant and high priority actions/programs through a consultative process; 3) Develop criteria for priority ranking based on national and regional consultations; and 4) Using multi-criteria analysis rank action/programs in the order of priority.

Step 1 - Preparing list: Initially list of possible actions/programs for the main theme/action area based on previous works were made to identify gaps and recommended functions to deal with the prioritized water resources management and development issues. The situation analysis has identified gaps, constraints and challenges for IWRM. The strategy document has also summarized and presented strategies, intended immediate goals, outputs with indicative activities in logical framework format. The previous works on institutional and legal frameworks

(structures) have been completed by drafting new water resource policy, proclamations and regulations. During the process of action plan preparation, these documents were reviewed to make sure that the proposed actions have addressed all gaps, challenges and constraints towards achieving IWRM and identified all type of barriers at all level (systemic, institutional and individual). Prior to conducting a regional consultation meetings a total of 95 actions/project portfolios were identified.

Step 2 - Identify high priority Actions: Following the identification of list of actions consultative meetings with key stakeholders were held in regional capitals. Thorough discussions on the proposed actions were held and finally all actions relevant to the region were presented and categorized under each main themes/action areas.

In the consultative meeting each action were classified as short, medium and long term, and appropriate implementing bodies were identified. Detailed action plan that includes objectives, strategies, actions and indicative activities including logical strategic framework were prepared for all actions identified as priority. The logical strategic framework covers all the necessary components of a project profile.

Step 3 - Develop Criteria for Priority Ranking: For obvious reasons not all of the priority actions listed (step 1 and 2) can be implemented either due to financial constraints and/or lack of capacity or absence of institutional framework or other reasons. To further refine criteria for prioritization multiple criteria which reflect national policies and strategies, consider the international process underway, relevance with promoting IWRM have been identified through a consultative process and applied to rank actions in the order of priority and their importance. The criteria used to evaluate the actions are:

1. Degree of raising planning and implementation capacity of institutions involved in water management, development and use
2. Degree of enhancing conducive enabling environment
3. Level of synergy with national policies, national and regional strategies and development plans
4. Synergy with MDGs
5. Cost effectiveness (low investment but high contribution)
6. Likelihood to secure fund

Step 4 - Rank Actions in the order of priority: Using criteria identify the top priority projects/actions and categorize them as medium and long term interventions. Short to medium term projects/actions are those which their needs are immediate, their impact is quick and their planning and implementation could be accomplished within 2009-2011 planning horizon. Long term projects/actions are those their planning period is between 2009 and 2016.

Annex-A present logical strategic framework for the action plan which includes action (outputs), strategies (results), indicators, estimated budget, implementing body and timeframe.

Annex-B presents all actions ranked using these multiple criteria. It has to be noted that this is a simple and very subjective ranking exercise that need to be reviewed any time depending the countries priority issues.

3.0 WATER RESOURCES OF ERITREAN SITUATION

3.1 Policy, Legal and Institutional Framework

3.1.1 National Policies and Strategies

The importance of water resources policy and law is becoming more recognized by policy makers and planners. Despite the gain of high level commitment, Eritrea has only draft water policies, laws and regulations which are still waiting for enactment.

However, there are policies, strategies and action plans relevant to the water sector and require consideration for sustainable and effective management of the nation's water resources. Under this section, the macro policy, the Eritrean water resources policy, the interim-poverty reduction strategy, food security strategy, agricultural policy, National environmental management plan, national action program under UNCCD, national environmental impact assessment procedures and guidelines and coastal policy are reviewed and taken in to consideration during the development of IWRM action plan objectives, strategies, actions and activities.

The review support the action plans for IWRM to be responsive to the development problems of the country which are expressed or addressed in these national and sect oral policies, strategies and plans as well as regional development plans.

3.1.1.1 Macro policy

The Macro-Policy Document adopted in November 1994 outlines the background for Eritrea's national economic growth strategy and pursues the guiding principles of human-centered, efficient, sustainable and equitable development. It also takes account the negative impact of some development activities on the environmental.

As stated in the policy document (chapter 16) proper attention will be accorded to:

- Potential environmental consequences of investment decisions by undertaking appropriate environmental impact assessments before investment decisions are made,
- Land use planning to reduce land degradation and biotic loss,
- The use of water for different purposes including agricultural production,
- Protect environmental hazards,
- Industrial and urban waste disposal system.

Moreover, the Macro-Policy directives promote a balanced approach between resource use and conservation for the attainment of sustainable growth and development.

3.1.1.2 Eritrean Water Resources Policy (2004 & 2007)

Water resources policy was initially drafted in 2004 and redrafted in 2007. The newly drafted policy (2007) emphasizes that the absence of a comprehensive water resources development and management policy has resulted in adverse situations on several aspects of the development and management of the nation's water resources. Unless timely addressed, this situation could have negative impacts on the sustainable development of the resource; and consequent cause unintended

negative impacts on long term social, economic, and agricultural activity in the watershed that rely on it. Due to the absence and enactment of comprehensive water policy, the new draft policy has among others, identified the following problems:

1) Inadequate knowledge on both the surface and groundwater resource
2) Unregulated water use practice
3) Unsustainable and ineffective water resources management
4) Uncoordinated and disintegrated water resources management functions resulting from the absence of proper institutional set-up for the sector as well due to inadequate human and financial capacity in all aspects of the water resources sector
5) Unavailability of standardized information exchange
6) Inadequate awareness on the significance of water for social and economic development
7) Poor knowledge on gender sensitivity to water resources management

The policy recognizes drainage basin as the basic unit of planning for development of water resources and calls for appropriate measures to optimize utilization of this resource for the benefit of the people living in the basin.

The policy has developed policy guidelines on the management, development and use of the nation water resources by categorizing into six thematic areas which are very similar to the key areas of the IWRM action plan. These are:

- Water resources, assessment, development and protection
- Trans boundary water resources
- Water resources allocation and water use
- Disaster management
- Institutional frames and mandates
- Financing mechanism

3.1.1.3 Interim Poverty Reduction Strategy (2004)

The Interim Poverty Reduction Strategy Paper (I-PRSP) provides an overview of the nature of poverty in Eritrea and a statement of the Government's commitment to poverty reduction. It lays out the Government's macroeconomic framework and steps to create the conditions for resuming rapid economic growth, and policies and programs for poverty reduction. It presents an initial articulation of a national strategy that aims at directly impacting on poverty through broad based economic growth and targeted interventions. The strategy and the processes followed in its formulation are country-owned and reflect national priorities and local realities.

Keeping in view the factors responsible for slowing growth and increasing the incidence of poverty in Eritrea, the Government in its I-PRSP has formulated a comprehensive economic revival program aimed at reinvigorating economic growth and in the same vein a multi-pronged poverty reduction strategy aimed at addressing the underlying causes of poverty in Eritrea. Of these economic revival

program and strategy proposed, the following proposed strategies carefully considered in the preparation of IWRM action plan for Eritrea so that water resources management, development and use can be sustainable, efficient and equitable.

1) Increase water availability: the strategy is to harness the seasonal water flows and direct them to where they are needed, through catchments rehabilitation, rainwater harvesting through construction of embankments, canals, lining of watercourses and introducing modern methods that enhance on-farm water use efficiency. Another is to store water to irrigate farm plots in seasons with low rainfall. The objective is to augment water storage capacity by constructing water reservoirs, small dams, diversion canals and wells and new irrigation schemes.
2) Investment in both urban and rural water supply systems by installing new rural water supply and sanitation systems and rehabilitating old ones.
3) Water saving measures such as rehabilitation of watercourses and land leveling and improved water application techniques at the farm level will be undertaken.
4) Reorienting the extension and research system towards addressing priority problems and concerns of subsistence farmers, particular emphasis give to on farm irrigation water use.
5) Supporting building small dams to harness the seasonal water flows and supporting rehabilitation of degraded catchments.
6) Encourage rehabilitation of small scale Irrigation Projects. High priority will be given to the development of smallholder irrigation schemes that have high levels of community participation in planning and cost sharing of the construction (mainly in labor) and full operation and maintenance (O&M) expenses. To encourage efficient utilization of water in agriculture for new water sector projects, water pricing will be put in place.
7) In protecting the vulnerable, the strategy emphasizes the need for improving involvement of women in key economic, political and social life of the nation. Designating focal points in key sectors ministries and public agencies to promote gender mainstream in national and sectoral policies and programs is one important step identified by the I-PRSP.
8) Emphasize the need to put in place the enabling environment and strengthen the institutional capacity to plan, monitor and implement macroeconomic and poverty reduction programs. Among other the devolution of power and enhance popular participation by strengthening capacity of regional governments by increasing decentralization and accountability of administrative operations and peoples participation in their local affairs is one strategy adopted by the I-PRSP.

3.1.1.4 Food Security Strategy

This FSS document was prepared in 2004 and its objectives rests on three pillars: (a) Enhance the domestic food production capacity; (b) Increasing the national capacity to import and adequate quantity of food supply; and (c) Enhancing the effective use of food assistance to fill the supply gap during emergency. Under its

pillar "a" the following key strategies were identified, integrated and considered during the IWRM action plan of Eritrea.

The priority on Rain-fed agriculture

- The need to increase domestic agricultural production on rain-fed agriculture through appropriate intensive and extensive farming; Effective research and extension services, raising farm productivity (unit yields) by introducing and adopting improved farming techniques and promoting the use of modern farming practices and increase water availability.
- The need to improve land use in dry and highly degraded highland areas, the priority will be on implementing measures that would reduce soil erosion, conserve topsoil, restore soil fertility and improve water conservation.
- The need for the development and protection of forestry and wildlife by adopting more effective measures including proper tree and land tenure schemes, development of alternative sources of energy (to minimize the use of fire wood); and providing seedlings and guidance to communities that want to establish woodlands and enhancing the tree survival rates to above 70% of seedlings planted. Furthermore, the strategy includes rangeland areas that require protection by temporary closure to be identified and protected.

The priority on Irrigation

- Support measures to enhance water availability for irrigation;
- Supports the development of smallholder irrigation with priority given, where feasible, to irrigation schemes that have high levels of community participation in planning, cost sharing in the construction (mainly in labor) and full operation and maintenance (O&M) of the schemes.
- Gives special attention to water pricing and water tariffs for irrigation schemes aimed at recovering the O&M costs.

The key elements of the livestock and Rangeland strategy include:

- Introducing and promoting better pasture management, forage development and providing more water points at strategic locations to increase pasturelands and reduce their degradation;
- Improvements in management of rangelands will be achieved by improving soil fertility by undertaking an accelerated and sustainable afforestation program in partnership with communities.

3.1.1.5 Agricultural policy

The preparation of irrigation policy of the country is underway, however the Macro policy paper (1994) which initially articulated the over all national development policy and strategy of the country was stated the overall agricultural policy as follows:

- The creation of modern, technologically advanced and competitive agricultural sector;

- The production of high value agricultural commodities through the development of irrigated agriculture;
- The better utilization of water for irrigated agriculture and new irrigation schemes; and
- The promotion of research and extension

In general all policy and strategy papers related to agriculture are targeting mainly on reducing poverty, enhancing national food security, and adding to export earnings and support industrialization by increasing area under irrigation and water use efficiency, maintaining and restoring the environment and investing in human resources development.

3.1.1.6 National Environmental Management Plan (NEMP-E)

The National Environmental Management Plan for Eritrea was adopted in 1995 and becomes the basis for actions in environmental management and conservation. The management plan tries to introduce management practices that addresses a) in repairing the existing harmful practices; b) sustainable and rational of the national historical heritages.

NEMP-E emphasizes the need for integrated approach involving all relevant sectors, to improve the understanding of scientific and human interactions through integrated research and management and to take into consideration the human factors which stress the value of extensive public awareness programs.

The NEMP-E presets the following guiding principles for environmental and development planning:

1) Recognize that the real aim of development is to improve the quality of human life in a sustainable manner
2) Understand that good management of renewable terrestrial, coastal and marine resources is of strategic importance for social and economic development and is therefore cost effective.
3) Recognize the need to maintain the vitality and diversity of environmental system
4) Develop integrated management strategies that allow for multiple use of natural resources, (integrate complementary activities and segregate conflicting activities)
5) Balance broad scale management with targeted managements.
6) Develop a planning and management process that is sensitive to the question of gender, class and equity.
7) Involve local population in the planning process, recognizing that local people are the actual day-to day manager of the natural resources.
8) Recognize the need to change peoples' attitude and practice if sustainable development is to be achieved.
9) Accept that planning and management should not be fixed, but dynamic.

In 1995 the Management plan has identified preparation of water law, promotion of water conservation measures, comprehensive water resources assessment of groundwater potential, protection of water resources from pollution as priority areas, intensive training and raising of public awareness, development of appropriate pricing policies and promotion of cooperation in environmentally sound exploration of trans-boundary Rivers.

3.1.1.7 National Action Program under UNCCD

Being sensitive to the issues of land degradation, Eritrea has joined global effort to combat desertification by signing and ratifying the 1994 United Nations Convention to Combat Desertification (UNCCD). As outlined in the convention it has prepared National Action Program (NAP) to combat desertification and mitigate the effect of drought. NAP has identified factors contributing to desertification and incorporated long term strategies practical measures to combat desertification and/or to mitigate the effect of drought. Effort is underway to integrate those strategies and measures in to the national policies for sustainable development.

In relation to issues related to water NAP has identified unfavorable climate conditions, low retention capacity of the terrain, unwise irrigation practices and unregulated use of available resources as major factors contributing to desertification. Correspondingly, NAP has forwarded:

1) Developing an effective water resources development and management strategy by expanding the existing hydrological and hydro geological data base through long-term monitoring and assessment of the water resources and to develop the relevant regulations;
2) Promoting water conservation practices: the action programs proposed to conserve water include catchment treatment programs to minimize sedimentation of reservoirs, construct water impoundment structures to increase water supply and induce groundwater recharge and promotion and advocating water harvesting, and conservation methods and strategies with regard the use of available water;
3) Developing a water resources information system. The main physical components of information system emphasized are data collection, transmission, storage, analysis, and transformation into 'use-friendly' information.

In relation to issue related to agriculture (irrigated agriculture), NAP to combat desertification has also identified that climate condition, improper irrigation systems and soil erosion as major factors contributing to desertification. Soil and water conservation measures and development of irrigation schemes are considered as some of the appropriate measures to combat desertification and mitigate its effect.

3.1.1.8 National Environmental Impact Assessment Procedures and Guidelines (NEAPG)

The Ministry of Land Water and Environment, being responsible for the implementation of the national environmental policies and strategies, has developed the National Environmental Impact Assessment Procedures and

Guidelines in 1999. This document lays out the general principles, approaches and instruments to fulfill the obligations required to maintain a safe and healthy environment; and through the application of its procedures determine the potential negative environmental consequences of all development projects. Moreover, the NEAPG is a tool for integrating environmental issues into a planning process.

The NEAPG document contains a set of procedures such as the screening and categorizing projects. Based on their type, size, location, and mode of operation projects are classified into three major categories with different level of Environment Impact Assessment procedure based on their potential impact on the environment and the necessary mitigation measures. This document, by itself, is not a legally binding instrument. It should have been backed by Environmental Proclamation but still the proclamation is in a draft form.

3.1.1.9 Coastal Policy and its Guidance Document

The Draft Coastal Policy was completed and endorsed by all parties in October 2006 and submitted to the State for approval and to be published in the national Gazette. The policy laid down the framework to serve as a foundation for laws, regulations, guides, and institutional structures for sustainable management of the coastal areas; both natural and human made assets. To make the Coastal Policy operational, the government developed an Integrated Coastal Area Management plan that outlines clear sets of guidelines, objectives and indicators.

The coastal policy document and ICAM plan

- Recognizes that water resources of the coastal area are the critical resources for all development and therefore, their development must be preceded by strategic assessment to determine their social, economic and environmental impact. It also emphasize the need for careful consideration of regulating all type of discharges from all areas and development activities in order to maintain the required water quality and for downstream users.

- Recognize integrity and continue service delivered by watersheds and basin in the coastal area are critical to water supplies to coastal communities and urban areas, and therefore, emphasis the need for watershed and basin management.

3.1.2 Institutional framework

Since independence in 1991 the Government of Eritrea has been reforming the water sector for better economic growth of the nation. During the reformation process several policy, strategy and regulation were drafted.

Finally, in 1996 considering their importance in the development progresses of the nation, the Government of Eritrea decided the three complementary departments namely Land, Water and Environment to be administrated in one ministry that is Ministry of Land, Water and Environment. Inline with this decision, the Water Resources Department has been restructured to become the responsible department of the ministry to assess, allocate, manage, monitor and evaluate the water resources of the nation.

The Proclamation for the Establishment of Regional Administrations (PERA) No 86/1996 further elaborates the role and responsibility of central government bodies. This Proclamation is a prime mechanism for the Government's policy of regional decentralization of governance and implementation of various development initiatives. Moreover, several provisions of this Proclamation have strong implications on the management, development and use of water resources and other natural and environmental resources.

As per the Proclamation for the Establishment of Regional Administration of 1996, Article 36, Ministry of Land Water and Environment, which is the Central Government body, is mandated to formulate policy and regulations, research, develop human resources and provide technical support in order to ensure that Eritrea's water resources are protected, developed, used, conserved, managed and controlled in a sustainable, efficient and equitable manner for the benefit of all its people.

The same proclamation Article 37 provide mandate to Regional Administration to follow up the proper implementation of policies, standards, regulations, directives in all type of development works within their respective administrative area. Article 19 mandates the creation of Water Supply Development office within the infrastructure section of the Regional Administration.

The proposed action plan for IWRM in Eritrea is designed to be operational within these institutional framework and decentralization policy.

3.2 Water Resources Potentials

3.2.1 Physical Setting and Climate

Eritrea is located in the Horn of Africa covering an area of 124 320 km^2. It is bounded by Sudan to the west and north-west, Ethiopia to the south, Djibouti to the south-east, and the Red Sea to the east and north-east. The country has about 1200 km coastal line and more than 350 small and medium sized islands with in the Red Sea. The country is, to a large extent, characterized by a semi-arid to arid climate. Annual rainfall over much of the central part of the country is about 500 mm, falling mainly during June to September. Rainfall increases to the southern central highlands, near Adi-Quala to about 700 mm while the northern mountains, western and eastern lowlands annual rainfall declines to less than 100 in the most arid southern coastal part of the country. There is only one small area of significantly higher rainfall which is part of the eastern escarpment where annual totals reach a maximum of about 1050 mm. This area and eastern lowland are also marked by a peak of rainfall in the winter (October to March) in contrast to the June to September peak in the rest of the country.

3.2.2. Surface Water Resources

Eritrean surface water resources have been divided into five major River Basin systems namely, Mereb-Gash; Barka-Anseba, Red Sea Basin, Danakil Basin and Setit. Due to inadequate published rainfall and stream flow data, the runoff of various River Basins has been estimated either from modeling (for ungauged catchments) or simulation (for catchments with short period of data) values.

Therefore, its dependability for major water resources development is questionable. The estimated runoff yield of the River Basins is given in Table 1.

Table 1 Major drainage basins of Eritrea and their estimated runoff yield in Billion Cubic Meters (BCM).

Basin	Area (Km^2)		Average Annual Yield (BCM)
	Eritrea	Total	
Mereb-Gash	17,256	23,176	1.423
Barka-Anseba	41,920	41,920	0.932
Red Sea	44,376	44,376	0.961
Danakil Basin	8,905	10,485	0.422
Setit	7,292	68,255	6.23
Total			**9.967**

Source: **Water Resource Department, Water Balance Framework for analysis and planning, 2007.**

3.2.3. Ground Water Resources

Despite groundwater importance for both irrigation and domestic water supplies, there is no comprehensive study on its occurrence, aerial distribution, development potential, and groundwater dynamic. Separate and very small area covered hydro geological and geophysical investigations are usually conducted mainly for community water supply projects but even these findings are no well documented. Such information is a prerequisite on improving the knowledge level of the resources to understand impact of the economic development on the resources and support IWRM as a tool for sustainable, efficient and equitable use of the resources. Despite this there are different estimates on the amount of groundwater produced internally. AQUASTAT Information system (FAO) has estimated 0.5 billion cubic meters while a recent estimate by WRD is around 1.7 billion cubic meters annually (WRD, Situation analysis, 2007).

On the basis of aquifers properties, it may be concluded that groundwater resources in most of the central highland, eastern and western escarpment are minor to absent. Exception to this is the basaltic volcanic plateau of the central highland south of Asmara up to Adi Quala where the volcanic rock aquifers are supplying low yielding wells for irrigation and domestic purpose.

The most important group of aquifers is the unconsolidated deposits of alluvial, which exists particularly along the bedding of the Barka-Anseba and Gash Rivers. Water quality is generally fair to good. These aquifers offer significant potential for irrigation from shallow groundwater and that is where the majority of groundwater irrigated lands are located

Limited groundwater potential is expected from alluvial aquifers along the main river beds of the Northern Red Sea Coasts. Along the coast mostly salinity is a problem and it increases with depth, distance from river channel and approaching the coast.

Due to karstification (predominantly in fault zones) marble creates solution cavities and high water transmissivity and, in general, is a promising aquifer. Typical examples are the marble around the village of Sawa and the occurrence of calcareous rocks around the village of Gogne, west of Barentu. These marble beds are running south-westward towards Omhager.

The groundwater potential of the dense rock (*Non-calcareous metamorphic or plutonic rocks)* is in general low, except when extensively weathered or in fracture zones. Most promising areas are the large faults zones in the Gash-Barka river basin. Probably higher yields can be encountered in major fracture zones because of (expected) higher transmissivity and indirect recharge, but the use of surface geophysics is essential to locate the zones with highest fracturing.

More detailed description of the potential and constraints of the groundwater resources of the country are presented in the Situation Analysis Report prepared at the initial stage of the IWRM plan development process.

3.2.4 Water Quality

Water quality data for both surface and groundwater sources in Eritrea are based on the data supplied by WRD, which were accumulated over ten-year period (1994-2004). The data indicate that the chemical water quality in the central highland region and the western lowlands is good. With the exception of some isolated fresh water lenses (like Assab), groundwater from wells in the Red Sea Coastal area is generally saline. Geothermal spring sources occur along the eastern escarpment and many of these are moderately saline and reportedly contain high concentrations of fluoride.

In general, the following observations can be made regarding groundwater quality.

1) Limited investigations in the eastern lowlands have indicated the presence of good alluvial aquifers in some areas but with high level of salinity; this is mainly due to deep circulation from the mountains, highly gypsiferous bedrock, seawater intrusion, high evaporation rate and low amount of rainfall.
2) Better groundwater water quality is observed in the western lowlands and central part of the country;
3) Water quality is better in the shallow alluvial aquifers and relatively inferior water quality in the hard rock aquifer;
4) Most of open hand dug wells and water reservoirs serving as community water sources are prone to bacteriological contamination. From 548 water points surveyed for bacteriological contamination an average of 59.7% were found to be contaminated. Poor hygiene practices, low sanitation coverage and poor construction and maintenance of water points are key causes for this level of contamination

3.2.5 Water Resources Management Problems and Challenges

Eritrea, as a county, is facing a number of serious challenges related to water resources management. A number of these challenges are as a result of factors both within and outside the water sector. Climate variability, increasing in demand for water as a result of development and population growth, low level of investment on improving the supply and efficiency of water use, weak regulatory and enforcement mechanism for proper water allocation and use, high level of environmental degradations, low level of knowledge on the resources base are some of the key water management challenges facing the water resources sector.

Climate Variability and Water Scarcity: Considering that Eritrea is a water scarce country; its annual water availability is highly variable both within a year and over the years. Drought is a recurring phenomenon with a considerable impact on water resources. Just for indicative comparison the occurrence of drought years of 1913-1914, early 1940, 1973 and 1984 were compared with the long term average rainfall for Asmara station and it has been proved that the rainfall record on those years were far below the average (Figure 2). Floods lead to disasters particularly in low lying and river bank areas. Occasionally floods have caused devastating impact on the sector and society particularly people and property located along the banks of western major rivers.

Therefore, these issues call for careful disaster preparedness in terms of adapting appropriate response mechanism to hider and mitigate their catastrophic impact on the society.

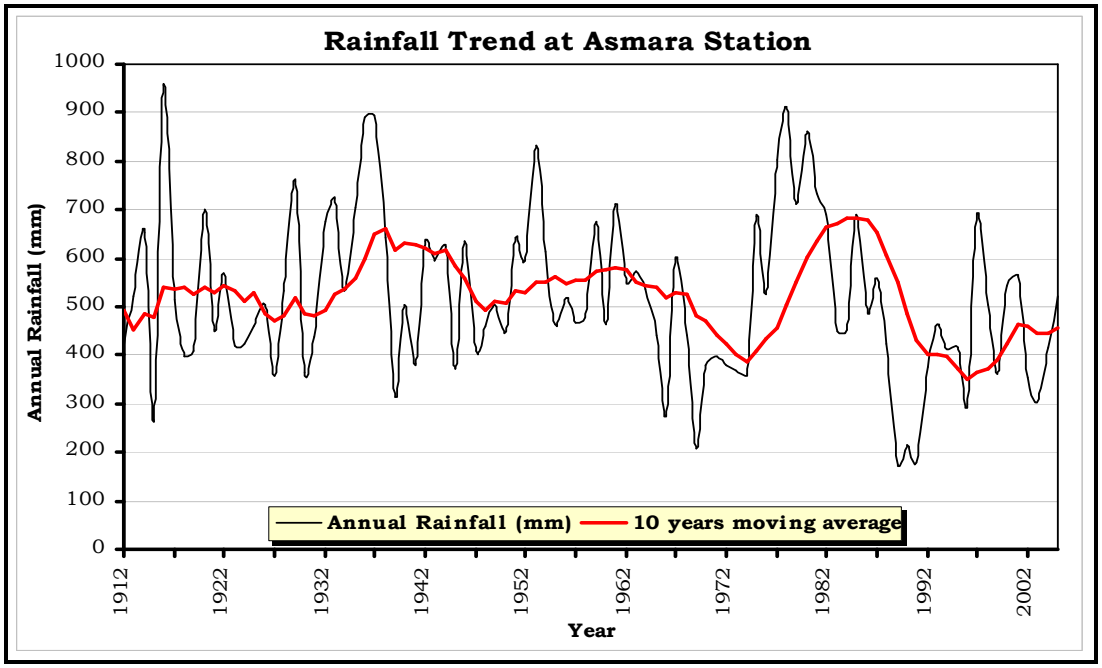


Figure 2: Annual Rainfall trend at Asmara Rainfall Station (1903-2005)

Catchment Degradation: Catchments degradation results in increased runoff, flash flooding, reduced infiltration, erosion and siltation. Catchment degradation is one of the major problems, which is undermining the limited water resources base of the country. The main causes of catchment degradation are unsustainable farming practices, overgrazing and deforestation. For example this is manifested by a sediment yield of 1350 tones/km^2/year in highland of the country. If this situation is not averted, it will consume the capacity of our water harvesting structure before their design periods.

Low investment on Storage and Infrastructure: Even though the investment on storage infrastructures is increasing, it still requires more investment to ensure reliable water supply for future needs of economic development. Water supply is becoming a greater issue in the country mainly because of the declining of water levels, reduced flows to storage dams and low system efficiency in the delivery, supply and distribution systems. Level of investment on research and application of appropriate water harvesting technology like rainwater harvesting, fog harvesting etc. also contribute for the manifested water supply problem.

Water Demand: Due to increasing economic growth of the country, the water demand for domestic, industry, agriculture, livestock, environmental requirement, and others is expected to increase significantly in the future. The present practices on actions related to demand management are almost absent. In order to satisfy this increasing demand, it is very important to incorporate actions that reduce consumers demand for water through mechanisms such as water Conservation initiative and water costing mechanism. Actions like boosting awareness and information exchange on water management and conservation; increase the planning capacity by developing a methodology for water demand forecasting for major sectors on by river basin will also contribute in improving the demand management.

Groundwater depletion: Groundwater depletion is clearly manifested in the shallow and unconfined aquifers of central highland. Similarly, the eastern and western foothills significantly drop in groundwater level from year to year and run dry during drought periods.

Tsilima plain, Alla valley, Hagaz are some of specific areas which suffer due to unregulated withdrawal of ground water. Unregulated expansion of agricultural land, lack of accurate information on groundwater potential, poor water development planning and absence of groundwater monitoring have lead to the depletion of groundwater in such areas which are agriculturally important to the nation.

Pollution: Most municipal sewerage plants and industries in the country discharge partially treated or untreated wastewater containing high levels of organic, metals and other toxic substance directly into surface watercourses (Example: Mai Bella). Open sewages prevailing in the country are currently contaminating groundwater resources. It is therefore, critically important to incorporate the planning and management of pollution control system by identifying, controlling and regulating point and non-point sources of pollution to safeguard the quality of the nation' s water resources.

In Proper Water Allocation: In Eritrean context, water is allocated to users with out proper procedures and regulatory instruments. Mostly, decision on water allocation particularly sitting of the water resources development sites and procedures have been made by non water management bodies mainly because of the absence of the necessary legal and regulatory frameworks that assign the responsibility and other procedures to the appropriate water resources management body. In addition inadequate decisions related to surface and ground water abstractions were made without adequate data and information and this lead to the depletion of pocket groundwater in the country in particular the highlands. Therefore, this calls for a need to introduce an appropriate legal and regulatory framework, improving the knowledge level of the resources, the existing and projected demand and strengthen the capacity of water management institutions.

Inadequate Resources Assessment: Eritrea being a water scarce country, it is vital to ensure that the water resources of a country are continuously monitored, assessed and evaluated. It is necessary to understand the climate variability and its impact on supply and demand of the water resources. Existing records are incomplete both in time and space, institutions are week in capacity to undertake assessment and information management system is in inefficient and/or absence.

Inadequate Enabling Environment: One of the key factors which contributed to inadequate water resources management are absence of enacted water resources policy, insufficient legislative and legal framework, inefficient institutional framework, weak financing mechanisms, and inadequate professional and technical capacity to undertake role and duties of the sector institutions. The existing water resources management practices have dominated and have lead to the fragmented and uncoordinated development, management and use of the resources. There are draft Water Policy and Water Law papers which are not yet enacted. These proposed policy and legal frameworks are expected to offer solutions to most of the water management problems stated. Therefore, the proposed water proclamation, water policy, regulations and improved institutional arrangement are recommended to be implemented so as to provide the required enabling environment.

Poor Monitoring and Evaluation Process: At present, water projects are not properly monitored and evaluated; and as a result many of the projects are proved to be inefficient and ineffective in light of the intended purposes. There are many rural water supply systems, dams, ponds and other harvesting structures that have been constructed in the country whose current situations are not yet evaluated and monitored.

4.0 VISION AND MISSION

Eritrean Water Vision: To efficiently and effectively use the water endowment and equitably shared among users, water resources are developed and managed in a coordinated and integrated manner, multi stake-holders' platform is established, alliance with other sectors secured and vital ecosystem sustained.

Mission: The mission of Water Resources Department of the Ministry of Land Water and Environment for the water sector is "to establish a beneficial legal and regulatory framework and effective mechanism for managing, developing, using protecting, controlling and conserving water in an environmentally and economically sound manner in order to meet the needs of all the people of Eritrea." This mission statement will provide a guiding light towards establishing national strategies for both short and long-term efforts by all agencies, people and stakeholders towards the common goals of national socio-economic development and environmental conservation.

5.0 OBJECTIVES OF THE ACTION PLAN

The overall objective of the Action plan for the Integrated Water Resources Management is to contribute to the implementation of integrated water resources management in the country, fully linked and coherent with the government's policies, laws and strategies to enable equity, efficiency and environmentally sustainable management of the water resources.

Specific objectives of the action plan are:

- To enhance the creation of an appropriate enabling environment for water resources management, development and use.
- To facilitate the creation of institutional frameworks for water resources management, development and use at national, regional, sub regional and community levels;
- To improve the knowledge base on which rational water resources decisions will be made;
- To improve the water resources assessment capabilities of the water sector through the introduction of appropriate analytical tools and upgrading the institutional and human resources capacity.
- Facilitate the implementation of the future framework of water resources management of the country; and
- To prioritize and classify action plans in terms of short, medium and long term.

6.0 GOALS, OBJECTIVES, STRATEGIES AND ACTIONS

The process of action plan preparation for IWRM in Eritrea will take into consideration the need to produce an action plan which is operationally realistic in the present Eritrean context and ensure its sustainability in the future. The functions, structures, procedures and proposed actions will be pragmatic and shall take into account the resources constraints existing in Eritrea in particular in water resources management, development and use, existing institutional structures and the management capacity available for implementation. The actions will also, as much as possible, be flexible to meet the immediate needs while leaving the possibility open for further improvement whenever deemed necessary and appropriate.

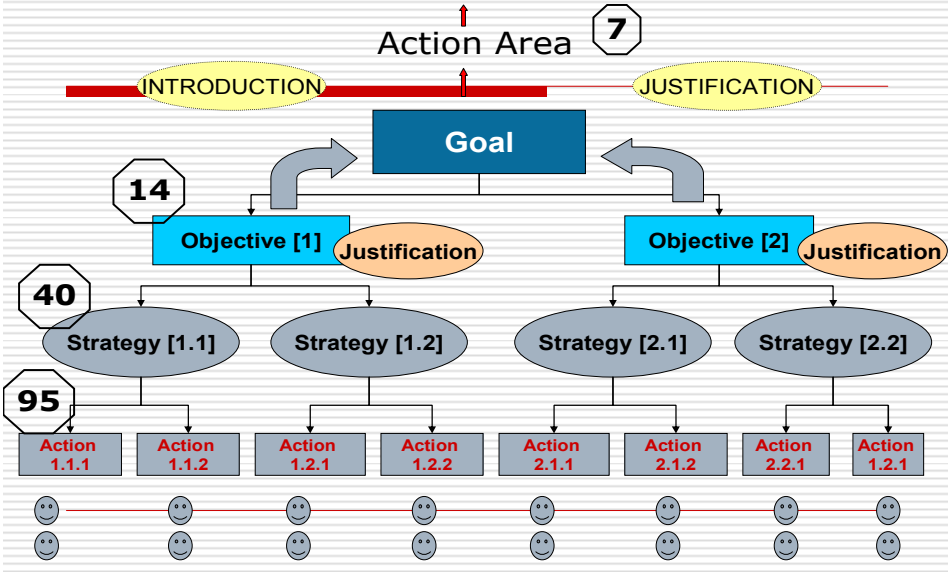
Each area of action permits so to define a set of specific actions helping to solve a given problem of the transition towards IWRM and permitting to get coherent and additional outcomes.

Based on the previous stages of the IWRM process, that is the situation analysis and strategy document, seven broad action areas have been identified for reformation of water resources management framework of Eritrea in the future. These are:

- Water resources assessment, development and protection;
- Water resources allocation and water use;
- Disaster management;
- Enabling environment;
- Implementation and financing mechanism;
- Research and information exchange; and
- Basin Management Plan.

The action plan sets out a serious of objectives, strategies and accompanying actions for key areas of action that enable equity, efficiency and environmentally sustainable management of water resources by the implementation of IWRM in Eritrea. Goals for each key area of actions have been set in order to streamline and focus on the action plan development process. For all actions/programs an indicative activities that is believed to provide more information on the type and extent of programs interventions are included. Figure 3 presents a schematic diagram on the flow of the action plan development process and its components.

Figure 3 - Schematic Presentation of the Action Plan Development Process



6.1 Action Area 1: Water Resource Assessment, Development and Protection

6.1.1 Water Resources Assessment and Development

6.1.1.1 Background and Justification

Both the Eritrean knowledge base on water resource potential and the coverage of water resources assessment are limited and inadequate often characterized by irregular data collection. The effort was uncoordinated with inadequate institutional arrangement that has led to inefficiency and data gaps. There is also low level of assessment facilities to conduct the needed assessment activities.

The knowledge base of the water resources of the nation need to be developed in several stages including basic data collection, their validation and stocking, their processing and analyzing, and the diffusion of information obtained on water situation. Therefore, it is mandatory to provide a set of actions to reinforce the existing situation of the knowledge base of the water resources of the nation.

Goal: Surface and groundwater resources are well defined and assessed to ensure availability of sufficient quantity and good quality water for all uses.

6.1.1.2 Objectives, Strategies and Actions

Objective-1: To improve the knowledge base on the nation's water resources and their potential for sustainable water resources management, development and protection.

Justification: Currently only 7 first class weather stations, 21 river gauging stations and 244 rain gauges are reported to be established in the country. Insufficient budget allocation for data collection, maintenance, calibration of

stations and expansion of stations have caused more than 90 % of meteorological and hydrological stations to be out of order, created data gaps and poor coverage in monitoring stations.

There is a Water Resources Information Unit within WRD - responsible section for water resources information database management system. However the inadequacy of existing spatial and non-spatial information systems, inadequate trained human resources and low level of institutional capacity were found to be the major constraints for data exchange. The absence of commonly agreed standards aiming at defining contents, formats, and qualities of information affected the usability of the information both at national as well as regional levels. In addition, the confidence level of professionals to share information and data is very low.

***Strategy 1.1**: Strengthen the national capacity to collect, store, process, and disseminate hydro meteorological data (quantity and quality).*

Action 1.1.1: Improve the coverage and status of stream gauging stations for each major drainage basin of the country.

- Assess the status of existing river gauging stations;
- Rehabilitate the existing malfunctioning river gauging stations;
- Upgrade the existing river gauging stations to the recommended standard station level;
- Design a hydrometric network of river gauging stations (Identify gagging station sites for both short term and long term planning);
- Establish new river gauging stations in line to the designed hydrometric network and according to the priorities.
- Assess and collect, compile and disseminate the available historical hydrological data from different institutions in and outside of the country.

Action 1.1.2: Improve the coverage and status of meteorological stations of the country.

- Assess the status of the existing meteorological stations (in terms of standard and reliability of data retrieved form the stations);
- Rehabilitate the existing malfunctioning meteorological stations;
- Upgrade the existing meteorological stations to the recommended standard station level;
- Design a network of meteorological stations for short term and long term planning and designing of water resources;
- Establish new meteorological stations based on the designed network and priorities of meteorological stations; and
- Assess and collect, compile and disseminate the available historical meteorological data from different institutions in and outside of the country.

Action 1.1.3: Develop standard and specification for acquiring and installation of hydrological and meteorological stations.

- Specify the type of hydrological and meteorological stations and type and level of data required for characterization of each river basin; and
- Prepare standard designs and specifications for installation of hydrological and meteorological stations.

Action 1.1.4: Provide equipments, facilities and training to strengthen the WRD and other institutions involved in collecting, storing, processing and disseminating of hydro meteorological data.

- Identify all institutions involved in collecting, storing, processing and disseminating of hydro meteorological data.
- Assess capacity (institutional and human) in data collecting, storing, processing and disseminating of WRD and other institutions
- Strengthen WRD and other institutions by filling the identified gaps

Action 1.1.5: Raise awareness of policy and decision makers focusing on the importance of reliable and representative hydrometeorology data on the national development (support the reform process, allocation of fund and human resources).

- Organize workshops and sponsor scientific papers which clearly show the country's situation on hydro-met data and information and its impact on the water resources development. Presenting similar developing countries situation might be relevant to sensitize policy and decision makers including professionals.
- Produce a regular annual/seasonal publication of key water resources information for public awareness

Strategy 1.2: *Conduct groundwater inventory to improve our knowledge level on the main aquifers, groundwater resources and development problems*

Action 1.2.1 Collect and compile all existing dug or drilled well information from drilling and contracting companies

- Conduct awareness workshop to facilitate the overall groundwater inventory work (Can be to sensitize government officials, drilling companies, development partners and even used to mobilize resources)
- Develop a standard groundwater inventory format
- Collect and store data
- Devise a system for information sharing

Action 1.2.2 Undertake groundwater inventory

- Develop groundwater inventory methodology
- Complete logistical and human resources arrangement
- Conduct the office and field work of groundwater inventory
- Undertake data analysis and verifications

Strategy 1.3: *Design and establish national groundwater monitoring network aimed at improving the knowledge level of the country's GWR both in terms of quality and quantity*

Action 1.3.1 Design groundwater monitoring network based on field studies of geophysical, geological, hydro geological and groundwater quality variations and estimate cost by phase with reasonable timeframe. (*Groundwater inventory result can be an input*)

- Assign professionals to undertake the design of the groundwater monitoring network
- Follow up the network deign process
- Review the proposed groundwater monitoring network, its implementation procedure, budget, financing mechanism, equipment and training requirement, etc.
- Present to key stakeholder for validation and further development

Action 1.3.2: Implement establishment of the network phase by phase.

- Identify material, equipment and logistical requirement for implementation of the network establishment
- Follow up the network establishment as per the network design
- Provide on the job training to relevant staff

Strategy 1.4*: Establish an efficient information system and flow of data among and between key institutions.*

Action 1.4.1: Identify relevant institutions whose contribution/support is critical to establish a data and information link mechanism and put in place coordination mechanism to facilitated access and linkage to database.

- Identify institutions and effective information delivery mechanism;
- Identify the data level for sharing (important for planning);
- Establish data link between and among institutions
- Determine and agree data sharing formats; frequency and level (could be monthly, quarterly or yearly reports etc.)

Action 1.4.2: Establish/Strengthen Eritrean Water Information Center (EWRIC) within Department of Water Resources.

- Assess the existing capacity, mandate and responsibility of Water Resources Information Unit of WRD and propose actions needed to strengthen or up-scale to EWRIC
- Implement and follow up the proposed actions.
- Organize a regular annual/seasonal publication of key water resources data and information for public consumption.

Action 1.4.3: Develop manuals, guidelines, formats on the collection, recording and storing of hydro meteorological and groundwater data.

- Develop manuals, guidelines, formats on the collection, recording and storing of meteorological data;
- Develop manuals, guidelines, formats on the collection, recording and storing of hydrological data;
- Develop manuals, guidelines, formats on the collection, recording and storing of groundwater related data and information;
- Conduct seminars, workshops, meetings etc. to train on the use and application of those manuals, guidelines and formats.

Objective-2: To strengthen the national capacity to conduct water resources assessment and monitoring for sustainable water resources management, development and protection.

Justification: The situation analysis document identifies that there is deficiencies in capacity at national and regional levels to conduct essential water resources assessment and monitoring. As a result these constraints prevent the nation from conducting proper planning, development and sustainable management of the nation's water resources. Moreover, there is no systematic and coordinated approach to addressing theses deficiencies. There is also inadequate baseline data that is readily available for planning and development.

***Strategy 2.1**: Strengthen the national capacity with special emphasis the Water Resources Department to conduct water resources assessment and monitoring on a river basin basis.*

Action 2.1.1: Facilitate training in hydrological and hydro geological assessment tools.

- Conduct assessment needs (identify gaps)
- Determine the type of training required (field of specialization)
- Set priorities of the type of training

Action 2.1.2: Establish a procedure that facilitate water resources assessment

- Assess and evaluate the current practiced water resources assessment procedures.
- Identify gaps of the assessment procedures.
- Develop reviewed procedures

Action 2.1.3: Develop and enforce guidelines and standards for conducting water resources assessment and development.

- Prepare design guidelines for hydraulic structures (dams, flood protections, diversions, hydropower facilities, levies canals etc.)
- Prepared design guidelines for pumping stations
- Develop geological, hydrological, geotechnical, structural etc standards for investigation, assessment, design and implementation of all type of hydraulic structures.
- Develop procedures for approval.

Action 2.1.4: Enhance education and career development opportunities in the water sector

- Provide scholarships for advanced training courses, including regional or national training workshops; and
- Support (fund) participation in appropriate research and implementation of projects.

Action 2.1.5: Mainstream IWRM into the national education systems (including higher level)

- Conduct study to review school curriculum and their coverage of water related topics
- Conduct workshops to justify and undertake curriculum revisions that are relevant to national development
- Support educational institutions in curriculum development to introduce water related issues and topics
- Integrate water resource management subjects in school curricula at appropriate levels.

Strategy 2.2: *Improve the knowledge base on the existing and projected water use by sectors in terms of quantity and quality.*

Action 2.2.1: Establish a system of data collection and information exchange on the existing water uses and present and projected demand of relevant sectors.

- Determine the type and level of data and information required by all water users of relevant sectors for IWRM, i.e. to determine sector's present and future demand, efficiency in water use, efficiency and effectiveness in water delivery system etc.
- Develop procedures and guidelines for data collection, storage, processing and dissemination and information exchange on the existing water uses, demand, efficiency etc of relevant sectors.
- Support the establishment of inter-linked data base with institutions that have relevant data for water resources assessment.

6.1.2 Water Quality and Pollution Control

6.1.2.1 Background and Justification

Water is one of Eritrea's most important natural resources. It has a critical role to play in the development of the national economy; and therefore, top priority is given to the careful management of this resource. Cases of pollution of both ground and surface water resources with industrial and municipal wastes are common occurrences rather than exception. Contamination of groundwater by saltwater intrusion in the costal areas has also been reported as a problem. This trend is likely to become worse unless actions are taken both to tackle the existing pollution incidences and to prevent the development of new sources of pollution.

A water quality survey is needed to develop effective water pollution control regulations, to assess the extent of the problem and to provide baseline data for the establishment of a national water quality monitoring network.

Box 1 - The following are some facts on water quality and pollution.

1. *Coastal water sources are highly mineralized (dominantly saline) and reported to range from 2000 – 20,000 μs/cm. Salt intrusion is identified as one source of water pollution in the area.*
2. *Biological contamination: WRD 2002 survey indicated that on the average out of 548 water points surveyed for bacteriological contamination an average of 59.7% were found to be contaminated mainly due to poor hygiene practices and low sanitation coverage. Zoba Debub, which is highly populated part of the country, has the highest level of contamination*
3. *Sewage and waste water: Sewage infiltrating to a leaking pipeline network system, or disposed into streams and dams is a potential cause of epidemics of water borne diseases.*
4. *Application of sewage sludge and solid waste materials from landfill sites as agricultural fertilizer is becoming more common in irrigated vegetable farming of peri-urban areas mainly in the vicinity of Asmara. This is expected to be a main source for transfer of toxic elements like heavy metals into the food chain.*
5. *Industrial wastes mainly from the capital Asmara disposes their effluent directly to natural drainage (Maibella) and become a serious threat to water supply sources located along bank this stream.*
6. *All urban centers in Eritrea have practically no well-designed solid waste disposal sites due to rapid urbanization and inadequate awareness of pollution problems at the time of their establishment. These municipal waste disposals are cause for air and groundwater pollution due to leaching during waste decomposition. Properly constructed landfill sites are needed to dispose of refuse from residential, commercial and industrial sources.*
7. *Further uncontrolled exploitation of groundwater; poor irrigation water management practices, poor sanitation practice and animal waste disposal and industrial and sewage contaminations are mentioned as key regulatory and management failures that potentially expose the environment for further risk.*

6.1.2.2 Objectives, Strategies and Actions

Objective 3: Ensure the availability of good water quality for sustainable national economic development by effectively controlling pollution.

Strategy 3.1: *Develop and enforce regulatory instruments focusing on maintaining water quality standards and control pollution*

Action 3.1.1 Develop standards, guidelines and procedures on wastewater quality, solid wastes and discharge regulation

- Develop wastewater quality standards
- Develop wastewater discharge regulation
- Develop solid-waste regulations
- Introduce “polluter pays” principle

- Finalize and facilitate the approval of the draft wastewater discharge permit.
- Develop standards and guidelines on the application and use of agricultural, industrial chemicals and other uses (like fertilizers, pesticides etc.)

Action 3.1.2 Prepare Guidelines for design of wastewater treatment, disposal and reuse facilities.

- Conduct a comprehensive study on the existing wastewater treatment, disposal and reuse facilities and experience in the country;
- Evaluate wastewater treatment, disposal and reuse practices and design guidelines of other countries of similar economic development status.
- Prepare design guideline

Action 3.1.3 Develop water quality standards for rural, municipal and irrigation water supplies

- Prepare national drinking water quality standard
- Prepare irrigation water quality standards
- Support the development of water quality standards for other water uses.
- Incorporate water quality issues on standards and specification for water works construction material and practice

Strategy 3.2: *Strengthen the capacity to enforce regulations and make appropriate assessment of water quality and pollution sources and control.*

Action 3.2.1 Provide equipment and facilities that enhance the water quality monitoring and regulating capacity of relevant institutions

- Identify institutions involved in water quality monitoring and regulating for different purpose in the country
- Assess their institutional capacity (availability of equipment, transport, etc) to carry out monitoring and establish regulatory instruments (laws, rules and standards)
- Supply equipments and facilities

Action 3.2.2 Provide education and training to water sector's staff on water quality monitoring, data analysis, pollution control mechanism and on the development and application of different water quality regulatory instruments.

- Identify institutions involved in water quality monitoring and regulating for different purpose in the country
- Identify the training needs of each institute
- Provide training

Action 3.2.3 Inventory of water quality and pollution sources

- Review surface and groundwater quality data
- Commission (undertake) detailed assessment of water quality and pollution sources.
- Identify mitigation measures both physical or management to improve the existing water quality of important water sources (surface or ground).
- Provide technical support to major cities and towns in improving the existing sanitary land fill sites or to have new but proper one.

Action 3.2.4 Develop coastal aquifers development and management plan

- Study the coastal groundwater occurrence and present use
- Study the potential for the development and projected need
- Propose alternative development and management plan
- Establish monitoring and evaluation mechanism.

Strategy 3.3: *Improve public awareness aimed at increasing and achieving behavioral changes in pollution control and wastewater management.*

Action 3.3.1 Increase public knowledge, attitude and practice (KAP) through a range of social mobilization and sensitization measures

- Carry out an assessment study to determine stakeholders' knowledge, attitude and practice regarding pollution sources, impacts and management;
- Develop and strengthen methods and procedures aimed at enhancing public awareness about wastes and their management.
- Develop educational module and materials to facilitate formal and informal public education and information dissemination on water pollution, waste disposal and management

6.1.3 Trans-Boundary Water Issues

6.1.3.1 Background and Justification

Rivers do not respect political boundaries i.e. many cross national boundaries (trans-boundary Rivers) and some provide the boundary between countries (contiguous rivers). Eritrea shares four major river basins with neighboring countries:

- Gash-Mereb river basin is shared with Sudan (trans-boundary) and Ethiopia (contiguous);
- Barka-Anseba river basin is shared with Sudan (trans-boundary)
- Setit (Tekezze) river basin is shared with Sudan (trans-boundary) and Ethiopia (contiguous); and
- Danakil Depression river basin shared with Ethiopia (trans-boundary).

Eritrea has limited knowledge on international conventions and agreements and experiences in managing trans-boundary basin and an IWRM approach requires

that human resources and institutional capacity in trans-boundary water resources to support development, management and protection of the shared countries. It is also important to have a capacity and then confidence to build and accept common data sets and knowledge about water resources issues and shared vision about the future of the resources. Therefore, the action plan will address these issues by identifying actions/programs that enhance the human resources and institutional capacity to undertake tasks related to trans-boundary water issues.

Action plans that will support the creation of responsible body for trans-boundary water issues that provide a framework for managing water resources across international boundaries and deal with issues of management of common resources will be developed.

Action plans that strengthen an active involvement of the country in trans-boundary water issues are also relevant, timely and urgent. This can be achieved through actions that strengthen the regional networking, improve knowledge on international conventions, treaties and improving collaborative WRM by incorporating interests of trans-national stakeholders.

6.1.3.2 Objectives, Strategies and Actions

Objective 4: *To raise the involvement of the county in dialogues, data sharing, management and development of trans-boundary water resources.*

Strategy 4.1: *Enhance the institutional and human resources capacity of Water Resources Department and other key stakeholders to undertake tasks and strengthen the active involvement of the country in trans-boundary water issues*

Action 4.1.1: Establish a new unit/administration within water resources department with mandates of trans-boundary water issues

- Review the existing organization structure of the WRD and include Trans-boundary water resources unit with clear mandate, responsibility, required personnel and qualification.
- Facilitate the approval of the restructuring through consultation.

Action 4.1.2: Develop human and institutional capacity of WRD, focusing on the newly established trans-boundary water Unit/ administration.

- Allocate trained staff and facilities focusing on international trans-boundary water issues.
- Support to provide training and conduct awareness workshops focused on international conventions, treaties and agreements concerning trans-boundary water issues.
- Establish link with regional networks and support participation of regional conferences, meetings etc.
- Conduct study on benefit of being member to key trans-boundary organization.

Action 4.1.3 Conduct comprehensive study on regional, bilateral and international agreements, treaties, conventions, negotiations on trans-boundary water issues and recommend the appropriate path for Eritrea in order to secure equitable share (demand management).

- Develop specific task for the action
- Assign experts to undertake the study
- Present findings on national workshop
- Submit the study for higher authority for endorsement

6.1.4 Catchment Protection

6.1.4.1 Background and Justification

Eritrea has serious water and wind erosion, manifested in the widespread degradation of the agricultural and other landscapes. Land degradation is mostly manifested in the central and northern highlands, with a degraded area covering 2,420,380 hectares. This constitutes 19 percent of the total area of the country (NEMP-E, 1995). Research indicates soil loss in the central highland reaches between 2 and 25 tones per hectare annually. On the other hand, average sediment yield from seven monitored major basins/catchments is 7.8 tones/ha/year. Crop yield per unit area of land has declined drastically, and the vegetation cover is decreasing at an alarming rate. Groundwater level is dropping, springs are drying and water is becoming increasingly scarce. Forest cover is dropping from 30% only a century ago to less than one percent. In most areas, peasants lack wood for fuel and construction purposes. Many parts of the country have lost the top soil along with grass seeds, and grass has ceased to grow even after sufficient rainfall. As a consequence, livestock and wildlife population are on the decline, and productive landscapes and natural flora and fauna are threatened.

Given the magnitude of the problem associated to land degradation and to seek appropriate solution in an acceptable manner is to work at catchment level through putting the community at the center.

The country strategy for IWRM identified that there is inadequate catchment management plan and water conservation infrastructure with limited soil and water conservation programs as well as practices. Further, the existing water conservation infrastructures are not efficiently utilized and their effectiveness and economical viability is not properly evaluated. Moreover, water protection guidelines, standards and controlling and coordination mechanisms are not adequate.

Therefore, the action plan need to identify priority catchment areas and develop catchment master plan, introduce appropriate incentive and regulatory mechanism to harmonize polices on land, water and forest, strengthen catchment protection measures, and introduce appropriate technology focused on the assessment and management of catchments with particular emphasis on soil and water conservation and raising awareness and building capacity of CBOs and grass root communities.

6.1.4.2 Objectives, Strategies and Actions

Objective 5: Enhance and upgrade catchment protection and management practices to improve the ecosystem.

Strategy 5.1: *Formulate harmonized policies on land, water and forest for management of catchment area.*

Action 5.1.1: Review the existing land use policy and land law and harmonize it with sound catchment protection and management principles;

- Develop the ToR
- Assign professionals to undertake the review and harmonization
- Supervise and follow up the assignment
- Present in regional and national workshop for validation and approval
- Submit for higher authority for approval
- Facilitate the dissemination to relevant institutes
- Monitor the implementation and document lesson learned

Action 5.1.2: Review the existing water policy and harmonize with sound catchment protection and management principles;

- Develop the ToR
- Assign professionals to undertake the review and harmonization
- Supervise and follow up the assignment
- Present in regional and national workshop for validation and approval
- Submit for higher authority for approval
- Facilitate the dissemination to relevant institutes
- Monitor the implementation and document lesson learned

Action 5.1.3 Review the existing forest and wildlife proclamation and relevant regulations and guidelines and harmonize with sound catchment protection and management principles.

- Develop the ToR
- Assign professionals to undertake the review and harmonization
- Supervise and follow up the assignment
- Present in regional and national workshop for validation and approval
- Submit for higher authority for approval
- Facilitate the dissemination to relevant institutes
- Monitor the implementation and document lesson learned

Strategy 5.2: *Develop assessment, planning, management, enforcement and regulating capacities of public institutions and CBOs responsible in protection and management of catchments.*

Action 5.2.1 Undertake stakeholder analysis and capacity assessment pertinent to protection and management of catchments (at national and regional level)

- Develop Terms of Reference or specific task for the action
- Assign professionals to undertake the assignment.
- Conduct national and regional consultation and validation workshops to validate the findings and recommendation addressing capacity constrains at systemic, intuitional and individual level.

Action 5.2.2 Develop laws and regulation for catchment protection and management

- Assess the existing regulatory framework related to catchment protection and management
- Review existing by laws at all levels
- Develop laws and regulations applicable for catchment protections and management

Action 5.2.3 Develop strategy and action plan (short, medium and long) for capacity building targeted catchment protection and management.

- Develop Terms of Reference or specific task
- Assign professionals to undertake the assignment
- Conduct national and regional consultative workshops to validate the strategy and action plan

Action 5.2.4 Implement programs that will respond to the capacity needs of all public institutions and other relevant stakeholders

- Prioritize the action plans
- Develop proposals for priority capacity actions/program
- Mobilize resources and implement capacity building projects

Strategy 5.3: *Introduce adaptive watershed/catchment management plan and develop implementation mechanisms*

Action 5.3.1 Prepare watershed management plan for priority catchments

- Undertake regional stakeholder consultation to identify major and priority catchments in the regions
- Conduct situation analysis including establishing environmental degradation status
- Prepare watershed management plan for priority catchments

Action 5.3.2 Implement catchment programs and projects particularly on catchment to conserve, restore, enhance and maintain healthy environment.

- Support biological diversity maintenance and improvement
- Support groundwater management and protection programs/projects
- Support water quality enhancement programs
- Support planning and implementation of soil and water conservation programs
- Introduce financial incentives, cost-share and rental payments to beneficiaries who voluntarily reinstate conservation practices.
- Support planning and management of fire management

Strategy 5.4: *Develop appropriate awareness raising techniques and implement awareness programs focused on catchment protection and managements*

Action 5.4.1 Identify relevant catchment protection and management topics or issues, devise appropriate methods of information dissemination and conduct awareness programs.

- Identify and categorize targeted stakeholders for awareness programs
- Identify the most important knowledge gaps in public servants, CBO's and communities on catchment protection and management
- Identify appropriate methods of information dissemination (based on target stakeholders)
- Establish baseline on awareness level of community and society on catchments degradation and protection issue.
- Conduct awareness program
- Undertake monitoring and evaluation activities related to awareness level

Action 5.4.2 Support the implementation of watershed education and public outreach

- Establish or designate a body that work to raise the profile of watershed education and organize experts who plan and advise institutions and government body in watershed education
- Develop watershed education activities
- Establish education networks
- Mobilize resources and provide support during program implementation

6.2 Action Area 2: Water Resources Allocation and Use

6.2.1 Background and Justification

The County strategy for IWRM has identified water use for various purposes that mainly include: for domestic use, sanitation and hygiene, agriculture, industrial use, environment, mining, tourism, and fishery sectors which the action plan gave due consideration.

Under this action area, the action plan has included programs that enhance the capacity of water demand assessment for various water uses over a certain period of time; which, among other things include, setting up appropriate regulation and enforcement mechanisms; up grading the capacity and awareness of water institutions and community for their implementation, compliance monitoring and enforcement, promoting and introducing efficient water use technology, water sanitary and hygiene practices, reusing and recycling practices. The action plan is also designed to incorporate price and other market-based measures that provide incentives to consumers and all water users to utilize water carefully, efficiently and safely and promote sanitation and the use of hygiene facilities.

Water supply, sanitation and hygiene promotion and education must be considered as an integral unit if real progress is to be made in improving the health and well being of the society.

In Eritrea only about 4% of the rural population have access to sanitation facilities (DHS, 2002). Health problems are associated with poor hygiene and sanitation. About 80% of the preventable diseases reported by health facilities in the country are related to poor environmental sanitation and hygiene. Considering these Significant investments are being made countrywide in the provision of safe water for all. The social, health and environmental costs of ignoring the need to address sanitation and hygiene are far greater than the costs of incorporating sanitation and hygiene education into water supply programs.

Effective regulation of water abstraction (surface and groundwater) requires information on the available water resources and the present abstraction. Therefore, action plan related to improving the knowledge base on the existing use in terms of quantity and quality will be priority.

Box 2 - The following are some facts on the water resources allocation and use of the country:

1. *No effective legal framework or regulatory mechanism on the allocation of water resources (surface water abstraction and granting of borehole permits) for all types of uses.*
2. *No comprehensive study on the capacity or availability of surface water stored for all purposes. This is priority in water resources allocation and use. There are more than five municipality dams supplying Asmara, medium to large dams under construction (like Gerset, Fanko), significant number of river diversion used for spate and supplementary irrigation like (Sheib, Engulit, Deressa, Balkay, Hashenkit, Berhetara) and more than 187 small dams, mainly earth embankment dams scattered through out the country and no reliable information for most of them on their current storage, status and use.*
3. *No appropriate environmental impact assessment (EIA) has been undertaken.*

4. *Protected water supply coverage for the rural population is about 59.7% and urban population about 95% and the nation coverage about 71% (Country Strategy Doc. 2007).*
5. *More than 80 percent of the population depends on groundwater as drinking water supply sources and will remain the main realistic domestic sources for the next 15-20 years.*
6. *Un accounted losses for urban and rural piped water supply system estimated in the range of 25-45% of the supply (Country Strategy Doc. 2007)*
7. *Preliminary estimate by Water Resources Department have shown that the current water need for all uses is about 1406 Million m^3 and by 2020 this will raise to 2540 million m^3.*
8. *Water resources planners, developers, users and decision makers knowledge level and experience in developing and applying water use regulating frameworks and water use controlling mechanism is low.*

Goal: Economic and social development objectives will be met through sustainable management of water resources including their proper allocation, development and protection and through increased efficiency of water use and sanitation and hygiene promotion.

6.2.2 Objectives, Strategies and Actions

Objective-6: To enhance the creation of enabling environment that support optimal and efficient utilization of the nation's scarce water resources on the basis of priority of national strategies

Strategy 6.1: *Put in-place effective national water resources policy that specify the role of government, identify and set priorities for key water resources issue, water supply, and designed proactively.*

Action 6.1.1 Facilitate and lobby for the enactment of the draft Eritrean Water Resources Policy.

- Identify championship and provide material and facilities to push the enactment of the draft water policy
- Conduct orientation and conceptualization workshop

Strategy 6.2: *Put in-place effective legislative framework that support efficient investment in water development, conservation and use*

Action 6.2.1 Facilitate the approval and implementation of the water resources proclamation

- Identify championship who push for the approval of the proclamation
- Review the draft proclamation
- Conduct orientation and conceptual workshop

Action 6.2.2 Facilitate the approval of the regulation for the issuance of permits for water use and constructing of hydraulic works

- Identify championship who push for the approval of the permit
- Review the draft permit

- Conduct orientation and conceptual workshop

Action 6.2.3 Prepare guidelines and procedure for the operation and maintenance of municipal, industrial, commercial and agricultural water supply facilities including rural water supply facilities.

- Prepare design guidelines for water conveyance and distribution system mainly for major water supplies
- Prepare guidelines on the operation and maintenance of water supply systems mainly for major water uses

Action 6.2.4: Set up standards of water utility equipment and spare parts.

- Identify priority water utility equipment and spare parts for the development of standards
- Commission and follow up the preparation of standards
- Disseminate and educate the standard to relevant government and private institutions.

Strategy 6.3: *Develop national capacity (human and institutional) to develop laws, regulations, standards and procedures that facilitate an appropriate decision on water allocation and use.*

Action 6.3.1: Provide training to build professional capacity to perform appropriate and effective decisions on water allocation and use.

- Identify public institutions whose role and function is related to water allocation and administration
- Identify major public and private institutions and organizations which are water resource developers and/or users
- Identify public and private institutions, CBO and development partners that are relevant to community water supply, sanitation and hygiene promotion.
- Provide training relevant to regulations, standards, and procedures on water allocation and registration as well as community water supply. *The training could also cover subject relevant to determining different water uses and their efficiency; determine water tariff and charges and other economic instruments, undertake efficient data collection, storing, processing on water allocation, uses and promote sanitation and the use of hygiene facilities.*

Action 6.3.2: Establish a unit or section under Water Resources Department and Regional Administration offices responsible for water use registration and verification.

- Determine the role and function of the department
- Propose the facility, human and financial resources requirement and institutional set up
- Present the proposal for the Minister for approval
- Mobilize resources to establish the unit

- Recruit staff, provide material and equipment. *This action will enhance the data collection, processing and monitoring and regulating capacity of the water resources manager (WRD)*

Objective 7: To increase knowledge level and sensitize policy makers, water resource planners and managers to promote appropriate water allocation and use.

Strategy 7.1*: Addressing important knowledge gap on water resources present and project demand of all users, on mechanism that increase water use efficiency, technologies and water availability.*

Action 7.1.1 Establish system of data and information gathering and exchange and knowledge management between sectors and water resources managers and planners specifically on water use and water use efficiency.

- Identify the most important gaps in knowledge that limits the ability of policy makers, water resources planners and managers to plan, allocate and enforce appropriate water use practices.
- Develop an inventory and a monitoring program of all water allocation/abstraction for all major water uses.
- Develop data and information exchange format and mechanism
- Establish forum for sharing experience on water use and water use efficiency

Action 7.1.2 Conduct in depth studies on the present and projected water demand for all water sectors (human, agriculture, industrial, commercial, ecosystem etc)

- Develop terms of references
- Assign responsible body to undertake the study and conduct close follow up

Action 7.1.3 Support actions that increase efficiency in supply and delivery of water for major water users.

- Identify major water users (municipal, irrigation, industrial etc) and assess their existing water supply and delivery efficiency.
- Present appropriate action plans or mechanisms (like training on Operation & Maintenance, implementing efficient technology like drip irrigation, rainwater harvesting) that will increase water supply efficiency.
- Implement action plans improving the efficiency in supply and delivery of water for major water users.

Action 7.1.4 Develop a mechanism and support actions that increases water use efficiency, conservation, recycling and reuse of water

(demand management) with particular focus on behavioral and attitude changes.

- Develop appropriate economic incentives like tariff and charges for water use,
- Identify appropriate and affordable technologies for reducing water consumptions, like on best irrigation practices like drip irrigation, sprinklers etc.; reuse and re-cycling for industries; and water saving devices for tourism (demand management instrument).
- Develop mechanism (awareness programs) to change people's attitude and behavior towards adopting technologies reducing water consumptions.
- Conduct awareness programs that brings overall behavioral and attitude changes on water supply and use.
- Develop and introduce Drought Management Plan (DMP) that restricts certain water use rights during drought time,
- Support the development of bylaws or standards at community and resident level etc.

6.2.3 Sanitation and Hygiene

Objective 8: To improve the health and living condition of rural communities by achieving safe and sustainable sanitation and hygiene practices in relation to water supply and use.

Strategy 8.1: *Put in-place effective policy and legislative framework that support efficient investment in sanitation and hygiene facilities and promote sustainable sanitation and hygiene practices (in urban and rural environment)*

Action 8.1.1: Review the draft rural sanitation policy and strategy direction, harmonize with IWRM principles and facilitate its enactment.

- Develop ToR
- Assign experts to undertake the review
- Supervise and follow up the assignment
- Present in regional and national workshop for validation and approval
- Submit for higher authority for approval
- Facilitate the dissemination to relevant institutes
- Conduct lobbying to facilitate its enactment

Strategy 8.2: *Develop national capacity to promote sanitation and environmental hygiene.*

Action 8.2.1: Undertake human resources capacity building programs to develop regulations and technical standards on sanitation and environmental hygiene as an integral part of water supply program.

- Identify public institutions whose role and function is related to developing regulation and standards on sanitation and environmental hygiene.
- Identify trainees and provide training on subjects that enhance their knowledge level on development of regulations, standards and procedures related to sanitation and environmental hygiene vis-à-vis community water supply.

Strategy 8.3: *Bring social changes (behavioral) in order to improve environmental sanitation and hygiene.*

Action 8.3.1: Incorporate water supply, sanitation and hygiene issues into the topics of pre-school, elementary and high school education system.

- Conduct a study on how water supply, sanitation and hygiene messages be integrated into the school curriculums
- Support and facilitate the review and integration of the subject into the school curriculums.
- Undertake workshops create awareness among students and teachers.

Action 8.3.2: Design and implement public awareness programs focused on environmental sanitation and hygiene.

- Identify key policy and decision makers, planners, researchers and professionals who have influence to put sanitation and hygiene an integral part of water resources development and management.
- Design and conduct awareness programs targeting community that brings behavioral and attitude changes
- Design and conduct awareness programs targeting CBOs all development partners.

6.3 Action Area 3: Disaster Management

6.3.1 Background and Justification

In Eritrea, recurrent droughts and floods have created severe stress on the people, economy as well as on the already established and developed water resources infrastructures.

The most terrible recorded famine in modern times, due to rain failure, in the horn of Africa including Eritrea was in the years from 1888 to 1892. There were other serious drought periods in 1913, 1914 and 1940s which are still remembered by many Eritreans. When rains failed again in 1973, it caused a series famine and losses of enormous human lives which is characterized as the first of its kind in the Eritrea's drought history.

The country strategy for IWRM document tries to identify drought and flood as one of the main phenomenon that frequently put the nation/community at risk. In

Eritrea, the impacts of drought and flood are linked most closely to the agricultural sector (crop and livestock), and for obvious reasons they are often indicators of non-sustainable land and water management practices.

Flood occurrence has, in recent times, increased along the major river banks causing significant damage on environment and livelihood of the rural community.

Having mentioned the above problems and limitations in disaster management, the action plan for IWRM has addressed key problems like absence of prevention, mitigation, preparedness and response mechanism; insufficient policy, institutional and legal frame to facilitate risk management for disaster events; inadequate recovery and rehabilitation systems; and insufficient public awareness.

In addition, poor land use practices, deforestation and catchment degradation have increased the effects of floods and droughts. In general this action plan is directed towards reducing risk by developing better awareness and understanding of the drought and flood hazard and the underlying causes of vulnerability of local communities. The principles of risk management should be promoted by building greater institutional capacity within country through encouraging the improvement and application of seasonal and shorter-term forecasts, developing integrated monitoring and disaster early warning system (EWS) and associated information delivery systems, developing preparedness plans at various levels of government, adopting mitigation actions and programs, and creating a safety net of emergency response programs that ensure timely and targeted relief.

Goal: Minimize the impact of drought and flood (disaster) to reduce societal vulnerability by shifting from traditional to more pro-active risk management approach.

6.3.2 Objectives, Strategies and Actions

Objective 9– to ensure the creation of effective enabling environment that promote disaster (drought and Flood) management system that reduce communities' vulnerability (preventive or risk reducing)

Strategy 9.1 - *Provide policy framework for an integrated approach to minimize the impacts of drought on its people and resources and support to review and strengthen the traditional drought copping mechanisms and incorporate in its operation guidelines.*

Action 9.1.1 Develop National Disaster (drought and flood) Policy with the overriding principle of drought policy that emphasis on risk management through the application of prevention, preparedness and mitigation measures with decentralized strategy for quick response.

- Assign institutions or individuals who develop the draft policy
- Conduct consultation on the draft policy and secure approval

Action 9.1.2 Formulate policies on settlement in flood prone areas

- Assign institutions to draft the policy
- Draft the policy
- Conduct consultation on the draft policy and secure approval

Strategy 9.2: *Develop institutional framework that control and coordinate all disaster management activities and operations.*

Action 9.2.1: Establish a national body that coordinates the preparedness and response for major disasters (drought and flood) through out the country.

- Identify government institutions and development partners whose activities are linked to Disaster (drought and flood) prevention, preparedness and mitigation efforts.
- Develop a proposal for the establishment of a national disasters prevention, preparedness and mitigation body with its organizational structures and institutional arrangement including function, mandate and its relation with the decentralized regional and sub regional bodies.
- Facilitate the review and approval of the establishment process
- Effect the establishment by assigning office, recruiting personnel, equipping the office etc.
- Undertake awareness raising programs (workshops, radio programs, meetings etc) focused on the creation, its role and expected public cooperation to the Disaster management bodies.

Action 9.2.2: Establish regional and sub-regional bodies that coordinate the preparedness and response for major disasters within their respective administrative boundary.

- Identify government institutions and development partners whose activities are linked to Disaster (drought and flood) prevention, preparedness and mitigation efforts but within the region or sub-region.
- Develop a proposal for the establishment of a regional and sub-regional disasters prevention, preparedness and mitigation body with its organizational structures and institutional arrangements including function, mandate and its relation with the national body.
- Facilitate the review and approval of the establishment process
- Effect the establishment by assigning office, recruiting personnel, equipping the office etc.
- Undertake awareness programs (workshops, radio programs, meetings etc) focused on the creation, its role and expected public cooperation to the Disaster management bodies.

Strategy 9.3: *Integrate development plans and regulations with disaster mitigation. All development projects (engineering and non engineering) including irrigation and industrial projects should be targeted towards disaster mitigation*

Action 9.3.1: The National Disaster Preparedness and Mitigation Body review all national and regional development plans and regulations and make sure they incorporate regulations towards disaster mitigation.

- Develop Terms of Reference or specific tasks to be undertaken by this assignment
- Assign professionals to undertake the task
- Collect all relevant national and regional development plans and review the plans to incorporate regulations towards disaster mitigation

Objective 10: Improve the national capacity in Disaster (drought and flood) monitoring, forecasting and mitigating.

Strategy 10.1: *Identify and develop capacity for institutions who are presently involved in disaster (drought and flood) monitoring, forecasting and mitigating activities.*

Action 10.1.1: Conduct capacity need assessment of institutions which are presently involved in disaster (drought and flood) monitoring, forecasting and mitigating activities.

- Develop terms of reference
- Assign professionals to undertake the task
- Conduct consultation workshops

Action 10.1.2: Implement capacity building programs focused on disaster (drought and flood) monitoring, forecasting and mitigating activities.

- Provide training to build professional capacity to perform systematic data collection, analysis, and dissemination of drought-related information;
- Provide material and equipment to enhance data collection, analysis, and dissemination of drought-related information

Strategy 10.2: *Develop plans and guidelines that emphasize a preventive, anticipatory (Risk management) approach to disaster (drought and flood) management and promote self resilience*

Action 10.2.1: Identify and map flood and drought prone areas so as to plan for their protection.

- Identify and map flood and drought area
- Classify type and level of floods and droughts
- Conduct assessment of resources and constraints to protect and mitigate impacts of flood and drought

Action 10.2.2: Prepare national disaster preparedness and mitigation plan (DPMP) which could act as operational guideline in the national and regional disaster management.

- assign disaster plan task forces for the preparation of DPMP
- Assign technical advisory board to undertake the technical role
- Draft the DPMP – this will definitely include disaster (drought and flood) forecasting and early warning system.
- Review and approve the DPMP through a consultative process.
- Publicize the proposed DPMP and solicit reaction. Undertake workshops, radio programs, information meetings etc. focused on how the plan is expected to relieve impact of drought, expected public cooperation etc.

Strategy 10.3: *Develop better awareness and understanding of the underlying causes of societal vulnerability and disaster issues that will reduce disaster risk by focusing on drought and flood hazard*

Action 10.3.1: Conduct study on the underline cause of social vulnerability for disasters and develop strategy to reduce disaster risk.

- Develop Terms of Reference
- Commission the study and conduct follow-up

Action 10.3.2: Implement broad-based education program to raise awareness of short- and long-term drought and flood issues. *This will help to ensure that people know how to respond to drought when it occurs and that drought planning does not lose ground during non drought years.*

- Assess the public, policy makers, planners etc. awareness level
- Identify awareness gap and develop strategy to raise awareness on disaster preparedness and mitigation issues
- Implement awareness programs based on the developed strategy and using available and appropriate awareness tools.

Action 10.3.3: Conduct Community awareness raising programs on water conservation and different cultural practices that improve agricultural productivity and reduce society vulnerability to drought.

- Evaluate present practices of training and awareness raising programs
- Document existing good cultural practices
- Prepare training material on appropriate water conservation and improved cultural practices
- Provide training and awareness raising programs

6.4 Action Area 4: Implementation and Financial Mechanism

6.4.1 Background and Justification

Based on the competing uses and users' nature of water, the country strategy for IWRM recognizes and appreciates partnership with all concerned stakeholders at all levels as one of the most fundamental elements for effective and productive implementation of integrated water resources management.

Considering the available resources and capacity of the Water Resources Department, relevant government and private institutions and development partners, the full implementation of IWRM action plan including fund raising require considerable resources. The resources required are not only to implement the action plans but also develop action/programs into bankable (feasible) project proposals. In Eritrean situation it is unlikely that such resources can be made available in the short term as IWRM action plan implementation is conceived by all as a priority. Developing alternative implementation strategy that considers these constraints are important.

The most logical feasible implementation strategy is to use the current available institutional resources and to achieve goals and objectives of IWRM action plan and national development objectives in development and environmental programs focusing on IWRM priority areas. The rationalization and prioritization of the action plans will certainly make the implementation more manageable and attractive to development partners.

Therefore, action plans that facilitate and speed up the implementation of IWRM action/programs under each action areas and support IWRM objectives and principles are developed. These are focused on action and/or programs that broaden and strengthen political support at the highest level, establish framework for broader stakeholder participation and networking, raise awareness in order to promote the implementation of integrated water resources management. This will be built around the policy and legal frameworks that are in place to adequately address the water crisis, it will require firm political will, support and commitment.

Possible financial sources for the implementation of actions supporting IWRM are from internal sources (government budget, private sector and community contribution) and loans and grants from bilateral and multilateral institutions. Therefore, action plans that mobilize resources from different sources and facilitate the streamlining into the national or regional budgetary processes are proposed.

Partnership of different implementing partners is key to the success of the implementation of IWRM action plan. This is useful in generating funds and mobilization of internal and external resources. Implementation strategy that allow adequate budget from the government, private as well as community contribution to implement priority IWRM need to be developed. Similarly grants and loans from development partners and other agencies should be mobilized for effective and productive implementation of IWRM action plan.

Goal: To achieve goals and objectives of IWRM approaches and national development strategies and priorities by Implementing the action plans.

6.4.2 Objectives, Strategies and Actions

***Objective 11**: To facilitate and speed up the implementation of IWRM action plan*

***Strategy 11.1:** Streamlining (mainstreaming) activities that support IWRM into sectoral physical planning and national and regional budgetary system.*

Action 11.1.1 Mainstream relevant IWRM action plans into sectoral physical planning and national and regional budgetary system

- Review key sectoral and regional plans and strategy documents and identify relevant IWRM priority Actions/programs and develop strategy to integrate them during the planning and implementation phase;
- Undertake inter-sectoral dialogue or discussion to secure streamlining IWRM actions into the national and regional development plans;
- Perform lobbying of key decision making and stakeholders in order to internalize IWRM Action Plans into the government policies, development planning and budget process and into development cooperation framework.

***Strategy 11.2:** Mobilize resources for the implementation of IWRM priority actions/programs by developing fund raising strategy.*

Action 11.2.1: Strengthen WRD and/or ERI-CWP to follow up the implementation of IWRM action plans particularly priority areas and to coordinate the mobilization of resources.

- Assess the human, equipment and material requirement of the WRD and/or ERI-CWP to undertake the coordination task
- Hire staff and supply equipment and material.

Action 11.2.2 Develop quality project proposals that suit a range of donor requirements (it is an important art of fund raising)

- Identify potential donors in the country
- Review their format and standards for proposal writing (check their web sites, communicate by e-mail etc.)
- Prepare quality proposals for priority IWRM actions/programs (this proposal will present the financial and technical requirements of priority IWRM actions/programs)

Action 11.2.3 Organize donor consultation forum to speed up their implementation

- Identify and articulate the relationships that exist between IWRM action plans and on going and planned development projects of national and regional programs of the government.
- Consult all potential IWRM priority action implementers to review, update, discuss and finalize action implementation strategy (important prior to presenting or contacting donors).
- Use diplomatic channels to secure funds from the International communities.
- Organize donor consultation forum and secure fund to implement projects

Strategy 11.3: *Creating a commitment (consensus building) to implementation by allowing all stakeholders in the decision making.*

Action 11.3.1: Undertake regular high level consultation to create commitment and review the IWRM action plan implementation process.

- Conduct awareness programs at regular time at national level with key stakeholders and policy decision makers;
- Conduct meetings and workshops at regional level and community level to raise level of involvement on the Implementation of IWRM.

Strategy 11.4 – *Introduce self financing mechanisms that support the implementation of IWRM action plans.*

Action 11.4.1: Mobilize local resources (cash and in-kind) from government and private sources as well as communities to implement IWRM action plans:

- Identify IWRM action plans or component of action plans that could fully be financed by mobilizing resources from community and/or private sources and/or government budgets;
- Develop a strategy on creating partnership between responsible implementing authority and private sector and community to facilitate resource mobilization and speed up implementation;
- Identify the types and scope of resources, technical support, capacity building required to implement programs/actions by the community or private sector;
- Raise awareness for sensitization of the community for project ownership.

Action 11.4.2: Introduce (devise) efficient financing mechanism for IWRM actions related to rural water supply thereby ensuring sustainability of water supply system.

- Assess and evaluate the current financial mechanism related to rural water supply.

- Identify gaps of financial requirements in rural water supply systems.
- Provide technical support to improve the current financing mechanism.

Action 11.4.3: Promote private sector involvement in IWRM action implementation or facilitation

- Identify action areas where private sector is more productive,
- Draft and approve policy and legislative measures that encourage private investment inline with the IWRM priority area,
- Conduct continuous awareness program on the need of private sector involvement

Action 11.4.4: Introduce and ensure efficient pricing system for water supply systems

- Review the current accounting and financial management practices in the water sector (water utilities)
- Introduce improvements and computerized system of financial accounting (software) for water utilities

Action 11.4.5: Introduce proper accountability and transparency in financial management practices. (Increase efficiency and help funding agencies to develop trust)

- Evaluate the current financial management practices of the urban, rural water supply utilities, agricultural and other water uses and propose efficient system
- Provide technical and financial assistance to improve the financial management practices.

6.5 Action Area 5: Research and Information Exchange

6.5.1 Background and Justification

Applied research in water resources management related issues are essential for the success of IWRM. Research findings could be useful in the design and development of appropriate policies and in making timely and informed decisions about water resources. Water investments to a large extent require huge resources and are non-shift able. Thus costly mistakes in investments in water projects could be avoided if they are based on careful research and analysis of information and data. Thus research and information exchange and the establishment of water database is very important for effective management and planning of water resources.

With the exception of National Agricultural Research Institute (NARI) which undertakes research activities related to the catchment protection, soil and water conservation, water use efficiency for irrigated agricultures, there is no other water institute or organization in charge of undertaking water use and management related researches.

The development and establishment of water research institutes and the involvement of higher education institutions in research activities and wider dissemination of research findings would help improve knowledge about water resources. On the other front, mass media could be used but may not provide adequate coverage of scientific knowledge on water-related issues and findings. Thus it is important that experts from different fields publish their research findings and share their experiences among each other.

Therefore, improved information systems and flows between key groups in water sector and creating research capacity in water resources and related fields is vital for the effectiveness of IWRM. There should be continuous interactions, links and means of communication with researchers, experts, water resource managers and policy makers if the research results are to be useful for policy and decision-making. The public and communities should also be involved, consulted and informed and above all it is important to note that conflicting objectives and interests, institutional barriers and poor information do hinder the flow of information between and among all stakeholders.

Hence, the action plan should initially focus on strengthening the existing institutional and research capacity of NARI and other similar institutions and actions that support the establishment of water research institute/division which will be responsible for carrying out research on IWRM issues and programs. Once the institute is established, action plans related to *inter allia* improvement of water resources evaluation methods, improving knowledge of climate change on water resources, on low cost treatment facilities, on appropriate technologies for efficient water use for different purposes, improve understanding of un sustainable water resources management on the ecosystem, improve our understanding of the coastal area groundwater can be developed.

Information exchange for IWRM shall focus on allowing professionals, practitioners and the general public to exchange and share experiences in implementing IWRM.

This will also help water professionals or non professionals in the government decision making agencies. From experience and understanding of the situation, action plan on the following areas are expected to be relevant for IWRM in the country in consideration.

- Action plans that identify key institution for research and research information exchange and build capacity to develop and implement effective research information management and exchange.

- Action plans that create research information exchange mechanism to engage local communities by providing opportunities for discussion and enable them to provide and gain access to research information readily.

- Action plan that facilitate the sharing of research findings and knowledge with other countries and sectors.

- Action plans that bring attitude and cultural change and build confidence on researchers, professionals and officials in different water sectors to participate in applied water in applied research in IWRM and improve information and data exchange.

Goal: ***Enhance an Effective management and planning of the nation scarce water resources through the promotion of applied research in WRM and establishing efficient information exchange.***

6.5.2 Objectives, Strategies and Actions

Objective 12: Promotion of applied research and the dissemination of findings in support of sound water resources management.

Strategy 12.1: *Create appropriate institutional framework and develop capacity to support the applied research in IWRM and research information exchange.*

Action 12.1.1: Establish a comprehensive national water research institute.

- Conduct a comprehensive study on research needs and the establishment of national water research institute to support IWRM;
- Based on the study, establish the national water research institute. This activity can be facilitated by assigning responsible body to establish the institute and fulfill all the requirements (legal, institutional and resources).

Action 12.1.2: Develop water research information communication and exchange strategy.

- Identify and categorize institutions of water related research information users;
- Develop guidelines and principles on research information communication and exchange.
- Formulate standards and formats for effective communication and exchange of water research information.

Action 12.1.3: Strengthen water resources research capacity (human and institutional) of existing research institutes working on water related issues.

- Undertake research capacity assessment for key institutions presently involved for water resources research and research information exchange
- Strengthening their research capacity both institutional and human based on the findings of the assessment. (Include training, provision of facility equipment etc. once they are strengthened, institutes would be able to Identify and determine research needs (prioritization).
- Encourage and support academic institutes to undertake IWRM related researches side by side with their training program.

Strategy 12.2: *Promote awareness on the importance of research and information exchange on water resources management.*

Action12.2.1: Organize forums to sensitize higher official and higher caliber professionals and encourage young professionals in research.

- Identify key policy makers and capable professions who can deliver sound scientific presentation on research and information exchange.
- Identify young professional who are potential researchers and civil servants in the water sector [For experience and knowledge sharing and to encourage young researchers)
- Organize a number of workshops to present papers and discuss the importance of research and information exchange on water for the nation development
- Prepare publications, proceedings, papers etc.

Action: 12.2.2: Organize forum and workshop targeted grass root communities and civil servants at regional level where most of the information are needed.

- Identify key research finding users at regional, sub regional and village level
- Provide forum for conducting awareness raising programs

Strategy 12.3: *Develop system of communication for proper information flow and to promote research capacity in the water sector*

Action 12.3.1: *Study and establish an efficient and effective research information communication and exchange system*

- Identify gaps in existing methods of communicating information between researchers, policy makers, planners, water resource managers and the public and develop better system of information flows

- Establish water resources and IWRM website for facilitation of research information exchange about actual and potential impacts of water related dynamics (changes)
- Create linkages with foreign institutions and research institutes dealing with water resources and involve local experts, professionals and water resource managers to interact regionally and internationally and to undertake experience sharing/gaining visits abroad

Strategy 12.4: *Support (Fund) for urgent issues that need applied research on WRM mainly to correct the existing unsustainable WRM practices.*

Action 12.4.1: Identify urgent and priority applied research needs

- Develop Terms of reference
- Assign professionals to undertake the task and follow up implementation of the study

Action 12.4.2: Support the implementation of urgent programs targeted applied research projects to address knowledge gap in terms of their priorities. As short term implementation prior to establishing the institutional framework a project could initiate applied researches on the following areas: (Can be revised during implementation)

- Surface and ground water pollution due to chemicals;
- Undertake groundwater modeling for areas where drop on groundwater level is a serious concern.
- Flood and drought prone area assessment in each river basin;
- Appropriate ground water recharge, extraction and estimation of sustainable yield;
- Training of personnel considering technical and social issues;
- Improving knowledge of impact of climate change on water resources
- Incorporate community awareness and participation.

6.6 Action Area 6: Basin Management Plan

6.6.1 Background and Justification

In recent years, our nation's water resources have been receiving an increased amount of attention. Considering the spatial and temporal distribution of water resources, Eritrea is characterized by general scarcity and high variability of water whose quality is generally taken for granted. Almost every activity on land has the potential to affect water resources situation. The rationale for basin management is that if we properly manage activities on the land that drains to bodies of water, we will protect and improve the water resources of the country both in terms of quality and quantity. Basin management also replenishes and ensures sustainability of the ecosystems.

Basin management is the process of addressing water related issues upon all land that drains to a common stream or river. Since water doesn't recognize political boundaries, this requires working across county, township, and other jurisdictional borders. Basin management plan brings national, regional, sub-regional and local agencies, interested organizations, and citizens together for the good of our water resources. People living within the basin have the opportunity to work together for solutions to water resources management problems.

The Eritrean Basin Management Plan attempts to design a course of action to work cooperatively toward an environmentally and economically healthy basin that benefits all stakeholders. The plan will identify actions that address the institutional mechanism that coordinate different administrative regions/sub regions, provide responsibilities for sustainable implementation of the plan and identify best management practices to reduce water resource management problems. The management plan will be developed from the knowledge and experiences of the regions/sub regions stakeholders.

As the demands on water resources continue to grow, management from a basin perspective becomes urgent. It is no longer a luxury to consider the long-term repercussions of our actions; it is rather a necessity. The County's economy, quality of life, and its role of providing some of the most beautiful and environmentally rich landscapes on the nation depend on integrative, scientifically-based management plan.

It is conceived that the following principles form the foundation for integrating the basics of basin management into all activities that affect land and water resources in the nation.

6.6.2 Basin Management Plan Guiding Principles

Everything is connected: All elements of a basin like the hydrologic cycle, the biotic community, human activities, and the land itself are connected through a complex web of relationships. Changes in one part affect the health and function of the whole basin.

Scientific understanding underlies effective basin management: The more we understand about basin function and relationships, the better we are able to

protect natural processes. Sound management choices need to be based on the acquisition and application of up-to-date and interdisciplinary sciences coupled with continuous and periodic assessment.

Long term watershed management requires continuous adaptation and modification: Monitoring is vital to understanding and continually improving the success of management and restoration actions. Monitoring also allows us to observe and document trends in the health of our water resources over time.

Everyone has an important role: Committed leadership and participation of the people who live and work in each basin is essential for effective planning, restoration, and ongoing water resources management.

Collaboration shares skills and resources: Basin management requires a vast range of skills, from community organizing to designing water resources monitoring programs to sustainable water resources management. Interagency coordination and partnerships with local basin residents bring multiple perspectives and durability into basin water resources management efforts.

Education creates the future: Education builds enduring connections between people of all ages and their basins. Being able to see ourselves as much a part of our local ecosystems as live oaks or salmon provides a deep and compelling sense of stewardship.

Protection and restoration: Zoning, land protection programs, land and water use policies can help protect water resources and balance environmental needs with healthy basin. Restoration can extend, connect, and enhance water resources potentials.

6.6.3 Physical Setting of River Basin Management

Water flows according to natural characteristics and does not respect administrative boundaries. Therefore, from a pure water resources point of view, there might be much logic in managing water according to drainage basin boundaries.

The river basins of Eritrea can conveniently be divided into five main basins. These are Gash- Mereb, Barka-Anseba, Red Sea, Danakil Depression and Setit. The headwaters of some of these basins are outside the country

Gash-Mereb Basin: The Gash-Mereb basin lies north of the Setit and has a total area of 23, 200 km^2, of which 17, 200km^2 are within Eritrea. The Mereb rises near Asmara and flows southwards, then turning west to form the border between Ethiopia and Eritrea in the central part of the country. Only a relatively small part of the basin is within Ethiopia. Further west, it becomes the Gash. It flows into Sudan, but does not reach the sea, instead forming an inland delta north of Kassala. River flows in this basin and though the rest of Eritrea is seasonal with intermittent periods of rapid runoff in the rainy season. Generally speaking, the rivers are dry through the period November to April.

Barka-Anseba Basin: This is the largest basin rises within Eritrea (41, 900 km^2), covering a large portion of the western lowlands. Both the Barka and Anseba rise

close to Asmara and flow northwest. The rivers meet near the border, and then flow to Sudan, finally flow towards the Red Sea, although it is probable that runoff actually reaches the sea only infrequently. The catchment areas for the Anseba and Barka sub-systems are 13, 000 Km^2 and 28, 900 km^2, respectively.

Red Sea Basin: The Red Sea Rivers flow from the eastern escarpment towards the sea along the whole of the Eritrea's coastline. This basin has a total area of 43, 400 km^2. This basin is climatically different from the rest of the country, generally it is much more arid and rainfall tends to be mainly in the period of October to March. The rivers of this basin respond to the main rainy season in the highlands (July to August), but can experience significant runoff during other periods.

Danakil Depression: Many small rivers flow southwards into the Danakil Depression, lying in the South of the country and the adjoining part of Ethiopia. The area within Eritrea of this basin is 19, 400 km^2. This is an internal drainage system, so flow does not reach the sea. The Danakil Depression lies in the most arid part of the country with annual rainfall of 100 mm or less. It is likely runoff events are of very short duration and occur extremely irregularly.

Setit River Basin: The Setit (Tekezze in Ethiopia) rises in central Ethiopia and flows northward, forming the border between Ethiopia and Eritrea in the far south western corner of the country. In Sudan it joins the Atbara, one of the main tributaries of the Nile River. The Setit is a large basin (68,300 km^2) but only a few portions (7,300 km^2) are within Eritrean territory. It is also the only perennial river in the country, and the only one for which there is any substantial hydrometric information.

6.6.4 Common River Basin Management Issues

Although each river basin has its own unique challenges, the following issues and needs are held in common by many areas.

River Basin Water Resources Assessment (quantity and quality): Assessment is the first logical step for developing a sound River Basin Management plan. Often, however, urgent problems and community concerns drive implementation projects to occur before assessments are undertaken. Assessment is as a process that characterizes current watershed conditions on a coarse scale using an interdisciplinary approach to collect and analyze information. Assessments identify issues and help focus the planning process.

Monitoring: Monitoring is a key need for all river basin management programs/plan. Baseline monitoring establishes the starting conditions, and trend monitoring tracks how restoration activities and changes in management are affecting these conditions over time. Monitoring is a fundamental component of adaptive management, the process of refining objectives and implementation strategies over time to improve overall success.

Public Participation: A successful River Basin Management Plan requires input from the people/stakeholder who live, work, and play in the basin. By involving stakeholders in the initial stages of River Basin Management Plan, long term success can become more secure. In order to provide consistent public input and

stakeholder commitment to the Basin Management Plan, a steering committee representative with varied backgrounds and occupations are required.

Information and Education: Getting effective information to the public, stakeholders, managers, and decision makers about water resources management is a critical need throughout the basin. The education and information component of river basin management offers fine opportunities for coordination between basin groups and for cost-effective agency support of local efforts.

Legal and Institutional Framework: A mandated River Basin Management Authority with the jurisdiction to act on behalf of the state in the river Basin shall be responsible for implementation of the Basin Management Master Plan. The authority shall be established through a proclamation as the instrument of choice for the sustainable and integrated management of the respective river basin.

The legal framework should be the principal instrument that guides the coordination of sectoral planning and development. It must also be perceived as a means to ensue the plan, strategies and decision concerning the management plan.

Evaluation: It is important to evaluate the effectiveness of the River Basin Management Plan throughout the implementation process in order to determine how well the plan is addressing goals and objectives.

Capacity Development: To fully enable the River Basin Management Plan it will be necessary to develop institutional capacity in each stakeholder's institutions and design awareness campaign to inform the public.

The River Basin Management Plan will be developed looking forward to address the many factors that contribute to the degradation of the water resources and action to mitigate existing problems, preventing future problems from deteriorating and preserving the wonderful characteristics of a river basins.

Therefore, based on these concerns, a list of River Basin goals, objectives, and strategies/actions will be developed.

Goal: ***Ensure national sustainable development and poverty reduction strategy, through IWRM principles and approaches (efficiency, equity and environmental sustainability) by developing River Basin Management Plan.***

6.6.5 Objectives, Strategies and Actions

Objective-13*: Introduce River Basin Management Master Plan concept into Eritrean WRM practices.*

Strategy 13.1: *Formulate national policy and legal framework for the establishment of River Basin Water Resources Management Plan.*

Action 13.1.1: Establish a unified political will of the politicians/decision makers and the public on the establishment of Basin Management Plan. This approach is included in the draft water resources policy.

- Undertake high-level awareness program and dialogue (ministerial, governors, higher political figurer) to secure consensus.
- Secure commitment by either establishing a task forces or technical body composed of those higher decision making institutions to follow up the implementation of the consensus.
- Undertake awareness raising programs targeting the public on the urgent need of River Basin Management approach.

***Strategy 13.2**: Institutionalize the development and follow up of Basin Management Plan considering the existing human and institutional capacity of the nation (WRD).*

Action 13.2.1: Establish institution responsible for development of basin water master plan. The institution could be a unit or department under WRD or an independent authority

- Assess and review the current institutional and human capacity of the water sectors, particularly WRD in relation to the capacity to develop Basin Water Master Plan.
- Prepare proposal for the establishment of the institution which specifies role and function, required professions, required facilities etc.
- Organize a forum for discussion and validation by key stakeholders and decision makers to secure approval
- Locate or provide office space
- Hire required professionals
- Organize experts' tour visit to typical basin for exposure and sharing of experience.
- Provide proper facilities and equipments
- Undertake awareness raising program to the public, regional and sub regional offices on the roles and functions of the institute.

***Strategy 13.3**: Promote the application of proper river basin management Plan.*

Action 13.3.1: Develop Basin Management Plans.

- Prepare Gash-Mereb Basin Management Plan
- Prepare Barka – Anseba Basin Management Plan
- Red Sea Basin Management Plan
- Danakil Depression Basin Management Plans
- Setit Basin Management Plan

Action 13.3.2 Develop monitoring and evaluation tools for adaptive water management master plan

- Undertake baseline data collection
- Define basin performance measures
- Establish monitoring and assessment protocols

6.7 Action Area 7: Enabling Environment

6.7.1 Background and Justification

As part of the Eritrean process to support IWRM, Water Resources Department and ERI-CWP have already drafted water resources policy, water law, water resources proclamation, proclamation for the establishment of Eritrean new water resources administration, legal notices for waste water discharge and water use and construction of hydraulic structures. As commented in the previous sections these are actions taken prior to building commitment for the action i.e. having political adoption and stakeholder acceptance.

Though it is clear that there is a need for legislative reform to be included as the core element of IWRM; such as value of water in use (water as a social and economic good), the role of women in water management and the sustainability of the resource are important and the reform process should follow certain steps and secure political adoption, as well as stakeholders' acceptance.

Water law is mainly to implement and enforce policy, and provide effective administrative and regulatory mechanisms at appropriate levels. Therefore, the envisaged enabling environment action plans essentially focus on programs that will support to build commitment to the reform by preparing programs that facilitate stakeholders' dialogues aimed at reviewing, inducing acceptance and securing political adoption. The first step will be on the policy and subsequently followed by laws and proclamations, regulations and permits.

Country strategy for IWRM concludes that the need for complete institutional reforming for the development and management of the nation's water resources. Actions are also taken by drafting a new proclamation for the establishment of a new water administration.

As per the process to support IWRM for Eritrea, the remaining step is to execute the proposed reform which really depends on its political and social acceptance. Stakeholders' dialogue to securing political commitment is priority. Therefore, the action plan will focus on actions that facilitate these dialogues while raising awareness on the need for reform. The action plan preparation process will consider the institutional reform as a slow process with a sequence of actions that will be carried out coherently and in consistence with the broader social and political policy of the country.

Considering this transformation human resources and the time it may require, the document has recommended that focusing on human resources development action plans/programs for the existing institutions as part of its short term program is a matter of urgency. These actions will be demand driven and gender mainstreamed. Action plan will also include building appropriate legal frameworks directives and guidelines related to capacity buildings.

At present, water resource isn't managed properly. The absence of enacted water policy and law, unclear entitlement and responsibilities of users and water suppliers, unclear regulatory norms and inadequate powers of enforcement for effective use of water resource has become the main problems.

Moreover, inter-sectorial conflict of interest, fragmented and uncoordinated development and management of water resource and inequitable water allocation for down and up stream users been common phenomenon due to the absence of appropriate and effective policy and frameworks. In addition, inadequate skilled expertise and in sufficient financial support are the main problems contributing to resource constraint.

During the development of action/programs for each key areas of action, the required policy and legislative frameworks, institutional frameworks and capacity building that support all water managing, developing and using institutions have been identified and presented under each thematic area. This is mainly to maintain smooth flow of action plan preparation and make it as comprehensive as possible through including required enabling environments out side of the water managing institutes that might have impact in achieving the objectives of the respective key action areas.

Box 3 presents actions particularly addressing the enabling environments for IWRM and which are already presented in their respective key action areas. These action plans are categorized under policy, legal, organizational framework and human resources capacity.

Finally action plan focused on gender mainstreaming is presented with its clear objective, strategies and actions.

Box 3 – Actions/programs proposed to improve the enabling environment for IWRM in Eritrea

7. A Action on Policy Framework

Action 5.1.1:	Review the existing land use policy and land law and harmonize it with sound catchment protection and management principles;
Action 5.1.2:	Review the existing water policy and harmonize it with sound catchment and management principles;
Action 5.1.3	Review the existing forest and wildlife proclamation and relevant regulations and guidelines and harmonize them with sound catchment and management principles.
Action 6.1.1	Facilitate and lobby for the enactment of the draft Eritrean Water Resources Policy
Action 8.1.1:	Review the draft rural sanitation policy and strategy direction, harmonize with IWRM principles and facilitate its enactment.
Action 9.1.1	Develop National Disaster (drought and flood) Policy with The overriding principle of drought policy should be an emphasis on risk management through the application of preparedness and mitigation measures with decentralized strategy for quick response.
Action 9.1.2	Formulate policies on settlement in flood prone areas

7. B Action on Legal Framework

Action 6.2.1	Facilitate the approval and implementation of the water resources proclamation

7. C Actions on Organizational Framework

Action 1.4.2: Establish/Strengthen Eritrean Water Information Center (EWRIC) within Department of Water Resources.

Action 4.1.1: Establish a new unit/administration within water resources department with mandates of trans-boundary water issues

Action 6.3.2: Establish a unit or section under Water Resources Department responsible for water use registration and verification

Action 9.2.1: Establish a national body that coordinates the preparedness and response for major disasters (drought and flood) through out the country.

Action 9.2.2: Establish regional and sub-regional bodies that coordinate the preparedness and response for major disasters within their respective administrative boundary.

Action 12.1.1: Establish a comprehensive national water research institute.

7. D Actions on Human Resources Capacity

Action 1.1.4: Provide equipments, facilities and training to strengthen the WRD and other institutions involved in collecting, storing, processing and disseminating of hydro meteorological data.

Action 2.1.1: Facilitate training in hydro meteorological and hydro geological assessment tools.

Action 3.2.1 Provide equipment and facilities that enhance the water quality monitoring and regulating capacity of relevant institutions

Action 3.2.2 Provide education and training to water sector's staff on water quality monitoring, data analysis, pollution control mechanism and on the development and application of different water quality regulatory instruments.

Action 4.1.2: Develop human and institutional capacity of WRD, focusing the newly established trans-boundary water Unit/ administration.

Action 5.2.1 Undertake stakeholder analysis and capacity assessment pertinent to protection and management of catchments (at national and regional level)

Action 5.2.2 Develop laws and regulation for catchment protection and management

Action 5.2.3 Develop strategy and action plan (short. Medium and long) for capacity building targeted catchment protection and management

Action 5.2.4 Implement programs that will respond the capacity needs of all public institutions and other relevant stakeholders

Action 6.3.1: Provide training to build professional capacity to perform appropriate and effective decisions on water allocation and use.

Action 6.3.2: Establish a unit or section under Water Resources Department and Regional Administration Offices responsible for water use registration and verification

Action 8.2.1: Undertake human resources capacity building programs to develop regulations and technical standards on sanitation and environmental hygiene as an integral part of water supply program.

Action 10.1.1: Conduct capacity need assessment of institutions who are presently involved in disaster (drought and flood) monitoring, forecasting and mitigating activities.

Action 10.1.2: Implement capacity building programs focused on disaster (drought and flood) monitoring, forecasting and mitigating activities.

Action 11.2.1: Strengthen WRD and/or ERI-CWP to follow up the implementation of IWRM action plans particularly priority areas and to coordinate the mobilization of resources.

6.7.1 Gender Mainstreaming

6.7.1.1 Background and Justification

Gender mainstreaming is a strategy to promote gender sensitivity and the empowerment of women.

In rural and urban Eritrea, women and girls are responsible for collecting water from wells and water vendor, carrying it to the homestead (often over long distances and steep sloped terrains in the rural, and up stairs in the towns), storing it for household use. Women have the major responsibility to take care of the availability of sufficient water for all in the household and use more water in and around the house. They are the one suffering from queuing at watering points and withdrawing water from deep wells using rope and bucket. As the main users of water, they suffer more from its mismanagement and scarcity. Hence, they must participate and have a decisive role in the planning, implementation, operation and maintenance of water supply and sanitation projects and water resources management in general at all levels.

Sanitation and health are complementary subjects that have been intimately associated with women and water supply or the lack of it. Women are responsible in household sanitary and hygiene and they are the ones affected by the absence of sanitary facilities therefore, access to adequate and sanitary latrines is a matter of security, privacy and human dignity for them

6.7.1.2 Gender Considerations in Draft Water Resources Policy

The draft water policy includes strong statements of commitment to take gender issue seriously. One of its underlining policy principles is gender inclusive integrated planning for management and development of water resources thereby maximizing the resultant socioeconomic benefit of the nation.

It also recognizes the need for the design gender sensitive water resource development projects, gender sensitive appropriate project management system; to take affirmative action to ascertain gender equity by mainstreaming gender in the planning, implementation and monitoring and evaluation of water programs and projects allocating budget for gender mainstreaming.

The draft policy also recognizes the need for establishing gender inclusive water resources management institutions; facilitating and supporting traditional institutions engaged in the water sector by providing gender sensitive guidelines, procedures and training in order to ensure sustainable development and management of the water sector while reducing gender imbalance in the sector. Such measures should also be strengthened through the introduction of affirmative actions in recruitment and training with the objective of creating gender sensitive water-oriented society.

It also emphasizes the need to use gender sensitive monitoring and evaluation indicators for the planning and implementation of all water resources management and development programs.

6.7.1.3 National Gender Action Plan- (2003-2008)

The National Gender Action Plan is a policy strategy document prepared by NUEW to the government that provides a framework for integrating gender into all aspects of the economy. The gender action plan is aimed at improving the situation of women and men and reducing gender inequalities and inequities in Eritrea. There are three strategic objectives closely related to IWRM issues, these are:

1. **Enhance awareness and access to services for land management in order to redress land degradation.** Under this objective, creating gender unit under the Ministry of Land, Water and Environment to enhance the ministry's role in undertaking gender sensitive planning, implementation and monitoring of policies and programs is identified to be important.

2. **Enhance public awareness of impact of environmental degradation & increase access to public health services in order to reduce the rate of environment related illnesses like water born diseases, and malaria.** Actions that intensify environment health education and health services on water born diseases and address and manage potential breeding sources and man-made water points are identified as key for achieving the objective.

3. **Improve communities' access to water and enhance community participation in water management in order to increase sources of safe drinking water**. To achieve these objectives, actions like public health education on water and sanitation, activities that enable increase in improved and safe sources of water and training women in water management.

6.7.1.4 Objectives, Strategies and Actions

Objective 13: to enhance the participation of women in policy and decision-making, legislation, planning and management of water resources and bring about institutional and organizational changes necessary to ensure gender equality as on-going commitment.

Background and Justification: The participation of women in water and sanitation projects was advocated as early as 1980, at the World Conference of the "United Nations Decade for Women". Women's desk has not yet been established in Eritrea in support of this. Thus, a desk should be established urgently within the Ministry of Land, Water and Environment. The concern of the desk will be increasing the integration of women in all phases of natural resources development and environmental protection.

In this regard it strives to increase the public awareness of the positive role of women as users and managers of these resources can play in setting priorities and formulating strategies. Equally important is that, the desk will help them to become more empowered through training and providing them access to the resources, appropriate technologies, income-generating activities, improved practices of water use and environmental sanitation facilities.

The desk will actively be involved in the integration of environmental, sanitation and health education activities of water supply projects, as well as addressing both

men's and women's needs and concerns as users of water and beneficiaries of water development programs.

Towards this end, the desk will begin creating an information system for gender issues. It will also work towards increasing the provision of gender disaggregated data on water resources to decision makers and will assist regional water offices with organizing seminars and workshops on women's participation in water development and management..

While promoting an integrated approach to water resources management, specific strategies and actions should be designed to address the need for both men and women for hygiene promotion and sanitation programs. All policy formulation, legislations, standards, guidelines and by-laws should go through a gender review before they are adopted.

Action to promote greater equality of influence, opportunity and benefit for women and men should be based on context specific sex disaggregated data and gender classified and analyzed information.

Strategy 14.1: *Improve water governance and water resources management by mainstreaming gender into the institutional and regulatory framework and building capacity.*

Action 14.1.1: Establish a Gender desk/unit in Ministry of Land Water and Environment and all Regional Administration.

- Prepare a proposal that include gender desk within MoLWE and Regional Administration. The proposal should include role and responsibility, required manpower and facilities etc.
- Conduct a workshop targeted decision makers to secure approval and budget
- Following the approval and budget allocation-establish the desk

Action 14.1.2: Review the existing regulations, operational guidelines, assessments criteria for project proposal, project assessments, standards and specification, action plans and incorporate action that help to achieve gender equality and ensure efficiency and sustainability

- Assign professional to undertake the review
- Review of existing regulations, guidelines etc. and discuss in meetings, workshops to develop ideas to mainstream gender.
- Produce revised regulations, guidelines standards etc.
- undertake monitoring and evaluation

Action 14.1.3: Undertake capacity building targeting women at the grass root level that enhances the participation of women in a meaningful way in the planning, implementation, and operation and

maintenance of water resources, water supply sanitation and hygiene program.

- Review existing training programs and make sure gender policies and strategies are reflected
- Review trainers' experience, identify gaps and propose to upgrade their capacity to incorporate gender and social equity approach in their trainings
- Identify issues of concern to poor women and men in terms in relation to planning, implementation and evaluating development activities
- Implement additional capacity building actions that enhance the mainstreaming of gender in IWRM

Strategy 14.2: *Improve knowledge and raise awareness of gender issues at all levels.*

Action 14.2.1: Undertake gender analysis that reveals the gender dimensions of water resources management and development problems.

- Prepare terms of reference
- Assign professionals to undertake the gender analysis
- Disseminate the findings and recommendations to relevant institutions
- Conduct meetings and workshops to raise awareness on gender issues and create a platform to include recommendations in their sector and regional plans and programs

Action 14.2.2: Provide training and education on gender mainstreaming in water resources management and development to increase the awareness of gender vis-à-vis water issues.

- Identify experts to undertake the gender mainstreaming training
- Develop a checklist to be used to prepare and review project proposals
- Provide training on gender mainstreaming, water management and development programs and projects
- Provide training on gender mainstreaming in water and related organizations

Action 14.2.3: Provide gender training for planning and statistics units or departments staffs of water management, development and use institutes, CBOs, NUEWs, NUEYS and other relevant stakeholders that support developing their capacities in collecting Gender-disaggregated data and develop gender sensitive indicators (key sectors includes water, sanitation, agriculture and irrigation.)

- Identify key institutions, categorize trainees and required course on gender and water management.
- Develop training materials
- Conduct training on gender and water management issues at regular interva

7.0 ACTION PLAN COST

The total cost to implement the IWRM action plan is about US$19.8 million and of these about 58.6 percent is allocated for actions that support water resources assessment, development and protection (Action Area-1), 14.2 percent for basin management (Action Area-6) and 10.3 percent for research and information exchange (Action Area-5). Table 2 summarizes cost by action area and Table 3 present detailed costs breakdown by actions/project portfolio. The costs given are only indicative and they are based on experiences of similar project costs implemented in this country. The standards, current cost and trends that are prevailing in the country have been considered and converted into more stable currency or US dollar.

Table 2 – Summary of Action Plan Cost by Action Areas

No	Description of Action Area	Estimated Budget (USD)	Percent of the Total Cost
1	Water Resource Assessment, Development and Protection	11,584,000	58.6
2	Water Resources Allocation and Use	1,742,000	8.7
3	Disaster Management	780,000	3.9
4	Implementation and Financial Mechanism	509,000	2.6
5	Research and Information Exchange	2,031,000	10.3
6	Basin Management Plan	2,811,000	14.2
7	Gender Mainstreaming	336,000	1.7
	TOTAL COST	**19,776,000**	**100**

Table 3 – Action plan cost by actions/project portfolio

No	**Actions ID**	***Description of actions/project portfolio***	**Estimated Budget (USD)**
	ACTION AREA 1: WATER RESOURCE ASSESSMENT, DEVELOPMENT AND PROTECTION		
	1A - Water Resources Assessment and Development		
1	Action 1.1.1:	Improve the coverage and status of stream gauging stations for each major drainage basin of the country.	**845,000**
2	Action 1.1.2:	Improve the coverage and status of meteorological stations of the country.	**447,000**
3	Action 1.1.3:	Develop standard and specification for acquiring and installation of hydro meteorological stations.	**12,000**
4	Action 1.1.4:	Provide equipments, facilities and training to strengthen the WRD and other institutions involved in collecting, storing, processing and disseminating of hydro meteorological data.	**300,000**
5	Action 1.1.5:	Raise awareness of policy and decision makers focusing on the importance of reliable and representative hydrometeorology data on the national development.	**19,000**
6	Action 1.2.1	Collect and compile all existing dug or drilled well information from drilling and contracting companies	**20,000**
7	Action 1.2.2	Undertake groundwater inventory	**253,000**

8	Action 1.3.1	Design groundwater monitoring network based on field studies of geophysical, geological, hydro geological and groundwater quality variations and estimate cost by phase with reasonable timeframe.	**41,000**
9	Action 1.3.2:	Implement establishment of the network phase by phase.	**2,000,000**
10	Action 1.4.1	Identify relevant institutions whose contribution/support is critical to establish a data and information link mechanism and put in place coordination mechanism to facilitated access and linkage to database.	**9,000**
11	Action 1.4.2	Establish/Strengthen Eritrean Water Information Center (EWRIC) within Department of Water Resources.	**151,000**
12	Action 1.4.3:	Develop manuals, guidelines, formats on the collection, recording and storing of hydro meteorological and groundwater data.	**26,000**
13	Action 2.1.1	Facilitate training in hydrological and hydro geological assessment tools.	**160,000**
14	Action 2.1.2	Establish a procedure that facilitate water resources assessment	**7,000**
15	Action 2.1.3:	Develop and enforce guidelines and standards for conducting water resources assessment and development	**370,000**
16	Action 2.1.4:	Enhance education and career development opportunities in the water sector	885,000
17	Action 2.1.5:	Mainstream IWRM into the national education systems (including higher level)	72,000
18	Action 2.2.1	Establish a system of data collection and information exchange on the existing water uses of relevant sectors.	**30,000**

1B - WATER QUALITY AND POLLUTIONS CONTROL

19	Action 3.1.1	Develop standards, guidelines and procedures on wastewater quality and discharge regulation	52,000
20	Action 3.1.2	Prepare Guidelines for design of wastewater treatment, disposal and reuse facilities.	80,000
21	Action 3.1.3	Develop water quality standards for rural, municipal and irrigation water supplies	15,000
22	Action 3.2.1	Provide equipment and facilities that enhance the water quality monitoring and regulating capacity of relevant institutions	460,000
23	Action 3.2.2	Provide education and training to water sector's staff on water quality monitoring, data analysis, pollution control mechanism and on the development and application of different water quality regulatory instruments.	41,000
24	Action 3.2.3	Inventory of water quality and pollution sources	32,000
25	Action 3.2.4	Develop coastal aquifers development and management plan	429,000
26	Action 3.3.1	Increase public knowledge, attitude and practice (KAP) through a range of social mobilization and sensitization measure.	141,000

1C- TRANS BOUNDARY WATER ISSUE

27	Action 4.1.1:	Establish a new unit/administration within water resources department with mandates of trans-boundary water issues	29,000
28	Action 4.1.2:	Develop human and institutional capacity of WRD, focusing the newly established trans-boundary water Unit/ administration.	83,000
29	Action 4.1.3	Conduct comprehensive study on regional, bilateral and international agreements, treaties, conventions, negotiations on Transboundary water issues and recommend the appropriate path for Eritrea in order to secure equitable share.	17,000
	1D - CATCHMENT PROTECTION		
30	Action 5.1.1:	Review the existing land use policy and land law and harmonize it with sound catchment protection and management principles;	33,000
31	Action 5.1.2:	Review the existing water policy and harmonize with sound catchment and management principles	10,000
32	Action 5.1.3	Review the existing forest and wildlife proclamation and relevant regulations and guidelines and harmonize with sound catchment and management principles.	19,000
33	Action 5.2.1	Undertake stakeholder analysis and capacity assessment pertinent to protection and management of catchments (at national and regional level)	68,000
34	Action 5.2.2	Develop laws and regulation for catchment protection and management.	33,000
35	Action 5.2.3	Develop strategy and action plan (short. Medium and long) for capacity building targeted catchment protection and management	29,000
36	Action 5.2.4	Implement programs that will respond the capacity needs of all public institutions and other relevant stakeholders	145,000
37	Action 5.3.1:	Prepare watershed management plan for priority catchments	475,000
38	Action 5.3.2	Implement catchment programs or project particularly on catchment to conserve, restore, enhance and maintain healthy environment	3,600,000
39	Action 5.4.1	Identify relevant catchment protection and management topics or issues, devise appropriate methods of information dissemination and conduct awareness programs.	84,000
40	Action 5.4.2	Support the implementation of watershed education and public outreach	62,000

Action Area 2:Water Resources Allocation and Use

41	Action 6.1.1	Facilitate and lobby for the enactment of the draft Eritrean Water Resources Policy	7,000
42	Action 6.2.1	Facilitate the approval and implementation of the water resources proclamation	7,000
43	Action 6.2.2	Finalize the approval of the regulation for the issuance of permits for water use and constructing of hydraulic works	7,000
44	Action 6.2.3	Prepare guidelines and procedure for the operation and maintenance of municipal, industrial, commercial and agricultural water supply facilities including rural water supply facilities	28,000

45	Action 6.2.4:	Set up standards of water utility equipment and spare parts.	67,000
46	Action 6.3.1:	Provide training to build professional capacity to perform appropriate and effective decisions on water allocation and use.	88,000
47	Action 6.3.2:	Establish a unit or section under Water Resources Department and Regional Administration offices responsible for water use registration and verification	84,000
48	Action 7.1.1	Establish system of data and information gathering and exchange and knowledge management between sectors and water resources managers and planners specifically on water use and water use efficiency.	131,000
49	Action 7.1.2	Conduct in depth studies on the present and projected water demand for all water sectors (human, agriculture, industrial, commercial, ecosystem etc)	198,000
50	Action 7.1.3	Support actions that increase efficiency in supply and delivery of water (supply management) for major water users	102,000
51	Action 7.1.4	Develop a mechanism and support actions that increases water use efficiency, conservation, recycling and reuse of water (demand management) with particular focus on behavioral and attitude changes.	171,000
52	Action 8.1.1	Review the draft rural sanitation policy and strategy direction, harmonize with IWRM principles and facilitate its enactment.	6,000
53	Action 8.2.1	Undertake human resources capacity building programs to develop regulations and technical standards on sanitation and environmental hygiene as an integral part of water supply program.	123,000
54	Action 8.3.1	Incorporate water supply, sanitation and hygiene issues into the topics of pre-school, elementary and high school education system.	194,000
55	Action 8.3.2	Design and implement public awareness programs focused on environmental sanitation and hygiene.	512,000

Action Area 3: Disaster Management

56	Action 9.1.1	Develop National Disaster (drought and flood) Policy with The overriding principle of drought policy should be an emphasis on risk management through the application of preventive, preparedness and mitigation measures with decentralized strategy for quick response	17,000
57	Action 9.1.2	Formulate policies on settlement in flood prone areas	17,000
58	Action 9.2.1:	Establish a national body that coordinates the preparedness and response for major disasters (drought and flood) through out the country	105,000
59	Action 9.2.2:	Establish regional and sub-regional bodies that coordinate the preparedness and response for major disasters within their respective administrative boundary	61,000
60	Action 9.3.1:	The National Disaster Preparedness and Mitigation Body review all national and regional development plans and regulations and make sure they incorporate regulations	22,000

		towards disaster mitigation	
61	Action 10.1.1	Conduct capacity need assessment of institutions which are presently involved in Disaster (drought and flood) monitoring, forecasting and mitigating activities	33,000
62	Action 10.1.2	Implement capacity building programs focused on disaster (drought and flood) monitoring, forecasting and mitigating activities.	132,000
63	Action 10.2.1	Identify and map flood and drought prone areas so as to plan for their protection	116,000
64	Action 10.2.2	Prepare national disaster preparedness and mitigation plan (DPMP) which could act as operational guideline in the national disaster management	59,000
65	Action 10.3.1	Conduct study on the underline cause of social vulnerability for disasters and develop strategy to reduce disaster risk.	35,000
66	Action 10.3.2	Implement broad-based education program to raise awareness of short- and long-term drought and flood issues.	135,000
67	Action 10.3.3	Conduct Community awareness raising programs on water conservation and different cultural practices that improve agricultural productivity and reduce society vulnerability to drought.	48,000

Action Area 4:Implementation and Financial Mechanism

68	Action 11.1.1	Mainstream relevant IWRM action plans into sectoral physical planning and national and regional budgetary system	26,000
69	Action 11.2.1	Strengthen WRD and/or ERI-CWP to follow up the implementation of IWRM action plans particularly priority areas and to coordinate the mobilization of resources	180,000
70	Action 11.2.2	Develop quality project proposals that suites a range of donor requirements.	121,000
71	Action 11.2.3	Organize donor consultation forum to speed up their implementation.	32,000
72	Action 11.3.1	Undertake regular high level consultation to create commitment and review the IWRM action plan implementation process.	15,000
73	Action 11.4.1	Mobilize local resources (cash and in-kind) from government and private sources as well as communities to implement IWRM action plans	11,000
74	Action 11.4.2	Introduce (devise) efficient financing mechanism for IWRM action related to rural water supply	23,000
75	Action 11.4.3	Promote private sector involvement in IWRM action implementation or facilitation	19,000
76	Action 11.4.4	Introduce and ensure efficient pricing system for water use	41,000
77	Action 11.4.5	Introduce proper accountability and transparency in financial management practices.	41,000

Action Area 5: Research and Information Exchange

78	Action 12.1.1	Develop/create a comprehensive national water research institute.	165,000

79	Action 12.1.2	Develop water research information communication and exchange strategy.	39,000
80	Action 12.1.3	Strengthen water resources research capacity (human and institutional) of existing research institutes working on water related issues.	121,000
81	Action12.2.1	Organize forums to sensitize higher official and higher caliber professionals and to encourage young professionals in research.	70,000
82	Action 12.2.2	Organize forum and workshop targeted grass root communities and civil servants at regional level where most of the information are needed.	96,000
83	Action 12.3.1	Study and establish an efficient and effective research information communication and exchange system.	120,000
84	Action 12.4.1	Identify urgent and priority applied research needs	20,000
85	Action 12.4.2	Support the implementation of urgent programs targeted applied research projects to address knowledge gap in terms of their priorities.	1,400,000

Action Area 6: Basin Management Plan

86	Action 13.1.1	Establish a unified political will of the politicians/decision makes on the establishment of Basin Management Plan.	30,000
87	Action 13.2.1	Establish institution responsible for development of river basin water master plan.	154,000
88	Action 13.3.1	Develop Basin Management Plans.	2,500,000
89	Action 13.3.2	Develop monitoring and evaluation tools for adaptive water management master plan.	127,000

Action Area 7: Gender Mainstreaming

90	Action 14.1.1	Establish a Gender desk/unit in Ministry of Land Water and Environment and all Regional Administration	55,000
91	Action 14.1.2	Review the existing regulations, operational guidelines, assessments criteria for project proposal, project assessments, standards and specification, action plans and incorporate action that help to achieve gender equality and ensure efficiency and sustainability	22,000
92	Action 14.1.3	Undertake capacity building targeting women at the grass root level that enhance the participation of women in a meaningful way in the planning, implementation, and operation and maintenance of water resources, water supply, sanitation and hygiene programs.	130,000
93	Action 14.2.1	Undertake gender analysis that reveals the gender dimensions of water resources management and development problems.	44,000
94	Action 14.2.2	Provide training and education on gender mainstreaming in water resources management and development to increase the awareness of gender vis-à-vis water issues	44,000
95	Action 14.2.3	Provide gender training for planning and statistics units or department's staffs of water management, development and use institutes, CBOs, NUEWs, NUEYS and other relevant stakeholders.	41,000
		TOTAL ACTION PLAN COST	**19,776,000**

8.0 IMPLEMENTING THE ACTION PLAN

8.1 Required Institutional set up and Coordination

Proposed actions presented in "Action Area 4 – implementation and financial mechanism" are key steps to be followed as the IWRM implementation strategy. Following the endorsement of this action plan by all stakeholders and secured the required political commitment for implementation, it would be mandatory to establish or strengthen WRD and/or ERI-CWP which would have the following major responsibility to speed up the implementation process.

1) Develop quality project formulation proposals for priority projects that suites a range of donor requirements and organize donor consultation forum to speed up their implementation.
2) Coordinate and integrated all water sector institutions which are responsible for the implementation of their respective IWRM actions/programs and provide technical and logistical support as necessary.
3) Coordinate and facilitate awareness and education programs that support the creation of commitment for the successful implementation of IWRM action plan
4) Liaison water sector institution engaged in implementing the part of the action plan with international and national organization working on sustainable water resources development and/or similar IWRM action plan.
5) Implement actions which are within the scope of WRD and/or ERI-CWP.
6) Facilitate the mainstreaming of the action plan into the national and regional budgetary system by identify entry points and advising water sector institutions to streamline the proposed action.
7) Develop adaptive monitoring and evaluation procedure to follow up the IWRM action plan implementation and advise Department of Water resources of the Ministry of Land Water and Environment for action.

As it is clearly stated in the Logical Strategic Framework for Action Plan the responsibility for the implementation of the proposed priority actions/programs will be shared among the key water sector institutions within whose operational mandate the activities within the action plan are encompassed.

Securing commitment from these responsible water sector institutions can not be seen an easy task, therefore, Department of Water Resources and the ERI-CWP should allocate sufficient time and resources to fully integrate actions into the sector plan.

As part of the implementation strategy department of water resources jointly with key implementation responsible institute should revise the priority and categorize the action plans into phases as per the need and priority of the respective implementation bodies. Fore example most action plans which improve the nation knowledge on the water resources base and provide important enabling environment can be priority and start immediately with the available fund.

The action plan will need to be reviewed periodically. This will ensure that it remains coordinated with the proposed applied research outcomes on water resources management and development, as well as with designed monitoring, evaluation and adaptive management system. The action plan is to be

comprehensively reviewed after three to four years to ensure that the implementation of its actions are on track, and that longer-term actions are integrated into the national water resources management and development strategy.

8.2 Proposed Fund Raising Strategy

In the previous sections project portfolio/actions with their indicative costs are presented, implementation the necessary institutional set up and the required coordination are indicated as part of the implementation strategy. For successful and timely implementation of these priority IWRM action plans, developing fund raising strategy is another crucial implementation strategy that should be thought at the initial stage of the planning process. Developing a fund raising strategy for any project is a complicated task for which there is no guarantee of a successful out come. The set of prioritized actions provides a firm basis for cooperation with funding agencies. To speed up the implementation of the identified priority projects/actions the following funding strategy is recommended to be followed by the Water Resources Department, the ERI-CWP and other responsible implementing partners.

- Identify entry points to mainstream the identified short and long term priority action plans into the national and regional planning processes, development cooperation frameworks. For example like UNDAF.
- Identification of major funding sources that offer support for development projects in Eritrea and other least development projects. Once identified a mechanism would be proposed for communication and network establishment.
- Identify international groupings or initiatives that focus on trans boundary water issues, analysis their mission and vision and identify how this action plans could be relevant to those institutions and indicate ways of funding the priority project/actions
- Identify UN system mandates and focus area and establish linkage with the identified priority action areas for possible financing.
- Identify development partners who are involved or have close linkage with water resources, assessment and development. Using their overall mission and vision statements as a background try to linkage between their projects and the implementation of priority actions identified in this process.
- Propose a way how resources mobilization forum would be organized. This forum will accelerate the implementation of identified priority projects/actions of the main theme/action areas.

In general the fund raising strategy that is intended to be implemented by the responsible implementing and coordinating bodies should ensure that there is:

- Coordination of activities
- Popular participation and consultation
- A forum for discussion
- Partnership building
- Efficiency and transparency
- Commitment by government, communities and development partners
- Project/action targets with clear benefit
- Fundraising body or unit or officer who will implement fundraising activity.

8.3 Terms and Conditions to Implement the Action Plan

There are some issues that should be taken care as a condition for successful implementation of the IWRM action plans.

8.3.1 Political commitment

The existing culture, tradition and way of doing water resources management, development and use is quite different from what the proposed IWRM concept and therefore, a continuous and conscious actions focused on building political commitment starting from the beginning of the implementation of the action plan is crucial. The political commitment can be achieved through a continuous awareness program and the need for change among the highest political decision-makers, managers, practitioners and other stakeholders.

8.3.2 Coordination of Institutions

The project will be implemented mainly within the framework of Ministry of Land Water and Environment and Regional Administrations which are really the responsible implementing bodies for most of the actions/project portfolios identifies to support IWRM in Eritrea. Despite their leading effort all actions/project portfolios can only implemented with support and for some of them with the lead effort of all other government institutions identified as implementing body and involved either in the development and use of water resources of the nation.

Therefore, for smooth implementation of the action and its success securing the commitment of all high level decision makers of the implementing partners, avoiding ambiguities of duties and responsibilities of institution and raising the awareness level of decision makers on the importance of IWRM for the sustainable development of the nation are critical conditions.

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