



**THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**  
**MINISTRY OF WATER RESOURCES**

# **ETHIOPIAN WATER SECTOR STRATEGY**

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## LIST OF ABBREVIATIONS

ADLI	=	Agricultural Development Led Industrialization
BOD	=	Board of Directors
CSA	=	Central Statistical Authority
EEPCO	=	Ethiopian Electric Power Corporation
EIA	=	Environment Impact Assessment
ESTC	=	Ethiopian Science and Technology Commission
ETH	=	Ethiopia
EWRIC	=	Ethiopian Water Resources Information Center
GDP	=	Gross Domestic Product
GWH	=	Gegawatt Per Hour
HPD	=	Hydropower Development
KWH	=	Kilowatt Per Hour
MoH	=	Ministry of Health
MoWR	=	Ministry of Water Resources
NGOs	=	Non Government Organizations
NWRRC	=	National Water Resources Research Center
O&M	=	Operation and maintenance
R&D	=	Research and Development
UNDESA	=	United Nations Department of Economic and Social Affairs
UNDP	=	United Nations Development Programme
WSS	=	Water Supply and Sanitation
WUA	=	Water Users Associations

# NATIONAL WATER STRATEGY OF ETHIOPIA

## 1. BACKGROUND OF THE STRATEGY

Historically, a number of factors have affected the development and management of water sector in Ethiopia. These issues are discussed in detail in a recent review of the water sector carried out by the Ministry of Water Resources (MoWR), and summarised in Section 3 below. In order to address these issues, the MoWR is pursuing a three-prong sector reform agenda in the water sector with an aim to secure basis for sustainable development and management of country's water resources. One important element of this agenda is the formulation of national water strategy. The main objective of the water strategy is to translate the national water resources management policy into action. For ready reference, the goals and objectives of the national water management policy are reproduced below. In other words, the national water strategy aims at providing a road map in terms of ways and means to attain the water policy objectives--with due recognition to the principles around which these objectives have been developed.

The overall goal of the national water resources management policy is: *to enhance and promote all national efforts towards the efficient, equitable, and optimum utilisation of the available water resources of Ethiopia for significant socio-economic development on sustainable basis.* To realise this goal, the Government has spelled out a wide range of policies to achieve the following five major water management policy objectives.

- Development of the water resources of the country for economic and social benefits of the people, on equitable and sustainable basis.
- Allocation and apportionment of water resources based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource.
- Managing and combating drought as well as other associated slow on-set disasters through, *inter-alia*, efficient allocation, redistribution, transfer, storage, and efficient use of water resources.
- Combating and regulating floods through sustainable mitigation, prevention, rehabilitation and other practical measures.
- Conserving, protecting and enhancing water resources and the overall aquatic environment on sustainable basis.

The term strategy is defined in many ways, depending upon who is using the term and for what purpose. Within the context of development planning jargon, it is usually defined as means of translating the policy into action. In other words, it is not a self-contained objective or policy. Instead, it provides the framework that contains ways and means for attaining the given objectives. Since the purpose here is to translate the national water management policy into action, it may be defined as a set of short, medium and long-term action programs to realise the achievement of development goals and water-related policies. This definition is also consistent with that adapted by the Government in the preparation of economic development strategy.

## **2. OBJECTIVES OF THE NATIONAL WATER STRATEGY**

As mentioned earlier, the principal objective of the water resources strategy is to translate the national water resources management policy into action. More specifically, this strategy sets the road map as how to make meaningful contributions towards:

- Improving the living standard and general socio-economic well being of the Ethiopian people.
- Realising food self-sufficiency and food security in the country.
- Extending water supply and sanitation coverage to large segments of the society, thus achieving improved environmental health conditions.
- Generating additional hydro-power.
- Enhancing the contribution of water resources in attaining national development priorities.
- Promoting the principles of integrated water resources management.

By doing so, the strategy will be able to make meaningful contributions towards achieving a broader national development objectives of poverty alleviation and sustainable human resources development. Pursuance of these objectives make the water strategy compatible with the national economic development strategy.

More specifically, the objective of the water supply and sanitation sub-sector strategy is to develop viable and implementable guidelines that promote the sustainable, efficient, effective, reliable, affordable and user-acceptable development of water supply and sanitation services, including livestock watering, in Ethiopia.

## **3. GUIDING PRINCIPLES**

Fundamental principles pertaining to the formulation of national water strategy remain the same as those were adapted for the preparation of national water resources management policy. These principles, as driven by the policy statements, are reproduced below for ready reference:

- Water is a natural endowment commonly owned by all the people of Ethiopia.
- As far as conditions permit, every Ethiopian citizen shall have access to sufficient water of acceptable quality to satisfy basic human needs.
- In order to significantly contribute to development, water will be recognised both as an economic and social good.
- Water resources development shall be underpinned on rural-centred, decentralised management, participatory approach as well as integrated framework.
- Management of water resources shall ensure social equity, economic efficiency, systems' reliability and sustainability norms.
- Promotion of the participation and community management of all stakeholders and user communities, particularly women's participation in the relevant aspects of water resources management.

## **4. THE WATER STRATEGY**

### **4.1 GENERAL WATER RESOURCES STRATEGIES**

The overall goal of the Water Resources Strategy is to enhance and promote all national efforts towards the efficient, equitable and optimum utilisation of the available water resources of Ethiopia for significant socio-economic development on a sustainable basis. Towards this

aim, the following strategic directions will be adapted with respect to main elements of the strategy.

#### **4.1.1 Water Resource Development**

Water resources development and utilisation will be integrated with Ethiopia's overall socio-economic development objectives, and guided by those objectives at the federal and regional levels of the government. Alternative options for water resources development will be systematically evaluated, giving full consideration to the alternative supply and demand options. In this regard, the following actions will be undertaken.

1. Undertake assessment and development of the country's surface water resources:
  - (a) Make inventory of the available surface water in the country both in quantity and quality.
  - (b) Apply suitable methodologies to assess the available surface water resources both in time and space.
  - (c) Develop strategic mechanisms for sustainable development and utilisation of surface water in all water using sectors.
2. Develop ground water resources and ensure its optimal utilisation for different water uses. The spatial and temporal occurrence and distribution of the country's ground water resources will be identified and its utilisation for the different water uses ensured. The exploitation of ground water will be based on abstraction of the maximum amount equal to the sustainable yield. Regulatory norms will be developed and enforced for sustainable development of groundwater resources.
  - (a) Develop a system for regular monitoring of ground water levels, discharge and pumping for all uses.
  - (b) Undertake inventory of existing water wells with their complete information with respect to type of wells, withdrawals and usage; and establish system to continuously update this inventory.
  - (c) Carry out ground water investigations and geophysical surveys. Based on the results, undertake hydrogeological mapping and exploratory drilling.
  - (d) Assess ground water potential of the country at basin level.
  - (e) Identify different uses for which ground water in a given basin can be utilised and will be used.
  - (f) Foster and encourage conjunctive use of ground water and surface water to maximise benefits from water use.
  - (g) Establish and enforce regulatory norms, standards and general guidelines for sustainable development and management of ground water.
  - (h) Assign priority to drought-prone and water-scarcity areas while undertaking ground water investigations.
3. Make effective and optimum use of available water resources by giving priority to multipurpose water resources development projects.
  - (a) Identify water resources projects with more search for multipurpose projects.
  - (b) Recognise that multipurpose projects are economically more viable than single purpose since increase in costs is often not proportional to increase in benefits.
  - (c) Make maximum use of available water resources by developing and implementing multipurpose projects.
4. Follow the integrated approach rather than the fragmented approach for water resources development.

- (a) Conduct preliminary investigations of the whole river basin leading to a broad idea of what kind of basin development program seems technically possible.
  - (b) On the basis of the preliminary investigations, if satisfactory, proceed with a more detailed survey of existing conditions and potential development of the basin.
  - (c) Conduct integrated development master plan studies.
5. Strengthen and expand hydrological and hydro-meteorological activities for attaining long-term reliable records for safe, effective and sustainable water resources development.
- (a) Assess and evaluate the state of existing hydrological and meteorological network, stations, data compilation, and operation.
  - (b) Rehabilitate and update the existing stations; and expand the monitoring network to bridge the gaps.
  - (c) Install key stream gauging stations at points of border crossings of trans-boundary rivers, and at the sites of high priority water projects.
  - (d) Standardise observation methods, instruments, and procedures for data compilation, processing and analysis.
  - (e) Produce hydrological and hydro-meteorological bulletin on yearly basis and make it available to users.
  - (f) Modernise collection, classification and storage and processing of hydrological and hydro-meteorological data.
6. Update and take follow-up actions on completed Integrated River Basin Development Master Plans (Gibie-Omo, Baro-Akobo, Abbay, Tekezie, Mereb), and prepare master plans for the remaining river basins (Wabi Shebelle, Awash, Genale-Dawa, Rift Valley Region, Aysha, Ogaden, etc).
- (a) Treat each basin as a whole for the purpose of its development and master plan studies, and not project by project.
  - (b) Strengthen the management of established databases and, where appropriate, bridge information gaps.
  - (c) Undertake periodic review and update of the Master Plans; once every five years for updating and once every ten years for complete review.
  - (d) Take necessary steps to implement the projects proposed in the master plan studies.
  - (e) Continue without interruption the operations of the hydrological and meteorological stations located at strategic sites and at the sites of high priority projects.
  - (f) Prepare "National Water Master Plan" on the basis of River Basin Plans.
7. Harvest rainwater through the construction of small check dams to meet domestic water supply and irrigation needs at the local level. This has proven to be the most sustainable and cost effective technology that could be planned, implemented and managed with the involvement of local communities.
8. Reclaim existing wetlands, and prevent the formation of the new ones by using appropriate mechanisms.
- (a) Undertake the inventory of existing wetlands.
  - (b) Develop preventive mechanisms to avoid formation of waterlogged areas.
  - (c) Develop guidelines as how to reclaim wetlands, and enforce these guidelines.
  - (d) Carry out appropriate drainage works on all wetlands.
9. Enhance and promote water transport, both passenger and cargo, on sustainable basis over rivers, lakes and reservoirs in the country.
- (a) Undertake surveys on the extent of existing facilities and on the future needs for improvement and development.

- (b) Explore and develop the potential of rivers, natural and man-made lakes in the country to contribute to the transport infrastructure of the country.
  - (c) Ensure that the development of inland water transport is in line with the overall transport policy of the country.
  - (d) Foster and develop appropriate technology in matters relating to channel clearance and maintenance of waterways.
  - (e) Conduct hydrographic surveys for river reaches, natural and man-made lakes for production of navigation charts, installation and improvements of buoys, shore signals, optical signals, etc.
10. Undertake proper assessment, preservation and enrichment of aquatic resources in rivers and lakes; and incorporate aquatic resources development in large scale water resources master plan studies.
- (a) Conduct surveys to assess the existing state of aquatic resources development.
  - (b) Take actions to develop and maintain the potential of aquaculture.
  - (c) Enhance development of capture fisheries in existing and future reservoirs.
  - (d) Install fish breeding stations in the reservoirs to enhance fish production.
  - (e) Investigate and develop rain water harvesting options in areas where there is scarcity of water resources for enrichment of aquatic resources.
11. Include the development of tourism and recreation resources associated with water in all water resources development master plan studies.
- (a) Ensure inclusion of tourist attractions and recreational activities (such as hiking, camping, boating, fishing, swimming and other water sports etc) in the design of major water projects where large reservoirs are involved.
  - (b) Safeguard the scenic value of water in all water projects, where appropriate.

#### **4.1.2 Water Resources Management**

Water allocation for drinking and sanitation purposes will hold the highest priority followed by water requirements for livestock in any water allocation plan. Rest will be allocated to the uses yielding highest socio-economic benefits. This principle will be agreed upon for a fixed time horizon that best fits the socio-economic development plans of the country, and will be subject to appraisals and adjustments in the light of changing conditions and new developments. The water allocation plans will be developed taking into consideration basin, sub-basin and other hydrological boundaries, with due consideration to the needs of drought prone areas. Appropriate watershed management practices will be used to maximise water yields and quality. Protection of water quality will be secured.

1. Ensure that water allocation is based on efficient use of water resources; takes into account special consideration of the needs of drought-prone and water-scarce areas; and gives the highest priority to water supply and sanitation.
  - (a) Develop and implement criteria to allocate water among different uses, and prepare water allocation procedures and guidelines.
  - (b) Give special consideration to drought-prone areas--consider transfer of water from water-surplus to water deficit areas.
  - (c) Devise and implement demand management measures to improve the water use efficiency in all water using sectors.
2. Promote appropriate watershed management practices to promote water conservation, maximise water yields, improve water quality, and reduce reservoir siltation.

- (a) Undertake soil and water conservation measures such as the check dams, contour bunding contour ploughing, terracing, etc. to reduce soil erosion and reservoir siltation. Enhance the infiltration of water into the soil through development and implementation of afforestation and terracing programs.
  - (b) Rehabilitate degraded watersheds and regenerate natural vegetation.
  - (c) Establish soil and water conservation guidelines in relation to water resources development and ecosystem management .
  - (d) Encourage and promote local community participation in watershed management and water conservation measures and practices.
3. Co-ordinate the development and enforcement of appropriate mechanisms and standards to protect national water resources from pollution.
- (a) Conduct a systematic study to determine the extent of pollution of rivers flowing through cities from industrial waste; sewage and other pollutants.
  - (b) Identify sources of pollution and their characteristics, in type, volume, quality and frequency; and prescribe measures and mechanisms to minimize pollution effects.
  - (c) Ensure that industrial wastes or effluents are not dumped into water bodies without necessary and adequate treatment.
  - (d) Set monitoring and control procedures, which are attainable, realistic, and enforceable.
  - (e) Establish national standards of water quality in consultations with relevant institutions.
  - (f) Introduce strong planning and regulatory framework to safeguard water quality protection. In this regard, develop legislative means to prevent indiscriminate discharges of toxic materials into water bodies and follow-up the enforcement.
  - (g) Utilise natural self purifying process of streams wherever possible.
4. Develop a coherent, efficient and streamlined process of information management in the water sector.
- (a) Develop databases on all aspects of water resources, such as surface water, ground water, hydrology, meteorology, wells, boreholes, springs, water works, etc.
  - (b) Review and assess available water resources data and information at all levels, and identify water resources information gaps.
  - (c) Identify sources of water information, and initiate a program for data collection to bridge these gaps.
  - (d) Design database structure to facilitate entry, storage, retrieval, review, analysis and dissemination of collected water data.
  - (e) Identify and define information requirements of users.
  - (f) Develop guidelines on the dissemination of water resources information to enhance information networking.
  - (g) Establish/strengthen Ethiopian Water Resources Information Centre (EWRIC) within the Ministry of Water Resources with adequate facilities and professional staff.
  - (h) Establish interface between federal database and regional databases.

### **4.1.3 The Enabling Environment**

In order to strengthen the institutional framework, appropriate linkage mechanisms will be planned and implemented to secure co-ordination of water resources development and management activities between the federal and regional governments. In view of installing decentralised management, the participation of user communities will be fostered by establishing the appropriate institutional framework at the lowest administrative structure. Relevant stakeholders will be encouraged to engage in joint management of basin authorities. Main elements of the strategy on enabling environment will be as follows.

1. Establish effective institutions to secure sound institutional basis for sustainable development and management of water resources.
  - (a) Establish appropriate and effective river basin management institutions.
  - (b) Establish autonomous or semi-autonomous utility agencies or companies in big towns.
  - (c) Promote local artisans and the private sector to establish association for proper and sustainable O&M activities.
  - (d) Promote the creation of Water Users Association (WUA) and Irrigation Agencies, where appropriate.
  - (e) Encourage the establishment of water committees at woreda, zonal, kebele and water scheme levels.
  - (f) Decentralise the water services, to the extent possible, to financially autonomous utilities and institutions, which may be public corporations, private firms, co-operatives or user groups.
  
2. Develop and implement capacity building programs at all levels (federal, regional, zonal, woreda, private sector and grass root level) on the relevant areas of water resources management. Following actions form the main elements of the capacity building strategy.
  - (a) Assess technical capacity gaps; develop and implement training programs to bridge these gaps. Strengthen technical capacities of all stakeholders (public institutions, private sector, local communities etc.) in subjects such as: resource evaluation, resource management, resource monitoring, water management analysis, planning and design of schemes, O&M of schemes, contracts administration, financial management, information management, and monitoring systems etc.
  - (b) Provide means for high level professional and sub-professional manpower training locally and abroad, and encourage training of community promoters.
  - (c) Enhance skilled and craftsman manpower training in all fields of water resources.
  - (d) Strengthen higher institutions like Addis Ababa University, Arba Minch Water Technology Institute and other universities and colleges in carrying out more training in various fields of water resources.
  - (e) Promote and encourage on-the-job training; training-by-rotation; short-term training and study tours; workshops and seminars, etc in different fields of water resources.
  - (f) Attract and retain able and experienced professionals and sub-professionals by providing incentives and conducive working environment.
  - (g) Provide essential equipment, instruments, tools, and other required facilities for water schemes, as well as equip laboratory facilities with precision instruments.
  - (h) Establish a training centre in the water sector
  
3. Formulate appropriate and essential water legislation required to expedite water resources development and management.
  - (a) Review existing legislation in order to improve and streamline its scope to cover aspects pertaining to all surface and ground water resources; protection of quality as well as quantity; pollution prevention; penalties for undesirable effluent discharge, etc.
  - (b) Develop and enact suitable legislation that will provide an enabling framework for sustainable and effective water resources development and management.
  - (c) Provide legal basis for the participation of all stakeholders, including water users' associations, the community, particularly women, so they may play the central role in water resources management activities.
  - (d) Strengthen enforcement capacities to ensure that the enacted legislation is put in practice.

#### 4.1.4 Trans-boundary Waters

Trans-boundary waters will be managed in compliance with the international covenants adopted by Ethiopia, allowing Ethiopia to ascertain its entitlement and use of these waters. Efforts will continue to promote fair regional co-operation on the efficient use of trans-boundary waters with the riparian countries.

1. Develop projects on trans-boundary waters that are in the best national interest of Ethiopia, and are consistent with the international covenants adapted by the Nile Basin member states.
  - (a) Develop and implement projects that can be undertaken unilaterally.
  - (b) Develop and implement projects that falls within the framework of Eastern Nile Subsidiary Action Programme at sub-regional and national levels.
  - (c) Participate in basin wide development initiatives along with other basin countries.
2. Assess and update every 3 years the state of water affairs of trans-boundary rivers.
  - (a) Install automatic recorders and measuring facilities (such as cable ways) at the stream gaging stations; and operate without interruptions at the points of border crossings of trans-boundary rivers.
  - (b) Carry out stream flow and sediment flow measurements, as frequently as possible during the year, with particular attention to high flows.
  - (c) Take water samples during flow measurements for water quality analysis.
  - (d) Determine the availability of water and sediment volume of each trans-boundary river on regular basis.
3. Assess and update every 5 years the demand for water of development projects in each of the trans-boundary rivers with particular emphasis on high priority projects. Estimate water supply-demand balance for each river. If demand is excess of available resources, undertake inter-basin transfers and implement demand management measures to bridge the demand gap.
4. Identify common development projects that can be developed jointly with other riparian countries on equitable basis, paying special attention to Ethiopia's interest. Towards this aim, give priority to multipurpose projects such as irrigation and hydropower, recognising that joint development of hydropower project alone is of less advantage to Ethiopia, since it regulates the flow for downstream countries, and it traps sediment giving longer life to downstream dams and reservoirs at the expense of Ethiopia's water structures.
4. Develop and enhance capacity in trans-boundary negotiations and conflict resolution.
  - (a) Actively participate in the Nile Basin Initiative.
  - (b) Assess and identify trans-boundary issues that require co-operation, and develop strategies to address these issues.
  - (c) Establish a National Consultative Group on trans-boundary issues.
  - (d) Raise public awareness about trans-boundary issues.

#### 4.1.5 Finance and Economics

1. Treat water resources as a unitary resource requiring coherent planning for its effective use and management in order to reflect its economic value. Privatisation of utility services and increased user involvement will be promoted.

2. All external support agencies, the government and the private sector will be called upon to include in their budgets for water programs, provisions for water conservation and protection, operation and maintenance, rehabilitation and replacement costs, training and human resources development, adequate information and documentation as well as other mechanisms necessary to ensure the sustainability of the systems. Provision of credit services will be encouraged for water resources development activities.
3. Promote and ensure that tariff setting is site specific, and will depend on the project specifics, location, the users, the cost and other characteristics of the schemes (such as the level of technology chosen), using fairness and transparency. Water will be recognised as an economic and social good; and it will be ensured that fees paid are for services rendered; and a reasonable and fair charge for use of water will be applied.
  - (a) Develop and implement water pricing measures that leads, stage by stage, to full cost recovery based upon user's payment capacities and by giving due consideration to appropriate technologies.
  - (b) Promote that capital costs of water projects for the poor communities are borne by the government provided the communities pay for the O&M of the water schemes. Provide subsidies to aid the poor; rectify price inequalities and encourage service expansion.
4. Ensure the proper utilisation of funds and other resources obtained from different external and internal sources. Establish and promote the use of "Water Fund" for financing water projects. Ensure that national commitments are in place for financing of water projects that involve "consumptive use" of water.

#### **4.1.6 Research and Development**

1. Evaluate the existing state of R&D activities in the water sector with an objective to identify and categorise pressing and critical problems in water resources that need possible solutions by undertaking R&D activities.
 

Collect, study, assess and evaluate all existing information on R&D activities in the water sector.

  - (a) Identify R&D gaps in the water sector and undertake studies to bridge these gaps.
  - (b) Take steps to disseminate R&D results to the beneficiaries.
2. Develop institutional framework to promote R&D activities at different levels, and create conducive environment for carrying out R&D activities.
  - (a) Co-ordinate all R&D activities in water resources being carried out in the institutions of higher learning.
  - (c) Establish linkages with the international R&D institutions and networks.
  - (b) Strengthen the participation of the water sector in the Water, Mines, Energy, and Geo-Information Research Council of ESTC.
  - (c) Establish "National Water Resources Research Centre" (NWRRC) in the water sector with adequate facilities and professional staff.

#### **4.1.7 Stakeholders Participation**

1. Stakeholders at each level in the water resources will be consulted and their participation in decision-making will be secured. Attention will be given to the disadvantaged groups, especially women, who normally have little say in water management and planning.
  - (a) Promote and enhance the participatory approach in project identification, planning, implementation, operation and maintenance of water resources projects.

- (b) Involve all stakeholders as partners in decision-making in water resources projects from inception to completion.
  - (c) Enhance and encourage the devolution of management responsibilities to the lowest appropriate level in water schemes.
  - (d) Establish mechanisms for stakeholder involvement such as, water committees, water boards, water users associations, professional and civic associations.
2. Promote building and strengthening of partnerships between community-government-private sector-external support agencies by creating fora for discussions and consultations amongst the stakeholders.

#### **4.1.8 Gender Mainstreaming**

1. Secure gender mainstreaming in all aspects of water resources planning, development and management.
  - (a) Pay special attention to the role of women while establishing community based structures for the management of localized WSS and small scale irrigation systems. Allocate specific number of seats for women in these community based structure, depending upon the nature and size of the scheme.
  - (b) Enhance the active involvement of women for the success of water projects and programs; and for the sustainable services of water schemes. Launch campaigns to encourage women to contribute in improved management of water schemes
  - (c) Take steps to relieve women from the huge burden of fetching and carrying water for the family by empowering them in decision-making in water projects.
2. Take special measures to reduce the vulnerability of women to the environmental health risks stemming from inadequate WSS facilities. Contribute to the holistic well being of the community by educating women in water-environment-health issues.
3. Design and implement special training programs to strengthen the technical capacities of women in O&M of WSS and small scale irrigation schemes, as well as in management and monitoring of the water systems etc. Promote conditions that will enable women to assume increasing managerial responsibilities in water sector institutions.
4. Reorient research and development efforts to better understand the constraints that restrict women in playing lead role in the management of localized water systems, and devise appropriate measures to address those constraints.

#### **4.1.9 Disasters and Public Safety**

Co-ordinated efforts in terms of water resources development and management will be made to overcome flood related disasters and combat drought and desertification. Such measures will include the safety of water retaining, transmission and diversion structures like weirs, barrages, dams, reservoirs, pipelines, against natural and man-made disasters.

1. Develop and implement comprehensive plan of action to address flood related disasters.
  - (a) Undertake frequent and systematic forecasting of floods, and install automatic stage recorders at the strategic sites on the flood-prone areas to record flood levels. Estimate flood sizes, in particular peak floods.
  - (b) Determine flood characteristics of the area, and issue timely flood warnings.
  - (c) Establish flood-plain zoning.

- (d) Determine the possible methods of flood protection for given site specific conditions; and select the appropriate sites for disaster prevention actions.
  - (e) Undertake appropriate flood control structural measures (levees, floodwalls, channel improvements, flood ways, etc) in flood-affected areas.
  - (f) Ensure timely and regular maintenance of flood control structures.
2. Combat the droughts that claim the appalling loss of human life and livestock and deteriorate the environment.
    - (a) Undertake a study of history of droughts and damages in the country with an objective to guide water resources development in the drought prone areas.
    - (b) Explore options for possible transfer of water from water surplus regions to drought-prone or water deficit areas.
    - (c) Intensify ground water exploration; formulate a comprehensive program for the selection of wells, boreholes, stock ponds, sub-surface dams etc in the drought-affected areas.
    - (d) Ensure the proper maintenance of existing wells, ponds, sub-surface dams and the new schemes with active participation of local communities.
    - (e) Avoid congested distribution of water points and cattle troughs to reduce desertification.
    - (f) Develop and implement schemes that encourage voluntary resettlement of people from water-scarce areas to water surplus areas.
    - (g) Plan ahead of time for combating droughts rather going into crisis management of droughts and their effects.
  3. Ensure the safety of water structures and carry out periodic safety checks.
    - (a) Use as far as possible long-term hydrological record and carefully correlated data while undertaking the design of water structures.
    - (b) Take special care in the design of water structures on soft and difficult foundations; apply sound construction methods and use appropriate construction materials.
    - (c) Provide corrective measures at the lowest practical cost while retaining project and environmental benefits.
    - (d) Apply state-of- the art design standards and construction practices.
    - (e) Carry out periodic safety checks, at least once in three years, on existing water systems.
    - (f) Establish and implement safety regulations for major water structures. Preserve the structural safety of these structures through regular checks and O&M, including allowance for earthquake affects.

#### **4.1.10 Environment and Health Standards**

Environment conservation and protection will be treated as an integral part of the water related projects. Towards this aim, Environmental Impact Assessments will be made mandatory for all water resources projects. Standards and classification systems will be established in conjunction with the various water uses in terms of quality and quantity including limits and ranges for desirable and permissible levels, waste discharges, source development, catchment management, etc.

1. Incorporate environmental studies as a component of the studies to be carried out for water resources development projects.
  - (a) Develop suitable procedures and approaches to evaluate the environmental impact of water projects in both the qualitative and quantitative terms. Undertake environmental studies both before and after the implementation of water project.

- (b) Prevent indiscriminate discharges of industrial effluents into water courses without adequate treatment; and issue regulations to enforce them.
  - (c) Investigate the possibilities of the spread of water borne diseases as a result of large-scale water projects during the project formulation stage, and take necessary remedial actions during the implementation phase.
  - (d) Establish safe limits for the location of sanitary landfill sites in the vicinity of wells, bore holes, and dams; and issue regulations to enforce them.
2. Adopt Environmental Impact Assessment (EIA) to serve as part of the major criteria in the evaluation and selection water resources development projects.
- (a) Analyse the effects of water withdrawals from the surface or ground water sources on local economies and the environment. Assess the impacts and indicate the mitigation measures.
  - (b) Determine the reliability and sustainability of water source, particularly in drought conditions in water-scarce areas.
  - (c) Assess the impact of disposal systems on local water sources, when the disposal system discharge to the nearest watercourses such as a stream, river or lake (e.g. Akaki river, Tana lake, Awassa lake, etc.)
  - (d) Assess treatment proposals, effluent quality and quantity, in particular from industries; and the probable impact on the receiving water.
  - (e) Reduce adverse impacts and increase positive impacts through better project design and operation.
  - (f) Ensure that any proposed introduction of exotic species into water ecosystems be subject to detailed ecological studies and environmental impact assessment.
  - (g) Adopt affordable treatment process like cultivated wetland wherever possible.

#### **4.1.11 Technology and Engineering**

Guidelines and criteria will be developed for overseeing professional certification, renewal of trades permit, consultancy and contracting services as well as for inspection, preventive, routine and curative maintenance services, for technology selection, training of technicians and to develop the network for maintenance of water systems.

1. Develop selection criteria for water technologies suitable for different set of technical and economic conditions. Distinguish between “suitable” and “unsuitable” technologies after inventorying various water technologies being used in the country. Promote and encourage the use of labour-intensive technologies in the construction and maintenance of water projects.
2. Promote development of indigenous technologies by using local experience and raw material; develop practical ways and means for successful transfer, adaptation and assimilation of imported technologies to the local circumstances; and promote local manufacturing of appropriate materials, equipment and facilities for water resources development.
3. Formulate and adapt national guidelines, standards and criteria for planning, study, design, construction, supervision, operation and maintenance for water resources development and management undertakings. In this context, establish a standing committee of technical professionals from government and private organisations, expert-individuals, etc. who have the expertise to assess the existing standards and design of water projects.

4. Promote the establishment of integrated operation and maintenance system so that water projects could provide reliable and sustainable services. In this context, encourage the direct involvement of local communities in O&M activities; recognise that deferred maintenance is more expensive than the regular maintenance; develop guidelines and procedures for undertaking inspection, preventive, routine and major maintenance and operation of water schemes; and develop monitoring mechanisms for O&M.
5. Establish and develop, as appropriate, suitable criteria and guidelines for the evaluation of professional services; and create a conducive environment for professional practices. Towards this aim, enhance and encourage issuing professional certification, permits, and licences for consultancy and contracting activities, and encourage participation of local consultants and firms in water resources projects by creating appropriate incentive systems.
6. Establish a professional society under the name of “Ethiopian Water Resources Association”; develop its mandate and mission statement; promote its membership; and take necessary steps for publishing a professional journal under the auspices of the association.

## 4.2 HYDRPOWER DEVELOPMENT STRATEGY

### Preamble

Ethiopia has a significant hydropower potential. According to recent studies, the estimated hydropower potential amounts to 160,000 GWh/year. Industries and households account for 77% of the national hydroelectricity consumption. Although the low levels of demand for electricity results largely from the low level of development of consumer sectors, recent analysis indicates that demand has outstripped the supply capacity of the hydropower sector. The projected forecast calls for tripling the present generation capacity by year 2016 to meet local market requisites alone, not withstanding impending demands for power exports to neighbouring countries. The energy policy of Ethiopia duly recognises the relative advantage that Ethiopia has in terms of hydropower resources. Consequently, the policy accords high priority to hydropower resources development to meet the long-term socio-economic development goals of the country.

### Objectives

The principal objective of the hydropower development strategy is to guide the development of potential hydropower resources as permissible by economic feasibility, and by social and environmental constraints, to meet the present and future domestic demand and, if possible, to generate additional hydropower to cater for the demand of neighboring external markets.

### Main Elements of the Hydropower Strategy

#### Technical and Engineering Aspects

1. Promote and adapt hydropower development technologies that encourage local level manufacturing of hydro mechanical equipment and spare parts, create employment opportunities, and ensure technological self-reliance on sustainable basis.
2. Establish hydrological, topographical (surveying and mapping), socio-economic, and environmental database for each of the candidate sites to facilitate subsequent feasibility studies and analysis. Continue updating the database until the feasibility studies have been carried out and beyond. For instance, carry out one feasibility study per year for medium scale hydropower plants to ensure that an adequate number of HPD candidate sites would be studied for development by the year 2015.
3. Ensure that an adequate number of HPD candidate sites (small, medium and large) are studied over the planning horizon on a systematic basis so that implementation of feasible schemes is not delayed when financing becomes available.
4. Issue guidelines with respect to approval criteria for hydropower development studies, design, construction, operation and de-commissioning, ensuring that interests of all stakeholders will be met to the extent possible.
5. Consider hydropower development as an integral part of the multi-purpose development projects to achieve cost reductions in per unit of output produced.
6. Negotiate with the neighbouring countries possibilities and arrangements for exporting electricity.

7. Ensure through regular monitoring that standards for the study, construction, operation and decommissioning phases are strictly met.
8. Monitor electrification levels, electrification needs and electrification means in demand centres in the various regions as a *pre-requisite* for developing small hydro schemes for electricity supply to small urban centres and rural areas.
9. Prepare inventories of the complete hydropower potential of the country, and identify the site specific conditions that should be put into place to exploit this potential. Take measures to create those conditions.
10. Define the size and scope of small hydro schemes for each region based on their respective existing and projected capacities to undertake the tasks relevant to the design and implementation of these schemes.
11. Implement appropriate watershed management measures to ensure long life of hydro dams by minimising siltation of water ways and reservoirs. Consider terracing and reforestation of reservoir boundary belt. Involve local populations to sustain the impacts of watershed management measures.

#### Financial and Economic Aspects

1. Generate financial resources for future investments in the hydropower development by:
  - (a) rationalising the electricity tariff structure;
  - (b) exporting the locally produced electricity to neighbouring markets; and
  - (c) promoting conditions for the development of a diversified financial sector.
2. Reduce investment needs in the hydropower development by:
  - (a) using imported power--if it is cheaper as compared to the locally produced electricity;
  - (b) purchasing of power from the independent power producers who provide bulk-sale electricity to the public grid;
  - (c) rationalising domestic demand using efficient demand management measures;
  - (d) enhancing supply side efficiency by reducing distribution losses and leakage's;
  - (e) choosing appropriate schemes together with right timing for their commissioning; and
  - (f) encouraging local consultants and contractors in the design, implementation and management of hydropower schemes.
3. Identify and exploit economic opportunities in utilising cheap hydropower in various facets of agro-industrial, mining, metallurgical, transport and entertainment activities.

#### Institutional Aspects

Streamline co-operation among the institutional stakeholders both at the federal and regional levels by issuing a Decree redistributing the institutional responsibilities as per provisions made in Proclamations No:197/2000 and 41/1993. Reorganise the relevant federal and regional institutions to accommodate the provisions made in the Decree.

#### Capacity Building Aspects

1. Minimize reliance on foreign experts by strengthening technical capacities of the national staff using appropriate training modules. At the federal level, strengthen capacities in:
  - (a) study and design of medium and large scale hydropower development;

- (b) licensing of operators to undertake hydropower development projects; and
  - (c) supervision of construction and operation of hydraulic structures.
2. Strengthen technical capacities of the regional staff and institutions in planning of appropriate electricity supply means to rural demand centres; and supervision of the study and design, construction and operation of small-scale hydro schemes.
  3. Strengthen EEPCO's capacities in bid evaluation, contract negotiation and administration in HPD infrastructure works and power purchase agreements.
  4. Create conducive economic conditions and enabling environment to encourage private sector participation in hydropower development projects, ranging from their participation in carrying out technical studies and designs to local manufacturing of spare parts.
  5. Support and strengthen manufacturing capacities of private sector in hydro-mechanical equipment and spare parts to realise technological self reliance.

### 4.3 WATER SUPPLY AND SANITATION STRATEGY

#### **Preamble**

Provision of safe and sufficient water supply and adequate sanitation services are indispensable components in the sustainable development of Ethiopia's urban and rural socio-economic well-being. At present, most of the population does not have adequate and safe access to water supply and sanitation (WSS) facilities. As a result, over 70% of the contagious diseases in the country are water borne/based diseases. Source of most of these diseases could be traced back to inadequate WSS facilities. Providing access to clean and adequate WSS facilities and improving the performance of this subsector directly reduces the morbidity and mortality rates of the population. By the same token, it increases the productive capacity of the economically active population, who otherwise, under conditions of scarcity, compromise their health and have to pay disproportionately high prices for water, thus perpetuating the poverty cycle.

#### **Objectives**

The principal objective of the strategy is to secure basis for the provision of sustainable, efficient, reliable, affordable and users-acceptable WSS services to the Ethiopian people, including livestock watering, in line with the goals and objectives of relevant national and regional development policies.

#### **Main Elements of the Water Supply and Sanitation Strategy**

##### Technical and Engineering Aspects

1. Identify and promote the development of appropriate, efficient, effective, reliable and affordable WSS technologies which are demand driven and have great acceptability among the local communities. Facilitate local level decision making in choice of technology by presenting a comprehensive analysis and evaluation of available technological options to the local populations.
2. Develop national standards, specifications and design criteria which are rational, affordable, acceptable, implementable and sustainable for the design, installation, implementation, operation, maintenance and inspection of the WSS systems. These are to be based on internationally recognised norms and to be in conformity with the socio-economic, historical, geographical and cultural factors of Ethiopia.
3. Promote the use of sustainable and cost effective technologies such as the hand pumps to expand water supply coverage in rural communities. Use springs where available. Adopt economically affordable and appropriate waste-water treatment and management systems.
4. Develop appropriate procedures and standards to determine and evaluate water requirements, types of water sources and services that can be made available, and service levels to be achieved by taking into account parameters related to desirable levels, permissible limits, specifications, minimum and maximum levels, etc. Describe these procedures in the form of manuals for ease of application.
5. Develop standards for different types and levels of sanitation systems--including both on-site and off-site, non-water dependent and water dependent systems. Ensure application of

these standards in the design of future sanitation projects to sustain the functioning of these systems in relation to availability of water resources.

6. Formulate procedures and processes to carry out routine and specialised O&M activities for different types of WSS systems. Prepare manuals to facilitate and guide the implementation of these procedures.
7. Conduct studies and research on traditional WSS technologies (indigenous technology, culturally and socially acceptable) and alternative appropriate and low-cost WSS technologies (including: systems, equipment and materials) to promote the acceptability of most suitable technologies for given site specific conditions.
8. Develop and enforce standards and guidelines for maintaining water quality in all recognised water uses; eg., water supply (domestic, industrial, livestock, others etc.) and sewerage and sanitation.
9. Conduct studies on the water requirements of industries, both existing and planned (based on the future industrial development plans), by addressing among others, the water quality requirements, integrating industrial and other water uses in the national and regional water resources management plans. Monitor and supervise the development and use of industrial water supplies and ensure compliance with established standards; ensure that industries will be responsible to cover the water supply and waste water treatment costs.
10. Promote and encourage water conservation through regulatory and demand management measures in those existing systems where efficient utilisation of water is as feasible as development of a new schemes.

#### Financial and Economic Aspects

1. Consider water sector as important as other crucial sectors of the economy while making financial resource allocation decisions at the national level.
2. Establish financial management rules and feasible arrangements for resource allocation, cost-sharing and accessing funds for demand driven WSS systems. These rules and arrangements should define the roles and obligations of various partners (government, communities, private sector etc.) in the management of funds to improve transparency and accountability.
3. Ensure self-reliance, through the promotion of local self-financing of programs and projects, based on the overall socio-economic development conditions of local communities, and through appropriate incentive mechanisms. To this end, engage the participation of banks, private operators, micro financing institutions, national water fund, and rural credit services, etc.
4. Subsidise the capital costs only for communities that are unable to cover the cost of the basic services so as to ensure social equity; establish financial resource allocation criteria to access these subsidies based on local socio-economic factors, and implement phasing out mechanisms of such programs (to promote self-reliance).
5. Establish and implement cost-sharing arrangements to share the capital, O&M and capacity building costs between government, local communities, consumers, external support agencies and non-governmental organisations.

6. Promote the ‘user pays’ principle in accordance with the user’s willingness and ability to pay for the service, based on costs of services vis-à-vis given socio-economic conditions of the beneficiaries/users.
7. Establish criterion to access the financial resources from the government budget to expand the coverage of WSS services both in urban and rural areas. As a matter of principle, utilise the government resources to strengthen national capacities, to meet O&M expenditure, and to support the community based initiatives. Undertake infrastructure development and feasibility studies using the funds acquired from external sources.
8. Ensure transparency, fairness, responsibility and accountability in the utilisation and management of the WSS funds, namely through Community Water Committees (rural) and Consumers’ Councils (urban), and by conducting regular audits and inspections by community members who are not members of the water committees/councils. Establish line of responsibility and authority within these community-based structures. Institute good contracting arrangements to engage the consultants and private firms to perform planning, design, implementation and O&M tasks, and effectively administer these arrangements to ensure quality control.
9. Promote the development of site specific water tariffs based on financial, economic, and social equality considerations. Involve local communities in price setting to ensure that tariff structures are compatible with consumers ability to pay, with a view of providing sustainable services at affordable prices, and based on equitable and practical guidelines and cost-sharing criteria.
10. Set tariffs in rural areas with the aim of recovering operation and maintenance costs; while, in urban areas, aim at total cost recovery through time (which covers operation & maintenance costs, depreciation and debit servicing). Implement progressive tariff rates in the urban areas that are tied to consumption levels. Develop mechanisms to continuously update the pricing structure.
11. Promote rational subsidisation norms based on the severity of local problems, focusing on the direct beneficiaries and promoting localised initiatives as well as water use efficiency. Determine a ‘social tariff’ for poor communities which minimally covers operation and maintenance costs. Develop special flat rate tariffs for communal services like hand pumps and public stand posts. Consider providing support to cover “connection fee” in areas where it turns out to be beyond the reach of local communities.
12. Provide incentives to local stakeholders such as community groups, manufacturers, and consulting firms etc. in terms of concessions in import duties, tax rebates, subsidies, credit facilities and through other similar economic instruments to encourage their participation in the planning, design, implementation and management of WSS systems.

### Institutional Aspects

1. Reorganise and strengthen the role of public sector institutions in the provision of WSS services. Ensure that public institutions (at higher level decision making) are continuously engaged in the formulation and enforcement of policies, strategies, regulations, and legislation, as well as in development and implementation of information management systems and capacity building programs. On the other hand, assign more responsibilities to

the local level institutions concerning implementation, management, monitoring and supervision of WSS schemes, as well as to secure local level inter-sectoral co-ordination.

2. Improve the existing institutional framework for the management of WSS systems (including drainage and wastewater systems) at the federal, regional, zonal, woreda and kebele levels, and clearly define the relationships and interactions among these administrative layers. Establish new structures below the regional or zonal level, if not already in existence
3. Put in place a system to legalise the ownership of WSS systems. In this regard, promote decentralized management of these systems. In the case of urban systems, encourage the establishment of autonomous municipal institutions with authority to provide services using most efficient management modes. In the case of rural systems, institutionalize and regulate the role of local communities by:
  - (a) promoting the establishment of community based structures;
  - (b) facilitating these community in developing an interface with the local administrative structures; and
  - (c) defining the rules of engagement for service providers.
4. Develop guidelines, principles and norms for streamlining the interventions of external support agencies and NGOs. Secure effective collaboration amongst all the formal and informal stakeholders in the WSS subsector by undertaking the following actions:
  - (a) strengthen the role of the public sector in regulatory, supportive and facilitative aspects;
  - (b) promote private/informal sector involvement in consultancy, contracting, supply of spare parts, maintenance and operation as well as management of WSS (especially urban) services;
  - (c) involve religious and customary organisations in water source selection, public awareness and environmental education;
  - (d) involve NGOs in funding and in the actual implementation, operation and maintenance of WSS projects; and
  - (e) seek co-ordination with external support agencies to obtain financial and technical assistance in line with the government policies.
5. Develop and enforce appropriate management actions for water supply and sanitation services to achieve autonomy and commercial viability which recognise:
  - (a) the regulatory role of the government;
  - (b) the role of communities in decentralised management;
  - (c) the use of local skills and resources; and
  - (d) the involvement of private/informal sector entrepreneurs.
6. Equip water supply and sanitation organizations at all levels with the necessary facilities in terms manpower and equipment.
7. Develop appropriate institutional arrangements at the federal and regional levels to cater to the specific needs of livestock watering.

#### Capacity Building Aspects

1. Develop and implement a comprehensive and well coordinated training plan to strengthen the technical capacities of national professionals, both in formal and informal sectors, to

enable them to deal with different aspects of WSS systems. The training plan should support the mandates of the institution, and be in conformity with needs of the staff.

2. Develop suitable training programs to meet the capacity building needs emerging from continuously evolving role of government and communities in the regulation, facilitation, co-ordination, supervision and monitoring of WSS services.
3. Promote objective oriented training with special emphasis on trades-level training. Training programs should define purpose, type and level of training and should answer who is to be trained, who are the trainers, when, who provides the funds, where is the training to be conducted, etc.
4. Strengthen the capacity of water users associations (water committees/water councils) so that they may make independent informed choices, and remain and serve as a focal point in the WSS management structure which can ensure autonomous decentralised management of the WSS systems.
5. Establish viable public information management systems (including conventional, electronic and internet-based systems) that could be used to access and disseminate the technical information, documentation, and analysis of data on various aspects of WSS systems.

#### Social Aspects

1. Establish and legalise a process for the participation of all stakeholders (formal and informal) to ensure efficient management of WSS systems, and promote participatory, consultative and consensus building methodologies so as to enhance the involvement of users at different levels of decision making.
2. Launch public awareness campaigns to educate people about important WSS issues and related environmental health risks.
3. Pay special attention to the role of women while establishing community based structures for the management of localized WSS systems. Contribute to the holistic well being of the community by educating women in water-environment-health issues. Strengthen the role and technical capacities of women in O&M and management of WSS schemes.
4. Make it mandatory to include WSS services in future urban development plans, especially the housing schemes. Develop and enforce regulations to ensure that approval of future housing schemes or individual dwellings will be contingent upon the inclusion of WSS services in the housing plan.
5. Conduct studies on the traditional and customary livestock watering practices with an objective to provide closer access to water for pastoralists by providing livestock water supply to all regions, particularly the lowland areas. Develop standards and designs for source selection, provision of facilities and operation and maintenance of livestock water supply systems.
6. Examine alternative arrangements (different scheme designs) to provide water supply to pastoralists which may enable grazing of the land, but should not promote over-grazing.

## Environmental Aspects

1. Define parameters for the definition of access to safe and adequate water supply. Conduct sound water quality analysis before construction of WSS schemes to ensure that the water is potable.
2. Protect water bodies from pollution by industrial wastewater and other wastes through strong enforcement of legislative measures so that people have access to safe drinking water.
3. Integrate and co-ordinate the development of industrial water supply and waste water treatment with other water sector development objectives including, irrigation, hydro-power, etc. Recycle wastewater when it has been found to be safe for health and the environment.
4. Promote improvement of environmental sanitation in urban centres and rural areas and protect water bodies from being polluted and contaminated.

## 4.4 IRRIGATION DEVELOPMENT STRATEGY

### Preamble

Recent estimates indicate that the total irrigated area in Ethiopia is 197,225 ha. In recent years, much of the increase in irrigated area had come as a result of expansion in small-scale irrigation. Yet, the existing irrigation development in Ethiopia, as compared to the resources the country has, is negligible. Uneven spatial and temporal distribution of rainfall in the country adds to the problems. Irrigation development is key to the sustainable and reliable agricultural development, and thus for the overall economic development of the country. In order to ensure food security at the household level for Ethiopia's fast growing population, more small, medium and large scale irrigation infrastructure needs to be developed. Such development could also generate externally marketable surplus that would earn the much needed foreign exchange and provide required raw material to the local industries.

### Objectives

The principal objective of the irrigation development strategy is to exploit the agricultural production potential of the country to achieve food self sufficiency at the national level, including export earnings, and to satisfy the raw material demand of local industries, but without degrading the fertility and productivity of country's land and water resources base. More specific objectives of the strategy are to: expand irrigated agriculture, improve irrigation water-use efficiency and thus the agricultural production efficiency, develop irrigation systems that are technically and financially sustainable, and address waterlogging problems in irrigated areas.

### Main Elements of the Irrigation Strategy

#### Technical and Engineering Aspects

1. Initiate the planning and implementation of a comprehensive, well coordinated and targeted irrigation development program that entails simultaneous efforts to:
  - (a) rehabilitate the existing schemes suffering from deferred O&M;
  - (b) complete those schemes which were started but discontinued for various reasons (provided these schemes are still feasible); and
  - (c) develop and implement new schemes.
2. Design appropriate irrigation schemes by taking into account the physical conditions, hydraulic characteristics, irrigation engineering, management capacity of the users, and detailed agronomic and agricultural considerations such as crop water requirements, irrigation methods, integrated pest management and farming practices.
3. Implement measures to secure long-term viability and sustainability of irrigation schemes. Towards this end, develop complementary infrastructures and share development costs with other sectors, and involve relevant institutions in the planning and development of schemes. Also, enhance the adoption of improved agricultural practices based on detailed agronomic and agricultural studies of crops, soils, farming practices, efficient irrigation methodology, etc that will contribute to improved irrigation systems management.
4. Adopt improved and affordable systems and tools for water harvesting and pumping, for reducing seepage losses in canals, for water control, storage and retention systems and measurement structures.

5. Undertake measures to improve water conveyance efficiency, especially the irrigation water use efficiency by implementing agronomic, engineering, demand management, and economic measures based on detailed studies and analysis of these measures. Towards this aim, strengthen the irrigation research and extension system, and maximize returns to water by allocating the water to its highest value use. For areas with undulating topography, promote the use of alternative irrigation options such as sprinkler and drip irrigation etc.
6. Develop standards, guidelines, manuals and procedures for the sustainable operation and maintenance of irrigated schemes and systems, while ensuring their successful application, monitoring and improvement.
7. Develop and promote simple designs and standards for construction and O&M of irrigation schemes. These designs and standards should be easy to replicate, compatible with the capacities and skills of local beneficiaries, and promote the use of local materials and resources.
8. Establish water allocation and priority setting criteria, as well as fair and transparent management systems. Prioritize the implementation of various types of irrigation schemes based on a well spelled out evaluation criteria that takes into account reliability and availability of physical resources, economic and financial parameters, social equity considerations, technical feasibility, technological options, environmental impact assessment, and availability of project management capacities.
9. Pursue integrated planning approach in the development and implementation of irrigation projects. Follow sub-basin/valley development approach in studying and implementing irrigation projects; ensure the complementarity of irrigation development projects with the other sectors' activities such as watershed management and agricultural practices; and consider the possibility for multi-purpose development between irrigation and power, livestock, fishery, tourism and recreation etc. Consider diversification of the outputs from irrigation by including industrial and agro-processing plants.
10. Consider development of groundwater resources as supplementary mean of irrigation in drought-prone areas, where the rainfall duration is less than the length of the growing season, as it is the only insurance against crop failure.
11. Develop necessary technical guidelines and standards for mechanisms, systems, materials and technologies to be used for improving water use efficiency in small, medium and large scale agriculture, so as to avoid both shortages (stress) and excesses (loss). Ensure enforcement of these standards, and continue to improve upon these standards as new knowledge is gained.
12. Give emphasis to water harvesting methods for small scale irrigation development in areas where wet season runoff can be stored and used for crop production. Expand small scale irrigation schemes by:
  - (a) building micro dams on rivers/streams having sufficient base flows;
  - (b) constructing dams based on seasonal runoff;
  - (c) considering cost effective pumping stations associated with pressurized irrigation systems;
  - (d) promoting shallow wells with hand and foot pumps;
  - (e) using medium to deep wells in areas with potential groundwater resource; and

- (f) exploring the feasibility of having pumping schemes in case of upstream regulated rivers or availability of natural storage's like lakes for irrigating large areas.
13. Create conditions conducive to the implementation/construction of medium and large scale irrigation schemes. This may entail: identification/prescription of less costly technologies, development of contract administration and management capacities, improvements in the contract evaluation and award procedures, and encouraging the involvement of private and public sector firms etc.
  14. Give appropriate consideration to past performance and technical capacity while selecting contractors and consultants for implementation/construction of irrigation projects because, in general, the least bidder principle had not proven successful in construction works.
  15. Implement a sequential framework for project authorisations for the planning (studies and design), implementation and management phases. Analyse and outline the operation and maintenance as well as management requirements with respect to the beneficiary skills, and availability of materials, budgets and technical capacities.

#### Financial and Economic Aspects

1. Make higher budgetary allocations from the government sources for the implementation of short, medium and long-term irrigation development plans. Allocate certain percentage of the GDP for irrigation development and tap higher resources from the water fund.
2. Share irrigation development costs with other sectors like power, road, health, education and agriculture etc. To do so:
  - (a) develop procedures for cost-sharing arrangements based on irrigation development contributions to other sectors;
  - (b) involve concerned institutions from the project initiation phase throughout;
  - (c) provide adequate and sufficient data and information to the stakeholders from the onset; and
  - (d) establish co-ordination arrangements to facilitate stakeholders active and continued involvement.
3. Establish and implement norms and procedures for financial sustainability and viability of irrigated schemes. For this purpose, implement a stage by stage cost recovery transition procedure (initial grace period; O & M costs borne by the beneficiaries from the beginning; cover costs of minor structures beyond the primary off takes; finally, total costs of scheme are to be recovered). Medium and large scale irrigation development schemes are generally considered to operate on full cost recovery principle, although a transition procedure may be justified to stimulate development of the region.
4. Establish users' fee according to the related level of cropping patterns and farm level profits, scheme efficiency, and in a simple and clear cost recovery system. Ensure that the water charges and fees are timely collected for efficient operation of the service rendering institution. Sustain the functioning of irrigation systems through their regular O&M and gradual upgrading of the O&M capacities of the local beneficiaries.
5. Implement a price stabilisation mechanism to protect the producers against market risks. Facilitate producers in rationalising their production choices by providing updated production and marketing information. Discourage import of agricultural products to protect local producers through strict enforcement of standards, quality control and high

import taxation. Increasing agricultural production efficiency will be the key to bring local production costs comparable to the international prices.

6. Extend credit facilities and bank loans for development of irrigation projects, especially small scale irrigation schemes to be executed by local community groups. Provide incentives to encourage private sector investment in the irrigation schemes.
7. Mobilise financial resources from external sources for undertaking the development of medium and large scale irrigation schemes.

#### Institutional Aspects

1. Strengthen institutional and regulatory frameworks at the federal and regional levels by undertaking assessment of the existing institutional capacities with respect to the regulatory and implementation roles and responsibilities so as to develop the appropriate institutional structures for the implementation and management of irrigated agriculture. Make efforts to avoid overlaps of duties and responsibilities among the institutions within the sector.
2. Reactivate and reinforce the role of the federal government and regional states in the development of small, medium and large scale irrigation schemes. This involves, *inter-alia*, undertaking of activities related to rehabilitation and upgrading of existing schemes, updating of previous studies and designs, and implementation of new schemes.
3. Enhance greater participation of the regional states and federal government in the development of large scale irrigated schemes and farms in high water potential basins where there is low population density. Since large and medium scale irrigation areas are more in the lowlands, the conflict arising from resettlement and loss of grazing land will be of prime concern. In such cases, compensation measures such as provision of irrigated pasture and livestock watering facilities may be considered.
4. Ensure operational sustainability of the small scale irrigation schemes by establishing O&M departments within the regional bureaus; description of O&M requirements for these schemes; identification of means to meet these requirements; preparation of O&M manuals; and strengthening the capacities of beneficiaries before handing over the schemes to them. In this regard, ensure a transitional period during which the capacity of the beneficiaries is to be ascertained with an objective to identify and remedy difficulties and problems. Provide training to farmers using pilot level demonstration schemes, experience-sharing programs, and research and study tours to improve water use efficiency and product quality.
5. Establish self-financing autonomous public institutions to undertake O&M activities of large scale irrigation schemes. Involve major stakeholders in the BOD of these institutions. Make these institutions responsible for all aspects related to irrigation water management in the area.
6. Encourage the participation of private sector, specially for the O & M and management phases of medium and large scale irrigation schemes. Towards this aim:
  - (a) devise and implement incentive systems such as tax holidays, longer grace periods of repayment, duty free import of construction and farm equipment, and provision of main infrastructure, etc;
  - (b) launch business promotion campaigns and forums;

- (c) facilitate co-operative or joint venture arrangements with the potential investors;
- (d) make approval procedures simple and easy--such as the 'one stop shop principle'; and
- (e) distribute up-to-date information regarding investment possibilities in the irrigation sub-sector to local as well as foreign investors.

### Capacity Building Aspects

1. Equip the institutions involved in project implementation with the available modern know-how in the fields of project study, design, construction and operation and management. Facilitate the transfer and adaptation of modern technology in irrigation development and secure basis to sustain the technological base.
2. Strengthen technical capacities of national/regional/zonal/woreda level offices in: project planning, design, implementation, operation and maintenance, information management, monitoring and evaluation, and other aspects related to irrigation management. Towards this aim:
  - (a) expose the national staff to higher level of training;
  - (b) implement targeted training programs;
  - (c) encourage research and development activities;
  - (d) execute skill transfer programs through on-the-job training; and
  - (e) link national institutions to regional and international networks.
3. Strengthen contract administration and management capacity of the clients and national consultants to improve and upgrade the operational efficiency of existing and planned schemes.
4. Develop and strengthen information management capacities. In this regard, improve the adequacy, reliability and accessibility of existing databases at the national and regional levels (especially with regard to data on potential irrigable land, water resources availability, water use patterns, crop water requirements, farming systems, and irrigation efficiency) to carry out water management analysis and to determine potential to increase agricultural production.
5. Strengthen the existing technological base to improve the productivity and efficiency of irrigated agriculture. Take appropriate measures to sustain this technological base and to ensure that its expansion (either through local production or imports from external sources) complements the existing base and confers with the development needs of the sector.

### Social Aspects

1. Integrate irrigation development activities within country's socio-economic development plans, particularly within the Agricultural Development Led Industrialisation (ADLI) Strategy, based on the two-pronged approach of: (a) strategic planning for achieving socio-economic development goals, namely through feasibility studies and designs for potential projects, and (b) participatory-driven approach for promoting efficiency and sustainability.
2. Institute decentralised and grassroots user-based management of irrigation systems, taking into account the special needs of rural women in particular, during the planning, implementation/construction, operation, management and monitoring phases. Enable the

local community to benefit from the irrigation schemes in terms of provision of social services, job opportunities and prevention of adverse social effects.

3. Assign priority to those irrigation projects which are of multi-purpose in nature and would contribute towards ensuring food security, provision of irrigated pasture in areas where cattle grazing and watering is a problem, increasing household incomes, and enhancing regional development.
4. Establish and strengthen the Water Users Associations or Irrigation Co-operatives in each scheme on a voluntary basis. Encourage and promote the role of women in these community based structures. Provide training to the women to assume greater role in the functioning of these community based structures. Make these structures focal point for development and management of irrigation schemes. Towards this aim:
5. promote partnership building between relevant government institutions, NGOs and local communities at different levels for the provision of bulk water storage, flood control and transfer schemes in particular;
  - (a) mobilize local community groups and assign them greater role in the planning, construction, and O&M of small scale irrigation schemes;
  - (b) involve local people in the project cycle of irrigation schemes, as well as the settlers in the decision-making process; and
  - (c) institute conflict resolution mechanisms based on traditional approaches and cultural practices.
6. Make use, to the maximum extent possible, of local materials and resources in the construction of small scale irrigation schemes since these lead to reduction in construction costs and help in avoiding delays in procurement.

#### Environmental Aspects

1. Conduct appropriate Environmental Impact Assessment (EIA) Studies for the irrigation schemes, including the implementation of remedial measures, based on the National Conservation Strategy and Environmental Guidelines.
2. Establish guidelines for maintaining irrigation water quality.
3. Establish drainage parameters/requirements, and integrate appropriate drainage facilities in all irrigated agricultural development schemes.
4. Consider technical and technological options which avoid the prevalence of breeding ground for vectors; minimise loss of forests; reduce seepage; and protect erosion, siltation, salinisation and pollution.

## 5. MOVING AHEAD IN THE SHORT-TERM

The water strategy presented in the previous section sets a road map as how to develop and manage country's water resources to achieve national economic and social development objectives. Some of these development objectives such as achieving food self-sufficiency, providing sustainable water supply and sanitation services to large segments of the society, and developing hydropower potential are long-term objectives. Achieving long-term objectives is not a one time shot, but it should be viewed as a result of continuous *process* that is to be build and strengthened overtime. Such a process starts with the implementation of most important actions and measures in the short-term, which are carried over to the next phase and reinforced by other actions. Success or failure of these actions and measures in the short-term determines what should be done next--whether implementation of these measures should continue, or how the scope and direction of these measures should be adjusted, or if some additional measures should be put in place etc.

Accordingly, implementation of the strategic measures proposed in this document is viewed as a process aiming to achieve long-term objectives. This section identifies those measures which could be implemented in the short-term (within next 2-3 years). Successful implementation of these measures in the short-term will secure necessary basis for the implementation of more complex measures in the medium and long-term. This, however, does not mean that measures other than those spelled out below cannot be implemented in the short-term. Indeed, they can be and it will depend upon what is being aimed to achieve. The important principle to be respected is that the development, implementation and management of future water sector programs and projects should derive their rationale and guidance from the overall strategy.

### *Water Resources Development*

1. Start implementing a program to carry out the resource assessment studies. In this regard, undertake inventory of the available surface water in the country both in quantity and quality; and assess the availability of surface water resources both in time and space.
2. Initiate a program to assess ground water resources at the basin level; undertake inventory of existing water wells, as well as information on withdrawals and usage. Also, foster and encourage conjunctive use of ground water and surface water to maximise benefits from water use.
3. Assess and evaluate the existing hydrological and meteorological network, stations, data compilation; standardise observation methods, instruments, and procedures for data compilation, processing and analysis. Develop information collection program to bridge information gaps, and start implementing it.
4. Initiate a program for undertaking periodic review and updating of the Master Plans. Set up specialized stakeholders committees to carry out this task.
5. Harvest rainwater through the construction of small check dams to meet domestic water supply and irrigation needs at the local level.
6. Undertake surveys on the extent of existing water transport facilities and on the future needs for improvement and development.

### *Water Resources Management*

1. Assign first priority to water supply and sanitation; then to watering livestock; followed by irrigation and hydropower and free environmental water flow.
2. Devise and implement demand management measures such as pricing, improved extension services, public awareness, and regulatory measures to improve the water use efficiency and conserve the water resources.

3. Undertake soil and water conservation measures such as check dams, contour bunding contour ploughing, terracing, etc. to reduce soil erosion and reservoir siltation.
4. Encourage and promote local community participation in watershed management and water conservation measures and practices. Organize the communities around common goals and objectives.
5. Enforce legislative mechanisms and penalties to prevent indiscriminate discharges of toxic materials into water bodies, and to protect water quality both at source and during the distribution system to ensure access to safe drinking water and for irrigation purpose.
6. Initiate programs to develop databases on all aspects of water resources, such as surface water, ground water, hydrology, meteorology, wells, boreholes, springs, water works, etc. and other relevant socio-economic aspects.

#### *The Enabling Environment*

1. Put together a program for the establishment of river basin management institutions, autonomous or semi-autonomous utility agencies or companies in big towns, and development of water committees at woreda, zonal, kebele and water scheme levels.
2. Assess technical capacity gaps, develop training programs to bridge these gaps, and start implementing these programs. Strengthen technical capacities of all stakeholders (public institutions, private sector, local communities etc.) in relevant aspects of water resources development, planning and management.
3. Promote and encourage on-the-job training; training-by-rotation; short-term training and study tours; workshops and seminars, etc in different fields of water resources.
4. Attract and retain able and experienced professionals and sub-professionals by providing incentives and conducive working environments.
5. Review existing legislation in order to improve and streamline its scope to cover aspects pertaining to all surface and ground water resources; protection of quality as well as quantity; pollution prevention; and penalties for undesirable effluent discharge, etc.

#### *Trans-boundary Rivers*

Identify common development projects that can be developed jointly with the other riparian countries on equitable basis. Start developing these projects in line with the international covenants adapted by the Nile Basin member states. Review and update the projects that were prepared in the past but not implemented. Ensure funding for implementation before embarking on large scale planning efforts to develop new projects or updating of past projects. Develop and enhance capacity in trans-boundary negotiations and conflict resolution.

#### *Finance and Economics*

Establish tariff structure for water services based on site-specific characteristics of the schemes, and ensure that pricing for water projects leads, stage by stage, to full cost recovery based upon user's payment capacities and by giving due consideration to appropriate technologies. While setting water charges, recognise water as an economic and social good. Promote subsidies to aid the poor; rectify price inequalities, encourage service expansion, and promote suitable technologies.

#### *Research and Development*

Start with the assessment and evaluation of all existing information on R&D activities in the water sector. Identify the gaps for improving the R&D activities in the water sector and

prepare an action plan to bridge these gaps. Promote and enhance effective co-ordination of water related R&D activities, including co-operation among the relevant institutions.

### *Stakeholders Participation*

Promote building and strengthening of partnerships between community-government-private sector-external support agencies. For this purpose, establish mechanisms such as, water committees, water boards, water users associations, professional and civic associations. Also, launch public awareness campaigns, and organize regular meetings and workshops as means to provide forums for different stakeholders to air their views as how to strengthen these partnerships.

### *Gender Mainstreaming*

Enhance the active involvement of women for sustainable development and management of water projects. Take steps to relieve women from the huge burden of fetching and carrying water for the family by empowering them in decision-making in water projects. Assigning specific number of seats for women in the community based organizations is one way to empower them in decision making. Design and implement special training programs to strengthen their technical capacities in O&M of WSS and small scale irrigation schemes, as well as in the management and monitoring of the water systems etc. As part of the project preparation, carry out social surveys to better understand how in a given social setting women can make meaningful contributions towards the management of the project.

### *Disasters and Public Safety*

1. Install automatic stage recorders at the strategic sites on the flood-prone areas to record flood levels. Estimate flood sizes, in particular peak floods.
2. Determine the possible methods of flood protection; and select the appropriate sites for disaster prevention actions; and ensure appropriate and timely maintenance of flood control structures.
3. In drought affected areas, intensify ground water exploration; formulate a comprehensive program for the selection of wells, boreholes, stock ponds, sub-surface dams etc.
4. Carry out proper and regular maintenance of existing wells, ponds, sub-surface dams and the new schemes with active participation of the local communities.
5. Carry out periodic safety checks, at least once in three years, on existing water systems.
6. Establish safety regulations for major water structures.

### *Environmental Health Standards*

1. Prevent indiscriminate discharges of industrial effluents into water courses without adequate treatment; issue regulations to ensure their strict enforcement.
2. Assess the impact of disposal systems on local water sources, when the disposal system discharge to the nearest watercourses such as a stream, river or lake (e.g. Akaki river, Tana lake, Awassa lake, etc.) by carrying out detailed surveys and studies.
3. Assess treatment proposals, effluent quality and quantity, in particular from industries; and the probable impact on the receiving water. Raise awareness among industrial managers as how to minimize the affects of industrial wastes on water quality.
4. Recycle wastewater when it has been found to be safe for health and the environment.
5. Promote improvement of environmental sanitation in urban centres and rural areas both through infrastructure development and public awareness, and protect water bodies from being polluted and contaminated.

### *Technology and Engineering*

Formulate and adapt national guidelines, standards and criteria for planning, study, design, construction, supervision, operation and maintenance for water resources development and management undertakings. In this regard, promote the development of indigenous technologies for the construction of WSS systems and small scale irrigation schemes by using local experience and raw material because these could lead to reduction in costs and have multiplier effects in the national and regional economies.

### *Hydropower development*

1. Prepare inventories of the complete hydropower potential of the country, and identify the site specific conditions that should be put into place to exploit this potential.
2. Improve electricity use efficiency by implementing promising demand management measures, especially rationalising the electricity tariff structure. Reduce distribution losses through regular O&M and restricting illegal connections to enhance supply side efficiency.
3. Establish hydrological, topographical (surveying and mapping), socio-economic, and environmental database for each of the candidate sites to facilitate subsequent feasibility studies and analysis.
4. Carry out one feasibility study per year for medium scale hydropower plants to ensure that an adequate number of HPD candidate sites would be studied for development by the year 2015.
5. Issue guidelines with respect to approval criteria for hydropower development studies, design, construction, operation and de-commissioning, ensuring that interests of all stakeholders are met to the extent possible.
6. Streamline co-operation among the institutional stakeholders by issuing a Decree redistributing the institutional responsibilities as per provisions made in Proclamations No: 197/2000 and 41/1993.
7. Strengthen technical capacities of the national staff in the study, design, construction, and O&M of hydropower schemes through specialized training programs. Equally important in the short-term will be to strengthen EEPKO's capacities in bid evaluation, contract negotiation/administration in HPD infrastructure works and power purchase agreements.

### *Water Supply and Sanitation*

1. Identify the most appropriate, efficient, effective, reliable and affordable WSS technologies which are demand driven and have great acceptability among the local communities. Evaluation of past schemes could help in this identification. Promote these technologies in the new schemes.
2. Develop national standards, specifications and design criteria which are rational, affordable, acceptable, implementable and sustainable for the design, installation, implementation, operation, maintenance and inspection of the WSS systems.
3. Develop standards for different types and levels of sanitation systems--including both on-site and off-site, non-water dependent and water dependent systems.
4. Formulate procedures and processes to carry out routine and specialised O&M activities for different types of WSS systems. Prepare manuals to facilitate and guide the implementation of these activities.
5. Promote and encourage water conservation through regulatory and demand management measures such as water pricing and public awareness in those existing systems where efficient utilisation of water is as feasible as development of a new schemes.

6. Determine a 'social tariff' for poor communities which minimally covers operation and maintenance costs. Develop special flat rate tariffs for communal services like hand pumps and public stand posts.
7. Establish progressive tariff rates in the urban areas tied to consumption rates which are simple and easy to implement. Regularly update the pricing structure with the objectives to achieve cost recovery and improve water use efficiency. While establishing pricing structure, consider the costs to be covered vis-à-vis the consumers ability to pay.
8. Strengthen the role of the higher level public sector institutions in regulatory, supportive and facilitative aspects; and assign more responsibilities to the local level institutions concerning implementation, management, monitoring and supervision of WSS schemes.
9. Develop a comprehensive and well coordinated training plan to strengthen the technical capacities of national professionals, both in formal and informal sectors, to enable them to deal with different aspects of WSS systems. Start implementing the program.
10. Initiate a capacity building program to strengthen the capacity of water users associations (water committees/water councils) so that they may make independent informed choices, and remain and serve as a focal point in the WSS management structure.
11. Establish and legalise a process for the participation of all stakeholders (formal and informal) to ensure efficient management of WSS systems. In this regard, promote participatory, consultative and consensus building methodologies so as to enhance the involvement of users at different levels of decision making.
12. Pay special attention to the role of women while establishing community based structures for the management of localized WSS systems. Train them in the O&M procedures.
13. Make it mandatory to include WSS services in future urban development plans, especially the housing schemes.

#### *Irrigation Development*

1. Rehabilitate the existing schemes suffering from deferred O&M; and complete those schemes which were started but discontinued for various reasons (provided these schemes are still feasible).
2. Adopt improved and affordable systems and tools for water harvesting and pumping, for reducing seepage losses in canals, for water control, storage and retention systems and measurement structures.
3. Undertake measures to improve water conveyance efficiency, especially the irrigation water use efficiency by implementing agronomic, engineering, demand management, and economic measures based on detailed studies and analysis of these measures.
4. Develop standards, guidelines, manuals and procedures for the sustainable operation and maintenance of irrigated schemes and systems, while ensuring their successful application, monitoring and improvement.
5. Prioritize the implementation of various types of irrigation schemes based on a well spelled out evaluation criteria that takes into account reliability and availability of physical resources, economic and financial parameters, social equity considerations, technical feasibility, technological options, environmental impact assessment, and availability of project management capacities.
6. Give emphasis to water harvesting methods for small scale irrigation development in areas where wet season runoff can be stored and used for crop production. Expand small scale irrigation schemes.
7. Make higher budgetary allocations from government sources for the implementation of short, medium and long-term irrigation development plans.
8. Implement a stage by stage cost recovery transition procedure (initial grace period; O & M costs borne by the beneficiaries from the beginning; cover costs of minor structures beyond the primary off takes; finally, total costs of scheme are to be recovered). Set the

users' fee according to the related level of cropping patterns and farm level profits, scheme efficiency, and in a simple and clear recovery system.

9. Extend credit facilities and bank loans for the implementation of small scale irrigation schemes to be executed by local community groups.
10. Strengthen institutional and regulatory frameworks at the federal and regional levels by undertaking assessment of the existing institutional capacities with respect to the regulatory and implementation roles and responsibilities.
11. Reactivate and reinforce the role of the federal government and regional states in the development of small, medium and large scale irrigation schemes.
12. Develop a program to strengthen the technical capacities of national/regional/zonal/woreda level offices in: project planning, design, implementation, O&M, information management, monitoring and evaluation, and other aspects related to irrigation management. Start implementing this program.
13. Assign priority to those irrigation projects which are of multi-purpose in nature and would contribute towards ensuring food security, provision of irrigated pasture in areas where cattle grazing and watering is a problem, increasing household incomes, and enhancing regional development.