

**THE FEDERAL DEMOCRATIC REPUBLIC OF
ETHIOPIA**

MINISTRY OF WATER IRRIGATION AND ENERGY

Draft

**URBAN WASTEWATER MANAGEMENT
STRATEGY**

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1 **ACRONMY**

MoWIE:	Ministry of Water Irrigation and Energy
IWRM:	Integrated water Resource management
UWWM:	Urban Wastewater Management
AAWSA:	Addis Ababa Water and Sewerage Authority
GTP:	Growth and Transformation Plan of Ethiopia (I and II)
NGO:	Non-Governmental Organizations
ISO:	International Organization for Standardization
MDG:	Millennium Development Goal
UAP:	Universal Access Plan
MWW:	Municipal/ Urban Wastewater Management
UNEP:	United Nations Environment Programme
UN-HABITAT:	The United Nations Human Settlements Programme
VIP Latrine:	Ventilated Improved Pit Latrine
WHO:	The World Health Organization of the United Nations
WSSCC:	Water Supply and Sanitation Collaborative Council
SAP:	Strategic Action Plan on Municipal Wastewater
OSS	On-site sewage system or septic system

2 GLOSSARIES / DEFINITIONS

Combined Sewer System:	A sewer system that carries wastewater and storm water in the same conduit;
Combined Sewer Overflow:	Discharge of a mixture of storm water and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms;
Domestic Wastewater:	Wastewater principally derived from households, business buildings, institutions, etc., which may or may not contain surface runoff, groundwater or storm water;
Dry Latrine	The term is used to describe both: Latrines from which water and urine are excluded in order to increase the rate at which excreta decomposes; Effluent: waste water, gas or other fluid, treated or untreated, discharged directly or indirectly into the environment;
Goals	Broad, qualitative statements of what the MoWIE hopes to achieve.
Groundwater:	Subsurface water in a saturation zone or aquifer that can be extracted through a well;
Hazardous Waste:	any unwanted material that is believed to be deleterious to human safety or health or the environment;
Industrial Wastewater:	Waste water that results from industrial processes and manufacturing. It may either be disposed of separately or become part of the sanitary or combined wastewater;
Latrine:	An installation used for defecation and urination.
Municipal Wastewater:	A mixture of domestic wastewater, effluents from commercial and industrial establishments, urban runoff and effluent which originates from any other source and is discharged into a municipal wastewater system;
Objectives	Specific, measurable statements of what will be done to achieve the Goals within a particular time frame.
Off-Site Sanitation:	Normally a water based sewerage system, where the effluent is removed from the site by a conventional sewer network, to a place where it can be safely treated.
Off-Site Sanitation:	On-Site Sanitation: A sanitation system that is contained within a householder's plot occupied by the dwelling and its immediate surroundings;
Pit Latrine:	Latrine with a pit for the accumulation and decomposition of excreta and from which liquid infiltrates into the surrounding soil;
Pour Flush Latrine:	A latrine that depends on small quantities of water poured to flush feces away from the point of defecation. The term is normally used for a latrine incorporating a water seal;
Primary Treatment:	The first stage of contaminant removal in a wastewater treatment plant through screening and settling processes, which can remove 40-50% of contaminants;
Sanitation:	Control of physical factors in the human environment that could harm development, health, or survival; The study and use of practical measures for the preservation of public health;
Secondary Treatment:	Second stage of wastewater treatment to reduce suspended solids through biological cleansing, to remove between 85-95% of contaminants;
Separate Sewer System:	Sewer system having distinct drain pipes for collecting superficial water and separate sewers for wastewater;
Septic Tank:	A tank or container, normally with one inlet and one outlet, which retains wastewater and reduces its strength by settlement and anaerobic digestion of excreta;
Strategies	General approaches or methods for achieving Objectives and resolving specific issues. Strategies speak to the question "How will we go about accomplishing our Objectives?"
Wastewater Disposal:	WASTEWATER: Sewage or water carrying wastes from homes, businesses and industries that is a mixture of water and dissolved or suspended solids; Collection and removal of wastewater deriving from industrial and urban settlements by means of a system of pipes and treatment plants;
Wastewater Management:	All of the institutional, financial, technical, legislative, participatory, and managerial aspects related to the problem of waste

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3 BACKGROUND TO WASTEWATER STRATEGY

3.1 Overview of Wastewater Management in Ethiopia

Recent reports indicate that worldwide more than half of the population of less developed countries does not have access to sanitation and more than 80% of the waste water generated is directly discharged into surface and ground water bodies.

In Ethiopia, the sanitation facility coverage gap remains unacceptably large and collection and emptying mechanisms are one of the challenges. The habit of open field disposal of liquid waste is one of the main causes of soil and water contamination and consequently a cause of many communicable diseases.

The management of liquid waste at household level is very poor. About half of the households handle grey water (household liquid waste) by openly discharging into any accessible public properties, such as streets, drainage lines and nearby open space. Sewer line application is not that much familiar in the country except Addis Ababa.

The 2014 Ethiopia Mini Demographic and Health Survey (EMDHS) (CSA) in Ethiopia in 2014 showed that only 4.5% Percentage of de jure population with access to flush toilet, ventilated improved pit latrine, traditional pit latrine with a slab, or composting toilet and does not share this facility with other households.

The odour of sewage is common in in most road side drains of the cities and towns, and most rivers along the main industry zones are excessively polluted. These all generates water borne diseases, decreases the quality of life, and undermines the attractiveness of cities to foreign investors, and the competitiveness of tourism, water intensive industries, fisheries and agriculture.

3.2 The Urban Wastewater Management Plan

According to the CSA 2014 released report, Ethiopia has over 900 towns of varying sizes, infrastructures and population numbers. In most towns currently urbanization has accelerated rapidly with economic growth in the country. Urbanization and rapid economic growth have resulted in demand for better water supply and Sanitation services at national level. Because of all those reason Waste management is one of the urban basic services being addressed by the Government of Ethiopia.

The Ministry of water, Irrigation and energy has tried to indicate the concern of the issues in its policy clearly. On UAP, though sewerage was planned to be implemented in 36 towns at a cost of Birr 1,399,300,000 in the water supply and sanitation plan document, the progress is little. In reality Addis Ababa is the only chartered city that started the implementation of sewerage system expansion and new construction.

Preparing strategic document is important with strong and indicative action of the plan with the participation of key stakeholders including the public and private sectors are actively engaged. Partnerships are required between government, community, the private sector and non-government organizations (NGO) to accomplish its objectives.

3.3 The need for Structured Strategy Document

One of the most fundamental necessities of modern development is responsible and sustainable wastewater management. Therefore the scope of the Strategic document is structured mainly to focus on the current critical challenges of waste management activities such as;

- a) **Ensure equitable service provision** including youth, women, elders and people with disabilities and the poor,
- b) **Draw system** for safe collection, storage, treatment and disposal/re-use /recycling of waste at household, communal and institutional levels,
- c) **Collection and management** of industrial waste product, ,
- d) **Management of hazardous** waste and chemical /radioactive and other dangerous substances, health care institutions waste water,
- e) **Put in place proper management** of waste in streets, market centers, public places and parks, household levels and business areas,
- f) **Tools for sanitation** management
- g) **Indicated strategic** way to implement sanitation system at each level.

4 THE OBJECTIVES OF STRATEGY

The current Ethiopian towns and cities practiced urban wastewater management system is a linear treatment system that is based on figured system operation majorly on disposal, open dry beds and small size conventional treatment. The traditional system needs to be transformed into a sustainable, closed-loop urban wastewater management system that is based on the conservation of water and nutrient resources. For a sustainable wastewater strategy the Ministry has developed a strategy that meets the needs an urban population that is in need of better wastewater management.

4.1 Vision

“By 2025, Ethiopia shall have reached the UAP and GTP II targets and ensured the highest quality of life embracing a beautiful and healthy natural environment free from the harmful effects of water in the urban areas” within the frame of its National Plan...

4.2 Mission

- For the coming GTP II, 36 towns shall have feasibility study and detail design for sewerage and for those WITH greater than 200,000 populations, full WWM plan is exercised
- Provision of sanitation services to ensure high quality of life for the customers and sustainable city development, to build the culture of water use and to preserve the water resources.
- Protect public health by providing our community with waste water collection and treatment system for use or disposal in an environmentally responsible efficient and reliable manner.
- Design, construction, operation and management of sanitation (liquid waste from domestic , public, institutions and industries) treatment and recovery systems within a framework of economic, financial, technical, social and environmental sustainability.
- Develop a strong and highly competent industrial group, capable of responding effectively to the important challenges that currently exist in the environmental sector (untreated effluent).
- Innovative solutions to continuous improvement, implementation of new technological, research and development to build a cleaner environment and a better future.

4.3 Goals

The ultimate goal of the Urban Wastewater Strategy is consistent with the MDG targets, National Growth and Poverty Eradication Strategy and of successive National Socio-Economic Development Plans.

4.3.1 Objectives

The objectives are identified as stated below in specific, measurable statements of what will be done to achieve the Goals within a particular time frame:

1. To ensure environmental protection and mitigate impacts from wastewater on the environment
2. To ensure health protection and appropriate wastewater services to the urban population
3. To guide future urban investment and development of wastewater services in terms of:
 - a. legal and institutional framework
 - b. improvement of the capacity of central/local governments to provide and sustain urban wastewater services
 - c. application of appropriate and affordable technologies
4. To ensure financial sustainability in the wastewater sector

4.4 The Strategy Content

The strategy document purpose is to translate the national water and wastewater management policy and regulation into action. The following are summary list of basic Strategic outlines

- 1) Disseminate the MoWIE UWWM strategy to all regions and towns
- 2) Technical Support towns and cities during the service providing stage
- 3) Prepare and provide operational management guidelines to help continue preventative pipe maintenance mapping and expand community education and management
- 4) Monitor Towns and Cities operational activity
- 5) Provide teaching and operational manuals

5 ENABLING POLICIES AND LEGAL FRAMEWORK

5.1 The Current Practice at National Level

In MoWIE, there are different policy documents which describe the role and responsibility of the sector. Despite the proclamation gives a clear mandate to the Ministry, the issue of wastewater management was left to individual towns, cities and at higher level involvement of the MoUHD. Recently, the National Urban Planning Institute has issued urban waste water guideline. However, still the wastewater management system remains to have neither a leading institution responsible nor standard management guideline until this time.

The existing overview of National level policies, proclamation and strategy issues related to IWWM supporting guidelines are briefly pointed;

5.2 Integrated Water Resource Management

Wastewater management is part of the larger framework of Integrated Water Resource Management (IWRM). IWRM has emerged during the last decade as a response to the widespread

concern that the planet's freshwater resources are coming under increasingly unsustainable pressure from rising populations, growing demands for water and increasing pollution.

IWRM is based on the Dublin Principles that came out of the 1992 International Conference on Water and the Environment, and which emphasize a holistic approach, decentralized control, and respect for the Environment. Among noticeable international principles where most nations accepted to implement and include in their UWWS is the Dublin Principle. The principles set out:

1. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.
3. Women play a central part in the provision, management and safeguarding of water.
4. Water has an economic value in all its competing uses and should be recognized as an economic good.

The UWWM strategy along with the norms set in the international guidelines¹ guidance is expected to create an enabling policy environment through which:

- The strategy shall ensure equity, promote health, protect from disease, and protect the environment;
- Through time, the role of governments transforms from service provider to initiator and facilitator of sustainable wastewater management;
- Influential local authorities and communities, the private sector, regional and river basin agencies, and other partners can participate in planning and implementation of sustainable solutions; and
- Technically and financially realistic, step wise approaches can be applied, with appropriate time and geographic scales.

5.3 National Level Transforming Policies

The Federal Constitution of Ethiopia has generated a conducive atmosphere to create and enhance public and environmental protection works under various Authorities and Ministries. The most notable policies publicized and influenced the current trend are;

5.3.1 Constitution of Ethiopia

The Federal Democratic Republic of Ethiopia (FDRE) Constitution-the basis for all development-related policies, and legal provisions and related outcomes within the country.

- Article 44/1 of the Constitution gives all persons the right to live in a clean and healthy environment, while
- Article 92/1 of the constitution states that the government has the duty to ensure this right.
- Article 92/2 of the Constitution requires that the design and implementation of development programs and projects should not damage or destroy the environment (FDRE, 1994).
- The Environmental policy of Ethiopia (EPA, 1997)-stressed to ensure improved environmental sanitation to be placed highest on the federal regional agendas for achieving sustainable urban development.

¹ UNEP/WHO/HABITAT/WSSCC Guideline 2004

- The health policy of Ethiopia (MoH, 1993) - emphasized on environmental sanitation and it is listed as one of the top priority agenda in the primary healthcare service delivery.

5.3.2 Ethiopian Water Resources Management Policy

Proclamation No. 197/2000,

The overall goal of this policy is to enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available Water Resources of Ethiopia for significant socioeconomic development on sustainable basis. The following policy issues are depicted:

- Create appropriate mechanisms to protect the water resources of the country from pollution and depletion so as to maintain sustainable development and utilization of water resources.
- Establish procedures and mechanisms for all actions that are detrimental to water resources including waste discharges, source development, catchment management etc.
- Recognize that water supply and sanitation services are inseparable and integrate the same at all levels through sustainable and coherent framework.
- Promote the “User Pays” principle for urban water supply and sanitation services.
- Promote as far as possible, that the development as well as the operation and maintenance of water supply and sanitation systems are carried out at decentralized and appropriate body.
- Work in partnership with all concerned for water supply, drainage and wastewater master plans in major urban areas and prepare water supply and sanitation strategies in rural and other urban centers.

Water Resource Management Regulation

Under the regulation it set clearly that prominent wastewater effluent shall be treated based on the provisions of Article 13 (2) of the Proclamation and Article 5 of this Regulations, applications for the direct or indirect discharge of any treated trade effluent or sewerage effluent, or any poisonous, noxious or polluting matter into surface or ground water shall be made to the Supervising Body.

Here also, in deciding whether to grant or refuse a permit for the discharge of treated waste water into water resources, the Supervising Body shall, among other things, take into consideration effluent and/or stream standards. Any person using water for industry or for any other purposes which may cause pollution shall have an obligation to discharge only the type and volume of treated waste permitted.

5.3.3 Environmental Pollution Control

Environment Protection

The Environmental Pollution Control Proclamation No. 300/2002 clearly states that “no person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standards and all urban administrations shall ensure the collection, transportation, and, as appropriate, the recycling, treatment or safe disposal of municipal waste through the institution of an integrated municipal waste management system.

Management of Municipal Waste

All urban administrations shall ensure the collection, transportation, and, as appropriate, the recycling, treatment or safe disposal of municipal waste through the institution of an integrated municipal waste management system.

In collaboration with the relevant regional environmental agency, the Authority shall monitor and evaluate the adequacy of municipal waste management systems and ensure the effectiveness of their implementation. Any person responsible for the maintenance of and premise to which the public has access shall, at all times, ensure that adequate and suitable toilets and containers and other required facilities are provided for the disposal of waste.

The Authority shall, in collaboration with the relevant regional environmental agencies and any other competent agencies, monitor the situation with regard to the availability of waste disposal facilities and take the necessary measures to ensure that their availability is satisfactory.

Environmental Standards

In consultation with competent agencies, the Authority shall formulate practicable environmental standards based on scientific and environmental principles. The sectors that require standards shall include at least the following: Standards for the discharge of effluents into water bodies and sewage systems. Under Human Settlement, Urban Environment and Environmental Health the following policy concerns are stated:

- To ensure that improved environmental sanitation be placed highest on the federal and regional agendas for achieving sustainable urban development;
- To give priority to waste collection services and to its safe disposal;
- To the extent possible to recycle liquid and solid wastes from homesteads and establishments for the production of energy, fertilizer and for other uses.

Regulations

Environmental Pollution Control Proclamation No. 300/ 2002 under this, proclamations are made about control of pollution, environmental standards, environmental inspectors, offences and penalties, and other miscellaneous provisions. It is stated that all urban administrations shall ensure the collection, transportation, and, as appropriate, the recycling, treatment or safe disposal of municipal waste through the institution of an integrated municipal waste management system.'

On Part two (control of pollution article 3.4) of the Proclamation, it is stated that—Any person who causes any pollution shall be required to clean up or pay the cost of cleaning up the polluted environment in such a manner and within such a period as shall be determined by the authority or by the relevant regional environmental agency."

Also on article 3.5, it is stated that —When any activity poses a risk to human health or to the environment, the authority or the relevant regional environmental agency shall take any necessary measure up to the closure or relocation of any enterprise in order to prevent harm."

Regulation on Prevention of Industrial Pollution, Council of Ministers Regulation No. 159/ 2008. According to this regulation, the provisions shall apply to a factory which is listed in an industrial sector until it ceases to operate or until such additional time as has been determined by the competent environmental organ. The regulation clearly indicates the general obligations of factories, licensing requirements, emergency response systems, monitoring of environmental safety, public complaints, information on pollution management, and penalties.

5.3.4 Urban Development Policy of Ethiopia

The policy document emphasizes that the urban administrations, the government and the people should give proper attention to environmental protection to avoid continuous suffocation and pollution to be followed with the expansion of cities. In addition to strictly implementing the national and regional environmental protection policy, rules and regulation, the urban administrations are expected to take the following environmental protection measures that include:-

- i. Putting in place appropriate rules and regulation, manpower, organization and operation system to strictly control pollutions to be caused by institutions and individual households, and creating institutional capacity for sustainable implementation of same.
- ii. Devising system by which the role of the urban administration, investors and the public will be specified and integrated in the disposal of solid and liquid wastes and guiding implementation of same.
- iii. Devising system for recycling of wastes and encouraging those engaged in waste recycling and adopting simple technology of recycling at household, Kebele, urban and institutional levels.
- iv. Bringing in cultural and attitudinal changes of the public to maintain the environment and protect pollution and ensuring continuous and sustainable public participation in environment protection.

5.3.5 Ethiopian Public Health

Proclamation-No. 200/2000

The Ethiopian Public Health Proclamation No. 200/2000 article 12 states that “no person shall dispose solid, liquid or and other waste in a manner which contaminates the environment or affects the health of the society”. The article number 13 of this proclamation is also states that “any city administration is responsible to provide public toilet and ensure its cleanliness”.

This National Strategy for Improved Hygiene and Sanitation has been developed to complement the existing health policy (MoH) and the national water sector strategy (developed by the MoWR as it was named before 2014) in placing greater emphasis on on-site’ hygiene and sanitation. The primary focus is on blocking faeces from entering the environment through the safe management of faeces, hand washing at critical times and the safe water chain from source to mouth. It places responsibility for improving “on-site’ household hygiene and sanitation firmly in the hands of the household with the direct support of the health extension worker and other resources at community level.

According to the strategy, the sanitation vision for Ethiopia is a 100% adoption of improved (household and institutional) sanitation and hygiene by each community which will contribute to better health, a safer and cleaner environment, and the socio-economic development of the country. Some of the conditions for success are said to be: Getting consensus that the current limited and inappropriate access to sanitation and hygiene is a problem; and Ensuring dedicated political commitment, support and action.

5.3.6 Amended proclamations

In Proclamation No. 197/2000, article 13, the respected directive do not have clear mandate to control and monitor the operation of waste water management in different areas of intervention. To enable 100% adoption of improved hygiene and sanitation,

A national hygiene and sanitation strategy (MoH, 2005) as well as protocols for hygiene and “on-site” sanitation (MoH, 2006) were developed by the Ethiopian Ministry of Health.

National Water, Sanitation and Hygiene (WaSH) implementation framework was ratified by the Ministry of Health, Water and Energy, Education, and Finance and Economic Development in 2013 (FDRE, 2013).

The aim of the alliance is to establish a harmonious working modality between the four Ministries, donors and other partners active in the implementation of WaSH activities to realize the full benefits of the program. To perceive the various proclamation and policies which were put in to effect relevant to application of wastewater management system are briefly dealt below.

5.4 Policy and Regulation Gaps

5.4.1 Water Sector strategy

MoWIE under this National strategy is assumed to help develop standards for different types and levels of sanitation systems—including both on-site and off-site, non-water dependent and water dependent systems.

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

The main gaps of the policy identifies what to do on sanitation; however there is no progress in urban wastewater and integrated urban sanitation so far not properly treated or implemented.

The Proclamation No. 197/2000, article 11 and 13 and regulation article 11 – 13 prohibits the release of untreated waste into natural water bodies and the strategy supports to have standards at each level and type of system. But there no defined waste water control tools which explicitly explained within the regulatory bodies/organizations as mentioned on the regulation and proclamation. Currently due to the absence of waste water disposal system all source of waste water directly disposed to unsafe conditions. As we see on the proclamation the ministry has the mandate to give license and control the waste disposal systems but the Management tools are not clearly described to take measure. The Monitoring and Evaluation tools should be prepared by the responsible body to react on the unsafe waste disposals and to be licensed to have environmentally friendly and healthy conditions with responsible institution at each level.

5.5 National Enabling Environment

Develop and Assist stakeholders in exercising policies, regulations, legal authority, standards, manuals and other external limitations.

- ensure that a transparent subsidy mechanism is in place
- ensure that financial resources are allocated according to plans for the provision of sanitation in urban
- enforce wastewater Management regulations
- Ensure that appropriate technology options have been developed, as well as guidelines and training manuals are on place.
- Planning, monitoring and financing mechanisms for different scale developments
- Capacitating Skilled manpower and experience sharing
- Introducing Standards, benchmarking and accountability
- Capacity development and provide technical support on sanitation issues

5.5.1 Obligations of Wastewater Disposing Bodies

All stakeholders including the community have to respect their responsibility to save our natural resources. A factory, institutions and communities subject follow the regulation shall prevent or, if that is not possible, shall minimize the generation of every liquid wastes to an amount not exceeding the limit set by the relevant environmental standard and dispose of it in an environmentally sound manner; and every factor shall have the obligation to handle equipment, inputs, and products in a manner that prevents damage to the environment and health;

5.5.2 Regulatory tools and incentives system

Restrictive and enabling regulations are agreed procedures through which stakeholders are stimulated to treat their wastewater properly. Typically, a mix of regulatory and incentive instruments (sticks and carrots) is most effective. Incentives are especially relevant because they have the largest influence on behavior of people or an industry. Positive incentives include subsidies, co-financing arrangements, and tax reductions to promote the construction of wastewater facilities. Negative financial incentives include tariffs, charges, and penalties to discourage the production of potentially polluting substances, to reduce water use, or generally to make polluting alternatives more expensive than clean alternatives.

5.5.3 Environmental Standards Related to Wastewater

Formulating environmental standards is a crucial part of wastewater management planning. Two groups of environmental standards are:

Ambient standards which set maximum allowable levels of a pollutant in receiving water; these standards require explicit agreement on desired environmental quality objectives;

Emissions standards, which set maximum amounts of a pollutant allowed to be emitted by a plant or other source; they are typically expressed as concentrations, although there is increasing use of load-based standards, which more directly reflect the overall objective of reducing the total load on the environment.

6 WASTEWATER MANAGEMENT OPERATION SYSTEMS

6.1 Existed Wastewater Sources

6.1.1 Domestic wastewater

At present time the principal sources of domestic waste water are residential districts and predominantly public institutional facilities. Other important sources of waste water include commercial facilities and recreational areas. It is mainly composed of Black water, used to describe wastewater containing fecal matter and urine. It is also known as foul water or sewage and grey water or sullage, wastewater from the shower, bath, basins, washing machine, laundry troughs, and kitchen.

6.1.2 Industrial wastewater

The actual commercial or industrial enterprise that currently exists or potentially could exist on every other parcel in every cities and towns is not yet known. Consistent with referenced guidelines, a more generalized approach shall be used for the strategy level of analysis. The wastewater from industries varies so greatly in both flow and pollution strength. So, it is impossible to assign fixed values to their constituents. In general, industrial wastewaters may contain suspended, colloidal and dissolved (mineral and organic) solids.

In addition, they may be either excessively acid or alkaline, hazardous waste or chemical /radioactive, health care institutions waste water and may contain high or low concentrations of colored matter. These wastes may contain inert, organic or toxic materials and possibly pathogenic bacteria. These wastes may be discharged into the sewer system provided they have no adverse effect on treatment efficiency or undesirable effects on the sewer system. It may be necessary to pretreat the wastes prior to release to the municipal system or it is necessary to full treatment when the wastes will be discharged directly to surface or ground waters.

6.1.3 Landfill leachate

Leachate generation is a major problem for municipal solid waste (MSW) landfills and causes significant threat to surface water and groundwater. Leachate can be defined as a liquid that passes through a landfill and has extracted dissolved and suspended matter from it. Leachate results from precipitation entering the landfill from moisture that exists in the waste when it is composed.

6.1.4 Storm Water

Although the pollution load of storm water is generally lower than that of municipal wastewater, it may contain as much solids as domestic wastewater, depending on the debris and pollutants in the path of storm water run-off. During heavy storms, combined sewer overflows containing a mixture of storm water and sillage/ municipal wastewater can seriously contaminate the surroundings and the receiving water body or environment.

6.1.5 Wastewater from Agricultural activities

Agricultural wastewater generated from a variety of farm activities including animal feeding operations and the processing of agricultural products, can pollute surface and ground water if not properly managed. Examples of agricultural wastewater include but are not limited to manure, milking center wash water, barnyard and feedlot runoff, egg washing and processing, slaughterhouse wastewaters, and runoff associated with composting. Additionally, runoff from croplands can contribute sediment, fertilizers and pesticides into surface waters.

6.1.6 Waste from mining

Mining wastes include waste generated during the extraction, beneficiation, and processing of minerals, quarries such as stone, aggregate and selected material within the city/town boundary and mineral residues from various jewelry houses in the town.

6.2 Wastewater Management Technology Alternatives

The intention to attempt to transfer technologies from one place to another fails. Different approaches to wastewater management are required for different regions, rural and urban areas, with different population sizes and different stages of economic governance depending on capacity to manage wastewater and capacity for governance. Approaches can also vary depending on the quality standard required for end users or end-point disposal. The sanitation ladder provides a

useful instrument to assess the local status of sanitation in a community, municipality or region, pointing to optimal wastewater management strategies.

The following are appropriate wastewater management technologies applicable to different area of Ethiopia;

Onsite decentralized and cluster systems, the main users for these systems are condominium areas, universities, industries, private and government institutions to use the effluent for fertilizer, biogas production and recycling of the water to domestic uses as per the standard permits.

In areas with higher population densities, it is feasible to develop a local collection system and use a single facility to treat the community's wastewater.

Lagoons, constructed wetlands and stabilization ponds are inexpensive and common biological treatment options with low operational costs.

Conventional centralized systems Where the above options are considered insufficient to a desired system the use of conventional systems is practically considered which require large volumes of diluted wastewater, which is collected through an extensive sewer system and is treated in modern, centralized treatment works and also Require large investments, highly skilled labor, and stable socio-economic conditions.

6.3 Centralized wastewater managements

Separate Sewer Systems under this system its entire flow goes to a waste treatment plant or discharge point, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of storm water and wastewater into receiving waters and community settlements causes series flooding and environmental contamination.

Combined Sewer The second option is the separate system where it transports storm water and wastewater through separate storm water drains and sanitary sewers respectively. For both collection systems, the construction costs are relatively high, depending on slopes, soil, and topography and groundwater level.

6.4 Decentralized wastewater management

6.4.1 On-site management.

The on-site sanitation facilities are septic tank, Toilets and any chambers used to store wastes based on the suitability of the area. These strategies used in the case containers were placed beneath the seats of privies to collect human excrement and once full containers were emptied at a disposal location near the residence by Vacuum trucks. These systems were gradually replaced by the centralized strategy. On-site sanitation systems for wastewater collection and treatment are effective when little or no piped water is available.

6.4.2 Truck Supported Disposal System

Wastes can be collected by trucks, direct sewer system, transfer sites and disposed of by burial in trenches, by spreading on land/dry beds and on treatment ponds. Unless the sludge has been allowed to decompose until no more pathogens are present, the first two options may pose a threat to the environment, particularly where the emptying of wastes is practiced on a large scale.

6.4.3 Septage

For homes and business not connected to a central wastewater collection system, individual onsite wastewater treatment and disposal facilities would continue to be used. As noted in previous sections, it is anticipated that residential properties outside of the designed system area will continue to use on-site septic disposal systems.

6.4.4 Recycling

Solids removed from wastewater can be digested/stabilized and land spread, land filled, incinerated or composted, or otherwise stabilized prior to beneficial use. Sewage, household grey water and wastewater contain potential sources of fertilizer and energy. Treated effluent can replenish water courses or be reused directly for many purposes. Better management of wastewater would contribute to a solution to water scarcity.

6.5 Sustainable Treatment and Reuse of Wastewater

A key component in any strategy aimed at increasing the coverage of wastewater treatment should be the application of appropriate wastewater treatment technologies that are effective, simple to operate, and low cost (in investment and especially in operation and maintenance). Appropriate technology processes are also more environment-friendly since they consume less energy and thereby have a positive impact on efforts to mitigate the effects of climate change. Appropriate technology unit processes include (but are not limited to) the following

- a) Preliminary Treatment by Rotating Micro Screens;
- b) Grit Chambers;
- c) Lagoons Treatment (Anaerobic, Facultative and Polishing), including recent developments in improving lagoons performance;
- d) Anaerobic Treatment processes of various types, mainly, Anaerobic Lagoons, Up flow Anaerobic Sludge Blanket (UASB) Reactors, Anaerobic Filters and Anaerobic Piston Reactor (PAR);
- e) Physicochemical processes of various types such as Chemically Enhanced Primary Treatment (CEPT);
- f) Constructed Wetlands;
- g) Stabilization Reservoirs for wastewater reuse and other purposes; and others such as
- h) Overland Flow; Infiltration-Percolation; Septic Tanks; and Large Rivers Outfalls.

6.6 Technology Options and Practice

Selection of storage, collection, transport and treatment technology and the requirements of treated wastewater in accordance with the grounds size and features of the urban area. In addition the technology option encompasses current status of the existing sanitation, economic characteristics, technical capacity, natural conditions, and reliability of the technology, habits and customs of the local areas as well as the professional level and capacity to manage and operate the facilities in the future.

The two key issues in choosing a treatment technology are affordability and appropriateness. Affordability relates to the economic conditions of the community while appropriateness relates to the environmental and social conditions. As such, the “Most Appropriate Technology” is the technology that is economically affordable, environmentally sustainable and socially acceptable.

Improper wastewater management such as overflows, poor infrastructure maintenance, insufficient treatment, over-irrigation, inadequate lagoon lining lead to surface and groundwater pollution.

The lack of adequate treatment prior to storage or irrigation could also lead to odor generation. An evaluation done early during the design process has the advantage of providing early warnings if an alternative design is too costly relative to the available resources, saving the trouble of preparing final designs for those technologies that are outside the bounds of affordability.

The high costs for construction, maintenance and operation of conventional treatment systems exert economic (and social) pressure, even. Therefore, selection of treatment systems need sustainable, cost-effective and environmentally sound ways to control water pollution.

6.7 Operation and Maintenance

The installation and operation of wastewater treatment systems ensures an environmentally friendly effluent quality meeting the determined border values. Maintenance for wastewater systems can either be preventive/predictive or corrective activity. Effective maintenance programs are based on knowing what components make up the system, where they are located and the condition of the components. With that information, preventive/predictive maintenance can be planned and scheduled, rehabilitation needs identified, and long-term improvement programs planned and budgeted.

The MoWIE from time to time will issue a generic operation and maintenance manuals and guidelines for sustainable application of any WWM the system.

6.8 Monitoring and Evaluation

Monitoring and evaluation (M&E) is an extremely complex, multidisciplinary and skill-intensive endeavor. The Ministry shall develop a generic monitoring program that is capable of identifying deviations from the proposed action and any important unanticipated impacts on the operation systems and environment of a specific WWMS program. The key monitoring points listed below.

- Monitoring wastewater by a competent authority or appropriate body of waters subject discharges from urban waste disposers and wastewater treatment plants is the back bone for controlling of waste disposed improperly(low quality of effluents or wastes) or illegal commotions.
- Monitoring and evaluations used for modifying the design of infrastructure, quantity and quality of wastes at each level.
- It is important to recognize, in advance, the potential for effects that may lie completely outside the range of options considered for operation.
- If monitoring procedures cannot be adequately implemented, then mitigation agreements should acknowledge the uncertainty faced in implementing the development.
- Help to qualify the performances of the system based on the efficiency
- It is important to track the progress of the planned activates in terms of efficiency and budgeting and regulatory standards.
- For sustainable management of sanitation wastewater application monitoring and evaluation is key tool for scheming measures like punishments.
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7 CURRENT STATUS OF WASTE WATER MANAGEMENT

7.1 Implementation effort

There are efforts exerted by various governmental and non-governmental organizations including the private sector towards improving the sanitation sub-sector. These include: Ministries of

Health, MoWIE, Urban Development and Construction, Education, and Agriculture, as well as the Federal and Regional EPA Authorities/ Bureaus, Municipalities, NGOs, Academic Institutions, private sector sanitary suppliers and donors. Efforts are made in the areas such as policy and strategy formulation, planning, co-ordination, infrastructure provision, monitoring and evaluation. Urban wastewater management activity in the country in a planned manner is limited to Addis Ababa and few other cities.

Addis Ababa Metropolitan city

The Addis Ababa Water Supply and Sewerage Authority provides, among other services, water and wastewater (mainly human excreta) collection and disposal services. There are also other actors (such as the private sector and NGOs) involved in the area of wastewater collection and disposal activities. The major wastewater disposal system in Addis Ababa, as it is the case in other big cities and medium towns of the country, is by use of vacuum trucks. As regards sewerage, it has separate sewerage system built 25 years before with additional recent extension works. The magnitude of the wastewater disposal problem is severe. Out of the total amount of wastewater produced in the city, only 7.5% is entertained by this system. It has two treatment plants, the Kalitiy and Kotebe wastewater treatment plants.

According to the recent reports of AWSA Wastewater practices in the Metropolitan is poor. The estimated waste water in the Metropolitan is 398,985m³/day where as currently the authority removal capacity of this waste is 1727 m³/day. From the total wastewater which should be removed in the Metropolitan only 0.43% are disposed every day.

Dire Dawa city Administration

In this town there are five vacuum trucks serving the community and three are owned by Dire Dawa Town WSS and the remaining two are owned by private operators. The town WSS claims that it is giving service to all the requests coming to it. It has the capacity of moving 44m³ liquid waste every day. However, site selection of drying bed was already done for further implementation. Dire Dawa is one of the emerging cities in the country with wide range of urbanization. The current waste water production is estimated to be 32,387m³/day but its removal capacity is not more than 24 m³/day. The overall managing capacity of the city Administration is less than 0.05 %.

Hawassa

The SNNP regional center Hawassa city with over 240,000 current population estimates is amount the moderately urbanized area of the country. However, the city waste water removal is 58m³/day while the production of waste is higher which estimated 26483m³/day. The management capacity of the town is below 0.22% in the current period.

Mekelle

The capital town of the Tigray regional state Mekelle city currently has an estimate well over 300,000 populations with high rate of urbanization. But now days the waste water disposal is 123m³/day from the estimated and generated waste of about 34717 m³/day. The total capacity of the town Municipality is limited in to 0.35%.

Bahir dar

The Amhara regional state capital Bahir dar city has limited capacity in managing wastewater even though the current production rate is 25,538m³/day. The daily removal potential is not more than 56m³/day that is 0.22% from the total produced.

Adama

From the largest Oromia Regional State economic center is Adama city with estimate of 350,000 populations. The town waste water production is 33,527m³/day whereas the daily removal capacity of the city is about 139m³/day. The effort of managing waste water in the town is not more than 0.041% as compare to the demand of the service.

Gondar

The larger city of the Amhara Regional State Gondar is populated with an estimated 180,000 with hope of new developments is coming. Even though the city has wide range of tourist destination, the waste water management capacity is limited in to 24m³/day but the production capacity of the town is more than 32,411m³/day. This implies that the total managing capacity of the Utility is not more than 0.07%.

Jimma

The waste water management activity in Jimma city is managed by the Municipality Administrative. But the daily waste removal capacity is about 58m³/day. The potential of the disposal which is produced in the town greater than 19,607m³/day. From the demand of the town the coverage is not more than that of 0.029%.

Harar

Harar is the regional state of Hararei which has a population of 110457 but the potential of waste production in the area is more than 16257 m³/day. However the daily waste removal capacity of the town of 17m³/day, this is not more than that of 0.1% of the demanded service.

7.2 Summary of the findings

The table data presented here is only estimates and based on the information collected from each respective city water supply and sewerage Authorities during the preparation of this framework. The data are subject to updating and here only used to indicate the current level of the efforts undergoing.

It can be concluded that the wastewater service level of Addis Ababa and other secondary cities are matter of concern to the Ministry guiding to forward this document as awakening to help start planning and implementing.

Table 1: Estimate Wastewater generation, 2014(MoWIE)

	Major City Name	Surface area	Development area	Wastewater generating rate	Estimated WW		Current removal rate per year	Deficit
	Text	Ha	Domestic/year m ³	Ha	M ³ /day	M ³ /Day	M ³ /Day	M ³ /Day
1	Addis Ababa	109800	334074	10980	398,985	1727.5	397257	397257.5
2	Mekelle	7400	27361	740	34716	123	34593	34593.9
3	Bahir dar	2800	19102	280	25538	56	25482	25482.4
4	Adama	2986	27157	298.6	33527	139	33388	33388.1
5	Hawassa	5000	21267	500	26483.416	58	26425	26425.4
6	Jimma	4600	14917	460	19607.172	58	19549	19549.1
7	Dire dawa	37920	26289	3792	32702.148	66	32636	32636.1
8	Gondar	4027	25445	402.7	32410.636	24	32386	32386.6
9	Harar	1200	11046	120	16251.66	17	16234	16234.7

7.3 Challenges of waste water management

The main issues in the wastewater management are insufficient stakeholder awareness and involvement and the high mitigation costs, besides here are the basic challenges which identified by different actors in the field of wastewater,

- Wastewater management infrastructures (sewerage lines, vacuum tracks, public toilets, disposing sites, and treatment plants) not adequate.
- There is no guidelines, standards, and manuals that helps to support the implementation
- Low priority given by government and actors when compared to water supply
- Duplication of Roles among the implementers that create confusion among respected sectors and Poor coordination among different sector offices
- There is no clear role & responsibility for urban sanitation development program that carries out the specified activities with an adequately organized institutional manpower in Ethiopia
- The liquid waste management requires high investment(sewer line installation and absorption trench construction
- Lack of aggregated data on wastewater management status
- High population growth(demand) and incompatible of service
- failure to mobilize the community and make them active participants in wastewater service provisions
- gap of both skilled staff or experts and knowledge about appropriate technologies on liquid waste management system
- Ground and surface waters pollution due to poor liquid waste management systems in major cities
- Poor Attitude, Practice and culture of the community towards liquid waste management
- Sewer Drains are generally not adequately interconnected and do not form a network.
- Inadequate legal framework and unclear institutional responsibilities;
- Lack of access and monitoring of wastewater services;

7.4 Policy Recommendation

- a) Ethiopia shall follow a multi-sectoral approach to wastewater management as a matter of urgency, incorporating principles of ecosystem based management from the watersheds into the nearby water bodies, connecting sectors that will reap immediate benefits from better wastewater management.
- b) Successful and sustainable management of wastewater requires a cocktail of innovative approaches that engage the public and private sector at local, national and transboundary scales. Planning processes should provide an enabling environment for innovation, including at the community level.
- c) Innovative financing of appropriate wastewater infrastructure should incorporate design, construction, operation, maintenance, upgrading and/or decommissioning. Financing should take account of the fact that there are important livelihood opportunities in improving wastewater treatment processes.
- d) In light of rapid global change, communities should plan wastewater management against future scenarios, not current situations
- e) Solutions for smart wastewater management must be socially and culturally appropriate, as well as economically and environmentally viable into the future
- f) Education and awareness must play a central role in wastewater management and in reducing overall volumes and harmful content of wastewater produced, so that solutions are sustainable

8 STAKEHOLDER ROLES & RESPONSIBILITIES

There are a number of stakeholders with direct and indirect roles and responsibilities in urban wastewater management. Whilst not all encompassing, major stakeholders are listed and described below:

8.1 Environmental protection Authority

The Environment Protection Authority (EPA) is responsible for the protection of the own/City Administrative environment. The EPA's responsibilities for the management of domestic wastewater include:

- a) Administration of the Environment Protection Act 1970;
- b) Referral Agency (in the case of an application for offsite discharge);
- c) Development of guidance documents providing information on specific aspects of best practice in relation to onsite wastewater treatment;
- d) Declaration of State Environment Protection Policies (SEPP's) that set environmental objectives to be achieved;
- e) Establishing standards for discharge to surface water and off-site;
- f) Approving the design and type of septic tank systems which can be installed for the issue of a permit to install a septic tank system;]
- g) The publication and updating of the Septic Tank Code of Practice;
- h) Approving the design of domestic wastewater treatment systems via the Certificate of Approval process;
- i) Promoting provision of sewerage to not served areas; and
- j) Approval and regulation of systems discharging more than 5,000 liters per day.

8.2 City Administrations

The metropolitan city of Addis Ababa has well-structured wastewater management system in place. The staffing within the institution has equipped with better working environment any other secondary cities.

In Dire Dawa city Administration the WSS service enterprise has established the structure of wastewater management institution but the limited staffing capacity made the institution provide very limited service compared to the existing city generation demanded.

8.3 Secondary cities

Even though the mandate of wastewater management is incorporated within proclamation of the water Utility establishment in practice currently some of the Regional States share the responsibility to the municipalities of respective secondary cities such as Gondar, Bahir dar, Jimma, Adama and Mekelle. However, Hawassa and Harar water Utilities still stick to the mandate stated in the proclamation and so continued to deliver the service with the equipment's and manpower they have at hand.

8.4 Supporting efforts (Partnership)

There is no such recognized and formulated initiative to coordinate and network the issue of wastewater at the National and different implementer's level. Addis Ababa the only city currently utilizing the soft loan support from China Government banks, to curb the ever increasing wastewater generation removal problem. This indicates that a higher level commitment is required to take a transforming effort to change the situation of wastewater management in integral manner.

9 IMPLEMENTATION MODALITY

9.1 Increasing Coverage of the service

From the Analytical report of the Metropolitan city and other National regional state major towns the current wastewater management capacity is below 1%. This indicates that the demand of the service is for the wastewater removal is the ground zero level in general. In the country the urban population grown by 4.1% every year as compare to the potential of the utilities to provide services within each cities and towns. The Ministry as a responsible government body mandated to implement should strategically address this gap with different approach and tools in order to respond the demand of the community.

9.2 Supporting the institutional Capacity

There is a need for Government to embark on a comprehensive program of capacity building, training and recruitment aimed at improving institutional performance and staff capabilities in relation to: legislation; balanced and adequate investment in the sector; appropriate technical standard of facilities; operation and maintenance (O&M); regulation capacity; and institutional capacity for sector planning and policy development Wastewater Treatment .

Strong Leadership ,Commitment and Support at National, Regional and Local Levels , political Commitment and executive leaders are required with solid knowledge of wastewater, approving and allocating required resources to the sector and acting as project champions and sponsors. Leaders should mobilize sanitation issues through advocacy and effective information and communication.

Separate responsibilities for each actor at each level should be the crucial thing to implement wastewater management tools.

Because of high investment costs of wastewater management every actors have to take conscious actions to have efficient system and regulations. Separate distribution of responsibility encourages promoting the issues, identifying the problems and take mitigation measures, continuous control and monitoring for implementation of appropriate structures for wastewater management is needed.

9.3 Local Governance

- Identify areas for the safe disposal and construction of wastewater system
- Identify contractor, local artisan, service providers and organize and implement the contract
- Quality control of sanitation facilities construction
- Plan and coordinate with stakeholders for the implementation of sanitation in the selected community and ensure stakeholders mobilization
- Practice and develop Legislation and enforcement
- Monitoring and promotion wastewater management system
- Support to local services development
- Community Consultation
- Planning, setting service levels
- Sanitation applications.
- Sharing the coordination of implementation

9.4 Institutional Arrangement

A strong and clear institutional framework with accountable officials needed for delivery of efficient waste water management systems. The institutional arrangement of the wastewater sector will have to adjust continuously because the institutional environment around the sub-sector changes so much. Due to weak institutional arrangements several plans and undertakings doesn't have strategic out puts for several years. Government should resuscitate structures and clarify accountabilities at all levels for effective coordination and management. Wastewater management is frequently low on the list of priorities.

The main actors for urban water supply and liquid waste management in water sector are:

- Ministry of Water, Irrigation and Energy
- Region Water Bureau's
- Water Utilities and Sewerage Authorities
- Municipalities
- Water Utility Associations at each regions and national level,
- Town Water Boards
- Donors, NGO's and private sectors

The wastewater sector can only prepare and manage its programs properly if all institutions are appropriately involved in the three main phases; planning, implementation (construction), and operation and maintenance link with cost recovery. Although this is normal for formal organizations such as government departments, it is also true for all other institutions that are indirectly implicated and will affect, in one way or another, the wastewater management programs.

Current practices, in almost all towns', the liquid waste management are undertaken by municipalities, in the contrary the sewerage management mandate have been given to the Town water utilities by their indorsed proclamations. Institutional role distribution has big overlap to restrict the responsibilities to manage the challenges that are faced currently.

Table: Institutional Arrangements

No.	Project Cycle	Urban Wastewater Management
1	Planning	Federal MoWIE, Regional Water Bureaus
2	Decision Making	Council of Ministers (for major sewerage projects)Regional Council, Bureau of Water and Health, Environmental Protection Authority
3	Implementation	Regional Bureau of Water, Health, Partners, Private Enterprises, Town/City Admin. (municipality), Community Organization (Kebele), Households (for private facilities)
4	Operation and Maintenance	Regional Bureau of Water, City/Town Administration (Municipality), Community Organization (Kebele), Households
5	Monitoring and Evaluation	Regional Bureau of Water and Health, EPA, Funding Agencies, Partners, Planning and Economic Department

9.5 Legislation and Regulation

Placing duties and responsibilities of users for wastewater services in relation to water conservation, protection of collection and distribution networks, and prevention of risk to public health and the environment needs consolidate wastewater services law into a single modern code for ease of management and Strengthen administrative arrangements for planning the delivery of waste water services at national and local level. In addition introduce a licensing system to regulate the operations of groups of wastewater services schemes.

Enforcement of Standards & Regulations, in cases of violation of standards and regulation for Compliance to sanitation standards and legal requirements (compliance of effluent with quality standards; compliance of sanitation facilities with technical and structural standards), and also it should be remembered that the development of financial systems of charging for pollution to encourage the adoption of good practices, or to provide incentives against over-production of potential pollutants and over-use of treatment facilities, must be considered.

9.6 Standards, Guidelines and Code of practice

9.6.1 Standards and Guidelines

Standards are mandatory requirements that must be followed. Under this strategy Standards and guidelines for water utilities and wastewater facilities regulatory program directed at ensuring public health and environmental protection. Guidelines are basic requirements to implement a system in smooth way, but they usually include standards that have been developed for the particular aspect of wastewater management and often include best practices (Emptying of wastes, structure standards, criteria and application of recycled water, management of septic tanks, standards of different types of toilets, pollution control regulations for example systems in industries and institutions).

The Ministry shall develop technical guidelines for proper (appropriate practice) operations and maintenance of urban wastewater systems, including:

- The preparation of standard design guidelines for wastewater facilities;
- Materials use guidelines, technical standards, and codes of practice Standard model designs and drawings, and project management guidelines.
- Monitoring and control guideline
- Service and payment setting guideline
- Business Model guideline

9.6.2 Codes of Practice

The purpose of Code is to ensure the safe disposal sewage to safeguard public health and protect the environment. Codes of Practice have been developed for various aspects of wastewater management .A code of practice is a systematic collection of rules, standards and other information relating to the Practices and procedures followed in an area and generally demonstrate best practice.

9.7 Public Education and Communication

Public education/communication programers' include public awareness campaigns and educational programs designed to raise awareness about water and sanitation issues and to implement good water conservation and protection practices. Increased public awareness can also to generate demand and public support for efforts to expand sanitation services.

9.8 Involving Private sector and strengthen partnership

Proposed functions that can be outsourced to private sector needs proper assessment for identification of sanitation services have been provided by public authorities. Costs for investments, operation and maintenance, however, often outstrip their capacities, as do present and future requirements for serving the unnerved. Therefore more flexible, Innovative and effective financial management mechanisms have to be considered, e.g. micro - financing, revolving funds, and risk - sharing alternatives, providing tax free equipment's, municipal bonds. Public -private partnerships and public -public partnerships are important tools to assist local governments with initial financing and with on - going operations. Participation of private sectors scales up the sustainability of sanitation system by providing different business models on waste out puts.

9.9 Financial Mechanisms

The sources of funds may be from tariffs, grant finance, loans from government and multilateral agencies, commercial bank loans, revolving funds and other income including reuse of wastewater. Involvement of the private sector in the financing and provision of sanitation services should be encouraged where this would result in a more efficient and cost-effective level of service to consumers.

There should be a link between water supply and the provision of wastewater collection, treatment and re-use. Local participation, integrated, realistic, and thus tailor-made, stepwise approach to technology and financing (starting at modest levels, expanding if and when more resources become available) should be emphasized.

To overcome the burden of heavy head capital-intensive conventional, engineered solutions. Investments project planning and implementation should go step-by-step. Partnerships between public and private sectors are potentially useful tools to assist local governments in financing and operating infrastructure for wastewater management.

Therefore, Financing and cost recovery are key instruments for addressing questions on options for the financing of wastewater investments, and how much financing should be provided. Issues to be taken into account are (i) pricing rules, (ii) the capital and operating costs of public wastewater systems, and (iii) liability of loans and financing investments.

9.10 Wastewater Sector Monitoring

There is a need to improve sector monitoring and data collection. A sector database must also incorporate environmental, public health and sustainability aspects to properly reflect the improvements in terms of reaching the MDGs and GTP plan. The initial considerations are:

- 1) Wastewater production is rising
- 2) Wise and immediate investment will generate multiple future benefits
- 3) Improved sanitation and wastewater management are central to poverty reduction and improved human health
- 4) Successful and sustained wastewater management will need an entirely new dimension of investments, to start now
- 5)

10 MANAGEMENT STRATEGY

Taking into account the current regulatory environment, Strengthening leadership and the institutional framework for waste water management and setting clear roles and responsibilities for stakeholders with adequate coordination mechanism.

- Develop **Legislative and Regulatory** Frameworks, Harmonized and Communicated. All laws and regulations related to wastewater based on gap analysis and regulations related to health and environmental protection should be harmonized and practiced.
- **Conduct base line survey** to have adequate base line information for full cycle of sanitation chain from collection to disposal/ treatment for wastewater current status benchmarking and analyzing future performance.
- **Conduct feasibility study of towns'** waste system for selection of appropriate wastewater management system.
- **Develop master plans** of wastewater management systems for the major Cities and towns
- Develop guidelines and standards for the selection of wastewater development systems and implementation strategies which could facilitate decision-making.
- **Establish a transparent and equitable sanitation** tariff and subsidy system which leads to cost recovery.
- **Sensitize user payment obligation** for sustainable management. In different categories domestics on water bills and institutions and industries with separate modalities. In addition Illegal disposal and connection should have payment guidelines.
- **Study possible wastewater management** technologies for every source of wastes to enable mass take up of sanitation improvement relating to the size of the area, topography, affordability and infrastructure available.
- **Capacity building** of the institution with skilled manpower and facilities. For organized management staffs must be adequate and with the right combination of levels of expertise.
- **Build community awareness** and Stimulate behavioral change on waste water management for participatory and safe sanitation practices.
- **Improve sector monitoring**, evaluation, knowledge management and advocacy on waste management practices.
- **Develop wastewater management** business models for sustaining the system.
- Sustain financial and implementation mechanism of wastewater development systems.
- **Rehabilitate and expand** the existing infrastructure for efficient and proper uses.
- **Experience sharing and adaptation** of technology of urban sanitation proper mechanism from different countries like brazil and Vietnam which pass the challenges of waste management for facilitating the development
- **Promote innovative mechanisms** from different level of application from national and international practices (fecal sludge managements, business models, affordable recycling technologies and technical skills)
- **Technical Guidelines:** Develop technical guidelines for proper (appropriate practice) operations and maintenance of urban wastewater systems, including: The preparation of standard design guidelines for wastewater facilities; Materials use guidelines, technical standards, codes of practice, standard model designs and drawings and project management guidelines. Standard model designs and drawings and project management guidelines.

11 CONCLUSION AND RECOMMENDATION

11.1 Conclusion

Most of the towns in the country growing fast in terms of population and infrastructure. In the contrary the wastewater management system lags behind which needs serious attention in the coming futures. High cost of implementation and weak institutions arrangements are the main challenges of authorities lack the capacity to manage and maintain such facilities. Bearing in mind this the implementation strategy should be enforced to come up with fast and enabling system to alleviate the past delay. In order to accomplish the future plans and finalizing the ongoing plan all stakeholder cooperate each other to strengthen the enabling methodologies that challenges the current status.

Strengthening the proclamations, policies and strategies should be supported by standards and guidelines which help to implement and monitor the ongoing operation as efficient as required. The role and responsibilities of each implementing and controlling institution should be clearly identified to coordinate the development. Those developed standards needs to be enforced by laws and regulation, structural standards and penalties when understood between all stakeholders for proper monitoring and evaluations.

Finally, strong institutional arrangement, political commitment, financial stability, reliable and affordable technology, effective business models and skilled manpower will lead the wastewater management system to the target set by following the detailed strategies listed. Besides feasibility studies for all appropriate mechanism of wastewater management system should be studied for all levels to maximize the benefits of the plan.

11.2 Recommendation

The Ministry is responsible to support the effort undergoing for rehabilitation, expansion and new construction works of the Addis Ababa water supply and sewerage authority

- With step by step approach the other region towns should be working strongly to come to the modern wastewater management system from vacuum track with dry bed management to sewer system
- The Ministry should support in developing guide line and design manual to Promote and encourage the contribution of private and public service delivery in replicable wastewater technology (domestic waste treatment) such as constructed wet land, stabilization pond, treatment package and etc.;
- The Ministry should work strongly in securing finance in the form of loan and grants from different banks and financing institution to support the current and future wastewater management projects and programs
- In order to achieve the wastewater management strategy the Ministry should take the lead in planning and developing wastewater management master plan with current situation of the country
- Proper implementation of the above activities the Ministry should establish project manage unit at regional level for effective coordination and administration of the wastewater management system
- Incorporating sustainability considerations into water and wastewater utility planning can produce substantial benefits. It can help utilities:

- Reduce lifecycle costs by operating more efficiently, pursuing cost-effective investment strategies and optimizing investment choices.
- Optimize social, environmental, and economic benefits by selecting projects through a systematic process of setting sustainability goals and objectives that also support community priorities.
- Increase community support through upfront dialogue with community members and active consideration of other community priorities as alternatives are considered.
- Balance assessment of a range of traditional and non-traditional infrastructure alternatives using consistent criteria.
- Increase fiscal sustainability by analyzing the full lifecycle costs of investments, developing low cost financing strategies, and ensuring that revenue needs are accurately assessed to support maintenance, renewal, and replacement of infrastructure while meeting all regulatory requirements.
- Provide sustainability benefits information for making replicable, consistent, and transparent decisions and for explaining decisions to board members, local elected officials, the public, and others.
- Increase customer support through clear rate expectations (and avoided “rate shocks”), increased system reliability, and increased responsiveness when disruptions occur.
- Enhance the technical, financial, and managerial capacity of the utility.