THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER

WATER SECTOR DEVELOPMENT PROGRAMME

GUIDELINES OF GOOD ENVIRONMENTAL AND SOCIAL PRACTICES (GGESP)

JULY, 2019

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Abbreviations

BWOs	Basin Water Offices
CBWSOs	Community Based Water Supply Organisations
CITES	Convention on International Trade in Endangered Species
DAWASA	Dar es Salaam Water and Sewerage Authority
DEMC	District Environmental Management Committee
DEMO	District Environmental Management Officer
DIA	Direct Influence Area
EMA	Environment Management Act
EMU	Environmental Management Unit
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESPA	Environmental and Social Preliminary Assessment
ESSF	Environmental and Social Screening Form
EWURA	Energy and Water Utilities Regulatory Authority
GoT	Government of the United Republic of Tanzania
IAs	Implementing Agencies
IIA	Indirect Influence Area
IWRMD	Integrated Water Resource Management and Development
LGA	Local Government Authority
NAWAPO	National Water Policy 2002
NEMA	National Environmental Management Act
NEMC	National Environment Management Council
NEP	National Environment Policy
NESC	National Environmental Standards Compendium
NWSDS	National Water Sector Development Strategy
PAP	Project Affectation People
PESIA	Preliminary Environmental Impact Assessment
PMO-RALG	Prime Minister's Office – Regional Administration and Local Government
RAP	Resettlement Action Plan
RMF	Resettlement Management Framework
RPA	Resettlement/Compensation Preliminary Assessment
RUWASA	Rural Water Supply and Sanitation Agency
RUWASA	Rural Water Supply and Sanitation Agency
RWSSP	Rural Water Supply and Sanitation Programme
RWSTs	Regional Water and Sanitation Teams
TBS	Tanzania Bureau of Standards
UWSAs	Urban Water and Sewerage Authorities
UWSSP	Urban Water Supply and Sewerage Programme
VEMO	Village Environmental Management Officer
WATSANs	Water and Sanitation Committees
WHO	World Health Organization (United Nations)
WRMP	Water Resources Management Programme
WSDP	Water Sector Development Programme
WSS	Water Supply System
WSSAs	Water Supply and Sanitation Authorities

Definitions

- Air pollution: occurs when harmful or excessive quantities of substances including gases, particulates, and biological molecules are introduced into atmosphere

- **Biodiversity:** Short form for "biological diversity". Biodiversity refers to the wealth of ecosystems in the biosphere, of species within ecosystems, and of genetic information within populations.

- **Cumulative impacts:** Those impacts that result from the incremental impacts of individual events, when added to other past, present and foreseeable future events. The individual impacts contributing to the cumulative impacts may be minor on their own, but the impacts collectively may be significant.

- **Direct impacts:** Those impacts that are caused by a specific action and which generally occur at the same time and place as the action.

- **Ecology:** The study of relationships of organisms to their environment. It considers individual organisms, as well as large units of landscape, such as forests, estuaries and river basins.

- **Ecosystem:** Are the basic structural units of the biosphere, characterized by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space where macro-scale conditions and interactions are relatively homogeneous.

- **Endemism:** A condition where species occur only in a single, spatially limited, and distinct location, such as isolated islands, mountain valleys, caves, lakes, and craters. Endemic species are often highly specialized to the limited environmental conditions in which they exist, and are thus vulnerable to changes introduced from outside.

- **Environment:** Surrounding conditions that include all those physical, chemical, biological, and socio-economic factors those impinge on an individual, a community, or a population.

- **Environmental Authority**: Authority responsible for management and inspection of assessment work of the environment and social impacts. At the national level is the National Environment Management Council (NEMC).

- **Environmental and Social Management Framework (ESMF):** A management instrument that will be implemented by the Ministry of Water (MoW) in the "Water Sector Development Programme (WSDP)", in order to ensure compliance with the Tanzanian national law and the World Bank Safeguards Policies.

- **Environmental and Social Impact Assessment (ESIA):** The systematic process by which the effects on the bio-geo-physical and socioeconomic environment of a proposed human action or set of actions are evaluated, producing a set of recommendations which serves as influential input to the design of the action or actions. The ESIA should include as a result of the assessment a Environmental and Social Management Plan (ESMP).

- **Environmental and Social Management Plan (ESMP):** A synthesis report containing all proposed prevention, mitigation compensation, and monitoring actions, and, defining a timeline, budget, responsibilities, and follow-up actions. The ESMP is one of the most important outputs of the environmental assessment process.

- **Environmental and Social Audit Report (ESAR):** The evaluation of effectiveness of environmental and/or social management and monitoring practices and procedures during and after a project (e.g., post-project evaluation) so that remedial measures can be taken. An audit may also be a comparison of actual impacts against predicted impacts.

- **Environmental expert:** Environmental expert means an individual person or a firm of experts which has requisite qualifications prescribed by the regulations on registration of environmental experts made under the Environmental Management Act and duly certified and registered in the Register of Environmental Experts as may be kept and maintained by the NEMC.

- **Environmental and social impacts:** An effect (positive or negative), direct or indirect, on an environmental resource or people, resulting from infrastructure development projects.

- **Environmental Impact Statement (EIS):** A document that contains the results of an ESIA study.

- **Environmental and social management:** Management and control of the environment and social aspects to ensure the long-term sustainability of development efforts.

- **Environmental and Social Management Unit (ESMU):** Is a Unit established for the purpose of management of environmental and social issues in the projects.

- **Environmental social monitoring:** Continuous or periodic surveillance of the project activities to ensure that the environmental and social mitigation measures are followed during project implementation. It involves repeated observation and measurement of environmental quality parameters to observe changes in a period.

- **Environmental and social "scoping":** It is an early, open identification of potentially significant environmental and social impacts and the elimination of insignificant impacts or impacts that have already been addressed by other ESIA. It may also simply refer to procedures for determining the scope of environmental and social issues to be covered in the ESIA process.

- **Environmental and Social "screening":** It is the determination of the level of environmental impact assessment required for a particular proposed activity or project. It may also refer to procedures for categorizing projects based on professional judgment.

- **Implementing Agency (IA):** Is the owner of the project and responsible for the project implementation from the preparation of the studies, construction, operation and maintenance.

- **Implementing Agency Safeguard Coordinator (SC-IA):** Is the person inside the Implementing Agency responsible for the environmental and social safeguards during the project cycle of the project.

- **Indicators:** Physical, chemical, biological, or socio-economic attributes that provide some indication of the environmental condition.

- **Vulnerablegroups:** Collectively, the members of cultural groups that have a historical, ancestral, spiritual, and functional connection to the land on which and from which they live. In popular usage, ethnicsgroups are distinguished from members of those cultural groups whose connection to the land on which they live is limited to the historical period.

- **Indirect impacts:** Those impacts that are closely, but indirectly linked to the project activities that induce changes in the natural environment, population, economic growth, and land use.

- **Stakeholders:** Those affected by a project, who have the most to lose or gain from the completion of the project, and whose concerns must be addressed in an environmental assessment.

- **Mitigation measures:** Actions taken to reduce, avoid, or offset adverse (negative) impacts. Mitigation options include: 1) prevention (e.g., rejecting a project), 2) enhancement (e.g., modifying the design), and 3) compensation (e.g. replacing an economic activity or investment).

- **Natural areas:** Terrestrial and aquatic areas where the ecosystems component is characterized primarily by native species, and where human activities have not altered the ecological function to the point where the ecosystem has changed its character or distribution.

- **Participation:** A process through which stakeholder influence and share control over development initiatives and decisions on resources that affect them.

- **Project Affected People (PAPs):** Individuals, groups or communities, or other organizations, whose interests may be directly affected by the location, construction, and operation of the project.

- **Project area:** The area that includes the immediate and the proximity area of a project that the project may have an environmental or social impact on.

- **Project Cycle:** Means the complete process of the cycle project life, which includes project identification, pre-feasibility and feasibility study, design, construction, operation and closure.

- **Resettlement/Compensation Action Plan (RAP):** A plan prepared to address the issues of involuntary or voluntary resettlement/compensation of people and communities affected by a project.

- **Resilience:** A measure of how quickly an ecosystem or environmental variable returns to its natural state after cessation of a disturbance.

- **Sewer:** close cunduits which carry wastewater from residential, commercial, and industrial users, to storage, discharge, or wastewater treatment.

- **Significance:** A judgment of the magnitude of impact or the degree to which a proposed activity or project may (potentially) impact on the environment if implemented.

- **Wastewater:** is any water that has been affected by human and animal use. Wastewater is "used water from any combination of domestic, industrial, commercial or agricultural activities, surface runoff or stormwater, and any sewer inflow or sewer infiltration

CHAPTER ONE

1. INTRODUCTION

The Government of the United Republic of Tanzania (GoT), in collaboration with Development Partners (DPs), has been implementing the **Water Sector Development Programme (WSDP)** since 2006. This Programme focuses on prioritized water resources management and service delivery in the water and sanitation sector. The proponent of the Programme is the Government of the United Republic of Tanzania, while the Ministry of Water (MoW) is the implementing institution on behalf of the Government.

The second phase of the Programme (WSDP II) is implemented through the five (5) components: 1) Water Resources Management; 2) Rural Water Supply and Sanitation; 3) Urban Water Supply and Sanitation; 4) Sanitation and Hygiene; and 5) Programme Management and Delivery Support.

According to the Environmental and Social Status Report and site visits conducted by MoW, it was observed that in many cases the projects do not comply with the respective environmental management plans and environmental management best practices during the projects execution, mainly because of the inadequate knowledge or technical ability of Contractors, and the insufficient follow-up and supervision by the Implementing Agencies (IAs). Also, most of the projects (Category C) do not require environmental and social studies but are important to guide the Contractors to develop good environmental and social practices during construction.

In this regard, the present document or instrument **"Guidelines of Good Environmental and Social Practices (GGESP) for the Water and Sanitation Sector"** has been designed to promote and assure good environmental and social practices during the project cycle (design, construction, operation, and decommissioning) of the water and sanitation projects supported by the MoW through the IAs.

1.1 Objective

The overall objective of the GGESP is to guide the Minisrty, Implementing agencies and project executers (constractors and consultants) involved in implementing water related projects to streamline and enhance best practices on environmental and social consideration for water and sanitation works.

The specific objectives of the GGESP are to:

- Present general description of the water and sanitation project;
- Present the legal and institutional framework of the country, related to the environmental and social context in the water supply and sanitation sub-sectors;
- Present the main potential environmental and social impacts on the water supply and sanitation projects, including the main aspects related to the adaptation of climate change in the water and sanitation projects;
- Present the main action or measures of good environmental and social practices during the project cycle (design, construction, operation, and decommission), based on the national and international standards and best practices, to assure the environmental and social sustainability of the projects; and
- Present the main responsibilities of the main stakeholders during the project design, construction, and operation, (Contractors; Implementing Agencies; and Supervisors when a big project requires the support of external environmental and social supervision during the project construction).

1.2 Scope

The users of the GGESP mainly are MoW; the Implementing Agencies (including the Urban Water Supply and Sanitation Authorities, Water Basin Offices and Local Government Authorities); Consultants; Contractors; and Supervisors. This instrument should be used as a support for the preparation of the Environmental and Social Management Plans (ESMP) in the cases of projects classified as Category A and B, and also as part of the project design or feasibility studies of the projects classified as Category C.

The document is organised into nine **(9) Chapters** and Annexes:**Chapter One (1)**, provides an Introduction with the main purpose of the instrument and the scope including users and content of the Guidelines; **Chapter Two (2),** provides a General Overview of the Water Resources in Tanzania; **Chapter Three (3)**, provides secondary information about the legal and institutional framework in Tanzania about the water and sanitation sub-sectors, and the environmental and social aspects; **Chapter Four (4)**, provides a general description about Water and Sanitation project; **Chapter Five** (**5**), provide an Overview about the environmental and social assessment in a water and sanitation projects; **Chapter Six (6)**, provides a description of the main environmental and social impacts in the water and sanitation sub-sector, including the recommendation of best environmental and social practices; **Chapter Seven (7),** presents the main environmental and social management responsibilities of the a) Contractors; b) Implementing Agencies; and c) Supervisors, when the project requires an external support for the project supervision, mainly in big projects; and **Chapter Eight (8),** present Responsibilities of Contractor and Implementing Agency; and Chapter Nine (9) present the Environmental, Health, Safety Standards developed by the International Financing Corporation (IFC), which is part of the World Bank Group, in order to take into account as part of the good environmental and social practices proposed in this Guidelines.

Additionally, the document includes some Annexes with information to support the application of the Guidelines.

CHAPTER TWO

2. GENERAL OVERVIEW OF WATER AND SANITATION SUB-SECTORS

Water in adequate quantity and quality is a primary input for a whole array of productive activities. It is fundamental for domestic use, food security, livestock development, hydropower production, industrial production, wildlife and fishery water use, and for the sustenance of ecosystems. Therefore, water requires that careful management and development is ensured. In that case, the Government developed a comprehensive framework for sustainable development and management of these water resources, in which an effective policy, legal and institutional framework for its implementation has been instituted. The 2002 National Water Policy aims to address cross-sectoral interests in water, watershed management and integrated and participatory approaches for water resources planning, development and management. The water sector policy and strategy documents contain operational targets to be achieved in terms of level and timescale for improving water resources management, and water supply and sanitation. Those targets are reflected in the 2006 National Water Sector Development Strategy (NWSDS). The objectives, targets and timescale are reviewed from time to time when the need arises.

2.1 Water resources in Tanzania

Tanzania is endowed with numerous and diverse water resources (rivers, lakes, wetlands and aquifers). The country is divided into five (5) major drainage systems: Indian Ocean Drainage System; Internal Drainage of Lakes Eyasi, Natron and Bubu Depression; Internal Drainage of Lake Rukwa; Atlantic Ocean Drainage; and the Mediterranean Sea Drainage system.

These water systems have further been divided into nine (9) river and lake basins for ease management of the country's water resources on a "Water Basin" basis.
These Basins are the following: (1) Pangani (2) Wami/Ruvu (3) Rufiji (4) Ruvuma and Southern Coast (5) Lake Nyasa (6) Internal Drainage basin of Lake Eyasi, Manyara and Bubu depression (7) Lake Rukwa (8) Lake Tanganyika and (9) Lake Victoria. Additionally, Tanzania shares eleven international lakes and rivers with other nations including the three East African Great Lakes (Victoria, Tanganyika and Nyasa) and Lakes Chala, Jipe; and Rivers Kagera, Mara, Umba, Ruvuma and Songwe. Each of these water bodies exhibit unique characteristics and a complex range of water resources management and development issues and challenges.

2.2 Water Supply and Sanitation services

The provision of water supply and sanitation services is carried out by the Water Supply and Sanitation Authorities (WSSAs) which are responsible for management of water supply and sanitation services mostly in urban areas, and the Community Based Water Supply Organisations (CBWSOs) in rural areas. WSSAs are regulated by the Energy and Water Utilities Regulatory Authority (EWURA), while CBWSOs are regulated by the Ministry of Water. The Dar es Salaam Water and Sewerage Authority (DAWASA) is responsible for the provision of water supply services in Dar es Salaam City and neighbouring areas of Kibaha and Bagamoyo. Regional and District WSSAs are responsible for provision of water services in the Regional and District Headquarters, respectively, while Small Towns WSSAs serve the designated Small Towns. On the other hand, National Projects Water Supply and Sanitation Authorities are the big water schemes that cover more than one Local Government Authorities and serve both urban and rural settlements. While RUWASA is responsible for rural water supply and sanitation services in Tanzania.

CHAPTER THREE

3. LEGAL AND INSTITUTIONAL FRAMEWORKS

3.1 Legal Framework

A number of policies, laws and instruments support the water and sanitation sub sectors and the environment and social management in Tanzania. The Water Resources Management Act (2009), the Water Supply and Sanitation Act No. 5 of 2009, Environmental Management Act 2004, the Environmental Impact Assessment and Audit Regulation (2005), The National Water Policy (2002), the National Environment Policy (1997), the National Water Sector Strategy, the National Water Quality Management and Pollution Control Strategy, the and the National Environment Action Plan (1994) are the key instruments that cover the sub sectors and the environmental and social management in Tanzania.

3.1.1 National Environmental Legislations

In addition to the above policies, there are a number of legal and regulatory frameworks that proposed water projects must comply with. The **Environmental Management Act, No. 20 (2004)** is the principal legislation governing all environmental management issues in the country. Within each sector, there are sectoral legislations that deal with specific issues pertaining to the environment. A summary of the main environmental legislation in relation to the water supply and sewerage sectors is presented in **Annex 1**.

3.1.2 The Occupational Safety and Health Act of 2003

An act to repeal the Factories Ordinance; to make provisions for the safety, health and welfare of persons at work in factories and other places of work- to provide for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; and to provide for connected matters.

3.1.3 National Policies

The policies and strategies presented below are some of the relevant sectoral and cross-sectoral (environment) legal instruments in the country that is important to be considered in the water supply and sanitation projects. These instruments provide directives to ensure minimum impacts on the natural resources and sensitive ecosystems as well as welfare of the society.

a. National Water Policy

The main objective of the National Water Policy (NAWAPO) of 2002 is to develop a comprehensive framework for sustainable development and management of the nation's water resources and putting in place an effective legal and institutional framework for its implementation. The policy aims at ensuring that beneficiaries participate fully in all stages of water resource development. The Policy recognizes the fundamental but intricate linkages between water and socio-economic development, including environmental requirements. The Policy expounds on the importance of water for domestic use, environment, agriculture, livestock keeping, mining, energy, fisheries, human health, wildlife, tourism, forestry, navigation, and trans-boundary requirements. In view of this, the Policy calls for an Integrated Water Resource Management approach in Tanzania so that "there is equitable and sustainable use and management of water resources for socio-economic development, and for maintenance of the environment".

b. National Environment Policy

The National Environment Policy (NEP) of 1997, sought to provide the framework for making fundamental changes that are needed to bring environmental and social considerations into the mainstream of decision-making in Tanzania. It sought to provide policy guidelines and plans, gave guidance to the determination of priority actions, and provide for monitoring and regular reviews of policies, plans and programmes. It further provides for sectoral and cross-sectoral policy analysis in order to achieve compatibility among sectors. Additionally, as mention in the NEP, the environmental objective of the Water and Sanitation sub sectors is to support the overall national objective of providing clean and safe water within easy reach, to satisfy other needs, to protect water sources, and prevent environmental pollution.

The overall objectives of the NEP are:

- To ensure sustainability, security and equitable use of resources for meeting the basic needs of the present and future generations without degrading the environment or risk health or safety;
- To prevent and control degradation of land, water, vegetation and air which constitute our life support systems;
- To conserve and enhance our natural and manmade heritage, including the biological diversity of the unique ecosystems of Tanzania;
- To improve the condition and productivity of degraded areas including rural and urban settlements in order that all Tanzanians may live in safe, healthful, productive and aesthetically pleasing surroundings;
- To raise public awareness and understanding of the essential linkages between environment and development, and to promote individual and community participation in environmental actions;
- To promote international cooperation on the environment agenda, and expand our participation and contribution to relevant bilateral, sub-regional, regional, and global organizations and programs including implementation of Treaties.

c. National Land Policy and National Human Settlements Development Policy

The National Land Policy of 1995, aims to ensure a secure land tenure system, to encourage optimal land use, and to facilitate sustainable social and economic development. Land management is seen as one of the cornerstones of development policy. Land is to be publicly owned, and held by individuals only through rights of occupancy. Right of occupancy may be certificated and subject to terms and conditions (Granted Right), or customary (Deemed Right). Specific objectives of the Policy include equitable access to land, protection of existing land rights, prevention of concentration of land ownership, and promotion of land use planning and management for optimal but sustainable productivity.

d. National Forest Policy, 1996

The National Forest Policy identifies four main areas (forest land management, forest-based industries and products, ecosystem conservation and management, institutions and human resources) and present policy statements and instruments/directives to be applied to each of these. In accordance with the policy, an Environmental and Social Impact Assessment (ESIA) will be required for all investments, which convert forestland uses or may cause damage to the forest environment. Some of the policy strategy statements that are relevant for water and sewage projects include the following: (a) To enable sustainable management of forest on public lands, clear ownership for all forests and trees on these lands will be defined and management responsibility promoted; and (b)

Biodiversity conservation and management as well as watershed management and soil conservation will be included in the management plans for all protected forests.

e. National Mineral Policy, 2009

The Mineral Policy of 2009 aims at strengthening integration of the mineral sector with other sectors of the economy; improving economic environment for investment; maximising benefits from mining; improving the legal environment; 6 strengthening capacity for administration of the mineral sector; developing small scale miners; promoting and facilitating value addition to minerals; and strengthening environmental management.

One of the policy objectives is to promote safety and maintain hygiene conditions and protect the environment in mining areas. Policy statements regarding environmental management include:-

(i) Strengthening the institutional capacity in monitoring and enforcement of laws and regulations on safety and occupational health, environmental protection and management in mining areas;

(ii) Mining companies to set aside funds for enviromental rehabilitation and mine closure obligations;

(iii) Harmonize laws and regulations governing safety, occupational health and enviromental issues in the mineral sector; (iv) The Government will continue to collaborate with stakeholders to ensure that small, medium and large scale miners preserve the environment;

f. National Water Sector Strategy (2005-2015)

The National Water Sector Development Strategy (NWSDS) sets out how the Ministry responsible for Water will implement the National Water Policy to achieve the MKUKUTA targets. This, in turn, guided the formulation of the Ministry's harmonised National Water Sector Development Plan and the Water Sector Development Programme as inputs into the Medium Term Expenditure Framework financial planning process.

3.1.4 International Agreements

Tanzania is party to many international agreements related to environment and social management:

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989);
- Convention of the Protection of the World Cultural and Natural Heritage, Paris (1972);
- Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons, and their Destruction, London (1972);
- Convention on Biological Diversity (1992)
- Convention on International Trade in Endangered Species of Wild Fauna/ Flora (CITES, 1973);
- Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, Bamako, Mali (1991);
- United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994);
- Lusaka Agreement on Co-operative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994);
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987);
- Phyto-Sanitary Convention for Africa, Kinshasa (1967);

- United Nations Convention on the Law of the Sea (1982);
- United Nations Framework Convention on Climate Change (1983);
- Vienna Convention for the Protection of the Ozone Layer;
- Nile Basin Initiative Coorperative Framework Agreement (NBI –CFA); and
- Protocal for Sustainable Development of lake Victoria basin Commission (2003)

3.2 Institutional Framework

3.2.3 Water Sector Authority

a) The **Ministry of Water (MoW)** is the national government authority responsible for water supply, water resources management, and sanitation services.

Vision:
"The vision of the Ministry is to have sustainable management and development of water resources for social and economic development

Mission:
"To ensure that water resources are developed and managed sustainable in collaboration with all stakeholders."

The MoW has the following functions:

a. Formulation and revision of the National Water Policy, policy implementation strategies, legislation and regulations;
b. Promoting the development, management and use of the nation's water resources, provision of commercial water and sewerage services, and provision of community water supply and sanitation services in accordance with the national water policy and strategies;
c. Monitoring the implementation and performance of rural water supply and sanitation as well as urban water supply and sewerage development programmes;
d. Providing technical and financial support to the urban Water Supply and Sanitation Authorities (WSSAs), BWBs and RUWASA;
e. Coordinating the Ministry's participation in national and international dialogue initiatives on projects pertaining to the management and development of water resources;
f. Providing strategic guidance, technical and operational support to Basin Water Offices to enable them carry out their functions including water resources assessment, monitoring and regulation;
g. Collecting information and providing such information and associated services to other government institutions and the public;
h. Providing sector-related information and guidance to stakeholders;
i. Mainstreaming cross cutting and cross sectoral issues such as gender, HIV/AIDS, environment, health and land; and
j. Promoting the use of Information and Communication Technology (ICT) in the water sector.

b) **Urban Water Supply and Sanitation (UWSS) Authorities** at the regional level and district level established under Water Supply and Sanitation Act, No. 12 of 2009 are responsible for planning and managing the urban water supply and sanitation services. Currently, there are 25 Regional UWSSAs include DAWASA, 98 District WSSAs and 8 National water projects. The utilities enter into Memorandum of Understanding and performance agreements or contracts with MoW to handle

routine operations and maintenance and secure professional services to assist them improve efficiency and expand their systems over time.

c) The **Basin Water Boards (BWBs)** are responsible for water resources management and development at the Basin level. Basin management carried out through catchment committees and Water User Associations (WUAs).

d) **Rural Water Supply and Sanitation Agency (RUWASA)** is responsible for planning and managing rural water supply and sanitation projects including financial, procurement management and monitoring and evaluation of projects. RUWASA is ultimately accountable to the Ministry of Water.

e) **Energy and Water Utilities Regulatory Authority (EWURA).** The EWURA is an autonomous multi-sectoral regulatory authority established by the Energy and Water Utilities Regulatory Authority Act, Cap 414, of the laws of Tanzania. It is responsible for technical and economic regulation of the electricity, petroleum, natural gas, and water sectors.

The functions of EWURA include among others, licensing, tariff review, monitoring performance and standards with regards to quality, safety, health, and environment. EWURA is also responsible for promoting effective competition and economic efficiency, protecting the interests of consumers and promoting the availability of regulated services to all consumers including low income, rural and disadvantaged consumers in the regulated sectors.

3.2.4 Environmental Authority

a) Vice President Office – Division of Environment (VPO-DoE)

The Division of Environment in the VPO has the objective of providing overall policy guidance, coordination, expertise and services for sustainable environmental management and development.

The functions of DoE among others include coordinating issues relating to articulation and implementation of the National environmental policy and the Environmental Management Act No. 20 of 2004; developing, coordinating and assessing the implementation of strategies and plans to address the crossing cutting challenges related to environmental management and promote the integration of environment in other sector development frameworks; advising the government on legislative and other measures for the management of the environment and/or the implementation of the relevant international agreements in the field of environment; overseeing operations of the National Environment Management Council; developing and issue reports on the State of Environment; and coordinating the implementation of the green growth and climate resilient development agenda.

b) **The National Environment Management Council (NEMC)**

NEMC is in charge of the enforcement, compliance, review, monitoring of environmental impact assessments and the facilitation of public participation in environmental decision-making and supervision of all matters relating to the environment. Amongst its functions NEMC reviews ESIAs/PESIAs and recommends them (or not) for approval, and identifies projects or programmes for which environmental audit or monitoring must be conducted.

NEMC has six (6) Zonal Offices: Northern Zone based in Arusha Region; Southern

Highland Zone based in Mbeya Region; Lake Zone based in Mwanza Region, Southern zone based in Mtwara; Eastern zone based in Dar es Salaam; and Central zone based in Dodoma. Other additional zonal office will be established in the near future, in western zone, which will be based in Tabora.

CHAPTER FOUR

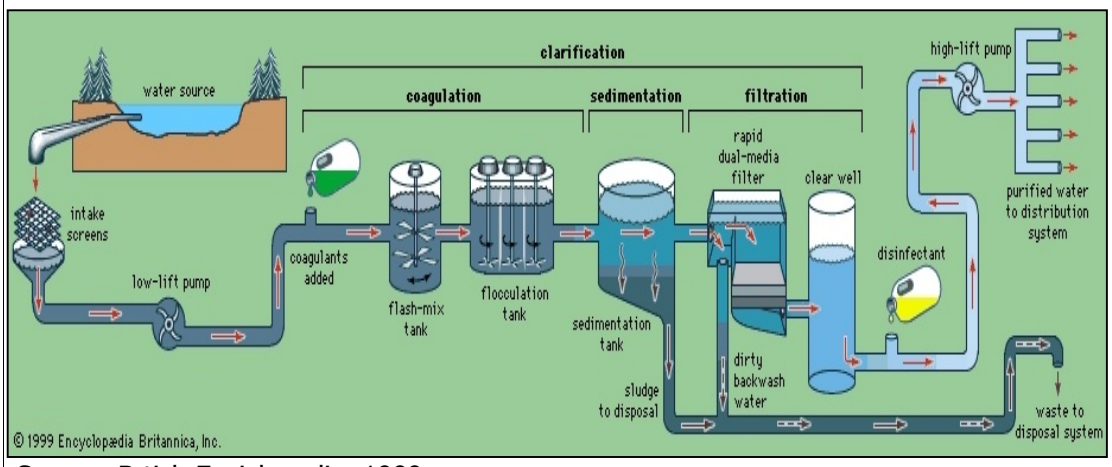
4 GENERAL DESCRIPTION OF WATER SUPPLY AND SANITATION PROJECTS

4.1 Water Supply

Access to water of an adequate quality is essential for public health and hygiene[1]. A drinking (potable) water supply system typically includes the following elements:

- A water source as river, lake, reservoir, or groundwater aquifer where water collects, as well as the surrounding watershed or recharge area that supplies water to the source and a means of extracting and transporting water from the source to a point of treatment;
- A treatment facility for water purification; and
- Treated water storage facilities and a distribution system to deliver treated water to consumption points (at houses, domestic points, fire hydrants, industrial use points, etc).

Figure 4.1: Drinking (Potable) Water Supply System



Source: Brtish Enciclopedia, 1999

4.1.3 Water Sources

Traditional sources for potable water treatment include surface and groundwater water resources.

a) Groundwater: Groundwater is recharged from ground and flows to the surface naturally, and provides a long-term reservoir in the natural water cycle, with residence times ranging from days to millennia. Groundwater quality varies depending on the source, but generally has good clarity because of the natural filtering of groundwater as it passes through porous soil layers. In general, deep groundwater has low concentrations of pathogenic bacteria but may be rich in dissolved solids, especially carbonates and sulfates of calcium and magnesium. The

[1]Access to water includes the volume of water available as well as the distances and time involved in water collection. The World Health Organization (WHO) has defined basic access to water to include a volume of bout 20 lt per capita per day (L/c/d) available at a distance of 100 m to 1000 m or 5 to 30 min total collection time, which is generally sufficient to meet basic consumption, hand washing, and food preparation needs.

bacteriological quality of shallow groundwater can be variable depending on the nature of the recharge area. A variety of soluble materials may be present including toxic metals such as zinc, copper, and arsenic.

b) Surface Water: Surface water quality is highly dependant on the source. Upland lakes and reservoirs are typically located in the headwaters of river systems upstream of human habitation. Bacteria and pathogen levels are usually low, but some bacteria, protozoa or algae will be present. Where uplands are forested or peaty, humic acids can color the water. Many upland surface water sources have low pH. Rivers, canals, and low-land reservoirs generally have higher bacterial concentrations and may also contain algae, suspended solids, and dissolved constituents.

4.1.4 Water Treatment

Treatment required to render water suitable for human consumption varies depending on the water source, but may include removal of suspended solids and dissolved materials, and disinfection.

c) Removal of Suspended Solids

Suspended solids are usually removed by sedimentation and or filtration. Coagulation, flocculation, and sedimentation may be used as pretreatment to enhance the effectiveness and minimize the cost of subsequent filtration. Coagulation involves adding chemicals to the water, such as pH buffers and coagulants, to facilitate subsequent treatment steps. The chemically treated water is sent into a floculation process where the suspended particles can collide and form heavier particles called flocs. Gentle agitation and appropriate retention times facilitate this process. The velocity of water is then decreased so that suspended material can settle out of the water stream by gravity. The flocs can also be removed directly during filtration. Smaller water treatment systems might also use membrane and cartridge filtration systems.

d) Removal of Dissolved Contaminants

Some water sources must be treated to remove dissolved materials, which are not affected by coagulation and filtration, to achieve water of adequate quality. High concentrations of metals such as calcium and magnesium contribute to "hard" water, and resulting scaling problems. Dissolved metals such as iron and manganese can adversely affect the water's taste and cause stains and buildup of metal oxide particles in water tanks and pipelines. Radionuclides, nitrates, and toxic metals, such as copper and arsenic, can cause health impacts. Dissolved organic compounds can also cause adverse aesthetic and health impacts. Treatment methods include lime softening, oxidation, ion exchange, reverse osmosis, electrodialysis, aeration, and activated carbon filtration.

e) Disinfection

Disinfectants are added in water supply systems to destroy microorganisms that can cause disease in humans. The most commonly used disinfection agents include chlorine, chloramines, ozone, and ultraviolet light. Other disinfection methods include chlorine dioxide, potassium permanganate, and nanofiltration. Primary disinfection achieves the desired level of microorganism kill or inactivation, while secondary disinfection maintains a disinfectant residual in the finished water that prevents the re-growth of microorganisms.

4.1.5 Water supply Distribution Systems and Storage tanks

a) **Water supply distribution** systems include all components necessary to carry portable water from a centralized treatment plant or well supplied by gravity or

pumped system to the storage tanks and distribution networks to the consumers. Distribution systems are designed and operated to deliver water of quality acceptable for human consumption and of sufficient quantity to meet all needs of the end user.

Water distribution systems may have a branch or loop network topology, or a combination of both. In a branch system, smaller pipes branch off or larger ones throughout the system such that water can take only one pathway from the source to the consumer. A loop system comprises of connected pipe loops throughout the service area such that water can take several pathways from the source to the consumer.

b) **Storage tanks** or reservoirs are used to provide storage capacity to meet fluctuations in demand, to provide reserve supply for fire suppression and other emergency needs, to stabilize pressures in the distributions system, to increase operating convenience and provide flexibility in pumping, to provide water during source or pump failures, and to blend different water sources. Elevated tanks are used most frequently, but other types and reservoirs include in-ground tanks and reservoirs.

Ideally, the water quality should not change between the time it leaves the treatment plant and the time it is consumed. However, substantial changes can occur to finished water in the distribution system as the result of complex physical, chemical, and biological reactions.

4.2 Sanitation

Sanitation systems protect human health and the environment by isolating, and in some manner treating sewage waste. For rural areas, on-site sanitation systems, ranging from pit latrines to flush toilets and septic systems, are the most common. In urban áreas, more complicated, centralized collection, storage, and treatment systems are needed.

4.2.3 Sludge Collection

On-site sanitation systems such as pit latrines and septic systems require periodic removal of fecal sludge for proper functioning. The first stage of proper management of fecal sludge is collection and transport to a storage or treatment facility. Collection may be accomplished by manual means or with mechanical equipment. Mechanical equipment for septic collection include truck- mounted vacuum tanks. In houses situated close to a road, the septic tank can be emptied with the large truck and the septage can directly be hauled to the treatment site. If the house is situated in a narrow lane, a mini-vacuum-tug can be used. In that case, an intermediate storage tank (3 to 6 m^3) can be placed in the closest point accessible by truck, and the sludge is transferred to the tank from the vacuum tug in several trips. This storage tank can then transferred to another emptying site or to the treatment site. One unit of equipment, either large or small, can serve 2 to 3 septic tanks per day or approximately 500m^3 (units) per year.

4.2.4 Sewerage

Sewers are closed conduits, usually circular in cross section, which carry wastewater. Sewerage refers to systems of sewers and includes pump stations, overflows, and other associated infrastructure. Most sewers are designed to carry either sewage or storm water, or combined sewers, which carry both sewage and storm water.

Sewers may carry wastewater from residential, commercial, and industrial users, to storage, discharge, or wastewater treatment. Because industrial liquid waste may contain a wide range of chemicals, solvents, and other contaminants that cannot be effectively removed by the centralized wastewater treatment plant, industries are often required to pre-treat their liquid wastes prior to discharging to sewer.

Design and sizing of sewerage systems considers population served, commercial and industrial flows, flow peaking characteristics, and wet weather flows. Besides the projected sewage flow, the size and characteristics of the watershed are the overriding design considerations for combined sewers. Often, combined sewers can not handle the volume of storm water runoff, resulting in combined sewer overflows, which are typically discharged to surface water with little if any treatment. Although separate sewer systems are intended to transport only sewage, all sewer systems have some degree of inflow and infiltration of surface water and groundwater. Inflow and infiltration are affected by existing moisture conditions, which also represent an important design consideration in separate sewer systems.

A typical method of conveyance used in sewer systems is to transport wastewater by gravity along a downward-sloping pipe gradient. These sewers, known as conventional gravity sewers, are designed so that the slope and size of the pipe is adequate to maintain flow towards the discharge point without surcharging manholes or pressurizing the pipe.

Alternative wastewater collection systems can be cost effective for areas where traditional collection systems are too expensive to install and operate. For example, pressure sewers are sometimes used in sparsely populated or suburban areas in which conventional collection systems would be expensive. These systems generally use smaller diameter pipes with a slight slope or follow the surface contour of the land, reducing excavation and construction costs. Pressure sewers differ from conventional gravity collection systems because they break down large solids in the pumping station before they are transported through the collection system. Their watertight design and the absence of manholes eliminate extraneous flows into the system. Thus, alternative sewer systems may be preferred in areas that have high groundwater that could seep into the sewer, increasing the amount of wastewater to be treated. They also protect groundwater sources by keeping wastewater in the sewer. The disadvantages of alternative sewage systems include increased energy demands, higher maintenance requirements, and greater on-lot costs. In areas with varying terrain and population density, a combination of sewer types may be appropriate.

4.2.5 Wastewater Treatment

Sewage treatment includes physical, chemical, and biological processes to remove physical, chemical, and biological contaminants. Its objective is to produce treated effluent and a solid waste or sludge that is suitable for discharge or reuse back into the environment. Typically, sewage treatment involves up to three stages, primary, secondary and tertiary treatment.

a) Primary Treatment

Primary treatment is designed to remove gross, suspended and floating solids from raw sewage. This stage is sometimes referred to as mechanical treatment, although chemicals are often used to accelerate the sedimentation process.

Preliminary screening removes large suspended and floating objects. After the wastewater has been screened, it may flow into a grit chamber where sand, grit, cinders, and small stones settle to the bottom. Removing the grit and gravel that washes off streets or land during storms is very important, especially in cities with combined sewer systems. Large amounts of grit and sand entering a treatment plant can cause serious operating problems, such as excessive wear of pumps and other equipment, clogging of aeration devices, or taking up capacity in tanks that is needed for treatment. The grit and screenings removed by these processes must be periodically collected and disposed of (e.g. by landfilling or incineration).

Primary treatment can reduce the BOD of the incoming wastewater by 20 – 30 % and the total suspended solids by 50 – 60 %. Primary treatment is usually the first stage of wastewater treatment. In some cases, treatment plants begin with primary treatment and add other treatment stages as wastewater load grows, as the need for treatment increases, and as resources become available.

b) Secondary Treatment

Secondary treatment uses biological processes to remove about 85 percent of the dissolved organic matter that escapes primary treatment. Secondary treatment technologies include fixed-film processes, activated sludge and other suspended growth processes, extended aeration systems, membrane biological reactors, aerated lagoons, pond and constructed wetland systems, and other forms of treatment that use biological activity to break down organic matter.

In attached growth (or fixed-film) processes, the microbial growth occurs on the surface of stone or plastic media. Wastewater passes over the media along with air to provide oxygen. Attached growth process units include trickling filters, biotowers, and rotating biological contactors. In suspended growth processes, the microbial growth is suspended in an aerated water mixture where the air (or oxygen) is pumped in, or the water is agitated sufficiently to allow oxygen transfer. Suspended growth process units include variations of activated sludge, oxidation ditches, and sequencing batch reactors. The suspended growth process speeds up the work of aerobic bacteria and other microorganisms that break down the organic matter in the sewage by providing a rich aerobic environment where the microorganisms suspended in the wastewater can work efficiently.

From the aeration tank, the treated wastewater flows to a sedimentation tank (secondary clarifier), where the excess biomass is removed. Some of the biomass is recycled to the head end of the aeration tank, while the remainder is "wasted" from the system. The waste biomass and settled solids are treated before disposal or reuse as biosolids.

Activated sludge and related processes can be appropriate where high removal of organic pollution is required, funds and skilled personnel are available for operation and maintenance, and land is scarce or expensive. The system typically needs some form or primary treatment, such as screening and sedimentation. When properly operated and maintained, the process is generally free of flies and odors. However, most activated sludge processes are more costly to operate than attached growth processes and a steady energy supply is required. The effectiveness of the activated sludge process can be adversely affected by elevated levels of toxic compounds in wastewater. Therefore, an industrial pretreatment program may be needed to control pollutants from the industrial users that may pass through or interfere with treatment processes, contaminate sewage

sludge, or create hazardous condition in the sewerage or treatment system such as formation of toxic gases.

General considerations for activated sludge process design include wastewater characteristics, local environmental conditions (including temperature), possible presence of inhibitory substances (such as those present in industrial effluents), oxygen transfer requirements and reaction kinetics (retention time in the system).

Extended aeration is a variation on the basic activated sludge process that uses a relatively low flow rate and long aeration time. The aerated sewage is formed into a brown floc-like sludge, which settles out in a separate settling tank. Thus, clear treated effluent is drawn off the top of the settling tank and sludge is drawn off the bottom of the tank. The advantage of this system is that the sludge is stable and needs no further treatment except dewatering. However, power demands are high because of the long period of aeration, thus the system is suitable for small plants.

Membrane biological reactors (MBR) or bio-membrane systems includes a semi-permeable membrane barrier system either submerged or in conjunction with an activated sludge process. This technology guarantees removal of all suspended and some dissolved pollutants. The limitation of MBR systems is directly proportional to nutrient reduction efficiency of the activated sludge process. MBR systems can achieve high effluent quality and use small land area. However, the MBR process is sophisticated and the cost of building and operating a MBR is usually higher than conventional wastewater treatment.

Waste Stabilization Ponds (WSPs) and wetlands are simple and robust wastewater treatment options with low operation and maintenance costs and demands. WSPs are classified as; Anaerobic ponds which are open basins in which wastewater is treated in the absence of oxygen, facultative ponds are large shallow basins that facilitate a combination of anaerobic and aerobic processes, (in which the processes may or may not use oxygen) and maturation ponds are similar but smaller, and are typically placed in series after facultative ponds. Maturation ponds are more efficient than most other treatment processes at removing both bacteria and parasitic worm eggs (in which the pond provides additional treatment in the presence of oxygen and sunlight to further reduce pollutants before discharge). Ponds and wetland systems are influenced by natural conditions, such as wind, temperature, rainfall, solar radiation, and seepage, as well as by physical factors such as surface area, water depth, short-circuiting, pH, toxic materials, and oxygen. Site-specific problems may include a high groundwater table, flooding, steep topography, and habitat for vectors.

c) Tertiary Treatment

Tertiary treatment is any practice beyond secondary treatment and is designed to remove non-biodegradable organic pollutants and mineral nutrients such as nitrogen and phosphorus salts. Tertiary treatment can remove more than 99 percent of impurities from the wastewater, and is capable of producing effluent of nearly drinking (potable) water quality. An example of tertiary treatment is the modified conventional secondary treatment to remove additional phosphorous and nitrogen. Activated carbon filters are commonly used for tertiary treatment.

4.2.4 Wastewater Disinfection and Re-use

a) Disinfection

Disinfection can be the final step before discharge of the effluent. Chlorine is the most widely used disinfectant but ozone and ultraviolet radiation are also frequently used for

wastewater effluent disinfection. However, some environmental authorities are concerned that chlorine residuals in the effluent can cause adverse impacts. Dechlorination of treated wastewater may be appropriate to achieve desired water quality parameters.

b) Wastewater Re-Use

Wastewater is increasingly used for agriculture, especially in areas of water scarcity, population increase, and related demands for food, as wastewater provides a source of both water and nutrients. Wastewater can also be a reliable source of water throughout the year.

The wastewater is applied to the land and moves through the soil where the natural filtering action of the soil along with microbial activity and plant uptake removes most contaminants. Part of the water evaporates or is used by plants. The remainder is either collected via drains or wells for surface discharge or allowed to percolate into the groundwater. Much of the water and most of the nutrients are used by the plants, while other pollutants are transferred to the soil by adsorption, where many are mineralized or broken down over time by microbial action.

4.2.5 Sludge Treatment and Disposal

a) Sludge Treatment

The most common sludge treatment are: anaerobic digestion and thermophilic anaerobic digestion.

Anaerobic digesters are large fermentation tanks which are continuously operated under anaerobic conditions. Anaerobic decomposition could be used for direct treatment of sewage, but it is economically favorable to treat the waste anaerobically. Large-scale anaerobic digesters are usually used for processing of the sludge produced by primary and secondary treatments. It is also used for the treatment of industrial effluents which have very high BOD levels. The final products of anaerobic digestion are approximately 70% methane and 30% carbon dioxide, microbial biomass, and non-biodegradable residue. Fully digested sludge has little readily biodegradable organic matter. Generally, does not have objectionable odors, and about 50% of the solids are inorganic.

Thermophilic anaerobic digestion takes place at higher temperatures, typically 50 – 70ºC, compared with standard anaerobic digestion, which most commonly is carried out at about 20 – 45ºC. Thermophilic anaerobic digestion can be faster, requiring only about two weeks to complete, compared with 15 to 30 days for standard anaerobic digestion. However, thermophilic digestion is more expensive, requires more energy and is less stable than the mesophilic process.

b) Sludge Disposal and Use

Following stabilization (e.g. by anaerobic digestion, thermophilic anaerobic digestion, aerobic digestion, or extended aeration processes), the sludge can be dewatered and disposed of in a landfill or incinerator, or subject to further processing for beneficial uses. There are concerns about sludge incineration because of air pollutants during emissions, along with the high cost of supplemental fuel, making this a less attractive and less commonly constructed means of sludge treatment and disposal. However, incineration may be appropriate if the composition of the sludge (e.g. because of industrial discharges to the sewer system) precludes other disposal or use option.

CHAPTER FIVE

5 OVERVIEW OF THE ENVIRONMENTAL AND SOCIAL ASSESSMENT

5.1 Awareness on the environmental and social issues

Water supply and sanitation projects have significant positive impacts beyond the expected improvements to health and reduction in time spent collecting water. These positive impacts include improvements in household income, security of livelihoods, increased children education, social and cultural benefits such as reductions in stress levels, increased status and self-esteem, better family and community relations, etc. Most of the main beneficiaries of positive impacts are poor rural people, which is why this type of investment should be part of a national strategy for poverty reduction.

The negative impacts of water and sanitation projects however, can be diverse and significant, affecting the natural, social and economic environments. In order to ensure that the optimum level of long and short-term benefit is obtained from the water and sanitation services, it is therefore essential that MoW, IAs, all stakeholders and interested parties of water and sanitation development projects in the country, are aware of both the positive and negative environmental and social effects of water and sanitation interventions.

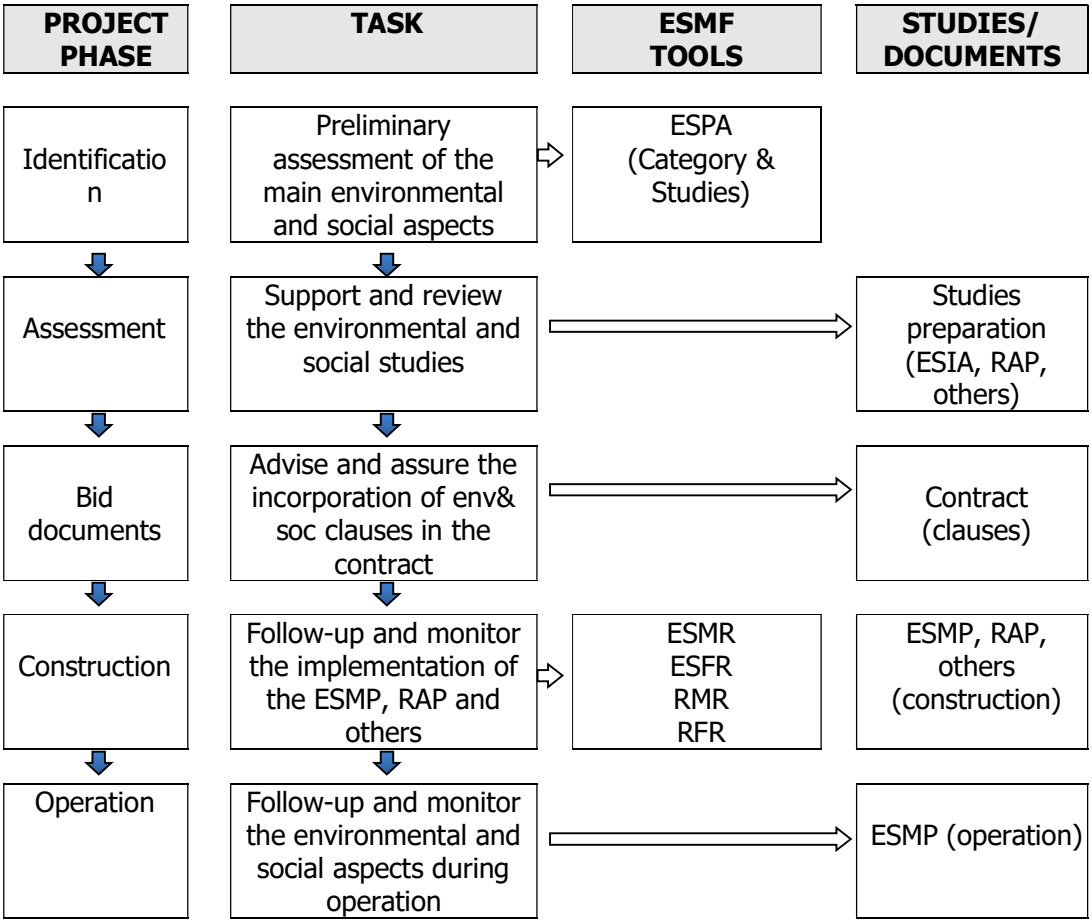
5.2 Environmental and social management frameworks

In order to assure the environmental and social management in the projects supported by MoW, an **Environmental and Social Management Framework (ESMF)** and **Resettlement Management Framework (RMF)** has been developed by the Ministry to be applied in the Water Sector Development Programme (WSDP) through the Implementing Agencies (IAs). These instruments include some methodologies, tools and procedures in order to assure the compliance of the national laws and the World Bank's Safeguard Policies.

The environmental and social management should be included in the "project cycle" (identification, assessment, contract, execution and operation). In this regard, specific internal tools or formats have been developed in order to include the environmental and social variables in the project cycle. Those tools or format are the following: a) Environmental and Social Preliminary Assessment (ESPA); b) Environmental and Social Monitoring Report (ESMR); and c) Environmental and Social Final Report (ESFR); d) Environmental and social management plan (ESMP); e) Ressetllement Action Plan (RAP); f) Ressetllement Management Report (RMR); and g) Ressetllement Final Report (RFR). Those tools developed for the Safeguard Coordinators of the IAs for each project.

For the specific issues about resettlement and vulnerable groups, which triggers the World Bank's Involuntary Resettlement Policy (OP/BP 4.12), and the Indigenous People Policy (OP/BP 4.10), the Environmental and Social Screening Form (ESSF) Form as annexed in the Resettlement Management Framework (RMF) and Environmental and Social Management Framework (ESMF) should be completed if a specific project will affect people or when the project is located in a recognized site of vulnerable groups.

Figure 2: Project cycle and main environmental and social management tools



ESSF: Environmental and Social Screening Form
ESMR: Environmental and Social Monitoring Report
ESFR: Environmental and Social Final Report
ESMP: Environmental and social management plan
RAP: Ressetllement Action Plan
RMR: Ressetllement Management Report
RFR: Ressetllement Final Report

5.3 Environmental and social assessment process

The purpose of the environmental and social assessment process is to contribute to good and holistic decisions that will assure project's environmental and social sustainability. By integrating the assessment work with planning, it ensures that adequate considerations and adjustments are being made at the right time in the project designs. A proper environmental and social assessment contributes: a) to identify and compare alternatives in the planning phase; b) to environmentally and socially adjustments of the solution, reducing negative impacts and increasing positive impacts; and c) to provide documentation to the decision-making process.

According to the Environmental Management Act No. 20 of 2004, the environmental assessment for projects with high environmental and social risk requires an **Environmental Impact Assessment (EIA)**; projects with moderate risk requires an **Preliminary Environmental Assessment (PEA)**; and projects with high or moderate

risk but under construction or extension of the existing project requires an **Environmental Audit (EA)**. All these studies should include its **Environmental Management Plan (EMP)**.

In regards to social assessment, the project who potentially will affect people should requires a **Resettlement and Compensation Action Plan (RAP)**; and projects that will be constructed in areas or location of ethnics' groups will require specific **Vulnerable Group Plan (VGP)**, in order to comply with the World Bank Safeguards Policies.

CHAPTER SIX

6 ENVIRONMENTAL IMPACTS, SOCIAL IMPACTS AND GOOD PRACTICES

This chapter presents a summary of the potential environmental and social negative impacts, and the measures or good practices to prevent, mitigate and compensate those impacts. For easy comprehension and use of these guidelines, the impacts and measures are presented in function of the project issues that are common in the water supply and sanitation projects.

The main construction factors that may potentially affect the environment and people are the following:

a. Work Safety, Camp and Site Installation

- Workforce
- Environmental training and awareness
- Workers protection
- Workers camp
- Wastewater
- Solid wastes
- Hazardous and chemical wastes
- Handling of construction materials (use and storage)
- Maintenance of construction equipment

b. Construction Site

- Clearing of construction areas
- Erosion and sedimentation
- Earthworks, cuts and fill
- Air quality
- Noise and vibration
- Traffic management

c. Ecological Considerations

- Landscape, visual impacts and restoration
- Scenic spots and sensitive areas
- Environmental emergency procedures

d. Social Considerations

- Community relations
- Health and Wellbeing of Communities
- Resettlement/Compensation
- Vulnerable groups
- Cultural and Archeological

6.1 Work safety, camp and site installation

6.1.3Workforce

Description:

Workforce includes all personnel hired by the Contractors to work in the constructions, rehabilitation, or improvement of the water supply or sanitation project. The workforce can be locally recruited or from outside locations.

Activities and issues that can potentially generate environmental and social negative impacts:

- Interaction between outside workers and local communities;
- Increased risk of prostitution and sexually transmitted diseases (mostly in big projects);
- Increase of waste production; and
- Affected living standard and income of local residents due to occupation of farmland.

Good practices:

- The Contractor shall, whenever possible, hire local labor from within or villages close to the project;
- The Contractor shall provide safety training to all workers;
- The Contractor shall provide education classes on HIV and sexually transmitted diseases;
- The Contractor shall establish a **"Code of Conduct"** to outline the importance of appropriate behavior in regards of: drug, alcohol, respect for local communities, and compliance with relevant laws and regulations. Each employee shall be informed of the Code of Conduct before start the job;
- The Code of Conduct shall address issues such as the prohibition to possess illegal substances, firearms, pornographic materials, gambling, etc;
- To have good system for waste management; and
- Failure to follow or not compliance of the Code of Conduct should result in disciplinary actions.

According to Occupational, Safety and Health (OSHA) requirements, the workplace of the project should be registered. The Application Form for Registration of Workplace is included in the **Annex 2 (2.1)**.

6.1.4Environmental and Social Training and Awareness

Description:

Environmental and Social training and awareness to the workers and all concerned staff is required before starting the works in order that these persons are aware of the relevant environmental requirements as stipulated in the studies, environmental legislation and the contract specifications.

Activities and issues that can potentially generate environmental and social negative impacts:

During construction the workers can cause:

- damages to the forest, waterways, or other environment or social element adjacent to camps and work areas and
- self –effected injuries

Good practices:

- The Contractor shall distribute to the key staff, including newly joined key staff members the Contractor's Environmental Policy and copies of the relevant extracts from the environmental documents, especially the ESMP;
- The Contractor shall provide training to all staff according to their level of responsibility for environmental and social matters. Managerial staff shall receive additional training;
- Training materials and methods shall be reviewed by the Safeguard Coordinator- IA (SC -IA);
- All Contractor's employees shall be required to comply with environmental protection procedures and they shall be able to provide evidence that they attended the training;
- The training shall educate all construction workers on the following issues but not limited to: fire arm possession, traffic regulations, illegal logging and collection of non-timber forestry products, non disturbance of resettlement communities, hunting and fishing restrictions, waste management, erosion control, health and safety issues, all prohibited activities, the Code of Conduct requirements and disciplinary procedures, and general information on the environment and social in which they will be working and living;
- Periodic training shall be provided when necessary;
- Records shall be maintained of the staff and could be submitted to the IA upon request;
- Records shall be kept on site where possible for each project activity for easy access during site audits or enquiries. Environmental training records (e.g. attendance records for environmental awareness training, topics covered) shall be kept; and
- Penalties for those who violate the environmental rules should be established.

6.1.5Workers protection

Description:

The Contractor's responsibilities include the protection of every person and nearby property from construction accidents. The Contractor shall be responsible for complying

with all national and local safety requirements and any other measures necessary to avoid accidents.

Activities and issues that can potentially generate environmental and social negative impacts:

- Risk associated with working in enclosed environment such as inadequate ventilation;
- Landslides during the construction through geologically unstable ground layers;
- Risk of falling objects and working on unstable working platform;
- Risk associated with blasting exercise and fires; and
- Traffic safety in the construction site.

Good practices:

- The Contractor shall appoint an accident prevention officer at the site, responsible for maintaining safety and protection against accidents;
- Conduct safety training for construction workers prior to beginning work;
- Provide personal protective equipment and clothing (goggles, gloves, respirators, dust masks, hard hats, steel-toed boots, etc.) for construction workers and enforce their use;
- During heavy rains or emergencies of any kind, suspend all work;
- Establish safe sight distance in both construction areas and construction camp sites;
- Place safety signs around the construction areas both in swahili or site language;
- The Contractor shall present to the IA, the measures to be taken during blasting;
- The Contractor shall notify any occupants/owners of surrounding land at least one week prior to blasting and shall address any concerns through the Grievance Mechanism;
- The Contractor shall submit a fire control and fire emergency method statement to the IA for approval. Fire-fighting equipment shall be available in camps, and construction areas;
- The Contractor shall take all reasonable steps to avoid increasing the risk of fire or emergency events through activities on site;
- Any work that requires the use of fire may only take place at a designated area and must be supervised at all times; and
- The Contractor must monitor, record, and report the situation of hazardous.

According to the OSHA requirements, the incidence, or accidents should be reported using the Incidence and Occupational Disease Notification, which is included in the **Annex 2 (2.2)**.

Good practice	Bad practice
 Siteworkers with safety gears	 No use of basic personal protection equipments

6.1.6 Workers camp

Description:

The construction, layout and extent of the construction site and its components, i.e. all offices, accommodation facilities, laboratories, storage and stockpiling areas, vehicle washing areas and all other areas/facilities required for completion of the project shall be planned, designed, located and managed in such a manner that environmental and social impacts are minimized.

Activities and issues that can potentially generate environmental and social negative impacts:

- Establishment of work site areas can result in short and long-term environmental impacts. Site selection shall be subject to environmental assessment, especially on big projects;
- Activities at the construction site can generate significant volume of wastewater, which require sufficient wastewater discharge facilities;
- Improper or insufficient waste management facilities and policies can lead to waste problems, e.g. work site with waste, illegal dumping, and others; and
- Spillage and leakage from storage of oil or hazardous substances (ground pollution).

Good practices:

- Site offices, camps, material depots, mixing stations, and workshops shall be located in appropriate areas as agreed by local villages and approved by the IA and not within 500m of existing residential settlements in big projects; 300m in medium size projects; and 100m in small size projects. *See the definition of big, medium and small size project in the ESMF*;
- Site offices, camps, depots and particularly storage areas for diesel or others fuels, shall not be located within 500m of water courses in the case of big projects, 300m

in medium size projects; and 100m in small size projects;
- The workforce shall be provided with safe, suitable, and comfortable accommodations, if the project requires. It should be maintained in clean and sanitary conditions;
- Potable water for human consumption shall be provided to the workers;
- A method shall be established for storing and disposing of all solid wastes generated by the labor camp and/or base camp. If applicable, kitchen wastes shall be disposed into soak pits;
- Separate and adequate lavatory facilities (toilets and washing areas) shall be provided for the use of male and female workers. A temporary septic tank shall be installed;
- A medical first aid facilities and first aid boxes shall be provided in the camp and site areas;
- Some security measures shall be put into place in the construction area such as adequate, day time, night time lighting; a perimeter security fence.

6.1.7 Wastewater

Description:

Wastewater includes wastewater generated during construction and wastewater produced by the domestic and sanitary use, water used for the maintenance and wash of vehicles.

Activities and issues that can potentially generate environmental and social negative impacts:

- Wastewater generated from construction equipment;
- Wastewater from bored piling locations. Re-suspension of bottom sediment and mud caused by cut-trench river crossings and construction of dams, bridges foundation within rivers;
- Soil erosion/flush away from uncovered stockpiling locations, uncovered excavation site and unprotected slope surface during adverse weather conditions;
- Uncontrolled surface water run-off carrying sediment laden discharges directly into natural water bodies such as streams, fish ponds, rivers and local irrigation channels;
- Domestic sewage generated by construction workers from kitchen, campsite, etc.

Good practices:

- The Contractor shall be responsible for compliance with the relevant Tanzania legislations to wastewater discharges into watercourses;
- The Contractor shall submit a method statement to the IA detailing how wastewater would be collected from all wastewater generating areas, as well as storage and disposal methods. If the Contractor intends to carry out any on-site wastewater treatment, should be included;
- Water from kitchens, showers, laboratories, sinks etc. shall be discharged into a conservancy tank for removal from the site;
- Runoff from fuel depots / workshops / machinery washing areas and concrete batching areas shall be collected into a conservancy tank and disposed off at a site approved by the IA;
- Domestic sewage from site office and toilets shall either be collected by a licensed waste collector or treated by on-site treatment facilities. Discharge of treated wastewater must comply with the discharge limit according to the legislations;

- Chemical toilets can be provided on site for construction workers. Domestic sewage collected from the site office and chemical toilets shall be cleaned up on regular basis. Only licensed waste collectors shall be employed for this disposal;
- At completion of rehabilitation works, soak pits and septic tanks shall be covered and effectively sealed off; and
- Wastewater shall not be disposed in watercourses without treatment.

6.1.8 Solid Waste

Description:

Construction, vehicle maintenance and domestic waste, if not disposed properly, can damage local forest areas, contaminate drainage watercourses, and impact agricultural land.

Activities and issues that can potentially generate environmental and social negative impacts:

- Surplus excavated materials requiring disposal due to earth moving activities and slope;
- Disposal of used wooden boards for trenching works, scaffolding steel material, site sign boards, packaging materials, containers of fuel, lubricant and paints;
- Waste generated by demolition of existing houses/buildings affected by the project or breaking of existing concrete surface;
- Domestic solid waste generated by construction workers, construction campsite and toilet;
- Waste from on-site wastewater facility.

Good practices:

- Establish and enforce daily site cleanup procedures, including maintenance of adequate disposal facilities;
- Debris generated due to the dismantling of existing structures shall be suitably reused, to the extent feasible in the project (e.g. fill materials for embankments). The disposal of remaining debris shall be carried out only at sites identified and approved by the IA or NEMC. The contractor should ensure that sites are (a) not located within designated forest areas; (b) do not impact natural drainage courses; and (c) do not impact endangered/rare flora and fauna. Under no circumstances the contractor shall dispose any material in environmentally sensitive areas.
- In the event any debris or silt from the sites is deposited on adjacent land, the Contractor shall immediately remove such debris or silt and restore the affected area to its original state;
- Water courses shall be cleared of debris and drains and culverts checked for clear flow paths;
- Include provisions for incorporating the most appropriate stabilization techniques for each disposal site and determine that the selected sites don't cause unwanted surface drainage;
- Assess risk of any potential impact regarding leaching of spoil material on surface water;
- Once the work is completed, all generated debris should be removed from the site;
- For domestic wastes, the Contractor shall provide refuse bins, all with lids, for all buildings. Refuse shall be collected and removed from all facilities at least twice per

week. Domestic waste shall be transported to the approved disposal site in covered containers or trucks; and
- Random disposal of solid waste in scenery areas shall be strictly prohibited.

Good practice	Bad practice
 Good disposal of the solid wastes in the camp R – Recyclable wastes I - Inert debris O – Organic wastes H – Hazardous wastes	 Bad disposal of the solid waste in the camp

6.1.9Hazardous and chemical waste

Description:

Construction of new water or sanitation projects can generate hazardous waste such as chemicals, asbestos, hydrocarbons, or other similar hazardous materials. If the construction site is expected to have or suspected of having hazardous materials, the Contractor will be required to prepare a Hazardous Waste Management Plan to be approved by the IA and NEMC.

Activities and issues that can potentially generate environmental and social negative impacts:

There will be potential for pollution of adjacent habitat areas and watercourses caused by hazardous wastes such as waste oil, spent lubricant, and contaminated materials resulting from leakage of oil and fuel.

Good practices:

- All hazardous and chemical waste shall be disposed of at an approved hazardous landfill site and in accordance with local law requirements. The Contractor shall provide disposal certificates to the IA or NEMC if is required;
- The removal of asbestos-containing materials or other toxic substances shall be

performed and disposed off by special trained workers following national requirements or international recognized procedures;
- Used oil and grease shall be removed from site by an approved company;
- Under no circumstances shall the spoil of hazardous products be allowed on the site, over embankments, in borrow pits or any burying;
- Unused or rejected tar or bituminous products shall be returned to the supplier's production plant;
- Used oil, lubricants, cleaning materials, etc., from the maintenance of vehicles and machinery shall be collected in holding tanks and send back to the supplier or removed from site by specialised oil recycling company for disposal at an approved hazardous waste site;
- Inform the IA of any accidental spill or incident;
- Initiate a remedial action following any spill or incident; and
- Provide a report to IA explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions.

Good practice	**Bad practice**
	
Good disposal of the concrete residuals	Bad disposal of the concrete residuals

6.1.10 Handling of construction materials (Use and storage)

Description:

The Contractor shall submit a method statement detailing cement storage, hazardous material storage, method of transport of cement, concrete, and hazardous material, storage and disposal of used cement bags, etc., for each concrete batching operation.

Activities and issues that can potentially generate environmental and social negative impacts:

Effects to the natural environment and people in the surrounding areas. Also, potential negative impacts on the landscape.

Good practices:

- The Contractor shall ensure that all suppliers and their delivery drivers are aware of procedures and restrictions (e.g. restricted areas);
- Materials shall be appropriately secured to ensure safe passage between destinations to the project site during transportation;
- Loads shall have appropriate cover to prevent from spilling from the vehicle during transit;
- The Contractor shall be responsible for any cleanup resulting from failure by his employees or suppliers to property secure transported materials;
- The Contractor shall provide a method detailing the hazardous substances/material that are to be used during construction, as well as the storage, handling, and disposal procedures for each substance/material and emergency procedures in the event of misuse or spillage;
- Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure;
- Fuel shall be stored in a steel tank supplied and maintained by the fuel suppliers. The tank shall be located in a secure and demarcated area;
- Used (empty) cement bags shall be collected and stored in weatherproof containers to prevent windblown cement dust and water contamination. Used cement bags shall not be used for any other purpose and shall be disposed according to the ESMP;
- All excess concrete shall be removed from site on completion of concrete works and disposed off. All excess aggregates shall also be removed;
- All transportation, storage, processing, packaging, and the disposal of blasting materials shall be carried out in accordance with the national and local regulations; and
- Pesticides/ herbicides shall be packaged, labeled, handled, stored, and disposed according to standards of the World Bank Pest Management Policy (OP/BP 4.09) and national laws.

Good practice	Bad practice
 Good handling of construction materials	 Bad handling of construction materials

6.1.11 Maintenance of construction equipment

Description: A wide range of construction equipment is used in the construction or rehabilitation of water and sanitation projects, mainly in big and medium size project, that require proper maintenance, such as trucks, bulldozers, batching plants, generators, mixers, front loaders, compactors, and others.
Activities and issues that can potentially generate environmental and social negative impacts: Haphazardly placement of construction equipment during construction may potentially cause pollution to vegetation and watercourses
Good practices: – Identify and demarcate equipment maintenance areas (>20 m from rivers, streams, lakes or wetlands); – Fuel storage shall be located in proper areas and approved by the IA or NEMC if is required; – Ensure that all equipment maintenance activities, including oil changes, are conducted within demarcated maintenance areas – Never dispose spent oils on the ground, in water courses, drainage canals or in sewer systems; – All spills and collected petroleum products shall be disposed off in accordance with standard environmental procedures/guidelines; and – Fuel storage and refilling areas shall be located at least 300m from all cross-drainage structures and important water bodies or as directed by the IA or NEMC.

6.2 Construction Site

6.2.3Clearing of construction area

Description:

New water and sanitation projects require move of material that potentially will affect the natural environment and communities located in the area where the project will be constructed. Sometimes, especially new water projects require construction, improvement or rehabilitation of access roads, that should be include as part of the project as ancillary component of the project and the respective studies and plans (ESMP, RAP, others).

Activities and issues that can potentially generate environmental and social negative impacts:

- Large-scale earth moving activities, disturbance of soil profile and removal of vegetation during the project construction which may result in soil erosion and visual impact;
- Poor/inadequate aesthetic design and landscaping design of the proposed project;
- Poorly implemented temporary measures during clearing or excavation works.
- Lack of appropriate plants restoration plan at the end of construction or non-native species are planted that are visually incompatible with the existing natural environment; and
- Lack of proper maintenance/watering of new-planted vegetation during the operation period.

Good practices:

- Areas proposed for clearing shall be included in the ESMP. Only required areas shall be cleared
- Before vegetation clearing, search, rescue and seed collection of natural vegetation shall be undertaken;
- Retain vegetation cover for as long as possible;
- Large or significant trees in the project area should be preserved wherever possible;
- The application of chemicals for vegetation clearing shall be minimized;
- The use of herbicides shall consider WB's Pest Policy (OP/BP 4.09) and national regulations, be effective against the target vegetation species, have minimum effect on the natural environment, inhabitants and domestic animals, as well as for personnel applying them;
- The design of the projects, including temporary and permanent access, shall avoid crop areas where reasonable and practical, if not, the people affected should be compensated;
- All native plants removed from cleared areas shall be stockpiled for mulching. All remaining vegetation shall be removed and disposed of at an approved landfill site; and
- Stripped topsoil shall be stockpiled in areas agreed with the IA for later use in re-vegetation and shall be adequately protected.

Good practice:	Bad practice:
 Change of alignment of the access road to avoid the affectation of the Baobab tree	 Cut of special trees

6.2.4Erosion and sedimentation

Description: There is the potential for site erosion and sedimentation of nearby land and waterways if the site activities are not carefully managed.
Activities and issues that can potentially generate environmental and social negative impacts: – Destruction of surface vegetation. – Aggravate soil erosion, and – Temporarily change of water flow patterns.
Good practices: – The Contractor shall implement erosion and sedimentation control measures during the construction, specially in new and big size water and sanitation projects; – The Contractor shall protect all areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking any other measures necessary to prevent storm water from concentrating in streams and scouring slopes, banks, etc. – Areas of the site not disturbed by construction activities shall be maintained in their existing conditions; – Conserve topsoil with leaf litter and organic matter, and reapply those materials to local disturbed areas to promote the growth of local native vegetation; – Apply local, native grass seed and mulch to barren erosive soil areas or closed construction surfaces; – In areas where construction activities have been completed and where no further disturbance would take place, re-vegetation should commence as soon as possible; – Spray water as needed on project area and access roads if not paved to reduce dust and wind-induced erosion; and – Traffic and movement over stabilized areas shall be restricted and controlled.

Good practice	Bad practice
 Good practice on erosion control to minimize sedimentation	 Improper handling of construction site which may cause erosion and sedimentation

6.2.5 Earthworks, cuts and fill

Description: Earthworks cuts and fill shall be carefully managed to minimize negative impacts on the environment and people surrounding.
Activities and issues that can potentially generate environmental and social negative impacts: Poorly designed and constructed earthworks (including earth moving activities and slope cutting) are unsafe and can cause damage to agricultural land and native vegetation and contaminate surface water drainage and watercourses.
Good practices: – All earthworks shall be properly controlled, especially during the rainy season; – The Contractor shall maintain stable cut and fill of slopes at all times and cause the least possible disturbance to areas outside the prescribed limits of the works; – In order to protect any cut or fill from erosion, in accordance with the drawings, cut-off drains and toe-drains shall be provided at the top and bottom of slopes and be planted with grass or other plant cover. Cut-off drains should be provided above high cuts to minimize water runoff and slope erosion; – Excavated cut or unsuitable material shall be disposed off in designated disposal areas as agreed in the ESMP; – Disposal sites should not be located where they can cause future slides, interfere with agricultural land or any other properties, or cause soil from the dump to be washed into any watercourse; – Ensure no effect to groundwater or aquifers. The hydrological studies will have to determine the presence or not of these underground bodies of water to avoid affectation; and – It will have to support a suitable control of the quality of these water bodies to assure that the works should not have affected in quality and quantity.

Good practice	Bad practice
 Proper cutting of earth materials during construction	 Bad practice in earthworks which may cause erosion during construction improper earthworks which may cause erosion during construction

6.2.6 Air Quality

Description:

Construction activities and the prevailing weather can cause adverse impacts on air quality during the construction.

Activities and issues that can potentially generate environmental and social negative impacts:

- Dust emissions due to exposure of surface, uncovered stockpiling area, earth moving and excavation activities;
- Dust emission due to blasting;
- Wind blow during transportation of material by vehicles and when transporting on unpaved access roads;
- Gases emissions from concrete mixing plants; and
- Air pollutant emissions from exhaust of construction plant and vehicles.

Good practices:

- The Contractor shall ensure that the generation of dust is minimized and shall implement a dust control measures to maintain cleanness in working area, minimize nuisance for surrounding residential areas/dwellings and protect damage to natural vegetation, crops, etc.;
- Vehicles shall comply with speed limits to reduce or minimize the dust;
- Material loads shall be suitably covered and secured during transportation;
- Exposed soil and material stockpiles shall be protected by wind erosion, and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors;
- The Contractor shall implement dust suppression measures (e.g. water spray vehicles, covering of material stockpiles, etc.) if and when required;
- In case water/sanitation project requires an access road and the road cross communities; the Contractor shall include special measures to reduce the generation of dust during the construction; and
- Prior to blasting event, if is required, water shall be sprayed on the surface of the blast area to increase its moisture content, wire mesh gunny sacks and sandbags shall be used ontop of the blast area at each shot to prevent flying rocks and dust.

Good practice	Bad practice
	
Dust suppression to control air pollution at constriction site	No dust suppression

6.2.7Noise and Vibration

Description:

A wide range of noise causing equipment is common during project construction works (e.g. concrete mixers, backhoes, bulldozers, air compressors, generators, earth work, transportation, construction vehicle movement, etc.).

Activities and issues that can potentially generate environmental and social negative impacts:

- Equipment operation during construction (air compressor, powered mechanical equipment, bulldozers, excavators, etc.);
- Noise and vibration of the vehicles transporting materials within construction site and beyond the construction boundary;
- Noise and vibration for the Borehole drilling; and
- Piling activities during construction of foundations/piers.

Good practices:

- The Contractor shall be responsible for compliance with the relevant standards and legislation with respect to noise;
- The Contractor shall try to keep noise generating activities to a minimum;
- The Contractor shall restrict all operations that result in excessive noise disturbance to local communities and/or dwellings (e.g. drilling, crushing, etc.) to daylight hours on weekdays or as agreed with the IA and the community;
- The Contractor shall inform local communities and/or residents that could be disturbed by noise and shall keep such activities to a minimum;
- In sensitive areas (including residential neighborhoods, hospitals, rest homes, schools, etc.) more strict measures may need to be implemented to prevent undesirable noise levels;
- Night time operations shall be banned near sensitive receptors;
- No blasting shall be allowed during night time unless prior approval is obtained from the government authority and the community; and
- The Contractor shall maintain the construction equipment in its best operating conditions and lowest noise levels possible.

6.2.8Traffic management

Description:

Construction activities can cause disruptions in traffic patterns and damage local roads and bridges.

Activities and issues that can potentially generate environmental and social negative impacts:

- Traffic congestion during construction, due to the increase of heavy traffic (of the construction of distribution pipes itself and from traffic diversions) may cause unrest of the population, especially in urban areas;
- Degradation of local roads due to heavy equipment machinery and traffic bypasses;
- Pedestrian affectation for safety, especially for school children during construction; and
- Increase of traffic accidents.

Good practices:

- Estimate maximum concentration of traffic (number of vehicles/hour);
- Use selected routes to the project site, as agreed with the local authority, and appropriately sized vehicles suitable to the class of roads in the area, and restrict loads to prevent damage to local roads and bridges used for transportation purposes;
- Maintain adequate traffic control measures throughout the duration of the construction and such measures shall be subject to approval of the local authority;
- Carefully and clearly mark pedestrian-safe access routes;
- If school children are in the vicinity, include traffic safety personnel to direct traffic during school hours;
- Avoid as much as possible the interruption of house or business access during construction, and when is necessary notify the villager at least oneweek before and the period of no access should be as minimum as possible;
- Preventive signals are required in order to avoid accidents to the people of a community; and
- Maintain traffic signs (including paint, tripod, sign material, etc.), road markings, and guardrails to maintain pedestrian safety during construction.

Best practice	Bad practice
 Fences with signal to avoid any accident during the construction	 No preventive signal to avoid accident of the people or villages

6.3 Ecological considerations

6.3.3Landscape, visual impacts and restoration

Description:

The ESMP should include measures for clearing, re-vegetation, and restoration of the construction area of the catchment area to assure the water source.

Activities and issues that can potentially generate environmental and social negative impacts:

- Poor/inadequate aesthetic design and landscaping of the proposed project;
- Poorly implemented temporary mitigation measures and slope protection measures during excavation works;
- Lack of appropriate compensatory planting at the end of construction or non-native species are planted that are visually incompatible to the surrounding environment; and
- Lack of proper maintenance/watering of newly planted vegetation during the post-construction phase.

Good practices:

- Conservation, protection, and re-vegetation of the catchment areas. Specific program in the ESMP should be included in order to ensure implementation during the construction and operation;
- Re-vegetation shall start at the earliest opportunity. Appropriate local native species of vegetation shall be selected for planting and restoration of the natural landforms;
- Restoration of cleared areas such as borrow pits no longer in use, disposal areas, site facilities, workers' camps areas, working platforms and any areas temporarily occupied during construction of the project works shall be accomplished using landscaping, adequate drainage and re-vegetation;
- Affected slopes shall be re-profiled to stable batters, and grassed to prevent

erosion;
- Restoration and re-vegetation shall be carried out timely for the exposed slopes/soils and finished areas shall be reinstated in order to achieve the stability of the area;
- All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including grassing and reforestation;
- Land use for agricultural activity prior to use for construction activities shall be, as much as possible, restored to a state to allow the same agricultural activity to continue; and
- Location of constructions sites in scenery zones shall be avoided.

Good Practice	Bad practice
 River bank well protected indicating restoration	 Erosion process in the catchment area

6.3.4 Scenic spots and sensitive areas

Description:

Prior the construction and site clearance, additional ecological survey shall be carried out by the Consultant to confirm the findings of the ESMP, and to carry out detailed ecological assessment for the proposed construction areas/access roads.

Activities and issues that can potentially generate environmental and social negative impacts:

- Site clearance, formation and removal of vegetation at the beginning of construction which results in loss of habitat and vegetation for nearby animals;
- Disturbance of soil profile during earth moving activities and disturbance to sediment and aquatic environment due to works within rivers;
- Displacement of wildlife due to construction activities;
- Temporary and permanent land occupation;
- Land activities at ecological sensitive areas, damage to vegetation beyond proposed working areas, and illegal hunting of wild animals by workers due to lacking of awareness/training of ecologically important areas; and
- Lack of re-construction of loss habitat and re-creation of affected biodiversity of ecosystem.

Good practices:

- Prior to construction, the Contractor shall provide an education program to workers on the knowledge of wildlife and bio-diversity;
- Measures shall be developed to encourage good practice of wildlife protection and aquatic ecosystems, and penalty the people who violate the clauses of wildlife protection;
- When required, animal crossings shall be constructed to help migration of animals;
- The Contractor shall be responsible for informing all workers about the need to prevent any effects on natural vegetation on or around the construction area as a result of their activities;
- Ancient trees are protected by laws and may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold except under license granted by a delegated authority;
- The construction shall be carefully scheduled to reduce the construction period in order to minimize the disturbance to the wildlife;
- Protected areas and environmentally sensitive areas shall be identified and protected;
- The area of land required shall be controlled to a minimum level; and
- The Contractor shall not work within river flood lines, watercourses and wetlands without written approval from the relevant authority.

Good practice	**Bad practice**
	
Scenic spot that will be re-shaped	Unappealing environment

6.3.5Environmental emergency procedures

Description:
Environmental Emergency procedures are unforeseen events that can occur during the construction of a water or sanitation project. The Contractor shall be prepared to take any necessary measures to solve such emergencies on a case-by-case basis. Events related to adverse weather conditions shall be addressed as part of the Contractor's Safety Plan, which shall be submitted to the IA before commencement of project construction works.

Activities and issues that can potentially generate environmental and social negative impacts:

Events of accidental leaks, spills, emissions and other unforeseen emergencies or issues.

Good practices:

- Training shall be provided to all workers working on the construction activities and site staff to ensure that they are fully aware of the potential emergency situations during the construction activities, the danger and potential damages caused by the emergency to the environment and the people, as well as the emergency response procedures to be followed;
- If a person identifies a leakage/spillage, s/he shall immediately check if anyone is injured and shall then inform the Contractor;
- The Contractor shall ensure any injured person are treated and assess the spilled/leaked;
- If the accidents/incidents generate serious environmental pollution (e.g. spillage/leakage of toxic or chemicals, large scale spillage/leakage, or spillage/ leakage into the nearby water bodies which are used for irrigation/portable water), the Contractor shall inform the IA and the environmental authorities immediately;
- In such cases, the Contractor shall take immediate action to stop the spillage/leakage and divert the spilled/leaked liquid to a nearby non-sensitive areas;
- The Contractor shall arrange maintenance staff with appropriate protective gears to clean up the chemicals/chemical waste. This may be achieved through soaking with sawdust (if the quantity of spillage/leakage is small), or sand bags (if the quantity is large); and/or using a shovel to remove the topsoil (if the spillage/leakage occurs on bare ground);
- Depending on the magnitude of the spill, evacuation of the activity site may be necessary;
- Spilled chemicals must not be flushed to local surface drainage systems. Instead, sawdust or sandbags used for cleanup and removed contaminated soil shall be disposed off by following the procedures for chemical waste handling and disposal already described; and
- The Contractor(s) shall prepare and present a report to the IA on the incident detailing the accident, cleanup actions taken, any pollution problems and suggested measures to prevent similar accidents from happening again in future.

6.4 Social and cultural considerations

6.4.3Community relations

Description:

As part of the ESMP, a Community Relations Plan should be included in order to enhance good relations with the community.

Activities and issues that can potentially generate environmental and social negative impacts:

Lack of communication and participation with local communities can lead to an opposition to the project, delays in the construction process, increased costs, and unsatisfactory solutions.

Good practices:

- Maintain open communications between the local government and concerned

communities;
- Have a mailing list/contacts to include agencies, organizations, and residents that have interest in the project;
- The Client and Contractor should prepare a Grievance Mechanism in order to receive any grievances or concerns about the project execution. This mechanism should include contact information from who receive the grievance at the office and on site. **Annex 3 (3.1) (RMF)** include guidelines to prepare a Grievance Mechanism;
- Provide all information, especially technical findings, in a language that is understandable to the community and in a form of useful to interested villagers;
- Monitoring of community concerns and information requirements as the project progresses;
- Respond to telephone inquiries and written correspondence in a timely and accurate manner;
- Up-date the Community Relation Plan and Grievance Mechanism if is required to be accurate during different project implementation phases;
- Inform the community about construction and work schedules, interruption of services, traffic detour routes and provisional routes, blasting and demolition, as appropriate;
- Limit construction activities at night. When necessary ensure that night work is carefully scheduled and the community is properly informed so they can take necessary measures; and
- At least five days in advance of any service interruption (including water, electricity, telephone, and bus routes) the community must be advised through postings at the project site, at bus stops, and in affected homes/businesses.

6.4.4Health and wellbeing

Description:

The ESMP should include a Health Management Plan to address matters regarding the health and wellbeing of construction workers, project staff and nearby communities.

Activities and issues that can potentially generate environmental and social negative impacts:

- Poor housekeeping and accumulation of domestic waste within the construction site may lead to spread of diseases;
- Stagnant water may result in mosquitoes breeding;
- Unsafe sex conduct could bring the HIV/AIDS risk to the local communities; and
- Illnesses brought by outside construction workers.

Good practices:

- Health screening of all workers on recruitment (annually);
- Implementation of a vaccination program including but not limited to vaccination against yellow fever, hepatitis A and B, tetanus, others.
- Periodical health check shall be provided to construction workers to ensure their health and wellbeing;
- Provide appropriate information and education to the workers on basic personal hygiene, prevention of diseases, including respiratory diseases such as tuberculosis, vector-borne diseases such as malaria and dengue, water and food borne diseases such as diarrhea, etc.;

- Implementation of a program for workers and local communities, via an approved service provider, for the prevention, detection, screening, and diagnosis of sexually transmitted diseases, especially with regard to HIV/AIDS;
- Distribution of educational materials to all workers including brochures, and leaflets, which provide information of Tuberculosis (TB), HIV/AIDS symptoms and counseling and treatment services.
- Provision of basic first aid services to the workers as well as emergency facilities for emergencies for work related accidents including an emergency medical equipment; and
- The Contractor shall ensure correct maintenance of water and water deposit to prevent the breeding of mosquitoes.

6.4.5Resettlement/Compensation

Description:

When a project affects people for the construction of the works. This affectation includes physical and economic displacement. In those cases, according with the national law and the World Bank's OP/BP 4.12, should be compensated. When this safeguard is triggered, a Resettlement Action Plan (RAP) is required considering the MoW Resettlement Management Framework (RMF).

Activities and issues that can potentially generate environmental and social negative impacts:

- Construction of pipelines along the private properties with crops;
- Construction of water supply and sanitation facilities that requires acquisition of land or relocate people located in the project area; and
- Construction of access road for the water and sanitation facilities, potentially affect the people located along the right of way.

Good practices:

- The participation process should be start as soon as possible in order to inform the people affected by the project (PAPs), about the projects and its implication for the community;
- A consultant (social specialist), who will be the responsible for the Social Assessment and the Resettlement/Compensation Action Plan (RAP), should develop a Public Participation Plan (PPP). The guidelines to prepare the PPP and RAP is included in the RMF;
- One of the most important issues during the preparation of the RAP is the "cut-of-date", when the consultant will develop the census or survey, in order to know how many people will be affected by the project. This census should be done once the feasibility study and final project design is done, in order to know exactly the affectation of people;
- The Implementing Agency (IA), and the local authorities should be involved in this process, in order to include the results of the RAP in the "valuation".
- Evidence of the participation process and the community or villagers' acceptances should be properly documented;
- The project construction can't start if the RAP has not been implemented properly;
- The Contractor should confirm if RAP is done; and
- During construction, when operators conduct bad practices and affect houses, crops, trees, or others assets, the Contractor should compensate for this affectation.

6.4.6Vulnerable groups

Description:
Vulnerable people include those that may be living below the poverty line, lack access to basic social services and are physical, social, or cultural affected. Vulnerable people includes: widower/widow, elderly, people living with HIV/AIDS, orphans, exploited children, street children, female-headed households, etc.

Activities and issues that can potentially generate environmental and social negative impacts:

- Construction of the water and sanitation project potentially will affect these vulnerable people and require additional attention of compensation in order to minimize its affectation.

Good practices:

- The ESIA or Social Assessment of the project should include an assessment about the potential negative impacts to these vulnerable groups;
- When is necessary, especially when the project will benefit or affect a group of "vulnerable" groups, a Vulnerable Group Plan (VGP), should be developed in order to identify some additional action or measures to improve the quality of lives of these groups. A guideline to prepare this Plan is included in the **Annex 3 (3.2)**;
- During the participation process, in the case of vulnerable groups, is important that all meetings and delivery information, should be in the language of the community;
- In the cases of specific vulnerable peoples (widower/widow, elderly, etc.), the Contractor should identify these vulnerable people and include as part of the project activities some measures to minimize the affectation of these people;
- If the vulnerable groups, especially elderly and widower/widow, requires the support to develop activities related to project, the Contractor should bring any additional support that these people requires; and
- The up-dated ESMP of the Contractor should include some measures to attend these people during the construction phase.

6.4.7Cultural and archaeological

Description:

Cultural, archeological sites and relics may be affected by the project. The locations of these sites that have been identified in the ESIA/PESIA, and if is confirmed, specific measures or "Chance Finds Procedures Plan" should be included in the ESMP.

Activities and issues that can potentially generate environmental and social negative impacts:

- Loss of cultural sites due to the project execution, especially if is expecting movement of material or excavations (ponds, boreholes, others);
- Potential damage of the structure/stability of the cultural site during construction of the project;
- Damage to the cultural site due to vibration during operation of the project.

Good practices:

- A Chance-Find Procedures Plan (CFPP) should be included in the ESMP and up-dated by the Contractor. **Annex 3 (3.3)** presents a Guidelines to prepare a CFPP;
- The ESIA/PESIA should include a specific assessment on cultural resources / heritage relics at the early stage of the project design in order to collect background information regarding the number, location and importance of cultural resources;
- If the project impacts cultural sites, suitable mitigation and rescue measures shall be incorporated into the design of the project. The project location or alignment (pipes) shall then be reviewed and adjusted so that the impact can be minimized or avoided;
- Contractor and Supervisor shall be trained before the construction starts to understand the procedures and the basics on how to recognize a potential archaeological chance find;
- If any archaeological or paleontological artifacts or remains are uncovered during construction activities, work in the vicinity of the find shall cease immediately.
- The Contractor shall immediately notify the local authority who shall contact the institution responsible on this matter;
- The site shall be secured immediately to prevent any damage or loss of removable objects;
- The Contractor will be required to abide by the specifications as set out by relevant authorities or the heritage specialist appointed to investigate the find;
- The Contractor may not, without a permit issued by the relevant heritage resources authority, destroy, damage, excavate, alter, or otherwise disturb archaeological material;
- Construction work could resume only after permission is given from the responsible local authorities or institution concerning safeguard of the heritage; and
- Qualified professional staff shall carry out continuous monitoring of the impact on cultural areas during both the construction and operational phases of the project.

CHAPTER SEVEN

7 QUALITY STANDARDS FOR DRINKING (POTABLE) WATER, WASTEWATER, AND AIR POLLUTION

The Tanzania Bureau of Standars (TBS) has prepared a National Environmental Standards Compendium (NESC), which include various standards for environmental quality. These standards include quality of drinking (potable) water, wastewater, and air quality. The standards for drinking (potable) water TZS 789-2016; for wastewater TZS 860-2006 (including TZS 344 and 343 of 1989); and for air quality TZS 845-2015. According to EMA 2004, as well as the Standards Act, the procedures of preparing national standards involve input from stakeholders.

The NESC is divided into three parts. Part 1 comprises of standards that require compulsory compliance; Part 2 contains those standards that may be implemented on voluntary basis; and Part 3 has the requisite test methods that should be followed when testing for compliance.

7.1 Drinking (Potable) Water

Water Quality standards prescribes the quality requirements for drinking (potable) in community piped water supplies, water systems serving cities, municipalities and townships, community standpipes and wells and water distributed by tankers. It applies to bacteriological, biological, virological, physical, chemical and radiological quality criteria.

7.1.1 General Requirements for Drinking (Potable) Water

Drinking (Potable) water shall conform to the requirements given in the following clauses:

- Water that is intended for human consumption is supposed to be free from micro-organisms and from chemical substances which may be hazardous to health;

- All supplies of drinking (potable) water are required to be as pleasant and safe to drink. Absence of turbidity, colour, palatable and acceptable, taste and odor are of the utmost importance in public supplies of drinking (potable) water. The situation, construction, operation and supervision of water supply, its reservoirs and its distributions system shall be such that they exclude any possible contamination of the water;

- Pipes for potable water supply shall conform to TZS 362:2006, Unplasticized polyvinyl chloride (PVC) fittings with plain sockets for pipes under pressure – Laying lengths – Metric series; and

- The requirement for quality is divided into three categories as shown below: a) Microbiological quality requirements; b) Microbiological requirement and classification of non-chlorinated piped water supplies; and c) Physical and Chemical requirements.

The specific standards for Microbiologica, Physical and Chemical are presented in the **Annex 4 (4.1)**.

7.1.2 Standards of Protection of Water Intake/source and Surrounding Land.

a. **Distance to Source of Contamination:** The following distances from sources of pollution should always be taken into account and be an integral part of every water supply system:

   - 60 meters for pit preview, septic tanks, sewers;
   - 100 meters from borehole latrines, seeping pits, trenches; and sub surface sewage disposal fields; 150 meters from cesspools, sanitary land field areas and graves.

   In addition to the above minimum distances, the following precautions must be observed:

   - Domestic livestock and other animals should be kept away from the intake by fencing the area of a minimum radius of 60 meters from the installation.
   - Defecation and urination around the intake should be completely prohibited, by law.
   - Drainage and run off waters should be led away from intakes.
   - The water source should be guarded against inundation by the flooding of nearby rivers.
   - Soil erosion should be prevented by reforestation and other methods.
   - Algal growth should be prevented by draining swamps and pools around the intake or reservoir.

b. **Frequency of sampling:** Irrespective of the size of the population, all types of waters should be tested quarterly.

c. **Surface Water Intakes:** When water is drawn from rivers, streams, lakes and reservoirs, the following shall be observed in respect of intakes. Intake should be placed and designed as to draw water that is as clean and palatable as the source of water supply can provide:

   - River intake should be constructed upstream from villages and industrial factories, and the intake should be in deep water close to a stable bottom.
   - Small stream intake should comprise of take-pool which can also act as a settling "basin".
   - Lake intake should as much as possible avoid shore water, stirring up of sediments, and seeks the clean bottom water.

d. **Protection:** Chlorination of newly built water supplies is advisable before handing over the water supply to the public.

7.2 Wastewater

The municipal and industrial wastewaters are important point source potential pollutants. They are frequently viewed by much of the public as being responsible for most of the water pollution problems in the country. They generally contribute oxygen demanding substances, suspended matter, pathogens and many specific chemicals, including heavy metals. The pollutants are capable of causing a wide variety of problems in watercourses or downstream uses. Effluents disposed off on land may seep into aquifers and pollute groundwater. The problems associated with municipal and industrial wastewater pollution include injury to marine life, wildlife resources and human health. Thus, to ensure sustained water quality and healthy aquatic ecosystems and human health in general, monitoring of effluents and compliance to the standards according to law is of paramount

importance. In this regard, monitoring against standards prove to be important components of a sound environmental management programme.

The effluents are varied and complex and the degree of their pollution effect upon the aforementioned systems depend on the constituents of the individual effluent and their corresponding concentrations/loads. The rationale for including permissible limits with regard to physical parameters, organic and inorganic substances as well as microbiological component is based upon their detrimental effect upon human health, aesthetic value, acquatic environment and treatment facilities. The permisible limits of these parameters are incldued in the **Annex 4 (4.2)**.

The Tanzania standard for wastewater is applicable to effluents discharged from all establishments. The standard prescribes the permissible limits for municipal and industrial effluents discharged directly into water bodies. The effluent parameters contained herein include Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Color, pH, Temperature, Total Suspended Solids (TSS) and Turbidity.

The purpose of the standard is to indicate the quality of effluents permitted to be discharged into water bodies. The use thereof is meant to promote a consistent approach towards prevention of water pollution in Tanzania.
In this regard, the wastewaters to be discharged into receiving waters should be free from:

- Substances that will settle in receiving waters forming putrescent or otherwise objectionable sludge deposits, or which will adversely affect aquatic life.
- Floating debris and other material in amounts sufficient to be noticeable and lead to deterioration of receiving waters.
- Nutrients in concentrations that promote nuisance growths of algae or aquatic weeds in the receiving waters.
- Materials in quantities or concentrations which are toxic or harmful to life.
- Materials that alone or in combination with other materials will produce color, turbidity, and odor in sufficient concentration to create a nuisance or adversely affect the aquatic ecosystem.

The effect of different effluents on water bodies, municipal sewerage, and treatment plants depends on the content, physical-chemical characteristics, and concentration of the effluent. Tolerance limits are set based on each parameter's detrimental impact on human health, the aquatic environment, and the treatment system. The main parameters are:

- **Total suspended solids (TSS),** affect light penetration and breathing of fish and others organism;
- **pH,** influences biological and chemical processes in waste water treatment systems;
- **Biological Oxygen Demand (BOD),** is a measure of biodegradable matter and the potential uptake of oxygen. It is a measure of the oxygen consumed by living organisms (bacteria), while utilizing organic matter in the wastewater. Usually, the biological oxidation of organic matter takes 5 days, and hence the test is usually carried out using 5 days incubation period at 20 ^{o}C;
- **Chemical Oxygen Demand (COD),** is and indicator of the organic content of wastewater. It measures the pollution load of municipal and industrial wastewater. The COD test is often used as substitute for BOD because it usually only takes about 3 hours to conduct the test and obtain the results;

- **Total Kjeldahl Nitrogen (TKN),** indicates the potential form of ammonia gas (NH_3) in water. Ammonia gas is toxic, consumes oxygen, and maybe directly used by plants to produce plant proteins. Converting ammonia to nitrites and nitrates consumes oxygen, which depletes the dissolved oxygen levels in water bodies;
- **Total Phosphorus (TP),** is an indicator of the eutrophication of the receiving water bodies. The growth of algae in water is greatly influenced by the amount of phosphorus. Algal blooms usually occur due to presence of nitrogen and phosphorus. Thus, measuring the phosphorus level can indicate the potential biological productivity of surface water ;
- **Fecal Coliform (FC),** is a facultatively anaerobic, rod-shaped, gram-negative, non-sporulating bacterium. Coliform bacteria generally originate in the intestines of warm-blooded animals; and
- **Heavy Metals,** are invariably present in municipal and industrial wastewater (e.g. tanning, metal plating, fertilizer, pesticides, petrochemical, and chemical industries). The heavy metal concentration is an indicator of the potential toxicity to a wide range of organisms.

7.3 Air Quality

The set of baseline parameters on air quality and emissions given in the standard are based on a number of considerations so as to come out with practical and acceptable limits. The Standard gives two types of limits via guidelines and limit levels. The limit levels are the legally bindingand shall be used for regulatory purposes. Limit levels are usually measurable in shorter periods. On the other hand, the guidelines are based on studies that indicate safe levels averaged over relatively longer periods and mostly, they are derived from WHO Guidelines.

The Tanzania Standards give permissible limits of some common substances found in polluted air, namely sulfur dioxide, carbon monoxides, suspended particulate matter (dust), oxides of nitrogen, hydrocarbons, and lead. The standards covers both the ambient air and emission sources.

For the purpose of these standard, the following definitions shall apply:

- **Ambient air** means an outdoor air to which people, plants, animals or material may be exposed.
- **Suspended particulate** matter means airborne particles of 10 microns or less in diameter (this is also the inhalable fraction (PM 10)).
- **Black smoke** means visible (black) aerosol usually resulting from combustion.
- **Emission Limit** is the highest permissible quantity of pollutants released into the air from a pollution source, expressed as the concentration of pollutants in relation to one unit of production or to the degree of air pollution caused by these sources (e.g., dark color of smoke).
- **Imission** means transfer of pollutants from the atmosphere to a receptor.
- **Imission limit** is the highest permissible weight concentration of pollutants contained in the air

The ambient air (immision limits) and the emmision sources limits are presented in the **Annex 4 (4.3)**.

CHAPTER EIGHT

8 RESPONSIBILITIES: CONTRACTOR AND IMPLEMENTING AGENCY

8.1 Responsibilities of the Contractor

The Contractor and workers shall adhere to firstly try to minimize the environmental and social negative impact that may result from the project construction activities and secondly, shall assure the compliance of the prevention, mitigation and compensation measures of good environmental and social practices, during the construction of the water and sanitation projects.

8.1.1 Contractor's environmental and social management plan

Prior to commencement of construction, the Contractor should review and up-date according with its methodologies, working plan and schedule, the Environmental and Social Management Plan (ESMP), and submit the up-dated document to the Implementing Agency (IA). The person or team who will be responsible for the ESMP implementation should be specified. The content of the Contractor's ESMP shall be in line with the project specific ESMP mentioned above and is enhanced by the Constructor works practices, implementation procedures and program.

The Contractor's ESMP shall provide details such as commitment to environmental protection by the environmental and social management team; methodology of implementing the project ESMP; organization chart of Constructor's environmental and social team; detailed designs and installation of the camp and access roads, and pollution control facilities (e.g. drainage channel, settling tank, temporary noise barrier, etc.); the Waste Management Plan (WMP); the Grievance Mechanism; and others plans or program that will be implemented during the construction stage.

The ESMP should be prepared during the design stage, which shall include preliminary designs on the temporary and permanent landscaping plan during both the construction and post-construction maintenance period. The landscape plan shall cover all project works which may affect vegetation and natural landform (e.g. borrow pits, disposal sites, slopes and temporary/stockpiling areas), sensitive locations and areas where landscaping works are required both during construction and after the construction shall be identified and incorporated into the design.

Finally, the Contractor should assure that the Resettlement/Compensation Action Plan (RAP), if the project requires, had been implemented prior start with the construction.

Environmental and social management duties of the Contractor:

The duties of the Contractor and Sub-Contractor include but not limited to:

- Compliance with relevant environmental and legislative requirements;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Implementing Agency Safeguard Coordinator (SC-IA), the Environmental and Social Safeguard Section of MoW, and other environmental institutions as NEMC;
- Provide and update information to the IA regarding works activities which may contribute, or be continuing to the generation of adverse environmental and social conditions;

- In case of non-compliances, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental and social impact; and
- Stop construction activities, which generate adverse impacts upon receiving instructions from the IA. Propose and carry out corrective actions and implement alternative construction method, if required to minimize the environmental and social impacts.

Prohibitions:

The Contractor will prepare and enforce an "Environmental Management Notice". The following activities are prohibited on or near the project site:

- Cutting of trees for any reason outside the approved construction area;
- Hunting, fishing, wildlife capture, or plant collection;
- Buying of wild animals for food;
- Disturbance to anything with archiological or historical value;
- Burning fires outside camp areas;
- Use of firearms (except authorized security guards);
- Use of alcohol by workers during office hours;
- Washing car or machinery in streams or creeks;
- Doing maintenance (change of oils and filters) of cars and equipment outside authorized areas;
- Disposing trash in unauthorized places;
- Having caged wild animals in camps;
- Working without safety equipment (including boots and helmets);
- Creating nuisances and disturbances in or near communities;
- Disrespecting local customs and traditions;
- The use of rivers and streams for clothes washing;
- Indiscriminate disposal of rubbish or construction wastes or rubble;
- Littering of the site;
- Spillage of potential pollutants, such as petroleum products.
- Latrine outside of the designated facilities; and
- Burning of wastes and/or cleared vegetation.

8.1.2 Contractor's environmental and social monitoring

To monitor the environmental and social impact of a project, the Contractor has to periodically monitor the environmental quality along the proposed project area. The monitoring requirement for the different environmental components is presented below.

a) Air Quality

In order to ensure all air quality impacts are properly managed and controlled, and to evaluate the effectiveness of the implemented air quality mitigation measures, monitoring on air quality parameters shall be carried out. The exact parameters, monitoring technique and frequency shall refer to the project EIA and the local environmental legislative requirements.

b) Noise and vibration

Noise and Vibration monitoring and parameters including the exact type and frequency shall refer to the ESMP and the law requirements.

c) Water Quality

Typical parameters to be monitored during construction and operational phases shall depend on the project EIA and the local legislative requirements.

d) Waste Management

Waste management can usually be monitored through carrying out waste audits. Waste audit can be carried out by both the Contractor or by external auditors. The audits shall look at all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. The audit shall cover each waste stream and to check all project activities for compliance with appropriate environmental protection and pollution control measures, including those set out in the ESIA/PESIA report and the Contractor's ESMP. The audit results and associated recommendations on improvements to the environmental protection and pollution control works shall be discussed among all parties and implemented by the Contractor(s) within an agreed time frame.

e) Landscape and visual impact

The proposed Landscaping Plan in the ESMP and its implementation shall be checked and monitored by a qualified staff. Follow up monitoring by the Landscape responsible shall continue until the specified post-construction period. The SC-IA shall undertake regular field inspection of the implementation of landscape measures during the regular site inspections. Findings of the inspections shall need to be duly reported to the Contractor.

f) Ecology

The Contractor will need to continuously monitor the implementation progress and review the effectiveness of the proposed measures based on the construction progress. Ecological survey shall be carried out by the project ecologist at the affected areas and those of re-created habitat areas so that the proposed / implemented mitigation measures are evaluated for adequacy.

g) Construction Site Safety

Regular safety site visits involving qualified representatives from each party will be organized throughout the construction in order to ensure the implementation of safety measures and to identify areas of concerns for improvement.

h) Equipment monitoring and record

The equipment and test methods to be adopted for the monitoring works by construction shall comply with the requirements stipulated in the relevant environmental quality standards. The monitoring equipment shall be calibrated regularly and calibration of equipment is required prior to the in-site measurement. All the calibration records and monitoring results shall be properly documented by the Contractor for future reference and audit by the concerned parties such as IA and MoW.

The following table shows the records that have to be maintained by the Contractor in each respective activity site office.

Table No. 6
Typical Environmental records to be maintained in construction phase

Category	Record
General	• Environmental training records (e.g. attendance records for environmental awareness training, topics covered); • Environmental permits and licenses. • Site diary and site inspection records; • Environmental log-book, complaint log-book and environmental quality limits exceedances notification forms; • Construction program and schedule; • Equipment maintenance and repair records • Correspondence with concerned parties and other parties in relation to environmental matters; • HIV/AIDS information; and • Meeting minutes.
Noise Control	• Updated list of Powered Mechanical Equipment currently on-site; • Details of examination periods and the results if any environmental sensitive receivers such as local schools, hospitals, resident villages may be affected.
Water pollution control	• Records of quantities of collected spent bentonitic slurries and/or drilling mud for reuse, reconditioning and disposal; • Records of maintenance and cleaning schedules for sediment and oil/grease traps; • Records of toilet sewage disposal (where connection to existing foul sewer main is not undertaken); • Records of the wastewater final discharge quantity and the pollutants concentration; and • Plans of construction site drainage.
Waste Management	• Copies of relevant valid licenses as provided by employed waste haulers and waste collectors; • Records of quantities of reused and recycled waste; and • Waste disposal records.
Atmosphere	• Route and the program of the construction material transportation; • Mitigation measures on the atmosphere effect such as sprinkling; and • The monitoring results of the atmosphere quality.
Culture Property	• Drawings of the identified Culture Property sites; and • Log of construction near the Culture Property sites.
Land contamination	• Preliminary analysis results of materials suspected to be contaminated (if any).
Ecological resources	• Records of sensitive ecological resources locations and associated protection plan.
Chemical storage	• Drawings of chemical storage facilities; and • Logs chemicals inventory and consumption.
Emergency	• Emergency incident reports.
Corrective and preventive action	• Corrective and preventive action request records and forms

8.1.3 Contractor's environmental and social team

The Contractor will establish an Environmental and Social Team (EST). The EST will be led by an EST Leader who shall have environmental and social management, training and monitoring experience (at least 5 years experience) in construction projects and familiar with the environmental legislative's requirements, mainly in medium and big size projects. The IA prior to commencement of project shall approve the qualification of the proposed EST Leader, the team is required to work full time on-site. Sufficient number of staffs shall be included in the team in order to carry out the duties specified in the ESMP. The Contractor shall ensure adequate resources are available to the EST for the implementation of the ESMP throughout the construction and maintenance period.

The roles and responsibilities of EST are:

- Sampling, analysis and evaluation of monitoring parameters with reference to the ESMP recommendations and requirements;
- Carry out environmental site surveillance to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental and social mitigation measures;
- Review the success of the ESMP to cost-effectively confirm the adequacy of mitigation measures implemented;
- Monitor compliance with environmental protection, pollution prevention and control measures, and contractual requirements;
- Monitor the implementation of environmental and social mitigation measures;
- Audit and prepare reports on the monitoring data and site environmental conditions;
- Complaint investigation, evaluation and identification of corrective measures;
- Advice to the Contractor on environment improvement, awareness, proactive pollution prevention measures;
- Engage a qualified staff, to review and monitor the landscape measures and compensatory planting Plan, and to supervise the landscaping works;
- Follow the procedures in the ESMP and recommend suitable mitigation measures to the Contractor in the case of non-compliance / discrepancies identified;
- Carry out additional monitoring works within the specified timeframe instructed by the IA; and
- Liaison with the Contractor and theIA on all environmental and social performance matters, and timely submission of reports to the IA, and relevant administrative authorities, if required.

Remedial actions which cannot be effectively carried out during construction, shall be carried out on completion of the works (and before issuance of the acceptance of completion of works). All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including grassing and reforestation; water courses shall be cleared of debris and drains and culverts checked for clear flow paths; all sites shall be cleaned of debris and all excess materials properly disposed; and borrow pits shall be restored.

8.2 Roles and Responsibilities of the Implementing Agencies

The main roles and responsibilities of the Implementing Agencies (IAs) are: a) assure the application of the Environmental and Social Management Framework (ESMF) and Resettlement Management Framework (RMF) during the project preparation and evaluation; and during the construction, to monitor the application of the Environmental and Social Management Plan (ESMP) and others Plans required by the specific project.

8.3 IA's Environmental and Social Management

During the construction, the Implementing Agency Safeguard Coordinator (SC-IA) has the responsibility to monitor the implementation of the ESMP and others plans developed for the project. SC-IA shall periodically visit the construction site to observe any environmental and social non-compliance based in the ESMP. Such observation should be submitted to the Contractor and as the reference to judge the performance of complying with the environment regulation. More specifically, as the integral and critical part of the ESMP, the environmental and social monitoring has the following objectives:

- Confirm the impacts forecasted in the ESIA;
- Determine the actual extent of impact;
- Evaluate the effectiveness of the mitigation measures, implemented on site; and
- Identify and justify the additional mitigation measures against unexpected impact as may be necessary during project implementation and operation.

Additionally, the SC-IA shall carry out the monitoring activities on the following main environmental and social issues:

- Monitoring of the noise level at the sensitive receptor by portable monitoring kit; the monitoring shall take place during the heavy construction activities, such as excavation, piling, power generation, material transportation and night time construction, if any and shall be conducted near villages, schools, and other sensitive receptors along the project alignment;

- Visual inspection to check the air-borne dust, during demolition, bulk material handling and storage, transportation routes near the villages;

- Visual inspection to check the water quality in the receiving rivers, fish ponds and lakes affected by the construction activity such as turbid, smell, color, fish kills, etc. particular at the receiving areas of the water bodies from the construction sites and construction camps.

To summarize the environmental and social issues observed during the site visit, the SC-IA should apply the Environmental and Social Monitoring Report (ESMR), template which is included in the ESMF (**Annex 5.1**).

Once the construction is finalized, the SC-IA should apply the Environmental and Social Final Report (ESFR), template which is included in the ESMF (**Annex 5.2**).

8.3.1 IA's Environmental and Social Monitoring

In order to minimize the environmental and social impacts during construction and operational phases of the projects, the Implementing Agency (IAs) shall ensure that the mitigation measures recommended in the project ESIA report are included in the project-specific ESMP, that as mentioned in the previous chapter should be reviewed and up-dated by the Contractor before start of the construction.

Impact's monitoring during project construction period consists of routine measurements on environmental quality parameters at the designated monitoring locations and the regular site inspections. During the peak construction period or at the request from the IA

Manager, the SC-IA shall also carry out additional measurements using hand-held equipment in order to monitor short-term impact. Once non-compliance with environmental quality performance criteria is identified, additional monitoring could be carried out.

Site Inspections

The SC-IA shall closely monitor the construction activities, the Contractor environmental performance, and status of implementation of mitigation measures. SC-IA shall carry out site visit for visual inspections to identify areas of potential environmental and social problems and report to the Contractor to take immediately remedial/preventive actions. The areas of inspection shall cover both the construction areas and the environment outside the site area that could be affected directly or indirectly by the site activities.

The IA shall organize regular joint site inspections, e.g. Monthly, with participation of the SC and other technical engineers, and Contractor.

The SC-IA shall keep a log-book of each and every circumstance or change of circumstances which may affect the environmental impact assessment and every non-compliance with the recommendations of the ESMP or the project contract. The log-book shall be kept readily available for inspection by all persons assisting in the supervision of the implementation of the recommendations of the ESMP and contract.

The SC-IA shall refer to the following information/documentation in conducting the inspection:

- The contractor's environmental performance, waste reduction, hazardous waste management, and implementation of the required mitigation measures;
- Good practices and general environmental mitigation measures;
- Compliance with the ESMP requirements, contractual specification and national law;
- Protection to the sensitive locations and control mechanism of the restricted areas;
- The construction methodologies and condition of construction plant when is required;
- Individual works methodology proposals (which shall include proposal on associated pollution control measures);
- Works progress and program;
- The adequacy and efficiency of the pollution control measures/ treatment facilities for minimizing environmental impacts;
- Housekeeping of the camp or site (treatment plant, storage tanks, others);
- Landscaping and soil erosion controls;
- Location, management and pollution control at the waste/material storage areas, borrow pits and access roads; and
- Previous site inspection results.

The Contractor shall update the SC-IA with all relevant information of the construction contract before the site visit. The inspection results and its associated recommendations on improvements to the environmental and social management shall be submitted to the MoW if any compliance or significant damages has been identified during the site visit.

CHAPTER NINE

9. ENVIRONMENTAL, HEALTH, AND SAFETY STANDARDS

In order to comply with international environmental, health and safety standards for the water and sanitation projects, the International Finance Corporation (IFC), which is part of the World Bank Group, has developed an Environmental, Health, and Safety Standards (EHSS) that contain the performance levels and measures for the operation and maintenance of the water and sanitation projects (**Annex 6**).

These EHSS are generally considered to be achievable in new projects by existing technology at reasonable costs. Application of the EHSS to existing facilities may involve the establishment of site-specific targets, with an appropriate time frame for achieving them.

The applicability of the EHSS should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons.

In the Water Sector Development Programme (WSDP), the MoW agreed with the Development Partners (DPs) to apply the World Bank's environmental and social safeguards Policies. In this regard, is important to take into account these EHSS during the execution of the specific projects financed by the WSDP and others water and sanitation projects finance by the Ministry, especially in projects classified by the MoW as Category A and B.

Applicability

The EHS Standards for Water and Sanitation include information relevant to the **operation and maintenance** of (i) potable water treatment and distribution systems, and (ii) collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by cesspit emptier) and treatment of collected sewage at centralized facilities.[2]

[2]Pit latrines and other decentralized systems that do not require servicing and subsequent treatment of contents at centralized treatment facilities are not included in the scope of this document.

Annexes

Annex 1: Main environmental and social law in Tanzania

a) Water Resources Management Act, No. 11 (2009)

The Water Resource Management Act (WRMA), 11/09, was passed by the National Assembly of the United Republic of Tanzania, on 28 April 2009 and assented to by the President on 12 May 2009. It came into force on 1 August 2009. The Act provides for the institutional and legal framework for sustainable management and development of water resources; outlines principles for water resources management; provides for the prevention and control of water pollution; provides for participation of stakeholders and the general public in implementation of the National Water Policy, repeal of the Water Utilization (Control and Regulation) Act, and provides for related matters.

The objective of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which consider the following fundamental principles, including:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water and the principle that water is essential for life and that safe drinking (potable) water is a basic human right;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social economic development;
- Promoting stakeholders' involvement in water resources management at all levels, especially by ensuring decentralization to the lowest possible level o f government, consistent with available capacity at such level;
- Protecting biological diversity, especially the aquatic ecosystems;
- Providing for systems for managing the growing demand for water use through integrated planning and management of surface and groundwater resources, in ways which incorporate economic, environmental and social dimensions in the planning process;
- Preventing and controlling pollution and degradation of water resources;
- Providing implementation of international obligations stipulated under international legal instruments to which the United Republic is a party; and
- Promoting dam safety security and the management of water related disasters.

b) Water Supply and Sanitation Act No. 5 (2019)

An Act to provide for sustainable management and adequate operation and transparent regulation of water supply and sanitation services with a view to give effect to the National Water Policy, 2002; to provide the establishment of Rural Urban Water Supply and Sanitaion Authorities, Water Supply and Sanitation Agency (RUWASA) as well as community Owned Based Water Supply Organisations; to provide for appointment of service provider.

c) Energy and Water Utilities Regulatory Authority Act, No. 11 (2001)

The general functions of EWURA are provided for under Section 7 of the Energy and Water Utilities Regulatory Authority Act, 2001. Under the provisions of Section 7 (1) of that Act, the functions conferred on EWURA thereby shall be to perform the following in relation to the regulation of the provision of water supply and sanitation services by a water authority or other person, other than a community organisation established in accordance with Section 37 of this Act:(a) exercise licensing and regulatory functions in respect of water supply and sanitation services including the establishment of standards

relating to equipment attached to the water and sanitation system; and (b) also among others provide guidelines on tariffs chargeable for the provisions of water and sewage services.

d) The Forest Act, No. 14 (2002)

The Forest Act, No. 14 of 2002, provides for the management of forests. Its main objectives are to promote and enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resources for the benefit of present and future generations. In addition, the legislation aims to ensure the stability of ecosystems through the conservation of forest biodiversity, water catchments and soil fertility.

According to section 18 of this Act, an EIA is required for certain developments in accordance with the modalities and substance as set out in the guidelines by authorities responsible for the protection of the environment. Among others are: (a) road construction or the laying of pipelines; (b) construction of dams, power stations, electrical or telecommunication installations; and (c) construction of buildings.

e) Occupation Health and Safety Act, No. 5 (2003)

The Occupation Health and Safety Act, No. 5 of 2003, is an Act for health and safety. The Act is administered through the Ministry of Labour. Under the Act, the labour minister shall appoint the chief inspector (CI) to perform the functions stipulated in the Act. The CI may in turn also designate any person as an inspector to perform all functions assigned to an Inspector in respect of water projects, this act shall be enforced in all work places.

f) Contractors Registration Board Act, No. 17 (1997)

According to this act, all construction contracts are required to be executed by registered companies and entitled class in respect to the costs of the project.

g) Wildlife Conservation Act, No. 5 (2009)

The Act protects wildlife and vegetation by restricting the utilisation of wildlife to license holders. The use of sensitive wildlife habitats is restricted during certain times of the year or for specified periods.

Annex 2: OSHA requirements

2.1OSHA: Application Form for Registration of a Workplace

OSHA 1B

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF LABOUR AND EMPLOYMENT
OCCUPATIONAL SAFETY AND HEALTH AUTHORITY

OSHA

APPLICATION FORM FOR REGISTRATION OF A WORKPLACE

(Made under Section 17(1) of the Act No. 5 of 2003)

A. For Official Use Only

Application Form verified by		Registration No.	
Registration fee to be paid		File	
Certificate prepared by		S.B register	
Certificate approved by		C. Index	

B. To be Filled by the Workplace Authorised Person

I hereby apply for the - i) New Registration ☐ ii) Re- Registration ☐ of the premises of which particulars are given below, (Please tick (√) where appropriate above).

1. Name of the occupier, or intending occupier……

2. i) Physical Address of the Workplace: ii) Postal Address:

   Plot No…… P.O Box……

   Block No…… ……

   Street/Village……

   District…… Mob…… Tel ……

   Region…… Fax…… E-mail……

3. Nature of the work carried on, or proposed to be carried on, in the workplace:

   ……

4. Are the following items used or intended to be used? Please tick (√) where appropriate:

ITEM	YES	NO	If YES how many?
Electricity			
Steam Boilers			
Steam receivers			
Air receivers			
Iron Press			
Hoist and passenger lift			
Chain blocks			
Cranes			
Forklifts			
Other lifting (its name) equipment ……			

All correspondence should be addressed to the Chief Executive
P.O. Box 519, Tel: +255 -22 2760548 Fax: (0) 22 – 2760552 Dar Es Salaam, Tanzania

5. i) Total number of persons employed or intended to be employed in the workplace:

	Number of employees
Men	
Women	
Under 18	
Total	

ii) Owner of the workplace? Please tick (√) where appropriate:

Private ☐ Public ☐

iii) Shift work: Number of shifts ☐

Number of employees per shift ☐

6. Have the premises previously been used as a workplace? YES ☐ NO ☐

If YES state the name of the previous occupier……

7. Capital investment of the whole business undertaking……

Declaration

I……(*Name of Authorised Person*) declare that, to the best of my knowledge, all the facts stated in this Application Form for registration of a workplace are true and correct.

Date…… ……

Signature of intending occupier and official stamp

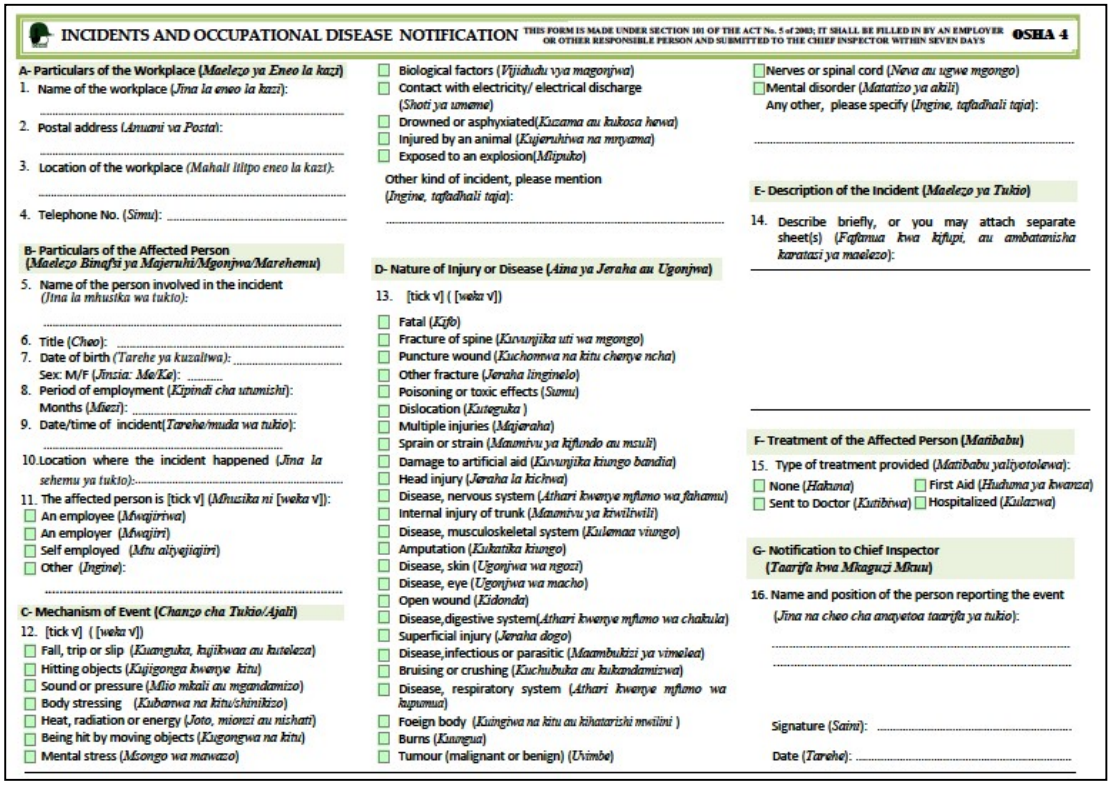
NOTE:

Section 16 of the OHS Act No. 5 of 2003 requires that, before any person occupies or uses as workplace or premises which were not occupied or used by him at the commencement of this Act he shall apply for the registration of such premises by sending to the Chief Inspector a written notice containing the particulars set out in the First Schedule to the Act. It is an offence for any person to occupy or use the workplace or any premises which were not so occupied or used by him at the commencement of the Act without their having been issued to him a certificate of registration in respect of such premises. Where the Chief Inspector refuses to issue a certificate of registration, he must if so required by the applicant, state in writing the grounds of such refusal; appeal against the Chief Inspector's refusal to register is provided for under section 19 of the Act.

This Form may be used for the purpose. When completed, it should be sent to the Chief Inspector. When necessary the completed application form may be submitted to the Chief Inspector through OSHA Zonal Office or Area Labour Office.

All correspondence should be addressed to the Chief Executive
P.O. Box 519, Tel: +255 -22 2760548 Fax: (0) 22 – 2760552 Dar Es Salaam, Tanzania

2.2 OSHA: Incidents and Occupational Disease Notification



INCIDENTS AND OCCUPATIONAL DISEASE NOTIFICATION THIS FORM IS MADE UNDER SECTION 101 OF THE ACT No. 5 of 2003; IT SHALL BE FILLED IN BY AN EMPLOYER OR OTHER RESPONSIBLE PERSON AND SUBMITTED TO THE CHIEF INSPECTOR WITHIN SEVEN DAYS **OSHA 4**

A- Particulars of the Workplace (*Maelezo ya Eneo la kazi*)

1. Name of the workplace (*Jina la eneo la kazi*):
2. Postal address (*Anuani ya Posta*):
3. Location of the workplace (*Mahali lilipo eneo la kazi*):
4. Telephone No. (*Simu*):

B- Particulars of the Affected Person (*Maelezo Binafsi ya Majeruhi/Mgonjwa/Marehemu*)

5. Name of the person involved in the incident (*Jina la mhusika wa tukio*):
6. Title (*Cheo*):
7. Date of birth (*Tarehe ya kuzaliwa*):
   Sex: M/F (*Jinsia: Me/Ke*):
8. Period of employment (*Kipindi cha utumishi*):
   Months (*Miezi*):
9. Date/time of incident(*Tarehe/muda wa tukio*):
10. Location where the incident happened (*Jina la sehemu ya tukio*):
11. The affected person is [tick √] (*Mhusika ni* [*weka √*]):
    - ☐ An employee (*Mwajiriwa*)
    - ☐ An employer (*Mwajiri*)
    - ☐ Self employed (*Mtu aliyejiajiri*)
    - ☐ Other (*Ingine*):

C- Mechanism of Event (*Chanzo cha Tukio/Ajali*)

12. [tick √] ([*weka √*])
    - ☐ Fall, trip or slip (*Kuanguka, kujikwaa au kuteleza*)
    - ☐ Hitting objects (*Kujigonga kwenye kitu*)
    - ☐ Sound or pressure (*Mlio mkali au mgandamizo*)
    - ☐ Body stressing (*Kubanwa na kitu/shinikizo*)
    - ☐ Heat, radiation or energy (*Joto, mionzi au nishati*)
    - ☐ Being hit by moving objects (*Kugongwa na kitu*)
    - ☐ Mental stress (*Msongo wa mawazo*)
    - ☐ Biological factors (*Vijiduddu vya magonjwa*)
    - ☐ Contact with electricity/ electrical discharge (*Shoti ya umeme*)
    - ☐ Drowned or asphyxiated(*Kuzama au kukosa hewa*)
    - ☐ Injured by an animal (*Kujeruhiwa na mnyama*)
    - ☐ Exposed to an explosion(*Mlipuko*)

    Other kind of incident, please mention (*Ingine, tafadhali taja*):

D- Nature of Injury or Disease (*Aina ya Jeraha au Ugonjwa*)

13. [tick √] ([*weka √*])
    - ☐ Fatal (*Kifo*)
    - ☐ Fracture of spine (*Kuvunjika uti wa mgongo*)
    - ☐ Puncture wound (*Kuchomwa na kitu chenye ncha*)
    - ☐ Other fracture (*Jeraha lingineloo*)
    - ☐ Poisoning or toxic effects (*Sumu*)
    - ☐ Dislocation (*Kuteguka*)
    - ☐ Multiple injuries (*Majeraha*)
    - ☐ Sprain or strain (*Maumivu ya kiflundo au msuli*)
    - ☐ Damage to artificial aid (*Kuvunjika kiungo bandia*)
    - ☐ Head injury (*Jeraha la kichwa*)
    - ☐ Disease, nervous system (*Athari kwenye mfumo wa fahamu*)
    - ☐ Internal injury of trunk (*Maumivu ya kiwiliwili*)
    - ☐ Disease, musculoskeletal system (*Kulemaa viungo*)
    - ☐ Amputation (*Kukatika kiungo*)
    - ☐ Disease, skin (*Ugonjwa wa ngozi*)
    - ☐ Disease, eye (*Ugonjwa wa macho*)
    - ☐ Open wound (*Kidonda*)
    - ☐ Disease,digestive system(*Athari kwenye mfumo wa chakula*)
    - ☐ Superficial injury (*Jeraha dogo*)
    - ☐ Disease,infectious or parasitic (*Maambukizi ya vimelea*)
    - ☐ Bruising or crushing (*Kuchubuka au kukandamizwa*)
    - ☐ Disease, respiratory system (*Athari kwenye mfumo wa kupumua*)
    - ☐ Foeign body (*Kuingiwa na kitu au kihatarishi mwilini*)
    - ☐ Burns (*Kuungua*)
    - ☐ Tumour (malignant or benign) (*Uvimbe*)
    - ☐ Nerves or spinal cord (*Neva au ugwe mgongo*)
    - ☐ Mental disorder (*Matatizo ya akili*)

    Any other, please specify (*Ingine, tafadhali taja*):

E- Description of the Incident (*Maelezo ya Tukio*)

14. Describe briefly, or you may attach separate sheet(s) (*Fafanua kwa kifupi, au ambatanisha karatasi ya maelezo*):

F- Treatment of the Affected Person (*Matibabu*)

15. Type of treatment provided (*Matibabu yaliyotolewa*):
    - ☐ None (*Hakuna*)
    - ☐ First Aid (*Huduma ya kwanza*)
    - ☐ Sent to Doctor (*Kutibiwa*)
    - ☐ Hospitalized (*Kulazwa*)

G- Notification to Chief Inspector (*Taarifa kwa Mkaguzi Mkuu*)

16. Name and position of the person reporting the event (*Jina na cheo cha anayetoa taarifa ya tukio*):

Signature (*Saini*):

Date (*Tarehe*):

Annex 3: Guidelines for specific safeguards instruments

3.1 **Preparation of a Grievance Mechanism**

The purpose of this Annex 3.1 is to provide a practical guide to help IAs design and implement a mechanism for dealing with Complaints or grievances which will also be more detailed in the RAP for each site or area. Grievance redress mechanisms are necessary avenues for allowing affected persons to voice concerns about the resettlement and compensation process as they arise and, if necessary, for corrective action to be taken promptly. Such mechanisms are important to achieving transparency in the land acquisition and resettlement processes.

The design and implementation of a grievance mechanism can be divided into four phases:

Phase 1. Define the scope and identify targets: Design and RAP team develops the overarching purpose and goals of the grievance mechanism, and verifies that the design decisions flow from its purpose.

Phase 2. Design: The RAP team puts together a draft plan that outlines the purpose, goals, scope, resolution approaches, structure, and specifications on how the mechanism will work. This preliminary plan is tested and adjusted through consultation with employees and community members and presented to management for approval, and then included in the RAP.

Phase 3. Implementation: The IA ie the community work together to present adjust and institutionalize the mechanism of claim.

Phase 4. Monitor, report and learn: Information is gathered about the effectiveness of the mechanism in particular and more generally on the ability of the company/developer to prevent and address grievances. This information is used to adjust the system.

Elements of Good Practice

The problems are often solved more easily; efficiently and at lower cost when serve them promptly and locally.

Experience and research compiled for this guide indicate a core set of practices that mark grievance mechanisms in the companies/communities as effective and credible. These practices are offered as trademarks of good practice for effective systems of complaint resolution. The following are some of good practices in handling grievances: -

i) Adjust the core values of the company: To improve relations with the community in general and the resolution of claims in particular, companies can adopt certain critical values and attitudes, including:

- Justice commitment in the process and results;
- Guarantee no retaliation for all parties involved in the company and in the community;
- Effort in creating a broad institutional support for the grievance mechanism in all projects;
- Designation of responsibility to meet claims through the project, rather than isolating them in one department;

- Willing managers to lead, visible and honestly the claim system.

ii) Start time in the project cycle: The most successful grievance mechanisms are installed as soon as possible, ideally, during the feasibility phase of the project and modified for subsequent phases. The problems are often solved more easily, more efficiently and at lower cost when serve them promptly and locally.

iii) Involve the community in the design: The stakeholders of the community and the company must be involved in the design of the grievance mechanism. In fact, some experts believe that imposing a system designed by the company could be worse than having an ad hoc system. The company should involve community representatives to identify key issues, such as the type of disputes that may arise during the project life, how the people in the community can raise concerns, the effectiveness of existing company procedures of settling claims, and the availability of resources to resolve conflicts. Based on this assessment, community representatives should help shape the mechanism and future improvements.

iv) Ensure accessibility: An effective grievance mechanism should be accessible to the various members of the community, including vulnerable groups. It should provide multiple entry points, including face-to-face meetings, written complaints, telephone or email. The confidentiality and privacy of the complainants is important when is necessary.

v) Keep a wide range of topics. The grievance mechanism should be open to a wide range of issues, both those based on real data and those arising from perceptions, right or wrong. Perceptions can be as important to address as the real risks. The mechanism should also be able to address complaints from different parts and different issues.

vi) Develop culturally appropriate procedures: The mechanism must respond, be respectful and predictable (have a timeframe for key milestones) in the process. The grievance mechanism should be able to reconcile the differences, including cultural aspects. The design and operation of grievance mechanism should consider cultural differences such as the preferences of communities to carry out direct or indirect negotiations must take into account the attitudes towards competition, cooperation and conflict, the desire to preserve relationships between the claimants, authority, social rank and status, ways of understanding and interpreting the world, time management concepts, attitudes towards others and the wider social environment and institutional.

vii) Incorporate a variety of approaches to resolving complaints: To accommodate differences in personal and cultural preferences, the grievance mechanism should offer a variety of approaches to resolving complaints, not a single complaint procedure. The complainant should have influence over which approach to choose. Some complaints can be handled informally, only by those directly involved, as a representative of the company and the claimant. Others may rely on a separate more formal compensation as arbitration of a neutral third party. Some mechanisms may arise from an interest-based, such as responding to perceived and legitimate needs, declared by the claimant approach. Others may have a rights-based approach, legal, contractual, etc. Where possible, local or customary methods of resolving complaints should be evaluated and incorporated into the system.

viii) Identify a focal point for coordination: Must keep a well-publicized and consistent position for an individual or a team. This central coordinator facilitates the development and implementation of grievance mechanism, given some of its resources, and monitors internal and external good practice, ensures coordination between access points and verifies that the system responds to the information handled.

ix) Maintain and publish multiple access points: Expanding access beyond those individuals who have the primary responsibility for claims can significantly reduce barriers to enter the system and encourage community members to address problems early and constructively. Individuals in the access points are more effective if they are reliable, trained, ready and accessible, regardless of ethnicity, gender and/or religion of the complainant.

x) Report to the community: The company should provide information to relevant stakeholders on a regular basis, to clarify expectations about what the mechanism may or may not do; encourage people to use it; present results and collect information to improve the system of claims. The information given may include types of cases and how they were resolved, how it has influenced the claim on company policies, procedures and operations and grievance mechanism itself.

xi) Use a record of complaints to monitor cases and improve the organization: In addition to resolving individual or community disputes, the grievance mechanism is an opportunity to promote improvements in the company. A record of complaints can be used to analyze information on trends in claims or disputes, community affairs and operations of the project, to anticipate the kinds of conflicts that can be expected in the future, both to ensure that the mechanism is equipped to handle such questions as to propose organizational or operational changes. Sometimes implement policies or other structural changes may resolve complaints on the same issue, rather than continue serving individual claims case by case.

xii) Evaluate and improve the system: The company should periodically conduct an internal assessment of grievance mechanism to evaluate and improve their effectiveness. Important elements of an evaluation are: a general awareness of the mechanism; whether or not it is used and by whom; the type of issues addressed; the ability of the mechanism to resolve conflicts early and constructively; actual results (impacts on project operations, management systems and benefits for communities); efficiency and, most importantly, the ability to achieve its stated purpose and goals. Sometimes, the company must also request and include the views of representatives of stakeholders, to see how the mechanism proves effective in practice.

A good grievance mechanism should be simple to understand, but not simplistic in dealing with people and issues. The clarity and pro-user approach will return positive results.

3.2: Vulnerable Group Plan

Objectives and Scope

Where the project results in adverse impacts on vulnerable groups (VGs) the project should be classified as Category A, and a Vulnerable Group Plan (VGP) will be developed as a standalone document. However, where some vulnerable minority groups are integrated socially and economically with the mainstream population, and such is confirmed during the screening process and subsequent studies, a VGP will not be necessary.

Surveys and information required

a) Surveys

In projects with likely impacts on VGs, the ESPA should include additional specific screening to address this issue.

The social assessment should, among others, focus on VGs issues in projects with likely adverse impacts on this people. While the social assessment will address macro-level issues and broad strategies to mitigate impacts, specific and focused studies would be required for the VGP preparation.

b) Information Required

The information required for preparation of VGP will include the following:

- The basic census, socio-economic data and inventory of affected assets
- Household ownership of economic and productive assets
- Annual income from primary and secondary employment opportunities
- Economic information of community (e.g., brief information on economic and natural resources, production and livelihood systems)
- Social information of community (e.g., brief description of kinship, value system; types of social organizations of formal/informal groups, farming groups, etc., especially those that can help group in adjusting to potential impacts)
- Potential impact of project on basic social services (e.g., water supply, health clinics, and schools)
- Potential impact of project on the social and economic livelihood

Information should be gathered from group meetings, one with a general assembly of affected vulnerable groups in the area and one with vulnerable women, especially those who live along the zone of influence of the project area. Discussions should focus on the project objectives, potential positive and negative impacts, and recommendations for project design. If the social assessment indicates that, the potential impact of the proposed project will be significantly adverse and that the vulnerable minority community rejects the project, the project authorities should consider redesigning or reformulating the project.

c) Formulation of Development Alternatives

The proposed mitigation measures should ensure that social and economic benefits they receive are in harmony with their cultural preferences. The focus of the VGP should be on resource-based andnon-cash measures that are developed through an extensive public participation and consultation to mitigate adverse impacts on such communities. The assistance should also include institutional strengthening and capacity building of tribal elders and community groups working on resettlement activities.

d) Public Participation and Consultation

The community participation and consultation framework and grievance redress mechanism should be developed in culturally appropriate ways familiar to the vulnerable groups. They should be developed with the vulnerable groups and their leaders in close collaboration with local officials. Wherever possible, staff with vulnerable group knowledge background and experience should be hired as part of the social impact assessment team as well as the monitoring team.

e) <u>Vulnerable Group Plan</u>

In case the screening exercise identifies major impacts on vulnerable groups, and further confirmed during the studies, warranting the preparation of standalone VGP, necessary surveys and investigations would be prepared during the feasibility study of project preparation.

A VGP addresses the (i) aspirations, needs, and preferred options of the affected VGs; (ii) local social organization, cultural beliefs, ancestral territory, and resource use patterns among the affected VGs; (iii) potential positive and negative impacts on VGs; (iv) measures to avoid, mitigate, or compensate for the adverse project effects; (v) measures to ensure project benefits will accrue to VGs; (vi) measures to strengthen the capacity of the Catalytic Fund to address VG issues; (vii) the possibility of involving local CBOs and NGOs with expertise in VG issues; (viii) budget allocation; and (ix) monitoring.

The VGP is prepared in a flexible and pragmatic manner, and its level of detail varies depending on the specific project and the nature of effects to be addressed. The VGP includes the following elements, as needed:

- A summary of the social assessment;
- A summary of results of the free, prior, and informed consultation with the affected VGs' communities that was carried out during project preparation and that led to broad community support for the project;
- A framework for ensuring free, prior, and informed consultation with the affected VGs' communities during project implementation;
- An action plan of measures to ensure that the VGs receive social and economic benefits that are culturally appropriate, including, if necessary, measures to enhance the capacity of the project implementing agencies;
- When potential adverse effects on VGs are identified, an appropriate action plan which includes measures to avoid, minimize, mitigate, or compensate for these adverse effects.
- The cost estimates and financing plan for the VGP; and
- Accessible procedures appropriate to the project to address grievances by the affected VGs arising from project implementation.
- Mechanisms and benchmarks appropriate to the project for monitoring, evaluating, and reporting on the implementation of the VGP. The monitoring and evaluation

mechanisms should include arrangements for the free, prior, and informed consultation with the affected VGs' communities.

3.3 Guidelines: Chance Finds Procedures Plan

Contracts for civil works involving excavations should normally incorporate procedures for dealing with situations in which buried Physical and Cultural Resources (PCR) are found unexpectedly. The final form of these procedures will depend upon the local regulatory environment, including any chance find procedures already incorporated in legislation dealing with antiquities or archaeology.

Note: The general guidance provided applies when there will be an archaeologist on call. In exceptional situations in which excavations are being carried out in PCR-rich areas such as a United Nations Educational, Scientific, and Cultural Organization World Heritage site, there will normally be an archaeologist on site to monitor the excavations and make decisions. Such cases will require a modified version of these procedures, to be agreed upon with the cultural authorities.

Chance finds procedures commonly contain the following elements.

a) PCR Definition

This section should define the types of PCR covered by the procedures. In some cases, the chance find procedure is confined to archaeological finds; more commonly it covers all types of PCR. In the absence of any other definition from the local cultural authorities, the following definition could be used: "movable or immovable objects, sites, structures or groups of structures having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance."

b) Ownership

This section should state the identity of the owner of the artifacts found. Depending on the circumstances, the owner could typically be the state, the government, a religious institution, the landowner, or it could be left for later determination by the concerned authorities.

c) Recognition

This is the most difficult aspect to cover. As noted above, in PCR-sensitive areas, the procedure may require the contractor to be accompanied by a specialist. In other cases, the procedures may not specify how the contractor will recognize a PCR, and a clause may be requested by the contractor disclaiming liability.

d) Procedure upon Discovery

Suspension of Work
This paragraph may state that if a PCR is found during execution of the works, the contractor shall cease activity. However, it should specify whether *all works* should cease, or only the works immediately involved in the discovery, or, in some cases where large buried structures may be expected, all works may be stopped within a specified distance

(for example, 50 meters) of the discovery. This issue should be informed by a qualified archaeologist.

After stopping work, the contractor must immediately report the discovery to the Resident Engineer (RE). The contractor may not be entitled to claim compensation for work suspension during this period.

The RE may be entitled to suspend work and request that the contractor provide excavations at the contractor's expense if the RE thinks that a discovery was made and not reported.

Demarcation of the Discovery Site
With the approval of the Resident Engineer, the contractor is then required to temporarily demarcate and limit access to the site.

No Suspension of Work
The procedure upon discovery may help the Resident Engineer decide whether the PCR can be removed and work can continue, for example, in cases where the find is one coin.

Chance Find Report
The contractor should then, at the request of the Resident Engineer, and within a specified period, complete a Chance Find Report, recording:

- Date and time of discovery;
- Location of the discovery;
- Description of the PCR;
- Estimated weight and dimensions of the PCR; and
- Temporary protection implemented.

The Chance Find Report should be submitted to the Resident Engineer and other concerned parties as agreed upon with the cultural authority and in accordance with national legislation. The Resident Engineer, or other party as agreed, is required to inform the cultural authority accordingly.

Arrival and Actions of Cultural Authority
The cultural authority ensures that a representative will arrive at the discovery site within an agreed time, such as 24 hours, and determines the action to be taken. Such actions may include:

- Removal of PCR deemed to be significant;
- Execution of further excavation within a specified distance of the discovery point; or
- Extension or reduction of the area demarcated by the contractor.

These actions should be taken within a specified period, for example, seven days. If the cultural authority fails to arrive within the stipulated period (for example, 24 hours), the resident engineer may have the authority to extend the period by a further stipulated time. If the cultural authority fails to arrive after the extension period, the resident engineer may have the authority to instruct the contractor to remove the PCR or undertake other mitigation measures and resume work. Such additional works can be charged to the contract. However, the contractor may not be entitled to claim compensation for work suspension during this period.

Further Suspension of Work
During this seven-day period, the cultural authority may be entitled to request the temporary suspension of the work at or in the vicinity of the discovery site for an additional period of up to, for example, 30 days.

The contractor may or may not be entitled to claim compensation for work suspension during this period. However, the contractor will be entitled to establish an agreement with the cultural authority for additional services or resources during this further period under a separate contract with the cultural authority.

Annex 4: Quality Standards

4.1 Drinking (Potable) Water Standards

Table 4.1.1: Microbiological requirements

Class of piped Water/Type of test count	Coliform count per 100 ml at 37°C	E. Coli (faecal coliform) count per 100 ml at 44°C
Excellent Satisfactory Suspicious Unsatisfactory	0 1-3 4 -10 More than 1 0	0 0 0 1 or more

Table 4.1.2: Chemical and physical limits for quality of Drinking (Potable) Water Supplies

Group	No. Substance	Unit	Lower Limit	Upper Limit
Toxic	1. Lead Pb	mg/L	-	0.1
	2. Arsenic As	mg/L	-	0.05
	3. Selenium Se	mg/L	-	0.05
	4. Chromium (6+) Cr	mg/L	-	0.05
	5. Cyanide CN	mg/L	-	0.20
	6. Cadnium Cd	mg/L	-	0.05
	7. Barium Ba	mg/L	-	1.0
	8. Mercury Hg	mg/L	-	0.001
	9. Silver Ag	mg/L	-	n.m
Affecting Human Health	1. Fluoride F	mg/L	1.5	4.0
	2. Nitrate N03	mg/L	10.0	75.0
Organoleptic	1. Colour	TCU	1.5	50
	2. Turbidity	NTU	5	25
	3. Taste	-	n.o	-
	4. Odour	-	n.o	-
Salinity and Hardness	1. pH	mg/L	6.5	9.2
	2. Total Filterable Residue	mg/L	500	2000
	3. Total Hardness (CaC03)	mg/L	500	600
	4. Calcium Ca	mg/L	75	300
	5. Magnesium Mg	mg/L	50	100
	6. Magnesium+Sodium S04	mg/L	500	1000
	7. Sulphate S04	mg/L	200	600
	8. Chloride CI		200	800
Less Toxic Metals	1. Iron Fe	mg/L	0.3	1.0
	2. Manganese Mn	mg/L	0.1	0.5
	3. Copper Cu	mg/L	1.0	3.0
	4. Zinc Zn	mg/L	5.0	15.0
Organic Pollution of Natural Origin	1. BOD (5 days at 30 oC)	mg/L	6.0	6.0
	2. PV (Oxygen abs KMN04)	mg/L	10	20
	3. Ammonium, (NH3 + NH4)	mg/L	2.0	2.0
	4. Total Nitrogen (Excluding N03)	mg/L	1.0	1.0

Organic Pollution Introduced Artificially	1. Surfactants (Alkly Benzyl Sulphonates)	mg/L	1.0	2.0
	2. Organic Matter (as carbon in Chloroform extract)	mg/L	0.5	0.5
	3. Phenolic Substances (As Phenol)	mg/L	0.002	0.002

4.2Wastewater quality Standards

Table 4.2.1: Physical Components

Parameter	Limit	Test Method
BOD5 at 20 oC	30 mg/l	EMDC1 1173: Part 3 Five-day BOD Method
COD	60 mg/l	EMDC1 1173: Part 4 Dichromate Digestion Method
Color	300 TCU	ISO 7887: 1994, Water quality Examination and determination of color Section 3: Determination of true color using optical instruments
pH range	6.5 – 8.5	EMDC1 1173: Part 2 Electrometric Method
Temperature range	20 a 35 oC	
Total Suspended Solids (TSS)	100 mg/l	EMDC1 1173: Part 1 Gravimetric Method
Turbidity	300 NTU	APHA Standard Methods:2130 B. Nephelometric Method

Table 4.2.2: Inorganic Components

Parameter	Limit (mg/l)	Test Method
Aluminum (Al)	2.0	EMDC1 1173: Part 7 Direct Nitrous Oxide-Acetylene Flame Atomic Absorption Spectrometry
Arsenic (As)	0.2	EMDC1 1173: Part 8 Manual hydride Generation- Atomic Absorption Spectrometry
Barium (Ba)	1.5	EMDC1 1173: Part 7 Direct Nitrous Oxide-Acetylene Flame Atomic Absorption Spectrometry
Cadmium (Cd)	0.1	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Chromium (total)	1.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Chromium VI	0.1	EMDC1 1173: Part 9 Colorimetric Method
Chlorides (Cl)	200.0	APHA Standard Methods: 4110 B. Ion Chromatography with Chemical Suppression of Eluant Conductivity
Cobalt (Co)	1.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Cooper (Cu)	2.0	EMDC1 1173: Part 7 - Flame Atomic

		Absorption Spectrometry
Fluorides (Fl)	8.0	APHA Standard Methods: 4110 B. Ion Chromatography with Chemical Suppression of Eluant Conductivity
Iron	5.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Lead (Pb)	0.1	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Manganese (Mg)	5.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Mercury (Hg)	0.005	EMDC1 1173: Part 10 Cold-Vapor Atomic Absorption Spectrometry
Nickel (Ni)	0.5	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Nitrates (NO3)	20.0	APHA Standard Methods: 4110 B. Ion Chromatography with Chemical Suppression of Eluant Conductivity
Phosphorous total (P)	6.0	EMDC1 1173: Part 6 Colorimetric-Ascorbic Acid Method
Selenium (Se)	1.0	EMDC1 1173: Part 8 Manual hydride Generation- Atomic Absorption Spectrometry
Silver (Ag)	0.1	ISO 15586: 2003, Water quality Determination of trace elements using atomic absorption spectrometer with graphite furnace
Sulphate (SO4)	500.0	APHA Standard Methods: 4110 B. Ion Chromatography with Chemical Suppression of Eluant Conductivity
Sulphides (S)	1.0	APHA Standard Methods: 4110 B. Ion Chromatography with Chemical Suppression of Eluant Conductivity
Tin (Sn)	2.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry
Total Kjeldahl Nitrogen (as N)	15.0	EMDC1 1173: Part 5 Kjeldahl Method
Vanadium	1.0	ISO 15586: 2003, Water quality Determination of trace elements using atomic absorption spectrometer with graphite furnace
Zing (Zn)	5.0	EMDC1 1173: Part 7 Flame Atomic Absorption Spectrometry

Table 4.2.3: Organic Components

Parameter	Limit (mg/l)	Test Method
1, 1, 2 - Trichloroethane	0.06	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas

		chromatographic methods.)
1,1,1 - Trichloroethane	3.0	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
1,2 - Dichloroethylene	0.2	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
1,2 - Dichloroethane	0.04	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
1,3 - Dichloropropene	0.5	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
Alkyl benzene sulfonate (ABS)	0.1	ISO 7875 1: 1996, Determination of surfactants Pat 1: Determination of anionic surfactants by measurement of the methylene blue index (MBAS)
Aromatic nitrogen containing compounds (e.g., aromatic amines)	0.001	APHA Standard Methods 6410: Liquid-liquid extraction GC/MS method
cis-1, 2 - Dichloroethylene	0.4	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
Dichloromethane	0.2	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
Oil and Grease (fatty maters and hydrocarbons)	10.0	APHA Standard methods 5520
Organochlorine pesticides (Cl)	0.0005	GC ECD (ISO 6468: 1996, Water quality Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes Gas Chromatographic method after Liquid-Liquid extraction)
Other aromatic and/or aliphatic hydrocarbons not used as pesticides	0.05	GC ECD (ISO 6468: 1996, Water quality Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes Gas Chromatographic method after Liquid-Liquid extraction)
Pesticides other than organochlorines	0.01	GC ECD (ISO 6468: 1996, Water quality Determination of certain organochlorine insecticides, polychlorinated biphenyls and

		chlorobenzenes Gas Chromatographic method after Liquid-Liquid extraction)
Phenols	0.002	GC ECD (ISO 6468: 1996, Water quality Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes Gas Chromatographic method after Liquid-Liquid extraction
Tetrachloroethylene	0.1	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
Tetrachloromethane	0.02	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)
Trichloroethylene	0.3	GC ECD (ISO 10301: 1997, Water quality Determination of highly volatile halogenated hydrocarbons Gas chromatographic methods.)

Table 2.2.4: Microbiological Components

Parameter	Limit	Test Method
Total Coliform Organism	10,000 count/100 ml	ISO Method, 622:1999, Microbiological

4.3 Air Quality Standards

Table 4.3.1: Immision Limits

Pollutant	Guideline	Limit Level	Test Method
Sulphur oxides, SOx	Annual mean of 40 60 g/Nm3 (0.05-0.08 mg/kg) or 24 hour average 100 g/Nm3 (0.129 mg/kg)	Daily average of hourly values shall not exceed 0.1 mg/kg 0.5 mg/Nm for 10 minutes	TZS 837 Parts (1, 2, and 4).
Carbon monoxide, CO	Aims at preventing carboxyhaemoglobin levels exceeding 2.5- 3% in non-smoking people.	1. A maximum permitted exposure of 100mg/Nm3 for periods not exceeding 15 minutes.	TZS 837 Parts 1,2, and 6

		2. Time-weighed exposures at the following levels: 100 mg/Nm3 for 15 minutes 60 Mg/Nm3 for 30 minutes 30 Mg/Nm3 for 60 minutes 10 Mg/Nm3 for 8 hours or Daily average of hourly values shall not exceed 10mg/kg and average of hourly values in eight consecutive hours shall not exceed 20 mg/kg.	
Black smoke and suspended particulate matters (PM 10)	Black smoke 40 to 60 g/Nm3 (0.05-0.08 mg/kg) PM 10 60 to 90 g/Nm3 (0.05 0.116 mg/kg)	Daily average of hourly values shall not exceed 0.10 g/Nm3 and hourly values shall not exceed 0.20 g/Nm3	TZS 837 Parts 1, 2 and 3.
Nitrogen dioxide. NOx	Annual mean of 0.1 g/Nm3	150 g/Nm3 for 24 hours avarage value 120g/Nm3 for 8 hours	TZS 837 Part 1, 2, and 5
Lead	Annual mean of 0.5 1.0 g/Nm3	1.5 g/Nm3 for 24 hours avarage value	ISO 9855:1993
Ozone	Annual mean of 10 100 g/Nm3	120 g/Nm3 for 8 hours avarage value	

Table 4.3.2: Emmision Sources

Pollutant	Guideline	Limit Level	Test Method
Sulphur oxides, SOx	Large Combustion Plants (LCP) using solid fuel with thermal effect: 50 to 100 MWth	Yearly average of: 850 mg/Nm3	TZS 837 Part 4
	100 to 300 MWth	200 mg/Nm3	
	> 300 MWth	200 mg/Nm3	
	LCP using liquid fuel with thermal effect of:		

	50 to 100 MWth	850 mg/Nm3	
	100 to 300 MWth	400-200 mg/Nm3 (linear decrese)	
	> 300 MWth	200 mg/Nm3	
	LCP using gaseous fuel	35 mg/Nm3	
	LCP using low calorific gases from gasification of refinery residues, coke oven gas, blast- furnace gas	800 mg/Nm3	
Carbon monoxide, CO	Liquid fuel combustion with heat output exceeding 5MW.	Not to exceed 175 mg/Nm3	
	Solid fuel combustion with the heat output of 50MW and above	Not to exceed the level of 250 mg/Nm3	
Hydrocarbon (Total Organic Carbon)		Not to exceed the level of 20 mg/Nm3	TZS 837 Part 7
Dust	Inert dust, including cement.	Not to exceed the level of 250 mg/Nm (24 hours mean value)	TZS 837 Part 3
Nitrogen Oxides (NOx)	LCP using solid fuel with thermal effect of: 50 to 500 MWth	Yearly average of: 600 mg/Nm3	TZS 837 Part 1, 2, and 5
	>500 MWth	500 mg/Nm3	
	LCP using liquid fuel with thermal effect of: 50 to 500 MWth	450 mg/Nm3	
	>500 MWth	400 mg/Nm3	
	LCP using liquid fuel with thermal effect of: 50 to 500 MWth	300 mg/Nm3	
	>500 MWth	200 mg/Nm3	
Lead	Not exceed 5 Ton/year of lead or compounds (measured as elemental lead) by a stationary source		ISO 9855:1993

Annex 5: Tools/Formats for the IA's monitoring

5.1 Format: Environmental and Social Monitoring Report (ESMR)

ESMR

ENVIRONMENTAL AND SOCIAL
MONITORING REPORT

Name of the project					
Implementi Agency:					
Component WSDP:	□ Water Resources Management □ Rural Wat Supply and Sanitation □ Urban Wat Supply and Sanitation		**Project Categor**	□ □ □	
Location:	– **Region:** – **District** – **City/Villag**				
Evaluator name:			**Sign:**	**Date:**	

a. People participating in the site visit:

Name	Institution	Position	Signature
1.			
2.			
3.			

b. Status of the legal and safeguards compliance:

- What types of environmental and social studies were required by the project during the preparation phase? ESIA, PESIA, RAP, ARAP, VGP, Others.
- Did the project have the Environmental Certificate?
- Were the safeguards instruments (ESIA, RAP, VGP) disclosed? Date of disclosure.

c. Status of project execution

- date of the commencement of the works
- expected date of completion of the works
- progress of the project, in terms of percentage
- Have the main activities of the project with a potential environmental impact been carried out?

d. Environmental and social effects observed during the field visit

Summary of the environmental effects observed during the field visit:

- Predicted effects and nature of observation; and
- Unpredicted effects and nature of observation.

e. Compliance of Environmental and Social Specifications

Analysis of project compliance with environmental design specifications (Environmental and Social Management Plan – ESMP), including environmental and social control, mitigation, and compensation measures, if any.

f. Conclusions and recommendations

Corrective measures are recommended, when necessary, for contractors, in order to take into account, the environmental and social problems observed during the site visit.

5.2 Format: Environmental and Social Final Report (ESFR)

ESFR

ENVIRONMENTAL AND SOCIAL FINAL REPORT

Name of the project			
Implementi Agency:			
Component WSDP:	□ Water Resources Management □ Rural Wat Supply and Sanitation □ Urban Wat Supply and Sanitation	**Project Categor**	□ □ □
Location:	– **Region:** – **District** – **City/Villag**		
Evaluator name:		**Signatur**	**Date:**

On (date) _____, the final review of the environmental and social aspects corresponding to the project _____ was conducted to verify fulfillment of the prevention, mitigation and/or compensation measures proposed for the project in the ESMP, as well as to ascertain if any other negative impact has occurred during the period in which the activity took place. Content was integrated by the following persons:

Name	Institution	Position	Signature
1.			
2.			
3.			

a. Background

Describe case record including dates, brief narration of the problem, and recommendations from previous site visits.

b. Results of the review

Describe in detail the conditions in which the mitigation measures were developed, the grade of fulfillment, and current state, explaining when necessary the reasons why measures were not completed. Completing the table below will help visualize this information.

No.	Mitigation measures	Accomplishment			Time needed to accomplish measures	Observations
		Yes	No	%		

c. Conclusions and recommendations

Based on the examination, prepare conclusions regarding fulfillment of the mitigation measures and recommendations.

Annex 6: IFC Environmental, Health, and Safety Guidelines

The EHS Guidelines for Water and Sanitation, developed by the International Financing Corporation (IFC), which is part of the World Bank Group, include information relevant to the **operation and maintenance** of (i) potable water treatment and distribution systems, and (ii) collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities.[3]

1. Impacts and Management

1.1 Environment

Environmental issues associated with water and sanitation projects may principally occur during the construction and operational phases, depending on project-specific characteristics and components. Recommendations for the management of Enviroment, Health and Safety issues associated with construction activities as would typically apply to the construction of civil works are provided in the General EHS Guidelines[4].

1.1.1Drinking (Potable) Water

Water Withdrawal

Traditional sources for potable water treatment include surface water from lakes, streams, rivers, etc. and groundwater resources. Where surface or groundwater of adequate quality is unavailable, other sources of water including seawater, brackish water, etc. may be used to produce potable water. Development of water resources often involves balancing competing qualitative and quantitative human needs with the rest of the environment. This is a particularly challenging issue in the absence of a clear allocation of water rights which should be resolved with the participation of appropriate parties in advance of project design and implementation.

Recommended measures to prevent, minimize, and control environmental impacts associated with water withdrawal and to protect water quality include:

- Evaluate potential adverse effects of surface water withdrawal on the downstream ecosystems and use appropriate environmental flow assessment to determine acceptable withdrawal rates;

- Design structures related to surface water withdrawal, including dams and water intake structures, to minimize impacts on aquatic life. For example:
  - ✓ Limit maximum through-screen design intake velocity to limit entrainment of aquatic organisms
  - ✓ Avoid construction of water intake structures in sensitive ecosystems. If there are threatened, endangered, or other protected species within the hydraulic zone of influence of the surface water intake, ensure reduction of impingement and entrainment of fish and shellfish by the installation of technologies such as barrier nets (seasonal or year-round), screens, and aquatic filter barrier systems

[3]Pit latrines and other decentralized systems that do not require servicing and subsequent treatment of contents at centralized treatment facilities are not included in the scope of this document.

[4]www.worldbank.org

- ✓ Design water containment and diversion structures to allow unimpeded movement of fish and other aquatic organisms and to prevent adverse impacts on water quality
- ✓ Design dam outlet valves with sufficient capacities for releasing the appropriate environmental flows

- Avoid construction of water supply wells and water intake structures in sensitive ecosystems;

- Evaluate potential adverse effects of groundwater withdrawal, including modeling of groundwater level changes and resulting impacts to surface water flows, potential land subsidence, contaminant movement and saltwater intrusion. Modify extraction rates and locations as necessary to prevent unacceptable adverse current and future impacts, considering realistic future increases in demand.

Water Treatment

Environmental issues associated with water treatment include: a) Solid waste; b) Wastewater; c) Hazardous chemicals; d) Air emissions; and e) Ecological impacts.

a) Solid Waste:

Solid waste residuals generated by water treatment include process residuals, used filtration membranes, spent media and miscellaneous wastes. Process residuals primarily consist of settled suspended solids from water source and chemicals added in the treatment process, such as lime and coagulants. Pre-sedimentation, coagulation (e.g. with aluminum hydroxide [alum] or ferric hydroxide), lime softening, iron and manganese removal, and slow sand and diatomaceous earth filtration all produce sludge. Composition of the sludge depends on the treatment process and the characteristics of the water source, and may include arsenic and other metals, radionuclides, lime, polymers and other organic compounds, microorganisms, etc. Damaged or exhausted membranes are typically produced from water treatment systems used for desalination. Spent media may include filter media (including sand, coal, or diatomaceous earth from filtration plants), ion exchange resins, granular activated carbon, etc.

Recommended measures to manage solid wastes from water treatment include:

- Minimize the quantity of solids generated by the water treatment process through optimizing coagulation processes;

- Dispose of lime sludges by land application if allowed, limiting application rates to about 20 dry metric tons per hectare (9 dry tons per acre) to minimize the potential for movement of metals into plant tissue and groundwater;

- Dispose of ferric and alum sludges by land application, if allowed and if such application can be shown through modeling and sampling to have no adverse impacts on groundwater or surface water (e.g. from nutrient runoff). Balance use of ferric and alum sludges to bind phosphorous (e.g. from manure application at livestock operations) without causing aluminum phytotoxicity (from alum), iron levels in excess of adulteration levels for metals in fertilizers, or excessively low available phosphorous levels;

- Potential impact on soil, groundwater, and surface water, in the context of protection, conservation and long term sustainability of water and land resources, should be assessed when land is used as part of any waste or wastewater treatment system;

- Sludges may require special disposal if the water source contains elevated levels of toxic metals, such as arsenic, radionuclides, etc.; and

- Regenerate activated carbon (e.g. by returning spent carbon to the supplier).

b) Wastewater:

Wastewater from water treatment projects include filter backwash, reject streams from membrane filtration processes, and brine streams from ion exchange or demineralization processes. These waste streams may contain suspended solids and organics from the raw water, high levels of dissolved solids, high or low pH, heavy metals, etc.

Recommended measures to manage wastewater effluents include:

- Land application of wastes with high dissolved solids concentrations is generally preferred over discharge to surface water subject to an evaluation of potential impact on soil, groundwater, and surface water resulting from such application;

- Recycle filter backwash into the process if possible; and

- Treat and dispose of reject streams, including brine, consistent with national and local requirements. Disposal options include return to original source (e.g. ocean, brackish water source, etc.) or discharge to a municipal sewerage system, evaporation, and underground injection.

c) Hazardous Chemicals

Water treatment may involve the use of chemicals for coagulation, disinfection and water conditioning. In general, potential impacts and mitigation measures associated with storage and use of hazardous chemicals are similar to those for other industrial projects and are addressed in the General EHS Guideline.

Recommended measures to prevent, minimize, and control potential environmental impacts associated with the storage, handling and use of disinfection chemicals in water treatment facilities include:

- For systems that use gas chlorination:

  - Install alarm and safety systems, including automatic shutoff valves, that are automatically activated when a chlorine release is detected
  - Install containment and scrubber systems to capture and neutralize chlorine if a leak occur
  - Use corrosion-resistant piping, valves, metering equipment, and any other equipment coming in contact with gaseous or liquid chlorine, and keep this equipment free from contaminants, including oil and grease

- Store chlorine away from all sources of organic chemicals, and protect from sunlight, moisture, and high temperatures

- Store sodium hypochlorite in cool, dry, and dark conditions for no more than one month, and use equipment constructed of corrosion-resistant materials;
- Store calcium hypochlorite away from any organic materials and protect from moisture; fully empty or re-seal shipping containers to exclude moisture. Calcium hypochlorite can be stored for up to one year;
- Isolate ammonia storage and feed areas from chlorine and hypochlorite storage and feed areas;
- Minimize the amount of chlorination chemicals stored on site while maintaining a sufficient inventory to cover intermittent disruptions in supply;
- Develop and implement a prevention program that includes identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures; and
- Develop and implement a plan for responding to accidental releases.

d) Air Emissions:

Air emissions from water treatment operations may include ozone (in the case of ozone disinfection) and gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia). Measures related to hazardous chemicals discussed above will mitigate risks of chlorine and ammonia releases. In addition, specific recommended measures to manage air emissions include installation of an ozone-destroying device at the exhaust of the ozone-reactor (e.g., catalytic oxidation, thermal oxidation, others).

e) Water Distribution

The most fundamental environmental health issues associated with distribution networks is the maintenance of adequate pressure to protect water quality in the system as well as sizing and adequate maintenance to assure reliable delivery water of suitable quality. The most significant environmental issues associated with operation of water distribution systems include: water system leaks and loss of pressure; and water discharges.

Water System Leaks and Loss of Pressure
Water system leaks can reduce the pressure of the water system compromising its integrity and ability to protect water quality (by allowing contaminants enter into the system) and increasing the demands on the source water supply, the quantity of chemicals, and the amount of power used for pumping and treatment. Leaks in the distribution system can result from improper installation or maintenance, inadequate corrosion protection, settlement, stress from traffic and vibrations, frost loads, overloading, and other factors. Recommended measures to prevent and minimize water losses from the water distribution system include:

- Ensure construction meets applicable standards and industry practices;
- Conduct regular inspection and maintenance;
- Implement a leak detection and repair program (including records of past leaks and unaccounted- for water to identify potential problem areas);
- Consider replacing mains with a history of leaks with a greater potential for leaks because of their location, pressure stresses, and other risk factors.

Water Discharges

Water lines may be periodically flushed to remove accumulated sediments or other impurities that have accumulated in the pipe. Flushing is performed by isolating sections of the distribution system and opening flushing valves or, more commonly, fire hydrants to cause a large volume of flow to pass through the isolated pipeline and suspend the settled sediment. The major environmental aspect of water pipe flushing is the discharge of flushed water, which may contain high suspended solids, residual chlorine, and other contaminants that can harm surface water bodies. Recommended measures to prevent, minimize, and control impacts from flushing of mains include:

- Discharge the flush water into a municipal sewerage system with adequate capacity;
- Discharge the flush water into a separate storm sewer system with storm water management measures such as a detention pond, where solids can settle and residual chlorine consumed before the water is discharged; and
- Minimize erosion during flushing, for example by avoiding discharge areas that are susceptible to erosion and spreading the flow to reduce flow velocities.

1.1.2Sanitation

A sanitation system comprises the facilities and services used by households and communities for the safe management of their excreta[5]. A sanitation system collects excreta and creates and effective barrier to human contact; transports it to a suitable location; stores and/or treats it; and reuses it or returns it to the environment. In addition to excreta, sanitation systems may also carry household wastewater and storm water[6]. Transport, storage, and disposal facilities may also manage wastes from industries, commercial establishments, and institutions.

Fecal Sludge and Septage Collection

In communities not served by sewerage systems, sanitation may be based on on-site systems, such as pit latrines, bucket latrines or flush toilets connected to septic tanks. While pit and bucket latrines must be emptied frequently (typically daily to weekly), solids that accumulate in septic systems (septage) must also be removed periodically, usually every 2 to 5 years depending on design and usage to maintain proper function and prevent plugging, overflows, and the resulting release of septic tank contents. If suitable facilities for storage, handling and treatment of fecal sludge are not available, it may be indiscriminately dumped into the environment or used in unhygienic manner in agriculture.

Recommended measures to prevent, minimize, and control releases of septage and other fecal sludge include:

- Promote and facilitate proper septic tank design and improvement of septic tank maintenance. Septic tank design should balance effluent quality and maintenance needs;
- Consider provision of systematic, regular collection of fecal sludge and septic waste;

[5] Feces and urine

[6] The exceeds water from rainfall that does not naturally percolate into the soil

- Use appropriate collection vehicles. A combination of vacuum tanker trucks and smaller hand-pushed vacuum tugs may be needed to service all households;
- Facilitate discharge of fecal sludge and septage at storage and treatment facilities so that untreated septage is not discharged to the environment.

Sewerage

Where population density or local conditions preclude effective on-site sanitation systems (e.g., septic tanks and drain fields), sewage is typically conveyed via a system of pipes, pumps, and other associated infrastructure (sewerage) to a centralized storage and/or treatment system. Solids and liquids may be transported to a centralized location, or sewage solids may be collected in and periodically removed from on-site interceptor tanks (see Septage and Fecal Sludge Collection, above) while the liquids are transported to a centralized location for storage, treatment, or disposal. Users of the sewerage system may include industry and institutions, as well as households.

Grey water (water from laundry, kitchen, bath, and other domestic activities that normally does not contain excreta) is sometimes collected and managed separately from sewage. Though greywater is generally less polluted than domestic or industrial wastewater, it may still contain high levels of pathogenic microorganisms, suspended solids and substances such as oil, fat, soaps, detergents, and other household chemicals and can have negative impacts on human health as well as soil and groundwater quality.

The most significant potential environmental impacts associated with wastewater collection arise from: a) Domestic wastewater discharges; b) Industrial wastewater discharges; and c) Leaks and overflows.

a) Domestic Wastewater Discharges

Uncontrolled discharge of domestic wastewater, including sewage and greywater, into aquatic systems can lead to, among other things, microbial and chemical contamination of the receiving water, oxygen depletion, increased turbidity and eutrophication. Wastewater discharge onto streets or open ground can contribute to spread of disease, odors, contamination of wells, deterioration of streets, etc. Measures to protect the environment as well as public health include:

- Provide systems for effective collection and management of sewage and grey water (separately or combined);
- If grey water is managed separate from sewage, implement grey water source control measures to avoid use and discharge of problematic substances, such as oil and grease, large particles or chemicals.

b) Industrial Wastewater Discharges

Industrial users of a sewerage system can discharge industrial wastewaters to the sewer system. Some industrial wastes can cause fire and explosion hazards in the sewerage system and treatment facility, disrupt biological and other processes at the treatment facility or affect worker health and safety; some waste components may not be effectively treated, and may be stripped to the atmosphere, discharged with treated effluent or partition into treatment plant residuals rendering it potentially hazardous.

Recommended measures to prevent, minimize, and control industrial discharges to the sewerage system include:

- Treatment or pre-treatment to neutralize or remove toxic chemicals should ideally take place at the industrial facility itself, prior to discharge of the effluent to the sewer or water body. Consider collaboration with public authorities in the implementation of a source control program for industrial and commercial users to ensure that any wastewater discharged to the sewer system can be effectively treated. Examples of problematic discharges include: flammable, reactive, explosive, corrosive, or radioactive substances; noxious or malodorous materials; medical or infectious wastes; solid or viscous materials that could cause obstruction to the flow or operation of the treatment plants; toxic substances; non-biodegradable oils; and pollutants that could result in the emission of hazardous gases;

- Collaborate with public authorities in the regular inspection of industrial user facilities and collect samples of wastewater discharges to the sewerage system to ensure compliance with the source control program;

- Conduct surveillance monitoring at sewer maintenance and of the influent to the wastewater treatment facilities;

- Investigate upstream sources of pollutants causing treatment plant upsets or interference; and

- Facilitate public reporting of illicit discharges and connections.

c) Leaks and Overflows

Leaks and overflows from the sewerage system can cause contamination of soil, groundwater and surface water. Depending on the elevation of groundwater, leaks in gravity mains may also allow groundwater into the sewer system, increasing the volume of wastewater requiring treatment and potentially causing flooding and treatment bypass. Overflows occur when the collection system can not manage the volume of wastewater, for example due to high flows during rain events or as the result of power loss, equipment malfunctions, or blockages. The excess flows may contain raw sewage, industrial wastewater, and polluted runoff.

Recommended measures to prevent, minimize, and control leaks and overflows include:

- Consider the installation of separate sewer systems for domestic wastewater and storm water runoff in the overall planning and design of new sewerage systems;

- When on-site sanitation systems where excreta are mixed with water predominate, consider use of small-diameter sewerage system to collect water effluent from septic systems or interceptor tanks;

- Limit the sewer depth where possible (e.g., by avoiding routes under streets with heavy traffic). For shallower sewers, small inspection chambers can be used in lieu of manholes;

- Use appropriate locally available materials for sewer construction. Spun concrete pipes can be appropriate in some circumstances but can suffer corrosion from hydrogen sulfide if there are blockages and/or insufficient slope;

- Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation;

- Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replace if broken to minimize entry of garbage and silt into the system;

- Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas;

- Establish routine maintenance program, including:

  - Development of an inventory of system components, with information including age, construction materials, drainage areas served, elevations, etc
  - Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. Cleaning activities may require removal of tree roots and other identified obstructions
  - Inspection of the condition of sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration
  - Monitoring of sewer flow to identify potential inflows and outflows

- Conduct repairs prioritized based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);

- Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed; and

- When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sewer system.

Wastewater and Sludge Treatment and Discharge

Sewage will normally require treatment before it can be safely discharged to the environment. The degree and nature of wastewater and sludge treatment depends on applicable standards and the planned disposal or use of the liquid effluent and sludge and the application method. The various treatment processes may reduce suspended solids

(which can clog rivers, channels, and drip irrigation pipes); biodegradable organics (which are consumed by microorganisms and can result in reduced oxygen levels in the receiving water); pathogenic bacteria and other disease-causing organisms; and nutrients (which stimulate the growth of undesirable algae that, as they die, can result in increased loads of biodegradable organics).

Wastewater discharge and use options include discharge to natural or artificial watercourses or water bodies; discharge to treatment ponds or wetlands (including aquiculture); and direct use in agriculture (e.g., crop irrigation). In all cases, the receiving water body use (e.g. navigation, recreation, irrigation, or drinking (potable) needs to be considered together with its assimilative capacity to establish a site-specific discharge quality that is consistent with the most sensitive use.

The most significant environmental impacts related to wastewater and sludge treatment, discharge, and use include: a) Liquid effluents; b) Solid waste; c) Air emissions and odors; d) Hazardous chemicals; and e) Ecological impacts.

a) Liquid Effluents

Treated wastewater (liquid effluents) may be reused for irrigation or other purposes or disposed subject to regulatory oversight. If not re-used, treated wastewater can be discharged to the sea; rivers; large surface water bodies; smaller, closed surface water bodies; and wetlands and lagoons.

Recommended measures to prevent, minimize, and control liquid effluents include:

- Minimize bypass of the treatment system by using separate storm water and wastewater systems, if possible, and providing capacity sufficient to treat peak flows;

- Implement an industrial source control program which includes monitoring and effective regulatory enforcement;

- Collaborate with public officials to select appropriate treatment technologies, considering factors such as the quality and quantity of raw wastewater and its variability; available land area for the treatment facility; and resources for capital expenditures, operation, maintenance, and repair; availability of skilled operators, operator training, maintenance personnel, treatment chemicals, and replacement parts;

- Design, construct, operate, and maintain wastewater treatment facilities and achieve effluent water quality consistent with applicable national requirements or internationally accepted standards and consistent with effluent water quality goals based on the assimilative capacity and the most sensitive end use of the receiving water;

- Consider discharge of treated wastewater to natural or constructed wetlands, which can buffer the impact from discharge on the aquatic environment, unless the wetland itself would be degraded by the discharge;

- Treat greywater, if collected separately from sewage, to remove organic pollutants and reduce the levels of suspended solids, pathogenic organisms and other problematic substances to acceptable levels based on applicable national and local regulations. Greywater lines and point of use stations should be clearly marked to prevent accidental use for potable water quality applications;

- Based on an assessment of risks to human health and the environment, consider re-use of treated effluent, especially in areas with limited raw water supplies. Treated wastewater quality for land application or other uses should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements.

b) Solid Waste

Solids removed from wastewater collection and treatment systems may include sludge and solids from cleaning of drainage and sewer collection systems (including seepage systems), screening solids, and sludge from various unit operations used for wastewater treatment.

Recommended strategies for the management of solid wastes include:

- Select appropriate sludge treatment technologies, considering, for example, the quantity and sources of sludge; available resources for capital expenditures, training, operations and maintenance; availability of skilled operators, maintenance personnel, etc.; and the desired disposal methods or end uses of the treated solids;

- Land application or other beneficial re-use of wastewater treatment plant residuals should be considered but only based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements;

- Processing, disposal and re-use of wastewater treatment plant residuals should be consistent with applicable national requirements or, in their absence, internationally accepted guidance and standards.

c) Air Emissions and Odors

Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (such as from industrial discharges), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols (discussed in Section 1.2 below). Odors from treatment facilities can also be a nuisance to workers and the surrounding community.

Measures related to management of air emissions from drinking (potable) water treatment systems, discussed above, are also generally applicable to wastewater treatment facilities. In addition, the following measures are recommended to prevent, minimize, and control air emissions and odors:

- Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio- filters,

chemical scrubbers, etc.) as needed to reduce odors and otherwise meet applicable national requirements and internationally accepted guidelines; and

- Where necessary, consider alternate aeration technologies or process configurations to reduce volatilization.

d) Hazardous Chemicals

Wastewater treatment often includes the use of hazardous chemicals, such as strong acids and bases for pH control, chlorine or other compounds used for disinfection, etc. Environmental impacts and mitigation measures discussed above for disinfection in drinking (potable) water treatment are also generally applicable to disinfection in wastewater treatment facilities. Additional guidance on chemicals management is provided in the General EHS Guidelines.

1.2 Occupational Health and Safety

Occupational health and safety impacts during the construction and decommissioning of Water and Sanitation facilities are common to other large industrial projects and are addressed in the General EHS Guidelines. Occupational health and safety impacts associated with the operational phase of water and sanitation projects primarily include the following:

- Accidents and injuries
- Chemical exposure
- Hazardous Atmosphere
- Exposure to pathogens and vectors
- Noise

1.2.1Accidents and injuries

Work at water and sanitation facilities is often physically demanding and may involve hazards such as open water, trenches, and slippery walkways, working at heights, energized circuits, and heavy equipment. Work at water and sanitation facilities may also involve entry into confined spaces, including manholes, sewers, pipelines, storage tanks, wet wells, digesters, and pump stations. Methane generated from anaerobic biodegradation of sewage can lead to fires and explosions.

Mitigation measures for accidents and injuries are addressed in the General EHS Guidelines. In addition, the following procedures are recommended to prevent, minimize, and control accidents and injuries at water and sanitation facilities:

- Install railing around all process tanks and pits. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available;
- Use PFDs when working near waterways;
- Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance;
- Use fall protection equipment when working at heights;
- Maintain work areas to minimize slipping and tripping hazards;

- Use proper techniques for trenching and shoring;
- Implement fire and explosion prevention measures in accordance with internationally accepted standards;
- When installing or repairing mains adjacent to roadways, implement procedures and traffic controls, such as:

  - Establishment of work zones so as to separate workers from traffic and from equipment as much as possible
  - Reduction of allowed vehicle speeds in work zones;
  - Use of high-visibility safety apparel for workers in the vicinity of traffic;
  - For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing motorists;
  - Locate all underground utilities before digging.

1.2.2Chemical Exposure and Hazardouz Atmospheres

Water and wastewater treatment involve use of potentially hazardous chemicals, including strong acids and bases, chlorine, sodium and calcium hypochlorite, and ammonia. Water may contain radioactive substances and heavy metals, which typically accumulate in the water treatment sludge. Potential sources of exposure to radionuclides include: pumps and piping where mineral scales accumulate; lagoons, and flocculation and sedimentation tanks where residual sludges accumulate; filters, pumping stations, and storage tanks where scales and sludges accumulate; facilities where filter backwash, brines, or other contaminated water accumulates; facilities that are enclosed (radon); residuals processing or handling areas; and land disposal or application areas where residuals are shoveled, transported, or disposed.

Wastewater may contain potentially hazardous chemicals depending on the source water quality, drinking (potable) water treatment processes, and industries discharging to the sewer, including chlorinated organic solvents and pesticides, PCBs, polycyclic aromatics, petroleum hydrocarbons, flame retardants, nitrosamines, heavy metals, asbestos, dioxins, and radioactive materials. In addition, workers may be exposed to hydrogen sulfide, methane, carbon monoxide, chloroform, and other chemicals generated during wastewater treatment. Oxygen may be displaced or consumed by microorganisms, thus resulting in an oxygen deficient environment in areas where wastewater or wastewater residues are processed.

Prudent handling and storage of hazardous chemicals, as described in General EHS Guidelines and in Section 1.1, above, will help to minimize potential risks to workers. In addition, the following procedures are recommended to prevent, minimize, and control chemical exposure at water and sanitation facilities:

- Implement a training program for operators who work with chlorine and ammonia regarding safe handling practices and emergency response procedures;
- Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance.
- Prepare escape plans from areas where there might be a chlorine or ammonia emission;
- Install safety showers and eye wash stations near the chlorine and ammonia equipment and other areas where hazardous chemicals are stored or used;
- If water source contains radioactive substances, locate water treatment units and water treatment sludge areas as far as possible from common areas (e.g., offices);

- Conduct radiation surveys atleast annually, especially in areas where radionuclides are removed;
- Limit wastes entering the sewer system to those that can be effectively treated in the wastewater treatment facility and reduce the amount of air-strippable hazardous compounds entering the system by controlling industrial discharges (e.g., by permit or similar system). Analyze incoming raw wastewater to identify hazardous constituents;
- Ventilate enclosed processing areas and equipment, such as pump stations, prior to maintenance;
- Use personal gas detection equipment while working in a wastewater facility;
- Continuously monitor air quality in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency);
- Periodically sample air quality in work areas for hazardous chemicals. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to limit worker exposure, for example collection and treatment of off-gases from air stripping;
- Prohibit eating, smoking, and drinking (potable) except in designated areas;
- Rotate personnel among the various treatment plant operations to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials.

1.2.3Pathogens and Vectors

Workers and staff at wastewater and sludge treatment facilities and fields where treated wastewater or sludge is applied, as well as operators of sludge collection vehicles, can be exposed to the many pathogens contained in sewage. Processing of sewage can generate bioaerosols which are suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. Vectors for sewage pathogens include insects (e.g. flies), rodents (e.g. rats) and birds (e.g. gulls).

Recommended measures to prevent, minimize, and control exposure to pathogens and vectors include:

a) Wastewater and Sludge Treatment

- Include in safety training program for workers, safe handling and personal hygiene practices to minimize exposure to pathogens and vectors;

- Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods;

- Provide and require use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes;

- Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps to minimize chemical and radionuclide exposure;

- Encourage workers at wastewater facilities to wash hands frequently;

- Provide worker immunization (e.g. for Hepatitis B and tetanus) and health monitoring, including regular physical examinations;

- Reduce aerosol formation and distribution, for example by:

  - Planting trees around the aeration basin to shield the area from wind and to capture the droplets and particles
  - Using diffused aeration rather than mechanical aeration and using finer bubbles for aeration
  - Reducing aeration rate, if possible
  - Use of floating covers on the mixed liquor of the aeration basin
  - Suppression of droplets just above the surface, (e.g. by installing a screen or mesh above the basin);
  - Collection of droplets (e.g. by sedimentation, scrubber, electrostatic precipitator, or fabric filter)
  - Disinfection of airborne particles (e.g., by using ultraviolet lights)
  - Use of submerged effluent collector (such as pipes with orifices) rather than weirs

- Avoid handling screenings by hand to prevent needle stick injuries;

- Maintain good housekeeping in sewage processing and storage areas; and

- Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, especially composting facilities, facility because of their greater risk of infection.

1.2.4Water use efficiency

- Consider use of drip irrigation of treated wastewater, which minimizes worker exposure and the amount of water needed. Avoid use of spray irrigation of treated wastewater, if possible;
- Provide field workers with personal protective equipment, such as rubber gloves and waterproof shoes;
- Provide access to safe drinking (potable) water and sanitation (including hand washing) facilities;
- Provide worker health monitoring, including regular physical examinations; and
- Control vectors and intermediate hosts.

1.2.5Noise

High noise levels can be present in the vicinity of operating machinery and flowing water at water and sanitation facilities. Impacts and mitigation measures are similar to those at other industrial facilities, and are addressed in the General EHS Guidelines.

1.3 Community Health and Safety

Community health and safety impacts during the construction of water and sanitation projects include some which are common to those of other industry sectors and are therefore discussed in the General EHS Guideline. Community health and safety impacts associated with operation of water and sanitation projects are discussed separately below.

1.3.1Drinking (potable) Water

Water Intake (Water Supply Protection)

Both surface water and groundwater supplies can become contaminated with potentially toxic substances of natural and anthropogenic origins, including pathogens, toxic metals (e.g. arsenic), anions (e.g. nitrate), and organic compounds. Such contamination might result from natural sources, actions or releases that are routine (e.g. discharges within permit limits), accidental (e.g. from a spill), or intentional (e.g. sabotage).

Recommended measures to protect the quality of the water supply include:

– Determine the area that contributes water to the source (e.g. watershed of a stream or recharge area for groundwater), identify potential sources of contamination with the area, and collaborate with public authorities in the implementation of management approaches to protect the source water quality, such as:

- Zoning ordinance provisions
- Facility inspection or ha zardous material survey program
- Information to businesse s con cerning applicable requirements
- Environmental permits checklist for new businesses;
- Strategic monitoring within area
- Development and implementation of educational campaigns to promote best management practices that reduce the risk of water contamination
- Incorporation of surface water protection into regional land use planning

Evaluate the vulnerability of the water source to disruption or natural events, and implement appropriate security measures as necessary, such as:

- Continuously monitor raw water for surrogate parameters (such as pH, conductivity, total organic carbon [TOC], and toxicity)
- Inspect sites at random times
- For reservoirs and lakes, implement a neighborhood watch program with local park staff and other community users of the reservoir/lake
- Equip wellheads with intrusion alarms

Water Treatment

The most significant potential community health and safety impacts associated with water treatment include: a) Drinking (potable) water quality and supply; and b) Hazardous chemicals.

a) Drinking (potable) Water Quality and Supply

An adequate supply of clean drinking (potable) water is critical to community health and hygiene. Recommended measures related to water treatment include:

- Ensure that treatment capacity is adequate to meet anticipated demand;

- Construct, operate and maintain the water treatment facility in accordance with national requirements and internationally accepted standards to meet national water

quality standards or, in their absence, WHO Guidelines for Drinking (potable) Water Quality ;

- Evaluate the vulnerability of the treatment systemand implement appropriate security measures, such as:

  - Background checks of employees
  - Perimeter fencing and video surveillance
  - Improve the electrical power feeds to the facilities. Redundant electrical power systems significantly reduce the vulnerability risk to essential operations

b) Hazardous Chemicals

Hazardous chemical associated with drinking (potable) water treatment and mitigation measures associated with minimizing potential impacts to the environment and to workers are discussed in Sections 1 and 2, respectively. If a worst-case release scenario could affect the general public, prepare and implement a release prevention program for major hazards as described in the General EHS Guidelines. The prevention program should include identification of hazards, written operating procedures, training, maintenance, accident investigation, and an emergency response plan.

Water Distribution

The water distribution system is a critical component in delivery of safe potable water. Even if water is effectively treated to remove contaminants and destroy pathogens, waterborne diseases outbreaks can occur because of deficiencies in the water distribution system. Recommended measures to prevent or minimize potential community health risks associated with the water distribution syste m include:

- Construct, operate, and manage the water distribution system in accordance with applicable national requirements and internationally accepted standards;

- Construct and maintain the distribution system so that it acts as a barrier and prevents external contamination from entering the water system by, for example:

  - Inspecting storage facilities regularly, and rehabilitate or replace storage facilities when needed. This may include draining and removing sediments, applying rust proofing, and repairing structures
  - Ensuring that all installation, repair, replacement, and rehabilitation work conforms to requirements for sanitary protection and materials quality
  - Testing material, soil, and water quality and implementing best practices to prevent corrosion, such as cathodic protection
  - Preventing cross- connections with sewerage systems. o Separating water lines and sewer pressure mains (e.g., at least 10 ft apart or in separate trenches, with the sewer line at least 18 inches below the water line)

– Maintain adequate water pressure and flow throughout the system, for example by:

  - Implementing a leak detection and repair program (see section 1.1)
  - Reducing residence time in pipes
  - Maintaining positive residual pressure of at least 20 pounds per square inch (psi)

- Monitoring hydraulic parameters, such as inflows, outflows, and water levels in all storage tanks, discharge flows and pressures for pumps, flows and/or pressure for regulating valves, and pressure at critical points, and using system modeling to assess the hydraulic integrity of the system

Prevent introduction of contamination from the distribution system itself, for example by:

- Minimizing microbial growth and biofilm development (e.g. by ensuring adequate residual disinfection levels). Collect samples from several locations throughout the distribution system, including the farthest point, and test for both free and combined chlorine residual to ensure that adequate chlorine residual is maintained;
- Choosing residual disinfectant (e.g. chlorine or chloramines) to balance control of pathogens and formation of potentially hazardous disinfection by products; and
- Using construction materials that do not contribute to release undesirable metals and other substance or interact with residual disinfectants.

1.3.2Sanitation

Measures to minimize potential community health risks can be implemented both in the collection and treatment of wastewater and sludge.

Wastewater and Septage Collection

Collection of sewage and transportation away from residential areas, while not alone sufficient to protect public health, is nevertheless generally the most important aspect of sanitation. Therefore, provision of collection services, or ensuring that collection services are available, is of primary concern. Effective design and operation of a sewerage system, as addressed in Section 1.1, can minimize the potential for community exposure and health impacts from raw wastewater and sludge collection, for example by:

Preventing sewerage system overflows;
Preventing buildup of potentially toxic and explosive gasses in the sewer.

Wastewater and Sludge Treatment

Potential community health and safety impacts associated with wastewater and sludge treatment facilities include: a) Liquid effluents; b) Air emissions and odors; and c) Physical hazards.

a) Liquid Effluents

Treated wastewater effluents are typically discharged to surface water or re-used for irrigation or other purposes. In many cases, direct or indirect human contact with treated wastewater is likely. Therefore, adequate wastewater treatment to remove contaminants and, especially, microorganisms and pathogens, as described in Section 1.1, is important not only to prevent adverse environmental impacts, but to protect public health as well.

b) Air Emissions and Odors

Odors from wastewater treatment facilities can be a nuisance to the neighboring community. Bioaerosols can also carry disease-causing microorganisms. Furthermore, releases of hazardous gases, such as chlorine, could adversely affect nearby residents.

Air emission and odor controls are addressed in Sections 1.1 and 1.2, as well as in the General EHS Guidelines. In addition, the following measures are recommended to prevent, minimize, and control community exposure to dust and odors from waste management facilities:

- Provide adequate buffer area, such as trees, or fences, between processing areas and potential receptors;

- Avoid siting facilities near densely populated neighborhoods and installations with potentially sensitive receptors, such as hospitals and schools. Site facilities downwind from potential receptors, if possible.

c) Physical Hazards

Visitors and trespassers at wastewater treatment facilities may be subject to many of the hazards for site workers, described in Section 1.2. Recommended measures to prevent, minimize, and control physical hazards to the community include:

- Restrict access to waste management facilities by implementing security procedures, such as:

  - Perimeter fencing of adequate height and suitable material, with lockable site access gate
  - Security cameras at key access points, and security alarms fitted to buildings and storage areas; and
  - Use of a site visitor register

- Light the site where necessary. As this may cause light nuisance to neighbors, the lighting installations should be selected to minimize ambient light pollution.

d) Land Application

Use of treated wastewater in agriculture can pose public health risks. Hazards associated with crops irrigated with treated wastewater include excreta-related pathogens and toxic chemicals that may be present in the wastewater. The following methods are recommended to protect consumers:

- Treat wastewater and sludge used for land application in a manner consistent with WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater and applicable national requirements;
- Stop irrigation with treated wastewater two weeks prior to harvesting;
- Limit irrigation with treated wastewater to crops that are cooked before eating;
- Restrict public access to hydraulic structures carrying wastewater and to fields irrigated with treated wastewater.

2. Performance Indicators and Industry Benchmarks

2.1 Environmental Performance

2.1.1Guidelines

a) Drinking (potable) Water

Water quality of potable water supply systems should meet nationally legislated drinking (potable) water standards or, in their absence, the most recent World Health Organization (WHO) Guidelines for Drinking (potable) Water Quality throughout the distribution network.

b) Sanitation

Effluent Guidelines: The choice of sanitation technology and design of wastewater treatment begin with a determination of the required level and type of treatment. Project-specific effluent guidelines for sanitation projects should be established based on a clear definition of health objectives and a comprehensive evaluation of alternatives, considering appropriate treatment technologies; quality and quantity of raw wastewater and its variability; available land area for the treatment facility; resources for capital expenditures, training, operation, maintenance, and repair; and availability of skilled operators, maintenance personnel, treatment chemicals, and replacement parts.

The selected approach should achieve effluent water quality consistent with applicable national requirements or internationally accepted standards and with effluent water quality goals based on the assimilative capacity and the most sensitive end use of the receiving water.

Treatment standards usually are either technology standards, which specify the treatment technologies or processes that must be used to meet water quality objectives, or effluent standards, which specify the physical, biological, and chemical quality of the effluent to be produced by the treatment. Effluent standards often set limits on allowable concentrations of biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), nitrogen, phosphorous, etc.

Treated Wastewater Re-use and Sludge Management: Treated wastewater and sludge quality for land application should be consistent with WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater and applicable national requirements. Potential impact on soil, groundwater, and surface water, in the context of protection, conservation and long term sustainability of water and land resources should be assessed when land is used as part of any wastewater treatment system. Sludge from a waste treatment plant needs to be evaluated on a case-by-case basis to establish whether it constitutes a hazardous or a non-hazardous waste and managed accordingly as described in the Waste Management section of this document.

2.1.2Environmental Monitoring

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Environmental monitoring

activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to the particular project.

Monitoring frequency should be sufficient to provide representative data for the parameter being monitored using internationally recognized standards and procedures. Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Additional guidance on applicable sampling and analytical methods for emissions and effluents is provided in the General EHS Guidelines.

2.2 Occupational, Health, and Safety Performance

2.2.1Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®) occupational exposure guidelines and Biological Exposure Indices (BEIs®) published by American Conference of Governmental Industrial Hygienists (ACGIH), the United States National Institute for Occupational Health and Safety (NIOSH), Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA), Indicative Occupational Exposure Limit Values published by European Union member states, or other simi lar sources.

2.2.2Accidents and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive).

2.2.3Occupational Health and Safety Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by credentialed professionals experienced in water and sanitation as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the General EHS Guidelines.

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