THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

MINISTRY OF WATER, IRRIGATION AND ELECTRICITY

RURAL PIPED SYSTEMS TECHNICAL MANUALS

BUSINESS PLAN GUIDELINE

Addis Ababa, March 2016

Generic Business Plan for Rural Piped System

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Glossary

Terms	Definition
Advisor	The specialist or team of specialists who will assist the Water Board through the process of business planning. The advisor(s) may be a consultant(s) or staff member(s) of a regional/ Zone/Woreda government agency assigned to carry out this role. A combination of these options may also be used.
Business Plan	The document that sets out the RPS's development strategy over the next 5 years, based over a longer term planning horizon. This can be used as a basis to identify performance targets.
Business Planning	The process of outlining how the RPS service will develop over time to provide the level of service required by its customers, owners and regulators
Cash flow	Cash collected less cash disbursed during a defined period. Operating cash flow arises solely from operations and excludes any capital expenditure. Pre-financing cash flow is operating cash flow less capital expenditure.
Contingencies	Amounts added to base costs to take into account physical contingencies (e.g. uncertainty arising from unanticipated ground conditions or changes in design) and price contingencies (typically comprising inflation, the effects of exchange rate movements and lenders' fees and charges, if any).
Contract	A generic term for a contract signed between the town oversight body (the Water Board) and an operator or a professional service provider to delegate management of a service provision function.
Oversight Body	The entity in charge of supervising the RPS operator, including of providing overall direction to the management of the operator, approving budgets and business plans and performing other duties as defined in the articles of the association and regional proclamation. This may take name the Executive Water Board.
Cost-effective design	Cost effective design is design that makes the most effective use of available resources, bearing in mind the likely rate of increase in demand for water supply and sanitation services, the availability of financial resources and the physical characteristics of system components.
Cost recovery	The recovery of the costs of providing a service from the users of the service. Full cost recovery implies charging users not only for day to day operating expenses, but also for the depreciation charges arising from the use of fixed assets. Financing costs are also sometimes included in full cost recovery.
Cost Recovery ratio	This is the ratio of turnover to total operating costs and depreciation. The ratio should be above 1 for a financially sound entity.
Creditor	Party owed money by the utility, typically suppliers (trade creditors) and lenders. Amounts owed are a current liability and are a balance sheet item. (U.S: accounts payable).
Debtor	Party owing money to the utility, typically water users (trade debtors). Amounts due by debtors are a current asset and are a balance sheet item. (U.S: accounts receivable).
Debt Equity Ratio	This is the ratio of debt as defined as long term borrowings to equity. The ratio should be below 1 for a financially sound entity. Grant funds have been taken as part of equity.
Depreciation charge	An amount representing the wear and tear on a fixed asset during a defined

Terms	Definition
	period. It is charged against income.
Discount rate	A percentage that represents the premium placed on money now versus money in one period's time. Discount rates are usually expressed in real terms, i.e. they exclude inflation.
Full service operator	An operator capable of providing all professional support services to a rural piped system/ utility, including routine and specialist services.
Income	The amount of money falling due to a service provider in exchange for the supply of services over a defined period. May include income from connection charges. Also known as revenue or turnover, but not to be confused with cash collected.
Operator	An entity responsible for the day-to-day operations of the utility under alternative contractual forms (including performance, management, afterimage or concession contracts).
Operating Ratio	This is the ratio of operating costs (including depreciation and interest costs) to operating revenues. The ratio should be below 1 for a financially sound entity. The operating ratios for both investment scenarios mean that the investments are capable of generating adequate revenues to cover their operating costs.
Performance contract	A contract signed between the Water Board and the Operator/service provider setting out targets for improvement in the RPS/ utility's performance in exchange for financing.
Present value	The present value (PV) of a future sum (or sums) represents today's exchange value of that future sum, given a market interest rate or a specified discount rate. The net present value (NPV) is the difference between the PV of income (or benefits) and the PV of expenses.
Professional support	External assistance provided for assisting with or carrying out one or several RPS/town water sector functions.
Professional support provider	An entity providing professional support services to the RPS/utility. Professional support providers may include: (i) consulting engineers and financial advisors (ii) operators through a contract; (iii) umbrella organizations such as NGOs or Apex organization; (iv) larger urban utilities.
Regulation	A water sector function consisting of ensuring that the RPS/ utility complies with existing rules and regulations with respect to tariffs or quality standards and of adapting those rules overtime in order to cope with unforeseen events.
Regulatory oversight body	The entity in charge of regulating the RPS/utility.
Routine operator	An operator capable of carrying out routine tasks, and so requires the support of specialists to efficiently operate the system, to resolve problems, and plan expansion.
Rural Piped System	A water supply system serving the majority of rural community and multiple small towns from a single or multiple water sources, which is managed by rural water boards/WASHCOs.
Service contract	A contract under which a company/micro enterprise provides selected services (such as meter reading or billing and collection, but not management) to a RPS/water utility in return for a fee.
Service provider	Entity providing water and sanitation services. In a RPS/town, this may include the RPS/town operator and/or alternative providers.

Terms	Definition
Tariff structure	The relationship between the price charged for water and some characteristic of the consumer. For example, a rising block structure applies a different price per unit volume depending on the quantity bought in a given time period.
Water Board	A type of oversight body who elected by the user community for a RPS water supply.
WASHCO	It is a water supply, sanitation and hygiene committee who elected by user community to manage the rural water supply system.
Water tariffs	The price of water to a final consumer.
Working Ratio	This is the ratio of operating costs (exclusive of depreciation and interest charges) to operating revenues (which include revenues from water and sewerage tariffs, service charges, connection fees and re-connection fees). The ratio shows the ability of a business to cover its operating costs. Sound financial management requires the working ratio to be well below 1. Under both scenarios, the working ratio shows that the investment is capable of covering its operational costs excluding depreciation and interest.

1 INTRODUCTION

1.1 General

In 1999 the Government of the Ethiopia adopted a Water Resource Management Policy containing cost coverage principles. Rural water supply systems at least cover O&MM cost through the devolution of the responsibility for user community with continuous technical support of local authorities mainly the Water Bureaus and Water Offices at Zones and Woredas. A business plan provides a thought out and logical framework within which a business can develop and pursue business strategies over the planned period. It provides a benchmark against which actual performance can be measured and reviewed. A business plan furthermore helps WASHCO/WB to clarify, focus and research their business's development and prospects and serves as a basis for discussion with third parties (e.g. the financial institutions, stakeholders, regulator, etc). The business plan should cover a period of five years. A revised business plan is to be presented before the period of five. The WASHCO/WB therefore must endorse it, as future board and management decisions will be within the framework of the business plan. The other documents to be elaborated by the providers should be consistent with it, e.g. the agreements concerning the minimum service level should be reflected in the business plan and the tariff adjustment proposals should be based on the objectives and targets set out in the business plan. Years of a valid business plan expires and at every review of tariffs.

1.2 Purpose of Business Plan

Any Rural Piped System (RPS) can benefit from a Business Plan. Your system does not need to be a for profit business to have a Business Plan. If you prefer, you can refer to a Business Plan for a governmental or private non profit organization as an enterprise plan. The purpose of the plan is to put down in black and white the assets of the system, the service area's basic needs, how those needs are to be addressed, and how the system is going to operate and sustain itself over time. For existing systems, the time when a Business Plan is most needed is when a major change or capital improvement is going to occur, although a system can benefit from a Business Plan at any time.

The start up phase is the most important time to have a Business Plan, for it can help prevent investments in systems that may become problems for everyone WASHCO/WB, operator, customer, community, and regulator down the line. Before making a significant investment in a new system, it is necessary to identify the risks that exist and provide assurances that the proposed system will be capable of meeting drinking water requirements and of providing a safe and adequate supply of water for domestic, livestock and irrigation consumptions over time. It is important that before a new system commences operation that its WASHCO/WB have given some thought to what it is they intend to do, how they are going to do it, and what the long-term likelihood of success is. The Business Plan is a methodical approach to answering those questions. A Business Plan is intended to show that a water system can remain viable.

1.3 Business Environment

In order to be realistic in setting objectives and related strategies, a number of activities will be conducted to assess the business environment in which the RPS services is operating. These activities included an internal and external analysis of the Water Board by management and staff of the service offices, a comprehensive Social Economic Survey and a stakeholder consultative meeting which is aimed at getting stakeholders views and

inputs into the project. Key issues in business environment should need to exercises as presented below:

- The existing water supply system is needed to be verifying its age and adequacy to meet the demand. As such, coverage, NRW, continuity of the supply, pipeline capacity, pressure, reservoir capacity etc
- The existing water sources: its yield, actual production, installed capacity and future potential water sources to augment due to the demand as a result of population pressure, changing of life standard and climate.
- Water quality is another issue where whenever there is a breakdown and water supply stops, customers are served with dirty water when supply is restored.
- Water supply disruptions which results from high dependency on electricity when pumping water. This has made the water supply system prone to power problems leading to interruptions for longer periods.
- Late settlement of bills by consumers has sometimes affected cash flow, which impacts adversely on operational efficiency.
- Failure to retain highly qualified staff as a result of poor terms and conditions of service.
- Inadequate public water supply points is another area where stakeholders expressed dissatisfaction with the current service level
- The last issue concerns the customer service level within the institution. Customers expressed concern on how they are treated by members of staff whenever they interact with them.

1.4 Aim of the Business Plan

In order to alleviate the problems above as well as in response to the ever growing demand for portable water, The Water Board has to developed business plan. The business plan aims to ensure the investment recommended under the broader scheme improvement project can be justified to the Government and financiers. The business plan recommends a proportion that should be made towards meeting social obligations and a proportion that should be invested in potentially viable areas. The plan also includes the proposed tariff structure, projected cash flow, balance sheet, and profit and loss account and sensitivity analysis.

The Business Plan outlines strategies that RPSs will employ in order to achieve the proportion of people with sustainable access to safe drinking water by 100% coverage as per Government of Ethiopia (GoE) target. The Business Plan also estimates the viability and profitability of water supply business in five years interval.

1 The Priorities of this Business Plan

a) Prudent Investment

To avoid financing over-designed water supply systems that customers cannot afford to pay for their services, the business plan focuses on a phased investment system aimed which is going to result into an affordable tariff structure. The proposed systems will be designed to allow for an expansion as population grows and customers can afford a higher level of service. The emphasis is on keeping the cost per capita low, designing for the longer term in phases, but initially constructing facilities to serve the expected population for the next ten years at a relatively low per capita consumption level, consistent with current consumption patterns. The scenario

for the phased investment should be divided every 5 years interval and indentify which of the facilities should be constructed by prioritizing.

b) Sustainable Development

Environmental sustainability is becoming an increasingly important policy objective. The water boards along with the zone and woreda water offices will strive to ensure that the benefits the water supply system delivers must also be measured against its impact on the environment. In this case, all the investment being pursued will aim at reducing environmental degradation both in the short and long term.

c) Providing Capacity

The provision of required capacity can potentially be delivered in a number of ways. These options should set out in detail in the Detailed Design Report of the schemes. The strategies set out below are therefore incremental, affordable and consistent with the overall mission of the Board.

d) Increased Access to Water

The plan will also emphasize the need to enhance access to portable water especially through the establishment of additional Public Water Points. The plan also defines the required improvements that need to be made in managing these Public Water Points especially concerning governance to reduce close down frequencies.

e) Enhanced Customer Relations

The plan also proposes the decentralisation of the customer relations management system. The aim is to get as close as possible to the customer.

1.5 Who is the user of this Guidance and how should it be used?

The primary audience for this manual is Water Boards and their "advisor(s)"— staff or consultants engaged to assist the Water Boards in preparing their business plans. A secondary audience is Regional Water Bureaus, Zone/Woreda Water Offices who may use the manual to build Water Board and Rural Piped System Service staff capacity for planning and managing their services; or as background material for establishing an effective policy and legal framework.

While the manual and modules assumes that the operator with an independent entity oversight body will be established, if this is not already the case, Regional Water Bureaus could apply this approach on a pilot basis to test the ability of RPS services to plan and operate their water services effectively

1.6 Procedures for Development of a Business Plan

The procedure that is described below will assist RPS in developing a business plan. The first step is to discuss the proposed Business Plan scope with the WASHCO/WUB, woreda water supply engineer during a Planning Consultation meeting. It is required that you request this meeting from WASHCO/WUB. This meeting can be held simultaneously with the Planning Consultation Meeting required for user community and other stakeholders. The purpose of the meeting is to identify system needs, perform a pre feasibility assessment to identify possible alternatives to be explored as part of the Business Plan, and discuss Business Plan scope and procedures.

It will be helpful if the applicant's engineer is prepared to discuss the water supply problems and possible alternative solutions. As can be seen from the meeting checklist topics, the Planning Consultation Meeting is designed to be a preliminary meeting to lay out the scope of the Facility Plan, particularly the alternative identification and analysis.

The Planning Consultation Meeting will ensure that the right "something" are examined. The next step is to prepare a draft Business Plan, and bring it with you to the Preliminary WASHCO/WUB and Woreda water supply engineer meeting.

1.7 Business Plan Format

No matter what format a Business Plan is prepared in, it must contain the same basic information. To assist in completing a Business Plan, this Guideline also contains a format of the information that must be included in each component of the Business Plan. The Business Plan must:

- Identify the water supply needs of the area;
- Identify alternatives to address those needs;
- Evaluate the alternatives;
- Recommend a specific alternative;
- Identify how the organization which will implement that alternative will be structured and operate, and;
- Demonstrate that the operation of the proposed alternative will be financially viable for a period of at least five years.

Other systems will also find it useful. The format has three basic components:

a) Facilities Plan-including an assessment of the current and foreseeable water supply needs of the area, a description of alternatives considered (including both construction and operating costs) and the rationale for the approach selected.

   Facility Plan Format to capture all of the necessary information RPS supplying for Community Water System includes but not limited to the following items illustrated in Annex-A.

b) Tariff Plan format including documentation that the WASHCO/WB has sated tariff that financial sustain to operate and maintain the system, and cover a management and administrative and administrative cost. Tariff Plan Format to capture all of the necessary information RPS supplying for Community Water System includes but not limited to the following items illustrated in Annex-B.

c) Financial Plan projections and assurances that the system's revenues and cash flow will be sufficient for meeting the costs of construction, operation, and maintenance for at least five full years from date of implementation of Business Plan. Financial Plan Format to capture all of the necessary information RPS supplying for Community Water System includes but not limited to the following items illustrated in Annex-C and D.

Each of the three components in turn has sub-parts. The tariff calculation section of this Guideline describes these components and their parts in more detail. In some cases, existing documents can be incorporated by reference to reduce duplication of effort. Some additional documents are to be included with the plan as supplements.

Included in this manual are appendices containing forms to include in the Business Plan. You may modify these forms to reflect the differences in your system and proposed project. However, all of the same basic information should be provided. The more detailed the information is, the less likely that follow-up questions will be necessary. Applicants should provide additional justification or documentation for the assumptions used in completing schedules and preparing entries for the business plan.

Also, if you prepare worksheets or make calculations to develop a number used in one of the forms, please attach a copy of your documentation. Please use narratives to describe

how assumptions were made and what factors were considered. The better you support your projections, the less time will be required during the review process.

Be sure that all assumptions are reasonable, and that there is some margin for error if more adverse assumptions are used. The plan should provide the system's owner and operator, WASHCO/WB, local officials and customers with assurance that the proposed system is strong enough to remain viable even if some of the assumptions and targets are not met. The purpose of preparing a Business Plan is to help you develop a drinking water system that will be viable for a long period of time.

1.8 What does this Guidance Manual consist of?

This Guidance Manual provides the context for the six sections that outline the Business Planning approach. The Manual sets out the main components of business planning for RPS water services. It provides a walkthrough of the business planning process and an outline of the main outputs that the WB will need to prepare. It also contains annexes with examples of tariff calculation for gravity and pumping system.

The business plan should comprise but not restricted to the following main parts:

1. Objective
2. Business Description
3. Business Opportunity
4. Operational Plan
5. Financial Plan
6. Management Plan
7. Performance Indicators

2 THE BUSINESS PLAN PROCESS

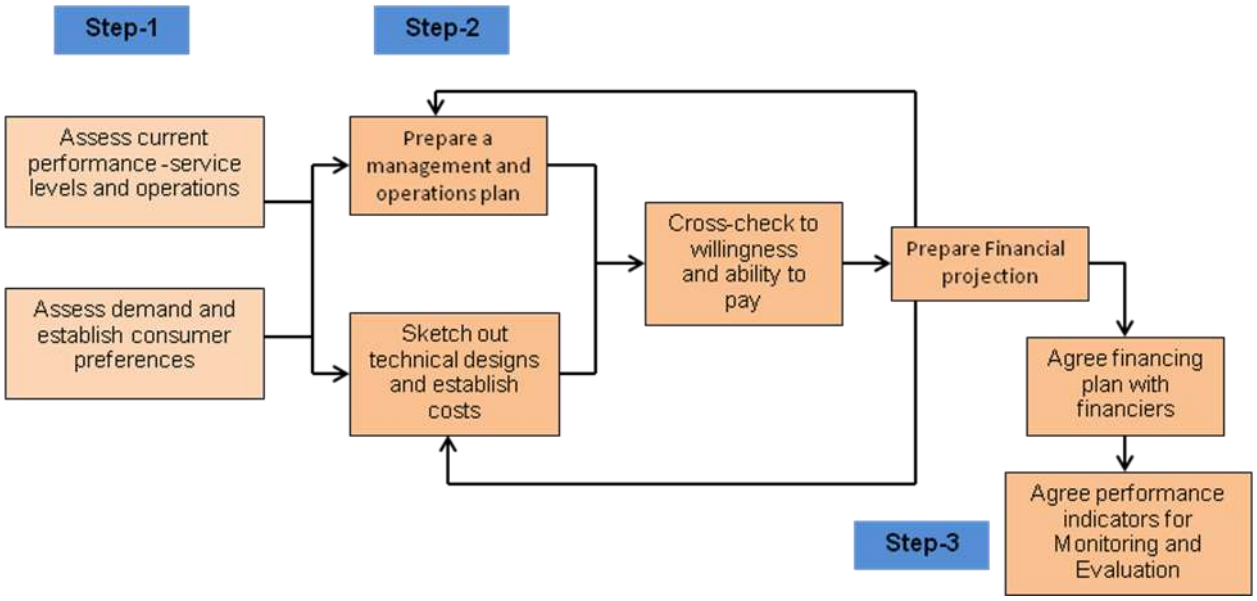
2.1. General

This section contains a step-by-step walk through the business planning process set out and a description of the outputs that the RPS service office and Water Board (and its advisors) will need to prepare. These outlines should not be treated as a formal requirement but as a guide to the type of analysis that needs to be conducted.

The following steps are shown the process of business plan preparation:

Figure --- presents the steps to be followed in preparation of business plan.

Figure 2-1: Steps to be followed in preparation of Business Plan



- **Step – 1:** Identifying critical issues and prioritizing interventions: includes collecting baseline information and preparing an Initial Assessment Report to better understand the situation the RPS/utility is currently in and the key challenges moving forward. The objective is to define concrete, time-bound objectives for improvements along institutional, financial or technical lines. Emphasis is placed on identifying improvements that can be implemented "in time" and lead to a positive impact on performance, as well as other longer-term improvements. The importance of gathering and evaluating information is emphasized throughout the business planning process.

- **Step - 2:** Preparing the business plan: involves preparing a five year "business plan" that sets out measures the RPS's/ utility will take to meet demand and improve services over time; testing and cross checking various options to ensure their viability; and including performance standards in technical and financial plans that allow results to be measured over time. It also involves identifying gaps in capacity and arranging to fill these through "professional support" options such as a "routine operator", "specialist service provider" of "full-service operator"; and requires RPSs to assess whether to join forces with neighboring RPSs to yield scale economies (a process

referred to as “aggregation”). The outputs of this process comprise the key building blocks of the business plan— a living document to be adjusted over time as conditions and capacities change.

- **Step – 3:** Formalizing relationships and implementation arrangements: consists of formalizing institutional arrangements through agreements and contracts that outline roles and responsibilities and allow monitoring of progress. Several types of agreements may be required: including a contract with a “specialist service provider” or “full-service operator”. Institutional arrangements governing the RPS may also need to be revised or strengthened and a monitoring and evaluation framework set out. Such a framework could be used, for example, by the providers of finance or the local stakeholders to ensure that the objectives set out in the business plan are effectively fulfilled.

1 Assess the Institutional Arrangements

- Administrative perimeter of RPS: population (rural + urban) and area size (covered and uncovered)
- Who does what at rural and town level – allocation of rural and town water functions
- Assessment of skills and organizational performance
- Evaluation of institutional arrangements: need for reforms

2 Understand the Rural Piped System – Technical Aspects

- RPS location and topography – brief description
- Map representing existing and potential sources of water, production, transport and distribution and water point facilities
- Estimated current production and potential future production
- Evaluation of commercial performance
- Evaluation of technical performance: technical efficiency ratios

3 Understand the Rural Piped System – Financial Aspects

- Evaluation of financial autonomy and cash position
- Assessment using selected financial indicators and financial statements
- Breakdown of income and expenditure items
- Suggestions for improvements

4 Understand the Market

- Socio-economic context: population, household income, local economy
- Charges; utility income; cash collected
- Consulting customers: surveys, focus groups etc
- Baseline consumption assessment; affordability; willingness to pay

5 Identify Critical Issues and Define Strategic Objectives

- Identify critical issues
- Define Strategic Objectives, which may include:
  - Improving operations
  - Making physical investments

- Reforming institutional arrangements
- Building capacity and accessing professional support

2.2. Steps in Business Plan Process

2.2.1. Step 1 – Identify Critical Issues and Prioritize Interventions

Based on the initial review of the national policies and legal framework, the rural water board advisors/consultants will support the key players to the following level:

- Consult local stakeholders to identify critical issues for the RPS's water services;
- Review whether existing institutional arrangements are adequate or should be reformed;
- Carry out a technical and financial assessment of RPS services;
- Identify the strengths and weaknesses of the current service and the needs for improvement in order to meet future demand and allow service expansion;
- Identify what immediate improvements can be carried out.

It will be necessary to draw all the threads of analysis together in order to identify the critical issues that the RPS is currently facing and prioritize the options for improvement.

Due to their limited resources, many RPSs address WSS problems in a bit by bit approach, or through "crisis" management. Preparing a business plan allows RPSs to set priorities and phase in implementation— starting with activities that provide the most benefits for the least cost. To help prioritize interventions, simple financial models have been prepared that the RPS can use, with the assistance of a financial specialist, to identify the relative payoff (in terms of the impact on consumers and improved cash flows) from alternative interventions.

2.2.2. Step 2 – Prepare the Business Plan

a) Formulate Choices on Sources of Professional Support

Having identified and prioritized critical issues and potential solutions, RPSs will need to answer the following questions:

- What is the most appropriate institutional arrangement for the RPS:
- What skills are required to deliver the necessary improvements?
- Can in house capacity be strengthened by providing training, or will it be necessary to outsource some functions?
- Are the skills (either for training or for service provision) available locally and, if so, at what cost?

b) Draw up Investment, Management and Operations, and Financing Plans, and Prepare the Business Plan

In drawing up an investment plan and management and operations plan, the RPS will be encouraged to identify easily realizable benefits that improve the service delivery. For longer-term options, the RPS will need to take account of cost-effective design principles and seek to achieve maximum operating efficiency in order to reduce the costs of delivering the service. A modular approach to planning investments should also be adopted so as to reduce the risk of over-design and ensure that consumers' are able to pay for services, particularly in initial years.

A critical part of this stage of the work will be to test proposals against financial viability through application of the financial models, and to evaluate proposals against the willingness and ability to pay of end users. If necessary, plans may need to be revised to ensure that they are viable and acceptable.

In step-2, the following issues should be outline and implement:

1 Statement of Goals

- The Water Board should set out goals, critical issues and benefits to the community,

2 Formulate Strategy

- Details on how the Water Board will achieve its goals, including specified tasks, a timeframe (e.g. 5 year business plan), milestones and performance targets, the skills needed and the plan to access them, and specified roles and responsibilities.

3 Investment and Financing Plans

- Prioritized investments, costs and how to finance them.

4 Management and Operations Plan

- In house and outsourced arrangements to manage and operate facilities, including contract details, operational performance targets, and reporting arrangements, as well as training programmes.

5 Financial Forecasts

- Financial forecasts from the (RPS water) financial model.

6 Communications Plan

- Specify the form that communication will take, and key messages to be delivered.

2.2.3. Step 3 – Formalize Relationships and Implement Arrangements

In this final Step, the Advisors/Consultants will assist the Water Board to formalize all of the arrangements that are necessary in order to make the implementation of the business plan feasible and to monitor such implementation. These could include:

- The signing of contracts with professional support providers (such as a routine operator and specialist services or a full-service operator);
- The revision of institutional arrangements to oversee the contracts (through the creation or strengthening of a corporate oversight body, at town and rural level or for several towns/rural in the event of aggregation);
- The establishment of a monitoring and evaluation framework in order to verify implementation. Such M&E framework could be used, in particular, by an entity providing financing in order to release additional tranches of funding linked to improvements.

3 STRATEGIC GOALS

3.1. General

In coming up with intended performance, Rural Piped Systems services have been guided by the Growth and Transformation Plan; Sustainable Development Goals through the planning and implementation of the National One WASH Program.

The intended performance is therefore as follows:

- To achieve xx % coverage of people accessing potable water in the next five years.
- To provide high quality water service to the customers at all times.
- To satisfy customer needs in a cost effective manner.
- To protect water catchment areas to ensure sustainability of raw water sources.
- To continue developing and maintaining water works in order to expand, extend and upgrade the infrastructure to meet the present and future demand.
- To keep a motivated and result-oriented human resource that will uphold positive operational, financial and economic water supply efficiency, through good customer care.

In order to achieve the intended performance as outlined above, the following are the specific objectives that the RPS services will aim at accomplishing over the five-year period covering this Plan.

- Increase peoples' access to quality water services to xx % by xxxx year.
- Reduce Non Revenue Water from xx in year xxxx to xx % by the year xxxx.
- Implement total quality management programs to create a culture of quality service provision.
- Carry out quarterly customer needs survey to align the activities to the customers' interest.
- Establish and strengthening community based management structures.
- physical boundary to be covered,
- Strategy to address the poor communities.

3.2. Business Opportunity

- Specify the business opportunities of the water supply unit from the point of view of supply & demand.
- From the supply side specify the source & capacity of water supply, distribution and treatment systems.
- From the demand side specify the existing as well as potential customers by type and size or number. Define the share of consumption of each category of customers. Moreover, indicate whether there are competitors in some line of activities (for instance legalized private water vendors).

3.3. Operational Plan

3.3.1. Assessment of Socio-Economic Conditions

The first requirements in developing business plan for water supply provision, it requires to obtain information on the socio-economic situations of the communities to be served. Information on socio-economic situations includes the followings:

- Current population size
- Number of households

- Average size of households
- Households by occupation category
- Average household income (if not available use average regional household income)
- Willingness to pay
- Seasonal variation of income (the time of the year when the community has better income and low income)
- Current source of water supply
- Price of water (if water is purchased from suppliers).

3.3.2. Population Projection

Water demand depends on the size of the population served, their standard of living, activities and importantly the cost of water supplied.

The present population and its anticipated growth should be analyzed on the basis of: the Statistical Abstract xxxx year of Central Statistics Agency; the growth rates adopted in xxxx year Population and Housing Census of Ethiopia. Project the population number using the growth rate over a specified Business Planning period (usually 5 years).

Geometric progression method can used to project the population.

$$P_n = P\left[1+\frac{r}{100}\right]^n \qquad (1)$$

Where, P_n = Population at the n^{th} year

P= Initial year

r = Rate of population increase % (from CSA)

n = Number of years (usually 5 for business plan preparation)

Refer annex-A for the general format to project the population, demand and water production.

Table 3-1: Procedures to fill the population and demand projections

Row No.	Description to fill the requirements (refer Annex_A)
1	Can be filled by adapt CSA, analytical report for the population growth rate stipulated for different region of rural and urban aspects. The growth rate varies with a certain period. The base year is the year before the first year of the financial analysis. It is usually the current year. It is a base for projection of the future population. For instance in May, 2007, National Population and Housing Census was conducted, which is the initial year for project the population.
2	the total population from the base year, for instance, in 2015, will be projected using the above formula in equaltion-1

Row No.	Description to fill the requirements (refer Annex_A)
3	Coverage is calculated as: (Row-4/Row-2)*100 (Population served/total population). Population served further calculated as present below.
4	Population served is the sum of number of inhabitants connected with house (row-12) + yard connected (row-18) + public tap (row-26)
9	Population number depending on house connected users calculated as (row-10/row-4)*100 which means number of inhabitants benefited as house connection from the system divided by population served X by 100.
10	Number of inhabitants connects as house connection is (row-12 X row-11), which means total number of house connected customers (HHs) times the average family size.
11	The average family size for the specific region as well as rural and urban is different, can be referred CSA report.
12	The customer numbered connected with house connection obtained from the utility/water supply service office, customer section database.
13	The per capita consumption can be calculated from the customer consumption bills that are connected as house connection. The customer types should be categorized.
14	Total consumption is calculated as (per capita consumption l/c/d in row-13) multiplied by number of inhabitants in row-10) divided by conversion factor in m^3/day.

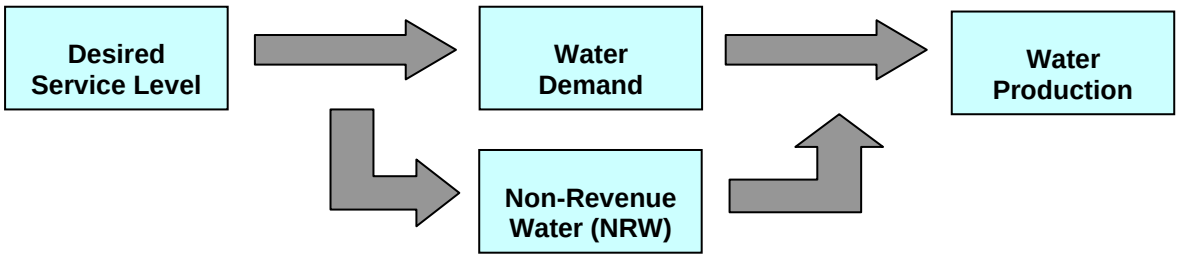
Remark: The same procedure is applied for yard connection and public water points users

3.3.3. Water Demand Projection

Next to population projection, water demand analysis and projection is followed. To achieve to a reliable water demand data, existing consumption records, desired expressed demand and affordability surveys need to be known covering both residential and non-residential consumers.

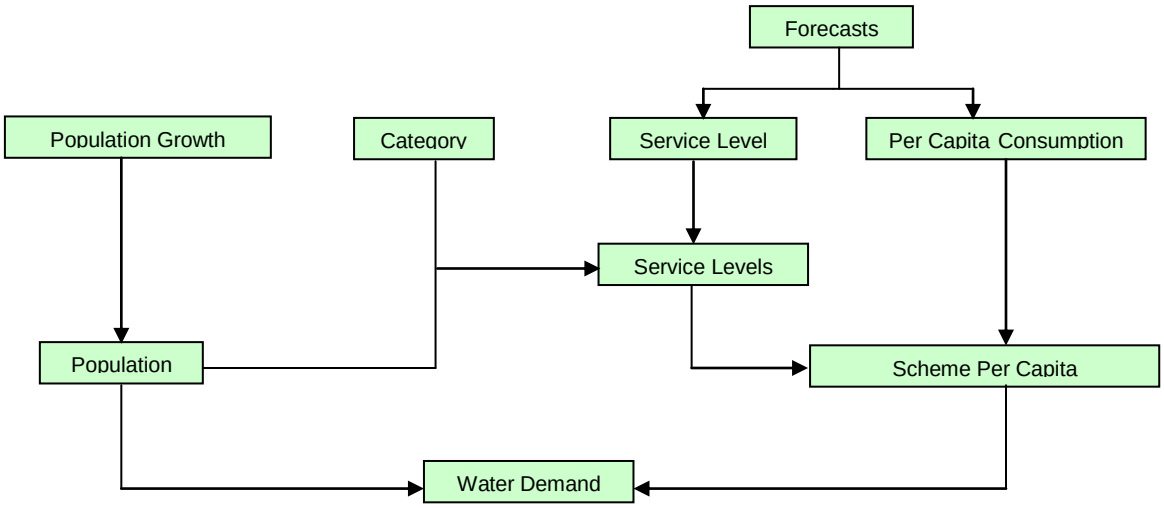
On the basis of the above work, a demand-forecast database is established and the forecasted consumption for each consumer group is determined. Excel spreadsheet can be used for the analysis. Figure 2-1 illustrated the required service and the corresponding water production.

Figure 3-1: From desired service level to water production



The water demand forecasts follow the procedure the chart shown in Figure 2-2 below. Figure 2-2 shows the procedure to determine the water demand.

Figure 3-2: Structure of the Water Demand Model



3.3.3.1. Domestic Water Demand

Domestic per capita water demand is estimated taking into consideration analyzed actual and desired expressed demand during the survey; expected increase in per-capita consumption and population of users with time and domestic water consumption variation based on the mode of service. The main modes of service considered as primarily sources are classified further as:

- Public tap users (PTU)
- Neighbourhood (shared yard) tap users - (SYCU)
- Yard connection users (YCU)
- House connection users (HCU)

Modes of secondary sources utilized for purposes of washing clothes, watering animals and house cleaning purposes particularly in the rural areas are be classified further as:

- Improved traditional sources (ITS)
- Traditional sources (TU)

3.3.3.2. Projection of Per-capita Consumption by Mode of Service

The per capita consumption is the specific consumption of the customers which can be found from the bill and water point attendants with the corresponding population for different modes of services indicated above. Nevertheless, theoretically, it can be categorized for different purpose of uses as indicated in Table 2-2.

Table 3-2: Breakdown of Per capita water demand by Purpose

Activity	HCU	YCU	SYCU	PTU
Drinking	3	3	3	3
Cooking	4	3	3	3
Ablution	4	4	4	3
Washing Utensils	4	4	3	3
Washing Clothes	4	4	3	2
House cleaning	3	3	2	2
Bath or shower	8	6	6	4
Flushing Toilet	8	4		

Activity	HCU	YCU	SYCU	PTU
Total	40	35	25	20

This per capita consumption is subject to modify based on the GTP-2 and household survey.

The average domestic water demand is the product of the population and projected per-capita per capita water demand. This is determined on a periodic basis over the business plan period.

3.3.3.3. Non-domestic Demand

This is water required for institutional, commercial and public purposes. Institutional demand includes water required for offices, schools, health stations, health posts, and so on while commercial demands include water requirement for restaurant, bus stations, shops, Local drinks (Tej, Areke, Tella) etc and water for public purposes include recreational purposes such as watering public gardens and parks, running fountains and public toilets, and water for military camps.

In most cases, it is expressed as the percentage of the domestic water consumption.

3.3.4. Non-Revenue Water (NRW)

NRW includes physical and non-physical losses that include water used by the water works for cleaning filters, for sanitary use in operation buildings, water used for flushing the distribution system is and other un-authorized connections. NRW are determined as a percentage of the urban domestic, non-domestic water demands. The NRW percentage after implementing the project is expected to be maintained at 20%.

The existing water production and the corresponding consumption should be recorded to determine the NRW. Thus, the water administration offices or operators for small RPS should regularly record these data.

3.3.5. Estimation of Required Water Production

The required amount of water production is calculated by using the following formula:

$$Q_{wp} = \frac{Q_{wc.avg}}{\left(1 - \frac{l}{100}\right)}$$

Where: Q_{wp} = Water production (m^3/day)
$Q_{wc.avg}$ = Average water consumption (m^3/day)

4 STAREGIES

4.1 Production and Operation

The X Rural Piped System will increase its production to surpass the future demand in the entire service area. The increment should be through a phased investment process covering a period of 5 years but the design period could be 15 years. The water production will be divided into three stages for the design and implementation of the scheme components in line with the priorities set: For instance, Phase 1 – 2016-2020 and Phase II – 2021-2025 and Phase-III – 2026 - 2030. The main aim will be to increase access to water as well as reduce interruptions in water supply to customers. Specific strategies here will there include the following:

4.1.1. Increase the Distribution System

It is needed to expand the distribution system and covers the entire service areas. Since the rural settlement is scattered, the distribution system covering the entire village in the service area need to be implemented by phase. Phase-I for distribution system shall be taken the year 2025, and phase-II – 2030. It should be designed based on peak hour projected demand.

4.1.2. Optimize the Storage Capacity

The optimisation of storage reservoir will be carried out on the basis of supply and demand analysis over the period of 24 hours and taking into consideration that 50% of its storage will be replenished daily. Standard reservoir sizes will be used whenever applicable. The adequate storage give relief whenever the pumps stopped and during the maintenance period.

4.1.3. Increase the Pumping Station Capacities

The main pumping and booster stations will have a stand-by capacity as follows:-

- Station with one pump will have a stand-by capacity of 100%
- Station with two pumps will have a stand-by capacity of 50%.
- Station with three pumps will have a stand-by capacity of 33%.

Stations with four or more pumps, the stand-by capacity will be decided on the basis of the pump types and amount of water pumped.

The capacity of the pumps will be designed for the maximum daily demand of year 2025 and 2030 for phase-I and Phase-II, respectively.

4.1.4. Increase the Number of Public Water Points

In order to increase the service coverage, it is necessary to construct public water points near to the village. It is also need to consider the Government plan to decided the location and distance of the public water point relative to the remote village situation. GTP-2 should be taken in to consideration. The existing water points are needed to be reconsidered based on the GTP-2 plan. If considered that one PWP with four faucets shall be provided for every 150 people using PWP depending on the local population density and physical situation. The flow from one faucet will not be less than 0.25 l/s. The maximum walking distance to a PWP will not exceed 500 meters, if this is planned in GTP-2. The Water Board can annual plan to construct the PWP as needed.

4.1.5. Improve Water Quality

The raw water source shall be free from the dangers of chemical pollution and free from contamination. In addition, intake structures should be free from human and animal interactions and should be fenced. The bacteriological, chemical and physical qualities of the treated water shall be within the drinking water standards specified by the Guideline of the Ethiopia and the World Health Organization Guide Lines for water quality. Non-chlorinated supplies and distribution systems will not be recommended.

Thus, the WB should provide annual plan to take samples and conduct water quality tests from different location on the distribution system.

4.1.6. Non-Revenue Water

The water production and the corresponding water consumption should be recorded regularly to known the non-revenue water. Schedule maintenance, regular water meter checking and maintaining, avoid illegal connections and overflow at service reservoirs, avoid un-authorized use, increase collection efficiency strategies should be carried out in order to minimize the NRW and increase the income of the service office.

4.1.7. Conducting a Continuous Maintenance

The Scheme will draw a comprehensive plan for instituting corrective and preventive maintenance programme at institutional and community level.

4.1.8. Marketing Strategies

The marketing strategy adopted in the business plan is focuses on promoting knowledge water as a scarce resource. The specific aim will be to promote economic usage of water. There will also be a social marketing component aimed at promoting awareness campaign on environmental protection with a view to sustain water supply sources.

Conduct direct marketing with all key Institutional Customers:

These include schools, collages, health care's, health stations, hospitals, government offices, commercial (restaurant, cafe, shops etc)

Other strategies will include:

- Increase customer understanding of the Water Resource
- Conduct Media Relations to promote economic Water Usage
- Hold Water Open Days
- Enhance Customer Relations among Staff
- Establish Customer Contact Points in strategic points
- Introducing a demand driven approach for Public Water Supply scheme
- Improve Governance of the Public Water Points.
- Introduce a segmented pricing scheme
- Instituting a customer friendly disconnection campaign

4.1.9. Environment and Social Safeguards Strategies

Improvements that will be introduced in the water supply system (i.e. rehabilitation, upgrading and extension of pipelines) will have the following positive impacts, among others:

- Incidences of the diseases and sicknesses associated with the practices of washing, bathing and collecting drinking water from contaminated sources will decrease. This will result in overall reductions in morbidity, time lost due to sickness, and overall economic losses due to mortality and medical costs for treatment.
- The availability of adequate water supply will generate new or additional income-generating initiatives related to water.
- Increased time will be available to women and children, who are the traditional water carriers, to engage in other economic activities.

However, despite the above positive impacts, the improvements in the water supply system will result in some negative impacts; the most likely one being soil erosion. Since the storage tanks and some stretches of pipelines may be constructed on steep slopes, the WB will take the following mitigating measures:

- Use of most appropriate technology to stabilize slopes or dissipate runoff from exposed slopes during construction. This shall include planting of grass and trees on bare grounds.
- Re-vegetation of slopes as soon as within 45 days after final grading.
- use of barriers to sedimentation in proximity to watercourses (silt curtains, check dams)

Re-settlement of existing community residents due to the project is not expected. However, in case of some crops or trees being damaged in the course of implementing the project, appropriate compensation for the loss will be determined in consultation with the affected stakeholders.

All this will be done in accordance with Environmental Management Act, National Environmental Action Plan, Environmental and Social Management Framework, Resettlement Policy Framework, and other health, safety and environmental related laws. In addition, Financier's guidelines on environmental and social issues shall be taken into account.

The key strategies here will therefore include:

- Increase stakeholders' involvement in the management of the water supply catchment areas
- Reduce land degradation in areas where infrastructure is erected/constructed
- Conducting a comprehensive compensation package
- Enhance relations with Woreda councils
- Ensure continuous adherence to the legal framework surrounding the water sector

4.1.10. Human Resources Strategy

Most of the RPS service offices human resource set up faces a number of challenges. There is no clear organisation structure and there has been a deliberate capacity building process tailored to enhance the management of the Scheme. The number of staff on most positions is just not adequate. However, accounts, cashiers, plant operators and security guards are too many for the operations in most of the RPS service offices. On the other hand, plumbers and computer operators are not enough for the work. Therefore, the number of members of staff needs to be optimised. Small RPSs do not have clear organization structures and the necessary human power.

In order to ensure effective implementation of the business, the RPS will have its own management structure that will be responsible for the day-to-day running of the business. The Zone and Woeda Water Offices role will be to provide policy direction and guidance in the management of the Scheme business. Technical support from the Zone and Woeda Water Offices will only be provided if demanded by the Scheme. All costs associated with this technical support will be borne by the Scheme. The following strategies are therefore put in place to effectively conduct business of the Scheme:

- Conduct a comprehensive Institutional Review of the RPS with a view to define the ideal structure together with the human resource capacity requirements
- Implement a new Structure to optimise staffing
- Conduct a capacity building process that is based on a formal capacity needs assessment process
- Design and implement contract/performance management system

4.1.11. Investment and Financing Strategy

a) Investment Strategy

The aim of the Investment and Financing Strategy will be:

- Improve the very old water supply facilities that are not able to produce and convey required amounts of water to meet consumer demand
- Increase water supply coverage to some newly developed areas that do not currently have reticulation at all.
- Increase the capacity of water sources in line with the upgraded and expanded distribution system.
- Carrying out catchment protection works
- Conducting feasibility studies and designing of the water supply system.
- Capacity building in human resources and surrounding working environment

5 FINANCIAL FORECAST

5.1 General

A financing plan shows, quite simply, how the investment plan is to be financed. Funding bodies have their own preferences for the layout of a financing plan. At a minimum, the plan will show, for every year, expenditure and a matching amount by financing source. In some cases financing of every item is not split between financing sources, rather certain items are entirely financed by one institution ("parallel co-financing").

5.2 Methodology and Assumptions

The basic criterion taken to evaluate the financial viability of the project is that the revenue to be collected from the service of the water supply should cover all of the relevant costs of the project. This is done through the discounting of the cost and the revenue streams of the project to ensure that the discounted revenues are equal to the discounted costs. This principle can symbolically be presented as follows:

PWC = PWR

Where:

PWC = Present worth value of the relevant costs required to produce and provide water

PWR = Present worth value of the revenues to be obtained from the provision of the water service.

The above formula leads to the conclusion that the Net Present Value (NPV) and the Cost Benefit Ratio (C/B) of the project should have a value of zero and 1 respectively. These values indicate that the project will be operating on full cost recovery basis without assuming any extra revenue above the cost of the project.

The project costs that need to be recovered by the sale of the water in the water supply services differ from the situation of the rural piped system.

The whole component of the project costs:

a) the initial investment cost,

b) periodic replacement costs,

c) the annual operation and maintenance costs, as well as

d) The running costs of the project required by the water supply services,

It is need to be recovered fully for urban, whereas in a rural area, the community is expected to only cover the O&M costs but in case of RPS, since the service offers for both rural and urban a combination of the two can be applied. .

In order to determine this financial viability of the project, Net Present Value (NPV) and Benefit Cost Ratio (B/C) have to be estimated through the discounted cash flows technique. The net cashflow of the water supply project is estimated by deducting all the relevant cost of the project from the gross income of the project .The gross income of the project originates mainly from the annual sale of water and the residual values of machinery, equipment and other infrastructure of the project at the end of the project time. Symbolically these are presented as follows.

NCF = (C1+C2+C3+C4) – (B1+B2)=0

Where:

NCF = Net Cash Flow
C1 = Initial Investment
C2 = Replacement Costs
C3 = Operation and Maintenance Costs
C4 = Running Cost
B1 = Revenue from the Sale of water
B2 = Residual value of the fixed assets

On the other hand, the net cash flow of the rural areas of the project is given as follows:

NCF = (C1) – (B1+b2) =0

Where:

NCF = Net Cash Flow
C1 = Annual O&M Cost
B1 = Revenue from the sale of water
B2 = Residual value of the fixed assets

The following assumptions and values should be adopted in the financial analysis.

5.2.1. Reference Time

All of the cost components as well as the revenue from the water service do not occur at a same point in time. The initial investment occurs during the construction phases of the project, whereas the annual operational costs commence largely after the completion of the construction phase and then continue up to the end of the project life. The replacement costs also occur at certain time intervals depending on the economic life of the equipment under consideration. Due to the time-value of the money involved the year-to-year value of the revenue and cost streams of the project vary significantly. It is therefore convenient to calculate the present value to, which is the represent of the cash flow characteristics of the project under consideration and the time-varying costs actually incurred.

5.2.2. Analysis time

The analysis time of the project covers a total of business plan period that will range from the start of the implementation up to year end of the financial analysis. The period of analysis therefore covers the entire useful life of investment. A period X years is also considered to be sufficiently long to assess the viability of project even though the infrastructure could remain economically function beyond this period. In addition the analysis time should coincide with the repayment period of the project so that the appropriate tariff rates to recover the cost could be determined.

5.2.3. Residual Value

The majority of the investment would take place during the early phase of the project life and so have an opportunity of being fully depreciated before the end of the analysis time. However the investments, particularly those for gravity pipelines and water points, will occur annually, up to the end of the analysis year X. Furthermore, investments are also planned for implementation from year X-5 up to X-3, implying that they would not fully be depreciated. There are also replacement Mechanical/Electrical M&E costs that will be invested at year X that can continue to be economical beyond the analysis period. Such investment takes place on the ground that the project remains functional beyond the analysis time period. The residual values of these items are therefore included as a benefit to the project at the end of the financial analysis time.

5.2.4. Interest Rate

An annual interest rate of Y% is assumed for the project on the grounds that funds could be available from international financing lending agencies which could provide a soft loan. The existing lending agency of the country, i.e. Water Development Fund Office, is also assumed to be one of the potential financiers of the project, and could also provide a loan at a low interest rate.

5.2.5. Construction Time

The first phase of the construction is planned to start in year A and to be completed be, year A+2. It will take a total of 3 years, excluding the time required for the preparatory works of the project which includes design, tendering and land acquisition.

5.2.6. Grace Period

The grace period of the project is taken to be as 3 years, which covers the construction time. During this period, no payment of the principal amount of the loan is expected.

5.2.7. Loan Repayment Periods

The project is expected to start supplying water in year A+3 and the loan is assumed to be paid from this year onwards up to year X. This period of ------ years is taken to be sufficiently long to repay the loan. The project should be capable of repaying all of its debts within this period of time.

5.2.8. Sunk Costs

The source of the current water supply system will not continue functioning after the project becomes operational. Any investments undertaken to rehabilitate and construct the existing water supply source are not considered. The cost of water will be entirely independent from the existing water supply scheme.

5.3 Financial Statement Analysis

The income statement and the cash flow of the RPS water supply project is calculated on the basis of the following methodologies and assumptions:

Number of Connections

The number of household connections is estimated as follows:

House and Yard Connection

- The annual population that will be served by the house and yard connections is projected for the whole of the analysis period;
- The house and yard connected population is divided by 5, which is the average family size in order to estimate the number of households to be connected to the water supply.

Yard shared Connection

- The annual population that will be served by yard-shared connections is projected for the analysis time;
- The house-connected population is divided by 5, which is the average family size in order to estimate the number of households connected;
- Assuming that one-yard shared connection serves for 3 households, the annual projected number of households is divided by 3.

See section ---- and Table 2-1 for detail methodology

Non-Domestic Connection

- The number of the non-domestic connections is taken to be e.g as 10% of the domestic connections.

Using the above methodology, the number of annual connections that could be available annually is estimated. In order to identify the number of annual new connections, the preceding year's connection is subtracted from the current year.

Estimation and Connection Fee

Assuming that the current connection fee will operate during the operation time of the project, the number of new connections is multiplied by ------ Birr of the application fee and --------- Birr of the connection fee.

Meter Rental Income

Meter rental fee is charged proportionally to the level of water consumption. The average of fee of Birr 2.00 or more is used for the estimation of the income from the provision of this service.

Material Sales

Other types of annual income of the water service could originate from the sale of containers of different items, such as chemical containers and other items that will be scrapped by the office. This income is calculated as 1% of the annual cost of the project.

Working Capital Requirement

The annual working capital requirements of the project are estimated based on the average unit cost of water production, the output and input stock estimate, the accounts payable, and the accounts receivables. The following figures are applied for computation of the working capital of the project.

Description	Unit of Measurement	Amount (Birr)
Total Investment Cost	'000ETB	
Total O&M Cost	'000ETB	
Total Cost	'000ETB	
Total Volume of Production	'000m^3	
Average Unit Cost of Production	ETB/m^3	0.7
Proportion of Output Stocks		1.0%
Proportion of Raw Material Stock		1.0%
Proportion of Accounts Payable		1.0%
Proportion of Accounts Receivables		1.0%

Equity Capital

Equity capital is assumed to be zero, implying that the office would not be expected to provide a matching fund for the construction of the project. This implies that the investment cost of the project would entirely be covered by the fund available from other sources.

Interest during Construction

Interest during construction is computed and added to the initial investment cost at the start of the repayment of the loan.

5.4 Cost of the Water Supply Scheme

The different cost components of the project for both the RPSs are presented as follows. The overall cost of the combined project i.e. (urban and rural) should be filled with the format shown in Table 5-1. The detailed cost estimates will be presented in the various tables of Annex D.

5.4.1. Initial Investment Costs

All the cost components that will be required to establish the project are presented under the heading of the initial investment cost, which denotes the total capital outlay necessary to build the water supply project and bring it into operation.

There are many types of cost streams required for the implementation of the project over the entire life of the project. These costs are broadly classified as main facilities, sources development, pumping mains, gravity pipelines, storage reservoirs, pump station reservoirs, water point's service roads, power supply and transmission (HT), diesel power generation as well as miscellaneous. Each cost category consists of many types of sub cost items and all of these costs are grouped under smaller category for sake of making the financial and economic analysis easier.

The classification of the initial investment cost under different cost categories facilitated the financial analysis of the project. The initial cost occurs during the different phases of the project time and each of the classification further is grouped under civil, M&E and engineering and administration cost.

Table 5-1: Total Cost of the Project (ETB '000)

Item Description	Initial Investment Cost			Replacement Investment Cost			Grand Total
	Urban	Rural	Sub-Total	Urban	Rural	Sub-Total	
Sources development							
Pumping Mains							
Gravity Pipeline							
Storage Reservoirs							
Water Points							
Service Roads							
Power Transmission Line							
Diesel Fuelled Gun sets							
Miscellaneous							
Total							

Table 5-2: Urban and Rural Cost Component of the Project (ETB '000)

Item Description	Urban Initial Investment Cost				Rural Initial Investment Cost				Grand Total	Cost sharing (%)		
	Civil	M&E	Eng. and Admin. Cost	Sub-Total	Civil	M&E	Eng. and Admin. Cost	Sub-Total		Urban	Rural	Total
Main Facilities												100%
Pumping Mains												100%
Gravity Pipeline												100%
Storage Reservoirs												100%
Pump Station Reservoirs												100%
Water Points												100%
Service Roads												100%
Power Transmission Line												100%
Diesel Fuelled Gun sets												100%
Miscellaneous												100%
Total												100%

5.4.2. Replacement Costs

The various components of the fixed assets have a specified economic life and the asset lives refer to the period during which the asset is expected to perform the service for which it was originally designed, with no more than routine maintenance and occasional major overhaul. The asset should be replaced at the end of this life. The average asset lives of civil assets and M&E assets are presented in Part-H of Asset Management Manual. After a certain time period, they will not be productive and will need to be replaced within a certain interval time period in order to make the system operational. The periodic replacement of the different components, specifically that of the M&E, is included in the cost estimate of the project under the heading of replacement cost.

Apart from the initial investment cost of the project, a total of ------ Birr would be required for replacement and this brings the overall capital cost of the project to ----------Birr.

5.4.3. Operation and Maintenance Cost

O&M percentage of the annual Investment Cost: The operation and maintenance costs refer to the annual expenditure incurred during the operation of a project. They include direct and indirect costs of manpower, maintenance and refurbishment expenses, consumable supplies, lubricating oil, cleaning materials and minor items, which have to be routinely replaced. These costs have to be met as soon as the project comes in to service and will continue for as long as the project remains in service. The estimated annual cost of the various components of the project is computed on the basis of their magnitude as a proportion of the annual investment cost stream of the project.

The O&M cost ranges from a maximum of 3% for the pumping mains down to a minimum of 0.5% for main facilities and storage reservoirs. The average annual operation and maintenance cost is calculated to be 1.5% of the annual investment cost and this is applied to estimate the annual O&M cost. The percentage of the annual O&M costs in terms of the different components of the capital costs is presented in Table 5-3.

Table 5-3: Annual Operation and Maintenance Cost Out Of the Annual Investment Cost

Item Description	O&M out of the annual Investment Cost (%pa)
Main Facilities	0.5%
Pumping Mains	3.0%
Gravity Pipeline	2.0%
Storage Reservoirs	0.5%
Pump Station Reservoirs	0.5%
Water Points	3.0%
Service Roads	0.5%
Power Transmission Line	1.5%
Three Phase Transformers	1.5%
Diesel Fuelled Gun sets	1.0%
Miscellaneous	2.0%
Average	1.5%

Running Costs: A running cost refers to the costs of the actual operation of the project and includes the cost of power and chemical additives used for the water treatments. The estimate is directly adopted from the engineering cost estimate. The annual running cost of the project is presented in Table 5-4.

Annual Investment and Operating Costs: The investment occurs within a given year of the project, and this need to be converted into annual cost stream throughout the analysis period. The computation of the annual cost stream also provides the annual O&M. All relevant costs of the initial investment, as well as periodic replacement costs, are converted into an equivalent standardised annual cost of capital over the lifetime of the project.

Table 5-4: Annual Cost of the Project

Discount Rate (% per Annum) = 3.0%
Capital Recovery Factor 0.059

Nominal Year	Present Worth Factor	Initial Investment Cost ('000 ETB)	Replacement ('000 ETB)	Total ('000 ETB)	Annual Costs ('000 ETB)				
					CR ('000 ETB/Yr)	O&M	Energy	Chemicals	Total
2014	0.8375		-			-	-	-	
2015	0.8131		-			-	-	-	
2016	0.7894		-			-	-	-	
2017	0.7664		-						
2018	0.7441		-						
2019	0.7224		-						
2020	0.7014		-						
2021	0.6810		-						
2022	0.6611		-						
2023	0.6419		-						
2024	0.6232		-						
2025	0.6050		-						
2026	0.5874		-						
2027	0.5703		-						
2028	0.5537		-						
2029	0.5375		0						
2030	0.5219		0						
2031	0.5067		0						
2032	0.4919		-						
2033	0.4776		-						
2034	0.4637		-						
2035	0.4502		-						
Total									

The capital recovery factor of the project at an interest rate of 3% and a repayment period of 20 years is calculated to be 0.059. The annual investment of the project is worked out for the cost components.

5.5 Financial and Revenues Viability

5.5.1. Future Water Sales

The future water sales from the project consist of the water sales for the small town of and the rural communities. The water demand for both urban and rural customers with the above project mode of service will be adapted to determine the future water sales. A summary of the projected urban and rural saleable water volume format is presented in Table 5-5.

Table 5-5: Projected Urban and Rural Water Demand of the Water Supply Project ('000m^3)

No.	Consumer Category	Annual Domestic Water Demand Projection					Annual Non Domestic Water Demand Projection					Total
		House	Yard	Yard Shared	Public Tap	Sub Total	Institutional	Industrial	Commercial	Livestock	Sub Total	
1	**Urban**											
1.1	Water Demand											
1.2	Unaccounted For											
1.3	Net Saleable Water											
2	**Rural**											
2.1	Water Demand											
2.2	Unaccounted For											
2.3	Net Saleable Water											
3	**Total**											
3.1	Water Demand											
3.2	Unaccounted For											
3.3	Net Saleable Water											
	Proportion of Urban Water Net Demand (%)											
	Proportion of Rural Water Net Demand (%)											

Percentage of Unaccounted For Water

The percentage of unaccounted for water is calculated as (volume of water produced-volume of water sold divided by volume of produced) multiplied by 100. Look at the past five years UFW trend. At the initial period of the construction, the existing UFW can be reduced and later approaching to the end of life, it would be increasing trend.

An example of this is demonstrated in Table 2-8 below.

Table 5-6: Example for Percentage of Unaccounted for Water out of the Gross Demand

No.	Year	Percentage
1	2010-2014	32.5%
2	2012-2019	27%
3	2020-2024	25%
4	2025-2029	20%
5	2030-2035	25%
6	2035	26%

Future Water Sales

Gross Demand

The annual water demand for the urban and the rural areas of the project is given on a yearly basis covering the effective periods from year 2017 up to year 2035. The annual water demand projections are given in terms of two major consumer categories, namely domestic and non-domestic. The overall gross water demand of the project over the entire life of the analysis period will be sum up and is presented in Table 5-7.

Annual Volume of Unaccounted-For Water

The multiplication of the percentage of the unaccounted-for water by the respective gross water demand provided the estimated volume of yearly-unaccounted water, and this is presented in Table 5-8.

Projected Saleable Urban Water Demand

Deducting the annual unaccounted for water from the gross annual water demand projections provided the annual saleable urban water demand. Table 5-7 present the annual saleable of urban water demand.

Future Water Sales of Rural Areas

The future annual water sales of the rural areas should be presented in the format presented in Table 5-7.

Table 5-7: Projected Nominal Urban Water Demand ('000m^3)

Yr.	Annual Domestic Water Demand Projection					Annual Non Domestic Water Demand Projection					Total
	House	Yard	Yard Shared	Public Tap	Sub Total	Institutional	Industrial	Commercial	Livestock	Sub Total	
2017											
2018											
2019											
2020											
2021											
2022											
2023											
2024											
2025											
2026											
2027											
2028											
2029											
2030											
2031											
2032											
2033											
2034											
2035											
Total											

Table 5-8: The Annual Unaccounted For Water ('000 m^3)

Yr	Annual Domestic Water Demand Projection					Annual Non Domestic Water Demand Projection					Total
	House	Yard	Yard Shared	Public Tap	Sub Total	Institutional	Industrial	Commercial	Livestock	Sub Total	
2017											
2018											
2019											
2020											
2021											
2022											
2023											
2024											
2025											
2026											
2027											
2028											
2029											
2030											
2031											
2032											
2033											
2034											
2035											
Total											

Table 5-9: Annual Saleable Water Demand ('000m^3)

Yr	Annual Domestic Water Demand Projection					Annual Non Domestic Water Demand Projection					Total
	House	Yard	Yard Shared	Public Tap	Sub Total	Institutional	Industrial	Commercial	Livestock	Sub Total	
2017											
2018											
2019											
2020											
2021											
2022											
2023											
2024											
2025											
2026											
2027											
2028											
2029											
2030											
2031											
2032											
2033											
2034											
2035											
Total											

Table 5-10: Projected Water Demand, Unaccounted For and Net Saleable Water of the Rural Areas

Year	Rural Annual Water Production ('000 m^3/Yr)		
	Nominal Volume	Unaccounted For	Net Saleable Nominal Volume
2017			
2018			
2019			
2020			
2021			
2022			
2023			
2024			
2025			
2026			
2027			
2028			
2029			
2030			
2031			
2032			
2033			
2034			
2035			
Total (Rounded)			

5.5.2. Water Tariffs

5.5.2.1. The Tariff Policy

The basic Ethiopian Water Resources Management Policy issues that are considered for the setting of the water tariff of the project are listed as follows:

- ensure that pricing for urban water supplies shall aim at full cost recover, develop cross-subsidisation strategies and promote credit services;
- promote tariff setting that is site-specific, depending on the particulars of the project, location, the users, the cost and other characteristics of the scheme;
- ensure that the basic needs of water for disadvantaged rural communities, who cannot afford to pay for development of water systems, shall be borne by the government, as appropriate, and in so far as the communities are able and willing to cover the operation and maintenance costs on their own;
- ensure that the price for water should be neither too high (and discourage water use) nor too low (and encourage abuses and over use water);
- develop flat-rate tariffs for communal services such as hand pumps and public stand posts;
- Establish progressive tariff rates, in urban water supplies, tied to consumption rates.

5.5.2.2. Proposed Tariff Structures

The proposed tariff structure of the urban water supply system is estimated following different methodologies and procedures and the major ones that serve for tariff computations are customer category, consumption grades, grade proportion, and consumption weight, as well as monthly income and expenditure.

5.5.2.3. Customer Category

The consumers are classified in two categories namely 1) customers fetching water from public water points (PWP) and (1) customers drawing water from a pipe connection in their premises. The latter category may be subdivided further into the following groups:

- domestic customers having yard or house connection which are domestic and livestock (DPC);
- commercial customers (CPC);
- Industrial customers (IPC); this might not be applied for RPS.
- Institutional customers (military, government and local offices, public-health, education institutes, utilities and bank office, NGOs etc (IPC).

5.5.2.4. Consumption Grades

Five types of consumption grades are recommended per month, as shown below.

- 0 to 3 m^3/month
- 3.1 to 6 m^3/month
- 6.1 to 9 m^3/month
- 9.1 to 12 m^3/month
- 12 m^3/month and above

The first category is taken as a base case for the tariff determination. The classification helps to establish progressive tariff rates for the urban areas.

5.5.2.5. Consumption Gradation Weight

The various consumer categories are assumed to attach different weights to the value of water they use. The public tap consumers are assumed to attach a weight of 1, so that this consumer group serves as a base line for the determination of the other weights. The other consumers attach a weight of more than 1 for a given volume of water, as compared

with the public tap users. They have higher incomes as well and will be provided with clean and reliable water within their compound. In addition, they would not spend time fetching water. Customers having pipe connection to their premises should therefore be charged a higher rate. A demand for pipe connections indicates affordability of the connection and the associated better service. The various consumption gradation weights of the customers are presented below.

5.5.2.6. Public Water Point Customers

The public tap consumers would use only one meter cubic of water per month due to their income constraints, lower daily water demand, as well as relatively longer distance of the water source from their place of residence. It is not expected that public water point customers will exceed the first gradation limit, and it is therefore assumed that the first cubic meter of water would meet their 100% consumption demand.

5.5.2.7. Domestic Customers

The domestic consumers would consume all of the different consumption grades of water.

- 0 to 3 m^3/month: 1 unit
- 3.1 to 6 m^3/month: 1.2 units
- 6.1 to 9 m^3/month: 1.4 units
- 9.1 to 12 m^3/month: 1.6 units
- 12 m^3/month and above: 1.8 units

5.5.2.8. Commercial Customers

- 0 to 3 m^3/month: 1 unit
- 3.1 to 6 m^3/month: 1.3 units
- 6.1 to 9 m^3/month: 1.6 units
- 9.1 to 12 m^3/month: 1.9 units
- 12 m^3/month and above: 2.2 units

5.5.2.9. Institutional Customers:

- 0 to 3 m^3/month: 1 unit
- 3.1 to 6 m^3/month: 1.25 units
- 6.1 to 9 m^3/month: 1.50 units
- 9.1 to 12 m^3/month: 1.75 units
- 12 m^3/month and above: 2.00 units

These block categories can be modified subject to the local conditions.

5.5.2.10. Grade proportion

The various consumer groups consume various volumes of water per month and the magnitude of consumption from each consumption grades is presented in Table 5-11.

Table 5-11: Consumption Grades, Gradation Weight and Grade Consumption Proportion

No.	Consumption Grade	Gradation Weight	Grade Proportion
1	**Public Water Point**		
1.1	0 to 3 m^3/month:	1	100%
1.2	3.1 to 6 m^3/month:		0%
1.3	6.1 to 9 m^3/month:		0%
1.4	9.1 to 12 m^3/month		0%
1.5	12 m^3/month and above:		0%
2	**Domestic**		
2.1	0 to 3 m^3/month:	1	50%
2.2	3.1 to 6 m^3/month:	1.2	25%

2.3	6.1 to 9 m^3/month:	1.4	15%
2.4	9.1 to 12 m^3/month	1.6	8%
2.5	12 m^3/month and above:	1.8	2%
2	**Commercial**		
3.1	0 to 3 m^3/month:	1	5%
3.2	3.1 to 6 m^3/month:	1.3	10%
3.3	6.1 to 9 m^3/month:	1.6	20%
3.4	9.1 to 12 m^3/month	1.9	25%
3.5	12 m^3/month and above:	2.2	35%
3	**Institutional**		
3.1	0 to 3 m^3/month:	1	5%
3.2	3.1 to 6 m^3/month:	1.25	10%
3.3	6.1 to 9 m^3/month:	1.50	20%
3.4	9.1 to 12 m^3/month	1.75	25%
3.5	12 m^3/month and above:	2.00	35%

These grading proportion subject to changes based on the local conditions.

5.5.2.11. Water Tariffs by Phase

The monthly income level of the public tap users is assumed to average about Birr 100 and, of this income, 4% would be used for water purchase. Therefore, the public tap users pay Birr 4.00 /m^3 of water from their monthly income. Income is assumed to grow at 3% annually and therefore the tariff rate needs to be increased accordingly. The reason for the increment of the tariff rates is that the base tariff rate is directly a function of gross income of the customers. There would be three phases of tariff structure throughout the 10-year analysis period. Accordingly, the first, second and third phases would have different tariff structures. The base income of phase one is applied to establish the phase one tariff while the tariff rate of the second and 1.3 and 1.75 multiplies third phases respectively. The income growth factors of the different phases are presented as below.

Phase	Year	Income Growth Factor
1	2017-2020	1
2	2020-2029	1.30
3	2020-2035	1.75

It is proposed that the tariff rates be increased in three phases. Table 5-12 presents the tariff rates of these three phases in terms of ETB/ m^3 of water consumption.

Table 5-12: Tariff Rates by Phase (ETB/m^3)

Consumer Category	Consumption Category (Birr/m^3)					Consumption Category (Birr/m^3)					Consumption Category (Birr/m^3)				
	Year 2017-2020					Year 2020-2029					Year 2030-2035				
	0.01 to 3	3.01 to 6	6.01 to 9	9.01 to 12	12.01 and above	0.01 to 3	3.01 to 6	6.01 to 9	9.01 to 12	12.01 and above	0.01 to 3	3.01 to 6	6.01 to 9	9.01 to 12	12.01 and above
PWP Tariff	4.0	-	-	-		5.2	-	-	-	-	7.0	-	-	-	-
DPC Tariff	4.0	4.8	5.6	6.4	7.2	5.2	6.3	7.3	8.4	9.4	7.0	8.4	9.8	11.2	12.60
CPC Tariff	4.0	5.2	6.4	7.6	8.8	5.2	6.8	8.4	9.9	11.5	7.0	9.1	11.2	13.3	15.40
IPC Tariff	4.0	5.0	6.0	7.0	8.0	5.2	6.5	7.8	9.1	10.4	7.0	8.75	10.5	12.25	14.00

Note: PWP: Pubic Water Point
DC: Domestic Projected Connection
CC: Commercial Projected Connection
IC: Institutional Projected Connection

5.5.2.12. Proposed Tariff Rate of the Rural Areas

The rural customers are expected to cover the entire O&M cost of the system and therefore the tariff rate should necessarily be equal to the O&M costs which is calculated as example to be Birr 2.10/m^3) of water. Any tariff rate below this would lead to the conclusion that the rural people are not able cover the O&M cost of the scheme. According to the Ethiopian Water Resources Management Policy, the government should bear the investment cost of water development in so far as the communities are able and willing to cover the operation and maintenance costs on their own. The calculation of the tariff rate for the rural communities (or the average O&M cost of water) is presented under item 5.5.5 of this report.

Tariff calculation from the point of technical requirements of the system

As a basis for the calculation of the water tariff from the technical requirements of the system, i.e. irrespective of the willingness to pay survey result and the affordability/ability to pay of the users is presented below.

In general in piped water supply systems water tariffs are usually set in cost per unit volume of water used and put mathematically as follows:

$$\textbf{Water tariff} = \frac{\textbf{Functioning costs for a daily production of water in Birr}}{\textbf{Volume of water produced from the source daily in cubic meter}}$$

As discussed in detail above, one problem in the village's water supply schemes tariff setting is to decide which components of the costs are to be included in the tariff. Hence it is proposed to calculate the tariff in three different types assuming different cost coverage components. And the final decision can be made in discussion with the people and based on the willingness to pay survey result which is conducted during the pre feasibility study and also the affordability/ability to pay based on some studies conducted by the World Bank which is to be presented in the next section of this manual.

Hence the three alternatives tariffs from the technical requirements of the system are:

$$\textbf{O \& M (minimum) cost tariff (Social tariff)} = \frac{\textbf{O \& M cost spend in a day in Birr}}{\textbf{Volume of water produced from the source daily in } m^3}$$

$$\textbf{Replacement cost tariff (Real cost tariff)} = \frac{\textbf{(O \& M cost + replacement cost) in a day in Birr}}{\textbf{Volume of water produced from the source daily in } m^3}$$

$$\textbf{Total (full) cost tariff} = \frac{\textbf{(O \& M cost + recovery of capital cost) in a day in Birr}}{\textbf{Volume of water produced from the source daily in } m^3}$$

5.5.3. Importance of willingness to pay survey and affordability in tariff setting

One the most important issues in designing and implementing a water supply system is how to ensure the financial sustainability of the project. This can involve predicting what users will be able and willing to pay for water in the future.

The water tariff calculation shown in sections above is only taking into consideration the technical requirement of the water supply system i.e. irrespective of willingness to pay survey result and the affordability/ability to pay of the users.

But in order to have a well accepted and sustainable tariff structure, the tariff calculated from the technical requirements of the scheme would be compromised with the willingness to pay survey result and the affordability of the users for the tariff.

5.5.3.1. Willingness to pay

" Willingness to pay (WTP) is that the maximum amount that an individual states he/she is willing to pay for a good or service" - in this case improved water supply offered"

Willingness to pay, is an expression of community's demand, is a strong pre-requisite for the financial sustainability of a water supply system. Willingness to pay, which is a useful yardstick for assessing the project feasibility, depends on the number of factors as:

- Demand for water and participation of communities
- Level of income
- Socio-cultural factors
- Perception of ownership and responsibility
- Service level and standard
- Price
- Relative costs to other services such as schooling, health etc.
- Reputation of service agency
- Transparency of financial management
- Perceived benefits
- Characteristics of existing sources
- Policy environment

Questionnaire need to be developed to gather the willingness to pay data from the expected consumers.

If the average willingness to pay survey result is found to be less than the operation and maintenance requirement tariff calculated in section above during the detailed design of the scheme, the result to be explained to the users if they are willing to revise their willingness to pay at least for covering the O & M tariff, and if they are willing to increase the project can be implemented and if they are not willing to increase the project need not to be implemented.

5.5.3.2. Affordability/ability to pay of users

Based on different studies conducted such as by World Bank, it is generally admitted that people should not have to pay more than 2 - 4 % of their income for water services (affordability criteria). A higher percentage of income expended on water will mean other important needs may not be fully met. Great care is therefore required when setting users' tariff.

The affordability data of the specific water supply system can be determined from willingness to pay survey. And this is determined by multiplying the average annual or monthly income of the household determined during the willingness to pay survey by 2 - 4%.

Of course compared to the willingness to pay survey, this is not as such a perfect measure of what people will pay for water. Anyhow, the purpose of knowing this criterion is that sometimes two extreme figures may come during the willingness to pay survey result as follows:

- The first category of data is that in order the water supply system to be constructed people may express higher amount of willingness to pay irrespective of their monthly or annual income.
- The other is that some people may express lesser amount of willingness to pay for water as compared to their income due to various reasons one may be assuming that

the government to cover the operation and maintenance cost if they express lesser amount of willingness to pay.

Hence in such cases the affordability criteria may also be considered to set well accepted tariff.

5.5.4. Revenue Projection

The revenue projection is estimated by multiplying the yearly saleable water demand by the established tariff rates.

5.5.4.1. Revenue Projection for Urban Water Supply

On the basis of the different grade consumption level of the various customers, the annual volume of the saleable water is presented in Table 5-14. The projected urban water demand, which is presented based on the category of consumption, is equal to the annual saleable water that is presented under 5.5.1 above.

The annual consumption is the multiplied by the different tariff rates of the phases and the annual projected revenue of the RPS water supply is presented accordingly in Table 2-17.

The values in Table 2-17 should be filled with spreadsheet Excel.

5.5.4.2. Revenue Projection of the Rural Areas

The streams of the projected revenue from the saleable water supply of the rural areas is obtained by multiplying the annually net saleable water presented under Table 5-10 by the established flat rate tariff, for example of ETB 2.10/m^3 of net saleable water. The stream of income projections is presented in Table 5-13 for the period from year 2017 up to 2035. The revenue starts at a minimum figure of ETB 340,000 and shows annual increments over the years. The annual increment of revenue is the result of water demand increase, since the tariff rates are fixed.

Table 5-13: Projected Revenue of the Rural Water Supply Side

Year	No	Annual Revenue from Water sale ('000 USD)
2017	1	340
2018	2	
2019	3	
2020	4	
2021	5	
2022	6	
2023	7	
2024	8	
2025	9	
2026	10	
2027	11	
2028	12	
2029	13	
2030	14	
2031	15	
2032	16	
2033	17	
2034	18	
2035	19	
Total (*000 ETB Rounded)		

Table 5-14: Projected Saleable Urban Water Demand by Category of Consumption ('000m^3)

Yr	Year	PWP	DPC					Total DPC	CPC					Total CPC	IPC					Total IPC	Grand Total
		100%	50%	25%	15%	8%	2%	100%	5%	10%	20%	25%	35%	100%	5%	10%	20%	25%	35%	100.0%	
2017	1	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-
2018	2	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-
2019	3	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-
2020	4								-	-	-	-		-	-						
2021	5								-	-	-	-		-	-						
2022	6								-	-	-	-		-	-						
2023	7																				
2024	8																				
2025	9																				
2026	10																				
2027	11																				
2028	12																				
2029	13																				
2030	14																				
2031	15																				
2032	16																				
2033	17																				
2034	18																				
2035	19																				
Total																					

Table 5-15: Projected Revenue of Urban Water Demand ('000 ETB)

Year	No	PWP	DPC					Total DPC	CPC					Total CPC	IPC					Total IPC	Grand Total
		0-3	0 to 3	3 to 6	6 to 9	9 to 12	12+		0 to 3	3 to 6	6 to 9	9 to 12	12+		0 to 3	3 to 6	6 to 9	9 to 12	12+		
2017	1								-	-	-	-		-							
2018	2								-	-	-	-		-							
2019	3								-	-	-	-		-							
2020	4																				
2021	5																				
2022	6																				
2023	7																				
2024	8																				
2025	9																				
2026	10																				
2027	11																				
2028	12																				
2029	13																				
2030	14																				
2031	15																				
2032	16																				
2033	17																				
2034	18																				
2035	19																				
Total Revenue ('000 ETB)																					
Total Saleable Water ('000m^3)																					

5.5.5. Average Cost of Water

Average Life-Cycle Cost of Water

The average life-cycle cost of the project is the average unit cost of supplying water over the entire life of the project. The average cost is calculated on a discounted basis and also as nominal streams of the water demand and costs. This is obtained by dividing the total cost of the project by the total net saleable of water. It can be represented as follows:

ACW=TC/TSW

where ACW=Average cost of Water
TC =Total Cost of Water
TSW=Total Saleable of Water

The average production of water should be filled in Table 5-16 with Excel spreadsheet.

The average unit cost of water, which is computed based on the full cost of the project, is adopted as basic parameters for evaluating the financial performance of the project. It was computed for five scenarios representing varying levels of consumers' responsibility of participation.

Full Recovery Cost: The revenue is intended to cover all of the entire cost of the project, including capital recovery, O&M costs and running costs. This average cost is calculated to be Birr ----- /m^3 of water;

Operating Costs: The revenues are intended to cover all the operating costs involved in the production of the water, excluding capital recovery. The operating cost recovery average cost of water amounts to Birr ---- / m^3 of water;

Running Cost: The revenues are intended to cover only the running cost of producing the water in terms of energy and chemicals. The cost recovery is Birr ------/ m^3.

Capital Recovery Cost: The revenues are intended to cover all of the capital recovery cost of the project. This cost recovery is USD 0.9/ m^3 or Birr 8.10/ m^3 of water.

Operation and Maintenance Cost: The revenues are intended to cover only the operation and maintenance cost of producing the water. The cost recovery is Birr -----/ m^3.

The first scenario represents the current policy of the country calling for the consumers to cover the full burden of the project, including its capital recovery as well as its entire operation, maintenance and running costs. It is a target goal indicative of full community participation level.

The other scenarios relate to lesser financial contribution of the community and are indicative of increasing levels of subsidy from other sources. Under the operating cost scenario, the community is responsible for all the project costs except for its initial investment cost. Under the running cost scenario major subsidy enters while the community is required to cover only the very basic running costs of the project. Under any of the presented scenarios, the community is required to participate in the project cost that is indispensable irrespective of the magnitude of the involvement. Table 5-17 presents the average cost of water under the various scenarios described.

Table 5-16: Average Production Cost of RPS Water Supply Project

Year	No.	Present Worth Factor	Urban Annual Water Production ('000 m3/Yr)			Annual Costs ('000 ETB)					Discounted Annual Values	
			Nominal Volume	Unaccounted For Water	Net Saleable Nominal Volume	Initial and Replacement	O&M	Energy	Chemical	Total Cost	Net Saleable Nominal Volume (*000 m^3)	Total Cost ('000 ETB)
2017	1	0.9709										
2018	2	0.9426	-	-	-		-	-	-			
2019	3	0.9151	-	-	-		-	-	-			
2020	4	0.8885										
2021	5	0.8626										
2022	6	0.8375										
2023	7	0.8131										
2024	8	0.7894										
2025	9	0.7664										
2026	10	0.7441										
2027	11	0.7224										
2028	12	0.7014										
2029	13	0.6810										
2030	14	0.6611										
2031	15	0.6419										
2032	16	0.6232										
2033	17	0.6050										
2034	18	0.5874										
2035	19	0.5703										
Total (Rounded)												

Birr/m^3

Not Discounted Average Cost of Water (ETB/m^3) ----

Discounted Average Cost of Water (ETB/m3) -----

Table 5-17: Average Cost of the RPS Water Supply Project

Consumer Group	Annual Value ('000 ETB)						Average Cost of Water (ETB/m^3)				
	Capital Recovery	O&M	Running Cost	O&M and Running Cost	Full Cost Recovery	Saleable Water (*000 m^3)	Capital Recovery	O&M	Running Cost	O&M and Running Cost	Full Cost Recovery
Rural											
Urban											
Total											

***Present Value of Annual Costs and Revenues of the Project Based on the Average* Cost of Water:** Assuming that the average cost of water is applied, the cost of the project would be fully recovered at the end of the analysis period, as can be filled in Table 5-18 below. The result of both the discounted and not discounted figures gives the same result of zero balance at the end of the analysis period. However the tariff structure needs to be established, which would be affordable by the various urban consumers.

Table 5-18: Present Value of Annual Costs and Revenues of the Project

Year	No	Present Worth Factor @ annual 3% discount rate	Annual Revenue Sale and Revenue (Not Discounted)		Annual Revenue Sale and Revenue (Discounted)		Annual Cost		Annual Cash Flow ('000 USD)	
			Net Saleable Nominal Volume ('000 m^3)	Revenue on Full Cost Recovery ('000 ETB)	Net Saleable Nominal Volume ('000 m^3)	Revenue on Full Cost Recovery ('000 ETB)	Not Discounted ('000 ETB)	Discounted ('000 ETB) @ 3%	Not Discounted ('000 ETB)	Discounted ('000 ETB) @ 3%
2017	1	0.9709	-	-	-	-				
2018	2	0.9426	-	-	-	-				
2019	3	0.9151	-	-	-	-				
2020	4	0.8885								
2021	5	0.8626								
2022	6	0.8375								
2023	7	0.8131								
2024	8	0.7894								
2025	9	0.7664								
2026	10	0.7441								
2027	11	0.7224								
2028	12	0.7014								
2029	13	0.6810								
2030	14	0.6611								
2031	15	0.6419								
2032	16	0.6232								
2033	17	0.6050								
2034	18	0.5874								
2035	19	0.5703								
Total (Rounded)									(0)	-

Financial Viability of the Project:

Three commonly used alternative criteria, i.e. Net Present Value (NPV), Financial Internal Rate of Return (IRR) and Benefit Cost Ratio (C/B ratio), are used to determine the viability of the urban, rural and the combined (Urban and Rural) project. The Net Present Value is the discounted net benefit, where the net benefit is the difference between total benefit and total cost, discounted over the life of the project. As a general rule, projects with NPV >0 are accepted when net benefits are discounted at an acceptable rate, as interest rate for idea repayment. The internal rate of return is the discount rate that makes the present value of total benefit equal to present value of total cost (i.e. NPV=0). Projects with are FIRR greater than the discount rate are accepted. The Benefit/Cost ratio is the present value of total benefit divided by the present value of total cost. In general, a benefit / cost ratio higher than 1 indicates that a project is viable and the higher the B/C ratio, the more viable the project.

Viability calculation formats are presented in Table 5-19, 2-20 and 5-21 , respectively for urban, rural and a combination of the two.

5.5.6. Cash Flow the Water Supply System

The future financial situation is represented by the cash flow of the project. The cash flow statement contains information regarding the movement and availability of the financial resources. This gives an overview of whether there is enough available cash to meet the financial expenditure requirements of the project in any particular year. The cash flow statement contains cash inflow and outflow.

The cash inflow includes the following items:

- Loan and
- Revenue from different sources.

The cash outflow includes the following items:

- periodical investments;
- incremental working capital;
- operating costs;
- loan interest and
- Loan repayment (if any)

Subtracting the annual cash outflow from the annual cash inflow gives the net annual cash flow and this is carried forward to subsequent years as the cumulative cash flow. The positive streams of the cumulative balance indicate that the WSS should not have any significant liquidity problems in relation to its financial plan. Table 5-22 presents the project cash flow.

Water system expenses are different for different water systems. Therefore the price paid for water in one community may be different from the price paid for water in another community. The main sources of income and expenses for the water system are shown below.

Income	Expenses

Water sales from: - public standpipes - house connections - institutional connections (schools, health clinics, public service offices) - industrial/commercial connections	Operation and maintenance costs: - staff salaries - administrative costs (including travel and transport) - chemicals - energy (electricity or diesel) - repair and maintenance costs
Connection fees	Payment of vendors (either a fixed salary or a percentage of their water sales)
Interest earned on money in the bank and from other investments such as government bonds	Water quality sampling and analysis (carried out by authorized laboratories)
	Professional support services for electrical and mechanical items, and for financial management (including external audit)
	Extension of the system pipe network
	New standpipes and individual connections
	Replacement of major components: - borehole - pumping equipment - electrical works - pipes and civil works
	Interest paid on bank overdraft or other loans

Table 5-19: Viability Calculation Format for Urban Part of the System

Discount Rate (% per Annum)= 3%

Year	Series No.	Present Worth Factor	Annual Revenue ('000ETB)	Residual ('000ETB)	Total Benefit ('000ETB)	O&M Costs	Running Costs	Initial Investment Cost	Replacement Costs	Annual Cost ('000ETB)	Net Benefits ('000ETB)	Discounted Annual Revenue to be Sold ('000ETB)	Discounted Annual Cost ('000ETB)	Net Cash Flow (000ETB)	Discounted Cash Flow (000ETB)
2017	1	0.9709	-		-	-	-		-			-			
2018	2	0.9426	-		-	-	-		-			-			
2019	3	0.9151	-		-	-	-		-			-			
2020	4	0.8885							-						
2021	5	0.8626							-						
2022	6	0.8375							-						
2023	7	0.8131							-						
2024	8	0.7894							-						
2025	9	0.7664							-						
2026	10	0.7441							-						
2027	11	0.7224							-						
2028	12	0.7014							-						
2029	13	0.6810							-						
2030	14	0.6611							-						
2031	15	0.6419							-						
2032	16	0.6232							-						
2033	17	0.6050													
2034	18	0.5874													
2035	19	0.5703													
Total															

FB/C Ratio	-------
FRR	----
FNPV ('000 ETB)	-----

Table 5-20: Viability of the Rural Part of the Project

Discount Rate (% per Annum)= 3%

Year	Series No.	Present Worth Factor	Annual Revenue ('000ETB)	O&M Costs	Running Costs	Initial Investment Cost	Replacement Costs	Annual Cost ('000ETB)	Net Cash Flow ('000ETB)	Discounted Annual Revenue ('000ETB)	Discounted Annual Cost ('000ETB)	Discounted Cash Flow (000ETB)
2017	1	0.9709	-	-	-		-	-	-	-	-	-
2018	2	0.9426	-	-	-		-	-	-	-	-	-
2019	3	0.9151	-	-	-		-	-	-	-	-	-
2020	4	0.8885					-					
2021	5	0.8626					-					
2022	6	0.8375					-					
2023	7	0.8131					-					
2024	8	0.7894					-					
2025	9	0.7664					-					
2026	10	0.7441					-					
2027	11	0.7224					-					
2028	12	0.7014					-					
2029	13	0.6810										
2030	14	0.6611										
2031	15	0.6419										
2032	16	0.6232					-					
2033	17	0.6050					-					
2034	18	0.5874					-					
2035	19	0.5703					-					
Total						-	-					

FB/C Ratio	-------
FRR	--------
FNPV ('000 ETB)	---------

Table 5-21: Viability of the Combined Project

Discount Rate (% per Annum)= 3%

Year	Series No.	Present Worth Factor	Annual Revenue ('000USD)	O&M Costs	Running Costs	Initial Investment Cost	Replacement Costs	Annual Cost ('000USD)	Net Cash Flow ('000USD)	Discounted Annual Revenue ('000USD)	Discounted Annual Cost ('000USD)	Net Cash Flow (000USD)	Discounted Cash Flow (000USD)
2017	1	0.9709	-	-	-		-			-			
2018	2	0.9426	-	-	-		-			-			
2019	3	0.9151	-	-	-		-			-			
2020	4	0.8885					-						
2021	5	0.8626					-						
2022	6	0.8375					-						
2023	7	0.8131					-						
2024	8	0.7894					-						
2025	9	0.7664					-						
2026	10	0.7441					-						
2027	11	0.7224					-						
2028	12	0.7014					-						
2029	13	0.6810											
2030	14	0.6611											
2031	15	0.6419											
2032	16	0.6232											
2033	17	0.6050											
2034	18	0.5874											
2035	19	0.5703											
Total													

FB/C Ratio	--------
FRR	--------
FNPV ('000 ETB)	--------

Table 5-22: Projected Cash Flow Analysis Format ('000 ETB)

Year	Cash Inflow								Cash Outflow						Net Cash Flow	Cumulative Balance
	Equity Capital	Loan Principal	Sales Revenue	Estimation fees	Connection Fees	Meter Rental	Material Sales	Total	Investment Costs	Incremental Working Capital	Operating Costs	Loan Interest	Loan Repayment	Total		
2017																
2018																
2019																
2020																
2021																
2022																
2023																
2024																
2025																
2026																
2027																
2028																
2029																
2030																
2031																
2032																
2033																
2034																
2035																
Total	-															

5.5.7. Source of Finance

The major financial sources of the project should be clearly identified whether it is proposed to be grants, loans and the customers themselves. Since the cost of the project is too high to be fully covered by the customers alone, cost-sharing mechanism is essential unless otherwise its implementation couldn't be practical. The urban community will participate in covering 10% of the initial investment cost through loan arrangement whereas the rural community contribution will be nil. On the other hand the revenue generated from the community will finance all of the replacement costs required for the urban water supply system. In addition to this, the customers themselves without a need of being subsidised could cover the annual operational costs of both the urban and the rural parts. The sources of finance should be presented as a format in Table 5-23 below.

Table 5-23: Source of Finance for the Project ('000 ETB)

No.	Type of Costs	Urban				Rural				Grand Total
		Equity	Grant	Loan	Total	Equity	Grant	Loan	Total	
1	Initial Investment Costs					-				
2	Replacement Costs									
3	Operational Costs									
4	**Total**									
5	%age share of Initial Investment Costs	-	90	10	100		100	-	100	100
6	%age share of Replacement Costs	100	-	-	100		100	-	100	
7	%age share of Operational Costs	100	-	-	100	100	-		100	
8	%age share of Total Cost									
9	Grant Share of Total urban Rural Initial Investment (%)									
10	Loan Share of Total urban Rural Initial Investment (%)									

5.5.8. Projected Income Statement

The main items carried in the income statement are revenues, current operating expenses, depreciation and interest on long term debts. The last column of the income statement shows that the project can operate in a sustainable manner throughout its life. The projected income statement is presented in Table 5-24.

The first part of the profit and loss account (income statement), which is the gross margin, is calculated by subtracting the variable cost i.e. the chemical and energy costs, from the total revenue of the project (sales revenue, estimation fees, connection fees, meter rental fee and material sales). The net revenue before tax is then calculated by subtracting overhead costs, depreciation and loan interest. VAT (at the rate of 15%) is deducted from the cumulative net revenue before tax and streams of cumulative net revenue are calculated as shown in the last column of Table 5-24. reception

Table 5-24: Projected Income Statement of the Water Supply Services ('000 ETB)

Year	Sales Revenue	Estimation fees	Connection Fees	Meter Rental	Material Sales	Total Revenue	Variable Costs	Gross Margin	Over heads	Depre-ciation	Interest Charged	Total Cost	Net Revenue before Tax	Cumulative Net Revenue before Tax	VAT @ 15%	Net Revenue After Tax	Cumulative Net Revenue after Tax
2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
2020																	
2021																	
2022																	
2023																	
2024																	
2025																	
2026																	
2027																	
2028																	
2029																	
2030																	
2031																	
2032																	
2033																	
2034																	
2035																	
Total (Rounded)																	

5.5.9. Sensitivity Analysis

The FIRR, B/C ratio and NPV have been subjected to sensitivity tests by varying significant variables in order to assess the robustness of the estimates. Although efforts have been made to make the estimates as realistic as possible, there always remain some uncertainties.

Favourable circumstances (positive changes in variables) will further increase the already positive IRR. Changing important variables with respect to unfavourable circumstances was therefore assessed.

Assuming that other things remain constant, sensitivity tests should be undertaken by changing 3 variables: (a) increase in operation and maintenance and running cost of the project say by 10%; (b) increase in investment cost say by 10%; and (c) decrease in the gross income say by 10%.

The results of the sensitivity tests should be presented by calculating the Excel spreadsheet with the format shown in Table 2-28.

Table 5-25: Results of Financial Sensitivity Tests

No	Sensitivity Test	FIRR	NPV ('000 USD)	B/C ratio
1	Base Case			
2	Increase the O&M and Running Costs by 10%			
3	Decrease in annual Revenue by 10%			
4	Increase in Investment Cost by 10%			

6 SYSTEMS FOR IMPLEMENTING AND MANAGING STRATEGIES

6.1 Financial Systems

The rural piped system service financial and accounting system will operate within the general framework of the Government Financial Management System.

The water board will operate as a strategic business entity with a complete accounting system run on accounting package and management structure. The rural piped system service management structure will include the Manager, Finance Head, technical Head and Administration Head as the core components of the management structure. The management structure will operate with full authority derived from the Water Board delegation.

The rural piped system service will operate within the following financial system and operations structure:

6.1.1. Planning and Budgeting

The Water Administration Office (WAO) or Operator will prepare an annual budget that will be reviewed by the Water Board and approved by the Zone or Woreda Water Offices. The annual budget will include an annual income statement, capital expenditure plan, detailed cost code analysis as well as the balance sheet. The annual budget will be broken down into the monthly calendar for ease of implementation and monitoring. The WAO/Operator will constantly refer to the budget in their day-to-day expenditure.

6.1.2. Internal Control and Internal Auditing

Internal control comprises the whole systems of control, financial or otherwise, established by the Water Board in order to: (i) carry out the WAO's activities in an orderly and efficient manner; (ii) ensure adherence to policies and procedures; (iii) to safeguard the assets of the Water Board; and (iv) secure as far as possible the completeness and accuracy of the financial and other records.

The WAO will consider the following key elements to ensure that a sound internal control system is in place:

- Segregation of functions to authorize, execute and record
- Physical control over fixed assets
- Clear delegations and channels of command
- Monthly reconciliation of various general ledger accounts.
- Integrity and performance of staff at all levels
- Supervision

The Internal Audit section of the WAO will be responsible for giving assurance to the internal control system is in place and is working as intended. The Internal Audit section will, therefore, carry out periodic reviews of the activities of the WAO and report its findings and recommendation to the Water Board. The review of the controls will encompass processes within the assets, systems, accounts, procurement, and human resource processes and procedures. The Internal Audit function will be complimented by the Regional Audit Office.

6.1.3. Accounting

The WAO's accounting process will be maintained on a historic accrual basis. The WAO will have clear documented accounting processes and procedures that will guide its accounting staff in managing the accounting processes.

The WAO's accounting and billing system will be run on a double entry accounting system. The Billing system will be interfaced to the general ledger accounting system. Where possible the fixed asset as well as the stock management system will be run on the accounting package interfaced with the general ledger system.

The WAO will adopt a common chart of accounts to facilitate preparation and consolidation of financial results of the Board. The common chart of accounts will assist the WAO in preparing relevant monthly, quarterly and annual financial statements that include the following:

- Income statement
- Balance sheet
- Statement of movement of funds
- Cash-flow statement
- Capital expenditure analysis
- Revenue expenditure analysis.

The Water Board will review the performance reports submitted by the WAO and provide the necessary incentives and disincentives as agreed upon in the performance contract for WAOs/schemes under the performance initiative. This performance appraisal process will guide management in identifying gaps that will require redress.

6.1.4. External Auditing

The operations of the WAO will be subject to an annual audit by an approved external auditor. The Auditor will be approved by Regional Audit Office.

The primary responsibility of the auditor is to express an opinion on the **Annual Financial Statements** and check that the statements have been prepared in accordance with the International Financial accounting standards.

In addition to the audit report, the external auditors will be expected to prepare a **Management Letter** giving observations and comments, and providing recommendations for improvements in accounting records, systems and controls of the WAO/WASHCO/operator.

6.1.5. Financial Supervision

The Financial Controller of the Board will be responsible for the overall supervision of the financial management of the WAO. The Financial Controller will therefore closely monitor the financial activities of the WAO.

6.1.6. Bank Account

The WAO/WASHCO will operate its own separate bank account. The account will be used for receipts and payments of funds for the WAO/WASHCO. The revenues collected by the WAO/WASHCO will be ring-fenced, with only about 40 percent of revenues transferred to in return for higher level technical support.

The WAO/WASHCO Accountant will be responsible for reconciling the bank account of the WAO/WASHCO to the general ledger balances on a monthly basis. This reconciliation will be reviewed by the Finance Head and approved by the Manager and Water Board.

6.1.7. Petty Cash

The WAO/WASHCO will keep an optimal level of petty cash for their day-to-day operations. The optimal level of cash will be approved by Water Board in case of large RPS, and by Woeda Water Office for small RPS.

6.1.8. Tariff Structure

It is recommended that a workable automatic tariff adjustment formula which will facilitate transparency and clarity on the elements that trigger a request for tariff adjustment should be agreed upon and implemented. This would also enable both the Regional Water Bureau and the Water Board to clearly understand the impact of approved tariff levels on the income and therefore operations of the Board.

The Government and the Board will sign a corporate charter that will incorporate the tariff adjustment formula. The automatic tariff adjustment will follow the customer segmentation based on the following:

- Customer category (individuals, institutions, commercial, industrial and communal water points)
- Consumption (minimum consumption is charged a lower rate than excess consumption). The minimum consumption will reflect protection of the poor consumers within the individual category.

The water tariff for the excess consumption within the individual category as well as commercial, industrial, and institutional categories shall be part of the automatic tariff adjustment formula.

The tariff adjustment formula is expected to take care of the relevant inflation rate pertaining to the core costs of production such as chemicals, spares, energy, depreciation, interest, exchange rate movement and cost of living as presented in chapter five and example in Annex-D and E.

6.2 Operational Systems

There are a number of operational systems that the WAO will employ to guide operational activities. The systems are available for water treatment process, maintenance, new water connections and procurement among others.

6.2.1. Water Treatment

In the process of treating water, the WAO will continue checking the quality of raw water flowing into the treatment plant, if any. This will enable the WAO to decide on the amount of water to be allowed into the treatment plant and how much chemicals should be added. The WAO will also continue checking the quality of treated water to ensure that it complies with the standards of World Health Organization and Ethiopian Standards for Drinking Water.

The Zone and Woreda Water Offices will monitor the quality of water in the RPS regularly through the Water Quality section. The personnel in the Water Quality Section will continue visiting the WAO/RPS at least quarterly to check the quality of water.

6.2.2. Maintenance

The WAO/Operator will continue to undertake two types of maintenance i.e. corrective and preventive maintenance. The WAO/Operator will maintain breakdowns immediately they are reported. In this case, the WAO/Operator will continue having operational staff on standby all the time.

As regards preventive maintenance, the WAO/Operator will continue preparing and implementing maintenance schedules for different types of facilities.

The WAO/Operator will maintain a Break-down Call Centre that will be accessed by customers, well-wishers and WAO/Operator personnel in reporting system breakdowns.

6.2.3. New water connections

The process of making new water connection starts with a potential customer requesting the WAO to connect them to water supply services. The WAO determines the size and length of pipeline required to make a connection. The cost of the connection is determined. The potential customer is then asked to pay the determined amount.

The WAO will continue connecting potential customers within 10 days of making payments for new connections. Once a new connection is made, a customer's account will be opened on the billing system and passed on to the meter reader section for monthly billings.

The WAO will continue to civic educate the communities on the advantages of using potable water and disadvantages of using untreated water. The WAO will encourage potential customers to have household connections by allowing them to pay for a new water connection fee by instalment and where such potential customers will be unable to pay the new water connection fee, the WAO will apply for an output based funding from relevant donors to finance the new water connection materials.

The output based funding will only apply to those potential customers that cannot afford a new water connection fee but are able and willing to pay for the monthly water rates.

6.2.4. Procurement

The Water Board/WAO has Internal Procurement Committee (IPC) which makes procurement decisions following stipulations in the Procurement Guideline. The IPC at the WAO reports to the Water Board. The WAO's IPC can only make decisions on procurement of services, goods and works up to a certain threshold as set by Water Board. For procurements above the set thresholds, the WAO refers the procurement to the Water Board.

6.2.5. Billing and Collection Procedures

The WAO/Operator will use meters in recording consumption for various customer categories. The meter reading section within the WAO/Operator will be responsible for recording meter readings. The meter reading section will take monthly readings to determine the total consumption within that month.

The meter readings will be updated on the customer's accounts on the billing system. The WAO management will continue reviewing data captured in order to vet the accuracy of the meter readings.

Once the vetting process is through, the WAO/Operator Management will post the meter recordings to the various customer accounts as billings for that particular month. The WAO/Operator will continue producing bills timely in order to match the billing period with the customer's dates of receiving their salaries.

Customers are expected to honour their bills on receipt of such bills. Where customers have not paid their due debts, the WAO/Operator will employ the following strategies:

- Carry out reminders on settlement of due debts
- Draw and sign bill settlement agreements with customers where customers are unable to clear the outstanding amount at once.
- Disconnect the customer as a last resort.

6.2.6. Monitoring and Evaluation

In order to monitor progress of the business on the above key systems and consolidate performance data, the WAO shall collect key financial and operational data. The WAO will enhance the recording and monitoring system by using the appropriate technology thereby enhancing the speed and level of detail and accuracy of the information being provided. Recording will be done on regular intervals e.g. production volume will be recorded daily, billed volume monthly, cash collection daily, new water connection daily etc.

The WAO will prepare and submit to Water Board for review various reports that include the following:

- Monthly management accounts that will include income statement, cash-flow, expenditure analysis, volume analysis, and capital expenditure analysis.
- Operations report that will include sales analysis, production volume, unaccounted-for water, power usage, new water connection.
- Risk management report

In order to track impacts of the project in the WAO, monitoring shall be done as shown in the pages that follow:

6.2.7. Performance Monitoring

Clearly define the indicator of performance and specify the desired standard against which performance will be judged and the targets to be achieved in each year of the contract. Standards and targets may be expressed as numbers, percentages, ratios, or the frequency with which the task should be carried out.

The WAO/Operator shall, on a quarterly basis, submit a report with the following indicators/information (these items may be revised according to the business plan objectives and performance indicators):

The Water Board and WAO/Operator should sign performance contract agreement based on the agreed performance indicators and set targets. With those criteria, the WAO/Operator should get incentive as a bonus and salary increment. For badly performed WAO/Operator penalty conditions should be set.

The key performance indicators and assume targets are presented in Table 6.1 below. The targets are just an example. It can be modified based on the Growth and Transformation Plan (GTP-2) as well as Sustainable Development Goals (SDGs)

Table 6-1: Sample Format of Performance Indicator and Target

No.	Performance Indicators	Unit	Performance Standard/target	Base Year	Year-1	Year-2	Year-3	Year-4	Year-5
1	Increase Water Supply Coverage	%	100						
2	Average number of hours of service per day	Hrs	24						
3	Non-Revenue Water Reduced to	%	< 15						
4	Increase Per Capita Water Consumption								
4.1	House Connection	l/c/d	60						
4.2	Yard Connection	l/c/d	40						
4.3	Public Water Point	l/c/d	30						
5	Increase Water Production	m^3/year							
6	Down time reduced to	Hrs	2						
7	Average distance to fetch from PWP reduced to								
7.1	For Rural	km	0.25						
7.2	For Urban	km	0.10						
8	Average time taken to make a new connection reduced to	day	15						
9	Average time taken to respond to a complaint reduced to	day	5						
10	No. of staff per 1,000m^3 of water produced per day maintained at	number	8						
11	Sales volume increased to	m^3/year	X m^3/year						
12	Revenue amount increased to	Birr/year							
13	% of trained operators increased to	%	100						
14	Collection efficiency (percentage of billed amount that is collected monthly)	%	95						
15	Meters of piped network cleaned and maintained per month (including valve inspection and exercising, water main cleaning and flushing, pipe location and leak detection)	X meters							
16	Frequency of cleaning and maintenance of electromechanical equipment	X months							
	Energy use in kwh (or cost) /cubic meter into supply	[X] kwh/m3 or cost/ m3							

Annexes

Annex A: Format-1: Calculation of Future Population, Water Demand, Required Supply and Production

No.	Description		Year	*Base (2014)*	2015	2016	2027	2028
1	**Population**	Growth rate	%					
		Population	x 1000					
		Coverage	%					
		People served	x 1000	0.00	0.00	0.00	0.00	0.00
		People un-served	x 1000	0.00	0.00	0.00	0.00	0.00
2	**Water Demand (WD)**							
	a. Domestic Demand							
	*** house connections**							
		% population depending	%					
		number of inhabitants	x 1000					
		average per capita	l/c.d					
		total consumption	m^3/Day					
		total consumption	Mm^3/yr					
	*** yard connections**							
		% population depending	%					
		number of inhabitants	x 1000					
		average per capita	l/c.d					
		total consumption	m^3/Day					
		total consumption	Mm^3/yr					
	*** Public Water Points**							
		% population depending	%					
		number of inhabitants	x 1000					
		average per capita	l/c.d					
		total consumption	m^3/Day					
		total consumption	Mm^3/yr					
	*** Protected Springs or wells**							
		% population depending	%					
		number of inhabitants	x 1000					
		average per capita	l/c.d					
		total consumption	m^3/Day					
		total consumption	Mm^3/yr					
	b. Non-Domestic demand							
	**** Commercial Use***							
		Percentage of the Domestic Demand	%					
		Commercial Demand	m^3/Day					
		Commercial Demand	Mm^3/yr					
	b. Industrial use (if any)							
		Percentage of the Domestic Demand	%					
		total consumption	m^3/Day					
		total consumption	Mm^3/a					
	c. Institutional (if any)							
		Percentage of the Domestic Demand	%					

No.	Description		Year	*Base (2014)*	2015	2016	2027	2028
		total consumption	m^3/Day					
		total consumption	Mm^3/a					
	Total water demand		**m^3/Day**					
	Total water demand		**Mm^3/yr**					
3	**Losses** (leakages)		%					
			m^3/Day					
			Mm^3/a					
4	**Total annual supply into network**		Mm^3/a					
5	**Daily supply**	average day	m^3/d					
	Daily supply	average day	l/sec					
		peak factor pf_d^{max}						
		peak factor pf_d^{min}						
		maximum day	m^3/d					
		minimum day	m^3/d					
6	**Hourly supply**	average hour	m^3/h					
		peak factor pf_h^{max}						
		peak factor pf_h^{min}						
		maximum hour	m^3/h					
		minimum hour	m^3/h					
7	**Supply** from	existing plant	%					
	($S = P_{out}$)		Mm^3/yr					
		new plant	%					
			Mm^3/yr					
8	**Water use in plant (U)**							
		existing plant	%					
			m^3/d					
			Mm^3/yr					
		new plant	%					
			m^3/d					
			Mm^3/yr					
9	**Required production P_{in}** (total old plants and new plant)							
	a. yearly		Mm^3/yr	0.00	0.00	0.00	0.00	0.00
	b. average day		m^3/d	0	0	0	0	0
	c. *maximum day*		m^3/d	0	0	0	0	0
	d. minimum day		m^3/d	0	0	0	0	0
	e. *average hour on maximum day*		m^3/h	0	0	0	0	0
	f. average hour on minimum day		m^3/h	0	0	0	0	0
	g. average hour on average day		m^3/h	0	0	0	0	0
10	**Intake of raw water (R_{in})**							
		seepage & evaporation	%					
		intake (based upon 9g)	m^3/h					
		(open reservoir)	Mm^3/yr					

Annex B: Format-2: Tariff Plan Format

No.	Cost component	Amount in Birr/day of each cost component for each tariff type		
		O & M cost tariff	**Real cost tariff**	**Total cots tariff**
1	Power cost			
2	Personnel cost			
3	Maintenance cost			
4	Others cost			
5	Replacement cost			
6	Total cost to be recovered			
7	**Subtotal costs**			
8	Inflation (5% of sub total cost)			
9	Total cost/day= (7+8)			
10	Amount of water required/day in m^3			
11	Tariff / m^3 (9/10)			
12	Tariff / 20liters			
13	Tariff for 20 litters of water to the nearest practical payment (assuming one pot has 20 litters volume capacity)			

Annex C: Format-3: Personnel Cost

No.	Personnel title	Number	Salary/month (Birr)	Total salary (Birr)
1	Manager and accountant			
2	Cashier			
3	Plumber			
4	Tap attendant and bill collector			
5	Tap attendants			
6	Generator			
7	Guard			
Total personnel cost /month				

Annex D: Format-4: Maintenance Cost

It. No	Component	Investment cost (Birr)	% of yearly maintenance cost out of investment cost	Total maintenance cost (Birr)
1	Borehole			
2	Pump and generator			
3	Generator house			
4	Reservoir			
5	Pipeline			
6	Public fountains			
7	Valve boxes			
8	Cattle trough			
	Total maintenance cost /year			
	Total personnel cost /day = 9750Birr / 365days			

Annex E: Worked Example of Tariff Calculation - Gravity RPS

The worked example below demonstrates how to calculate annual expenses and then set a tariff that ensures that income covers all expenses. The method is intended for use by Water Board with a good understanding of water system income and expenses data, and basic knowledge of maths. The guidelines set the price of a standard jerican (20 liters) of water that ensures that income balances expenses over a one year period.

Example of Tariff Calculation:

A Rural Piped System serves for 30 villages and one small town water supply for a population of 80,000 through 125 water points, 1,250 house and 3,500 yard connections, respectively. There are also Institutional and commercial connections. The system is gravity feeding covering 3 woredas in two zones.

The water sources are springs with a total yield of 28.9 l/sec (2,500 m^3/ day). The water supply system have 30 km pipelines 4 service reservoirs with different capacity, 5 pressure reducing tanks and 125 water points.

Average Incomes and Expenditures

The income for the last year was 3,000,000.00 Birr and the corresponding expenditure was 1,900,000.00 Birr, the cost recovery ratio was calculated as 1.58, which means that 58% of the income saved for future expansion and rehabilitation works. The RPS service office has 2.5 Million birr in the Bank.

The existing water tariff

No.	Category	Tariff (Birr/m^3)	Remark
1	Public Water Point	3.00	flat
2	0 – 5 m^3	3.25	
3	5.1 – 10 m^3	3.50	
4	10.1 – 30m^3	3.75	Wide band
5	> 30m^3	4.00	

Based on the new investment, the water board intended to revise the existing tariff.

Water Supply Administration Staff

The administration office has 34 permanent staff and 80 contracts. Of the 34 permanent staff, 8 are technical; the rest 26 staff are non-technical staff (administrative and financial). The 80 contract staff are water point attendants.

1 Water Demand Projection

The existing water production is about 2,500 m^3/ day, which can be satisfied the demand until 2015 only. Beyond 2015, it is required to augment the demand.
The base year for the rehabilitation and expansion work is year 2015. It is assumed two years can be taken for planning and implementation, i.e up to 2017.

The rehabilitated and expanded system can start by year 2018.

The business plan is intended to be developed for the next 5 years until year 2022.
The water demand projection and the corresponding additional water production are presented in Table below.

1,228 m^3/ day of additional water source is needed to develop which will be satisfied the demand by year 2022.

Row No.	No.	Description	Year	*2014*	2015	2016	2017	2018	2019	2020	2021	2022
1	1	**Population** Growth rate	%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
2		Population	x 1000	80,000	82,000	84,050	86,151	88,305	90,513	92,775	95,095	97,472
3		Coverage	%	68.8%	70.4%	71.8%	72.0%	77.3%	79.8%	82.2%	85.4%	88.0%
4		People served	x 1000	55000	57750	60350	62000	68250	72250	76250	81250	85750
5		People unserved	x 1000	25000	24250	23700	24151	20055	18263	16525	13845	11722
6	2	**Water Demand (WD)**										
7		***a. Domestic Demand***										
8		*** house connections**										
9		% population depending	%	7.8%	9.1%	10.7%	11.6%	13.0%	14.4%	16.2%	18.4%	20.5%
10		number of inhabitants	x 1000	6250	7500	9000	10000	11500	13000	15000	17500	20000
11		family Size	No.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
12		number of Customers (HHs)	number	1250	1500	1800	2000	2300	2600	3000	3500	4000
13		average per capita	l/c.d	40.0	42.0	42.0	42.0	48.0	52.0	55.0	58.0	60.0
14		total consumption	m^3/Day	250.0	315.0	378.0	420.0	552.0	676.0	825.0	1015.0	1200.0
15		total consumption	Mm^3/yr	0.09	0.11	0.14	0.15	0.20	0.25	0.30	0.37	0.44
16		*** yard connections**										
17		% population depending	%	21.9%	23.2%	23.9%	24.1%	26.0%	28.2%	29.6%	31.5%	32.8%
18		number of inhabitants	x 1000	17500	19000	20100	20750	23000	25500	27500	30000	32000
19		family Size	No.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20		number of Customers (HHs)	number	3500	3800	4020	4150	4600	5100	5500	6000	6400
21		average per capita	l/c.d	30	32	34	36	38	40	42	44	46
22		total consumption	m^3/Day	525.0	608.0	683.4	747.0	874.0	1020.0	1155.0	1320.0	1472.0
23		total consumption	Mm^3/yr	0.19	0.22	0.25	0.27	0.32	0.37	0.42	0.48	0.54
24		*** Public Tap (standposts)**										
25		% population depending	%	39.1%	38.1%	37.2%	36.3%	38.2%	37.3%	36.4%	35.5%	34.6%
26		number of inhabitants	x 1000	31250	31250	31250	31250	33750	33750	33750	33750	33750
27		family Size	No.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28		number of Customers (HHs)	number	50	50	50	50	50	50	50	50	50
29		Number of Water Points	number	125	125	125	125	135	135	135	135	135
30		average per capita	l/c.d	20	22	22	22	24	26	28	30	30
31		total consumption	m^3/Day	625.0	687.5	687.5	687.5	810.0	877.5	945.0	1012.5	1012.5
32		total consumption	Mm^3/yr	0.23	0.25	0.25	0.25	0.30	0.32	0.34	0.37	0.37
33		**Total Domestic Demand**	**m^3/Day**	**1400.0**	**1610.5**	**1748.9**	**1854.5**	**2236.0**	**2573.5**	**2925.0**	**3347.5**	**3684.5**
34			**Mm^3/yr**	**0.51**	**0.59**	**0.64**	**0.68**	**0.82**	**0.94**	**1.07**	**1.22**	**1.34**
35		***b. Non-Doemstic demand***										
36		**** Commercial Use***										
37		Percentage of the Domestic Demand	%	10%	10%	10%	10%	10%	10%	8%	8%	8%
38		Commercial Demand	m^3/Day	140.0	161.1	174.9	185.5	223.6	257.4	234.0	267.8	294.8
39		Commercial Demand	Mm^3/yr	0.05	0.06	0.06	0.07	0.08	0.09	0.09	0.10	0.11
40		***b. Industrial use***										
41		Percentage of the Domestic Demand	%	0	0	0	0	0	0	0	0	0
42		total consumption	m^3/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43		total consumption	Mm^3/a	0	0	0	0	0	0	0	0	0
44		***c. Institutional***										
45		Percentage of the Domestic Demand	%	5%	6%	7%	8%	9%	10%	7%	6%	5%
46		total consumption	m^3/Day	70.00	96.63	122.42	148.36	201.24	257.35	204.75	200.85	184.23
47		total consumption	Mm^3/a	0.026	0.035	0.045	0.054	0.073	0.094	0.075	0.073	0.067
48		**Total water demand**	**m^3/Day**	**1,610.00**	**1,868.18**	**2,046.21**	**2,188.31**	**2,660.84**	**3,088.20**	**3,363.75**	**3,816.15**	**4,163.49**
49		**Total water demand**	**Mm^3/yr**	**0.59**	**0.68**	**0.75**	**0.80**	**0.97**	**1.13**	**1.23**	**1.39**	**1.52**

Row No.	No.	Description	Year	*2014*	2015	2016	2017	2018	2019	2020	2021	2022
50	3	**Losses** (leakages)	%	22%	23%	24%	25%	22%	20%	18%	16%	18%
51			m^3/Day	354.20	429.68	491.09	547.08	585.38	617.64	605.48	610.58	749.43
52			Mm^3/a	0.13	0.16	0.18	0.20	0.21	0.23	0.22	0.22	0.27
53	4	**Total annual supply into network**	Mm^3/a	0.72	0.84	0.93	1.00	1.18	1.35	1.45	1.62	1.79
54	5	**Daily supply** average day	m^3/d	1964.20	2297.86	2537.30	2735.39	3246.22	3705.84	3969.23	4426.73	4912.91
55		**Daily supply** average day	l/sec	22.73	26.60	29.37	31.66	37.57	42.89	45.94	51.24	56.86
56		peak factor pf_d^{max}		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
57		peak factor pf_d^{min}		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
58		maximum day	m^3/d	2,357	2,757	3,045	3,282	3,895	4,447	4,763	5,312	5,895
59		minimum day	m^3/d	1,316	1,540	1,700	1,833	2,175	2,483	2,659	2,966	3,292
60	6	**Hourly supply** average hour	m^3/h	81.8	95.7	105.7	114.0	135.3	154.4	165.4	184.4	204.7
61		peak factor pf_h^{max}		1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
62		peak factor pf_h^{min}		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
63		maximum hour	m^3/h	136.7	159.9	176.6	190.3	225.9	257.9	276.2	308.0	341.9
64		minimum hour	m^3/h	54.8	64.1	70.8	76.4	90.6	103.5	110.8	123.6	137.2
65	7	**Supply** from existing plant	%	127.3%	108.8%	98.5%	91.4%	77.0%	67.5%	63.0%	56.5%	50.9%
66			m^3/d	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
67		**($S = P_{out}$)**	Mm^3/yr	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
68		new plant	%	0.0	0.0	1.5%	8.6%	23.0%	32.5%	37.0%	43.5%	49.1%
			m^3/d	0.0	0.0	36.8	215.1	574.7	813.5	925.4	1,088.1	1,227.8
69			Mm^3/yr	0	0.00	0.01	0.08	0.21	0.30	0.34	0.40	0.45
70	8	**Water use in plant (U)**										
71		existing plant	%	2%	2%	2%	2%	2%	1%	1%	1%	1%
72			m^3/d	50.0	50.0	50.0	50.0	50.0	25.0	25.0	25.0	25.0
73			Mm^3/yr	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
74		new plant	%	0.0	0.0	1%	1%	1%	1%	1%	1%	1%
75			m^3/d	0.0	0.0	0.4	2.2	5.7	8.1	9.3	10.9	12.3
76			Mm^3/yr	0.0	0.00	0.000	0.001	0.002	0.003	0.003	0.004	0.004
77	9	**Required production P_{in}** (total old plants and new plant)										
78		a. yearly	Mm^3/yr	0.93	0.93	0.94	1.01	1.14	1.22	1.26	1.32	1.37
79		b. average day	m^3/d	2,550	2,550	2,587	2,767	3,130	3,347	3,460	3,624	3,765
80		c. *maximum day*	m^3/d	3,060	3,060	3,105	3,321	3,757	4,016	4,152	4,349	4,518
81		d. minimum day	m^3/d	1,709	1,709	1,733	1,854	2,097	2,242	2,318	2,428	2,523
82		e. *average hour on maximum day*	m^3/h	128	128	129	138	157	167	173	181	188
83		f. average hour on minimum day	m^3/h	71	71	72	77	87	93	97	101	105
84		g. average hour on average day	m^3/h	106	106	108	115	130	139	144	151	157

2 Estimation of Investments Cost

In order to augment the demand deficiency presented in table above, the Water Board has intended to rehabilitate the existing system and expansion woks for the new areas since the design period phased out. The Water Board has allocated budget of 7.5 million Birr, of which 2.5 million contributed from the water board and the rest 5 million from regional water bureau.

It is intended to implement developing spring source, 20 km pipeline, two reservoirs, 10 public water points, 1 pressure reducing tank, and rehabilitating and replacing of existing 4 km pipelines, 5 valve chambers, and rehabilitation of office and store, and water meter replacement.

Thus, the estimated investment cost to implement the water supply facilities is Birr 7.49 Million presented in Table below.

It. No.	System component	Investment cost (ETB)
1	Spring Source Development	150,000.00
2	Two Service Reservoirs	2,000,000.00
3	One Pressure Break Tanks	90,000.00
4	30km Pipelines	3,550,000.00
5	Ten Public Fountains	500,000.00
6	Valve boxes	40,000.00
7	Cattle troughs	50,000.00
8	Rehabilitation and meter replacement	600,000.00
9	Engineering Cost	150,000.00
	Sub Total	**7,130,000.00**
	Contingency (5%)	**356,500.00**
	Total investment cost	**7,486,500.00**

3 Calculation of expenses

a) Staff Salary

The RPS service office is paid a salary of 1,369,032.00 Birr per annum. The detail is presented in Table below.

No.	Personnel title	Number	Salary/month (Birr)	Total salary (Birr)
1	Manager	1	3,200.00	3,200.00
2	Technical Head	1	2,700.00	2,700.00
3	Finance Head	1	2,550.00	2,550.00
4	Administrator	1	2,550.00	2,550.00
5	Accountant Clerk	2	1,700.00	3,400.00
6	Customer Service	1	1,700.00	1,700.00
7	Bill Distributor	1	1,500.00	1,500.00
8	Secretary	1	1,800.00	1,800.00
9	Store Keeper	2	1,600.00	3,200.00
10	Archive	1	1,600.00	1,600.00
11	Bill Sellers	2	1,600.00	3,200.00
12	Purchaser	1	1,600.00	1,600.00
13	Driver	1	1,500.00	1,500.00
14	Water Meter Readers	5	1,500.00	7,500.00
15	Messenger	1	1,186.00	1,186.00
16	Plumbers	6	1,000.00	6,000.00
17	Guards	8	800.00	6,400.00
18	Water Point attendants	125	500.00	62,500.00
	Total Personnel Cost/Month	**161**		**114,086.00**
	Total Personnel Cost/day			**3,802.87**
	Total Personnel Cost/Year			**1,369,032.00**

b) Administration Costs

The Water Board checks its records for the previous year, and sees that 70,000 Birr were spent on stationary and printing, hospitality, telephone and postage, new office equipment and travel and transport. Inflation is known to be about 10 %. Thus, the estimated administration cost is about 77,000 Birr.

c) Repair and Maintenance Costs

The Water Board is advised by the Zone Water Office that the investment costs for its system when adjusted for inflation are presented in table below.

Repair and maintenance costs are calculated as a percentage of investments costs for each item (borehole 0.5 %, pumping equipment 3 %, electrical works 3 %, pipes and civil works 0.5 %):

No.	System Component	Investment Cost (ETB)	% of yearly maintenance cost out of investment cost	Total maintenance cost (ETB)
1	Source Development	150,000.00	0.3%	450.00
2	Service Reservoirs	2,000,000.00	0.3%	6,000.00
	Pressure Break Tanks	90,000.00	0.3%	270.00
3	Pipelines	3,550,000.00	0.3%	10,650.00
4	Public Fountains	500,000.00	0.3%	1,500.00
5	Valve boxes	40,000.00	0.3%	120.00
6	Cattle troughs	50,000.00	0.3%	150.00
	Total Maintenance Cost per year			**19,140.00**
	Total Maintenance Cost per day			**52.44**

d) Rehabilitation/Replacement Costs

Rehabilitation costs are calculated as a percentage of investments costs for each item pipes and civil works 5 %):

No.	**System Component**	**Investment Cost (ETB)**	**% of yearly replacement cost out of investment cost**	**Total maintenance cost (ETB)**
1	Source Development	150,000.00	5.0%	7,500.00
2	Service Reservoirs	2,000,000.00	5.0%	100,000.00
	Pressure Break Tanks	90,000.00	5.0%	4,500.00
3	Pipelines	3,550,000.00	5.0%	177,500.00
4	Public Fountains	500,000.00	5.0%	25,000.00
5	Valve boxes	40,000.00	5.0%	2,000.00
6	Cattle troughs	50,000.00	5.0%	2,500.00
	Total replacement Cost per year			**319,000.00**
	Total replacement Cost per day			**873.97**

e) Water Quality Test

The cost of conducting water samples and test is about 20,000 birr per annum which includes transportation and handling.

f) Summary of Costs and Capital recovery and Tariff setting

It. No.	Cost component	Tariff Amount in Birr/year of each cost component for each tariff type		
		O & M cost recovery tariff	**Full Cost Recovery Tariff**	**Total Capital Costs Recovery Tariff**
1	Salary Expenses	1,369,032.00	1,369,032.00	1,369,032.00
2	Administrative Cost	77,000.00	77,000.00	77,000.00
3	Repair and Maintenance cost	19,140.00	19,140.00	19,140.00
4	Water Quality Costs		10,000.00	10,000.00
5	Replacement cost		319,000.00	-
6	**Subtotal costs**	**1,465,172.00**	**1,794,172.00**	**1,475,172.00**
7	Capital Recovery Cost for 15 years period	-	-	91,268.80
8	**Total cost/Year**	**1,465,172.00**	**1,794,172.00**	**1,566,440.80**
9	**Total cost/day**	**4,014.17**	**4,915.54**	**4,291.62**
10	Average water supply required m^3/day	650.00	650.00	650.00
11	**Tariff (Birr/m^3)**(8/9)	**6.18**	**7.56**	**6.60**
12	**Tariff Birr/ 20liters**	**0.124**	**0.151**	**0.132**

Consumption Grades: Four types of consumption grades are recommended per month, as shown below.

- 0 to 3 m^3/month
- 3 to 6 m^3/month
- 6 to 9 m^3/month
- 9 to 12 m^3/month
- 9 m^3/month and above

The first category is taken as a base case for the tariff determination. The classification helps to establish progressive tariff rates for the urban areas.

Public Water Point Customers: The public tap consumers would use only (15*5*30=2,250) litters of water per month due to their income constraints, lower daily water demand, as well as relatively longer distance of the water source from their place of residence. It is not expected that public water point customers will exceed the first gradation limit, and it is therefore assumed that the first cubic meter of water would meet their 100% consumption demand.

Domestic Customers: The domestic consumers would consume all of the different consumption grades of water.

- 0 to 3 m^3/month: 1 unit

- 3 to 6 m^3/month: 1.2 units
- 6 to 9 m^3/month: 1.4 units
- 9 to 12 m^3/month: 1.6 units
- 12 m^3/month and above: 1.8 units

Commercial and Institutional Customers:

- 0 to 3 m^3/month: 1 unit
- 3 to 6 m^3/month: 1.3 units
- 6 to 9 m^3/month: 1.6 units
- 9 to 12 m^3/month: 1.9 units
- 12 m^3/month and above: 2.2 units

Grade *proportion*: The various consumer groups consume various volumes of water per month and the magnitude of consumption from each consumption grades is presented in Table below.

Consumption Grade	Gradation Weight	Grade Proportion
PWP		
0 to 3 m^3/month:	1	100%
3 to 6 m^3/month:		0%
6 to 9 m^3/month:		0%
9 to 12 m^3/month:		0%
12 m^3/month and above:		0%
DPC		
0 to 3 m^3/month:	1	50%
3 to 6 m^3/month:	1.2	30%
6 to 9 m^3/month:	1.4	15%
9 to 12 m^3/month:	1.6	4%
12 m^3/month and above:	1.8	1%
CPC		
0 to 3 m^3/month:	1	5%
3 to 6 m^3/month:	1.3	15%
6 to 9 m^3/month:	1.6	20%
9 to 12 m^3/month:	1.9	40%
12 m^3/month and above:	2.2	20%
IPC		
0 to 3 m^3/month:	1	5%
3 to 6 m^3/month:	1.3	15%
6 to 9 m^3/month:	1.6	20%
9 to 12 m^3/month:	1.9	40%
12 m^3/month and above:	2.2	20%

Water Tariffs by Phase:

The monthly income level of the public tap users is assumed to average about Birr 150 and, of this income, 4% would be used for water purchase. Therefore, the public tap users pay Birr 6.00 /m^3) of water from their monthly income. Income is assumed to grow at 3% annually and therefore the tariff rate needs to be increased accordingly. The reason for the increment of the tariff rates is that the base tariff rate is directly a function of gross income of the customers. There would be three phases of tariff structure throughout the 15-year analysis period. Accordingly, the first, second and third phases would have different tariff structures. The base year is taken as 1 and the tariff rates for second and

third phases are multiplied by 1.15 and 1.3, respectively. The income growth factors of the different phases are presented as below.

Phase	Year	Income Growth Factor
1	2017-2021	1.0
2	2022-2026	1.15
3	2027-2031	1.30

It is proposed that the tariff rates be increased in three phases. Table below presents the tariff rates of these three phases in terms of ETB/ m^3 of water consumption.

Customer Cataegory	Consumption Catagoy (birr/m^3)					Consumption Catagoy (birr/m^3)					Consumption Catagoy (birr/m^3)				
	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01
	Year 2017 - 2021					Year 2022 - 2026					Year 2027 - 2031				
PWP Tariff	6.00					6.90					8.70				
DPC Tariff	6.00	7.20	8.40	9.60	10.80	6.90	8.28	9.66	11.04	12.42	8.70	10.44	17.39	13.92	15.66
CPC Tariff	6.00	7.80	9.60	11.40	13.20	6.90	8.97	11.04	13.11	15.18	8.70	11.31	13.92	16.53	19.14
IPC Tariff	6.00	7.80	9.60	11.40	13.20	6.90	8.97	11.04	13.11	15.18	8.70	11.31	13.92	16.53	19.14

Proposed Tariff Rate of the Rural Areas

The rural customers are expected to cover the entire O&M costs of the project and therefore the tariff rate should necessarily be equal to the O&M costs which is calculated to be Birr 6.10/m^3) of water or 0.15 birr per 20 litter jerican. Any tariff rate below this would lead to the conclusion that the rural people are not able cover the O&M costs of the scheme.

Annex F: Worked Example of Tariff Calculation - Pumped RPS

Existing Situation of the --- Rural Piped System

The X rural piped system has a pumping system feeding for about 90,000 inhabitants (2014) at 20 villages and two small towns. The water source of the system is from 10 boreholes with the design discharge of 50 l/sec. The current water production is about 15 l/sec (1,315 m^3/day) or 39,286.9 m3/month. The theoretical per capita consumption include UFW is about 14.6 l/c/d. The corresponding average energy consumption was about 26,585.5 KWH. The energy consumption to produce 1m^3 of water was about 0.68 KWH @0.65 birr = 0.44 birr/m^3.

The water supply system conveyed through 70km pipeline from the 10 boreholes and has 9 service reservoir with the capacity varies from 10 to 100 m^3. 6 pressure break tanks, 100 water points and 20 cattle troughs stretched over 20 village and two small towns. A total of 1,600 individual connected customers exist.

Water is pumped from each of the boreholes and entered in collection chamber, then conveyed by gravity until it reaches to the booster station, from which water is pumped to the two small towns and a few villages.

The Water Board of X RPS financial report indicated the latest cost recover was about 1.16. The Water Board has 4 million birr in the bank which is intended to utilize for rehabilitation and expansion of the system.

Existing Water Tariff

No.	Band width in m^3	Tariff (Birr)	Remarks
1	At Water Point	8.00	Flat rate
2	0.0 – 5.0	7.50	
3	5.1 – 10.0	8.25	
4	10.1 – 30.0	9.00	wide band
5	>30	10.00	

The flat tariff set at public water point was higher than the first band of the individual connected customer, which had not realized the water resource management policy. So, the water board revised the tariff for second time as presented in Table below:

No.	Band width in m^3	Tariff (Birr)	Remarks
1	At Water Point	12.00	Flat rate
2	0.0 – 4.0	11.10	
3	4.1 – 7.0	12.20	
4	7.1 – 10.0	12.45	
5	10.1 – 15.0	14.80	
5	>15	16.25	
	For livestock,	14.00	At cattle trough

This tariff seems unrealistic since the rate for different bands is very small. It needs to revise based on the formal tariff calculation and considering the new investment costs embed.

1. Investment planning and financial sustainability assessment

- The excel spreadsheet allows the user to set and update the price of a standard 20 litters of jerican of water that ensures that income balances expenses over a five year period. The calculation requires input predictions for water demand (in litters per person per day consumed at water points and individual connections) and investment plans over the 5 year period. Investment plans and the tariff can be adjusted year by year to maintain a positive balance account.

- If the tariff is fixed at predetermined values over the five year period, then the theoretical water demand (in litters per person per day consumed at water points and individual connections) required to maintain a positive account balance can be calculated. In this way the spreadsheet provides a tool for assessing the likely financial sustainability of existing or proposed RPS water supply systems. If the required water demand is unrealistically high, the system is not likely to be financially sustainable.

- In addition the spreadsheet provides estimates of: percent of the population served by water points (based on investment plans for water point construction, and input number of persons per water point); percent of the population served by house/yard connections (based on input number of connections, and number of persons per connection); comparison of water production per capita (based on analysis of water demand) and installed production capacity per capita.

The spreadsheet is intended for use by Regional Water Bureaus', Zone/Woreda Water Offices and Water Boards with a thorough understanding of water system income and expenses data, the issues of water demand and investment needs, and working knowledge of excel.

a) Spreadsheet page one: investment costs and system characteristics

1. The base year is the year before the first year of the financial analysis. It is usually the current year.
2. Input is required for the current price of one (20 litter) jerican of water charged at public water points, the price ratio of individual connections/ water points, the connection fee[1], and the vendors commission (as a percentage of water sales). If vendors are paid a fixed salary then the percentage should be entered as zero, and the vendors salaries included under fixed costs.
3. The price of a jerican of water is input for each of the five years. When the analysis is run the tariff can be adjusted according to the amount of money required in the account balance over the five year timeframe.
4. Input is required for investment costs for boreholes, pumping equipment, electrical works, and pipes and civil works. These are at base year values. If the base year is not the same as the construction year then investment costs must be updated to base year values.
5. The actual costs of new borehole construction and their lifetimes are unpredictable. In the example the investment cost of the boreholes has been set at Birr 1.2 Million, and the lifetime set at 25 years.

[1] This is the fee paid to the RPS service office not the cost of materials which are paid for by the client.

6. Fixed costs include staff salaries, administrative costs (including travel and transport), water quality tests and professional support services for electrical/mechanical items and for financial management.
7. Variable costs for chemicals and power are entered in Birr/m^3.
8. Input is required for the base year population and population growth rate.

b) Spreadsheet page two: water demand

1. The numbers of water points, house/yard connections, institutional connections (schools, health clinics, public service offices), and industrial/commercial connections are input for each of the five years according to Water Board development plans.
2. The number of persons per water point and the number of persons per house connection is input for the base year and a target figure is input for the fifth year. The analysis assumes no change in the first year and then a linear increase to the fifth year.
3. The number of litters per person per day consumed from public water points and house/yard connections are input for the base year and a target figure is input for the fifth year. The analysis assumes no change in the first year and then a linear increase to the fifth year.
4. The average consumption at institutional connections and industrial/commercial connections are input in m^3/month for each of the five years on the basis of existing knowledge from meter readings and predicted changes. If not exist, take 5-10% of the average domestic water consumption.
5. Overall values for unaccounted for water (physical water losses and collection efficiency) are input for the base year and a target figure is input for the fifth year. The analysis assumes no change in the first year and then a linear increase to the fifth year.
6. The figures for required water production/capita and installed production capacity/capita allow the user to assess the system's capacity to serve the required water production/capita. If installed capacity is insufficient to meet required production (predicted consumption plus physical water losses), then the input values for predicted consumption at public water points and individual connections must be adjusted accordingly.

As per the demand analysis in Table below, the projected sealable water quantity over 5 years varies. The minimum is 2578.3 m^3 /day (2017) and the maximum is 42.26.2 m^3/day (2022). The average is 3,468.2 m^3 /day, for which the average tariff is calculated.

The existing water sources have not satisfied, even the current demand, so that in order to satisfy the demand up to 2022, 4 boreholes having 15 l/sec yield is required.

Row No.	No.	Description	Year	*2014*	2015	2016	2017	2018	2019	2020	2021	2022
1	1	**Population** Growth rate	%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
2		Population	x 1000	90,000	92,250	94,556	96,920	99,343	101,827	104,372	106,982	109,656
3		Coverage	%	66.7%	65.5%	64.3%	71.6%	77.5%	86.2%	86.4%	85.1%	91.2%
4		People served	x 1000	60000	60400	60800	69350	77000	87800	90200	91000	100000
5		People unserved	x 1000	30000	31850	33756	27570	22343	14027	14172	15982	9656
6	2	**Water Demand (WD)**										
7		***a. Domestic Demand***										
8		*** house connections**										
9		% population depending	%	4.4%	4.5%	4.5%	4.9%	6.0%	7.9%	9.6%	11.2%	12.8%
10		number of inhabitants	number	4000	4150	4300	4750	6000	8000	10000	12000	14000
11		family Size	number	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
12		number of Customers (HHs)	number	800	830	860	950	1200	1600	2000	2400	2800
13		average per capita	l/c.d	40.0	42.0	42.0	42.0	48.0	52.0	55.0	58.0	60.0
14		total consumption	m^3/Day	160.0	174.3	180.6	199.5	288.0	416.0	550.0	696.0	840.0
15		total consumption	Mm^3/yr	0.06	0.06	0.07	0.07	0.11	0.15	0.20	0.25	0.31
16		*** yard connections**										
17		% population depending	%	8.9%	8.9%	9.0%	10.3%	12.6%	14.7%	16.8%	17.8%	18.2%
18		number of inhabitants	number	8000	8250	8500	10000	12500	15000	17500	19000	20000
19		family Size	number	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20		number of Customers (HHs)	number	1600	1650	1700	2000	2500	3000	3500	3800	4000
21		average per capita	l/c.d	30	32	34	36	38	40	42	44	46
22		total consumption	m^3/Day	240.0	264.0	289.0	360.0	475.0	600.0	735.0	836.0	920.0
23		total consumption	Mm^3/yr	0.09	0.10	0.11	0.13	0.17	0.22	0.27	0.31	0.34
24		*** Public Tap (standposts)**										
25		% population depending	%	53.3%	52.0%	50.8%	56.3%	58.9%	63.6%	60.1%	56.1%	60.2%
26		number of inhabitants	number	48000	48000	48000	54600	58500	64800	62700	60000	66000
27		family Size	number	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
28		number of Customers (HHs)	number	80	80	80	70	65	60	55	50	50
29		Number of Water Points	number	100	100	100	130	150	180	190	200	220
30		average per capita	l/c.d	20	22	22	22	24	26	28	30	30
31		total consumption	m^3/Day	960.0	1056.0	1056.0	1201.2	1404.0	1684.8	1755.6	1800.0	1980.0
32		total consumption	Mm^3/yr	0.35	0.39	0.39	0.44	0.51	0.61	0.64	0.66	0.72
39		**Total Domestic Demand**	**m^3/Day**	**1360.0**	**1494.3**	**1525.6**	**1760.7**	**2167.0**	**2700.8**	**3040.6**	**3332.0**	**3740.0**
40			**Mm^3/yr**	**0.50**	**0.55**	**0.56**	**0.64**	**0.79**	**0.99**	**1.11**	**1.22**	**1.37**
41		***b. Non-Doemstic demand***										
42		**** Commercial Use***										
43		Percentage of the Domestic Demand	%	10%	10%	10%	10%	10%	10%	8%	8%	8%
44		Commercial Demand	m^3/Day	136.0	149.4	152.6	176.1	216.7	270.1	243.2	266.6	299.2
45		Commercial Demand	Mm^3/yr	0.05	0.05	0.06	0.06	0.08	0.10	0.09	0.10	0.11
46		***b. Industrial use***										
47		Percentage of the Domestic Demand	%	0	0	0	0	0	0	0	0	0
48		total consumption	m^3/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49		total consumption	Mm^3/a	0	0	0	0	0	0	0	0	0
50		***c. Institutional***										
51		Percentage of the Domestic Demand	%	5%	6%	7%	8%	9%	10%	7%	6%	5%
52		total consumption	m^3/Day	68.00	89.66	106.79	140.86	195.03	270.08	212.84	199.92	187.00
53		total consumption	Mm^3/a	0.025	0.033	0.039	0.051	0.071	0.099	0.078	0.073	0.068
54		**Total water demand**	**m^3/Day**	**1,564.00**	**1,733.39**	**1,784.95**	**2,077.63**	**2,578.73**	**3,240.96**	**3,496.69**	**3,798.48**	**4,226.20**
55		**Total water demand**	**Mm^3/yr**	**0.57**	**0.63**	**0.65**	**0.76**	**0.94**	**1.18**	**1.28**	**1.39**	**1.54**
56	3	**Losses** (leakages)	%	22%	23%	24%	25%	22%	20%	18%	16%	18%
57			m^3/Day	344.08	398.68	428.39	519.41	567.32	648.19	629.40	607.76	760.72
58			Mm^3/a	0.13	0.15	0.16	0.19	0.21	0.24	0.23	0.22	0.28
59	4	**Total annual supply into network**										
60			m^3/Day	1,908	2,132	2,213	2,597	3,146	3,889	4,126	4,406	4,987
61			Mm^3/a	0.70	0.78	0.81	0.95	1.15	1.42	1.51	1.61	1.82
62	5	**Daily supply** average day	m^3/d	1908	2132	2213	2597	3146	3889	4126	4406	4987
63		**Daily supply** average day	l/sec	22.08	24.68	25.62	30.06	36.41	45.01	47.76	51.00	57.72
64		peak factor pf_d^{max}		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
65		peak factor pf_d^{min}		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
66		maximum day	m^3/d	2,290	2,558	2,656	3,116	3,775	4,667	4,951	5,287	5,984
67		minimum day	m^3/d	763	853	885	1,039	1,258	1,556	1,650	1,762	1,995
68	6	**Hourly supply** average hour	m^3/h	79.5	88.8	92.2	108.2	131.1	162.0	171.9	183.6	207.8
69		peak factor pf_h^{max}		1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
70		peak factor pf_h^{min}		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
71		maximum hour	m^3/h	132.8	148.4	154.0	180.7	218.9	270.6	287.1	306.6	347.0
72		minimum hour	m^3/h	53.3	59.5	61.8	72.5	87.8	108.6	115.2	123.0	139.2
73	7	**Supply** from existing plant	%	68.9%	61.7%	59.4%	50.6%	41.8%	33.8%	31.9%	29.8%	26.4%
74			m^3/d	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315
75		**(S = P_{out})**	Mm^3/yr	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76		new plant	%	31.1%	38.3%	40.6%	49.4%	58.2%	66.2%	68.1%	70.2%	73.6%
77			m^3/d	593	817	898	1,282	1,831	2,574	2,811	3,091	3,672
78			Mm^3/yr	0.22	0.30	0.33	0.47	0.67	0.94	1.03	1.13	1.34
79	8	**Water use in plant (U)**										
80		existing plant	%	2%	2%	2%	2%	2%	1%	1%	1%	1%
81			m^3/d	26.3	26.3	26.3	26.3	26.3	13.2	13.2	13.2	13.2
82			Mm^3/yr	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
83		new plant	%	0.0	0.0	1%	1%	1%	1%	1%	1%	1%
84			m^3/d	0.0	0.0	9.0	12.8	18.3	25.7	28.1	30.9	36.7
85			Mm^3/yr	0.0	0.00	0.003	0.005	0.007	0.009	0.010	0.011	0.013
86	9	**Required production P_{in}** (total old plants and new plant)										
87		a. yearly	Mm^3/yr	0.71	0.31	0.34	0.48	0.68	0.95	1.04	1.14	1.36
88		b. average day	m^3/d	1,934	2,158	2,249	2,636	3,191	3,928	4,167	4,450	5,037
89			l/sec	22.4	25.0	26.0	30.5	36.9	45.5	48.2	51.5	58.3
90		c. *maximum day*	m^3/d	2,321	2,590	2,698	3,163	3,829	4,714	5,001	5,340	6,044
91		d. minimum day	m^3/d	774	863	899	1,054	1,276	1,571	1,667	1,780	2,015
92		e. *average hour on maximum day*	m^3/h	97	108	112	132	160	196	208	223	252
93		f. average hour on minimum day	m^3/h	32	36	37	44	53	65	69	74	84
94		g. average hour on average day	m^3/h	81	90	94	110	133	164	174	185	210
95	10	**Number of BHs required, if assumed 1 BH yield of 15 l/sec**	number	1	2	2	2	2	3	3	3	4

c) Spreadsheet page three: financial forecast

1. **Investment costs** at base year value are input for each of the five years according to the Water Board investment plan. From the information provided by the WB the following investment plan (with current costs) is proposed for:

S. No.	System component	Investment cost (ETB)
1	4 Boreholes drilling & construction	6,000,000.00
2	Pumps and Generators	4,000,000.00
3	Generator House	150,000.00
4	Two Service Reservoirs	600,000.00
5	One Pressure Break Tanks	90,000.00
6	10 km Pipelines	4,150,000.00
7	120 Public Fountains	1,200,000.00
8	Valve boxes	80,000.00
9	10 Cattle troughs	540,000.00
10	Rehabilitation old pipe and meter replacement	300,000.00
11	Engineering Cost	200,000.00
	Sub Total	17,310,000.00
	Contingency (5%)	865,500.00
	Total investment cost	**18,175,500.00**

A total of 18.2 million birr investment cost is allocated to implement the above activities in the next five years.

1 Expenses

a) Salary

No.	Personnel title	Number	Salary/month (Birr)	Total salary (Birr)
1	Manager	1	2,900.00	2,900.00
2	Technical Head	1	2,300.00	2,300.00
3	Finance Head	1	2,300.00	2,300.00
4	Administrator	1	2,300.00	2,300.00
5	Accountant Clerk	2	1,800.00	3,600.00
6	Customer Service	1	1,800.00	1,800.00
7	Bill Distributor	1	1,800.00	1,800.00
8	Secretary	1	1,800.00	1,800.00
9	Store Keeper	2	1,800.00	3,600.00
10	Archive	1	1,500.00	1,500.00
11	Bill Sealers	2	1,500.00	3,000.00
12	Purchaser	1	1,500.00	1,500.00
13	Driver	1	1,500.00	1,500.00
14	Water Meter Readers	5	1,200.00	6,000.00
15	Messenger	1	800.00	800.00
16	Plumbers	6	1,500.00	9,000.00
17	Guards	8	1,000.00	8,000.00
18	Water Point attendants	125	700.00	87,500.00
	Total Personnel Cost/Month	**161**		**141,200.00**
	Total Personnel Cost/day			**4,706.67**
	Total Personnel Cost/Year			**1,694,400.00**

The personnel cost of the Water Administration mainly salary of the staff as presented in table above. 141,200 birr has to be paid monthly to the employee of the service office.

b) Administration Costs

The WB checks its records for the previous year, and sees that 200,000 Birr were spent on stationary and printing, hospitality, telephone and postage, new office equipment and travel, transport, per diem. Inflation is known to be about 5 %. 210,000 birr is estimated for annual expense as administration costs.

c) Repair and Maintenance Costs

Annual repair and maintenance costs are usually calculated as a percentage of the original cost of the item. The following figures are typical:

- Boreholes: 0.5 % of original cost
- Pumping equipment: 3 % of original cost
- Electrical works: 3 % of original cost
- Pipes and civil works: 0.5 % of original cost

No.	System Component	Investment Cost (ETB)	% of yearly maintenance cost out of investment cost	Total maintenance cost (ETB)
1	4 Boreholes drilling & construction	6,000,000.00	0.5%	30,000.00
2	Pumps and Generators	4,000,000.00	4.0%	160,000.00
	Generator House	150,000.00	0.5%	750.00
3	Two Service Reservoirs	600,000.00	0.5%	3,000.00
4	One Pressure Break Tanks	90,000.00	0.5%	450.00
5	10 km Pipelines	4,150,000.00	0.7%	29,050.00
6	120 Public Fountains	1,200,000.00	4.0%	48,000.00
7	Valve boxes	80,000.00	0.4%	320.00
8	10 Cattle troughs	540,000.00	0.4%	2,160.00
	Total Maintenance Cost per year			**271,570.00**
	Total Maintenance Cost per day			**744.03**

271,570 birr per annum need to be saved each year to pay for repair and maintenance.

d) Chemical

Chlorine is required to disinfecting the pipeline and reservoirs. The estimated cost of chlorine is about 60,000 Birr.

e) Water Quality Test

Water quality tests that must be carried out twice per year to ensure that the water remains of a high quality and is safe to drink. Sampling and analysis should be carried out by approved government institutions. The WB should choose which institution is most suitable for them, based on location and cost estimates.

The physical, chemical and bacteriological tests are: Appearance – Taste, Colour Hazen – Apparent, Colour Hazen – True, Turbidity, Total suspended solids, Total dissolved solids, Conductivity, pH, Total alkalinity, Permanent hardness, Calcium, Magnesium, Iron,

Manganese, Chloride, Fluoride, Nitrite ,Nitrate, Ammonia, Sulphate, Total coliform, Faecal coliform.

The total estimated amount is Birr, 30,000 per year.

f) Energy Cost

i. Electricity

The cost of electricity or diesel depends on system characteristics. It is required 0.68 kwh to produce one cubic meter of water. The average rate of electricity is assumed to be 0.65 birr per kwh, thus the price of electricity t produce one cubic meter of water is about 0.44 birr per cubic meter. The average water production in the next five years would be 5,000 m^3/ day (150,000 m^3 /month). Thus, **66,000** birr per month is expected to pay by the water supply service office.

No.	Description	Unit	Consumption and Amount
1	Average energy consumption	kwh/month	26,585.54
2	Average water production	m^3/month	39,286.88
3	Energy consumption in kwh to produce 1 m^3 of water	Kwh/m^3	0.68
4	Average rate of energy	birr/kwh	0.70
5	Energy Cost	Birr/m^3	0.47
6	Average projected water production	m^3/month	99,170
	Total electricity cost	**birr/month**	**46,975.42**
	Total electricity cost	**birr/year**	**563,706.21**

The water supply service office is needed to save monthly Birr 46,975.42 for electricity payment.

ii. Diesel

During running out of electricity, it is proposed to use generator with the following aspects:

No.	Description	Unit	Input
1	Assume generator work hours	Hr/day	6.00
2	Unit cost of diesel	Birr/litter	20.00
3	Assume diesel consumption	litter/hr	6.00
4	Assume that electricity run out	Day/month	10.00
5	Diesel Cost	Birr/month	7,200.00
6	Lubricant (0.1* total diesel cost)	Birr/month	720.00
	Total diesel generator cost	Birr/month	7,920.00
	Total diesel generator cost	Birr/year	95,040.00

A total of 7,920.00 birr per month is needed to save by the water supply service office to keep the reliability of water to the consumers. This amount subject to change that depends on the availability of national electricity grid.

g) Replacement Costs

The replacement cost is set up by the WB to pay for certain major items that must be replaced after 10 to 25 years.

The annual cost of replacing such items is usually calculated as a percentage of the original cost for each item. The following figures are typical:

- Boreholes: 4 % of original cost (lifetime of borehole 25 years)
- Pumping equipment: 10 % of original cost (lifetime of pumping equipment 10 years)
- Electrical works: 10 % of original cost (lifetime of electrical works 10 years)
- Pipes and civil works: 4 % of original cost (lifetime of pipes and civil works 25 years)

No.	System Component	Investment Cost (ETB)	% of yearly replacement cost out of investment cost	Total maintenance cost (ETB)
1	4 Boreholes drilling & construction	6,000,000.00	4.0%	240,000.00
2	Pumps and Generators	4,000,000.00	10.0%	400,000.00
3	Generator House	150,000.00	4.0%	6,000.00
4	Two Service Reservoirs	600,000.00	4.0%	24,000.00
5	One Pressure Break Tanks	90,000.00	4.0%	3,600.00
6	10 km Pipelines	4,150,000.00	4.0%	166,000.00
7	120 Public Fountains	1,200,000.00	4.0%	48,000.00
8	Valve boxes	80,000.00	4.0%	3,200.00
9	10 Cattle troughs	540,000.00	4.0%	21,600.00
10	Rehabilitation old pipe and meter replacement	80,000.00	1	80,000
	Total replacement Cost per year			**992,400.00**
	Total replacement Cost per day			**2,718.90**

h) Other Cost:

Other costs can be involved as fuel cost, office rental and likes: Thus the 4% of the maintenance cost is taken as other costs, which is amounting Birr 276, 276.67 per year.

i) Summary of Expenses and tariff calculations

The following table summarized all expected expenses of the RPS water administration office and the calculated tariff to cover different expenses that are 1) O&M cost recovery, 2) O&M + replacement cost recovery and 3) capital cost recovery.

It. No.	Cost component	Tariff Amount in Birr/year of each cost component for each tariff type		
		O & M cost recovery tariff	**Full Cost Recovery Tariff**	**Total Capital Cost Recovery Tariff**
1	Salary Expenses	1,694,400.00	1,694,400.00	1,694,400.00
2	Administrative Cost	210,000.00	210,000.00	210,000.00
3	Repair and Maintenance cost	271,570.00	271,570.00	271,570.00
4	Water Quality Costs		30,000.00	30,000.00
5	Replacement cost		992,400.00	-
6	Energy Cost (Electricity & Diesel	658,746.21	658,746.21	658,746.21
7	Chemical Cost	60,000.00	60,000.00	60,000.00
8	Other Costs (4% of the maintenance costs)	276,276.67	276,276.67	276,276.67
9	Total Cost to be Recovered Cost for 15 years period			1,211,700.00
10	**Subtotal costs**	**3,170,992.87**	**4,193,392.87**	**4,412,692.87**
11	Inflation (5% of sub total cost)	158,549.64	209,669.64	220,634.64
12	**Total cost/Year**	**3,329,542.52**	**4,403,062.52**	**4,633,327.52**
13	**Total cost/day**	**9,122.03**	**12,063.18**	**12,694.05**
14	Average water supply required, (m^3/day)	**3,468.21**	**3,468.21**	**3,468.21**
15	**Tariff (Birr/m^3)**(13/14)	**2.63**	**3.48**	**3.66**
16	**Tariff Birr/ 20liters**	**0.053**	**0.070**	**0.073**

1 Tariff calculation process

Consumption Grades: Four types of consumption grades are recommended per month, as shown below.

- 0 to 3 m^3/month
- 3 to 6 m^3/month
- 6 to 9 m^3/month
- 9 to 12 m^3/month
- 9 m^3/month and above

The first category is taken as a base case for the tariff determination. The classification helps to establish progressive tariff rates for the urban areas.

Public Water Point Customers: The public tap consumers would use only (15*5*30=2,250) litters of water per month due to their income constraints, lower daily water demand, as well as relatively longer distance of the water source from their place of residence. It is not expected that public water point customers will exceed the first

gradation limit, and it is therefore assumed that the first cubic meter of water would meet their 100% consumption demand.

Domestic Customers: The domestic consumers would consume all of the different consumption grades of water.

- 0 to 3 m^3/month: 1 unit
- 3 to 6 m^3/month: 1.2 units
- 6 to 9 m^3/month: 1.4 units
- 9 to 12 m^3/month: 1.6 units
- 12 m^3/month and above: 1.8 units

Commercial and Institutional Customers:

- 0 to 3 m^3/month: 1 unit
- 3 to 6 m^3/month: 1.3 units
- 6 to 9 m^3/month: 1.6 units
- 9 to 12 m^3/month: 1.9 units
- 12 m^3/month and above: 2.2 units

Grade *proportion*: The various consumer groups consume various volumes of water per month and the magnitude of consumption from each consumption grades is presented in Table below.

Consumption Grade	Gradation Weight	Grade Proportion
PWP		
0 to 3 m^3/month:	1	100%
3 to 6 m^3/month:		0%
6 to 9 m^3/month:		0%
9 to 12 m^3/month:		0%
12 m^3/month and above:		0%
DPC		
0 to 3 m^3/month:	1	50%
3 to 6 m^3/month:	1.2	30%
6 to 9 m^3/month:	1.4	15%
9 to 12 m^3/month:	1.6	4%
12 m^3/month and above:	1.8	1%
CPC		
0 to 3 m^3/month:	1	5%
3 to 6 m^3/month:	1.3	15%
6 to 9 m^3/month:	1.6	20%
9 to 12 m^3/month:	1.9	40%
12 m^3/month and above:	2.2	20%
IPC		
0 to 3 m^3/month:	1	5%
3 to 6 m^3/month:	1.3	15%
6 to 9 m^3/month:	1.6	20%
9 to 12 m^3/month:	1.9	40%
12 m^3/month and above:	2.2	20%

Water Tariffs by Phase:

The minimum tariff as per the summary table is 2.63 birr per cubic meter as a flat rate to water point users . This rate change to prigrssiv block for domestic, commercial and

institutional customers as presented consumption grades above. Accordingly, the first, second and third phases would have different tariff structures. The base year is taken as 1 and the tariff rates for second and third phases are multiplied by 1.15 and 1.3, respectively. The income growth factors of the different phases are presented as below.

Phase	Year	Income Growth Factor
1	2017-2021	1.0
2	2022-2026	1.15
3	2027-2031	1.30

It is proposed that the tariff rates be increased in three phases. Table below presents the tariff rates of these three phases in terms of ETB/ m^3 of water consumption.

Customer Cataegory	Consumption Catagoy (birr/m^3)					Consumption Catagoy (birr/m^3)					Consumption Catagoy (birr/m^3)				
	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01	0.01 - 3.0	3.01 - 6.0	6.01 - 9.0	9.01 - 12.0	> 12.01
	Year 2017 - 2021					Year 2022 - 2026					Year 2027 - 2031				
PWP Tariff	2.63					3.02					3.81				
DPC Tariff	2.63	3.16	3.68	4.21	4.73	3.02	3.63	4.23	4.84	5.44	3.81	4.58	7.62	6.10	6.86
CPC Tariff	2.63	3.42	4.21	5.00	5.79	3.02	3.93	4.84	5.75	6.65	3.81	4.96	6.10	7.25	8.39
IPC Tariff	2.63	3.42	4.21	5.00	5.79	3.02	3.93	4.84	5.75	6.65	3.81	4.96	6.10	7.25	8.39

Proposed Tariff Rate of the Rural Areas

The rural customers are expected to cover the entire O&M costs of the project and therefore the tariff rate should necessarily be equal to the O&M costs which is calculated to be Birr 2.63/m^3) of water or 5 cents per 20 litter jerican. Any tariff rate below this would lead to the conclusion that the rural people are not able cover the O&M costs of the scheme.