SSIGL 1

NATIONAL GUIDELINES

For Small Scale Irrigation Development in Ethiopia

Project Initiation, Planning and Organization

November 2018

Addis Ababa

MINISTRY OF AGRICULTURE

National Guidelines for Small Scale Irrigation Development in Ethiopia

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Ministry of Agriculture
Small-Scale Irrigation Development Directorate
P. O. Box 62347
Tel: +251-1-6462355
Fax: +251-1-6462355
Email: SSIDdirectorate@moa.gov.et
SSIDdirectorate@gmail.com
eDMS (intranet): MoA SSID DMS (http://172.28.1.188:8080/DMS/login.jsp)
Website: www.moa.gov.et

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DISCLAIMER

Ministry of Agriculture through the Consultant and core reviewers from all relevant stakeholders included the information to provide the contemporary approach about the subject matter. The information contained in the guidelines is obtained from sources believed tested and reliable and are augmented based on practical experiences. While it is believed that the guideline is enriched with professional advice, for it to be successful, needs services of competent professionals from all respective disciplines. It is believed, the guidelines presented herein are sound and to the expected standard. However, we hereby disclaim any liability, loss or risk taken by individuals, groups, or organization who does not act on the information contained herein as appropriate to the specific SSI site condition.

FORWARD

Ministry of Agriculture, based on the national strategic directions is striving to meet its commitments in which modernizing agriculture is on top of its highest priorities to sustain the rapid, broad-based and fair economic growth and development of the country. To date, major efforts have been made to remodel several important strategies and national guidelines by its major programs and projects.

While efforts have been made to create access to irrigation water and promoting sustainable irrigation development, several barriers are still hindering the implementation process and the performance of the schemes. The major technical constrains starts from poor planning and identification, study, design, construction, operation, and maintenance. One of the main reasons behind this outstanding challenge, in addition to the capacity limitations, is that SSIPs have been studied and designed using many ad-hoc procedures and technical guidelines developed by various local and international institutions.

Despite having several guidelines and manuals developed by different entities such as MoA (IDD)-1986, ESRDF-1997, MoWIE-2002 and JICA/OIDA-2014, still the irrigation professionals follow their own public sources and expertise to fill some important gaps. A number of disparities, constraints and outstanding issues in the study and design procedures, criteria and assumptions have been causing huge variations in all vital aspects of SSI study, design and implementation from region to region and among professionals within the same region and institutions due mainly to the lack of agreed standard technical guidelines. Hence, the SSI Directorate with AGP financial support, led by Generation consultant (GIRDC) and with active involvement of national and regional stakeholders and international development partners, these new and comprehensive national guidelines have been developed.

The SSID guidelines have been developed by addressing all key features in a comprehensive and participatory manner at all levels. The guidelines are believed to be responsive to the prevalent study and design contentious issues; and efforts have been made to make the guidelines simple, flexible and adaptable to almost all regional contexts including concerned partner institution interests. The outlines of the guidelines cover all aspects of irrigation development including project initiation, planning, organizations, site identification and prioritization, feasibility studies and detail designs, contract administration and management, scheme operation, maintenance and management.

Enforceability, standardization, social and environmental safeguard mechanisms are well mainstreamed in the guidelines, hence they shall be used as a guiding framework for engineers and other experts engaged in all SSI development phases. The views and actual procedures of all relevant diverse government bodies, research and higher learning institutions, private companies and development partners has been immensely and thoroughly considered to ensure that all stakeholders are aligned and can work together towards a common goal. Appropriately, the guidelines will be familiarized to the entire stakeholders working in the irrigation development. Besides, significant number of experts in the corresponding subject matter will be effectively trained nationwide; and the guidelines will be tested practically on actual new and developing projects for due consideration of possible improvement. Hence, hereinafter, all involved stakeholders including government & non-governmental organizations, development partners, enterprises, institutions, consultants and individuals in Ethiopia have to adhere to these comprehensive national guidelines in all cases and at all level whilst if any overlooked components are found, it should be documented and communicated to MOA to bring them up-to-date.

Therefore, I congratulate all parties involved in the success of this effort, and urge partners and stakeholders to show a similar level of engagement in the implementation and stick to the guidelines over the coming years.

H.E. Dr. Kaba Urgessa
State Minister, Ministry of Agriculture

SMALL SCALE IRRIGATION DEVELOPMENT VISION

Transforming agricultural production from its dependence on rain-fed practices by creating reliable irrigation system in which smallholder farmers have access to at least one option of water source to increase production and productivity as well as enhance resilience to climate change and thereby ensure food security, maintain increasing income and sustain economic growth.

ACKNOWLEDGEMENTS

The preparation of SSIGLs required extensive inputs from all stakeholders and development partners. Accordingly many professionals from government and development partners have contributed to the realization of the guidelines. To this end MOA would like to extend sincere acknowledgement to all institutions and individuals who have been involved in the review of these SSIGLs for their comprehensive participation, invaluable inputs and encouragement to the completion of the guidelines. There are just too many collaborators involved to name exhaustively and congratulate individually, as many experts from Federal, regional states and development partners have been involved in one way or another in the preparation of the guidelines. The contribution of all of them who actively involved in the development of these SSIGLs is gratefully acknowledged. The Ministry believes that their contributions will be truly appreciated by the users for many years to come.

The Ministry would like to extend its appreciation and gratitude to the following contributors:

- Agriculture Growth Program (AGP) of the MoA for financing the development and publication of the guidelines.
- The National Agriculture Water Management Platform (NAWMP) for overseeing, guidance and playing key supervisory and quality control roles in the overall preparation process and for the devotion of its members in reviewing and providing invaluable technical inputs to enrich the guidelines.
- Federal Government and Regional States organizations and their staff for their untiring effort in reviewing the guidelines and providing constructive suggestions, recommendations and comments.
- National and international development partners for their unreserved efforts in reviewing the guidelines and providing constructive comments which invaluably improved the quality of the guidelines.
- Small-scale and Micro Irrigation Support Project (SMIS) and its team for making all efforts to have quality GLs developed as envisioned by the Ministry.

The MOA would also like to extend its high gratitude and sincere thanks to AGP's multi development partners including the International Development Association (IDA)/World Bank, the Canada Department of Foreign Affairs, Trade and Development (DFATD), the United States Agency for International Development (USAID), the Netherlands, the European Commission (EC), the Spanish Agency for International Development (AECID), the Global Agriculture and Food Security Program (GAFSP), the Italy International Development Cooperation, the Food and Agriculture Organization (FAO) and the United Nations Development Program (UNDP).

Moreover, the Ministry would like to express its gratitude to Generation Integrated Rural Development Consultant (GIRDC) and its staff whose determined efforts to the development of these SSIGLs have been invaluable. GIRDC and its team drafted and finalized all the contents of the SSIGLs as per stakeholder suggestions, recommendations and concerns. The MoA recognizes the patience, diligence, tireless, extensive and selfless dedication of the GIRDC and its staff who made this assignment possible.

Finally, we owe courtesy to all national and International source materials cited and referred but unintentionally not cited.

Ministry of Agriculture

DEDICATIONS

The National Guidelines for Small Scale Irrigation Development are dedicated to Ethiopian smallholder farmers, agro-pastoralists, pastoralists, to equip them with appropriate irrigation technology as we envision them empowered and transformed.

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ACRONYMS

AfDB	African Development Bank
AGP	Agricultural Growth Program
BoANR	Bureau of Agriculture and Natural Resource
BOWIE	Bureau of Water, Irrigation and Energy
CAD	Computer Aided Design
CPA	Cooperative Promotion Agency
CPM	Critical Path Method
DA	Development Agent
DD	Detail Design
DEM	Digital Elevation Model
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
ESRDF	Ethiopian Social Rehabilitation, and Development Fund
EVDSA	Ethiopian Valley Development Study Authority
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
FS	Feasibility Study
GIRDC	Generation Integrated Rural Development Consultant
GPS	Global Positioning System
GTP	Growth Transformation Plan
HHI	House Hold Irrigation
HIV	Human Immunodeficiency Virus
ICSAA	Irrigation Construction and Scheme Administration Agency
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
ISF	Irrigation Service Fee
IWUA	Irrigation Water Use Association
IWUDC	Irrigation Water Users Design Committee
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
M & E	Monitoring and Evaluation

MDG	Millennium Development Goal
MOAL	Ministry of Agriculture and Livestock
MOANR	Ministry of Agriculture and Natural Resource
MOFED	Ministry of Finance and Economic Development
MOWIE	Ministry of Water, Irrigation and Electricity
NGO	Non-governmental Organization
O & M	Operation and Maintenance
OIDA	Oromia Irrigation Development Authority
OWMEB	Oromia Water, Mine and Energy Bureau
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PCO	Project Coordination Office
PIPD	Project Initiation and planning document
PMU	Project Management Unit
RLAU	Rural Land Use Administration and Use
SDG	Sustainable Development Goal
SMS	Subject Matters Specialist
SNNPRS	Southern Nations, Nationalities and Peoples' Regional State
SSI	Small Scale Irrigation
SSID	Small Scale Irrigation Development
SSIGL	Small Scale Irrigation Guideline
SSIP	Small Scale Irrigation Project
SSIS	Small Scale Irrigation Scheme
ToR	Terms of Reference
USAID	United States Agency for International Development
VAT	Value Added Tax
WB	World Bank
WUA	Water Use Association

PREFACE

While irrigation development is at the top of the government's priority agendas as it is key to boost production and improve food security as well as to provide inputs for industrial development. Accordingly, irrigated land in different scales has been aggressively expanding from time to time. To this end, to enhance quality delivery of small-scale irrigation development planning, implementation and management, it has been decided to develop standard SSI guidelines that must be nationally applied. In September 2017 the Ministry of Agriculture (MoA) had entrusted Generation Integrated Rural Development Consultant (GIRDC) to prepare the National Small-scale Irrigation Development Guidelines (SSIGLs).

Preparation of the SSIGLs for enhancing development of irrigated agriculture is recognized as one of the many core initiatives of the MoA to improve its delivery system and achieve the targets in irrigated agriculture and fulfill its mission for improving agricultural productivity and production. The core objective of developing SSIGLs is to summarize present thinking, knowledge and practices to enable irrigation practitioners to properly plan, implement and manage community managed SSI schemes to develop the full irrigation potential in a sustainable manner.

As the SSIGLs are prepared based on national and international knowledge, experiences and practices, and describe current and recommended practice and set out the national standard guides and procedures for SSI development, they serve as a source of information and provide guidance. Hence, it is believed that the SSIGLs will contribute to ensuring the quality and timely delivery, operation and maintenance of SSI schemes in the country. The SSIGLs attempt to explain and illustrate the important concepts, considerations and procedures in SSI planning, implementation and management; and shall be used as a guiding framework for professionals engaged in SSI development. Illustrative examples from within the country have been added to enable the users understand the contents, methodologies presented in the SSIGLs.

The intended audiences of the SSIGLs are government organizations, NGOs, CSOs and the private sector involved in SSI development. Professionally, the SSIGLs will be beneficial for experienced and junior planners, experts, contractors, consultants, suppliers, investors, operators and managers of SSI schemes. The SSIGLs will also serve as a useful reference for academia and researchers involved and interested in SSI development. The SSIGLs will guide to ensure that; planning, implementation and management of SSI projects is formalized and set procedures and processes to be followed. As the SSIGLs provide information and guides they must be always fully considered and applied by adapting them to the local specific requirements.

In cognizance with the need for quality SSIGLs, the MoA has duly considered quality assurance and control during preparation of the guidelines. Accordingly, the outlines, contents and scope of the SSIGLs were thoroughly discussed, reviewed and modified by NAWMP members (senior professionals from public, national and international stakeholder) with key stakeholders in many consultative meetings and workshops. Moreover, at each milestone of SSIGL preparation, resource persons from all stakeholders reviewed and confirmed that SSIGLs have met the demands and expectations of users.

Moreover, the Ministry has mobilized resource persons from key Federal, National Regional States level stakeholders and international development partners for review, validation and endorsement of the SSIGLs.

Several hundreds of experienced professionals (who are very qualified experts in their respective fields) from government institutions, relevant private sector and international development partners have significantly contributed to the preparation of the SSIGLs. They have been involved in all aspects of the development of SSIGLs throughout the preparation process. The preparation process included a number of consultation meetings and workshops: (i) workshop to review inception report, (ii) workshop on findings of review of existing guidelines/manuals and proposed contents of the SSIGLs, (iii) meetings to review zero draft SSI GLs, (iv) review workshop on draft SSI GLs, (v) small group review meetings on thematic areas, (vi) small group consultation meetings on its final presentation of contents and layout, (vii) consultation mini-workshops in the National States on semi-final versions of the SSIGLs, and (viii) final write-shop for the appraisal and approval of the final versions of SSIGLs.

The deliberations, concerns, suggestions and comments received from professionals have been duly considered and incorporated by the GIRD Consultant in the final SSIGLs.

There are 34 separate guidelines which are categorized into the following five parts concurrent to SSI development phases:

Part-I. Project Initiation, Planning and Organization Guideline which deals with key considerations and procedures on planning and organization of SSI development projects.

Part-II. Site Identification and Prioritization Guideline which treats physical potential identification and prioritization of investment projects. It presents SSI site selection process and prioritization criteria.

Part-III. Feasibility Study and Detail Design Guidelines for SSID dealing with feasibility study and design concepts, approaches, considerations, requirements and procedures in the study and design of SSI systems.

Part-IV. Contract Administration and Construction Management Guidelines for SSI development presents the considerations, requirements, and procedures involved in construction of works, construction supervision and contract administration.

Part-V. SSI Scheme Management, Operation and Maintenance Guidelines which covers SSI Scheme management and operation.

Moreover, Tools for Small Scale Irrigation development are also prepared as part of SSIGLs.

It is strongly believed and expected that; the SSIGLs will be quickly applied by all stakeholders involved in SSI development and others as appropriate following the dissemination and familiarization process of the guidelines in order to ensure efficient, productive and sustainable irrigation development.

The SSIGLs are envisioned to be updated by incorporating new technologies and experiences including research findings. Therefore, any suggestions, concerns, recommendations and comments on the SSIGLs are highly appreciated and welcome for future updates as per the attached format below. Furthermore, despite efforts in making all types of editorial works, there may still errors, which similarly shall be handled in future undated versions.

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UPDATING AND REVISIONS OF GUIDELINES

The GLs are intended as an up-to-date or a live document enabling revisions, to be updated periodically to incorporate improvements, when and where necessary; may be due to evolving demands, technological changes and changing policies, and regulatory frameworks. Planning, study and design of SSI development interventions is a dynamic process. Advancements in these aspects are necessary to cope up with the changing environment and advancing techniques. Also, based on observation feedbacks and experiences gained during application and implementation of the guidelines, there might be a need to update the requirements, provisions and procedures, as appropriate. Besides, day-by-day, water is becoming more and more valuable. Hence, for efficient water development, utilization and management will have to be designed, planned and constructed with a new set up of mind to keep pace with the changing needs of the time. It may, therefore, be necessary to take up the work of further revision of these GLs.

This current version of the GLs has particular reference to the prevailing conditions in Ethiopia and reflects the experience gained through activities within the sub-sector during subsequent years. This is the first version of the SSI development GLs. This version shall be used as a starting point for future update, revision and improvement. Future updating and revisions to the GLs are anticipated as part of the process of strengthening the standards for planning, study, design, construction, operation and management SSI development in the country.

Completion of the review and updating of the GLs shall be undertaken in close consultation with the federal and regional irrigation institutions and other stakeholders in the irrigation sub-sector including the contracting and consulting industry.

In summary, significant changes to criteria, procedures or any other relevant issues related to technological changes, new policies or revised laws should be incorporated into the GLs from their date of effectiveness. Other minor changes that will not significantly affect the whole nature of the GLs may be accumulated and made periodically. When changes are made and approved, new page(s) incorporating the revision, together with the revision date, will be issued and inserted into the relevant GL section.

All suggestions to improve the GLs should be made in accordance with the following procedures:

I. Users of the GLs must register on the MOA website: Website: www.moa.gov.et
II. Proposed changes should be outlined on the GLs Change Form and forwarded with a covering letter or email of its need and purpose to the Ministry.
III. Agreed changes will be approved by the Ministry on recommendation from the Small-scale Irrigation Directorate and/or other responsible government body.
IV. The release date of the new version will be notified to all registered users and authorities.

Users are kindly requested to present their concerns, suggestions, recommendations and comments for future updates including any omissions and/or obvious errors by completing the following revisions form and submitting it to the Ministry. The Ministry shall appraise such requests for revision and will determine if an update to the guide is justified and necessary; and when such updates will be published. Revisions may take the form of replacement or additional pages. Upon receipt, revision pages are to be incorporated in the GLs and all superseded pages removed.

Suggested Revisions Request Form (Official Letter or Email)

To: ----------
From: ----------
Date: ----------
Description of suggested updates/changes: Include GL code and title, section title and # (heading/subheading #), and page #.

GL Code and Title	Date	Sections/ Heading/Subheading/ Pages/Table/Figure	Explanation	Comments (proposed change)

Note that be specific and include suggested language if possible and include additional sheets for comments, reference materials, charts or graphics.

GLs Change Action

Suggested Change	Recommended Action	Authorized by	Date

Director for SSI Directorate**:** _____**Date:** _____

The following table helps to track initial issuance of the guidelines and subsequent Updates/Versions and Revisions (Registration of Amendments/Updates).

Revision Register

Version/Issue/Revision No	Reference/Revised Sections/Pages/topics	Description of revision (Comments)	Authorized by	Date

1 BACKGROUND

1.1 GENERAL

A Guideline is defined as a technical and an official recommendation indicating how tasks or works should be done; steps to follow; what sort of action should be taken and when to act during the execution process.

To accelerate irrigation development and at the same time increasing the effectiveness and efficiency of SSI, improving the knowledge and capacity of the sector has a paramount importance of providing updated and comprehensive technical guidelines together with other inputs.

The country national plans, which spell a range of economic and social objectives and strategies meant to enhance growth and developments. Projects provide an important means by which investment and other development expenditures foreseen in the plans can be clarified, justified and realized. A project is a complex set of activities where resources are used in the expectation of returns and which lends itself to planning, organizing, financing and implementing as a unit.

Project planning and organization is an initial stage for the execution of projects. Planning is a core area of all the stages that shape the framework and guides the overall project phases in its implementation of sequential procedures. These stages of planning should be in place prior to the start of projects in the irrigation implementation institutions of the respective regions.

Accordingly, the planning is prepared for each of the phases and includes - physical plan with critical path, financial plan, person power, logistics and other resources required for each phase. The plan begins with the project phase, idea initiation, and formulation of the projects. The schedule, inputs, and outputs depend on the type of project phases. Therefore, formulation of project phases is an initial aspect of project planning and organization as covered in this guideline.

Review of the respective region existing and working guidelines and manuals indicate that most of the regional state's guidelines do not consider one of the important phases' i.e. The planning and organization aspect as an independent project phase. Therefore, this guideline is prepared with the intention of managing, resolving the problems of Irrigation project planning and organization.

1.2 OBJECTIVES

The main objective of this guideline is to produce a more inclusiveand simplified directionto assist professionals (planner, manager, decision maker, implementers)to clearly set the procedures, criteria, and guidelines to be used in proper planning and organization of irrigation projects.

According to the previous work assessment, not all regional states guidelines/ manuals gave adequate attention for planning and organization of an irrigation project. This guideline supposed to be a major springboard for site-specific irrigation development proposal. Considering the above indicated and other gaps, this guideline includes all-important components and procedures of small-scale irrigation project planning and organization issues.

1.3 SCOPE OF THE GUIDELINE

The guideline is prepared to provide essential directives to experts/planners/managers to carry out the planning and organization of small-scale irrigation projects, and it also captures the major gaps identified in the previous guidelines.

In this respect, planning aspects of each phase will be discussed, namely: SSIP Initiation, planning, and Organization, Planning for Site Identification & Investment Prioritization, Planning for Feasibility Studies, Detail Design and Tender Document Preparation, Planning for Contract Administration, Construction Supervision and Construction, planning for Operation and Management phases including Monitoring and evaluation.

1.4 THE NEED FOR PROJECT INITIATION, PLANNING, AND ORGANIZATION

Project initiation, planning, and organizations are the processes of formulating work procedures or methods for arranging resources (person power, logistics, budgets, and materials), time schedules and implementing identified project works or activities. Similarly, a project is an essential part of the overall planning and composed of prescribed activities, time boundary, costs and deliverables as a final benefit for intended target beneficiaries. Sustainable irrigation project implementation and development requires an organized project idea initiation, planning and organization tasks.

However, the absence of organized project planning and organization will result in poor potential site identification, study and design, which in turn resulted in the impediment of implementations. Similarly, weak planning and organization will result in ineffective contract administration and construction supervision, including construction itself that automatically lead to failure of SSI projects. These again drop to poor operation and maintenance condition and in most time resulted in non-functionality of most irrigation schemes. Therefore, prior to any irrigation project development, good project initiation, planning, and organization, including quality control will endure all the issues and problems at each phase and resulted in sustainable SSI scheme development.

2 PLANNING OVERVIEW

The government of Ethiopia has a national macro-level development plan and adopts national development plans, policies and strategies every five years. Accordingly, the national plans, policies, and strategies have emphasized on both smallholder and commercial irrigation and drainage development as major drivers of agricultural growth and transformation of the country. Some of the policies, strategies and national plans linked with irrigation development includes: Water Resources Management Policy (2001), Water Sector Strategy (2001), Agriculture and Rural Development Policy and strategies (2003), Plan for Accelerated and Sustained Development to End Poverty (2005), Agriculture Sector Policy and Investment Framework (2009), Growth and Transformation Plan-I (2010), Small Scale Irrigation Capacity Building Strategy (2011), Climate Green Resilient Economy Strategy (2013), Growth and Transformation Plan-II (2015).

Similarly, the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) adopted for the period 2005/6-2009/10 has given prime importance for rural and agricultural development with the aims for accelerated, sustained and people-centered economic development.

Following the PASDEP, Growth and Transformation Plan (GTP-I and II) adopted for the period (2009/10-2014/15) and (2016/17-2020/2021) is directed to achieve an economy which has a modern and productive agricultural sector with enhanced technology and an industrial sector that plays a leading role in the economy; to sustain economic development and secure social justice; and, increase per capita income of citizens so that it reaches the level of those in middle-income countries.

In the planning direction of GTP, smallholder farming will continue to be the major source of agricultural growth with the shift into commercialization. To complement this development objective, concentrated policy support should be provided for private investment in large commercial farms. Fundamentals of the strategy include the shift to producing high value crops, a special focus on high-potential areas, facilitating the commercialization of agriculture, supporting the development of small and large-scale commercial agriculture where it is feasible. In general, agriculture will direct on placing major effort to support the intensification of marketable farm products by small and large farmers for domestic and export market.

During the GTP period, it is planned to transform agriculture sector to a high growth path in order to ensure the food security challenge of the country and to curb inflationary pressure as well as broadening the export base of the country. The sector also serves as a springboard to bring about structural transformation in the long run through contribution to industrial growth. To promote multiple cropping, better cope with climate variability, and ensure food security, the Growth and Transformation Plan (GTP) has adopted an agricultural development and focus strategies include;

- Scaling up production and productivity of land, labor and available natural resource use based on agro ecological suitability.
- Specialization, diversification & strengthening agricultural production and marketing system
- Strengthen extension service for majorities of smallholders
- Provide support for the private large-scale commercial farms.
- Promotes the appropriate use of rain water and another water source,
- Improve water use efficiency by expanding of irrigation schemes with special attention to small-scale irrigation schemes development.

- Strengthen public participation in the planning and implementation and take affirmative action is to enhance women's participation at woreda and kebele level; engaging and mobilizing the public in the construction of local infrastructure development activities (road, schools, health stations, irrigation and others).

Similarly, GTP-II also prepared in a participatory approach in a more comprehensive manner and it assesses the gaps observed under GTP-I implementation process and tries to fill the gaps. In general, the agricultural Transformation Plan-II has adopted a range of interventions and public investments directed to basic infrastructure development mainly road, market infrastructures, and others to support and scale-up on the success in economic growth of the country. In line with the general development policy and strategic framework, several attempts underway in the study and design of small-scale irrigation project initiated by the respective regions with a vision towards water centered irrigated agriculture development for the smallholder benefit through efficient utilization of the existing water resource. These kinds and similar policies, strategies and regulations shall be analyzed during the planning of SSIP study and design and serves as an input to the formulation of the projects.

3 PROJECT PHASESES IN PERVIOUS GUIDELINES

In a review of existing guidelines, we discovered that different guidelines have different project phases for SSIPs having the same objectives. The regional states also adopt different phases. The following SSI project study and design phases are taken from existing reviewed guidelines and regional practices as adopted in their guidelines and SSIP Terms of References.

3.1 PROJECT PHASES PRACTICED IN THE REGIONAL STATES

The Terms of References prepared for conducting the study and design of SSIPs could serve as one of the sources for indicating the types of project phases practiced in Regional states. The aim of the TORs is to serve as a guiding framework for project studies and design, but it contains implementation and operation aspects. Despite these limitations, they provide an indication for project phases, specifically for study phases. In this respect, some TOR is referred and reviewed. The available regional TORs that are reviewed and presented here refer to Oromia, SNNPRS, Amhara, Tigray and Benishangul Gumuz Regional States as well as AGP project at the Federal level.

3.1.1 SSI project phases in Oromia regional state

Under the scope of the study presented under the TOR entitled “Oromia Water, Mineral& Energy Bureau, for feasibility & detail design studies of small scale irrigation projects”, it was mentioned that the OWMEB and later Oromia Irrigation Development Authority (OIDA) conducts a reconnaissance survey or prefeasibility study before feasibility study and detail design. The point that has to be taken from this presentation is that the bureau performs reconnaissance and prefeasibility tasks and contract out a feasibility study and detail design then construction.

This approach has limitations’ It is not clear whether the reconnaissance survey and the prefeasibility studies are performed under a single or different phase. Second, the planning aspect is not mentioned as a component of project phases. The process of Implementation and operational phases were not clearly given. Moreover, the project identification is not discussed and is not known whether it is skipped or combined with reconnaissance.

3.1.2 SSI project phases in SNNPRS

One of the Terms of Reference issued in the RFP by Irrigation Development and Scheme Administration Agency for the study and design of Small Scale Irrigation Schemes (SNNP, Hawasa, June 2015,) indicated different project phases that the consultants have to follow to conduct the assignment provided.

Here, the assignment of the consultancy service is proposed to have three stages: 1) Identification of most potential/prospective sites, 2) Preliminary Planning & Design or Reconnaissance/pre-feasibility study for identified/prioritized SSIP and 3) Feasibility Studies and Detailed Designs including preparation of bidding documents and Operation and Maintenance (O & M) manuals of the most potential SSIP.

Preliminary planning, prefeasibility, and reconnaissance/pre-feasibility studies are mentioned to be considered as one. However, it looks like these phases of the project preparations are mixed. It is not clear how they practice other project phases, which are Project Planning and Organization,

contract administration, and construction supervision phase, and operation and maintenance phases, as there is no SSIP guideline in the region.

The TOR demanded to undertake a mixed phase's work at a time since it lumped Preliminary Planning & Design or Reconnaissance/pre-feasibility works into one. On the other hand, the identification stage can involve all the tasks of resource identification, reconnaissance, prefeasibility and preliminary design works for all potential candidate projects and then transfer to feasibility and detail design works for a viable project screened using investment prioritization criteria.

3.1.3 SSI project phases in Benishangul Gumuz regional state

The TOR of this region, under the scope of services, states that the given project is studied at identification level and the next assignment is aimed at the execution of the pre-feasibility study, feasibility study and detail design and preparation of operation and maintenance manual. These studies are expected to be accomplished within two major phases. These phases consist of Phase one - Prefeasibility and preliminary design and Phase two - detail design and operation and maintenance preparation. Therefore, the entire project consists of 3 steps which are a) identification phase, b) Prefeasibility and preliminary design phase and c) detail design and preparation of operation & maintenance.

The TOR is provided for selected projects, which are given by name and location and does not indicate if this is the Regional state standard project phases. In this respect, it does not show the level of identification study whether the reconnaissance study is included in it or not. Besides, Project Planning and Organization phase is not shown.

There is no mention of any procedures /standard steps to adopt for implementation and operation, which include contract administration & construction supervision.

3.1.4 SSI project phases in Amhara regional state

One of the Terms of Reference issued by the Bureau of Water Resource Development for the study and design of Small Scale Irrigation Schemes of Agricultural Growth Program was referred to here.

As it mentioned under the introduction part of the TOR, regional governments have conducted identification study, reconnaissance surveys and/or prefeasibility for the SSIPs under consideration. Apart from mentioning the accomplished names of studies, it is not, however, clear whether these mentioned types of studies are conducted in one single phase or not. The scope of the service given in the TOR is mentioned to be limited to the Feasibility Study and Design of SSIP schemes. Besides, Operation and Maintenance Manual and preparation of tender documents are provided as part of the assignment.

We have fallen from a review of these TOR and discussions with regional staffs that; SSIP project study steps followed in the Amhara Regional state is not yet standardized.

3.1.5 SSI project phases in Tigray regional state

The guidelines which have been prepared (but not yet finalized) by the Tigray Water Resources Bureau are referred to identify the types of project cycles followed by the region and then augmented with regional stakeholder consultation.

One of the guidelines entitled “Tigray Water Resources Bureau, Socio economy Guidelines for Irrigation Projects” gave the different project cycles for the study in their sequential orders. As per this guideline, project cycles to be followed are 1) reconnaissance, 2) pre-feasibility, 3) feasibility and 4) Detail design. In here tender document preparation, contract management, and construction supervision are missed.

As could be referred in another guideline entitled “Guideline Manual on Feasibility Study, Detail Design of Irrigation Projects”, the project cycles provided in different places in the guideline document could be summarized as 1) Project Identification, 2) Feasibility study and preliminary design & Costing, 3) Detail engineering design & Costing, 4) Tender document preparation & Reporting, and 5) Preparation of Operational manuals & Reporting. In here too contract management and construction supervision are missed.

The limitations in the region are; there are no clear, definitively established stages of project cycles, which declared as regional applied standard in the study, design, and implementation of SSIPs. There is a differencein project cycles between the different groups, for example, the first does not include identification and starts at the reconnaissance stage. Though it looks like shortened and time effective, the second approach has not made clear how to handle reconnaissance and prefeasibility study. Therefore, there is a need to standardize the project cycle.

3.2 PROJECT PHASES IN PERVIOUS GUIDELINES

Project phases are not clearly and separately provided in the existing national and regional guidelines. There is an attempt at referring to different project phases that should be followed in the preparation and implementation of SSIPs. Different guidelines are reviewed; the findings are summarized as follows. The result shows that different guidelines recommended different phases.

i. The guideline, Manuals and Standard Design of Small and Medium Scale Irrigation Projects in Ethiopia, the FDRE Ministry of Water Resources, July 2002

Different types of project phases are provided within one of the guidelines under the title of “Part E: - Study Guideline for Irrigation”. The document simply explained conventional project cycles, which are 1) preparation for project formulation & identification 2) reconnaissance 3) pre-feasibility 4) feasibility 5) detailed design 6) construction and 7) monitoring & evaluation.

Unlike the conventional project cycle for the study of small and medium scale irrigation projects, the guideline lumped the three phases. (I) Preparation for project formulation, (2) reconnaissance and (3) pre-feasibility as one stage and named "identification and reconnaissance phase" followed by the feasibility stage. Thus, the guideline proposed four phases namely I) identification and reconnaissance 2) feasibility 3) detailed design and 4) construction. It also stated that the adoption of the convention project cycle is not ruled out if circumstances warrant its use.

The guideline does not consider the planning aspect as an independent project phase and is provided under a title of the project. Besides, the construction phase is given in its broad sense without distinctively sub-classifying into contract administration & construction supervision. Operation and maintenance aspects have not given due emphasis.

ii. Guidance for Oromia Irrigation Development Project Implementation, Japan International Cooperation Agency (JICA) and Oromia Irrigation Development Authority (OIDA), May 2014

Phases of SSIPs in this manual are discussed in "steps in the study and design of irrigation projects "provided under the title of "study & design" guideline. They are given as 1) Resource Identification, 2) Pre-Feasibility (some part) & 3) Feasibility (some part of Pre-feasibility and Feasibility) and Basic Design. The pre-feasibility study is split into two parts. Some parts of the study are undertaken at the pre-feasibility phase while the remaining part of the feasibility stage. Resource identification is executed before the pre-feasibility study. The last stage is the design stage, which is expected to be continued right after the result of the feasibility study is found to be promising for the continuation of design work.

Resource identification is not supported with prioritization and ranking steps and thus will not enable to help determine which project to proceed and which projects to be rejected or postponed. Besides, splitting the prefeasibility phase into two phases of prefeasibility and partial feasibility studies will not lead to conclude the potentiality and alternative options of the project that has to be promoted to the further level of studies. This phase should show the decision whether to study the proposed project further without incurring additional resources at the latter stage of the feasibility level. Similarly, the feasibility study should take all its own contents instead of performing some of the tasks of prefeasibility studies.

The proposed phases of resource identification and prefeasibility level are thus not established in the way, which can reduce cost and time, whereas they transfer the decision to invest, or not to the feasibility level. The prefeasibility and feasibility studies have split indivisible study components, which however can result in an integrated decision criterion. In addition, instead of conducting detailed design after the results of the feasibility studies are known, it could have been better to undertake the preliminary level of designs so that the level of accuracy would significantly be improved later in detail design stage. The SSIP project stage proposed here are not common and will lead to ambiguities.

iii. Small Scale Irrigation Project (Gravity) Technical Handbook, Ethiopian Social Rehabilitation, and Development Fund (ESRDF) 1997

The different project phases provided within this guideline are under the title of "component 1, Guideline on SSIP", and provided under chapter title of Project Formulation and implementation cycle. The phases provided in this guideline are: 1) Project formulation and identification phase 2) Reconnaissance phase 3) Feasibility phase 4) Detailed design phase 5) construction phase and 6) Handing over. Besides, monitoring and evaluation are given at the center of the phases indicating that it is applicable to all the different phases.

From the above given project phases, whether the pre - feasibility study is omitted or combined with one of the indicated phases is not shown. Since the outputs of the pre-feasibility phase enable to show better projects, their tasks should have been seen to which project phase it is merged.

The construction phase is represented by physical implementation while contract administration and construction supervision are not included. The operation and maintenance phase is not shown which comes next to the completion of basic infrastructures. Project handing over is included as a milestone, which could also be applied after final design of projects.

iv. FAO, Irrigation Manual 2006

This manual provides various project stages in Table 1 under the title "Project development stages and activities for smallholder irrigation (Adapted from Chancellor and Hide, 1996)". These phases are classified into 8 distinct activities, namely 1) Project Identification, 2) Pre-Feasibility, 3) feasibility, 4) Conditional Approval, 5) Detailed Design, 6) Final Approval, 7) Implementation, 8) Monitoring and Evaluation. Such international experience of project phasing helps to establish project phase applicable for SSIPs. However, the following limitations are observed.

The initial stage, which is project planning is not included in this system. Project identification is perceived only from the Farmers' request for assistance point of view, doesn't include planned project interventions, and doesn't include ranking and prioritization aspects. The degrees of identification are limited to only requests coming from farmers and thus simply enter to a higher level of prefeasibility phase without undertaking screening activities. The two stages i.e. prefeasibility and feasibility studies take substantial time and cost whereas they are separately recommended as separate phases. Implementation is given without its breakdowns into contract administration and construction supervision components. Besides, project operation and maintenance are not provided as a separate phase. One of the important points provided in the document is approvals. However, as such, they should not take own phases and should be part of each phase whereby work is done shall be appropriately handled.

v. GUIDELINES FOR THE PREPARATION OF PUBLIC SECTOR PROJECTS, MOFED, JANUARY 2006

This guideline has proposed 3stages, namely 1) Project Ideas, Profiles and Preliminary Screening 2) Pre-Feasibility Study 3) Feasibility Study.

The guideline is prepared as a general framework for public sector projects and doesn't address SSIPs in particular. It focuses on mainly study parts. The reconnaissance study does not give consideration by the guideline. Besides, it discusses up to the study phase, whereas the implementation and operation phases are not included in the document.

Many of them are focusing on reducing the project phases and in doing so; they have underlined the importance of the resource identification stage though did not produce identification guideline. Description of Contract administration, operation, and maintenance phases are skipped by many of the reviewed documents. Site handover of project designs is not provided almost with all guidelines. In general, in all guidelines, a completed project cycle that ranges from identification up to operation and maintenance is not given.

Clear steps of project phases have not been adopted in all regions. Some part of Prefeasibility phase is given to the identification and feasibility of some stages, which reduces the importance of profitability studies. A preliminary design is omitted and only detail design is recommended. The

guideline focused on identification and planning phases and do not include operation and maintenance stages which are crucial activity.

The guidelines, which are prepared, by MOWIE and the then EVDSA concerns mainly for large and medium projects and contain many project phases, which are not applicable for SSIPs. The guideline that is prepared by MOFED serves for public sector projects in general and is not directly applicable for SSIPs.

4 SSIP POTENTIALS, OPPORTUNITIES, AND CHALLENGES

Understanding the SSI potential, opportunities and challenges significantly contribute to the initiation, planning, and organization of an irrigation development. There are number of documents that identified the country irrigation potential, opportunity and challenges, here below, some of the findings of these documents are presented.

4.1 SMALL-SCALE IRRIGATION (SSI) POTENTIAL AND DEVELOPMENT

Irrigation potentials are mostly considered as the availability of water; land and labor resources in a particular area. Several previous studies have attempted to estimate the irrigation potential of the country, focusing on the surface, ground or rainwater, or some combination of these. MOAL recently estimated SSI potential to be 10.10 Million hectares, of which 2.8 Million hectares are already developed. Others sources like IWMI's Irrigation Potential study (2010), reported that; Ethiopia has surface water, groundwater and rainwater sources that can develop for at least 5.3 million hectares of irrigation land. This means that up to one-sixth of the country's cultivable land could be irrigated through existing water sources – which is a significant increase from the current levels. This includes 3.7 Million hectares from gravity-fed surface water and an additional 1.1 and 0.5 Million hectares from groundwater and rainwater harvesting, respectively.

Recently, study conducted by MOWIE has indicated that the irrigation potential is over 20 million hectares. The water resource including ground water is estimated at more than 220BCM. All these cases prove that the available potential land, conducive climate, availability of surface, ground water resource and rainfall, favorable social and infrastructure condition of market linkages, availability of inputs, technologies, and support institutions will vitalize SSI development.

4.2 OPPORTUNITIES

The basic opportunistic considerations regarding irrigation developments in the country are but not limited to:-

- Government's policy, strategies, strong political commitment and encouragement to the private sector and public enterprise's involvement in irrigation development,
- Emphasis and priorities are given to irrigation in the growth and transformation plan of the country,
- Indigenous knowledge and the introduction of promising household water harvesting and micro-irrigation technologies,
- Abundant water resources, climate, and land suitability,
- Availability of inexpensive labor,
- Availability of suitable lands and water resources potential for irrigation developments, especially in arid areas of the country,
- The existence of some equipped institutions,
- Availability of well-established infrastructure
- Availability of local &neighboring markets,
- The existence of support from development partners
- Therefore, this guideline will support planners and implementers to initiate and plan SSID and make use of these immense potentials.

4.3 CHALLENGES

Small-scale Irrigation Development challenges can be explained as technical constraints and knowledge gaps are identified as follows but not limited to:-

- Inadequate awareness of irrigation water management as in irrigation scheduling techniques, water saving irrigation technologies, water measurement techniques, operation and maintenance of irrigation facilities,
- Inadequate knowledge of improved and diversified irrigation agronomic practices,
- Shortage of basic technical knowledge of irrigation pumps, drip irrigation system, sprinkler irrigations, surface and spate irrigation methods
- A scheme based approach rather than area/catchments based approach for the development of SSI Schemes,
- Inadequate baseline data and information on the development of water resources,
- lack of experience in the design, construction, and supervision of quality irrigation projects,
- Low productivity of existing irrigation schemes,
- Inadequate community involvement and consultation in scheme planning, construction, and implementation of irrigation development,
- Poor economic background of users for irrigation infrastructure development, to access irrigation technologies and agricultural inputs, where the price increment is not affordable to farmers

Therefore, SSI implementer shall initiate, plan and establish an SSI organization system, which will review, and assess the potential, opportunities, and constraints of the potential and to is developed SSI area.

5 SSIP PLANNING ANDDEVELOPMENT PHASES

5.1 GENERAL

Development of irrigation projects follows well-defined phases and each of them takes projects a step forward milestone in the development cycle, based on the findings from the actual and previous stages. The investigation and planning pass several milestones before projects are acceptable for implementation and subsequent operation. The stepwise and sequential development of small scale irrigation project planning shall be technically sound and economically prudent and time conscious. While planning SSIPs, the time element must be given priority to be substantially acceptable. Optimum planning time is often achieved through the reduction of planning steps without losing efficacy and quality in the process.

In this respect, planning time can be saved by joining identification, reconnaissance and prefeasibility studies under Site identification and prioritization phase as well as feasibility and detail design studies to go as one-step. Therefore, this guideline advises the following project phases;

I. Project Initiation, Planning and Organization Phase
II. Site Identification and Investment prioritization phase,
III. Feasibility Study and Detail Design Phase,
IV. Contract Administration, Construction and Construction Supervision and;
V. Operation and Management Phase

The brief description of this phase is mentioned below

5.1.1 Project initiation, planning, and organization

The project initiation stage is the first stage within the SSI development phase, as it involves starting up a new project. It identifies a need or an opportunity and devices a project to address that need. During the initiation, the problem or opportunity is identified, a possible solution will be hypothesized or defined, a project is formed, and a project team that can handle planning will be appointed to envisage and draw pertinent project notion. The notion may indicate the project type, location, crude scope and responsible institutions.

Project planning is the main and initial framework for all subsequent project study phases and includes overall preparation of types of project activities, schedules and resource identification and arrangement of time, human, Equipment and cost/budget. Thus, it enables to decide on what is to be achieved when to achieve, how to achieve it and enables to look forward and anticipate the future. Project planning, in general, is a core area of all the stages that shape framework and guides the overall project phases.

The planning stage produces a roadmap that shows various stages of project phases that have to be followed from identification up to operation and monitoring and evaluation phases of SSIP. The different types of project phases are as mentioned in the preceding section are identical, feasibility and detail design, contract administration, construction& construction supervision phase, and operation and maintenance phases. It also shows the size of irrigation systems that have to be followed for small-scale irrigation projects.

Project Organization and Management refer to the organization type (unit, team, project office etc.), Structure, roles, and responsibilities. Here the Project Coordination Office (PCO) can be modified according to the project context and size.

5.1.2 Site identification and prioritization

Identification is the second phase coming after the planning phase. It covers a wide variety of study components that will be undertaken to identify and select a better project. This phase is classified into two stages:

1) Identification/verification of potential irrigable sites and
2) Preliminary assessment of identifying sites, the establishment of ranking and prioritization

There may be many small-scale irrigation project possibilities and a large number of alternatives to be investigated. Each project has different physical properties and conditions, which have to be considered in order to serve as a basis for planning and design. Therefore, the first part which is the identification of potential irrigable sites are carried out as part of an inventory of water and land resources; to identify, register and catalogue irrigation resources existing in a given sub basin, areas and sites. They may also be carried out region wide to prepare inventories of the overall irrigation potentials.

The task that would be included in this phase are:

- Preparation of target potential area base map;
- Identification of regional, Woreda, kebele, and community level stakeholders;
- Consultations with stakeholders;
- Desk studies of water and land resources &
- Socioeconomic conditions;
- Field survey to verify desk findings;

Preliminary assessment and evaluation of water resources, engineering, geological and Geotechnical investigation, topographic condition, agricultural condition and experience, basic soil information, environmental and social impact analysis

The major outputs of this part of the study are lists of identified projects, which can potentially be irrigated in the small-scale irrigation system. Ranking and prioritization should be according to the site identification and investment prioritization guideline. This helps to save time and money by screening feasible projects at an early stage. At this phase, each discipline report in a consolidated way with the technical decision should be produced and submitted to the relevant decision body. The outputs of this phase should be evaluated and the decision would be reached to transfer to the next feasibility and the detail design stage.

5.1.3 Feasibility study and detail design

The third phase includes a feasibility study and detail design, which will be conducted in the best ranked and prioritized project decided at the identification phase. During the feasibility and detail design of comprehensive project studies and detail, final design should be conducted for each prioritized and ranked project. The feasibility study is the logical conclusion of planning investigations, technical and economic evaluation of a proposed project.

The types of studies and designs that would be performed at this stage are:

- Hydro-meteorological analysis and water resources planning,
- Topography survey and mapping,
- Soil survey and land suitability evaluation,
- Irrigated agronomy,
- Socio economy,
- Organization and management,
- Watershed management,
- Geology and Geotechnical investigation,
- Engineering
- Operation and maintenance
- Environmental Impact Assessment
- Financial and economic analysis

The output of this stage will be independent and synchronized technical report of each discipline including detail engineering working drawings. The report should clearly indicate the project technically, socially, financially feasibility and parallel the report should explain how the project can be Environmental and socially acceptable. Based on this report the client can decide to take the project to the next phase or to consider further options. The detail study and design of the projects should be done in accordance of ‘’The National Guideline for SSID-feasibility and detail design’’.

5.1.4 Contract administration, construction and construction supervision

The next phase in the life of the project is its infrastructure establishment, contract administration, and construction supervision. This phase includes the execution of the outputs of feasibility and detail design phase: - procurement of consultant and contractors, managing the contract, construction supervision and ensuring the quality. More specifically, implementation of different types of activities, which are listed in the contract, detail design and work drawings, commissioning, as built drawings, operation and maintenance manual, personnel training on the operation and management should be performed.

5.1.5 Operation and management phase

This phase in its inherent nature is continuing and routine in the life of a project. It commences when projects are completed or at some stage of project construction. This phase includes commissioning, the operation of structures, irrigation scheduling; agricultural development, capacity development (beneficiaries and nearby experts);maintenance and replacement, monitoring & evaluation.

6 PLANNING APPROACHES AND GUIDING PRINCIPLES

Planning, by definition, is the process of devising detailed methods for doing, arranging and implementing pre-determined works or activities. For different works, different planning approaches will be adopted and used. Some of the useful approaches employed in irrigation project planning are described as follows:-

6.1 DEMAND DRIVEN

The demand-led approach starts with the consent and participation of beneficiary communities in the project conception, preparation, construction, construction supervision, operation and management phases. Therefore, the project will be a demand driven type and implemented in such a way that the first initiation has to come from the beneficiary communities.

Considering the beneficiaries' incapability to identify their resources and needs in a manner that it is required in the form of the project proposal, governmental institutions can be involved to assist them in various forms such as promotional works, preparation of technical proposals and project preparation following the request of the project beneficiaries.

6.2 BOTTOM-UP APPROACH

Many Irrigation Projects have failed because farmers and local communities were not involved in the planning process. Farmers heavily populated on irrigation or watershed development project areas. Therefore, any irrigation development plan will not be successfully carried out without their support or participation.

Several ways and methods could be employed to involve farmers in the planning process. For instance, existing farmers' organizations can be included in the survey and planning body. Local irrigation development committees can be organized in planning and implementation purposes. Conducting individual irrigation project planning or group planning with the farmers will obtain details on how farmers will use, develop and protect their farms. Involving communities in planning irrigation infrastructures needs are also scopes of the bottom-up approach. During such planning processes, government policy and farmers' needs can be fully discussed. For irrigation development plans to be useful and workable, they should be well understood and accepted at the grass-root level.

6.3 ITERATIVE APPROACH

Irrigation Development Planning follows an iterative approach. Before a final plan is prepared, many studies, assessments, alternative water sources considerations, technology option, and revisions will have to be made. Generally, a preliminary or interim report should be made by gathering the results and reports of each team. After receiving comments from all the related sources, a review and revision period begins. The process may need to be repeated several times to find the best final results of the plan.

6.4 FLEXIBLE APPROACH

A final Irrigation plan is not like a blueprint of an irrigation system. The Irrigation Development Plan should be considered as a starting point and should be kept under constant monitoring and adjustment. There are many reasons for these cases. First, project life may cover more years and many unpredictable things, caused by nature or man-made, may happen during the period. New problems need new policies, approaches, and techniques to cope with them. Second, irrigation development is a complex task dealing with social, economic, cultural, legal, institutional, and physical problems. Difficulties may arise during implementation and many times the original strategies and goals need to be revised. Therefore, learning by doing is a very important process; hence, any such plan should be kept flexible.

Flexibility means leaving room for future adjustment, modification, or revision. Consequently, a monitoring and evaluation process should be built into the plan for this purpose. This also means that the plan targets should be progressive, i.e. smaller at the very beginning and gradually expanding with the added experience.

6.5 CATCHMENT-BASED PLANNING APPROACH

A number of SSI schemes have failed due to lack of catchment-based planning and development. Catchment-based planning is important from the viewpoint of water resource planning, assessment of soil and water conservation requirements and the preventing of conflicts between downstream and upstream users. Scheme based approach should be replaced by the catchment based approach. Hence, catchment water balance studies should be undertaken to determine the potentials we have in the given catchments.

Of all, demand is driven and participatory approach is the most effective and feasible approach if supported by the other planning tools as discussed above.

6.6 INTEGRATED AND INTERDISCIPLINARY APPROACH

The SSIP plan has to be integrated with other existing and planned developments mainly agricultural (extension, improved input & technology, research, market & value chain...etc.), natural resource (Watershed management, land use…etc.), Socioeconomic, and of all cross cutting issues such as women and youth, nutrition, climate smart / resilient, HIV, environment, ..etc.

Moreover, a shift from a single discipline approach to multi-disciplinary approach is crucial for sustainability and balanced emphasis that required interaction and technical agreement among the different disciplines, institutions and involving in irrigation and agriculture.

The interdisciplinary approach should be pursued among scientific disciplines, through cooperation and coordination among the relevant specialized organizations of government at all levels and within the extension services and between subject matter specialists. An interdisciplinary approach requires experts to persistently cross-disciplinary boundaries in their understanding of local realities and to recognize the structures, functions, systems, and patterns of interdependence that are the local reality.

The involvement of all relevant Federal, Regional, zone, Woreda and kebele, level stakeholders in the planning, study, design, construction, and operation of irrigation schemes should be given due attention. Woreda stakeholders should be given the opportunity to participate at all levels of implementation.

7 STACKHOLDERS PARTICIPATION, OWNERSHIP AND COMMITMENT

7.1 PRINCIPLES

Full participation of beneficiaries and all stakeholders in the planning, study, design, construction, and O&M works of SSI schemes has to be made more effective and real. The plan seeks to establish a sense of ownership and control by the beneficiaries over their own schemes.

Successful implementation requires participation in the planning and implementation process by the farmer, experts, planners, manager, and overall stakeholders, in order to create a sense of ownership of, and consequent commitment to, the project. This requires that the project planning process should allow time for the existing stakeholders and users to participate in, or preferably drive, the planning process, and for any potential losers to have a substantive influence on decisions that affect their future. Ownership and commitment by the users are unlikely to be achieved unless they consider that the project would meet their felt needs and they have a stake in the equity - that is, they share in or bear all of the investment costs.

Building ownership and commitment through participation has often been difficult to achieve in the past. The conventional sequence of identification/preparation, carried out against tight deadlines by external planning teams, has seldom allowed time for genuine participation (which should go beyond mere consultation), either by government staff or farmers. On implementation, government irrigation engineers, for their part, have usually seen irrigation only from engineering, rather than a farming or social, perspective. They have been reluctant to adopt participatory approaches with farmers, mainly because of a misplaced belief that farmers are unable to understand or contribute to technical matters, or because of concerns that participation might delay implementation or result in design changes that compromise the quality of the final product.

Undue delays in project approval and implementation are undesirable, not least for the farmers; but taking time over stakeholders' participation in planning does not necessarily mean delay. It can often pay dividends, by preparing the implementers, ensuring smooth start-up, building farmers' commitment to change, and might ultimately lead to more rapid implementation and a more sustainable development impact. Experience has shown that the ultimate scheme design usually benefits of involving the users in the planning process. Farmers, or at least those with some experience or knowledge of irrigation, from the poorest illiterate smallholder to the richest well-educated commercial farmer, usually have practical ideas of what works and what does not, from their detailed local knowledge of weather patterns, hydrology, soils, markets, and so on. Communities often have strong preferences regarding the nature and location of development that needs to influence planning, such as aligning a canal to avoid excavation in sacred ground.

Participation or consultative planning is essential in rehabilitation projects or the upgrading of traditional farmer-managed irrigation systems, to take advantage of the invaluable store of cross-disciplinary knowledge that farmers possess about the existing systems. Projects that involve the displacement and resettlement of people can only be planned and implemented effectively if those affected are involved in the planning process and their suggestions and concerns are taken fully into account.

As described above, involving farmers and stakeholders in system design can also often result in significant cost savings, particularly if the farmers themselves are expected to take a share in the equity by contributing to the investment costs. The sound engineering is essential, but it can nonetheless take account of the farmers' experiences and preferences. Yet engineers still too often ignore farmers, as a possible source of system design input and as a result, schemes are often inappropriately planned against the interest of the beneficiaries usually resulting in the un-functional system.

7.2 BUILDING ON EXISTING KNOWLEDGE AND INSTITUTIONS

In the planning process, first analyzing and building on local knowledge and practices before considering innovations should be the basic parameter. The beneficiaries' perspective should always be the point of departure for analysis of problems and solutions. Avoid an interventionist approach. Instead, during planning listen to farmers and strive to understand specific local contexts. Respond to the problems identified by beneficiaries and facilitate planning and solutions based on techniques/technology they see as acceptable and useful. Participate in the fulfillment of their goals and understand their opportunities and constraints. Strengthening institutions that already exist with the aim of increasing their effectiveness is important. Try to minimize the creation of new water management institutions over the traditional ones.

7.3 PUBLIC AWARENESS CREATION, COMMUNITY PARTICIPATION, AND OWNERSHIP

Adoption of irrigation technology is limited due to incorrect attitudes and perceptions about the importance of irrigated agriculture. A number of irrigation schemes have failed to achieve the intended goals due to lack of public awareness. Hence, the degree of public awareness of irrigated agriculture is of crucial importance, awareness creates forums for the beneficiaries, and other stakeholders shall be arranged. The beneficiary’s participant shall start right from the inception of the project throughout O & M including M & E

7.4 STAKEHOLDERS PARTICIPATION AND COMMITMENT

Based on the existing institutional arrangements MOA, BOWIE/OIDA & ICSAA, BoANR is the planning and implementing institutions of SSI projects. The MOA is responsible for the overall coordination of SSIP at Country level. However, the general direction is to use other existing institutional structure at all levels (Federal, Region, Zone, Woreda, Kebele, and beneficiary level) such as CPA, Marketing & Input Agency, Research organization, Youth & Sport, Women & Children, RLAU, EIA, IWUA its offices. These offices at all levels shall be encouraged for their full participation and demonstrate strong ownership and commitment in the planning, organization, and implementation of the SSI Project in their respective regions. The implementing institution or the organization needs to be more strengthened and empowered with respect to its planning and implementation capacity at a different level.

7.5 INVOLVEMENT AND COMMITMENT OF PRIVATE CONSULTANTS, CONTRACTORS, AND SUPPLIERS

Study, design, construction supervision even construction can be executed by implementers own force in most cases, if and only the implementing agent is supposed to have adequate capacity for the work, the work doesn't attract private organization due to different reasons, etc. Whatever, the case it is not advisable for the stakeholders to handle rather concentrates on regulatory and supervisory activities including technical support of the beneficiaries at all stages.

Therefore, it is recommended that; local consultants, contractors and technology suppliers shall be deployed for study and design, construction and construction supervision of irrigation schemes. These groups have to be encouraged to abide by; professional ethics, standards, contractual obligation, laws and regulations and above all prove their commitment. During planning, it has been made sure who is who and assesses the history and profile of these groups.

8 SSI PROJECT INITIATION

8.1 BASIS OF INITIATION

The first stage in the project life is to find the project idea, hence initiation is the first and the most essential stage in the irrigation project formulation. At this stage, multiple ideas regarding a required intervention in a specific area to address an identified problem have to be developed. This idea is usually hatched through discussion with the community, specialists or local leaders in a community as need-based issues and crystallized into the proposal. This stage is the idea generation phase at which the concerned community or the concerned government body or NGOs take the initiative to point out the idea of SSI development. The initiated idea might be a new project, modernization of traditional irrigation from rivers, springs, ground water development or water harvesting irrigation development.

The project, therefore, is conceived on the bases of: -

- **Community Needs:-**The project could be initiated based on the community needs and demands, which assists in an area to make available to all people the minimum amount of certain basic material requirement or services. A needs assessment survey establishes the urgency for interventions.
- **Resource availability:-**The project could be proposed with the existing opportunity to make profitable use of available resources in a particular area. The resources could be land, water, existing labor and others.
- **Natural calamity:-**The project could be proposed for hedging against the adverse effect of natural events as drought or flood occurrences in an area.
- **Displacement of peoples from their land:-** the need may arise due to the displacement of people from their land for other public and infrastructure development.
- **Market demand:-**The market opportunities, which are available in the domestic or overseas, could be the point of focus for project formulation.
- **Technology:-**The project could also be proposed to make use of available technologies and to enhance production and productivity of products and services in a given area.
- **Political consideration:-** In this case some projects usually suggested by senior and powerful officials / Ministers in an organization with the aim of wanting, some areas " accelerated development"
- **Use of fund:-** This is available from government or financing agencies, for example, MDG/SDG fund

8.2 SSI PROJECT POSSIBLE INITIATORS

The project initiation ideas could come from different direction mainly from Technical Specialist, Communities or groups of farmers, individual innovative farmers, Local Leaders, NGOs, Entrepreneurs, Government policy and plans.

8.2.1 Communities, groups of farmers, Individual Innovative Farmers, and Local Leaders

The community and local leaders will usually have important ideas, which they, together with the local people, have identified as being important in improving the welfare of the people. In the case of Irrigation Development, for instance for a completely new SSI scheme, a group of farmers through the Kebele Administration request or suggest or apply the existence of water and land resources in their locality and generate the idea of a new SSI scheme development. Similarly, in the case of a traditional SSI system, water user groups, the “water fathers”, or existing informal water users' committee will suggest or point out the idea for the improvement/upgrading of their

scheme. In a modern SSI scheme, the existing water user groups, water users' committee, or irrigation cooperatives (if any) will also suggest or point out the idea of rehabilitation of their scheme. If the project idea comes from the farmers themselves, it has a significant contribution to project sustainability and future managements'.

8.2.2 Project ideas from technical specialist

Ideas will usually tend to come from technical specialists, who by virtue of their experience and/or research findings will give useful information, which may lead to the local level economic development and agricultural transformation, through the improvement of production and productivity of crops and livestock.

8.2.3 Joint efforts of community, kebele, das &woreda technical experts

Likewise, the existing water user farmers or groups, water user's committee, IWUA (if any), Irrigation Cooperative (if any) or village leaders or Kebele Administration may point out the idea or request the DAs and/or staff of the Woreda office to assist farmers with the preparation of the SSI development idea formulation. It is also possible that DAs or the staff of the Woreda office would identify the opportunity to develop a new SSI scheme, improve an existing traditional SSI scheme or rehabilitation of an existing modern SSI scheme. In that case, the DAs and/or Woreda staff should consult the concerned farmers and assess if they would be interested. If the concerned farmers are interested, the DAs and/ or Woreda staff may support them with the preparation of the SSI development idea formulation.

In all the cases, the guiding principles and strategic issues for project idea initiation are that the project should be demand driven and ensure public participation. This requires that the project will be implemented in such a way that it shall be a demand driven type in which has to be initiated that, the first project idea has to come from the community themselves. Therefore, the undertaking of project initiatives for study and design, construction, operation, and maintenance should be compatible with the community demands, even though some preparatory works are undertaken by local institutions due to technical limitations of the community. Under this situation, the community with the support of the kebele administration council will point out their idea or request to the nearest Woreda irrigation development institution for the successive stages of project development.

8.2.4 Project ideas from government policy and plans

Currently, most governments in the world are moving away from directly initiating community projects. However, government produces short and long-term national development plans, which spell out the directions of what the government is likely to do to achieve certain targets in various sections of the economy and help as guidelines to various organizations to plan in detail. The information contained in these documents is useful in generating ideas for new projects. The emphases are on the local participation of the people in all development matters. All rural development policies and strategies of the Ethiopian Government expresses the intention to have all the smallholder farmers' participation in the economic development of the country in order to increase the efficiency and effectiveness of development projects. Therefore, individuals using government policy guidelines as a source for project ideas must make sure that they operate within the overall national policy framework as contained in the relevant documents such as the country's irrigation sector policy documents, basin master plan studies, irrigation potential assessment, and other similar documents.

8.2.5 Project ideas from entrepreneurs

For commercial projects in this case out growers system with small holders, entrepreneurship is an important source of the idea. Entrepreneurship includes the characteristics of perception of managerial competence and motivation to achieve results. Although entrepreneurship skills have been passed on from one generation to another, along with family and socioeconomic circle, it has been recognized that programs for entrepreneurship development will help individuals to come up with useful ideas, which can be translated, into viable projects.

8.2.6 Project ideas, from international and bilateral development partners

Project ideas also emerged from international and bilateral development partners such as WB, AfDB, FAO, IFAD, USAID, JICA, KOICA, Millennium Development Goal (MDG) /Sustainable Development Goal (SDG) and others by themselves or through a request by the Government

8.2.7 Project ideas, from international and local NGOs

Most local, national and international non-government organizations and religion-based organizations participate on multi-sectorial integrated development programs and projects. They are also active enough in new idea generation and new technology dissemination, which could enhance the local level development of the people. Therefore, in the process of implementing their integrated development programs, they conduct base line and resource assessment survey, which could be significant sources of viable project ideas including SSID.

8.3 PROJECT INITIATION AND PLANNING DOCUMENT (PIPD)

Project Initiation and planning document (PIPD) have to prepare before the start of any SSIP or group of SSIP with the intent to describe the basis for initiating, planning approach and plans, projects organization and person power requirement, work activities and schedules, the budget required and financial plan, Administrative procedure, procurement plans. The PIPD has to be used as a working guideline during subsequent SSIP phases.

9 PROJECT ORGANIZATION AND MANAGEMENT

9.1 ESTABLISHING PROJECT MANAGEMENT UNIT (PMU)

A project is an undertaking that has a beginning and an end. It is carried out to meet established goals within cost, time and quality objectives. The project management unit brings together and optimizes the resource necessary to successfully complete the project. These resources include the skill, talents and cooperative efforts of a team of people (human resources), facilities, tools and equipment, information systems and techniques and budget.

In all the case, Organization and Project Management unit is the systematic management of projects in alignment with the achievement of strategic goals. The concept of organization and project management unit is based on the idea that there is a correlation between an organization's capability in project management, program management, and portfolio management and the organization's effectiveness in implementing the strategy.

Therefore, establishing the functional type of organization and management unit for implementation of projects will be optional and functional. The unit should be part of the implementing institutions. This type of organization as one of the possible forms of realizing a project in the implementing institution represents the possibility of its realizing in one, existing functional part of the institution. The major advantage of this organization and management unit can be grouped in the following way:-

- There is a maximum flexibility in using the staffs and they could be engaged in many different projects
- Experts can exchange knowledge, the experience they possess and the unit has access to any technical knowledge and the team can be the biggest resource of synergic solution for solving technical problems
- The project management unit serves as a basis of technological continuity and in the continuity of procedural, administrative and other policies which will result when the project continues in the implementing institution

Therefore, for implementation of projects in the different regions implementing institutions, an organization of Project management unit (PMU) with optional level will be necessary. Establishing the functional type of organization and management unit could be:-

- Project Coordination Unit (involve on the coordination part)
- Project implementation Unit (involve on technical, financial & supportive role)
- Project Implementation Support Team (involve on the technical, financial &the supportive role of the projects)

The Irrigation Implementing Institutions at the different level will benefit from technical assistance to enhance their capacity for the continues execution of the projects. Thus, during project planning and implementation, the PMU provides technical assistants and support the irrigation project planning, design, execution and overall coordination. Irrigation Engineers and other experts will be recruited as required for technical assistance to strengthen the PMU. The Project Management Unit (PMU) is a group of staff members designated officially to work together full-time, with separate accountability, to coordinate and manage a group of SSI project implementation. The PMU would be responsible for coordinating irrigation project preparation and construction management activities mainly programming and supervising projects, evaluation for quality

assurance, and implementation as well as overall administration of budgeting, procurement, recordkeeping, and reporting matters related to project implementation.

The PMU is also responsible to identify and address cross cutting issues (Gender, Climate Smart Agriculture, and Nutrition) in the planning, design, and implementation of SSI projects. Generally, these are the recommended approaches and strategies for project organization and managements. However, depending on the size and complexity of the project and whenever there are cases PMU could be established in the respective regional irrigation implementing institutions considering the existing situations at the ground level.

9.2 ORGANIZATIONAL SET UP AT IMPLEMENTING INSTITUTIONS

It is proposed that the implementing agency establish the independent project Management unit. Moreover, the unit can form clusters in assigning group staffs in different areas to cover all parts of the region for supervisory activities. This may include two administrative zones for regional staff where regional experts to be included in the supervision team. Therefore, the delay and untimely follow up intervention will be avoided. Figure 8.1 shows an organizational chart of the project management unit.

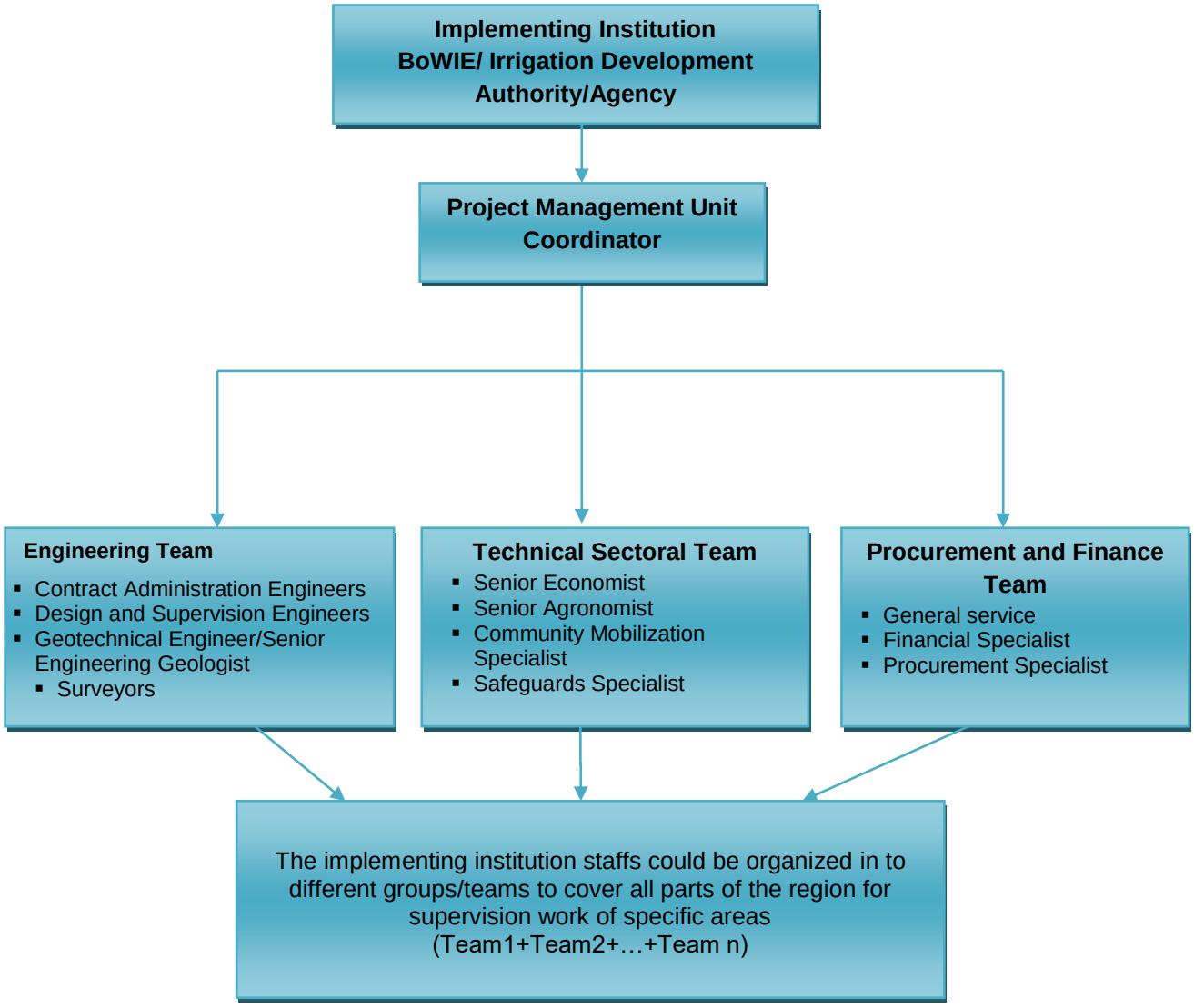

Figure 9-1: Organizational structures of Project Management Unit (PMU)

9.3 HUMAN RESOURCE

Human resources are the basic inputs in the Project Management Unit. Thus, the Project Management Unit (PMU) is a group of staff members designated officially to work together full-time, each with independents and group accountability, to coordinate and manage specific project or group of projects. The PMU would be responsible for coordinating Irrigation Projects, planning study and design, construction management activities mainly programming and supervising projects, evaluation for quality assurance and implementation as well as overall administration of budgeting, procurement, record keeping and reporting matters related to irrigation project implementation. The PMU is also responsible to identify and address cross cutting issues (Gender, Climate Smart Agriculture, and Nutrition) in the planning, design, and implementation of SSI projects. Proposed staffing for Project Management Unit (PMU) is presented in Table 9.1 below-

Table 9-1: Proposed staffing for Project Management Unit (PMU)

No	Job Title	Quantity
1	Team Leader	1
2	Contract Administration Engineers	As required
3	Design and Supervision Engineers	,,
4	Senior Geotechnical Engineer/Senior Engineering Geologist	,,
5	Financial Specialist	,,
6	Procurement Specialist	,,
7	Senior Economist	,,
8	Senior Agronomist	,,
9	Community Mobilization Specialist	,,
10	Safeguards Specialist	,,
11	Senior Surveyor	,,
12	General service	,,
13	Monitoring & Evaluation Specialist	
	Total	

9.4 BUDGET AND LOGISTICS

Budget and basic logistics are very necessary for the full functioning of the Project Management Unit (PMU). Detail budget and logistics plan expressed in quantitative terms that specifies how the implementing institutions will acquire and use resources during project lifetime should be prepared. The budget and logistics plan should indicate what the organization plans to do next year and what result it expects. It should state how available resources will be needed and priority would be placed and the performance required. Annual budget and the required logistics preparation must be framed within a sound available resource and should be organized along the funding program lines and procedures.

However, PMU in consultation with the Implementing Institutions is responsible for preparing their requests on an annual and quarterly basis within the spending limits provided. The request should be consistent with the notified ceilings or guidelines, and costs of the programs. It should be clear and adequate for proper implementation, without any under or over estimated. Implementing Institutions budget requests should clearly indicate the amount necessary to undertake planned activities and programs. PMU with the implementing institution must coordinate the preparation of the budget of their subordinate offices and give them appropriate directives. Moreover, the budget approval mechanisms and eligibility and/or priority criteria, among others will consider the

technical feasibility of the proposed activities, the social and environmental impacts and the synergy effect between implementing activities. A high consideration will also be given to the cross-cuttings issues: gender, nutrition and climate change. Similarly, the Unit should be supported with basic logistics such as vehicles, fuel, stationery and other necessary logistics. Thus, the PMU will participate in the preparation, approval, and implementation of the endorsed budget for the respective implementing institutions for the proposed intervention following its budget rules, regulations, and schedules.

9.5 OFFICE AND FIELD EQUIPMENT'

The project Management Unit (PMU) should be supported by the basic office and field equipment in order to implement their day-to-day tasks successfully. The office of the PMU could be inside the implementing institution compound or rented one in the adjacent of the implementing institution offices. Office equipment such as a table, chair, computers, photocopy machines, iron shelf and others are very necessary. Basic field equipment for the work such as GPS, electronic total station, compass, scales, plane meter, meter tape, soil color chart, rock color chart, binoculars, auger, level with its accessories, Laptop, software, geological hammer, infiltro-meter and others are also required to be fulfilled.

9.6 ADMINISTRATIVE, PROPERTY, FINANCIAL AND PROCUREMENT PLAN

Procedure and description of Administration and human resource management, Property and logistics management, Financial Management including auditing system, procurement plan shall beprepared as one of project planning task and discussed with all implementing stakeholders in order all to make all actors internalize the overall project management system.

10 PREPARATION OF THE TOR

10.1 PURPOSE

Preparation of Terms of Reference (TOR) is the basic guiding document that has significantly used for service assignment. TOR should be prepared for consultancy service of identification, feasibility study and detailed design and construction supervision of the SSID. TOR should be prepared even if the assignment is to be done by own force.

10.2 RESPONSIBILITY

Irrigation development implementing institutions in the respective regions shall be responsible for preparing the TOR for the service required. Accordingly, drafting the TOR requires expertise in the field of the assignment, as well as familiarity with the project background, knowledge of the terrain and the site. If the capacity to prepare a good TOR is not available in-house, the implementing institution should hire a competent external specialist.

10.3 OUTLINE OF THE TOR

The Terms of Reference (TOR) explain the objectives of the assignment, the scope of work, activities, provide background information (including a list of existing relevant studies and basic data required) to facilitate the service providers preparation of their proposals, tasks to be performed, the respective responsibilities of the implementing institution and the service providers, expected results, and deliverables of the assignment. A comprehensive and clear TOR is important for the understanding of the assignment and its correct execution. It reduces the risk of unnecessary extra work, delays, and additional expenses for the implementing institution. In addition, it helps to reduce the risk of ambiguities during the preparation of consultant proposals, contract negotiation, and execution of the services.

Similarly, the scope of the services described in the TOR shall be compatible with the available budget. If the transfer of knowledge or training is an objective, it should be specifically outlined along with details of staffs to be trained, and so forth, to enable service providers to estimate the required resources. TOR shall list the services and surveys necessary to carry out the assignment and the expected outputs (for example, reports, data, maps, surveys). However, TOR should not be too detailed and inflexible, so that competing service providers may propose their own methodology and staffing. Service providers shall be encouraged to comment on the TOR in their proposals. The implementing institution and service provider's respective responsibilities should be clearly defined in the TOR. Generally, the TOR comprises the following main sections:

i. Project background

The background information summarizes the main features of the project and describes the assignment's key objectives and general purpose. In particular, it should include the following:

- Name of the implementing institutions
- Project location
- The rationale for the project
- Project history (what has been done so far and by whom)
- List of relevant studies and basic data
- Need for consultants in the project and issues to be resolved
- Activities to be carried out by the consultants

- Source of financing for the assignment
- Supervision arrangements and modalities

ii. Summary of objectives

The TOR should precisely describe the objectives and expected results of the assignment. The typical objectives of the assignment in most projects may include the following:

- Sector and strategy studies or assessments
- Studies on public sector reform, institutional and regulatory reforms, or leadership and management change
- Project feasibility before investment
- Preparation of bidding documents and project detailed design
- Project management and implementation supervision
- Capacity building and training
- Collection and analysis of data
- Monitoring and Evaluation

iii. The scope of the work/assignment

The scope of the work/assignment in the TOR details all the main activities (or tasks) to be conducted by the service providers and the expected results of those activities (or tasks). The TOR should describe only the activities, the approach or methodology by which the results are to be achieved and the TOR may provide strong suggestions on the approach and indications on the methodology that the service providers could or should use to execute the assignment. Under certain selection methods, the implementing institution can disclose its own estimated staff-months or its estimated cost of the services, but not both.

Often the project may require a phased service provider's assignment. In such cases, the TOR should be more detailed for the first phase and less detailed for the subsequent ones. The TOR for the subsequent phases will be refined based on the outcomes of the earlier phases.

In a TOR, the scope of the work of the assignment is usually defined by addressing the following issues (depending on the project features and objectives of the assignment):

- The relevance of the assignment for the implementation of the project
- Definition, scope, and limits of the assignment
- The desired level of detail (level of design, accuracy, the composition of cost estimates, and so forth)
- The span of projections (time horizon, the life span of project components, and so forth)
- Necessary comparison of the assignment with similar projects
- Main issues to be addressed by sector or activity
- Alternatives to be considered, and the main criteria to be used to compare them
- Required surveys, special analyses, and models
- Special equipment requirements
- Implementing the institutional framework, organization, and legal setting
- Transfer of knowledge, objectives, and scope
- Language requirements
- Units of measurement to be used
- Need for continuity, such as data gathering
- Quality management requirements (if needed)

Phased assignments are likely to require that the scope of work be modified, depending on intermediate results. For instance, the scope of work for a feasibility study originally covering a number of alternatives will be reduced if, during the execution of the assignment, some alternatives prove not viable. Similarly, the scope of work can be expanded if more-accurate studies than initially anticipated becoming necessary. In such cases, the TOR should clearly indicate the circumstances under which a decision will be made by the implementing institution to modify the scope of work.

iv. Capacity-building and knowledge transfer

If capacity building and transfer of knowledge are a specific objective of the assignment, the TOR should provide specific details on the characteristics of the required services and propose approaches and methodology for such services. The most frequently used implementation tools include on-the-job training, formal stand-alone training for individuals, and twinning programs when organizations are involved.

v. Reports and schedule of deliveries

The TOR should indicate the estimated duration of the assignment, from the date of commencement to the date of the implementing institution receives and accepts the consultant's final report or a specified completion date. The assignment reporting requirements should be clearly specified. In particular, for inception and progress reports, there should be a balance between keeping the implementing institution well informed and not forcing the service providers to spend an excessive amount of time preparing reports. The TOR should indicate the format, frequency, and content of reports, as well as the number of copies, the language, and the names of the prospective recipients of the reports. For all major reports, an executive summary is recommended as a separate volume. Similarly, the TOR should clearly identify and define the output and deliverables required from the consultants, such as reports, data, maps, drawings, or software. Depending on the assignment, the following reports are usually required:

(a) Inception report: this report should be submitted shortly after the commencement date of the services. The report includes primary findings of the desk review, data collection instrument, data collection methodology, potential bottlenecks that needdecision from client sides and others. Any major inconsistency in the TOR, deficiency in implementing institution assistance, or staffing problems that have become apparent during this period should be included. The inception report is designed to give the implementing institution confidence that the assignment can be carried out as planned and as agreed on in the contract, and it should bring to the implementing institution's attention major problems that might affect the direction and progress of the work. The actual revised methodology of the service providers to be employed should be clearly presented in this report. Significant changes from the TOR scope should be supported by supplementary agreement.

(b) Preliminary reports, at this stage data type, data source, data quality and verification of the inception report should be conducted. Preliminary reports are required to inform the implementing institutions of preliminary results, alternative solutions and major decisions that need to be made if any.

(c) Draft report:- shall be submitted in order to give to the client or reviewing the findings and the result. The draft report should include, but not limited to a technical report of all disciplines with analyzed results and interpretation. Moreover, topography surveying, irrigation system layout, abstraction system design should be presented. In general, at this stage near to completed report should be submitted. The owner and the stakeholders shall review the draft report within a short

reasonable time, even check in the field, and give comments, suggestions for improvements. If the service providers do not accept comments or recommendations it should be included in the report the reasons for not accepting especially if it is for good reasons

(d) Final report: The final report is due at the completion of the assignment. At this stage specification, tender document, working drawing album, refined reports of all disciplines approved by the community should be submitted. The final report should incorporate all clients' comments and suggestions.

(e) Progress reports: these reports keep the implementing institution regularly informed about the progress of the assignment. They may also provide warnings of anticipated problems or serve as a reminder for payment of invoices due. Depending on the needs of the assignment, progress reports may be delivered monthly. For technical assistance and implementation supervision (in construction, for instance) progress reports are best submitted monthly. Progress reports may include a bar chart showing details of progress and any changes in the assignment schedule. Photographs are a quick and easy way of conveying the status of a project, and their use in progress reports is encouraged. For technical assistance services, progress reports also serve to set out the work program for the following months. Each team member usually contributes to the preparation of the monthly report.

vi. Data, services, personnel and facilities to be provided by the implementing institutions

The TOR should identify the implementing institution's executing team/department and explain institutional and organizational arrangements for the supervision of the works. In addition, the TOR should list and specify the facilities and counterpart staff to be provided or designated by the implementing institutions. The TOR should include all inputs that the implementing institutions will provide to the consultants. These may include past prepared studies, databases, aerial photographs, maps, and records of existing surveys. The TOR should also describe the implementing institution's available software and computer models to be used by the consultants if any.

To avoid difficulties caused by delays in allocating the implementing institution's counterpart staff to the project, the TOR should be provided for such staff before the assignment begins. The implementing institution's inputs, if not well defined in advance, are often a matter of contention for the duration of the assignment. Service providers tend to overestimate the implementing institution's contribution, and as a result, they reduce their proposal price, particularly if the method of selection considers the price. Implementing institutions also tend to promise more than they can actually deliver. It is therefore important that the implementing institution's inputs are defined in the TOR as precisely and realistically as possible.

vii. Institutional and organization arrangements

The TOR should define the institutional setup and the organizations surrounding the assignment and indicate the role and responsibilities of all those involved, specifying the type, timing, and relevance of participation. The TOR should define the hierarchy and level of authority of counterpart personnel, as well as the requested level of experience of the implementing institution's personnel who will be integrated into the consultants' team.

For reference typical, TORs for different service providers are attached to this guideline as follow;

- Appendix II: Typical TOR for Site Identification and prioritization adopted from different regions
- Appendix III: Typical TOR for Feasibility Study, Detail Design, Specification and Tender Document preparation; complied, adopted and then enriched mainly from TORs of regions)

viii. Quality assurance and control mechanism

Quality assurance and control mechanism establishment and existences are significanttools for both the consultant and the client side operators. Accordingly, for the quality assurance and control mechanism, the TOR should include data collection methodologies, tools, data quality checking mechanism, analysis and interpretation verification, synchronization and consistency of reports.

11 PROCUREMENT PLAN REQUIREMENTS

Implementation of irrigation project and its subsequent phases are the processes of turning a project into real outputs and each phase of an irrigation project implementation needs the well-organized procurement of works, goods, and services. A procurement plan shall be prepared and intended to provide guidelines with which to administer the procurement of works, goods, services, and training. The procurement plan shall provide guidelines and there are three main stages in project procurement processes, which include procurement planning, procurement implementation, and contract management for the different irrigation phases.

11.1 PROCUREMENT PLANNING

The purpose of procurement planning is for the procuring entity (implementing institutions) to schedule its procurement activities in advance. It should be consistent with its approved budget and its target date of implementation, including a list of procurement of works, goods, and services to be procured under the program yearly with estimated cost and method of procurement shall be detailed in appropriate formats for the budget year. Here the procurement plan clearly includes the plan of site identification and investment prioritization, feasibility study and design, construction and construction supervision and capacity developments activities and requirements.

11.2 PROCUREMENT IMPLEMENTATION

Procurement implementation is an important task that requires cost, time schedules, and efficient implementation strategies. Here, procurement implementation means the preparation of bids, advertising, evaluating and selecting a contractor, consultants, a service provider or a supplier, and making a clear agreement about what the contractor, consultants, service provider or supplier will do, when they will do it, what the price will be, and what other conditions apply. The result of the procurement process will be a contract document signed by the procuring entity (implementing institutions) and the contractor, consultants or service provider or supplier.

11.3 CONTRACT MANAGEMENT

After the procurement process is complete, the contractor, consultants or service provider must implement the contract(contract management). The procuring entity (implementing institutions) will be responsible to monitor implementation of the contract, to solve any problems that occur during implementation and to approve payments to the contractor, consultants or a service provider or a supplier. These activities continue until the end of the maintenance period, for a works contract, or until the services have been provided and all payments made for the services. Procurement management highly requires follow-up of schedules (time), quality of works and services, costs and related standard satisfaction levels.

12 PLANNING FOR SITE IDENTIFICATION & INVESTMENT PRIORITIZATION

12.1 BACKGROUND DESCRIPTION

Site identification phase was used to be mixed with others since an understanding of its scope is being limited and not well supported with prioritization and ranking steps. In this phase, the basic resources such as water resources, abstraction methods, land and people who benefit from the project will be identified and prioritized for investments. The basic inputs such as irrigation water can of-course are abstracted either from surface water (rivers, lakes, dams/reservoirs) or from groundwater (springs, shallow wells or deep boreholes). It can be abstracted from these sources by different irrigation infrastructures (such as Diversion Weir, Intake structure, Pump, Spring Protection of Micro Dams of a different type) and applied by different irrigation application systems. The Guideline for Site Identification and Investment Prioritization part has been treated in separate Guideline (Refer SSIGL-2 Guideline for Site Identification and Investment Prioritization).Therefore; this Guideline concentrates on the planning of Site Identification and Investment Prioritization of SSI Projects.

12.2 OBJECTIVE

The basic objectives of the Site Identification & Investment Prioritization study include: -

- Assess the available land and water resources potentials for irrigation development
- Collect necessary data for selection of potential SSI sites and analyze based on proposed criteria
- Characterize the potential SSI sites from physical and socioeconomic aspects
- Plan the possible means of water abstraction for the proposed irrigation development.
- Determine whether a project appears technically, economically, socially and environmentally feasible and whether a feasibility study will be pursued or not.
- Conduct SSI projects prioritization for Investments

12.3 DURATION OF THE STUDY

Time is the critical and important resources or inputs in the site identification of irrigation projects. The duration (time) required for site identification and investment prioritization study depends on the existing situation at each project site. However, on the average, the total number of days required for site identification and investment prioritization study of one SSIP is presented in the Table below with two options.

Table 12-1: Time required for site identification and investment prioritization study

No.	Description	Unit	Field work	Office Works	Total
1	Own-force bases	Days	3	10	13workingDays
2	Consultant bases	Days	3	5-7	8-10workingDays

12.4 PERSON POWER, PLANNING, AND ORGANIZATION

In the planning of site identification and investment prioritization of SSI projects, key person power with significant qualification, skill, and composition will be mandatory. The study crew will be organized by technical experts of various disciplines to conduct the study activities and one crew leader (mostly the engineer) will lead the study crew and coordinate both the field and office works. Moreover, most of the time for the purpose of simplicity the study crew will be organized into two Teams: The Engineering Team, which includes engineers, hydrologist, geologist and surveyor and the Sectoral Team which includes, agronomist, socio-economist, watershed expert, and environmentalist.

The key professional staff qualifications, competence, and composition for the assignment will be the major one. Key staff refers to the consultant's staff who have management responsibilities or the key qualifications required for the assignment. The success of the assignment depends to a large extent on the performance of the team leader and the remaining key experts. The study crew will be small teams and/or large teams, which depends on the scale of an irrigation project.

Person Power by Disciplines and Qualifications required for the assignment should be evaluated based on the general qualification, adequacy for the assignment and experience.

General qualifications criterion covers the general experience of the key expert (total duration of professional activity), level of education and training, positions held by the candidate, time spent on similar assignments, experience in the region where the assignment is to be carried out, and so forth.

Adequacy for the assignment this sub-criterion relates to the education, training, and experience of the candidate in the specific sector, field, subject, and so forth directly relevant to the assignment and the proposed position. This factor is critical and should be given the greatest weight among the three sub-criteria.

Generally, study and design of an irrigation project require multi- disciplinary key professionals by its very nature and the required Person Power by Disciplines and Qualifications responsible for field and office work of SSIP site identification and investment prioritization are summarized in the Table below.

Table 12-2: List of person power by disciplines and qualifications

S. No	Disciplines	Professions	Quantity	Remark
1	Engineering	Irrigation Engineer	1	Mandatory
2	Hydrology	Hydrologist	1	As required
3	Geology	Geologist	1	As required
4	Socio-economy	Socio-economist	1	Mandatory
5	Irrigation Agronomy	Agronomist	1	Mandatory
6	Environmental Impact Assessment	Environmentalists	1	As required
7	Watershed	Watershed expert	1	As required
8	Soil	Soil expert	1	As required
9	Surveying	Surveyor	1	Mandatory
	Total		**9**	

***As required-** during the identification phase based on the complexity and sensitivity of the proposed project these professionals can be deployed. Under normal conditions, the mandatory professionals should be deployed for the assignments.

12.4.1 Formulation of responsibilities of person power

In conducting the site, identification and investment prioritization study the proposed person power has the following responsibilities. The responsibilities of the key personnel were classified as pre-field (desk-based investigation) work, fieldwork and post field tasks. The detailed responsibilities of each discipline in the site, identification and investment prioritization study are presented in SSIGL-2

12.5 PHYSICAL PLANNING (ACTIVITY PLAN)

The detailed physical plan or activity plan of the site, identification and investment prioritization study are presented in SSIGL-2

12.6 RESOURCES REQUIREMENTS

Site identification and investment prioritization study are generally performed using different resources, equipment,and logistics.

12.6.1 Logistics

One of the basic resources that have a significant contribution for site identification and investment prioritization study is the availability of logistics. These logistics include vehicles, fuel, lubricant, etc.

12.6.2 Equipment and facilities

It is suggested that the study crew who carry out the site identification and investment prioritization study need to have at least the following equipment's; topographic map (s) of the area (scale 1:50,000 or any available scale), GPS, electronic total station, scales, meter tape, soil color chart, portable pH and EC meter, rock color chart, binoculars, auger, stop watch, note book etc.

12.7 FINANCIAL PLAN

In the site identification and prioritization, stage financial resources are very necessary to accomplish the assignment based on its requirement. Accordingly, budgets for fees, Per diem allowances, Fuel & Lubricant, Consumable, Materials & Stationary, Vehicle Maintenance, Spare part/vehicle rent, surveying materials rent, the budget for Daily laborers, the contingency of 10% and another necessary budget should be prepared and scheduled according to the physical workloads.

Table 12-3: Proposed budget for site identification and investment prioritization

S No	Disciplines	Unit	Total Required Budget
1	Person power Cost/fees	Birr	Xxxxx
2	Per diem allowances)	‘’	Xxxxx
3	Fuel & Lubricants	,,	Xxxx
4	Consumable Materials & Stationary	,,	Xxxx
4	Vehicle Maintenance, Spare part/vehicle rent,	,,	Xxxx
5	Surveying materials rent,	,,	Xxxx
6	Daily laborers, (Soil, Hydrologist, Geologist & Surveyor)	,,	Xxxx
	Contingency of 10%	,,	Xxxxx
	VAT (15%)	,,	Xxxxx
	Total		**Xxxxxxxxx**

13 PLANNING FOR FEASIBILITY STUDIES AND DETAIL DESIGN

13.1 BACKGROUND DESCRIPTION

This phase comprises the project feasibility study and detail design activities. At this phase, the contract between client and consultant/engineer for a feasibility study and detail design service is on board. At the beginning of this phase, the client shall prepare a term of reference (TOR) based on the nature of the identified project. As part of the feasibility study and detail design, the consultant should prepare the tender document and practicable construction schedule. (Refer SSIGL-15 Feasibility Study and Detail Design).

13.2 OBJECTIVE

The objectives of conducting the feasibility study are to insure that the project is:

- Selected the possible alternatives based on the most appropriate technical approach; in other words, assess the technical feasibility of the project:-
- Economically and financially viable
- Socially and environmentally acceptable
- Prepare detail design with full participation of communities and stakeholders
- Prepare contract documents and construction plan

13.3 DURATION OF THE STUDY

Time is the critical and important resources or inputs in the Feasibility Studies, Detail Design and Tender Document Preparation of irrigation projects. On the average, the total time required for Feasibility Studies, Detail Design and Tender Document Preparation study of one SSI project based on the size and complexity is presented in the Table below.

Table 13-1: Time required for a feasibility study and detail design study

No.	Description	Unit	Field work	Office Works	Total
1	Own-force bases	Days	15	3-5 months	90-150working days
2	Consultant bases	Days	15	3-5 months	90-150working days

13.4 PERSON POWER PLANNING AND ORGANIZATION

In the planning of Feasibility Studies, Detail Design and Tender Document Preparation of SSI projects, key person power with significant qualification, skill and composition will be mandatory. The study crew will be organized by technical experts of various disciplines to conduct the study activities and one crew leader (mostly the engineer) will lead the study crew and coordinate both the field and office works. Moreover, for the purpose of simplicity and logistics arrangement the study crew will be organized into two Teams: The Engineering Team, which includes engineers, hydrologist, geologist, surveyor and CAD Technician; the Sectoral Team, which includes the agronomist, socio-economist, Community promotion expert, soil and land suitability expert, watershed management expert and environmentalist.

13.4.1 Person power by disciplines and qualifications required

The key professional staff qualifications, competence, and composition for the assignment will be the major issue of this phase. Key staff refers to the consultant's staff who have management responsibilities or the key qualifications required for the assignment. The success of the assignment depends largely on the performance of the team leader and the remaining key experts. The study crew will be small teams and/or large teams, which depends on the scale of an irrigation project.

Person power by Disciplines and Qualifications required for the assignment should be evaluated based on the general qualification, Adequacy for the Assignment and Experience.

Generally, study and design of an irrigation project require multi- Disciplinary key professionals by its very nature and the required Person power by Disciplines and Qualifications responsible for field and office work of SSIP Feasibility Studies, Detail Design and Tender Document Preparation are summarized in Table below.

Table 13-2: List of person power by disciplines and qualifications for FS & DD

No	Description	Quantity
1	Irrigation and head work engineer/Team Leader	1
2	Hydraulic and structural Engineer	As required
3	Hydrologist	As required
4	Geologist/geotechnical engineer	As required
5	Soil and Land Suitability Analysis Expert	As required
6	Socio-Economist	As required
7	Sociology/Community promotion expert	As required
8	Irrigation Agronomist	As required
9	Watershed Expert	As required
10	Environmentalist	As required
11	Surveyor	As required
12	Drafts Person /AutoCAD/GIS expert	As required
	Total	

13.4.2 Formulation of responsibilities of person power

The responsibilities of the key personnel were classified as pre-field (desk-based investigation) work, fieldwork and post field tasks. The detailed responsibilities of each discipline in the Feasibility Studies, Detail Design and Tender Document preparation are presented in Appendix-III.

13.5 PHYSICAL PLANNING (ACTIVITY PLAN)

The detailed physical plan or activity plan of the Feasibility Study and Detail Design of small-scale irrigation project is presented in respective SSIGLs

13.6 RESOURCES REQUIREMENTS

Feasibility Studies, Detail Design and Tender Document preparationrequire significant quantities of resources and these resources are budgeted, equipment, and logistics. The description of each resource is mentioned below.

13.6.1 Logistics

One of the basic resources that have a significant contribution for site identification and investment prioritization study is the availability of logistics. These logistics include vehicles, fuel, lubricant..,etc.

13.6.2 Equipment and Facilities

At this stage detail, data collection is necessary and each member of the study crew requires important equipment. Essentially, it is recommended that the study crew requires the following basic equipment; topographic map (s) of the area (scale 1:50,000 or any available scale), GPS, electronic total station, altimeter, stereoscope, scales, meter tape, soil auger of different types, color chart, rock color chart, binoculars, auger, stop watch, level with its accessories, Laptop, software, geological hammer, infiltrate-meter, buckets, ropes, sample bags, etc. To locate reference control points and data collecting sites, satellite imagery, Google map and DEM are also required.

13.7 FINANCIAL PLAN

At this stage, financial resources are very necessary to accomplish the assignment based on its established quality standard. Accordingly, budgets for Per diem allowances, Fuel & Lubricant, Consumable Materials & Stationary, Vehicle Maintenance, Spare part/vehicle rent, surveying materials rent, for Soil & Water sample Laboratory test, budget for Daily laborers, contingency of 10% and other necessary budget should be prepared and scheduled according to the physical workloads and proposed time frame of the works.

Table 13-3: Proposed Budget for Feasibility Studies, Detail Design SSI projects

S. No	Disciplines	Unit	Total Required Budget
1	Person power fees	Birr	Xxxxx
2	Per diem /allowances		
3	Fuel & Lubricants	,,	Xxxx
4	Consumable Materials & Stationary	,,	Xxxx
5	Vehicle Maintenance, Spare part/ vehicle rent	,,	Xxxx
6	Surveying materials rent,	,,	Xxxx
7	Soil & Water sample Laboratory test,	,,	Xxxx
8	Geology and other related sample Laboratory tests	,,	Xxxxx
9	Daily laborers, (Soil, Hydrologist, Geologist & Surveyor)	,,	Xxxx
	Contingency of 10%	,,	Xxxxx
	VAT (15%)		Xxxxx
	Total		Xxxxxxxxx

13.8 INTEGRATION OF MULTIDISCIPLINARY EXPERTS WORK AND OUTPUT

These are the most important areas for proving quality of study & design of SSIP. Consequently, we will emphasize that a project study team needs to know the data and different survey required as an input to feasibility study and design of SSI schemes. Accordingly, topography, soil and Geotechnical data, Agronomy, socioeconomic data required have to be known and detailed before the start of the actual work. This will help the team, especially the team leader to have a comprehensive overview of what data required in the feasibility study and design processes and plan how to integrate their use for the intended purpose.

14 PLANNING FOR CONTRACT ADMINISTRATION, CONSTRUCTION AND CONSTRUCTION SUPERVISION

14.1 DESCRIPTION OF SSIP CONSTRUCTION

Construction phase includes the period from signing a construction agreement with the contractors to handing over of the project to the project beneficiaries. It is the phase when the major resources are practically implemented, or when constructions will be started and the consumption of resources (labor, material, finance, machinery, managerial capabilities and others) is high. Generally, this phase comprises construction operation activities. At this phase, the contract between client and contractor for construction of SSIP in one hand and the contract between client and consultant/engineer for contract administration and construction supervision service, on the other hand, are on board.

Construction works include tender preparation, bid evaluation, construction award, contract management, construction supervision and project handover. The major construction activities are considered to be undertaken by contractors whereas the implementing institution would manage, follow and monitor the progress of construction activities. The kebele and Woreda administration councils play a significant role in the task of monitoring, evaluation, mobilizing the community participation and resolving local conflict issues if they arise in the construction site.

Contract administration: -Under this phase, the contract will be established in the construction phase and there is contract implementation inthe project study and design phase. However, in both cases the main contract management implementation subjects or procedures mainly include the following:

- Contract Mobilization
- Contract Documentation and Record Keeping
- Contract Management Roles and Responsibilities
- Managing Relationships
- Performance Management
- Contract Monitoring
- Negotiating Contract Variations
- Managing Contract Disputes
- Ethics in Contract

(For detail, refer SSIGL-27 contract administration)

Construction Supervision: -On the other hand, small-scale irrigation project implementation passes three phases, namely the Pre-Construction Phase, Construction Phase, and Post-Construction Phase.

Pre-Construction Phase covers the period of the signature of the contract up to the commencement of the works. Construction Phase covers the period from the commencement of the works up to completion of the works. Post-Construction Phase it covers the period from project provisional hand over up to final hand over of the project at the end of the defect liability period. Hence, construction supervision services shall be undertaken in these three phases as discussed here under.

Major construction supervision task during pre-construction phase

- Mobilization and Work Initiation
- Preparation/review of the Construction Supervision Manual
- Data Collection and Reconnaissance Survey
- Review of Engineering Design and Reports
- Issuance of Relevant Documents
- Site Possession/Handing-over the Site
- Notice to Proceed Contractor's Mobilization
- Review and Approval of Contractor's Work Program and Method Statement
- Soils and Materials Investigation

Major construction supervision task during construction phase

- Health and Safety
- Time and Progress Control
- Cost Control
- Environmental Protection Monitoring
- Quality Control, which includes

Quality control of construction materials

- Materials produced by the contractor
- Materials procured from manufacturers
- Storage of materials

Quality control of workmanship

- Working drawings, calculations, and conformity with plans
- The capability of person power
- Monitoring of equipment and plants

Design modifications/changes

Inspection of works and approval

- Surveying
- Structures
- Other Inspections
- Quantity Surveying

Major construction supervision task during post construction phase

- Final Inspection
- Final Report
- Consultancy Completion Report
- Final Payment Certificate
- Payment of Retention Money

(For detail Refer *to SSIGL-28construction supervision*)

Construction Operation: - It is a Work contract legally binding agreement entered into between the employer and the contractor for the execution of the works desired by the employer. Here, it is an expression of the willingness of the employer to pay the contractor and of the contractor to do the work as per the agreement. Irrigation projects are capital projects that need to follow general contract management procedures during their implementation. In order to accomplish the job as per the contract, the contractor needs an effective project management system at the

organizational level as well as at the operational level on the site. Generally, it is the day-to-day and periodical construction tasks managed by the members of a construction crew in a sequential order. (For detail Refer *to SSIGL-29 construction Operation*)

14.2 PROJECT ORGANIZATION FOR CONSTRUCTION SUPERVISION SERVICE

The following project organization for Contract Administration and Construction Supervision Service is recommended for one lot that can comprise three to four projects per lot considering:

- The time allotted for construction of small-scale irrigation projects usually is 1 year. Field operation for about 7 months from first December up to end of June,
- Maintaining quality of works as per the specification forming contact through close supervision,
- Job opportunity for professionals that contributes to the successful completion of projects at the specified time, within the budget, and required quality,
- Regular and formal communication would be established between the supervisory team and the Employer,
- A quick response system for responding to Contractor's queries and approvals of his submissions would be brought into operation, and
- A channel for communication will be arranged with the experts in the supervision team members at the head office for advice on any specialized problems.

The project coordination office shall be established at supervisor head office for smooth liaison with the project client. At project coordination, office the assigned project engineer and contract engineer deliver their responsibilities, even for more than one lot. A lotshould be established considering Administrative Zones in order to optimize time cost as the result of long travel from one site to the other.

At each project site Supervisor Engineer, Surveyor, and Community Promoter should be permanently assigned as a member of the construction supervision team. For this typical project organization, project site -2 (as shown below in Figure 11-1) is a site located in the center, where the base camp and resident engineer's office situated. The Resident Engineer can serve even for three to four projects.

Design Engineer, Geotechnical/Materials Engineer, Electromechanical Engineer, and Quantity Surveyor can serve for three to four projects and sometimes even for more than one Lot considering the workload and the magnitude of impact on time, cost and quality of the project.

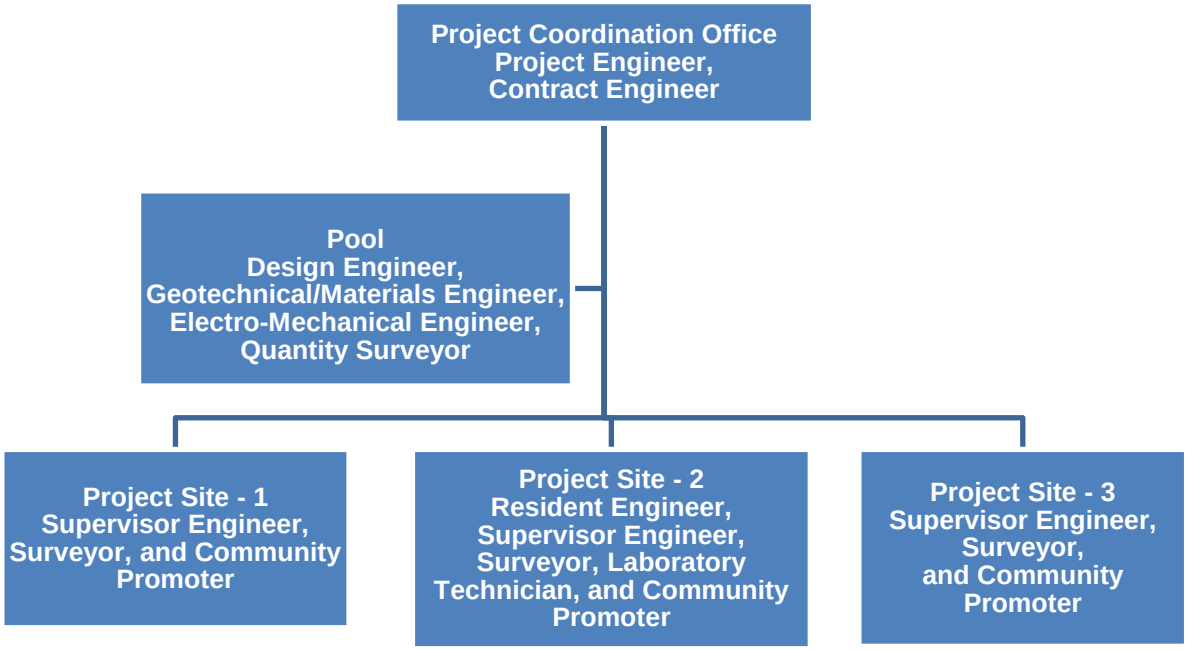

Figure 14-1: Project organization for contract administration and construction supervision service

14.3 DURATION FOR CONSTRUCTION OF SSIP

Contract administration, construction supervision and construction of SSI Projects require the relatively long time of implementation. The total time required for, construction supervision and construction of one SSI project will be 6- 24 months or 180-720 calendar days depending on the size and complexity of the project.

14.4 PERSON POWER PLANNING AND ORGANIZATION

Construction of SSI projects requires key person power with significant qualification, skill, and composition. The construction crew will be organized by technical experts of various disciplines to conduct the activities and one crew leader (must be an engineer) will lead the construction crew and coordinate the construction works at the site level.

14.4.1 Person power by disciplines and qualifications required

Person power is the most influential element in the construction process. Construction team for a project can comprise a complement of professional, technical and administrative staff. In general, the following skilled/professionals, semi-skilled and unskilled person power as the technical staffs together with the other administrative staffs as per the demand have a paramount importance for the construction of small-scale irrigation projects at the site level.

In order to deliver Contract Administration and Construction Supervision service, whether outsource or own-force modalities, assignment of competent supervision crew team members has a paramount importance. The staff composition in a given supervision, the crew may vary depending on the scale and complexity of the project. A contract administration and construction supervision service project coordination office that comprises the following staff members are recommended for a small scale irrigation project.

Table 14-1: Person power for contact administration and construction supervision

No.	Position	Required Number	Location	Remarks
1	Project Manager	1	Consultant Head Office	For different lots
2	Contract Engineer	1	Consultant Head Office	For different lots
3	Resident Engineer	1	Project Site	For different lots
4	Supervisor Engineer	1	Project Site	Per project
5	Geotechnical/Materials Engineer	1	Project Site	For different lots
6	Electromechanical Expert	1	Project Site	For different lots
7	Surveyor	1	Project Site	Per project
8	Laboratory Technician	1	Project Site	For different lots
9	Community Promoter	1	Project Site	Assigned by the client

Table 14-2: Person power by disciplines and qualifications for construction

No.	Person power					
A	**Technical Staffs**					
I	**Skilled/Professionals**	**II**	**Semi-skilled**	**III**	**Unskilled**	
1	Project Manager	1	Carpenter	1	Daily Laborer	As required
2	Site Engineer	2	Mason	2	Guard	As required
3	Construction Forman	3	Plasterer	**B**	**Administrative Staffs**	**1**
4	Surveyor	4	Chiseller	1	Purchaser	
5	Machinery Operators	5	Bar Bender	2	Cashier	1
6	Truck Drivers	6	Plumber	3	Store Keeper	1
7	Service Vehicle driver	7	Welder	4	Time Keeper	As required

14.4.2 Responsibilities of person power

Responsibilities of skilled, semi-skilled, unskilled and administrative staffs in construction are described in SSIGL-29 Construction Operation.

14.5 PHYSICAL PLANNING (ACTIVITY PLAN)

The detailed physical plan or activity plan of the contract administration, construction and construction supervision of small-scale irrigation projects are presented by the SSIGL-27 Contract administration, SSIGL-29 Construction Operation, and SSIGL-28 Construction Supervision.

14.6 RESOURCES REQUIREMENTS

The efficient and effective implementation of Contract Administration, Construction Supervision and Construction works of SSI Projects require significant quantities of equipment and logistics. Materials, Budget, Person power and Machinery (the 4 M's) are usual resources recognized in most situations. (For detail Refer to SSIGL-29 Construction Operation).

14.6.1 Logistics

Contract Administration, Construction Supervision and Construction works of SSI Projects requires the availability and existences of significant logistics. These logistics includes vehicles, fuel, oil. Similarly, during construction works the supply of basic logistics and materials such as Stone, Cement, Sand, Gravel, Reinforcement steel bar, Water, Formwork, Pipe and Fittings, Cement Mortar and Concrete mix are very necessary.(For detail Refer to SSIGL-29 Construction Operation).

14.6.2 Equipment's and Facilities

The small-scale irrigation project uses construction equipment's, tool and materials for the quality constructions. In order to increase job-site productivity, it is advantageous to select equipment with the proper characteristics and size most suitable for the work conditions at a construction site. Some of the equipment's that should be considered during planning for construction works are summarized in the SSIGL-29Construction Operation.

14.7 FINANCIAL PLAN

Construction of SSIP requires a significant amount of budget resources and procurement of the large amount of construction materials (on out sourced or own force bases). Accordingly, budgets will be estimated and planned in the engineering design documents or bill of quantity, which will be obtained through intensive surveying and data collection process at the time of feasibility study and detail design stage of SSIP. Similarly, the contingency of 10% and VAT (15%) and another necessary budget should be included and scheduled according to the physical workloads. Moreover, the community work shareis also one of the costs sharing mechanism where the community can take certain responsibilities from the total project costs usually 5-10%.

15 PLANNING FOR OPERATION AND MANAGEMENT

15.1 BACKGROUND DESCRIPTION

Operation and management will be the challenging task in SSID. Schemes may be of streams and river diversion, pumps and small dams. The completed schemes are usually “handed over” to IWUAs for operation, management, and maintenance with the support of grass root personnel from implementing organizations and stakeholders.

The operation, maintenance and management tasks are necessary for the continued functioning and effective delivery of benefits of SSI investment in the near future. The community should be fully responsible for the continued operations and management of the SSI systems. Responsibility for the continuing management and operation of the SSI project system will be with the community, through the IWUA. Implementing agency should ensure the community understands that, unless it accepts this responsibility long-term, sustainability of the system is not possible; and hence should continue to assist the community for an appropriate period following completion of the SSI project implementation.

Mostly, operation and management procedures and instructions are the most important services that the irrigation engineer or canal and gate operators provide to farmers in the delivery of irrigation water. Delivery of irrigation water from the farmer's point of view is freedom in terms of Timing, Flow-rate, and Duration of irrigation applications. However, there are four reasons for flow control in Irrigation systems: Meeting water requirements of crops in order to achieve optimum production; Water savings; Safety of operation; and Recovery of operating costs. For detail, the description refers SSIGL-30: Operation and Maintenance

15.2 OPERATION, MAINTENANCE, MANAGEMENT AND MONITORING PLAN

As in the case of other SSI project phase operation, maintenance and management of SSIP require regular planning. The beneficiary communities should have a plan to support and carry out routine maintenance and repairs. A plan outlining routine maintenance and repairs should be prepared and accepted by the community before handing over. At the operational level, most SSIP programs advocate the implementation of irrigation water allocation and delivery schedules which accommodate both male and female needs with respect to quantity, timeliness, timing, equity, and quality of water. Specific uses of water by women, like domestic uses or watering cattle, also need to be included in the operating systems of SSIP. Similarly, the community should also have a plan for the routine monitoring of system operations and maintenance activities.

15.3 DURATION FOR OPERATION AND MANAGEMENT

The operation, maintenance and management of SSIP totally shouldered on the existing IWUA and will continue in their responsibilities for the life of the project. However, implementing agencies should be prepared to provide assistance for perhaps at most, for two to five irrigation seasons, as may be needed, depending on the type of the scheme, the level of awareness of the community and IWUA committee, access to major towns, etc. For example, the pump project needs the continuous engagement of the government institution for operation and maintenance of pumps.

15.4 PERSON POWER PLANNING AND ORGANIZATION

15.4.1 Person power by disciplines and qualifications required

Here, in some complex SSI projects, there are cases to consider person power planning and organization for irrigation system operation and management. However, in most SSIP the direct users', the community and its IWUA committee will be the person power required for system operations and management. Accordingly, users', the community member and its IWUA committee need technical and advisory assistance for some time following the implementation of the project. The IWUA committee should be responsible for carrying out the operation and maintenance plan. Woreda and kebele technical units should help the community prepare and implement this plan and provide minor amounts of assistance in carrying it out.

Table 15-1: Person power by disciplines and qualifications for operation & management of ssi scheme

No.	Person power	Quantity
A	**Technical Staffs**	
I	**Skilled/Professionals**	
1	Soil and Water Management Engineer	1
2	Irrigation Agronomist	1
3	Social Worker/ Social Mobilizer/Sociologists	1
4	Water shade Management Specialist	1
5	Irrigation Technicians (DAs)	1
II	**Semi-skilled**	
1	Get Operator/Scheme Operator	As required
2	Carpenters	As required
3	Masons	As required
4	Guards	As required
III	**Unskilled**	
1	Daily Laborer	As required
2	Farmers	As required
B	**Administrative Staffs**	
1	IWUA Committee Members	5-7
2	Conflict Management Committee	3
3	Other Committee members	As required

15.4.2 Proposed responsibilities of person power

Table 15-2: Planning of person power by responsibilities for operation & management of SSI scheme

No.	Person power and their Professions	Responsibilities
A	**Technical Staffs**	
I	**Skilled/Professionals**	
1	Soil and Water Management Engineer	Responsible for coordinating and lead the works of O & M, develop system operation, maintenance and management plan, budgeting & implementation schedule, give clarification when ambiguity arises in water management, operation & maintenance works, draw technical recommendation if required, successful completion of the project O &M as per technical specification and as built drawings forming the contract, etc.
2	Irrigation Agronomist	Responsible for preparation of irrigation water scheduling,

No.	Person power and their Professions	Responsibilities
		distribution plan and on farm water management tasks and implementing for the agricultural development plan in collaboration with the engineer
3	Social Worker/ Social Mobilizer/Sociologists	Responsible for community awareness creation, mobilization and conflict management. Similarly, he/she is responsible for the strengthening of the IWUA as a whole, closely work on IWUA management, fee collection, and financial control
4	Water shade Management Specialist	Responsible for upper catchment and on-farm watershed management planning and implementation of community awareness creation, mobilization, and training
5	Irrigation Technicians (DAs)	Responsible for day-to-day system follow-up, mobilize the community to work on an agricultural development plan, regular maintenance, water management and uppercatchment and on-farm watershed management tasks. He/she is responsible for the successful operation of the scheme and its efficiency
II	**Semi-skilled**	
1	Get Operator/Scheme Operator	Responsible for opening, closing gates and managing the irrigation water delivery based on the demand of the community
2	Carpenters	Responsible for building of wooden objects or structures as specified in the specification and drawing forming the contract. He/she is working under close supervision of Construction Forman.
3	Masons	Responsible for stone and brick works as specified in the specification and drawing forming the contract. He/she is working under close supervision of Construction Forman.
4	Guards	Responsibility to protect project resources against danger or loss by being vigilant and taking defensive measures
III	**Unskilled**	.
1	Daily Labourer	Daily laborers work at a job that requires physical strength and stamina under Semi-skilled laborers.
2	Farmers	They are the direct users of the scheme and they are responsible for labor, materials, finance and managerial skill mobilization and contribution for the scheme operation, maintenance, and management. They are responsible for efficient utilization of land, water, crops and irrigation infrastructure for its maximum benefits
B	**Administrative Staffs**	
1	IWUA Committee Members	They are responsible for overall operation, maintenance, and management of the scheme on behalf of the community
2	Conflict Management Committee	Responsible for overall conflict management of the scheme caused on irrigation water uses
3	Other Committee members	They are responsible for overall operation, maintenance, and management of the scheme in collaboration with the existing IWUA committee

15.5 PHYSICAL PLANNING (ACTIVITY PLAN)

The detailed physical plan or activity plan of the operation and management of small-scale irrigation projects is presented in SSIGL-30 operation and management.

15.6 RESOURCES REQUIREMENTS

Like other SSI project phases operation and management of SSIP also requires different resources. Materials, Money, Person power, and Machinery (the 4 M's) are resources recognized in most situations of SSI project operation and management. However, in this stage the farmers and IWUA shoulder most of operation and management resource requirements.

15.6.1 Logistics

Operation and management of SSI projects require the availability and existences of significant logistic. The logistics that should be considered during planning includes Motorcycles, fuel, oil, etc. Especially, during conducting maintenance works the supply and availability of basic logistics and materials such as Stone, Cement, Sand, Gravel, Pipe and Fittings, Cement Mortar and spare parts for pump irrigation projects are very necessary and should be incorporated in the planning process.

15.6.2 Equipment and facilities

During operation and maintenance works of SSIP necessary equipment, tool and materials will be used for the quality maintenance activities. This equipment that should be considered in the planning, operation and maintenance works of SSIP includes Earth Work Equipment's, Hauling Equipment, Electromechanical Equipment, Surveying Instruments, Small Hand Tools, and Equipment. The detail description of this equipmentis presented in the following Table.

Table 15-3: Planning of tools and equipment for SSIP operation and maintenance works

No.	Name of Tools and Equipment's	Quantity	Types of equipment
1	Excavator	As required	Earth Work Equipments
2	Dump Truck	,,	Hauling Equipment
3	Tractor	,,	
4	Double Cabin 4WD	,,	
5	Wheelbarrow	,,	
6	Mixer	,,	Construction Plants
7	Vibrator	,,	
8	Crusher	,,	
9	Pump	,,	Electromechanical Equipments
10	Generator	,,	
11	Total Station	,,	Surveying Instruments, Equipment and Tools
12	Automatic Level	,,	
13	Meter Tape	,,	
14	Computer	,,	
15	Hammer	,,	
16	Peg	,,	
17	Shovel	,,	Small Hand Tools and Equipment
18	Spade	,,	
19	Fork	,,	
20	Vessel	,,	

15.7 FINANCIAL PLAN

Most SSIP operations, maintenance ,and management cost should be planned to be covered by the community through labor bases and collection of O & M fees. However, some SSIP O & M tasks will be beyond the capacity of the community, under such circumstances an independent budget will be prepared as estimated and available in the engineering design documents or bill of quantity, which will be obtained through intensive surveying and data collection process during O & M study and design of SSIP. Similarly, the contingency of 10% and VAT (15%) and another necessary budget should be prepared and scheduled according to the O & M physical workloads. In such cases, it should be planned and scheduled that community work share covers the large proportion of O & M cost sharing from the preparation and estimated costs.

16 MONITORING & EVALUATION

Monitoring and evaluation are part of the project management and it is a management tool. All SSI project plans and implementation activities require logical monitoring, follow-ups, and evaluation plan. Monitoring and evaluation of work may involve observations at key sites, phases, regular visits and discussions with site level staffs, users, officials and concerned experts. In the study, design, construction operation, contract administration and supervision works, monitoring and progress activities will be recorded on a daily base and later summarized for monthly reports, these require well-prepared work progress follow-up procedures.

16.1 FUNDAMENTAL PRINCIPLES

There are four fundamental principles of M&E:-

Participation: - its emphasis on the participation of a more diverse set of stakeholders and it could be externally led, internally led or jointly involved

Learning: - it is a learning platform for those involved in the process and can be characterized as a process of individual and collective learning, through which people become more aware of their strengths and weakness. Should serve to increase the analytical capacities of community members and empower them to question and become pro-active in development initiatives

Flexibility: - Flexibility and experimentation are also regarded as integral parts of Monitoring & Evaluation. There is no blueprint or a prescribed set of approaches to carry out Monitoring & Evaluation. The process of M&E should be continually evolving and adapting according to intervention-specific circumstances and needs**.**

Negotiation: - M&E is also perceived as a social process of negotiation among multiple stakeholders' need, expectations, and views. Negotiation is perceived as contributing towards the building of trust and changing perceptions, behaviors, and attitude among stakeholders.

16.2 SETTING OBJECTIVES

In order to conduct Monitoring &Evaluation activities, there must be clear and measurable objectives outlined in the project document. Clearly stated set project objectives among other things include-

- Provide a framework for project management
- Provide a basis for a comprehensive and realistic work plan
- Indicate how the project can meet the needs of the target group and facilitate the understanding and support of financiers, policy makers, and relevant stakeholders.

Projects use inputs in order to produce outputs, which in turn help to meet specified objectives. Project achievements can be measured in terms of different hierarchies' objectives, namely inputs, outputs, purpose, and goals. Objectives need to be SMART as possible.

Specific: all objectives should have specific output/outcomes
Measurable: the output/outcome should be able to be measured. It should be possible to measure the extent of attainment

Achievable: the objective should describe something that can be achieved within the time scale and resources set for the project
Realistic: objectives describe something that can actually be done
Time bounded: timescale should be set as to when the objective is to be achieved

16.3 MONITORING

Monitoring is a continuous process of gathering, compiling, analyzing, and interpretation of information mainly focusing on inputs' delivery and utilization, the process of transforming inputs into outputs and outputs generated against the target. In monitoring the major tasks mainly, focus on stipulating information requirements, collecting, recoding and processing information, comparing target and actual performance of planned activities, inputs of resources, assumptions, project impacts and assessing deviations of outputs from the objectives of the project.

In this phase, the progress and implementation of each project phase as well as the involvement of the community and forming of the IWUA should be monitored in order to follow the progress, to provide corrective measures, to check whether the proposed results of the scheme are as anticipated or not, to monitor the physical and financial activities of the scheme.

All responsible agencies should monitor the work of their affiliates in order that irrigation project will be carried out in accordance with the construction schedule and to the standard by agencies / Bureaus at all levels in the process. Monitoring takes place throughout project implementation and helps management to keep track of project progress. Monitoring reports provide the bulk of the information required for evaluating a project.

Therefore, monitoring records of inputs, activities, and results, Identifies deviations from work plans, Identifies constraints/ bottlenecks, gives information about overall system performance, learn from the achievements and mistakes and share results with others

16.4 EVALUATION

Evaluation is a systematic and periodical gathering, analyzing, and interpretation of information on the relevance, efficiency, effectiveness, and impacts of the project tasks/ activities and sustainability of benefits accruing to the target groups. The objective of the evaluation is to assess the sustainability and performance of all the project phases, including the technical, institutional and financial aspects. The focus will be on the relevance, efficiency, effectiveness, and impact of the project. Periodic evaluation results would provide pertinent information on how:

- To enhance the sustainability of the small scale irrigation facilities
- To allow time to detect any technical shortcomings and need for improvement and modification,
- To evaluate the projected effect and overall impacts

In order to undertake evaluation at any phase of the project, there should be the **establishment of indicators** and the following areas of evaluation indicators are important for irrigation schemes and both the financial and the implementing body. These are:

- Technical Performance Indicators
- Agricultural Performance Indicators
- Financial Performance Indicators
- Socioeconomic Performance Indicators

The evaluationcould be conducted in different aspects. Based on who conducts the evaluation, the evaluation could be an internal evaluation, external evaluation, and joint evaluation. Based on when/time they are conducted, the evaluation could be an Ex-ante evaluation, Ongoing Evaluation, and Ex-post evaluation

16.5 MONITORING AND EVALUATION AREAS

What the experts are going to Measure in the M&E system will be one of the basic and significant questions that need clear justifications. The bases for identifying the information on monitoring and evaluation items are **Inputs**, **Activities**, **Outputs**, **Outcomes,** and **Impact.** Thus, it is necessary to start by identifying the unique information needs in relation to each level of the performance.

Inputs: - Inputs are resources such as person power, finance, equipment, materials and others used in a project to complete activities.

Activities-Are actions undertaken or work completed by an organization/ Communities. The information need at this level relates to the completion of activities within the planned time and budget. Generally, activities are tasks undertaken to complete the outputs.

Outputs: - Are immediate or short-term development results that are the logical consequence of activities. At this level, the information needs related to products or services, which are the direct products and services delivered by a program and/or short-term result of the interventions. E.g. Improved knowledge and skill of farmers on the use of Irrigation Service Fee (ISF) and OM that increased availability of water for irrigated agriculture. Generally, outputs are specific results expected from project inputs to achieve the immediate objective for which the project is implemented.

Outcomes - Are changes about the use/utilization of outputs, outcomes are stated in past tenses indicating adoption of outputs. The information required at this level relates to whether, how and to what extent outputs have been utilized by intended beneficiaries. E.g. Farmers adopt regular Irrigation Service Fee (ISF) and OM tasks, irrigation technology, and farmers started irrigated agriculture.

Impact - Are changes that result from outcomes. They are the logical consequence of outcomes and the result of the intervention.

16.6 KEY STEPS IN MONITORING AND EVALUATION

Monitoring and evaluation tasks have been working approaches and procedures. For the implementation of M & E tasks, the following key steps are the basis:-

- Setting objectives
- Prepare data collection tools and instruments
- Select indicators at different level
- Set baselines and targets
- Collect data on indicators about inputs, activities, outputs, outcomes, and impacts
- Analyze and compare progress against baseline and targets
- Identify deviations from work plans
- Explain the causes of deviations
- Share results with others

16.7 BASIC REQUIREMENTS FOR MONITORING AND EVALUATION

Similarly, Monitoring & Evaluation require time schedule, person power, resources (logistic & some equipment), activity and financial plan. Prior to conducting M &E, there should be clear indicators, data collection tools, and instruments. M & E should be a participatory and conducted by a multi-disciplinary team for detail refer to SSIGL 32 M & E guideline.

17 IRRIGATION TECHNOLOGY OPTIONS CONSIDERATIONS

17.1 GENERAL

Planning for the choice of technology for irrigation primarily based on its appropriateness for the area and cropping patterns intended and should consider cost-effectiveness. Irrigation experts have in the past tended to overlook an additional need: for the technology, also to be matched to the level of sophistication or operational capacity of the irrigation users. It has become increasingly obvious that the design process must start from a consideration of how the users will operate and maintain the system; this should then be designed to provide the optimum combination of efficiency in water use and cost effective operation and maintenance. Equally important, the designer must consider how the user will cultivate his land and the implications that this may have for scheme layout. Thus, it may be that the design, which involves the lowest investment cost per hectare, may not be the most cost effective solution if it also involves large numbers of staff for its operation, or if, because of operational difficulty, it cannot be utilized to capacity. On the other hand, a design to improve water use efficiency on a traditional irrigation system by the introduction of "modern" water control structures may not result in overall efficiency gains if the users reject the modern controls in favor of their traditional proportional dividers.

Generally, the choice of technologies should be based on social acceptability, technical and economic feasibility, and previous experience with the technology, technical and financial capacity of the farmers to manage, operate and maintain the technology. The size and nature of irrigation projects need to be small scale and simple to be managed by the beneficiaries.

17.2 OPTIONS FOR IRRIGATION SYSTEMS AND STRUCTURES

Small river diversions and spring gravity diversions with surface irrigation methods conveying water through unlined and lined canals are well suited to current directions of the government. In areas where there are no permanent rivers with significant discharge, micro-dams can also be considered. Pump irrigation from rivers and lakes can also be taken as an option if physical limitations will not allow gravity diversions. In areas where surface water sources are not promising, ground water can be used as an option. In areas where there is a severe shortage of water, and topographic limitations for surface irrigation methods (free flooding, a furrow), drip and sprinkler irrigation methods can be piloted in limited schemes.

Moreover, options for Irrigation systems such as pipeline, drip, sprinkler shall be assessed with respect to its feasibility of technological, operation and maintenance system

17.3 BRING IN THE BEST PRACTICE & APPROPRIATE STUDY AND DESIGN TECHNOLOGIES

The option to bring the best local and international practices as appropriate and applicable to the Ethiopian context shall be assed.

17.4 OPTION FOR INITIATION OF INNOVATIVE TECHNOLOGIES

Encourage to initiate a more innovative study and design methodologies specific to the site terrain, river/ stream morphology, topography, specificity of construction supervision, contract administration, operation and maintenance, and appropriate monitoring and evaluation techniques.

17.5 TECHNOLOGY OPTIONS FOR QUALITY AND COST EFFECTIVENESS

Encourage the quality and cost effective SSIP planning, study and design, implementation techniques that is acceptable by all stakeholders and beneficiaries.

17.6 OPTIONS FOR IMPROVED TECHNOLOGIES

Planning has to consider the adaptation of improved and innovative technologies to enhance irrigated agriculture productivity and commercialization. Among many these are;

- Improved crop type, varieties and management practices, including the accelerated release of crop varieties and agronomic and integrated pest management technologies such as crop varieties with high quality, resistant/ tolerant to biotic and abiotic stress;
- Improved input and extension system
- Improved irrigation water application and efficiency technologies
- Improved soil and water management technologies
- Irrigation on higher slopes 15-30% using bench terrace, pipeline, drip, sprinkler system
- Others as finding appropriate to the specific SSIP

17.7 EMPHASIS ON MICRO-IRRIGATION AND HOUSEHOLD IRRIGATION SYSTEMS

SSIP initiation and plan should not overlook Micro-Irrigation Systems which comprise the command area less than 20 ha for plots of greater than or equal to ten households and House Hold Irrigation (HHI) systems that comprise the command area less than 5 ha, for plots of less than ten households.

Smallholders irrigated Micro Household Irrigation System (MHIS) promotes and should be established on a demand-driven basis, which includes as small stream diversions, ponds, hand-dug shallow wells, shallow tube wells, engine and manual pumps, check dams, and springs, water harvesting, and other micro-irrigation technologies/ structures. Generally, all possible technology options for Micro Household Irrigation System (MHIS) should be assessed and implemented as appropriate to specific areas and the site.

18 CAPACITY DEVELOPMENT

18.1 BACKGROUND

One of the institutional capacity building mechanisms is training as a powerful tool for institutional capacity building and can promote interdisciplinary and managerial sustainability. It can also accelerate the transition to a service orientation on the part of government agencies, and facilitate a partnership between beneficiaries and institutions that serve them. In view of the current endeavors in SSI, it is clearly vital to improving the capacity of experts and beneficiaries through training.

Planning should consider Training and capacity building as a tool for successful implementation and manage sustainable SSI schemes. Irrigation projects should be planned to match with local capacity for implementation, which implies that planning teams should first acquire a thorough appreciation of this capacity. The planning process should, therefore, give specific attention to an analysis of institutional capacity, and to providing a detailed program to enable the implementers to prepare themselves for carrying out the tasks expected of them, once the project becomes effective. If there is less option, the project scope and content may be reduced to match the existing implementation capacity.

Beneficiaries should also get training on how to use or operate the newly introduced technology, their participation at different project stage, water management, O&M of irrigation structures. Experts should get training on newly introduced technologies, construction supervision, water management, and O&M. The training can be local or abroad and short term, medium term or long term. Abroad long term and short-term training are justified if the fields cannot be given in the local universities and are crucial for project implementation and sustainability.

Capacity building and experience sharing activities should involve both Human and physical capacity development of expertise in the implementing institutions and project management Unit assigned staffs. Accordingly, human capacity development will focus on bridging knowledge and skill gaps for experts at PMU of the implementing institution and Subject Matters Specialist (SMS) through identifying the target needs separately and capacity development plan to respond to identified gaps. Similarly**,** physical capacity development will center on furnishing and equip offices, mobility support, and other ICT equipment, including internet connectivity and creation of a website and information databases which will assist the planning, implementation, monitoring, and evaluation of SSI projects supported by different programs. Experience sharing is also one of the best capacity building methods, which should be considered in the organization of Project Management Unit planning and budgeting.

18.2 TRAINING NEEDS ASSESSMENT

A training needs assessment shall be conducted to analyze and assess the present and future training needs of implementing stakeholders SSI experts at Federal, Regional, zonal, woerda and Kebele level including WUA, farmers, women, DAs. Based on the assessment a comprehensive training strategy would be prepared and implemented in order to upgrade the skills in irrigation, water management, irrigated agronomy and participatory processes. The result of the analysis of the training needs assessment survey will be used to design the training program for each level. The survey is expected to come out with the training courses, modules, seminars and workshops with detailed contents, reading references, service providers, This will help to prepare a

comprehensive plan for training activities with guidelines for the preparation of the annual training calendar. Training needs assessment should be conducted in order to prepare result-oriented training.

However, in the absence of training needs assessment, based on the gap we identified during the past related assignments in most regions on FS, detail design, and specification and contract document preparation, operation and maintenance by Regional own force staffs there are significant engineering and other sectorial deficiencies that resulted in negative technical, contractual, construction, cost and operation and management impacts. As an indicative, the following training topics are proposed for respective disciplines

18.3 PROPOSED MAIN TRAINING TOPIC

Based on the primary training needs assessment in SSIP and previous experience of working in SSIP the following training topics shall be planned for the Team

- Training on SSIP Initiation, Project planning, Organization and Management
- Training on Site identification and prioritization
- Training in the Feasibility study and detail design
- Contract Administration, Construction Supervision and Construction operation
- Training for surveyors
- Training for Geology and hydro-geology
- Training for Irrigation Agronomists
- Training for Socio-economist and Community promoters
- Training for Soil Survey & Land suitability experts
- Training for Watershed management study
- Training on Environmental and Social Impact Assessment
- Training for project administrators, financial and property experts
- Training for project Operation and maintenance system

18.4 ON THE JOB TRAINING & CAPACITY BUILDING

On the job training and capacity building is one of the strategic approaches of training and capacity building by which implementing stakeholders staffs work together with service providers like consultants, contractors, suppliers and installation, safe guards auditing groups. Therefore, it is encouraged that implementing institution's assign counterpart staff to the project. Therefore, it is important that the implementing institution's inputs in this respect are defined in the TOR as precisely and realistically as possible.

18.5 CAPACITY BUILDING OF SERVICE PROVIDERS

Upgrading the attitude, knowledge, and skills of local consultants, contractors, suppliers and marketing actors to assure quality service shall also be undertaken within the framework of the project, as found necessary. Hence, in the planning process, the planning and organization institution should assess the existing capacity gaps of the contractors, consultants, and suppliers and propose strategies to encourage the local consultants and contractors and increase their capacity in order to get efficient and result inoriented services.

18.6 EXPERIENCE SHARING PROGRAM

Planning shall be made for experience sharing in the following means but not limited to:-

- Study Tour both local and abroad
- Seminars and workshops both local and abroad
- Group site visit and assessment
- Field demonstrations, Field Days
- Exhibitions
- Recruiting short and medium term technical assistant in different disciplines
- Others as appropriate

18.7 THE REQUIREMENT OF RESOURCES AND SOURCES OF FINANCING

Capacity building and experience sharing activities should involve both Human and physical Capacity Development in the implementing institutions and project management Unit assigned staffs. For these activities, finance resources are highly required on time and quantity. The basic sources of such financial resources would be the respective programs, which implement SSI projects and sometimes the implementing institutions from regular government budgets. In all cases, the budget has to be estimated and included in the project management cost.

19 OVERALL WORK PLAN, SCHEDULE, BUDGET, AND LOGISTICS

19.1 THE NEED FOR WORK PLAN AND SCHEDULE

As mentioned above SSIP implementation has different phases and activities. The activities are implemented with the established work schedules. The work schedule is the determination of the timing of activities and sequence of operations in the project and their assembly to give the overall completion time. SSIP implementation work activities and schedules start from the planning stage, sub-contract of the; site identification, feasibility study, detail design, Construction Award, Construction, Handing over, Operation and Maintenance**.**

Scheduling requires determination of the work activities, activity durations, and logical relationships by drawing of the logic network; and performing of the total time required. Clients and service providers need project scheduling to

- Know the project start and completion date,
- Start and end of a specific activity,
- Help to coordinate with other supporting institutions
- Predict and calculate the cash flow,
- Improve work efficiency,
- Serve as an effective project control tool,
- Evaluate the effect of changes, and
- Prove delay claims

19.2 CRITICAL PATH METHOD

Critical path method helps to understand critical points in the project cycle that could delay the project, and thus helps the project in scheduling and also check where the problem will encounter. It is a technique used to complete projects on time by focusing on key tasks. By focusing on the tasks that make up the critical path, the project manager maximizes the chances of completing the project on time.

The Critical Path Method (CPM) is a schedule network analysis technique currently used and offers a visual representation of the project activities. Presents the time to complete the tasks and the overall project, and help in Tracking of critical activities

19.3 WORK AND CORRESPONDING BUDGET SCHEDULE

As any project is a time-limited task, its implementation should have a timetable so that necessary inputs be arranged accordingly. In view of that, these SSI projects are expected to be completed in 24 months under the Normal condition of the good supply of material, financial availability and person power arrangement.

Table 19-1: Detailed work activities and schedule

S.N	Work Activities	Schedule in Months																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	**Planning and Organization**																								
2	Contract of study &Design																								
3	Site Identification																								
4	Feasibility Study & design																								
5	Supervision &Construction Award																								
6	**Construction**																								
7	Handing over																								
8	**Operation and Maintenance**																								

Table 19-2: Budget schedule

Item No.	Description	Unit	Contract Amount, Birr	Total Financial Plan in Birr for the year _____ EFY	Financial Schedule for the year _____EFY Monthly Distribution											
					Nov		Dec		Jan		Feb		Mar		Apr	
					Amt, Birr	%	Amt, Birr	%	Amt, Birr	%	Amt, Birr	%	Amt, Birr	%	Amt, Birr	%

19.4 SUMMARY OF BUDGETS AND LOGISTICS

The implementation of the SSI project will be conducted in a continues process following its phases and therefore the budget requirement for each phase shall be estimated and requested for its implementation. The following Table will present the summary of the budget for all SSIP phases.

Table 19-3: Budget summary for SSIP implementation

No	Descriptions	Unit	Estimated budgets (Birr)
1	Project Initiation, Planning and Organization Phase	Birr	xxxxxx
2	Site Identification and Investment prioritization phase	,,	xxxxxx
3	Feasibility Study & Detail Design Phase,	,,	xxxxxx
4	Contract Administration, Construction and Construction Supervision Phase	,,	xxxxxx
5	Operation and Maintenance Phase	,,	xxxxxx
6	Project Monitoring and Evaluation	,,	xxxxx
	Total SSIP or SSIPs Budget		xxxxxx

20 QUALITY ASSURANCE, CONTROL SYSTEM, AND APPAISAL

20.1 QUALITY ASSURANCE AND CONTROL SYSTEM

20.1.1 Background

Starting from SSIP site identification to final hand over there should be realistic quality planning, assurance, and control system. Quality control involves management, technique, time and cost. Control of quality depends on the effective execution of responsibilities among implementers in their respective duties. All the actors, consultants, contractors, suppliers, are expected to execute responsibilities laid down in the contract and play a role for successful completion of quality design, construction supervision, construction Monitoring & Evaluation.

20.1.2 Evaluation of standards and procedures

Establishment of evaluation of standards and procedures for quality control of the design and construction of SSI projects has paramount advantages. For instance, in the construction of SSI Projects the quality control evaluation standard could be developed with respect to Quality control of Construction Materials, which could be evaluated with materials test result, materials produced by the contractor, materials procured from manufacturers/ producers and storage of materials. Accordingly, quality control of workmanship also the basic and the three most significant factors to be closely inspected during quality control of workmanship shall be Conformity with plans, Capability of Contractor's person power and Monitoring of Equipment and Plants. Similarly, the PMU and implementing institution could use existing, also formulate fitting evaluation standards and procedures for quality control of design, specification, draw, and cost estimates.

Everyone's expectations on quality are different. Therefore, it is necessary to clearly layout what the expected grade of quality. There must be a clear idea of what tasks entail and what quality measures will be used to confirm a task is complete. Quality within projects is an ongoing process.

Quality within projects consists of Quality Planning, Quality Assurance, and Quality *Control*

Quality Planning:- identify the quality standards relevant to the project and determine how to satisfy them. The primary benefits of meeting quality requirements are that there is less rework resulting in higher productivity, and lower costs associated with the project. Primary costs of implementing quality requirements are the expenses associated with the quality strategies.

Quality Assurance:- evaluate the overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.

Quality Control:- monitoring specific project results to determine if they comply with relevant quality standards. Find ways to eliminate the causes of unsatisfactory performance once they have occurred.

Within projects, it is important to focus on quality planning and quality assurance. It is more effective to prevent errors rather than fix them. A "0" defect attitude means you implement processes that people follow to ensure or assure quality rather than focusing on quality control or inspection.

Schedule of evaluation:- Implementable schedule (time of implementation) for quality evaluation is necessary tasks in the SSI project implementation. The Quality evaluation schedule for the design of the SSI project could be performed in parallel with the field data collection through the assignment of counter staffs, document review and with field level verification. For the construction of SSI project quality evaluation and control system schedule could be conducted continuously through the assignment of counter staffs at the site level. Moreover, it could be at the commencement of the project, midterm, and final evaluation. In all the cases, evaluation should be conducted by well prepared, known and agreed evaluation schedule.

In-house quality evaluation:- Design document and construction of the SSI project could be evaluated on an in-house basis. In this evaluation necessary arrangement, experts and concerned staffs should participate continuously. The PMU and implementing institution should take the responsibilities and resources necessary for this evaluation. Time, place, number and composition of participants and duration for in-house evaluation should be stated and described clearly in the TOR that is prepared for this purpose. The advantage of the evaluation in here is that the implementing institution and PMU could manage their evaluation issues in-house level.

Stakeholders' quality evaluation:- Similarly, design document and construction of the SSI project could be evaluated through the participation of different stakeholders' and in this evaluation process concerned stakeholders should participate in the process strongly. The PMU and implementing institution should take the responsibilities and resources necessary for this evaluation. Time, place, number of participants and duration of this evaluation should be stated and described clearly in the TOR that is prepared for this purpose.

Actions to be taken:- Based on the quality evaluation results obtained at each SSI project site, actions should be taken considering the short, middle and long-term effects of the evaluation outcomes. The action to be taken will be a correction of existing gaps and overall reworking of PMU should take actions based on the evaluation reports and outcomes.

20.1.3 Kick-off meetings and orientations on the assignments

Kickoff meetings and orientation on the assignments is one of the inputs in the quality assurance and control system. On the kick off meeting concerned stakeholders in the region, zone, Woreda, and even beneficiary farmers should participate. At the meeting, detail discussion should be conducted, on the roles, responsibilities of each party, work activities and schedule; expected quality standard output if not accountabilities thereof should be discussed and agreed by the parties.

20.1.4 Follow up of the work progress and progress report

Follow up on the work progress and reporting is another input to the quality assurance and control system. All SSI project plans and implementation activities require work progress monitoring and follow-ups. Monitoring of work progress may involve observations at key sites, regular visits, and discussions with site level assigned counter staffs, users, officials and concerned experts. Those responsible bodies for planning and implementation should list the tasks needed to correct problems as they arise and should take action.

Preparation of periodic work progress report (physical activity and financial) should be mandatory (is a must) and is a formal requirement. The assigned counter staffs at site level carry out work progress follow-up tasks on a daily basis and prepare work progress reports monthly. For

instance, on the study, design, construction, operation, contract administration and supervision works, work progress activities will be recorded on a daily base and later summarized for monthly reports, these require well-prepared work progress follow-up formats. The format is indicated in the Appendix of this report

20.1.5 Study and design review workshops

The implementing agencies have a good experience in conducting a review workshop at each milestone in the study and design to improve the quality of the study and design document. In this workshop, relevant and resourceful institutions and individuals are invited to participate. It is proved that these review workshops offer valuable inputs to the improvement of the study and design document and should be continue.

20.1.6 Establishment of quality control peer team

The best alternative option is the establishment of a Quality control Peer Team within the main implementing Agency who will be responsible to establish quality control standards, conduct quality control, take remedial actions. The team can be a full time permanent staff or short time independent expert. This team shall review all SSIP at all stages starting right from initiation/inception up to operation and maintenance.

20.1.7 Quality assurance study & design review and endorsement

Last but not least is Quality assurance study & Design Review and endorsement of independent firms is paramount important. The work shall include study and design review, identify gaps, make ground verification, and recommended correction measures or restudy/redesign works and finally endorse for implementation.

20.1.8 Ground verification and community approval

Ground level verification, approval and confirmation of the project beneficiaries and existing local level stakeholders at the project site level are very necessary for quality control. At each phase of an irrigation project, particularly at feasibility study & detail designs, construction and final handover phase, the responsible government institution has to arrange a draft design appraisal and confirmation meeting with the farmers and study and design committee members in order to review, discuss the documents, and other necessary estimated costs including operation and maintenance costs.

Necessary modification or adjustment compared with the first field data collected and the location of the canal route, social infrastructures must be clearly explained to the farmers and design committee members. In this connection, the reasons and justifications for the non-inclusion of any proposed infrastructure must also be explained and discussed in detail with project beneficiary communities.

Following the presentation and review of the draft detailed designs, the farmers Irrigation Water Users Design Committee (IWUDC) members have to decide on the approval of the final detailed designs as prepared by the responsible government institution. Similarly, ground level community verification and community approval should be conducted in all irrigation planning phases, following the transition of phases.

20.2 APPRAISAL REQUIREMENTS AND TRANSITIONS

20.2.1 General

Project appraisal and phase transition activities (approval techniques) are necessary for irrigation project development and management. The transition or forward movements from one project phase to the other phase should get an appraisal and needs attentions in the planning and budgeting process.

Accordingly, to identify the best SSIP from the available potential SSI schemes in a given area (woreda) for feasibility study, Detail Design; each of them has to be evaluated using a wide range of multi-sectorial criteria such as Engineering, topography, water resource, geology, land suitability, agronomic, socio-economics, institutional capacity, watershed characteristics, environmental sensitivity, project costs, and benefits. Project appraisal using these criteria should be based on an objective assessment of each sector using both qualifying and quantified indicators/criteria's.

20.2.2 Appraisal of proposed project phases

Appraisal of each project phase requires an intensive assessment of the documents prepared by a multi-disciplinary technical team. In the appraisal of the project phases, different indicators in the logical framework and the alignment of the project with the national development strategies should be assessed. The appraisal of project phase should be conducted by an established independent in-house appraisal team or by consultants. The project phases and transitions approval process requires agreements, proceedings of the discussion, signed by the responsible team members and endorsed by the authorized person. Moreover, the project phase appraisal and transition decisions should be open, transparent and participatory.

20.2.3 Confirmation by project beneficiaries and stakeholders

A project design appraisal should get significant attention. Design appraisal and confirmation of the project beneficiaries and existing local level stakeholders on the project site is mandatory. As soon as the draft detailed designs have been prepared together with the final net command area delineation, lay-out of the project and map, the responsible government institution has to arrange a draft design appraisal and confirmation meeting with the farmers and study and design committee members in order to review, discuss these documents, and other necessary estimated costs including operation and maintenance costs.

All modifications or adjustment compared with the first field data collected and the location of the canal route, social infrastructures should be clearly explained to the farmers and design committee members. In this connection, the reasons and justifications for the non-inclusion of any proposed infrastructure must also be explained and discussed in detail with project beneficiary communities. Following the presentation and review of the draft detailed designs, the farmers Irrigation Water Users Design Committee (IWUDC) members have to decide on the approval of the final detailed designs as prepared by the responsible government institution. In the design approval stage, there should also be agreements, preferably written and signed by the beneficiary communities, kebele, and wereda level administration councils.

20.2.4 Long-shelf life projects appraisals

Due to lack of budget, technical and social conflicts small-scale irrigation project design and similar projects, phases may stay on the shelf for long-time. In such conditions costs may vary, water resources and similar resource access will change; the appraisal process in such a situation will require detailed investigation and site level assessment. The appraisal of a long-shelf life design project requires time, cost and varied team compositions.

21 SSIP FINALIZATION AND HANDING OVER SYSTEM AT EACH PHASE

Design and construction of SSIP have pre-defined implementation schedules. For instance, the consultant's design works/documents and other deliverables of SSIP will be finalized and hand over to the client based on the existing agreement. Similarly, construction works or irrigation facilities should be finalized based on its planned schedule and these works will be hand over to the clients and irrigation beneficiary farmers as per its defined schedule. In all the cases, office and field level verification of finalizing tasks as described below should be conducted well.

21.1 OFFICE LEVEL VERIFICATION

As soon as the consultant and contractors submit a notice of completion of works/services or delivery of goods and equipment, the client has to conduct an intensive office level verification. This type of verification will include checking of existing agreement; payment conducted a head, remaining payment, claims, variation issues, retentions etc.

21.2 JOINT FIELD INSPECTION/ ASSESSMENT

Field level verification of implementedworks/ services or delivery of goods and equipment's physically at the site level is the consideration points. Accordingly, finalization and hand over the system of SSI projects include Joint inspection/ Assessment of completed works. This Joint inspection/ Assessment will be conducted through multi-disciplinary teams. The final inspection team must consist of the IWUA through its Works Subcommittee, the contractor, the staff of the responsible government institution and/or contracted private company and Irrigation DAs. During the joint inspection of the completed works, the team has to check if all construction works have been carried out in accordance with the detail designs and the signed contract. In this regard, the final inspection report must be prepared by the staff of the responsible government institutions and/or contracted private company, in which the main observations, conclusions, and recommendations are summarized. If the joint inspection of the construction works has revealed that some works have not been completed properly, the Final Inspection report must specify these observations clearly and mention the main reason(s) for non-completion or unsatisfactory completion of these works. In addition, the Final Inspection Report must specify the modalities for the execution of the outstanding works, including a tentative work plan, by the contractor.

21.3 TESTING AND PRELIMINARY HAND OVER

If the final inspection has revealed that all construction works have been completed properly, the contractor must make a preliminary handover of the SSI scheme to the responsible government institution and /or to the IWUA. Then, following the preliminary handing over, the entire SSI scheme must be tested during the entire in order to assess if all structures are functioning properly and the available amount of irrigation water can be distributed throughout the entire canal system. The IWUA, staff of the responsible government institution and Irrigation DA at site level must closely monitor the test run of the entire SSI scheme.

If the test run of the SSI scheme has revealed that the system cannot be operated as designed, the responsible government institutions with the support of the Irrigation DA must investigate the cause(s) and identify any remedial measures, which have to be discussed with the contractor and the IWUA. If the malfunctioning of the SSI scheme is the result of one or more construction faults,

the contractor has to carry out the necessary corrections/ repair and/or reconstruction works at its own expense. However, if one or more design faults are the reason for the malfunctioning of the SSI scheme, the contractor at the expense of the responsible government institution should execute any remedial works and this point should clearly fix in the detail design stage.

21.4 FINAL HANDING OVER

On the other hand, if the test run has revealed that the entire SSI scheme infrastructure is fully functional, the final handing over of all irrigation infrastructures and canal-related structures from the contractor to the responsible government institution and/or IWUA can take place. It shall be conducted through the Irrigation Management Transfer Agreement. (Refer Format attached with this guideline)

21.5 COMPLETION REPORT AS FEEDBACK FOR SUBSEQUENT PLANNING

The final activities undertaken on SSI project management and organization are a review of its overall success and failure by an independent resource. Success is determined by how well it performed against the defined objective and confirmed by the to management process outlined in the planning phase. SSIP completion report involves undertaking a series of activities to wind up the project, including: - Assessing whether the project completion criteria have been met, identify any outstanding item (activities, risks or issues), producing a handover plan of any deliverables, documentation, cancel contracts, release project resources, communicate completion of the project to all stakeholders and interested parties and etc. Completion certificate shall be issued to the contractor/consultants/suppliers after completion of works

The content of the Project Completion Report has toconsist of the following

- Project description and salient features
- Assessment of implementation activities
- Project cost and financial disbursement
- Major problems, constraints, and remedial action are taken
- Project outputs
- Project development impacts
- Sustainability in all aspects (technical, social, Environmental, institutional management)
- Lessons learned
- The possibility of scaling up
- Phase out strategies

22 EXPECTED RISKS, CONSTRAINTS & MITIGATION MEASURES

22.1 RISKS AND CONSTRAINTS

Expected risks and constraints have to be initially identified in order to plan for its mitigation measures. These may be the following but not limited to;

- Shortage of Budget and/or Delay in budget approval and release
- Poor study, design and contract administration
- Issues of the right of ways for a camp site, access road, and other irrigation and drainage, physical and social infrastructure may require compensation resulting in delays
- The capacity of implementing institutions
- High level staff turnover
- Poor integration and coordination of stakeholders
- Drought and climate change resulting in a shortage of water availability
- Inflation or Decline in price due to internal and external market variability
- Others specific to regions and SSI sites

22.2 MITIGATION MEASURES

Mitigation measures for expected risks and constraints shall be well planned during project preparation.

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APPENDICES

APPENDIX I: Formats For Progress Monitoring of Activities

APPENDIX-I.1 Planned and Executed Physical Activities of Study and Design

S.N	Work Activities'	Unit	Weight (%)	Plan	Work Executed (%)								
					Qu.1			Up to Qu, 1			From the Year plan		
					Pl.	Ex	%	Pl.	Ex	%	Pl.	Ex	%
A	**Field investigation and Surveying**		**65**	65									
1	**Topographic Survey**	%	5	5									
	Detail Field work activities												
	Detailed post field work activities												
2	**Hydrology**	%	7	7									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
3	**Geology &Geotechnical works**	%	7	7									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
4	**Soil & survey & land suitability**	%	8	8									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
5	**Headwork & Irrigation planning & design**	%	8	8									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
6	**Socioeconomic works**	%	8	8									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
	Data compilation and analysis												
	Report preparation												
7	**Irrigation Agronomy works**	%	7	7									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
	Data compilation and analysis												
	Report preparation												
8	**Watershed development plan**	%	3.5	3.5									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
	Data compilation and analysis												
	Report preparation												
9	**ESIA**	%	3.5	3.5									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												

S.N	Work Activities'	Unit	Weight (%)	Plan	Work Executed (%)								
					Qu.1			Up to Qu, 1			From the Year plan		
					Pl.	Ex	%	Pl.	Ex	%	Pl.	Ex	%
	Data compilation and analysis												
	Report preparation												
10	**Financial and economic analysis**	%	8	8									
	Detail Pre-field work activities												
	Detail Field work activities												
	Detailed post field work activities												
	Data compilation and analysis												
	Report preparation												
B	**Data analysis and Evaluation of Feasibility Study and Detail Design Report Preparation**	**%**	**35**	35									
1	Detail engineering design & preparation of working drawings												
2	Specifications and tender document preparation												
3	Preparation of operation and Maintenance manual & M												
	Total		**100**	**100**									

APPENDIX I.2 Planned and Executed Physical Activities of Construction Works

S.N	Work Activities'	Unit	Weight (%)	Plan	Executed Work (%)								
					Q1			Up to Q1			From the Year plan		
					Pl.	Ex	%	Pl.	Ex	%	Pl.	Ex	%
1	Mobilization	%	15										
2	Access Road	%	3										
3	Camping	%	10										
4	Head Work	%	30										
	Site clearance	%											
	Excavation	%											
	Masonry	%											
	Plastering	%											
	Back fill												
5	Main Canal	%	16										
	Site clearance	%											
	Excavation	%											
	Masonry	%											
	Plastering	%											
	Back fill	**%**											
6	Secondary Canal &RS		12										
	Site clearance	%											
	Excavation	%											
	Masonry	%											
	Plastering	%											
	Back fill												
7	Tertiary canal & RS	%	8										
8	Social Infrastructures	%	3										
9	Drainage works	%	3										
	Total		100										

APPENDIX I-.3 Planned and Utilized Financial Resources

S.N	Work Activities'	Unit	Total Budget (ETB)	Plan for the year (ETB)	Utilized budget (ETB)								
					Q1			Up to Q1			From the Year plan		
					Pl.	Ex	%	Pl.	Ex	%	Pl.	Ex	%
1	Project Initiation, Planning, and Organization	Birr											
2	Site Identification and Investment prioritization												
3	Feasibility Study & Detail Design												
4	Contract Administration and Construction Supervision												
5	Operation and Maintenance												
6	Project Monitoring and Evaluation												

APPENDIX I-4 Planned and Utilized Budget for construction

Item No.	Description	Unit	Contract Amount, Birr	Financial Plan in Birr for the year _____ EFY	Utilized budget (ETB)								
					Quarter-1			Up to Quarter-1			From the Year plan		
					Pl.	Ex	%	Pl.	Ex	%	Pl.	Ex	%

APPENDIX I-5: Monthly Work Progress Format

Project Name:_____
Client:_____
Consultant:_____
Contractor:_____

Plan Period : _____ Contract Time: _____

Fiscal Year: _____ Utilized time: _____

Commencement date : _____ Remaining contract time: _____

Completion Date: _____ Percentage completion to date: _____

Bill Item No	Activity	Unit	Unit Price' Birr	Tender Quantity	Previously completed quantity	Accomplished Quantity				To - Date Certified	Difference	Remark
						This month		To - Date		Quantity	Accomp-Certified	
						Planned	Executed	Planned	Executed		Quantity	

Remarks: _____.

Prepared by

Name: _____
Signature _____

Approved by

Name: _____
Signature _____

APPENDIX II: Typical TOR for Site Identification and Prioritization

This Term of Reference indicates major activities or assignments for executing of site identification & prioritization of potential small-scale irrigation sites. The study should be comprehensive and participatory to identify most preferable sites for further study in feasibility and detail design phase. The site identification & prioritization study need to be undertaken by group of specialists including irrigation engineer, geologist, agronomist, environmentalist, socio-economist, watershed expert, topographic surveyor, and soil expert.

Site identification assignment can be undertaken in two conditions:

- Identifying small-scale irrigation site from single water source where there is no other alternative to compare their suitability or potential.
- Identifying and prioritizing in order of their potential to select the most suitable site.

Each of the team members have to refer the detail assignments and involve in respective to the listed requirement.

- Prepare location base map for screened potential sites for general bio-physical observation and their distribution in watershed and administrative boundary
- Conduct stakeholder consultation with respective wereda/kebele administrative and sector offices

I. Preliminary screening of potential sites from wereda or larger hydrology boundary

- Identify and prepare list of potential irrigation sites from secondary sources including topographic maps; digital maps; previous studies
- Collect list of previously identified potential sites with basic parameters from wereda agricultural office or water resource development office
- Screen out the preferred potential sites from long list potential sites collected from different sources for further prioritization in consultation with wereda administration and wereda agriculture; and water resource development technical staff
- Identify manageable number of potential sites for further site visit and preliminary data collection. The study team and relevant stakeholders should reach in consensus on validity of the selected sites for further preliminary assessment

2. Potential site assessment

2-1 Climate and Hydrology

- Identify relevant climate and hydrologic data source to be used for preliminary analysis including ETo
- Determine minimum stream flow with appropriate and most common method
- Estimate preliminary water balance considering up/down stream users and environmental flow; with 70% dependable monthly flow
- Evaluate the hydrological findings from preliminary assessment taken for each potential sites. the hydrological parameters are stream flow, water balance effect, rainfall adequacy, and catchment drainage density

2.2 Water resource potential assessment

Delineate and characterize the watershed of the potential sites with basic parameters at preliminary level

- Estimate the catchment area and illustrate the drainage pattern
- Analyze the extent or impact of the catchment on water resources sustainability and health of the headwork
- Preliminary description of community watershed conservation experience from stakeholder consultation and secondary information

2-3 Engineering related assessment

Engineering related assessments need to be carried out to indicate major structure requirement for recommended type of irrigation system in turn it tentatively shows potential irrigable land and cost-effectiveness of water storage, distribution and drainage structures. In order to compare and prioritize the project sites, the following relevant factors should be defined

- Recommend appropriate type of irrigation system for each potential sites and their alternatives depend on cost effectiveness; complexity for management, social and environmental factors
- Identify cost effective, appropriate headwork site(s) for all potential sites together with study team members in consultation with communities, knowledgeable persons and representative of wereda offices (preferably engineer). The headwork sites might be 2-3 in number for each potential site
- Apply the recommended criteria in GL 2 site Identification and Prioritization Guideline to select appropriate headwork type
- Delineate the command area on 1:50,000 topographic maps, and recent high resolution satellite imageries. Cross-check appropriateness of the command area boundary with additional information from woreda irrigation experts, and the local people.
- Produce preliminary layout indicating the command area boundary, primary canal, and crossing points with close involvement of wereda irrigation/water engineer and community representatives
- Estimate engineering cost per hectare from secondary sources experienced in the project area.
- Summarize the engineering assessment findings and compare the potential sites to investigate most preferable sites from engineering aspects

2-4 Geological Preliminary assessment

At this level opf study, the geological investigation and description should be based on preliminary site observation and augering at selective pints for confirmation

- Review the geological and hydrogeological condition of the project area from secondary sources like Ethiopian geological survey map, satellite images; previous studies conducted in and around the project area similar to the project sites
- Identification of general geologic conditions of the headwork cross section i.e. weir axis geomorphology, geology, hydrogeology and engineering geology
- Check profile of canal routs and structures
- Study source of irrigation water supply river's/spring's profile around the headwork site from visual observation.
- Identification of stability conditions and potential geologic failures at the same sites which will be confirmed during feasibility study.

2-5 Topography Survey

Topographic survey of the potential sites at this level of study is limited on headwork sites cross sections and terrains of the command area.

- Carryout cross-sectional survey of the source river and its flood-plain up to 5m above the floodplain (on both right and left banks) 50-100m on u/s, d/s & along axis of headwork.
- Undertake cross-sectional survey to determine flood embankment requirements along some ±1 km of the River and its floodplain,

2-6 Soils and Land suitability evaluation

Soil and land suitability evaluation should be mainly based on preliminary investigation of bio-physical features of the command area. at this level of land resource assessment for characterization and

prioritization of the command area of the potential sites rely on physical assessment and soil augering at 1.2m depth

- Prepare soil survey base map for positional reference and to provide bio-physical data that can assist in the prediction of soil properties
- Identify major soil type, land use/cover type and distribution, topographic condition (use slope range classification of ranges (0-3%; 3-5%, 5-8%, 8-15%, 15-20%; 20-30%, 30-60% and >60%)
- Describe surface characteristics (Rock outcrops, Coarse fragment, Erosion, Surface sealing and Surface Cracks) of the command area
- Assess and determine the effective soil depth; water table; texture; color and top soil structures from auger observation
- Evaluate the identified command area for irrigated agriculture for potential prioritization

2-7 Irrigated Agriculture production potential assessment

Preliminary agricultural potential assessment should be undertaken to provide inputs for project site selection and prioritization. At this level of study, preliminary estimated figures, descriptions and analysis are adequate to characterize the project sites and compare for their potential. The following detail tasks should be undertaken by the agronomist

- Assess the existing farming system of the project site(s) in consultation with communities and wereda and kebele experts
- Identify crops grown in the potential site and classify into food and cash crop groups
- Investigate the prominent farming experiences including cropping calendar, crop intensity and major limiting factors of crop production
- Conduct climate matching analysis for selected crop groups potential for competent sites
- Describe the length of growing period and make compatible analysis for potential crops
- Analyze extent of environmental and climate induced vulnerability on crop production to compare the degree of exposure of the potential sites
- Propose appropriate crops and cropping pattern for preliminary assessment and determination of their irrigation demand. The crops could be few in numbers those selected from different crop groups like cereal, pulse, oilseed, vegetables and fruit tree crops.
- Estimate crop and irrigation requirements of the proposed crops
- Prepare indicative crop budget from the unit rate of the project area which can be obtained from previous studies, and wereda/kebele data sources
- Evaluate the potential of the project sites from crop requirement, water demand and production context for prioritization

2-8 Socio-economic, marketing and agri-service support assessment

Socio-economic and marketing preliminary assessment should be carried out at preliminary level to sufficient information to describe the SSI potential sites and compare from socio-economic and community participation context.

During site identification phase, the willingness of the communities in the intended command area or project kebele has to be checked whether they are interested to own and manage the proposed agricultural development.

- Identify the settlement pattern; and demographic features of the potential areas in consultation with key informants and secondary data source
- Conduct preliminary assessment on economic basis, availability of farm labor, and availability of agricultural based investments;

- Assess the attitude of the stakeholder and community in regard to the project potential to sustain socio-economic development with close consultation of stakeholders
- Conduct preliminary assessment on existing social infrastructure and agriculture support services
- Assess the marketing infrastructure and participants in and around the irrigation potential areas
- Carryout preliminary cost-benefit analysis to provide indicative figures to evaluate the potential sites for prioritization

2-9 Socio-economic, marketing and agri-service support assessment

- Conduct potential site screening and scoping to determine the requirement and describe the potential sites with basic environment study requirements
- Brief description of potentially affected areas including up/down steam of the potential project sites.
- Identify alternatives to be considered for planning of economically, socially and environmentally sustainable small-scale irrigation potential sites.
- Conduct preliminary bio-physical features of the potential sites
- Investigate basic environmental issues and beneficiaries' attitude towards the sustainability of the project and surrounding environment
- Identify preliminary environmental and social impacts and their mitigation measures

3. Potential site prioritization

Evaluate and prioritize competent irrigation potential sites with multi criteria analysis (MCA) method

- Identify evaluation criteria in the context of small-scale irrigation project. the evaluation criteria should be set for each sector involved in potential study.
- Examine the weighted main and sub-sector criteria for prioritization
- Prioritize and identify the first potential sites to be studied at feasibility level (at least three potential sites from the woreda depends on the client TOR)
- Ensure the acceptance of the prioritized potential sites by stakeholders and beneficiaries by organizing endorsement meeting at grass root level
- Get approval from project implementer stakeholders and beneficiaries

4. Prepare site identification and prioritization work plan and schedule

APPENDIX III: Typical TOR for Feasibility Study, Detail Design

1. Introduction

This TOR has been prepared targeting the development of small scale irrigation through assisting and supporting farmers to improve irrigation management practices and the promotion of modern irrigation systems.

Prior to the feasibility study and detail design feasible project option has been selected and agreed between the **client and the consultant**, or the client should select the feasible site and provide to the consultant for these detailed planning should be put in place. The feasibility study and detail design should have an outcome and the outcome should be project document that is in many respects a feasibility study and detail project design report: ideally it should define the project in all respects. The project report should therefore demonstrate that the project is:

- Inconformity with the country's sub sector objectives and priorities;
- Consistent with the felt needs of the intended users;
- Technically sound and the best of the available alternatives under existing technical and economic constraints;
- Institutionally workable;
- Unlikely to result in any adverse social impacts without adequate compensation;
- Technically, environmentally and fiscally sustainable;
- Economically and financially viable; and
- Ready for implementation.

Similarly, the final feasibility Study and Detail Project Design Report (FS & DPDR) shall include but not limited to the following aspects:

- Topography;
- Climate and Hydrology;
- Assessment of Catchment Water Balance
- Geological & Geotechnical;
- Availability of Construction Materials;
- Watershed Management Study and draft plan for proposed Soil and Water Conservation works in the vicinity of the headwork, along the main canal and within & around the envisage command area;
- Soil Survey and Land Suitability;
- Irrigation Agronomic and draft agricultural development plan for the project;
- Sociological and Socio-economic Investigation;
- Consultation of actual target Beneficiaries and other stakeholders;
- Assessment of IWUA aspects and draft plan for proposed Capacity development for the irrigation water users of the envisaged irrigation development,
- Detail Engineering Design and Investigation; and
- Environmental and social impact assessment (ESIA) and proposed Environmental and Social Management Plan;

1.1. Objective

The prime objective of enhancing the implementation of small-irrigation project is the starting point for securing better livelihood for the rural low income/ poor population. To make this happen, several attempts are underway, of which studying and designing of small-scale irrigation scheme by the regional officials and private firms is considered as a short cut for increasing the pace of irrigated agriculture development in the country.

1.2 Scope of the Service

The implementing institutions or service providers or consultants should conducted an identification study and ensured that beneficiaries have made the request for assistance and they are willing to form IWUA as well as contribute minimum 10% of the total scheme development cost. Besides, the identification study should indicate that there is a flow for the proposed irrigation development that should be confirmed by the implementation institutions or by the consultant in the identification report and the project is free from any conflict. Hence, there is a need to carry out feasibility study and detail design for construction.

This study should be done using PIDM (participatory Irrigation Development Management) approach in which more participation and decision making of the community is to be practiced. Accordingly, from the very beginning of the study like headwork selection, main canal route, night storage location and others structures should be discussed with the community design committee/ IWUA and endorsed by them. In addition, ground truth of the draft final design of the project should be done and presented to the beneficiaries design committee / IWUA and endorsed.

The aim of this TOR towards implementing feasibility study and detail design of small scale irrigation as a component of the livelihood project is:-

- To carry out detail design, bill of quantities and cost estimate for the head work and its components, canal system and its pertinent structures
- For preparation of tender documents for construction, Bill of quantities, cost estimates including break down for unit price.
- To realize that the project designs are in favor of the desired social, economic, technical & environmental objectives set for the particular project.
- In each study discipline, the community should participate according to the PIDM approach introduced in the region
- Detail TOR on each discipline is attached with this document

2. Detail Service

The stakeholders in charge of the feasibility study and detail design of small scale irrigation projects will be proposed to undertake the following services. The detail services include but not limited to the following activities.

2.1 Topographic Survey

Detail survey works both at the headwork site and irrigable area shall be conducted and a topographic map of the scheme area has to be prepared at a specified scale. Preparation of the topographic map of the

headwork, conveyance structures, division structures & other structures at the specified scales. The topographical survey shall include Topographic surveys; Alignment surveys; and Structure site surveys.

1. **Topographic Surveys:** The topographic surveys shall cover the whole project area including source works/head works and the irrigation command area and as required to provide adequate information for detailed design.

2. **Alignment Survey:** Topographic surveys shall be carried out along the alignments of the proposed canals and embankments.

3. **Structure site survey:** The Consultant shall carry out detailed topographical survey at each hydraulic structure site to enable the preparation of an existing site layout drawing with 0.25 m contours, detailing the canal alignments and levels, and any other relevant local features such as irrigation structures, access roads, houses, property fences or boundaries and any other permanent reference marks.

2.1.1 Drawings

General Arrangement and cross-section drawings shall be provided in AutoCAD format including: Plan of the site; Longitudinal section taken through the proposed structure and approaches; and Cross sections taken at 20-30 m intervals in two directions including one on the watercourse center line.

2.1.2 Bench Marks

Permanent reference benchmarks will be provided at each site to enable accurate location and control of construction of the works. The benchmarks shall comprise steel pins set in concrete or other permanent object. Sufficient benchmarks shall be established for each major structure site. These benchmarks (control points and temporary benchmarks) shall be accurately identified, referenced to the base maps and registered to the GIS system, and tabulated on the completed survey drawings. A hardcopy log shall be prepared containing location coordinates, photographs, and elevation. Photographs shall be digital photographs and provided in soft copy.

2.1.3 Survey Specification and Accuracy

The survey results for the topographic maps shall be represented on a 1:1000 scale plan drawing with elevation contours at 0.25 m intervals in height. The irrigation unit command area selected for detailed on farm design shall be surveyed with elevation contours at 0.25 m and represented at a scale of 1: 500.

Headwork Cross-sections shall be represented at a scale of 1:200 -1:100 horizontally and 1:100 vertically and their locations shall be shown on the plan. The plan shall also indicate land usage and the locations and levels of the permanent survey stations and benchmarks.

Some of the surveying and mapping requirements are detailed as follows:

- Detail surveying works both at the headwork site and irrigable area shall be conducted and topographic map of the scheme area is to be prepared using a specified scale.
- Topographic map of the head work at scale not more than 1:500 and at a contour interval of not more than 0.5m, showing all the features upstream and downstream, right & left of the proposed site including observation pits shall be prepared.
- Headwork cross section at a scale of both vertical & horizontal shall be 1:100 indicating the pertinent features of the head work shall be prepared.
- On purpose to acquire a complete documentation of geological conditions at the proposed site(s) selected detailed topographic map of scale 1:1000, with 2.5 contour intervals is of primary importance, cross sections along axis of river diversion, at 100 m d/s and 100 u/s, exploration of river diversion sites and investigations of construction materials and their suitability.
- Topographic map of the irrigable area at a scale of not more than 1:100 at a contour interval of not more than 1m for steeply area (≥ 25%) and not more than 0.25-0.5m for plane and undulating areas shall be established.
- The topographic map should also show all major features in the irrigable area. This includes traditional canals, water fetching points, springs, settlements, footpath and cattle crossings, gullies, trees, benchmarks, hills, graves & etc.
- All the required benchmarks and stations shall be established using stable features and shall be properly connected with the national grid station and benchmarks of the proposed headwork site.
- After the canal and drain route is selected from hydro geological and economic considerations, profiled data along the main canal, secondary canals, tertiary canals, main drain, secondary drains, tertiary drains shall be collected and longitudinal profile of the canals and drains shall be prepared at a scale of vertical 1:100 and horizontal 1:500 and at a contour interval of not more than 1m.
- Topographic plan at a scale of 1/500-1/1000 must be prepared to show the most appropriate canal route and topography of areas of the route in a width of equal 1.5 to 2 times the estimated reserved width. The salient features and building along the canal route reserve must be properly demarcated in the survey plans. These maps should also show the information necessary for land acquisition. Longitudinal plan with the point distance of 25 m and cross-sectional plan within the reserve at 50 m interval should be produced.

2.2 Climate and Hydrology

The study shall examine appropriate data and provide the climatic conditions of the study area providing the details of:

- Review previous relevant study documents and clearly identify the gaps and short comings;
- Ascertain and thoroughly check the availability and quality of hydro meteorological data;
- Data available shall be described and presented in the form of tables, bar-diagrams, etc. including source, location and altitude of the station, drainage area, and distance from the site under consideration.
- Internal and external checking of the consistency of available data shall be made at specific control points and corrections made, if any.
- Short data gaps shall be filled by using either of the appropriate hydrological methods
- Compilation, processing and validation of hydrological, hydro-geological and meteorological data;
- Assess all watershed features pertinent to analysis and simulation of hydrological data;
- Assess and confirm the availability of lean flow and its dependability for irrigating the proposed land;
- Examine and confirm the quality of water and its suitability for irrigation;
- Fix hydrologic criteria for design flood for weir/barrage/cross-drainage structures etc;
- Carryout flood analysis in order to determine the design flood either based on available flow data or using universally accepted methodologies;

- Determine standard project storm, maximum probable storm, 25 yr. 50 yr., 100 yr, frequency storm etc. for various structures;
- Examine and describe the sediment yield of the watershed and the nature of bed load coming along the river so as to mitigate any adverse effect on the headwork and outlet structures;
- Analyze the ground water conditions of the project area;
- Determine runoff and drainage characteristics so as to define drainage characteristics;
- Propose suitable recommendations with regard to flow measurement and other data to be collected such as river gauging, rainfall gauging and irrigation canal water flow measurement;
- Carry out all other data considered necessary and relevant for the hydrological component
- Carry out the water balance of the river/stream basin to avoid water use conflict between U/S and D/S users;
- Perform water supply and demand analysis of the proposed irrigation project;
- Carry out discussion with existing water users on the U/S and D/S of the proposed irrigation project and confirming that their already established water use right will not be breached or jeopardized.
- Ensure the availability of lean flow and its dependability for irrigating the proposed land;
- Ensure the release of 20% of the lean flow to the ecology.
- The possible hydrological effects that will prevail on the project area and particular on the downstream area of the project shall be assessed and discussed.

Note: - The design flood must be estimated based on data of at least 20 – 30 years. If such data is not available, new data must be generated (synthesized) using approaches outlined in hydrology manuals/guidelines.

Assessment of Catchment Water Balance

In assessing the adequacy of the proposed water source, account must be taken of the demands, both existing and planned, of other users drawing from upstream and downstream of the proposed abstraction site. Where appropriate, such demands should include flows necessary to support the aquatic ecosystem of the resource and of any wetlands downstream. It is not possible to define a precise distance downstream of the proposed abstraction site along which existing and possible future demands for water should be quantified; but the consultant has to make acceptable judgments and decisions based on available information.

Wherever a new scheme is planned whose water supply is to be obtained from a surface source, there will almost certainly be existing established demands for water upstream and downstream of the chosen abstraction point. A formal system of water rights may be in operation, or local people may have an agreement by traditional custom over the way in which water for irrigation is allocated. Therefore, base flow of the river and impacts of the diversion for irrigation both at upstream and downstream uses shall be assessed properly.

Therefore, information should be provided on water balance considering the minimum flow of the river, the current users (in the command area, downstream and upstream beneficiaries) of the given water resource for different purpose (irrigation, livestock, and domestic purpose, ecological function), the amount to be diverted, the deficiency resulted to the downstream users due to the diversion.

Future increases in demand on the source upstream of the proposed abstraction site, taken together with existing and any planned additional demands downstream, both net of downstream inflows, will give the equivalent demand at the abstraction point to be deducted from the supply when assessing the water available to the project. Where discharges at the abstraction site have been naturalized, the equivalent demand should also include existing demands upstream.

The assessment shall contain a detailed discussion of the hydrological analysis leading to an assessment of the available water resources and reviews of a methodology to determine the flow data series to better assess available surface water resources.

2.3 Geological and Geotechnical Investigation

Extensive geological and geotechnical investigations are to be conducted to confirm that, the site can be developed on the desired scale and at acceptable cost. The nature of soil and rock formations present, critical to foundation integrity, must be proved by subsurface exploration. Foundation competence must be determined by stability, load carrying capacity, deformability, and effective impermeability. All are to be assessed in relation to the type and size of structure proposed.

The geological and geotechnical investigations are required for headwork and other structures foundation verification, embankment design (if any), canal design, borrow area etc. Detailed Investigation Report on the foundation investigations of different structures/components of the project discussing the following points and additional points, if any, as relevant to the structure shall form an appendix of the Detailed Project Report. Summary of the investigations carried out, results, treatments, recommendations etc. shall be furnished under the chapter of the Detailed Project Design Report.

Generally, the consultant shall undertake the engineering geology and geotechnical investigations at the proposed sites in accordance with the references detailed below.

- Previous studies and relevant documents (geological reports and maps) if any will be thoroughly reviewed and the gaps and shortcomings shall be clearly identified;
- Visit to the proposed river diversion/dam sites of interventions and verify its suitability from geological and geomorphologic point of view through traverse downstream and upstream of river diversion sites;
- Conduct Geotechnical assessment for foundation structures, headwork site, main canal and appurtenant structures.
- Conduct suitable field and laboratory tests to determine the composition, compaction and integrity of existing embankments;
- Carry out bulk samples at 0.5 m intervals to appropriate depth at structure and borrow locations for soil characterization testing at a suitable laboratory. In situ and field test techniques should be employed to supplement laboratory testing;
- On purpose to acquire a complete documentation of geological conditions at the proposed site(s) selected detailed topographic map of scale 1:1000, with 2.5 m contour intervals is of primary importance, cross sections along axis of river diversion, at 100 m d/s and u/s, exploration of river diversion sites and investigations of construction materials and their suitability;
- Prepare details and location of the pits, along the river diversion axis and abutment, and in-situ tests conducted for foundation investigations including other locations;
- Present summary of the field investigations/observations, in-situ and laboratory tests data, evaluation of the design parameters and treatment proposed;
- Geology, engineering geology, and hydrogeology characteristics of the catchments are explained in brief and discussed.
- The drainage system, history, nature and relative age of the rivers studied and assessment on the catchment area related to the presence of soluble rocks, erodibility and degree of weathering with respect to sediment transport, identification of the possible sources for water quality problems and assessment on the presence of geological structure and their trend and extent are made.
- Weir or dam axis and abutment geomorphology, geology, hydrogeology and engineering geology are studied in detail and problems of stability, soil bearing capacity, instability, water tightness, such as presence of faults, fissured materials, and their permeability, slop and slip, etc… are addressed.

- Investigate foundation features of the recommended headwork site, canal route and retaining walls and determine the depths of bed rock/hard stratum.
- Carryout geological test pits at a depth of 3-5m or more if necessary at reasonable interval depending on the topographic features of headwork site along the cross section and longitudinal section of the proposed sites;
- Carryout a log profile to clearly indicate the material composition of the foundation material, foundation level and ground water condition;
- General engineering geological conditions of the main canal is investigated along the tentatively selected route and at its immediate vicinity by approximating the change from the headwork or from any well-known reference point, concerning its stability, permeability, workability etc,. Moreover, major gully crossings are also studied at the assumed point of canal crossing and its vicinity. During the investigation, samples are taken for different tests if necessary;
- Identify any geological hazard in the project area which threatens sustainability;
- Finally, detailed analyses of all the data are carried out and a brief engineering geologic, hydro-geologic, geologic report is to be produced which includes location map of the site and construction material.

2.3.1 Construction Material Survey

Adequate coverage survey shall be carried out at the proposed site for identification of suitable sites for construction material. This shall cover:

- Investigation for identification of locations of potential quarries for construction materials like rock, aggregates, sand, soils and water; and distance, quality, quantity and hauling distance including access route are to be examined;
- Estimation of quantity of material for each location, details of sample collection/testing of the materials, quality/suitability of the material, road maps showing the transport road up to the borrow area in relation to the construction site(s) shall be provided;
- Identifying the borrow areas; and preparation of location maps, road maps etc. showing the transport road up to the borrow area, relating the same to the construction site(s);
- Collection and evaluation of samples from borrow areas (rock, sand, soil and aggregate quarry sites) for its suitability for different types of materials shall be collected for laboratory tests;
- The depth of the pits/auger holes shall depend upon the availability of the soils and economic exploitation. The borrow area shall be located at near the working site as possible. Pits/auger holes (diameter 15 to 30 cm) shall be taken in the proposed borrow area on 30 to 50 m grid depending on the uniformity of soil depth & type and representative samples collected/tested for different types of strata/soil to determine their properties and delineate the soil zones;
- For assessment of quantities, drill holes shall be taken in consultation with geologist, if required;
- Required details of any other material as indicated in the earlier items shall be indicated.

Note that the plan and section showing the stratification of the borrow area shall be included in the appendix. The lead for different types of soils from the site(s) of work for different borrow areas shall be included in the appendix.

2.4 Watershed Management Study

- Previous studies, interventions and relevant documents on topography, or physical features of the watershed, climate, catchments morphologies, vegetation, soil, land use/ cover, socio-economic activities, erosion assessment, past conservation activities and scientific measures/ recommendations done in the area if any, will be thoroughly reviewed and the gaps and shortcomings shall be clearly identified; and the history of the watershed area in terms of the past land use practice and subsequent social, economical and ecological effect will have to be described.
- Investigate soil erosion and deforestation problems of the area and propose mitigating strategies;
- Investigate natural and human induced factors that aggravate soil erosion and land degradation. Any watershed management practice if existed and its ultimate output will have to be assessed

and the extent of work done or conservation efforts on agricultural land, grazing land, forest land, etc shall be quantified for each land use type and summarized in a tabular form.

- The study should cover the topography or physical features of the watershed, catchments morphologies, (drainage and stream density etc.), soil physical features, major socio-economic activities. It should also include land use/cover (past, present and future) of the watershed and define each of them. It should also include erosion assessment as its type, location and amount, past conservation activities and scientific measures done in the area;
- Identify existing land use and propose land capability classification in the watershed; Land capability classification based on criteria in relation to the most important features observed in the field and those directly or indirectly related with soil-water erosion such as slope, soil depth, past erosion, infiltration, water logging, soil texture, etc. Classify the land into soil requirement class based on appropriate method;
- Identify improved soil and water conservation, forestation and land use measure/technologies, for each land use classes which are harmonious to farmers' activities, work volumes, etc. to be undertaken for sustainable management of the watershed;
- Carry out erosion rate and sediment yield estimation and the implication for the future project (Diversion or Pond), before and after the project for the weir;
- The computation of important hydrological parameters C, CN, TC and determination of the design period, usually 10 years for SWC structures;
- Determine, design and fix capacities and dimensions for the recommended SWC structures. The detailed methodology used in designing and quantifying the required amount of conservation work shall be discussed.
- Prepare base maps and general SWC development maps and layouts for all the watershed area; showing the administrative, sub-watershed units, necessary structures and other relevant quantitative and qualitative information;
- Prepare specifications and estimate costs for the conservation measures and/or structures; which includes the time requirements, schedules and priorities including the implementation calendar corresponding to each activities and months of the year.
- Carryout hydrologic, hydraulic and structural designs of SWC structures;
- Identify physical and financial inputs required for the implementation of the proposal;
- If the water source for SSI is shallow groundwater, watershed management practices shall include ways to enhance artificial recharge;
- Produce watershed maps including DEM, soils, land use and land cover;
- Produce detailed hydro-meteorological data for the watershed and surrounding stations;
- Identify hotspots within the watershed in terms of soil and water conservation, groundwater recharge zones, etc;
- Identify the feasibility of cost sharing between upstream and downstream users, such as payment for environmental services;
- Identify availability of infrastructure such as roads, nursery, nursery store and office etc, availability of man power such as staffs in the Office of Agriculture, guards (forest and others) and nursery workers like foreman and the type and amount of tools and equipments for implementation of the watershed development programme and propose necessary measures.

2.5 Irrigation Agronomy

Aspects to be covered in the Irrigation Agronomy Studies will include: -

- Assessment and description of the physical features of the project/ project area/ including information about agro-ecology, climate, location, water resource, topography, soil and other features of the command area, in relation to the land suitability for irrigation development;
- Assessment and description of the present agricultural practices of the area; including, but not limited to, information about major crops, productivity, cropping pattern and calendar, farming practices, input use, crop protection, extension service and other relevant activities. Major production constraints should be clearly assessed and described so as to seek and propose appropriate solutions;

- Select the most appropriate crops which will be suitable for the prevailing climate, soil, available water and available labor in the new irrigation system;
- Carry out the estimation of crop water requirement through widely applicable methods;
- Determine cropping patterns, cropping calendar, irrigation intervals, and irrigation frequencies considering hydrology, soil, climatic, actual cropping practice of individual farmers, and socioeconomic data;
- Propose recommendations as to the most appropriate type of inputs such as seeds, fertilizers, and chemicals and their levels of use taking into account the environmental factors;
- Propose recommendations as to the most appropriate and improved agronomic/crop management/ practices such as crop protection, optimum planting/sowing depth, and optimum plating, spacing, threshing, storage and other relevant practices,
- Calculates the labour, animal, and machinery requirements of the farm, their distributions, and scheduling;
- Propose recommendations on the type and model of the farm machinery and tools;
- Estimate the availability of labor, draught animals, machinery rental facilities, regional market areas, etc.;
- Determines the projected agricultural development costs of the area and likely returns from the project during its early and later phases;
- Estimate crop yields based on any existing data from the study area; the factors taken into consideration for the projection should be described and justified.
- Identify the need for input supply, credit services, training, extension support, marketing facilities, and crop facilities and estimate cost for each service;
- Assess the agricultural marketing values of the selected crops and prepare crop budget of the crops at the final stage of the study;
- Assess the possibility of appropriate processing and storage techniques of the identified crops
- Compute the amount of water required for irrigation of the selected method of irrigation as well as for at least two irrigation efficiencies;
- Determine the critical periods for irrigation each selected crop so that to ensure adequate water availability at these times;
- Calculate and determine the consumptive use of various potential crops and the irrigation requirements and prepare irrigation scheduling considering complex cropping at a farm level;
- Collect climatic data from appropriate stations and simulate the data from the study area;
- Investigate all major crop diseases, pests, weeds and suggest prevention and control strategies.

2.6 Soil Survey and Land Suitability

Each different soil type has to be inspected to a depth from the surface of 2 m by means of a pit. In areas of uniform soil, one pit should be dug every 30-50 ha. Where more than one soil occurs within the project command area the survey shall be sufficient to define the approximate boundaries and areas of the different soils. This will be augmented through field observation, laboratory test, and by information from farmers. The consultant shall give due consideration to the knowledge of local farmers in terms of soil variation, susceptibility to flooding and tillage characteristics. The consultant will provide detailed information on land classification and soil physical and chemical properties of the command area as a basis for confirming crop selection, irrigation designs, and agricultural input requirements. The details shall cover the following:

- Preparation of soil survey and land evaluation report for irrigation within the command area;
- Assess and evaluate existing land use pattern and serve as a basis for assessment of land and crop suitability for irrigation;
- Identify the various topographic forms, soil types and existing land use;
- Assess and identify physical and chemical properties of the soil in the command area;
- Soil auger hole and profile description must be done as per the standard procedures;
- Carryout an overall intensity of soil observations, pits, typically one per 10ha (one per 4 ha-30ha) depending on command area conditions;

- Perform land irrigability and capability classification and/or land suitability evaluation for crops for sustainable development of irrigated agriculture;
- Soil and land suitability maps must be prepared and incorporated in the report at a scale of 1:1,000 with contours having an interval of 0.25 m; to an appropriate depth of 2m or the bed rock, whichever is shallower;
- In-situ soil physical parameters such as infiltration test, hydraulic conductivity, PH, etc should be included in the report;
- Procedures as proposed in the FAO guidelines for land evaluation will be used. FAO soils bulletin No32 (A frame work for land evaluation) and FAO bulletin No55 (A guideline for land evaluation for irrigated agriculture) will be followed.

Note that soil auger hole observation data, soil profile description, infiltration test, hydraulic conductivity tests and laboratory analytical data must be included in the appendices in electronic format.

2.7 Sociological and Socio-Economic Survey and Investigation

The socio economy study is to be conducted by the help of focus group discussion, consultative meetings, a sample household survey, PRA techniques and other data collection methods. If the irrigation projects cover a relatively lower area of land, all of the households could be identified by name and by their demographic characteristics whereas further detail study of the population and other socio economy study components could be made through a household sample survey and other data collection methods. The sample size will be determined based on the total number of households, the diversity of the socio economic conditions and the availability of local resources to be collected and organized. The survey and analysis will include but are unlikely to be limited to:-

1) Establish Study Frameworks: The Socio-economic Study shall prepare and present to the client for review and approval general and specific Objectives, approach and methodology, Project Rationale, data and information collection formats, data analysis tools as well as Scope and Limitation of the study.

2) Identification of the Various Components of the Project Area:- The various project places could be classified into temporary and permanent project area categories. Those project areas consist of the command area, headwork, camping & offices, material sites, working places and others. The study begins by clearly identifying those places into their categories and would conduct the study by giving emphasis for those project specific places. Apart from this the study would be made in comparison with the rest of the places such as kebele, wereda and region within which the project is located and at country level at large. The locations of Basin, woreda, and kebele, within which the project is found as well as the project locations for head work , command area and the various project component places would be provided with GPS aided reference data together with some description of the project areas.

3) Identification of the Population of the Project Area and Investigation of Population Dynamics: The number of population and households of the project areas classified into the number of male and female beneficiary households and population would be clearly identified. The population could be categorized into beneficiaries and those that could be affected by the project. The classification would be identified and analyzed by the study. In order to understand the impact of the present and future population growth on the resources and planned irrigation schemes, population dynamic will be investigated and family planning practice will be examined. The proportion of the economically active population will also be analysed so as to assess the labor availability of the area of or the intended project. Population size, religion, ethnicity, age and sex composition (heterogeneity and/or homogeneity), Population spatial distribution, population projection, the respective demand for food, supporting capacity and other necessities in the project and the catchment

area. Assess current settlement pattern, township, population movement or migration and Infant and child mortality situation in the area would also be investigated.

4) Investigate the Availability of Accessibility of All Social Services and Possibility of the Contributions It has for Future Development of the Irrigation Project: The availability and accessibility of social services such as health, education, water supply, Financial institutions, Energy supply/ Mineral source, Communication (road, transport, telephone, other ICT services ...) veterinary and other infrastructure and social services are to be investigated in order to assess the potentials/ constraints and possibility of the contribution it has for future development of irrigation project.

5) Identify and Analyze the Present and Projected Economic Systems, Input Demand, Supply and Consumption, Product Markets and Facilities, Primary &Secondary of the present and demand, supply and consumption; product markets and facilities; and credit services would be done. Few details are provided below.

Economic Systems:- In this line of study, the economic base of the beneficiary farmers would be studied. The list of activities that would be included in the study includes but not limited to : Economic source/ Major means of livelihoods/potential income generating activities; Farming System; Crop production (potential crops, area covered by potential crops , Current Irrigation Practices and Tradition, constraints of crop production); Livestock production (Major livestock type, size, major diseases ; Other economic activities &potentials (Potentials of apiculture, fish, forest &forest product etc.); Land Use Pattern (area under different use, cultivated/ cultivable, pasture, forest, bushes & shrubs land, rivers & lakes ...) and Land Tenure and Size of Holdings. The analysis would very much be supported with relevant data which can represent the study area under consideration.

Project Benefits:-The study shall identify and analyze direct and an indirect benefits of the project. The study shall identify direct economic benefit of the project to the area including land holding of the household, agricultural yields and production of major and minor crops, family income from both crops and livestock's and farm income per area as a result of the proposed project. Non- economic benefits includes upper watershed forestation, to reduce siltation problems of irrigation structures and thus lengthen the useful life of structures and reduce annual operation and maintenance costs. Besides, project development creates infrastructure benefits, welfare facilities and income and employment opportunities outside the project.

Input Used: - The type, quantity, availability and prices of input supply in comparison of demand and consumption requirements and credit services (existing &future) would be studied.

Product Marketing and Facilities:- The study of product marketing includes the followings: Proportion and quantity of marketable Agricultural products; Product marketing and agro processing; Communication (Transport, road ....); Storage; Marketing channels; Marketing size and structures; Marketing constraints. Actual and projected national/ regional and project data should be provided for the intended crops. Market potentials for project production should be identified and quantified to the extent possible such as own consumption, local and/or regional markets, national markets, international/export markets. Price analysis and fluctuations; prices of existing and proposed crops are required to be clearly stated and included. Besides, how demand &supply of crops &livestock are determined need to be studied.

6) Identify Development Potentials, Constraints in Order to Involve all stakeholders in the Project Area for Sustainability of the Project: The study shall Identify development potentials, constraints of the scheme in order to involve all stakeholders in the project area for sustainability of the project; Existing NGO's

and area of cooperation with the community, suggestions with regard to additional government and private institutions and services that may be required for effective implementation and operation of the scheme would be conducted.

7) Undertake Gender Analysis: For sustainability of the schemes, the extent of Involvement of women in the development of the project and ways of maximizing their role and active participation will be examined.

8) Social impact and mitigation measures

Direct social positive and negative impacts will be assessed and measures to mitigate negative impacts will be recommended. In light of this the following area of impact will be considered:-

- Impacts related with the reservoir area, Dam and appurtenant structures.
- Impacts related with canal, road, drain etc. alignments
- Impacts related with irrigation command area
- Impacts in selection of borrow area and quarry sites
- Social impediment impact (Compensation requirements)
- Attractive beneficiary impact (upstream and downstream impacts)
- Impacts on agricultural yields, water points, settlements, perennials and others for c compensation requirements and land redistribution

Generally assessments of the social implications of the project, including displacement, land reallocation, compensation, etc. would be undertaken. In this respect, the study should Identify the expected/existence of displacement and asset losses due to the intended project. The effect of displacement and asset losses if any, size and nature of land/asset that will be affected (settlement, grazing land, crop land, forest land, other social value such as recreational, holy place, aesthetic etc) need to be identified and quantified. If there is necessity of compensation payment or replacement of properties due to construction of the project, the study shall be conducted with the beneficiaries and the study and design team. The agreement and the consensus of the community shall be attached to the project document. Different option for compensation mechanisms should be sighted. Direct social positive and negative impacts will be assessed and measures to mitigate negative impacts will be recommended. In light of this , impacts on the headwork & appurtenant structures; canal, road, drain etc alignments; irrigation command area ; borrow area and quarry sites , social impediments (Compensation requirements and land redistribution) , current and projected upstream and downstream water users; agricultural yields, water points, settlements, perennials and others will be studied.

2.9 Community Organization and Management Study

- Assessment will be made on the existing irrigation organizational and management. Based on this and with the full participation of the beneficiaries, a Water Users Association (WUA) shall be proposed and that will be responsible for the day to day operation & management of the irrigation system.
- The organization & management proposal of the WUA should enable the irrigation system to sustainable operate based on cost effective operation and full participation of the beneficiaries. The recommendation will include procedures and techniques of the operation & maintenance fee collection form beneficiaries and the land distribution amongst the beneficiaries (as appropriate)
- Briefing the Woreda concerned bodies (Woreda administration, Woreda office of agriculture, cooperative agency, etc.) on the assignment of the study team and discuss on their participation and the roles they have to play in facilitating the study process and work closely with the study team;
- Conduct community consultation/sensitization to realize their full participation of the beneficiaries during the whole process of the feasibility study and detail design of the proposed project.

- Carry out the facilitation tasks to strengthen or establish irrigation water users association (IWUA) by beneficiaries and work together with the assigned IWUA committee during the study and design period.

2.9.1 Consultation of Beneficiaries and Other Stakeholders

The project development must begin with the community and with their concerns and needs. This helps to establish a sense of ownership and control by the beneficiaries over their own schemes. This can be achieved through a community demand-led approach where the consent and participation of beneficiary communities in project conception, preparation, construction, and construction supervision and operation phases is required as the main criteria for project funding. Therefore, the project will be implemented in such a way that the schemes shall be a demand driven type in which the first initiation has to come from the beneficiaries themselves.

The client would like to encourage communities to participate in decision-making and contribute 10% of civil works investment cost in the form of cash, labor and/or local materials during project implementation. Such involvement and contributions help develop a sense of community ownership of the project; enhance local responsibility for long-term operation, maintenance and sustainability; and reduce overall project costs. During the planning (conception, identification, survey, design) and construction stages there must be liaison between the design and/or construction teams and the beneficiaries. The projects designs must be discussed with and accepted by the community. The design process will proceed in parallel with the process of setting-up the Irrigation Water Users Committee (IWUC). Therefore, the study and design team should provide the liaison with the Community and deal with the detail of design and construction issues. The final detailed design must be discussed with and accepted by the community through the IWUC in order to ensure that the concerns of the community and potential impacts on non-beneficiary local residents are taken into account. Meetings and continuous dialogue throughout the development process are necessary for the stakeholders to contribute as well as to identify and defuse potential conflicts. There should also be agreements, preferably written and signed, that each party will execute its function throughout the planning, design, implementation, operation and maintenance phases of the scheme.

Undertake Public Consultation and Assessment of Attitudes: The study should conduct Clear consultation and communication with wereda officials & wereda administration council, PA officials, DA's and Individual farmers in the project area as well as other up and down stream users of the water. Community awareness creation (Brief description about project idea, its plan, future direction & the objectives of the study crew shall be given to District officials, PA officials, DA' s, individual farmers and others in & around the project area).

General Meeting with the community: Discuss with the community openly about Irrigation project plan; explain clearly the duties & responsibilities of the community & the client, Come to a certain consciences and carry out the study with the representatives of community **(Design committee consisting of minimum 7 members).**

- **Community Participation in the project cycle***:* The study shall discuss that peoples participation would be in all the phases of the project i.e. during Study & Design Phase; during Implementation Phase and During Scheme Operation and management phase.
- **Identify forms/Modes of Community Participation:** Contribution of the community (labor, material, money, etc,) from the total cost of project; should be quantified in terms of money; type and volume of the work they involve as well as in percentage. The beneficiaries will confirm

participation in the agreement and signed by the beneficiaries and authorized by the local administration. Also this participation shall be quantified and clearly shown in the value (Birr) in the project document to clearly state communities project costs share. The beneficiaries' labor contribution schedule will be done on the basis of their slack period and they also shall approve this.

- **Land Redistribution:** The beneficiaries shall decide on the irrigation land distribution and confirm this by the agreement signed by all beneficiaries and wereda administration and PA of the project area shall authorize this.
- **Cost Recovery:** The idea of the cost recovery will be discussed with the beneficiaries and the opinion of beneficiaries towards the water tariff payment shall be identified and included in the project document.

Attitudes: The important changes that population feels necessary to improve their economic conditions and in particular their understanding and desire for the introduction of irrigated agriculture will be identified. Assessments of the attitudes, views and opinions of different stakeholders towards the new project (Based on the meeting and discussion) would be conducted. In this regard, positive, negative and indifferent attitudes of the Community, kebele administration office, wereda administration council and officials, other water users of upstream, downstream and nearby residents would be assessed.

Petition of the community, PA and District confirmation: The socio economy study should attach a copy of a written application presented by the communities for development of the scheme and their commitment to participate in the whole project cycle. A written agreement attachment of wereda and kebele administration councils indicating that communities will contribute their project cost share in kind or cash is required. Moreover, the study should contain writing confirmation letter that District Administration and PA are consulted and certify the need for the project and community willingness to participate in the projects
It is clear that direct farmers participation or through the IWUC may take time and affect the planning and detailed design of the irrigation layout. Careful phasing of activities in the proposed work plan can minimize delays.

Therefore, the study and design team needs to follow the following steps to ensure and encourage the participation/involvement of stakeholders are to:

- Identify the persons, groups and organizations connected with or influenced by the project;
- Identify their level of influence on the project, for example key stakeholders such as women, who provide the bulk of the labour, and displaced persons should have a significantly stronger influence;
- Involve them in all decision-making processes and characterize their influence on the project;
- Assure them and make them feel that they have the power to influence in the course of development.

Farmers in irrigation scheme planning and design shall be involved in the following way and activities:

- Endorse layout of canal network specifically Tertiary and field canals layout based upon farmer and community meetings;
- Decide on the location of canal outlets and turn outs; and location of pumping points (if any) for diversion from canals;
- Location of crossing structures such as foot bridges across canals, and cattle crossings at points; and social structures such as washing points, cattle troughs, steps into the canal for water collection points at locations to be identified by the community;
- Endorse location of camping site and design of office as it will be used for IWUA office, which should be constructed, based on a standardized design;
- Farmers should identify and select lands to be irrigated and the irrigation design team should assist farmers by assessing the suitability of those lands;

- Farmers could provide information on past experience with floods, point out areas with potential for flooding, and suggest to the study and design team locations for structures such as water abstraction from the river to prevent the pump station from being flooded;
- Farmers should select the crops to be grown in the project and the study and design team should guide them only on technical matters related to the suitability of such crops for the climate, soils, the cost of production and expected returns as well as the marketing potential of these crops.
- The study and design team however should also provide farmers with various alternatives to choose from including new crops, especially those that are high-value crops that the farmers may not be familiar with, with clear potential for adaptation to local conditions, and potential for production and marketing (cost and benefit);
- The communities within the area to be developed should participate in the Environmental and Social Impact Assessment (ESIA) for the project, through contributing vital information, such as current uses of their natural resources, ecology, human health, etc;
- The study and design team should facilitate the exposure of the farmers to various irrigation methods and enlighten them as to the advantages and disadvantages of each. The farmers then should propose the irrigation methods they would prefer to be considered during irrigation design;
- The prospective irrigators should suggest the plot sizes they would prefer to irrigate and the irrigation study and design team should provide information on the management, labor and input costs required for different plot sizes, as well as on the potential of the land and water resources to satisfy the various sizes.

To this end, the consultant is expected to bring the following certificates to ensure that adequate consultations have been made:

- The consultant should be responsible for bringing a certificate from the respective Woreda Administration Office about acknowledgement and request made by the beneficiaries;
- The scheme initiation and identification should be carried out jointly with beneficiaries in such a way that the beneficiaries are willing to contribute 10% of the project civil works investment cost either in the form of cash, labor and/or supplying construction materials with detail action plan indicating what, when, where and how to implement.
- The consultant should be responsible for bringing a certificate from the respective Woreda Office of Water Resources/Office of Agriculture about agreement made between the IWUC members and the Woreda Administration. (A scheme implementation agreement must be entered into between the respective IWUC and Woreda Administration).
- The consultant should be responsible for bringing a certificate from the respective Woreda or Regional Bureau of Environment Protection, Land Use Planning and Administration environmental and social screening and land holding certificates; (or Realistic arrangements must be put into place for the issuance of land certificates to beneficiaries of the respective command area).

The consultant should be responsible for bringing a certificate from the respective Woreda Office or Regional Bureau of Agriculture stating that, the respective watershed has been treated or that realistic arrangements (including finance) have been made for its treatment.

2.9.2 Proposed Community Organization and Management of the Scheme

Generally assessment will be made on the existing irrigation organizational and management aspects. Based on this and with the full participation of the beneficiaries, a Water Users Association (WUA) shall be proposed and that will be responsible for the day to day operation & management of the irrigation system. The organization & management proposal of the WUA should enable the irrigation system to sustainable operate based on cost effective operation and full participation of the beneficiaries. The recommendation will include procedures and techniques of the operation & maintenance, fee collection from beneficiaries and the land distribution amongst the beneficiaries (as appropriate). The study O&M should include: Structure, duties and responsibilities of WUA as well as cost estimates.

2.9.3 Propose Monitoring and Evaluation

The study should contain proposals to monitor the physical and financial activities of the scheme; indicate responsible bodies for this task of Evaluation Mechanism and indicative costs.

2.8 Detailed Engineering Investigation and Design

2.8.1 Design of Headwork and Appurtenant Structures

- Previous studies and relevant documents if any will be thoroughly reviewed and the gaps and short comings shall be clearly identified;
- Carryout the selection of appropriate headwork site and associated structures to divert/store the water and convey it to the main canal by gravity considering the location of the command area, geology, hydrologic condition and economy;
- Select and fix the type, length, height of headwork structure considering the locally available construction material, the river morphology at the site, the magnitude of design flood, optimum command elevation, etc;
- Carry out detail hydraulic and structural designs for the headwork and other appurtenant structures (flood protection structures, retaining walls, intakes, under sluice and other gates) specifically Hydraulic design, to fix the overall dimensions and profiles of the structure, and Structural design, where the various sections are analyzed for stresses under different loads and reinforcement or other structural details are worked out;
- The canal head regulator should be properly aligned to reduce silt entry into the canal to avoid backflow and formation of stagnant zones in the pocket. To achieve this, as much as possible the axis of canal head regulator should be positioned at an angle of 90^{o} to 110^{o} with respect to the axis of the diversion work.
- Discharge capacity of the under sluices is kept based on the followings: (i)Two times the maximum discharge in the off take canal; (ii) 20% of maximum flood discharge; or (iii) Maximum flow in dry season; whichever is appropriate.
- Layout, profiles and cross-sections of river diversion and its appurtenant structures as well as canal and drainage networks and structures shall be prepared at appropriate scales;
- Detail design of Night storage (if the discharge is not sufficient) to irrigate the available irrigation land;
- If in case pump system is required in the irrigation system design, in the pump part the following points should be undertaken but not limited.
  - ✓ Pump house site selection and pump house design
  - ✓ Analysis of possible options on the number of pumps in relation to technical and economic points of view
  - ✓ Design information such as elevation data including Maximum and Minimum water levels, Foot value level, Pump seat OGL, Delivery pool OGL, Main canal out let at delivery, Delivery pool bed level, Delivery pool Pipe outlet level etc shall be clearly shown
  - ✓ Determination of Suction and Delivery heads and pipe sizes (diameters and thicknesses)
  - ✓ Head loss and power requirement calculations considering the irrigation demand and the required head
  - ✓ Comparison of the suction head along with the other accompanying losses to the theoretical atmospheric pressure at the pumping site altitude
  - ✓ Pump type selection
  - ✓ Stilling basin site selection and Design to regulate the discharge from the delivery pipe.
  - ✓ Summary of pumping unit
  - ✓ Detail specification of the pumping unit including construction materials of different parts such as casing, shafts, suction and delivery pipes etc.

2.8.2 Irrigation Infrastructure Study and Design

General Requirement

The alignment of the field canal shall be marked along high ground so that it can command maximum area. As far as possible, it should be taken along the boundary of a holding so that the field is not artificially divided by the channel. The field canals will be aligned either along the ridge so that irrigation can be done on both sides or along the contour with irrigation only on one side, depending upon topography. It should be ensured that the turnout can be placed in the holding it serves and near the boundary. Besides, suggestions from and endorsement by the farmers' organization regarding alignment, requirement and tentative location of off-takes, outlets and turnouts, are sought. Details of the individual holding in the unit command area should be obtained so that the number of farmers under each outlet is known at the time of design.

The profile should show the ground level, the bed level and eventually the water level at design discharge. Bed levels and eventually water levels are tabulated at the end of each reach, which means upstream and downstream of each structure where the water level changes. The location of outlet shall be such that it avoids canals in deep cutting. A canal in deep cutting creates major problems of blockage of canals due to collapse of side slopes. Location and sill level of turnout is very important. Hence, it is emphasized that location of turnout shall invariably be decided after interaction with the respective farmer. The location of turnouts shall be decided based on the experience (if any) and convenience of concerned farmers to irrigate his fields in one or two seasons.

Before the actual design of field canals shall be taken up, the longitudinal section shall be run along the alignment recording spot levels at 30 – 50 m interval. Cross section across the alignment may be taken at 50-60m interval and at the location of turnouts. The cross section may extend adequately on either side to judge the sill levels of turnouts, with respect to area it has to serve. The L- section for each segment of field canal shall be surveyed separately, with appropriate survey equipment.
While marking the alignment of the field canals, it should be seen that the canal can command the fields included in the design. For this purpose, preferably the water level in the field canal shall be kept as 10-15 cm higher than the ground, it is designed to serve.

The bed width of field canals shall be wide enough to allow easy cleaning. A bed width of 0.20-0.30 m is considered to be the minimum, as this still allows the cleaning of the canal with small tools such as a shovel.
Canal deliveries should be designed for an equal to crop water requirement during peak demand plus irrigation and operational losses. Water losses vary with the irrigation distribution system, method of irrigation, soils, crops grown, farm management practices, and others. For the reasons of economy, it should not be oversized. Canal delivery should be large enough to provide adequate water for crop requirements under existing and anticipated irrigation methods.

The consultant is expected to present canal design data for construction by drawing a longitudinal profile of the canal route and tabulating the data needed for construction. The data are tabulated under the graph, showing the elevation of ground and canal bed in figures at each given distance including water depths could also be shown. The chainage starts from a reference point, which is usually the beginning of the canal. Where possible the survey results of the topographic survey shall be used. If these are not sufficient, a detailed survey of the proposed ali

- Direction: water flow is always given from left to right.
- Horizontal scale: 1: 1 000 for short canals (1 cm = 10 m) and 1: 5000 for long canals (1 cm = 50 m)

- Vertical scale: 1: 20 for small canals and low gradient (1 cm = 0.2 m) and 1: 100 for larger canals and higher gradient (1 cm = 1 m)

Based on these basic design considerations, the consultant shall carry out the following specific activities:

- Carry out delineation of irrigable land based on accepted criteria;
- Carry out preparation of layout clearly indicating the canal and drainage networks;
- Design of proper irrigation and drainage system compatible with the local management system conditions;
- Identify canal lining requirements using the inputs from engineering geology studies and mitigate in the design process;
- Investigate drainage parameters required to perform the design of the drainage system of the project and establish proper drainage modules for the project to effect the design of the drainage system for the command area;
- Establish flood protection requirements for the command area and canal structures;
- Considering the total demand and base flow availability, perform detail hydraulic and structural designs of irrigation canal systems including determination of water profiles and calculation of canal cross sections and other elements to fix capacities for canals and associated structures; and prepare an equitable water distribution system b/n different blocks and individual plots;
- Carry out detail engineering design of the main irrigation system and drainage system (Intake structure, main, secondary, tertiary and field canals and drains and related hydraulic structures) considering the size of service unit to be between 10 ha to 20 ha;
- Preparation of profiles of main, secondary, tertiary and field canals at a specified scale including the canal and drain sections, sizing, lining type, crossing structures, division structures, regulating, measuring and protecting structures, etc;
- Compute the actual evapo-transpiration, crop water requirement, irrigation demand duty using the existing and recent agronomic, climatologically and soil data based more appropriate and acceptable methodologies;
- Determine and estimate water application, conveyance and other losses, irrigation hours per day and irrigation efficiencies and consider those parameters in design steps;
- If necessary, design access roads, farm roads and inspection roads, which will connect the project to the nearby road network and serve to give easy access to irrigation scheme, irrigation structures and all the irrigation command units;
- Prepare general plans and drawings for all irrigation infrastructure and irrigation system designs to the standard quality;
- Prepare specifications and priced bill of quantities for the irrigation project.

9. Environmental and Social Assessment (ELA)

9.1 Introduction

This terms of reference (TOR) is prepared for the irrigation water development project when the environmental and social impact assessment is be conducted to determine the most critical issues that will need to be addressed when site clearing, cut and fill, excavation, construction, camping, operation (water application, drainage, etc), and decommissioning.

A TOR provides descriptions of the proposed project, the current environmental condition of the project site, additional baseline data and methods that must be conducted, the probable environmental impacts associated with the project, and potential mitigation approaches to reduce the negative impacts of the project on the environment at a level of detail that satisfies the regional environmental protection, land use and administration bureau, and the donor – the World Bank.

9.2 Objective of conducting environmental and social impact assessment (ESIA)

ESIA is an important tool for incorporating environmental and social concerns at the project level. ESIA should be carried out as early as the project planning stage as part of feasibility thus it can assure that the project will be environmentally feasible. The general objectives of the ESIA study are to provide:

i. Baseline information about the environmental (biophysical environment), socio-cultural environment, and economic conditions in the project area;
ii. Information on potential impacts of the project and the characteristic of the impacts, magnitude, distribution, who will be the affected group, and their duration;
iii. Information on potential mitigation measures to minimize the impact including mitigation costs;
iv. To assess the best alternative project at most benefits and least costs in terms of financial, social, and environment. In addition to alternative location of the project, project design or project management may also be considered; and
v. Basic information for formulating environmental management plan;
vi. Information on public involvement on the ESIA process.

9.3 Environmental and social impact assessment requirements

The following World Bank Operational policy and Ethiopian legal regulations govern the conduct of environmental and social impact assessment.

- The constitution of Ethiopia
- Environmental policy of Ethiopia
- Environmental assessment (OP/BP 4.01)
- Pest Management (OP/BP 4.09)
- Involuntary Resettlement (OP/BP 4.12)
- Physical Cultural resources (OP/BP 4.12)
- Safety of Dams (OP/BP 4.37)
- Environmental Impact Assessment Proclamation (Proclamation No. 299/2002)
- Ethiopian Environmental Impact Assessment Procedural Guidelines (Nov. 2003)

9.4 Scope of the work

The implementing agency/national consultant that is going to undertake the ESIA of the subproject should carry out a thorough and comprehensive environmental and social impact study by executing the following but not limited tasks:

Task 1: Description of the proposed subproject

A comprehensive description of the relevant parts/component of the subproject, using maps, site plans, and other graphic aids and images, as appropriate and necessary, and including the following information on: location, general layout and size, general design and extent of the irrigation and design work (specification of the irrigation headwork and infrastructures, size of the command area), size of the catchment area; as well as pre-construction, construction, post construction plans, operation and maintenance of the irrigation works. Description of the need for the proposed project (economic and social benefits) should also be described. The following information should also be included:

- Subproject type and its components, scope, subprojects activities during each phases (pre-construction, construction, operation, and decommissioning if there is;
- Overall suitability of the identified subproject and the proposed activity in light of the existing environmental and social legal requirements;
- Technologies involved for design, construction, operation;
- Resources, manpower, time frame etc. required for the subproject implementation;

- Estimated cost of development of the subproject including the community contribution, environmental cost;

Task-2: Description of the Environment

Collection of baseline information on physical environment, biological environment, socio-economic and cultural aspects of the subproject area is the most important reference for conducting ESIA study.
The description of environmental settings includes the characteristic of area in which the activity of proposed subproject would occur and it should cover area affected by all impacts including potential compensation area, and potential area affected by its alternatives.

i) *Physical environment:* geology; topography; soil characteristics – physical and chemical; climate and metrology; surface and ground water hydrology; morphology of the watershed; surface and ground water quality; and erosion and sedimentation.

ii) *Biological environment:* a detailed description of the flora and fauna of the area should be presented; special emphasis will be placed on rare, endemic, protected or endangered species; sensitive habitats, parks or preserves, significant natural sites, wild life, and forests.

iii) Socio-economic and cultural constraints. (Include both present and projected where appropriate)

- Baseline data should include the demography, settlements, and existing infrastructure facilities in the proposed area.
- ***Social safeguard issues as a result of water use conflict between the upstream and downstream community***. Information should be provided on water balance considering the minimum flow of the river, the current users (in the command area, downstream and upstream beneficiaries) of the given water resource for different purpose (irrigation, livestock, and domestic purpose), ecological function, the amount to be diverted, the deficiency resulted to the downstream users due to the diversion.
- Control over allocation of resources use rights; community structure, employment, distribution of income, goods and services; public health and safety (creation of pathogen breeding ground (Malaria, Communicable Disease).
- Details of the properties, houses, businesses etc. activities likely to be affected by land acquisition and their financial lose annually should be well described.
- Identification of historical and archeological sites to be affected by the subproject should be done. While this analysis is being conducted, an assessment of public perception of the proposed development should be conducted. A public presentation will be conducted to alert the stakeholders about the project and its associated implications. This will be conducted on the completion of the ESIA.
- Data covering the community which is affected negatively by subproject including vulnerable groups or persons such as women, children, elderly, and people below the poverty line should be described.

Task-3: Policy, Legislative & Regulatory Considerations

Describe the pertinent regulations and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, sitting and land use control at the international, national, and regional levels.

Task-4: Analysis of alternatives to the proposed subproject

Describe alternative that were examined in the course of developing the proposed subproject and identify other alternatives which would achieve the same objectives. The concept of alternative extends to subproject sitting (changing site), design change, technology selection, construction techniques and phasing, and operating and maintenance procedures. Compare alternatives in terms of potential environmental and social impacts; capital and operating costs; suitability under conditions; and institutional, training, and monitoring requirements. When indicating impacts, describe which are irreversible or unavoidable and which can be mitigated. To the extent possible, quantify the costs and benefits of each alternative, incorporating the

estimated costs of any associated mitigation measures. Include the alternative of not constructing the project, in order to demonstrate environmental conditions without it.

Task 5: Determination of the potential impacts of the proposed subproject

The major environmental and public health issues of concern and their relative importance to the design of the subdivision will be identified and assessed.

Potential impacts to be assessed include:

i. Project Location: resettlement of people; loss of forest land; loss of agricultural land (cropping and grazing); impact on flora and fauna; impact on historic and cultural sites; effects on water resources outside and inside command area.
ii. Project Design: disruption of hydrology; drainage problems; design of dams and other structures; crossings for people and animals.
iii. Construction Works: soil erosion; land slide; gully formation; construction spoils (disposal of); sanitary conditions and health risks associated with construction camp and workers coming into area; social and cultural conflicts between imported workers and local people. Impacts on soils (water logging, salinization,
iv. Project Operation: pollution by agrochemicals; acidification of soil; impact on soils (water logging, salinization etc.); changes in groundwater levels inside and outside command area; changes in surface diseases. Water quality and risks of eutrophication; incidence of water-borne and water-related diseases.
v. Social impact

The social impacts due to land acquisition and property loss should be described clearly. Based on the information provided in task 2 above, information should be provided on the arrangements on how, who, when to manage (avoid, minimize, and compensate) the social safeguard issues should be clearly described. This should be done as per the Resettlement Policy Framework (RPF) of the program included in the ESMF guideline of the program.

The other social safeguard issues related to SSI is social conflict between the upstream and downstream community as a result of diverting the water. In this section of the work information should be provided, based on the information provided in task 2 above, on the degree of the impact and the mitigation measures for this. The impacts on the physical and cultural resources along with their mitigation measures should be provided clearly.

The significant positive and negative impacts, direct and indirect impacts, long term and immediate impacts should be indicated. Any avoidable as well as irreversible impacts should also be identified. A major environmental issue is determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It is also determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should be represented in matrix form with separate matrices for pre and post mitigation scenarios. ***For this, the assessment method/methods employed for the study should be explained.***

Task-6: Determination of mitigation measures

Recommend feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels, and to enhance positive impacts should be described. Mitigation measures should be proposed as required during the preconstruction, the construction as well as the operation stage of the subproject for all the identified impacts. Estimate the impacts and costs of those measures, and of the

institutional and training requirements to implement them. Consider compensation for to affected parties for impacts which cannot be mitigated. Prepare an environmental and social management plan (ESMP), and resettlement action plan (RAP – if there is land acquisition and property loss).

The mitigation measures for the social safeguard should be done in detail. This may include the arrangements on how, who, when to manage (avoid, minimize, and compensate) the social safeguard issues should be clearly described. This should be done as per the Resettlement Policy Framework (RPF) of the program included in the ESMF guideline of the program.

Task-7: Development of mitigation plan

Environmental and Social Management Plan (ESMP) is a valuable tool to define details of who, what, where and when environmental management and mitigation measures are to be implemented. The content of the ESMP includes: summary of the environmental and social impact, description of the planned mitigation measures, description of the planned environmental and social monitoring program, description of the responsibilities and authorities for implementation of mitigation measures and monitoring requirements, description of responsibilities for reporting and review, budget estimate, mechanisms for feedback & adjustment, implementation schedules, staffing and training requirements, and other necessary supports to implement the mitigation measures. The mitigation plan table Annexed in this TOR should be used as a template for the preparation of mitigation plan table.

In case when resettlement action plane (RAP) is required to be prepared for the social safeguard issues related to land acquisition and property losses, follow the elements of RAP in the ESMF prepared for AGP. Appropriate mitigation measures should be proposed when there are impacts identified on the physical and cultural resources of the project area. This is based on the information provided in task 2 and 5 above.
Information on the appropriate mitigation measures for the social safeguard issues to address the water users conflict between the upstream and downstream community should be done based on the information provided in task 2 and 5 above should be provided clearly.

Task-8: Development of monitoring plan

Prepare a detail plan to monitor the implementation of mitigating measures and the impacts of the project during construction and operation phases of the subproject. Include in the plan an estimate of capital and operating costs and a description of other inputs (such as trainings and institutional strengthening) needed to carry out it.

The monitoring program should clearly indicate the linkages between impacts identified in the ESIA report, indicators to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions, and so forth. Although not essential to have complete details of monitoring in the ESMP, it should describe the means by which final monitoring arrangements will be agreed. Responsibilities for mitigation and monitoring should be clearly defined. The ESMP should identify arrangements for coordination between the various factors responsible for mitigation. When preparing the monitoring plan table, use the mitigation plan table template annexed in this TOR below.

Task-9: Public consultation and participation

Consultation and participation by the affected communities and individuals is an essential element of the land acquisition, compensation and resettlement process. The study team should ensure that the interested and affected parties especially the local community activity participated and consulted in environmental and social impact assessment; identification of mitigation measures; and implementation and monitoring of measures. The study team should describe the consultation process that has taken place and list the

outcomes and recommendations made by the participant. His has to be documented in the ESIA report in the public involvement section. Though the public involvement is essential for the whole ESIA process, special attention should be given when identifying social impact, developing mitigation measures, and implementing them for those social impacts (land acquisition and property losses, and water user conflicts). The whole process supported with evidence should be documented.

Task-10: Reporting

The environmental and social assessment report should be concise and limited to significant environment and social issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citation for any references used in interpreting those data. Detailed or un interpreted data should be annexed or in separate volume.

An environmental impact statement (EIS) should contain the following information:

- An executive summary
- List of consultants/specialists who participant on the study team: Names and qualification of members of the study team.
- Introduction (scope and methodology of the study, important environmental issues in the study, report structure)
- Description of the subproject
- Policy, legal and administrative requirements
- Description of the environment (baseline environmental, socio-economic and health conditions such as fauna, flora, habitats, soil, water, air, cultural artifacts, and socio-cultural, socio-economic and health considerations).
- Analysis of alternatives
- An account of the prediction and assessment of each impact at all stages of the subproject cycle. Information for each impact must be provided on: the methodology used; the magnitude of immediate and cumulative impacts – long and short term (expressed in appropriate units); whether it is adverse or beneficial; whether it is reversible or irreversible; likelihood of its occurrence “with and without” scenarios; the time span for which impacts are predicted and the geographic boundaries selected to define the study area
- Description of measures to prevent or reduce significant adverse impacts and enhance beneficial effects and an assessment of their likely outcome.
- A description of residual impacts which cannot be mitigated or can only be mitigated partially.
- Description of the ESMP: in this section description of the following information should be done

A description of mitigation management plan.

See task 7 above and mitigation plan table indicated in the annex below for the information to be included in this section of the ESIA report.

Description of the monitoring plan

See task 8 above and monitoring plan table indicated in the annex below for the information to be included in this section of the ESIA report.

- **Public consultation and information disclosure:** the extent of involvement of the interested and affected peoples **(.** Describe the consultation process that has taken place and list the outcomes and recommendations made by the participant.
- Lists of references.
- Lists of appendices

APPENDIX IV: Environmental and Social Mitigation and Monitoring Plan Template Tables

A. Environmental and Social Impact Mitigation Plan Template

Subproject activities for each phases of the subproject	*Potential Environmental and Social Impacts*	*Proposed Mitigation Measure(s) (Incl. legislation & regulations)*	*Institutional Responsibilities (Incl. enforcement & coordination)*	*When to implement? (schedule of mitigation plan implementation)*	*Cost Estimates*	*Comments (e.g. secondary impacts)*
Pre-Construction Phase Activity 1. Activity 2. . .						
Construction Phase Activity 1. Activity 2. . .						
Operation and Maintenance Phase Activity 1. Activity 2. . .						

B. Environmental and Social Monitoring Plan Template

Proposed Mitigation Measure (for each impact and each activities)	Monitoring objective	Parameters to be Monitored	Indicators	Location	Measurements (Incl. methods & equipment)	Frequency of Measurement	Responsibilities (Incl. review and reporting)	Cost (equipment & individuals)
Pre-Construction Phase Activity 1. Activity 2. . .								
Construction Phase Activity 1. Activity 2. . .								
Operation and Maintenance Phase Activity 1. Activity 2. . .								
Total Cost for all Phases								

2.11 Financial and Economic Analysis

A) Project Cost Estimate

Project cost estimates provide the basis of determining the project's economic and financial viability and it's funding. Estimates should include all capital costs and incremental operating costs incurred by the project during the disbursement period and for the subsequent operation of the project. In principle, the engineering cost estimates should include all incremental goods and services required to complete the planned works. Cost estimates for the main civil engineering works should be based on Bills of Quantities (BOQ), derived from detail designs and justified unit rates. Costs of major equipment items should be based on recent quotations from potential suppliers. Costs of on-farm development may be drawn from an aggregation of representative farm models but it should be clearly indicated whether these include cash or non-cash contributions (e.g. in the form of family labour or locally available materials) by farmers. Cost estimates of an acceptable format should be prepared for all the proposed works considered at the final detailed design with schedules of expenditure. The consultant should make sure that:

- The cost per ha of the scheme shall not be more than 4000 USD as a result reasonable cost cutting options should be included while designing and estimating;
- Appropriate unit rate estimation/establishment and analysis is included in the design report;
- Provisions for contractor overhead cost and profit should be included in the estimate;
- Machine rental rates, material and labor costs should be based most recent data;
- A value added tax (VAT) of 15% shall be considered;
- A physica1financia1 contingency of 10-15% on the estimates shall be adopted to make allowance for changes in unit price and in item quantities and/specifications during construction.

B) Financial and Economic Analysis

The consultant shall conduct the financial and economic analysis covering the following aspects

- Prepare and present to the client for review and approval, the detailed approach, methodologies, assumptions and tools to be applied in undertaking financial and economic analyses of the proposed schemes, including (a) use and application of previous study methodologies, assumptions and results if any, (b) sources and assumptions to be used for financial pricing and conversions to economic prices, (c) discounting procedures, rates and periods to be used, (d) feasibility evaluation indicators and criteria to be calculated and applied (e.g. benefit/cost ratio, net present value, internal rate of return) and (e) sensitivity and risk analyses - including switching value calculations.
- Review the recommendations of previously conducted viability study reports, in terms of crops, cropping patterns, crop budgets, farm models, crop water and irrigation requirements, location of irrigable areas, and investments if there is any.
- Prepare crop budgets for without the project case. Prepare crop budget for the proposed range of irrigated crops taking account of (a) input requirements including labour, (b) attainable yields and yield development, and (c) gross and net crop margin. Compare summary of yearly production cost and revenue under "without" and "with" project condition
- In consultation with the agronomist, prepare crop production plan for the project.
- Review the cost data provided within the engineering and other sectoral studies and make use of them for the viability analysis.
- Assemble and tabulate financial cost estimates, covering all initial and replacement investment and recurrent (operation and maintenance) costs, prepared using constant prices, with physical and price contingency allowances included and disaggregated into foreign and local currency components, with tax and subsidy components separately identified, expressed in equivalent BIRR and presented on an annual cash flow basis over the assumed life of the development.
- Assemble corresponding estimated incremental direct agro-economic financial benefit streams, prepared using constant prices (or suitably applied price projections if warranted) and appropriate assumptions as to (a) likely build-up of agricultural production volumes over the years following in the initial investments and (b) likely future agricultural production trends in the " without production situation"

- To the extent that this is possible and significant, identify, estimate and incorporate into the financial benefit streams the potential indirect agro-economic benefits.
- Carry out a financial and economic feasibility analysis in accordance with the agreed approach and methodologies, and involving iterative interactions with agricultural and engineering development plans, designs, and cost and benefit estimates, as needed or as determined by the stakeholder consultation.
- Carry out a financial analysis at farm level to confirm financial viability, farmers' capacity to pay the full O&M costs plus any capital recovery that may be decided, and, returns to labour.
- Support in highlighting any other issues that would need to be resolved prior to proceeding with detailed designs and implementation with, where possible, recommendations as to how and by whom action is required, specifying an appropriate timeframe. These will include but are unlikely to be limited to agronomic, engineering and other sectoral costs and benefit streams.

2.12 Other additional outputs of the study

In addition to the outputs mentioned above in different disciplines, the following are also expected from the final output of the study:-

- Preparation of operation and maintenance manual
- Detail specification and bill of quantity
- Preparation of Tender Documents
- Preparation of Drawing Albums for construction

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Prepared by

GIRDC