

**GOVERNMENT OF NEPAL
MINISTRY OF IRRIGATION
DEPARTMENT OF IRRIGATION EASTERN REGIONAL
IRRIGATION DIRECTORATE**



SOCIAL AND ENVIRONMENTAL MANAGEMENT PLAN
For
ESI WORKS OF SUNSARI-MORANG IRRIGATION PROJECT

To be implemented under
Irrigation and Water Resources Management Project (IWRMP)

Table of Contents

Table of Contents	i
List of Acronyms	iv
Chapter I Introduction	1
1.1 Background	1
1.2 Social and Environmental Management Plan	2
1.3 Objective	3
1.4 Present Status	3
1.4.1 Settlement Pattern	4
1.4.2 Hydrology of the River	5
1.4.3 Soil Types and Agriculture System	5
1.5 Water Users Association (WUA) Structure	5
Chapter II Approach & Methodology	9
2.1 Background Information	9
2.2 Literature Review & Desk Study	9
2.2.1 Preparatory Meetings	9
2.2.2 Review of Documents & Preliminary Data Collection	9
2.2.3 Preparation of Questionnaire and Checklist	10
2.3 Field Visit	10
2.3.1 Mass Meeting	10
2.3.2 Walkthrough	10
2.3.3 Focus Group Discussion	10
2.3.4 Social Mapping	11
2.3.5 Time line Analysis	11
2.2.6 Debriefing/Wrap-up meeting	12
2.4 Data Collection	12
2.5 Data Processing and analyzing	12
2.6 Preparation of Draft Report	12
2.7 Preparation of Final Report	12
Chapter III Identification and Assessment of Potential Impacts and Mitigation Measures	13
3.1 Social and Environmental Issues	13
3.1.1 Canal Reshaping	13
3.1.2 Intake/Offtake Rehabilitation	14
3.1.3 Watercourse maintenance & operation	14

3.1.4 Water Supply Inequity	14
3.1.5 Seepage and damage of canal section	15
3.1.6flooding	15
3.1.7 Protected Areas, Forests and wild Life	15
3.1.8 Impediment of movement of people and domestic animal	15
3.1.9 Crop Productivity	16
3.1.10 Silt Deposition in the Canal and Field	16
3.1.11 Water Logging	16
3.1.12 Biomass, Brick Masonry and Air Pollution	16
3.1.13 Health, Sanitation and Safety	17
3.1.14 Gender Issues	17
3.1.15 Social Issues of Dalits	18
3.1.16 Social Issues of Indigenous People	18
3.1.17 Training and Skill Development	18
3.1.18 WUA Mobilization	18
3.1.19 Information Dissemination	19
3.2 Anticipated Beneficial Social and Environmental Impacts	19
3.2.1 Increased Agricultural Activities and Food Security	19
3.2.2 Employment Opportunities	19
3.2.3 Improved Infrastructure	19
3.2.4 Increased Income	20
3.2.5 Increased Access to Education	20
3.3 Anticipated Adverse Social and Environmental Impacts	20
3.3.1Vegetation Loss	20
3.3.2 Potential Displacements	21
3.3.3 Soil Erosion	21
3.3.4 Soil Compaction	21
3.3.5 Extraction of Construction Materials	22
3.3.6 Pollution; Dust and Air Quality Concerns	22
3.4.7 Pests, Crop Diseases and Chemical Fertilizer	23
Chapter IV Social & Environmental Management Plan	24
4.1 Background	24
4.2 Responsibilities	24
4.3 Tabulation of the SEMP activities along with responsible agencies and mitigation cost ..	25

4.4 Training and Awareness Raising	28
4.5 RAP, IPDP, and GAP	29
Chapter V Mitigation, Monitoring & Auditing Mechanism.....	31
5.1 Mitigation Mechanism	31
5.2 Monitoring Mechanism.....	32
5.3 Auditing the SEMP	32
CHAPTER VI CONCLUSION AND RECOMMENDATION	34
6.1 Conclusion	34
6.2 Recommendations	34
ANNEXES	36
ANNEX 1: Location Map	37
ANNEX 2: Layout Map Marked with Project Components.....	39
ANNEX 3: Attendance of Mass Meeting	41
ANNEX 4: Social Map sketched by Farmers and refined by SEMP team.....	51
ANNEX 5: Photographs	53
ANNEX 6: Minutes of Meeting.....	60

List of Acronyms

AMIP	Agency Managed Irrigation Project
CMC	Chatara Main Canal
DADO	District Agriculture Development Office
DDC	District Development Committee
DOI	Department of Irrigation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESI	Essential Structure Improvement
GAP	Gender Action Plan
IDD	Irrigation Development Division
IEE	Initial Environmental Examination
IGA	Income Generating Activities
ILO	International Labor Organization
IPDP	Indigenous People Development Plan
IWRMP	Irrigation & Water Resources Management Project
NGO	Non-Governmental Organization
ODF	Open Defecation Free
RAP	Resettlement Action Plan
RID	Regional Irrigation Directorate
SEMF	Social and Environmental Management Framework
SMIP	Sunsari-Morang Irrigation Project
SEMP	Social and Environmental Management Plan
VDC	Village Development Committee
WUA	Water User Associations
WUC	Water User Committee
WUCC	Water User Coordination Committee
WUCCC	Water User Central Coordination Committee
WUG	Water User Group

Chapter I

Introduction

1.1 Background

Department of Irrigation has launched Irrigation and Water Resources Management Project with the grant assistance from the World Bank to support the irrigation development and enhance poverty reduction in the country through the improvement of agricultural production with the proper utilization of available resources and strengthening of institutional development activities. There are altogether four project components included in the project appraisal. The project component, namely component B deals with the management transfer of some of the medium to large scale agency managed irrigation systems of Nepal. The first phase of the project ends at June 2014 and additional financing for second phase with the loan and credit assistance from the World Bank will start from July 2014. Under the additional financing period, the project has initiated the implementation of management transfer program in three sub-systems; Sunsari Morang Irrigation System (Ramgunj Branch), Narayani Irrigation System (Block-2) and Mahakali Irrigation System (Phase II). In this context, Irrigation Management Transfer program has been launched in Mahakali Irrigation System phase II with the command area of 5100 ha.

The Sunsari-Morang Irrigation Project (SMIP), the largest irrigation system in Nepal was established to irrigate an area of 68000 ha comprising 28000 ha from Morang district and 40000 ha from Sunsari districts of Eastern Development Region in Nepal. The project was constructed on 3 Phases with the support of the World Bank. The project is located in the southeast Terai, a continuation of the Gangetic Plain. The SMIP is served by the Chatra Main Canal (CMC), which extends 53 km from the left bank of the Koshi River in west to east direction, with a maximum capacity of 60 m³/second. A series of secondary, sub secondary and tertiary canals run in a southerly direction nearly 20 km to the Indian border.

This study is focused on the Ramganj secondary canal of the SMIP. Ramganj Secondary canal named as S10, has a total length of 11.463 km and it serves 4845 ha of land. The discharging capacity of this branch canal is 4.95 cumecs which bifurcates from CMC at a chainage of 28.12 Km. Moreover, Ramgunj S10 is situated in between Ramganj secondary canal and Biratnagar secondary canal. The S10 comprises of an intake, a secondary canal, 5 sub-secondary canals namely: SS10A, SS10B, SS10C, SS10D and SS10E and 6 direct tertiary canals namely: S10T1, S10T2, S10T3, S10T4, S10T5 and S10T6. In addition to this, the system has 13 other tertiary canals off-taken from the sub secondary canal and 230

watercourses. The system is fed with water from perennial river Koshi River through Chatara Main Canal (CMC).

The SMIP was intended to provide drought protection and deliver irrigation water to as many farmers as possible. This project aimed to provide supplementary irrigation of paddy rice during the monsoon season based on 80 percent rainfall. After the construction of the system in the mid-1970s, farmers began to utilize the system for a winter wheat crop in the rabi season (November–March). Farmers also started farming late spring season (April–July) crops in a portions of the system. As the demand for irrigation water on a year-round basis increased, the system has not been able to supply enough water in the entire command area.

To improve service performance and service delivery of the selected irrigation systems, irrigation management is being transferred to transfer to Water User Associations (WUA). The overall objectives of the Irrigation Management transfer are:

- a) completion/consolidation of Management Transfer Plan including streamlining and strengthening of WUAs,
- b) essential structural improvements,
- c) repair or procurement of buildings, transportation, communication, maintenance and information technology equipment and
- d) capacity building of WUAs and DOI

The transfer activities will be implemented through the existing DOI field scheme units as Irrigation Development Division and Irrigation Management Division offices. Regional Irrigation Directorates at the regional level will monitor and supervise the sub-project implementation.

1.2 Social and Environmental Management Plan

A Social and Environmental Management Plan (SEMP) for the Sunsari Morang Irrigation Project in eastern Nepal has been completed in accordance with the requirements of the World Bank as per its safeguard policies, even if no EIA/IEE is required as per the Environmental Protection Rules 1997, 1999, 2007 of Government of Nepal. A key requirement of the World Bank requirement is the development of a Social and Environmental Management Plan (SEMP) for the Project.

A Social and Environmental Management Plan (SEMP) identifies, develops and assesses the social and environmental impacts resulting from the proposed development activities and aims to prepare a management plan with mitigation measures including the cost of mitigation, monitoring, auditing, capacity development and training. In other words, the SEMP provides guidance on how to prepare and ensure the effective implementation of the social and environmental management tasks during different phases of sub-project development, monitoring and evaluation; cost for mitigation, M&E, capacity building and

environmental auditing. The site specific SEMP will be prepared for each sub-project to be financed by the World Bank as per its safeguard policies, even if no EIA/IEE is required as per the Environmental Protection Rules 1997, 1999, 2007 of Government of Nepal.

1.3 Objective

The objective of the SEMP is to mitigate the adverse (or negative) social and environmental impacts and enhance the positive outcomes from the project and project activities. It contains detailed description of the potential social and environmental impacts (both during construction and operation & maintenance stage), mitigation measures and mechanisms for both implementation and monitoring for each sub-project activity including the responsible agency. Followings are major broad objectives of the SEMP aims:

- Identification of social and environmental impacts, both positive and negative, of the project
- Assessing the magnitude of each impact
- Identification of set of measures to mitigate the potential impacts
- Identification of measures to enhance the positive social and environmental impacts of the project interventions
- Determination of site specific, detailed requirements for ensuring that those responses are made effectively and in a timely manner; and
- Description of the means for meeting those requirements

1.4 Present Status

The Sunsari-Morang Irrigation Project is an Agency Managed Irrigation Project (AMIP), started in 1978 and completed its three stages in 2002 (Status Report of SMIP, 2069). At present the second stage of the third phase is ongoing. The operation and maintenance of the system has been completely dependent on government provided budget. The discharge in the main canal is low due to the heavy siltation and leakages at several points of the canal. Lack of maintenance on side slope has caused seepage at several places along the canals. The tail portion of SMIP is affected due to the low flow of water in the main canal. The tail-enders farmers are compelled to adopt the 'Rotation' system to irrigate the crops.

The Ramgunj Secondary Canal, also named as S10 has water carrying capacity of 4.950 cumecs and a command area of 6845 ha land from Khanar, Majhel, Sonapur, Semaria, Tanmuna, Duhabi, Bhaluwa, PurwaKushaha, Ramgunj, and AmahiBela villages of Sunsari district. The system consists of a main canal of length 11.46 km, 24 sub-secondary canals of length 14.923 km, 19 tertiary canals of length 46.831 km. The canal also has 230 watercourses extending over the length of 312.61 Km and benefitting over 8229 households.

The canal is working at only 70% even though general condition of the canal is good. Many sections of canal (length varies from 2 m to 150 m) are defective due to landslide, damage

of lining and others. There is a serious problem at downstream of the aqueduct situated at ch. 10+130 at TengraKhola up stream of SS10C sub secondary canal. Despite temporary protection work performed in previous year, major protection works are still needed in both upstream, downstream region. Floor work along the canal length is required to check increased action of piping below aqueduct structure.

Although, culvert and drop structures have no major damages, many minor damages need attention. Water Spilling from canals, cutting of banks, animal encroachment, flood in the river/rivulets running parallel to canal has caused damaged at different sections of Sub Secondary Canals under S10. River protection work is needed to protect the SS10B canal and its tertiary SS10BT2 from KeshariaKhola, which has already damaged 100m of SS10B canal. General site observation showed most of gates are still working but there is major damages in 20% of structures of the tertiary canals and 25% in watercourses. Almost 40% of the structures of the tertiary canals and 60% of the structures of the watercourses have minor damages.

1.4.1 Demography

The majority of farmers residing in the area belong to Indigenous and Dalits communities. After construction of canal, socio-economic status of the farmers improved due to increased crop productivity, which they spend, on house construction/maintenance, purchase of household goods and other major investments. Unfortunately, majority of the people from the community are still illiterate. Meanwhile, noticeable numbers of people have left agricultural occupation and have migrated to urban areas and abroad in search of better livelihood opportunities.

The Ramgunj Irrigation System (RIS) has many clusters of settlements and squatters. The command area benefits 8229 households with 38,000 population. Population of the area is ethnically heterogeneous with Tharu (29%), Yadav (17%), Muslim (17%), Brahmins (11%), Chhetri (11%) as a major communities. Hinduism is the main religion of local people followed Islam. 95% of people follow Hinduism while 5% follows Islam.

The primary occupation of the people in the project area is subsistence farming. More than 90% of household are small landholders owing 5 kattha to 1 bigha and about 5 % of the owners have land holding between 1 bigha to 3 bighas. About 4% of the owners have land holding between 3bigha to 5 bigha and remaining 1% owns more than 5 bigha.

Due to high fertile land and irrigation facility in command area, in-migration rate is more than out-migration rate. Agricultural labor availability in the block is not sufficient especially in farming season. Migrants from India and other district of Nepal, especially Saptakoshi flood affected area of Sunsari district come to work as labor. Many uneducated people go to factory for the employment to work as a worker in Biratnagar, TankiSinwari, Khanar and Duhabi. Very few people are in government institutions.

1.4.2 Hydrology of the River

The source Chatara canal is Koshi River. The catchment area of the River above intake is about 57,000 km². Koshi is a perennial river with huge seasonal variation. The mean annual rainfall is 1840 mm, most of which occurs between May and September. Generally, the flow varies from an occasional peak of 10,000 cumec during monsoons to a mean monthly value of 400 cumec for March. Ground water levels in the project area vary with location and the season but are generally in the range of 3m to 10m below ground level. The catchments area of the river is vulnerable to landslides and soil erosion due to higher level of deforestation and loss of vegetative cover. Due to this reason, during rainy season the river water is loaded with high quantity of silt. The monthly mean value of 90 ppm for January to a mean monthly value of 2680 ppm for June. It has resulted in sand deposit formation in various portion of canal decreasing capacity of the canal system.

1.4.3 Soil Types and Agriculture System

Soil in project area is considered good for agricultural activities. The soil is alluvial in nature which can be classified into six textured groups as Loamy sand - 1.3%, Sandy loam - 12.8%, Loam - 50.4%, Silty loam - 6.4%, Sandy clay loam - 1.5%, and Clay loam - 25.8%. Because of their greater permeability, these soils are considered to be more suitable for irrigated diversified arable crops than for wetland rice.

The average landholding per household is 0.5–1 ha. Paddy and wheat are the main crops of command area. Summer paddy is planted in majority of land (about 90% land of the command area) followed by spring paddy in 50% land, wheat in 25% land, sugarcane, jute, pulses (lentil, soybean, other local varieties), oilseeds (mustard and linseed) & others in 25% land. An average yield of the summer paddy and spring paddy are 4.1 and 4.5 ton per ha respectively whereas this value for wheat is 1.6 ton per ha and maize 4 ton per ha. The traditional labor-intensive system is gradually changing into mechanization system. The traditional method for land preparation is practiced by 80% farmers whereas modern method by 20%. Farmers use both chemical fertilizer and compost fertilizer. Seasonal vegetables are grown for mostly local consumption but people are slowly switching to commercial farming. Marketing system for the crops is found satisfactory and market is easily available at in 1-2 km distance.

1.5 Water Users Association (WUA) Structure

The Sunsari Morang Irrigation System (SMIP) is comprised of 5 tiers of organization namely:

- Water User Central Coordination Committee (WUCCC) as Main Committee,
- Water User Coordination Committee (WUCC) for secondary canal, and
- Water User Committee (WUC) for sub secondary canal,
- Water User Sub-Committee (WUSC) for tertiary canal and

- Water User Group (WUG) for watercourse levels.

The project runs under three tier organizations, which are structured as:

- Water User Coordination Committee (WUCC) for S10
- Water User Committee (WUC) at the secondary canal
- Water User Group (WUG) for watercourses

WUCC

The WUCC comprises a total of 13 members including one chairperson, one secretary and 11 Executive Members (EMs). All the executive members are elected from the chairpersons of the all WUCs and WUGs under the Ramgunj Secondary Canal, for the duration of four years. WUCC is further divided into four Sub-Coordination Committees as follows:

- a) Maintenance Coordination Sub-Committee;
- b) Resource Mobilization Coordination Sub-Committee;
- c) Canal Operation Coordination Sub-Committee; and
- d) Election Coordination Sub-Committee.

WUC

The WUC comprises of 7 members including one Chairperson, one Secretary and five Executive Members (EMs). All the members are elected from the chairpersons of the all WUGs under the sub secondary canals, to work for four years. WUC is further divided into three sub committees in order to ease the management. They are:

- a) Maintenance Sub-Committee;
- b) Resource Mobilization Sub-Committee; and
- c) Canal Operation Sub-Committee.

WUG

The WUG comprises of 7 members including one Chairperson, one Secretary and five Executive Members (EMs). All the members are elected from the representatives (one from each of the outlets) of the outlets under the watercourses, for four years. This is further divided into three more sub committees, namely:

- a) Maintenance Sub-Committee;
- b) Resource Mobilization Sub-Committee; and
- c) Canal Operation Sub-Committee.

Moreover, the record of land acquired by the government of India for the construction of higher-level canals during its initial stage of development is not available including the area occupied by the canals, their infrastructures and the site office compound. At present, the

site has no tree and other properties like heavy machines. All the machines have already been handed over to Mechanical Division no.1 Office at Biratnagar, under the Department of Irrigation. It is mentioned by the SMIP Office that some vehicle (like Jeep and motorcycles) can be transferred to the WUA's. However, the capacity of WUA / WUO to maintain and operate the vehicle should be enhanced.

Furthermore, Ramgunj branch canal, S10 off takes from CMC at a chainage of 28.12 Km and 94 RD west from Khanar. The canal network diagram describes about the number of sub secondary canals and direct tertiary canals with their respective lengths, discharges, command areas, and flow depths. This information is presented in Figure 1.

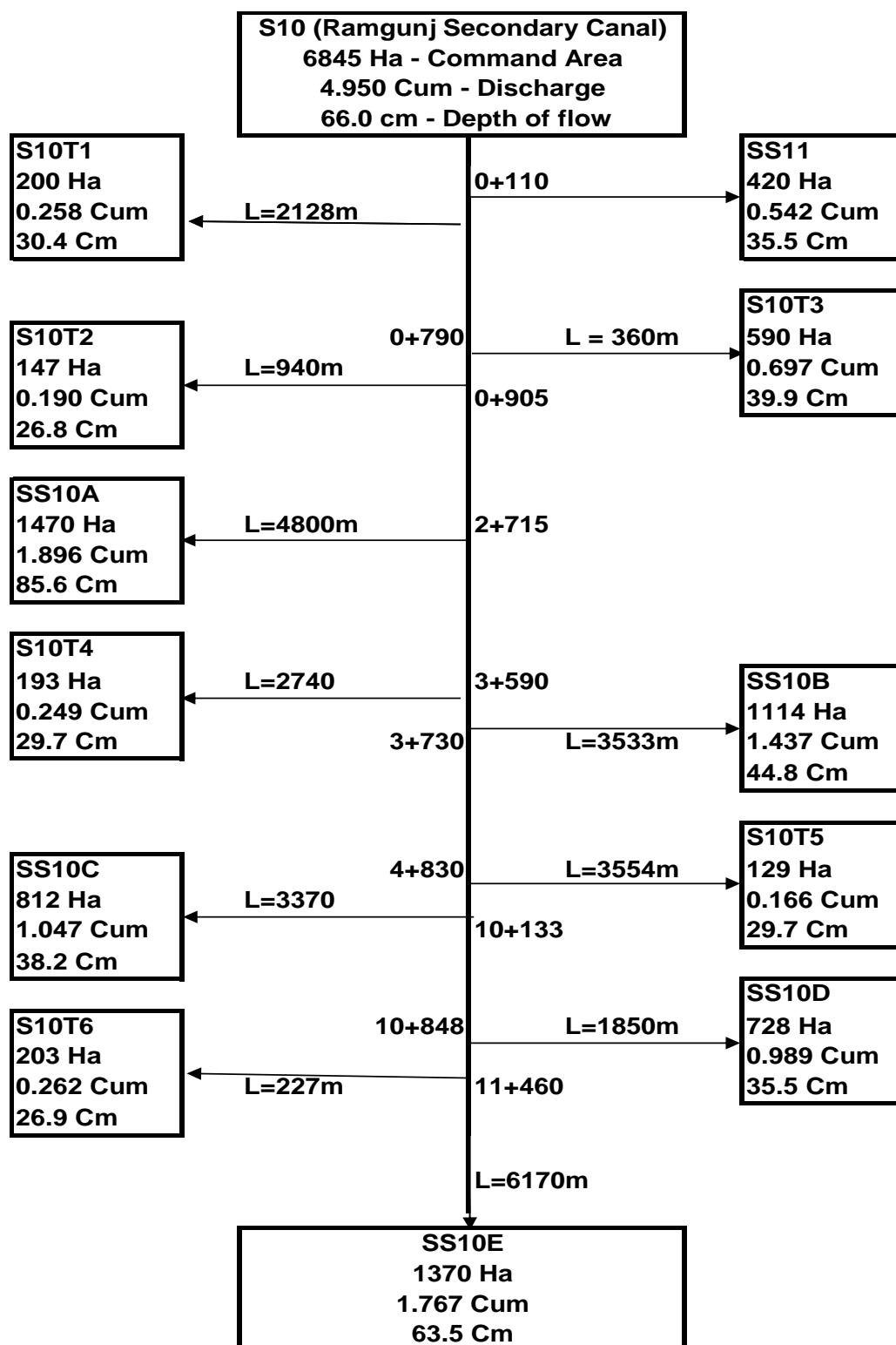


Figure 1: Canal Networks within the Ramgunj Secondary Canal

Chapter II

Approach & Methodology

2.1 Background Information

The SEMP team carried out background information review on the Social and Environmental Management Framework (SEMF), Resettlement Action Plan (RAP) policy, Indigenous People Development Plan (IPDP), Gender Action Plan (GAP), Rapid Appraisal Report, and Consultation Report using both primary and secondary data. In the course of data collection various tools such as checklist and semi-structured questionnaire were used. Social and Environmental Assessment procedures were enhanced through participatory public consultation and disclosure of relevant SEMP at the subproject level. Following activities were implemented in a step-wise manner for preparing SEMP report.

2.2 Literature Review & Desk Study

The SEMP team reviewed various project related documents such as SEMF, Resettlement and Rehabilitation (R&R) policy, Indigenous People Development Plan (IPDP), Dalits Development Plan, Asset Management Plan (AMP), Gender Development Strategy and other documents (including preliminary and pre-feasibility report) related to the SMIP to ensure report to contain all the necessary information in a succinct fashion. During this stage of study, the following tasks were performed.

2.2.1 Preparatory Meetings

The SEMP team met with representatives from DOI in order to collect information available in district level line agencies such as agricultural, Forest, Cooperatives, NGOs, and DDC. Discussion on the study methodology, work plan and preparation of inception report was also done during the visit. During the meeting, a tentative field plan and activities were discussed and finalized to carry out necessary fieldwork in the project district. The necessary logistics of the field and office work were managed. In addition, they reviewed topographical map of the project area.

2.2.2 Review of Documents & Preliminary Data Collection

The secondary information including flow data and agricultural production data were collected from various agencies such as; DOI, SMIP office, DADO, district line agencies and other relevant sources. The documents hence collected were reviewed and discussed by the SEMP team members in coordination with concerned stakeholders.

2.2.3 Preparation of Questionnaire and Checklist

Followed by preliminary data collection, the SEMP team members then developed a set of semi-structured questionnaire for the beneficiaries of the command area in order to collect the household information, socio-economic condition, agriculture production, impact of (both positive and negative) irrigation on production, and livelihood changes. Checklist was prepared for the Mass Meeting and Focused Group Discussion with the beneficiaries, discussion with the members of the Water User Association, SMIP staffs, and other related stakeholders.

2.3 Field Visit

The SEMP team visited the project location on different dates as per the field schedule plan and conducted meeting with local stakeholders. In consultation with local bodies, including farmers along the branch canals, the SEMP team reviewed and analyzed the list of proposed ESI structures. The interaction was focused on procedures so far adopted in project identification, implementation, and monitoring. Similarly, other aspects such as the role of WUA in project implementation and monitoring, level of participation, linkages and coordination with stakeholders were discussed during the field visit.

2.3.1 Mass Meeting

The SEMP team conducted mass meeting with the SMIP Water Users Committee and beneficiaries of the command area. During the meeting, the SEMP team highlighted the necessity of the SEMP, and its broader objectives and its importance to the members of WUA. The SEMP team then visited the project area and collected real time information related to ESI structures those needed to be carried out. The level of local participation was noticeable. Attendance of mass meeting are enclosed in Annex-3.

2.3.2 Walkthrough

SEMP team conducted a walkthrough survey along with key informants from the project area. Some of the outcomes of that walkthrough survey include:

- Obtained an overview of the whole operation;
- Identified the key hazards in each area; and
- Assessed the effectiveness of any control methods in place.

2.3.3 Focus Group Discussion

Following the mass meeting of a focus group, separate discussions were held with women, Indigenous people and Dalits of the community with facilitation from SEMP team. The focus group discussion proceeded with set of semi-structured questionnaire designed by the SEMP team. The team members facilitated during the discussions in order to get their discussion effective and get valuable information. During the discussion, the attendees expressed the strong need for skill-based trainings, such as; leadership development

training, Improved Agriculture practices based training, and empowerment training. Specifically, the women from the project area asked for skill development and income generating activities (IGA) trainings in order to enhance their living standard. The SEMP team members noted the issues expressed in the discussions down. The attendance of participants is presented in Annex-3.

2.3.4 Social Mapping

Community farmers in assistance with SEMP team then drew a social map of the project area. The map featured all major project components such as canals, settlements, roads, other water sources, agricultural land, forests and pasture, markets. The social map is presented in Annex-4.

2.3.5 Time line Analysis

A time line analysis was carried out in consultation with farmers chronicling major events that have had deep-seated impacts in the project area and its residents. They reported that ever since B.S. 2045 Koshi River have been cutting and damaging the farmland and banks at different branches along the canals.

SMIP Stage -I

Sunsari Morang Irrigation and Drainage Development Stage I Project was identified by 1975 IDA mission in line with HMG's objectives of upgrading and exploiting existing irrigation schemes as well as to develop the capacity of CMC and irrigation system. HMGN later engaged the consultant's service of Nippon Koei (Japan) to assist in the project feasibility study. During IDA appraisal in September 1977, a careful review of implementation capacity, project organization and farmers' participation was carried out, to determine an appropriate project design, including the construction schedule. SMIP-I was IDA financed to overcome these shortcomings by modification and rehabilitation of the system in planned manner with the development of 9,700 ha.

SMIP Stage-II

After completion of SMIP-I stage from 1978-1985 and completed with extension of three year in 1987. The SMIP -II (1986 – 1997) was implemented to support for modification and rehabilitation of Sunsari Morang Irrigation System (SMIS). The total command area of SMIP was originally defined as 68,000 ha. The project aims at increasing agricultural production and farmer's incomes through the rehabilitation and improvement of existing irrigation and drainage system and the efficient utilization of available resources.

SIMP-Stage III, Phase I

The stage III -Phase I project (1997 – 2001) was carried out for the further development of the command area and rehabilitation of the CMC and improvement of the Budhi Aqueduct. This phase has continuation of the second phase for the development of the

remaining command area of the SMIP. The stage was funded by the World Bank and GoN contribution.

2.2.6 Debriefing/ Wrap-up meeting

A wrap-up meeting held during the field visit comprised WUA committee members, farmers, key informants and stakeholders, and SEMP team members. During the meeting they identified and assessed potential environmental and social issues of the irrigation project. Amidst, the issues raised and pointed out by local experts were discussed and noted down. Also, the likely suggestions, comments and solutions presented by the farmers/water users were noted down along with suggested mitigation measure. The original minute is attached in Annex-3.

2.4 Data Collection

Secondary Data Collection

The informations were collected from various reports, documents and publication. The secondary information including flow data and agricultural production data collected from various agencies such as; DOI, SMIP office, DADO, district line agencies and other relevant sources.

Primary Data Collection

Primary Data Collection has been carried out from field visit of the project area. The Mass Meeting, Focused Group Discussion, Key Informants Interview was carried out to the respective informants. Household survey was carried out as case group for the beneficiary households who have irrigated land provided by the project and control group who have not been provided with the irrigation facilities in the project area.

2.5 Data Processing and analyzing

Following the collection and preparation of both primary and secondary data through desk study and field visit, the SEMP team analyzed the data and prepared report of the system.

2.6 Preparation of Draft Report

After all the data were processed and analyzed, the draft report was prepared and submitted to IWPM, Department of Irrigation.

2.7 Preparation of Final Report

After approval of draft report by IWPM and Department of Irrigation, the final report is prepared. The final report incorporates revision, amendments and comments made by OPD.

Chapter III

Identification and Assessment of Potential Impacts and Mitigation Measures

The following section deals with Environmental and Social issues that were identified and observed by SEMP team during the field visit. SMIP must prepare a 'Maintenance Plan' and allocation of budgets as per the plan must be made internally and externally. The SEMP team identified lack of coordination between farmers and project management. Plantation of rain-fed crops adjacent to the canals starting while spring paddy at the end of watercourses and planting of trees along the left bank of certain canals were observed in project area. This practice has resulted in damage of lining along the canals due to bank seepage. Some of the existing environmental issues identified are; problem related to water logging, sedimentation, seepage losses and draining hazards. No adverse impact were found on social and environmental issues due to ESI improvement works.

One of the main physical constraints identified by the SEMP team is that the flow of water along the canal in winter and spring is very low. In this low flow conditions with the present control strategy and infrastructure, it is very difficult to supply irrigation water equitably to different areas of the project. No wonder, tail-enders have always been suffered from water shortages, with majority of farmers receiving no or very less water from the canal branch.

3.1 Social and Environmental Issues

3.1.1 Canal Reshaping

Among the ESI activities, one of the major activities is reshaping of the canal. The reshaping work in the canal needs to be done at various branches of the canal. The construction/rehabilitation activities consist of cutting and filling of earthwork for maintaining the designed canal & bank section. During construction of canal banks, the trees and other types of vegetation existing in the area should be replaced or cut during reshaping works. Canal portion encroached by slums and landless people needs to be reclaimed and restored. In order to avoid cutting and breaching of the canal banks haphazardly, the following mitigation measures are recommended:

- The Irrigation Division Office needs to construct the permanent outlets for farmers which may control the cutting banks haphazardly without causing social and environmental problems.

- The WUA and farmers should regularly perform repair and maintenance of the outlets.
- Cooperation among farmers community for canal protection.

3.1.2 Intake/Offtake Rehabilitation

With decrease in water from the source, only 25 percent of the farmers get their livelihood from the agriculture in the selected watercourses command area. Rest of the command area is dependent on rainwater that has decreased crop productivity. Due to unavailability of water farmers are only been able to harvest two crops every year. The focused group discussion held during the field visit concluded that there is a need to design the intake with high dam so that enough water can be blown as per community need.

3.1.3 Watercourse maintenance & operation

During the field visit water losses was observed in various watercourses. The losses were mainly due to numerous turn-outs increasing leakages at junctions, higher elevation in absence of suitable gradient causing an increase in vertical and horizontal seepage and sharp curves contributing to frictional losses. One of the reasons for the conveyance losses is poor maintenance of watercourse and silt deposition in the head of outlets as farmers lacked cooperation and has little technical know-how; as such the watercourse were not de-silted on a regular basis. Moreover, hindrance in the flow due to vegetation and trees on the banks and high water requirement through evapotranspiration greatly decreased the conveyance efficiency of watercourses.

The water losses and inadequate watercourse maintenance and operation have led to the deterioration of agriculture. It is reported that watercourse needs periodic cleaning based on the extent of silt deposition with maintenance at few places. During the field visit majority of the farmers complained regarding the disputes related to maintenance and cleaning. Tail section farmers considered it injustice that the head and middle section farmers did not participate in maintenance. Also, there was complete lack of cooperation among the farmers for the watercourses maintenance. The slope of watercourse needs to be redesigned considering water can pass all through the canal length.

3.1.4 Water Supply Inequity

Due to inadequate water supply particularly in dry season, rotation of water distribution (Water delivery 4 days and 4 days' gaps) for the sub secondary canals is in practice. In dry season due to insufficient water in the canal (S10), rotation of water distribution is done according to the requirement and site condition. Out of system (S10)'s 6845 ha command area, only 75% of the area is getting fully irrigation facility whereas the rest 30% area getting partially irrigation facility. Water supply during dry season in the command area situated at the tail end (about 20% length from tail end) of the watercourses is scarce. The water delivery efficiency decreases as increasing the length (from head to tail) of the canal due to lack of proper cleaning and regular O & M. The water delivery efficiency of Sub

Secondary Canals under S10 canals is estimated at around 50% only in average and decreases as increasing the length (from head to tail) of the canals. The water delivery efficiency of the Tertiary Canals / Watercourses under S10 are estimated at around 40% and 30% respectively and decreases as increasing the length (from head to tail).

3.1.5 Seepage and damage of canal section

Encroachment by people and animal grazing has damaged most of the canal branches. In addition, rats and local reptiles have made holes and damaged the canal branch. Many farmers have diverted water by cutting and breaching the canal banks at their will. The continuation of such practices has impacted the sustainability of the canal system. In order to avoid cutting and breaching of the canal banks haphazardly, the following mitigation measures have been recommended.

- The Irrigation Division Office needs to construct permanent outlets which will let farmers get water without cutting banks haphazardly.
- The WUA and farmers need to perform regular repair and maintenance of the outlets.
- Improve cooperation among farmers community for canal protection.

3.1.6 Flooding

Tengra river and Kesharia river passes through the command area of subsection. Flooding in these rivers have caused damage to the canal. Tengra river has caused serious problem at downstream of the aqueduct situated at ch. 10+130 up stream of SS10C sub secondary canal. SS10B canal and its tertiary SS10B2 is under threat from Kesharia Khola which has already damaged 100m of SS10B. Major protection work is needed in damaged section along with floor work. River protection is required on both side of river for both canal protection and farm protection.

3.1.7 Protected Areas, Forests and wild Life

There are no protected areas in command area of canal. There are also no forest area or tree cover (except few in canal side) along the canal and also in command area. Lack of forest cover and vegetation has resulted soil erosion and rainwater wash-off in many section of command area. However, tree growth in canal section has damaged lining of some of canal section. Due to lack of forest cover, existence of wildlife has not been reported.

3.1.8 Impediment of movement of people and domestic animal

The farmers are facing problems due to insufficient numbers of footbridges. During the field visit of SEMP team to the project area, farmers have demanded to build few footbridges. Also, the Essential Structure Improvement (ESI) work of the project may have a negligible impact on the movement of local people and domestic animals.

3.1.9 Crop Productivity

In the recent years, due to increasing population growth and static productivity, the command area is under decreased food productivity. The decrease in food production is mainly due to declining soil fertility, poor access of irrigation, poor or no adoption of improved agricultural technologies (varieties, breeds and management) along with inappropriate government policies.

Moreover, the use of both compost and chemical fertilizers was noticed in the area. The use of chemical fertilizers in comparison of compost is unexpectedly high. Farmers are worried about the excessive use of chemicals fertilizers, because they have experienced decreased fertility of the soil.

3.1.10 Silt Deposition in the Canal and Field

Due to high silt content of water, silt deposition has taken place in the canal and field. Silt deposition in water course has led to reduction of water supplying capacity of the canal system. Silt deposition in field has caused loss in productivity of land. Enhancement of desilting capacity of intake is required to reduce silt input in canal water. Regular removal of silt from water course is also required.

3.1.11 Water Logging

Lately water logging has emerged as the most urgent issue in entire project area. Water logging is caused due to inadequate drainage structure, damaged drainage system and canal spillage due to various region. Water logging has caused inundation problem in many fields especially in rainy seasons. Construction of additional drainage system, proper rehabilitation of existing drainage and their regular maintenance is required to get rid of water logging problem.

3.1.12 Biomass, Brick Masonry and Air Pollution

Most of household in command area use traditional cooking stove (biomass) for cooking which are less efficient and also cause indoor pollution. It increased health risk to people especially women and children. Use of Cow/Buffalo dung for fuel has also reduced farmer's ability to prepare compost fertilizer, negatively affecting fertility of the soil.

Increasing urbanization has caused boom in brick masonry business. Brick masonries are dotted all over the command area. As Brick masonry uses coal to bake bricks, it has caused air pollution in command area. They also use fertile soil for brick production that has reduced fertility of many fields. Heavy vehicle movement in rural road has damaged most of road sections and caused air and dust pollution.

Access to alternative cooking technologies like improved cooking stoves and biogas can reduce biomass demand significantly, benefiting all users. Instead of burning cow/buffalo dung, using biogas plant can provide cooking fuel (biogas) without compromising its nutritional value. Construction of large number of biogas plant can indirectly help to

improve fertility of soil. Proper air emission regulation is required for Brick masonry to reduce air and dust pollution. Movement of heavy vehicles should be restricted on rural roads.

3.1.13 Health, Sanitation and Safety

In terms of Health, Sanitation and Safety, the present sanitation condition of the project area is not satisfactory. Despite district level authorities declaring Sunsari as Open Defecation Free (ODF) district, very few households use the toilets. Construction of road has affected the source of drinking water. Due to lack of proper solid waste disposal system and other various constructional activities residents of the community are suffering from various water-borne and air-borne occupational and non-occupational diseases such as jaundice, whiffing, gastritis, blood pressure etc. Consideration of the health and safety conditions of community involved in ESI construction activities must be considered. Unsafe working conditions should be avoided and the health of the laborers needs to be taken into account in accordance with national legal framework and international labor laws such as ILO. Moreover, problems of pure drinking water need to be addressed in some of command area. However, if district level bodies ensure adequate safety measures such impacts could be obviously minimized in days to come.

3.1.14 Gender Issues

Genders issues are one of the major social issues, where female are comparatively disadvantaged when considering basic things such as lack of education and bargaining power, health, nutrition, access to assets/resources such as land, and decision making within the households and community. Increased out-migration by men and off-farm employment has contributed in feminization of agriculture as women have taken up with the roles and responsibilities while creating familial balance. In addition, the present situation and the exodus of men from rural areas have contributed on women having to take the sole responsibility of agricultural production. During the focus group discussions women participation was disappointing with their name only limited to paperwork. The women and men have had very different work experiences, often to the detriment of women. To make things worse, the women engaged in farming still have limited access to basic and natural resources and institutional services, such as credit, market information, training and extension services, has been limited to a large extent. They are frequently shut out of 'social capital', such as agricultural groups, supply chain control and community networks that can enhance productivity and growth.

In this regard, it was agreed to provide capacity building trainings to women members of WUA and women farmers. In addition, it is noticed that there is wage disparity among female and men workers in the project area.

3.1.15 Social Issues of Dalits

The project area has significantly large numbers of Dalits people. Majority of Dalits people do not have toilets, and even the people with toilets are not been able to use it because of water scarcity. During the focus group discussion held with the Dalits people, they asked for skill based development training and employment generating opportunities trainings so that they can improve their living standard. In this regards, following set of activities were discussed and agreed upon:

- Dalits to be provided with priorities both in the construction and operation related works as per their skill and interest.
- Requesting local NGOs to include Dalits with other people for employment generation and skill development trainings.

3.1.16 Social Issues of Indigenous People

The focus group discussion held with Indigenous people resolved that the Indigenous people will be given priority for employment opportunity both during the time of construction and operation. A set of skill development program will be organized so as to empower these Indigenous people. In this regards, the following set of activities were discussed:

- Indigenous people to be provided with priorities in the construction and operation related project works as per their skill and interest.
- Capacity development training will thus be provided to bring them put their interest forward and help them in decision making related to project activities.

3.1.17 Training and Skill Development

During the construction & operation period, the local farmers are expected to learn technical skills related to construction and management of irrigation systems. The skill and knowledge gained during training activities will enhance the future employment opportunities in similar construction activities in other projects.

3.1.18 WUA Mobilization

The meeting with concerned stakeholders' show that the information dissemination is inadequate which is below the satisfactory level. This has adverse impacts on proper operation of the system resulting in lack of commitment from the beneficiaries, lack of sense of ownership and eventually carelessness. The farmer's participation in the project management which is critical for supplying water from the turnouts has been absolutely lacking. Because of the inadequate distribution system and lack of farmer's participation water could be only supplied to a limited area. The situation is steadily deteriorated because of lack of community participation at its core. Because of the cultural issues only men are the decision makers despite increasing number of women in agricultural practices in last few years. Awareness about water delivery and enforcement of the rules, regulations

and water sharing arrangements must be strictly implemented. There are no rules and regulations implemented so far in order protect the system, making condition worse day by day. The community itself is involved in deteriorating the system because unequal distribution system. As a consequence the project could supply irrigation water to only about 10-25% of its command area.

Proper organization of WUAs' members will have a significant beneficial impact during construction and rehabilitation of the irrigation system. It will help trigger the participation and change in perception of farmers with expectations of better services, eventually resulting in smooth implementation of system in greater magnitude.

3.1.19 Information Dissemination

The meeting with concerned stakeholders' show that the information dissemination is inadequate. Confusion created by lack of information has caused various problems. Lack of commitment from the beneficiaries, lack of sense of ownership and carelessness has caused adverse impacts on proper operation of the system.

3.2 Anticipated Beneficial Social and Environmental Impacts

The likely impacts that are expected to occur may be positive or negative. Some of positive impacts are

3.2.1 Increased Agricultural Activities and Food Security

The proposed development project provide better irrigation service to lands previously not well served. Adequate availability of water will also increase land acreage under crop farming, farm productivity and the number of livestock. Increased agricultural output and livestock will help to achieve food security at an individual household level and at the national level.

3.2.2 Employment Opportunities

Employment opportunities are expected to be generated during construction phase of project expansion. An increase in the population of the workers will lead to an increase in the demand for consequent services such as food demand and other services e.g. housing, health care and transport among others. These are set to be provided by the local communities thereby creating new opportunities.

3.2.3 Improved Infrastructure

Currently, farmer's faces huge challenges to transport their farm products from farm to store or store to market especially in rainy season due to undeveloped roads. The expansion and improvement of the access roads into the villages will benefit all stakeholders including farmers and help them to have better market access. Consequently,

the improved revenue growth will precipitate the development of other social amenities as well.

3.2.4 Increased Income

The expansion of the irrigation project and improvement of access roads into the villages will require construction materials which majority will be sourced from local hardware stores. This will inject much needed income into the local economy benefiting local businesses. Increased farm output as a result of improved irrigation, improved market access and increased employment benefit will help to improve local economy further.

3.2.5 Increased Access to Education

Improved infrastructure, especially better road gives better transport facilities to students, providing easy access to schools and colleges. It will further reduce current need of arranging separate living space for children near school and colleges which has made education very expensive and unaffordable to many. With improved road infrastructure, likelihood of establishment of school in villages also increases.

3.3 Anticipated Adverse Social and Environmental Impacts

The negative impacts during the construction phase are considered to be minor and short term. However, lack of effective maintenance or shortsighted construction but may pose a great danger to the environment in some case. So, great care should be given to reduce potential negative environmental impacts during construction and operation phase of the project.

3.3.1 Vegetation Loss

Clearing of vegetation (grassland and tree from canal side) may be required during infrastructure development and maintenance work. It will lead to loss of biodiversity prevalent in the areas. The area is also a home to many bird species and animals and therefore biodiversity loss will lead to the loss of habitats and interference in the migration corridors. The cutting of indigenous trees may interfere with some cultural values of the local community as some trees have medicinal value and have been used for treatment purposes.

Mitigation Measures

- Wherever possible, indigenous trees should be conserved during construction as much as possible,
- If clearing is necessary, cleared land should be landscaped and planted with as much indigenous vegetation as possible so as to restore the lost biodiversity.

3.3.2 Potential Displacements

The average land size within the project area was found to be between 0.5 to 4 acres per household. The individual land owners may be affected through land repossessions to pave way for canal laying. Clearing of encroached portion of canal will affect many people currently benefitting from their activities. Some of the structures likely to be affected have been identified and include the following:-

- Toilets
- Semi-Permanent houses
- Fences

Mitigation Measures

There is an apparent need to have in place a full resettlement plan and ensure there is compensation for people affected by the displacements. There is no provision to compensate loss of property built on encroached public land, but many of such households are economically and socially marginalized section of population. Special program should be brought to address issue of these people.

3.3.3 Soil Erosion

Soil erosion is expected to increase due to construction activities that involves excavation and vegetation clearing. Vegetation will be cleared along the canal conveyance route leaving the soil exposed to agents of soil erosion. In addition some of the loose soils accumulated in the area will be swept away by winds and rainwater leading to siltation and affecting the aquatic life.

Mitigation Measures

- Soil erosion control measures should be undertaken to avoid erosion in sensitive areas.
- The excavation works should be compacted.
- Soil conservation measures should be constructed especially at stockpiled areas.
- The topsoil should not be utilized during the construction activities

3.3.4 Soil Compaction

The high traffic especially of machineries and the construction workforce within the project area is likely to lead to compaction of the soil structure further leading to reduced capacity of the water to infiltrate into the soil thereby affecting the soil-water balance and the hydrological cycle largely.

Mitigation Measures

- Unnecessary vehicle movement should be avoided
- Compaction during stockpiling should be avoided by working the soil in its dry state
- Machineries need to be operated on the existing roads predefined area only

- Soil restoration work should be done after construction work is completed, especially in parking areas.

3.3.5 Extraction of Construction Materials

Heavy extraction and transportation of construction materials such as sand, gravel and rocks is likely to result in the distortion of the ground structure, vegetation loss, dust emission, oil spills, noise and potential for accidents. Further, the quarries and barrow pits associated with extraction of raw materials may collect water which will form ponds. Such stagnant water is highly suitable breeding grounds for mosquitoes and other diseases vectors thereby bring about water borne diseases such as malaria.

Mitigation Measures

- EIA needs to be done for big quarries used to extract the raw materials
- There should be adequate barrow rehabilitation plans approved by the local authority
- There should be adequate reuse of the excavated waste materials
- The proposed site quarries and barrow pits should be done carefully to minimize impacts on various land uses
- There should be adequate landscaping, backfilling and draining of the depressed areas to prevent breeding grounds for disease vectors

3.3.6 Pollution; Dust and Air Quality Concerns

The construction activities will generate a significant amount of dust which may be blown by the wind and construction vehicles. This is likely to affect the workers and the residents of the project area and surroundings. Through inhalation of significant amount of dust it may lead to respiratory problems. Spilled vehicle oils and grease from the construction vehicles and other machinery have the potential to pollute soil and other water sources and also the vegetation.

Noise pollution emanating from construction vehicles, other machinery and workers will have a great significant negative impact to livestock, and wild animals.

Mitigation Measures

- The vehicles transporting raw materials especially soil should be well covered to reduce dust emissions
- Requisite PPEs such as dust masks should be provided to the workers on dust prone areas.
- The speed of the construction machineries should be controlled and other vehicles
- The removal of vegetation should be avoided with the exposed surfaces being adequately re-vegetated

- There should be appropriate selection of construction machinery; their air pollution standard and sound pollution standard should be taken into account during such selection.
- Sprinkling of water in construction yards, road and soil heaps to keep down the dust produced.
- The noise levels should be kept at the minimum acceptable levels and the construction duration should be limited to day time.

3.3.7 Pests, Crop Diseases and Chemical Fertilizer

Increased irrigation facility may create a more conducive environment for commercial farming leading to increased use of pesticides and chemical fertilizer. Apart from negative health effect due to pesticide residue in food, its increased use will cause water contamination and the degradation of resources. Wash off of unused chemical fertilizer from farm may lead to water pollution. It may also cause algae boom in water bodies.

Mitigation Measures

- The farmers should be trained on pest and disease control and management including integration of appropriate crop rotation plans in the development of cropping patterns.
- Increased pest and disease surveillance to monitor prevalence of existing pests and diseases.
- Promotion of organic farming techniques to reduce use of chemical fertilizer in fields.
- Trainings on proper use of chemical fertilizer to avoid excessive use and runoff from fields to water bodies

Chapter IV

Social&EnvironmentalManagement Plan

4.1 Background

The Social and Environmental Management Plan (SEMP) is prepared to provide guidelines to promote the mitigation effort of identified adverse effects throughout the design, construction, operation and decommissioning phases so as to promote the positive effects. It identifies and assesses the social and environmental impacts resulting from the proposed development activities and prepare management plan with mitigation measures including the cost of mitigation, monitoring, auditing and capacity building. In this project, it is prepared to design guideline to help to promote mitigation of effects as a result of different issues and activities during and after management transfer of canal subsection.

4.2 Responsibilities

The social and environmental management of the proposed project should strengthen the mobilization of all stakeholders including beneficiary communities with regard to environmental and health aspects and render the proposed irrigation project sustainable. Various stakeholders involved in the project or involved towards implementation of the corrective actions recommended in SEMP plan are

- Contractors
- Water User Associations
- Line Ministry
- District Development committee
- Department of Irrigation
- Irrigation Development Division
- Village development Committee
- District Agriculture development Office
- NGOs

Different measures required for different identified issues and activities along with responsible agencies and cost are tabulated below.

4.3 Tabulation of the SEMP activities along with responsible agencies and mitigation cost

Activity/ Issue	Mitigation Measures	Responsible Agencies	Mitigation Cost
1.Canal Reshaping	<ul style="list-style-type: none"> Canal construction/rehabilitation will be done Safety measures should be adopted Existing vegetation should have to be replaced 	<ul style="list-style-type: none"> Contractor WUA IDD/WUA 	<ul style="list-style-type: none"> Included in the ESI cost
2.Intake/ Offtake Rehabilitation	<ul style="list-style-type: none"> Intake with high dam should be constructed 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Included in the ESI cost
3.Watercourse maintenance & operation	<ul style="list-style-type: none"> Periodic cleaning of watercourses Redesigning watercourses at few places 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> NO Additional Cost Included in the ESI cost
4.Water Supply Inequality	<ul style="list-style-type: none"> Canal rehabilitation Water Distribution Management 	<ul style="list-style-type: none"> Contractor WUA 	<ul style="list-style-type: none"> Included in ESI cost No Additional cost
5. Flooding	<ul style="list-style-type: none"> Flood protection& river training 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Additional cost
6.WUA Mobilization	<ul style="list-style-type: none"> Awareness related to canal management 	<ul style="list-style-type: none"> WUA 	<ul style="list-style-type: none"> WUA will maintain
7.Seepage and damaged of canal section	<ul style="list-style-type: none"> WUA will maintain control of branched haphazardly construct new field outlets at various locations 	<ul style="list-style-type: none"> WUA Contractor 	<ul style="list-style-type: none"> WUA will maintain Included in ESI cost estimate
8.Impediment of movement of people and domestic animal	<ul style="list-style-type: none"> Construction of footbridges across the canal 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Included in ESI cost estimate
9.Crop Productivity	<ul style="list-style-type: none"> Access to improved agricultural practices and technologies 	<ul style="list-style-type: none"> DOI 	<ul style="list-style-type: none"> Included in ESI cost estimate
10. Training and Skill Development	<ul style="list-style-type: none"> Trainings will be provided to farmers related to construction, operation &management of irrigation 	<ul style="list-style-type: none"> WUA 	<ul style="list-style-type: none"> WUA will maintain Included in SEMP cost

	system systems		
11. Silt Mitigation	<ul style="list-style-type: none"> • Enhancement of desilting facilities • Regular cleanup of canal 	<ul style="list-style-type: none"> • Contractors • WUA 	<ul style="list-style-type: none"> • Additional Cost • No cost
12. Health, Sanitation and Safety	<ul style="list-style-type: none"> • Awareness raising on use of toilets • The contractor will locate the place for disposal of solid wastes during the developmental activities and protect source of drinking water • The contractor will maintain the international law regarding health and safety of the labor • WUA will request the concerns NGOs and or Government agencies to improve the existing health and sanitation condition along with awareness programs for HIV/AIDS of the project area 	<ul style="list-style-type: none"> • WUA • Contractor • Contractor • WUA, NGOs 	<ul style="list-style-type: none"> • No Additional Cost • No Additional Cost • No Additional Cost • No Additional Cost
13. Gender Issues	<ul style="list-style-type: none"> • Training on preparation of organic manure, on-farm water management and modern agricultural practice will be provided • WUA in coordination with other stakeholders will commit to make equal wages, contractor will provide equal wage for equal work. • NGO will support women to gain access to the development programs of the concerned line agencies and other organization 	<ul style="list-style-type: none"> • IDD & DADO • WUA, Contractor • WUA & NGOs 	<ul style="list-style-type: none"> • NRs. 500000 • No Additional Cost • No Additional Cost

14. Social Issues of Dalits	<ul style="list-style-type: none"> • Dalits to be provided with priorities both in the construction and operation related works as per their skill and interest. • Requesting local NGOs to include Dalits with other people for employment generation and skill development trainings. 	<ul style="list-style-type: none"> • WUA, contractor • NGOs 	<ul style="list-style-type: none"> • No Additional Cost • No Additional Cost
15. Social Issues of Indigenous People	<ul style="list-style-type: none"> • Indigenous people to be provided with priorities in the construction and operation related project works as per their skill and interest. • Capacity development training will thus be provided to bring them put their interest forward and help them in decision making related to project activities. 	<ul style="list-style-type: none"> • WUA, contractor • IDD & WUA 	<ul style="list-style-type: none"> • No Additional Cost • NRs. 5000,000
16. Social & Environmental Monitoring	<ul style="list-style-type: none"> • Conduct S & E monitoring of the project area 	<ul style="list-style-type: none"> • IDD & DADO 	<ul style="list-style-type: none"> • NRs. 1000,000
17. Pests & chemical fertilizer	<ul style="list-style-type: none"> • Training program for farmers especially on integrated pest management • Develop Organic Farming Training Program • Develop training for proper use of chemical Fertilizer and pesticide us 	<ul style="list-style-type: none"> • WUA 	
18. Soil Erosion	<ul style="list-style-type: none"> • There should be erosion control measures on areas prone to erosion especially steep slopes • The topsoil should not be used during the construction phase • There should be intensive 	<ul style="list-style-type: none"> • Contractor • DOI • Farmers/ WUA 	<ul style="list-style-type: none"> • As per BOQ

	revegetation on bare grounds after construction		
19. Soil Compaction	<ul style="list-style-type: none"> The excavation works should be backfilled and compacted The quarries and barrow pits should be rehabilitated after activities 	<ul style="list-style-type: none"> Contractor DOI 	<ul style="list-style-type: none"> As per BOQ

4.4 Training and Awareness Raising

All the stakeholders involved in the SEMP need to undergo environmental awareness training to familiarize with ways to handle the resultant effects of the project. Training of all personnel allocated with various responsibilities should be completed before the implementation of the project activities commencement. Training should be aimed at practical aspects of environmental monitoring and management.

Trainee	Mode of training	Environmental aspects to be covered	Agency to train
DOI Environmental staffs	Workshops Group discussions Site visits	<ul style="list-style-type: none"> Environmental aspects Environmental regulations EMPs Environmental friendly construction and management 	Environmental and social experts, Supervision consultants
DOI operation/Maintenance staff	Seminar, Workshop	<ul style="list-style-type: none"> EMP implementation Environmental pollution associated with the project Best environmental practices 	Environmental and social experts, Supervision consultants
Contractors' workers	Seminar, Workshops	<ul style="list-style-type: none"> Environmental & Social overview Environmental regulations and acts EMPs 	Environmental and social experts, Supervision consultants DOI environmental

		–Environmental pollution	department
WUA & Farmers	Seminar, Workshops, Field Training	–Environmental Overview –Operation and Management of Canal –Improvement of Farming and Husbandry practices	- Environmental and social experts, - DOI environmental department - NGO, Agriculturists

4.5 RAP, IPDP, and GAP

As SMIP is an existing irrigation system and there are no major issues of land acquisition because land was already acquired by the government long time ago at the time of project construction. While constructing and rehabilitating new proposed ESI activities only minor amount of land will be required. Therefore, while acquisition these small areas of land, no people will need to be relocated, and there is no significant impact on their livelihood because of the acquisition. Hence preparation of a resettlement action plan (RAP) is not needed in SMIP.

As per the information collected from key informants, stakeholders and indigenous people; the Essential Structure Improvement (ESI) activities of the project do not have any adverse impacts to livelihood of indigenous people of the community. But the level of awareness regarding canal protection and management among indigenous people was below satisfactory level. So focus should be made to provide skill based development to these people in different stages of project activities. Access to modern agricultural farming practices and training activities are also required. Therefore, an IPDP needs to be revised.

The potential ESI improvement work benefits are gender biased. It has adverse (or negative) impact to the women's issue. The women participation and level of engagement in project activities was found to be minimal. The majority of the women from the project area are illiterate which makes them further marginalized. There is also disparity in wage between men and women. Hence women need training related to capacity building, farm water management and modern agricultural practices. These activities will help women to participate in different stages of project development and decision making process equally as men. Hence the Gender Action Plan (GAP) needs to be revised.

The ESI improvement activities do not really use toxic chemicals or any dangerous construction technologies. But the nearby brick industry has affected the occupational

health of local people. The harmful gases emitted though brick industry has adverse effect on health of the people. Moreover, the heavy vehicles that carry bricks have damaged the local infrastructure like roads. Looking at the occupational health and safety measures there is need to prepare additional plan for health and safety issues.

Whether sub-project activities involve	Yes/ No	If Yes, prepare
Acquisition/ appropriation of land and other properties	No	RAP
Janjatis/ dalits/ other vulnerable groups	Yes	IPDP
Any differential impact on women	Yes	GAP
Any health hazards	Yes	Plan to address safety measures

Chapter V

Mitigation, Monitoring & Auditing Mechanism

5.1 Mitigation Mechanism

The mitigation measures recommended in the SEMP aims to identify, develop, and incorporate common protective and preventive works, along with social awareness training programs. The costs for the ESI works are included in detailed project estimate. Based on SEMP team analysis the approximate cost required to help mitigate minor social and environmental impacts of the project is as follows:

SEMP Components	Location	Mitigation Measures	Mitigation Cost	Remarks
RAP		Not needed		
IPDP		Needs to be revised		
GAP		Needs to be revised		
Safety measures		Health and Safety plan is required		
EMP				
Training work	Project Area	<ul style="list-style-type: none"> The WUA members will be trained on on-farm water management, crop diversification and management Exposure field visits will also be organized to enhance the capacity of WUA Training will be arranged on the preparation & use of organic manure as well as controlled use of chemical fertilizer and integrated pest management (IPM) by DADO. Training will be organized for leadership development of Women, Indigenous people 	NRs. 500,000 NRs. 500,000 NRs. 500,000 NRs 500,000	

		and Dalits.		
Command Area and Canal Protection work	Project Area	Gabion protection, earth embankment and bioengineering work will be done in the affected areas.	As Per requirement	
Social & Environmental Monitoring	Project Area	IDD, RID, IWRMP, DOI will perform S and E monitoring	NRs 1000,000	

5.2 Monitoring Mechanism

The mitigation measures proposed in above sections need to be thoroughly monitored in regular basis. The measures which need to be incorporated in the contract document and bill of quantities must be monitored by the DOI, IDD and local stakeholders. The execution of civil or construction works such as the canal reshaping, rehabilitation of intake structures, maintenance of watercourses, and pipe crossings will be monitored in trimester progress basis. Monitoring mechanism can be enhanced by field verification by DOI, IDD and IWRMP. Progress of institutional development, legalization of WUAs, formation of women groups in the community, and management of system which are responsibility of the WUA should be closely monitored by the IDD and DOI.

The mitigation measures will be assessed and monitored jointly by DOI, RID, IDD and WUA and on regular and timely basis. Furthermore, the monitoring of ESI works, such as canal, intake and other structures, and monitoring of various training activities will be the responsibility of DOI, and IDD. Meanwhile, monitoring of canal alignment (such as canal banks, trees in canal, damage to canal banks, watercourse cleaning etc.) will be the responsibility of the WUA.

5.3 Auditing the SEMP

Periodical auditing and follow-up on the project activities are required to ensure that the SEMP is implemented and that its objectives are achieved. The implementing staff, the community, and the contractor should ensure that the mitigation measures are put in place as outlined in the EMP. Annual or periodical audit will be performed to ensure the systems are operating effectively. The audit is done to ensure that

- The ESMP being used is up to date
- Variations to the ESMP and non-compliance and corrective actions are documented
- The appropriate environmental training for personnel is undertaken

-
- Emergency procedures are in place and effectively communicated to the personnel
 - A register of major accidents is in place and other documentation related to the ESMP
 - The appropriate corrective and preventive action is taken by the contractor once instructions have been issued

CHAPTER VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study has been conducted to equip Ministry of Irrigation, Department of Irrigation, Eastern Regional Irrigation Directorate with relevant and sufficient information about the Sunsari-Morang Irrigation project. It is hoped that DOI would use this information to prepare mitigation plan and strategic planning to mitigate possible socio-environmental issues that may come during planned ESI activities and handover of irrigation sub-section to user groups. It is anticipated that the proposed canal improvement and change in management would bring substantial economic benefits to local economy as a result of increased economic activities and agricultural output because of better irrigation facility. No adverse impact were found on social and environmental issues due to ESI improvement works.

One of the main physical constraints identified by the SEMP team is low level of water flow on the canal in winter and spring. In this low flow conditions with the present control strategy and infrastructure, it is very difficult to supply irrigation water equitably to different areas of the project. No wonder, tail-enders have always suffered from water shortages, with majority of farmers receiving no or very less water from the canal branch. This problem is further compounded by lack of coordination between farmers and project management. Plantation of rain-fed crops adjacent to the canals starting while spring paddy at the end of watercourses and planting of trees along the left bank of certain canals were observed in project area. This practice has resulted in damage of lining along the canals due to bank seepage. Some of the existing environmental issues identified are; problem related to water logging, sedimentation, seepage losses and draining hazards.

6.2 Recommendations

It is important that during the implementation, relevant line ministries should be actively involved to address issues such as Health (water borne diseases), water resource use, labor, physical infrastructure, agriculture and security. This will ensure that potential issues are identified before they appear or tackled as they appear. Some of negative environmental effect can cause some severe health issues. Therefore, there is need for creation of awareness to the public on prevention and control of the diseases and expansion and equipping of existing health facilities to better cope with any outbreaks. If the project implementation is managed well then there will be no need for additional health facilities. However, any investment in healthcare will be positively taken by community.

Proper drainage development works should be carried out to minimize water logging and to reduce the retrogression of the rivers/rivulets and developed drains located in the canal. The slope of designed side of all canals must be properly maintained. The encroachment of the canal land must be stopped. The farmers must be persuaded to construct field channels to irrigate their lands as this will improve the efficiency of water delivery. Conjunctive use of surface and groundwater at the tail ends is recommended by developing shallow tube wells.

The mitigation measures provided under the SEMP need to be followed so as to address the environmental issues that may arise in the course of the implementation, so as to ensure there is safety both to the project workers and the communities. There is need to have all the safety measures put in place so as to promote the well-being of the workers especially at the construction phase and the farmers and entire community at the operation phase. Furthermore, the firm tasked with carrying out civil works should use the local labour during construction and expansion of the canals to empower the communities financially and also build their capacity in maintenance of the channels. The user group should improve their technical, management and supervision capability to effectively manage the scheme once transfer is completed.

In summary, the potential negative impacts of the project are low and easy to mitigate, therefore they should not prevent the project from proceeding. The positive impacts and the benefits to the communities are immense and highly beneficial. It is recommended, the project proceed as planned with the mitigation measures integrated in its implementation. It is however prudent that the project be implemented in compliance with World Bank requirement as proposed at all phases of the project implementation.

ANNEXES

ANNEX 1: Location Map

ANNEX 2: Topographical Map Marked with Project Components

ANNEX 3: Attendance of Mass Meeting

ANNEX 4: Social Map sketched by Farmers and refined by SEMP team

ANNEX 5: Photographs

ANNEX 6: Minutes of Meeting

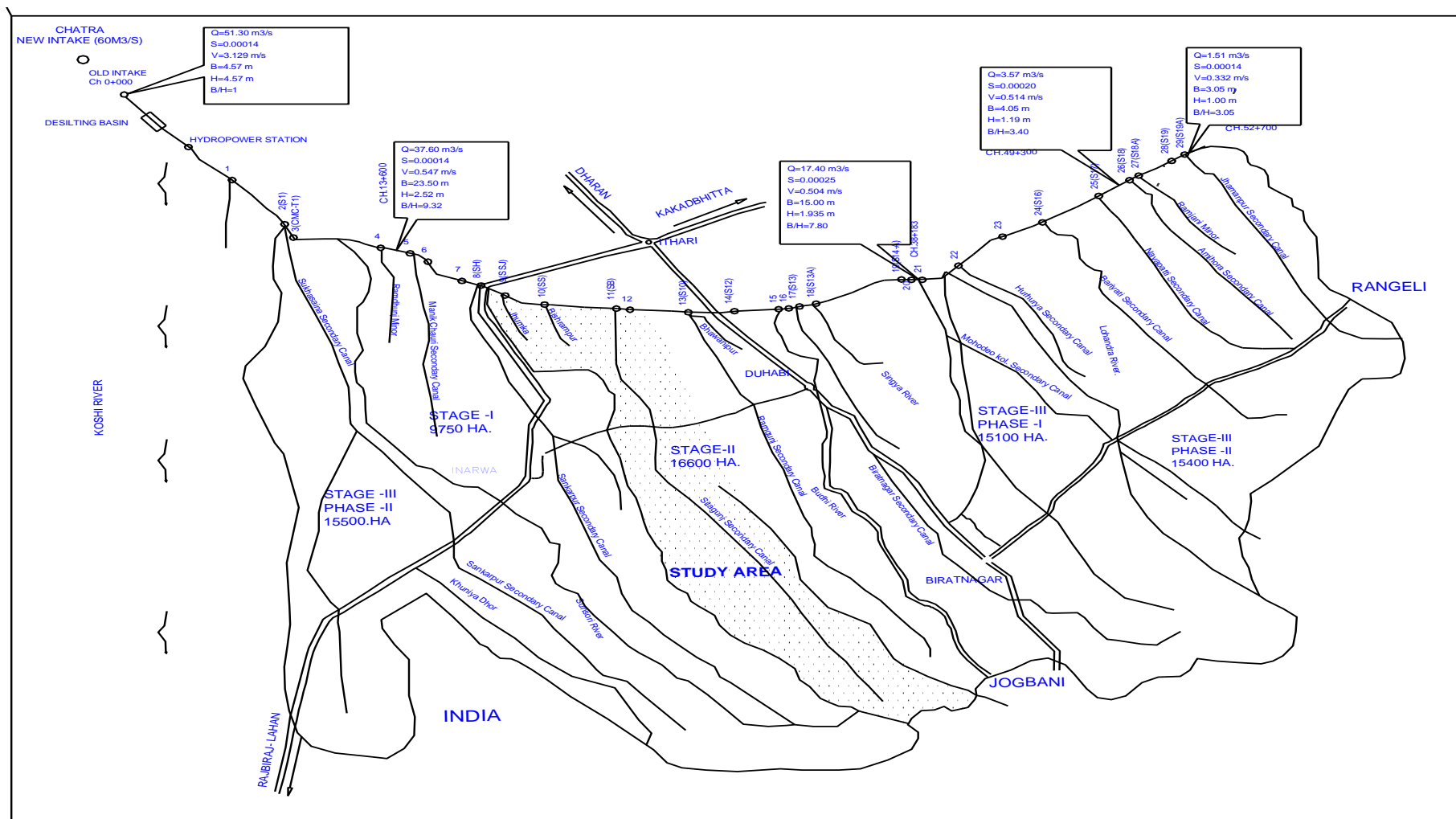
ANNEX 1: Location Map



ANNEX 2:

Layout Map Marked with Project Components

Layout map of Sunsari Morang Irrigation Project



ANNEX 3:

Attendance of Mass Meeting

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and Dalits people from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 1

S.No.	Name	Address	Remarks
1	HaranuRishidev	Bhaluwa 2	
2	Amar LalRishidev	Bhaluwa 2	
3	KritimRishidev	Bhaluwa 2	
4	HabaduRishidev	Bhaluwa 2	
5	MaharaRishidev	Bhaluwa 2	
6	PhaguRishidev	Bhaluwa 2	
7	SitaramRishidev	Bhaluwa 2	
8	AndiRishidev	Bhaluwa 2	
9	LaxmanRishidev	Bhaluwa 2	
10	DhanpatPaswan	Bhaluwa 2	
11	SanbhadraRishidev	Bhaluwa 2	
12	Deepak Paswan	Bhaluwa 2	
13	DomaPaswan	Bhaluwa 2	

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and water users from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 2

S.No.	Name	Address	Remarks
1	Dev Kumar Kha	Bhaluwa 5	
2	Trilok Chandra Biswas	Bhaluwa 5	SS10B-R6, President
3	DomaniPaswan	Bhaluwa 5	
4	Rubi Paswan	Bhaluwa 5	
5	TaradeviPaswan	Bhaluwa 5	
6	Sakuntala Devi Paswan	Bhaluwa 5	
7	KailiRishidev	Bhaluwa 5	
8	ChedaniPaswan	Bhaluwa 5	
9	Soni Devi Paswan	Bhaluwa 5	
10	Ranjana Devi Paswan	Bhaluwa 5	
11	GyanchandraMalah	Duhabi 3	
12	Hareram Chaudhary		
13	NaharLal Chaudhary		
14	ShyamlalMajhi		
15	KebaliPaswan		
16	Sanjha Devi Paswan		
17	Sanjula Devi Paswan		
18	RikiPaswan		
19	Janaki Rishidev		
20	Arja Devi Paswan	Bhaluwa 5	
21	KalawatiRishidev	Bhaluwa 5	
22	BagiyaRishidev		
23	PhulKumariRishidev		
24	Rita Rishidev		
25	ManjuPaswan		

26	AshiyaPaswan		
27	Chandu Devi Paswan		

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and water users from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 3

S.No.	Name	Address	Remarks
1	Shiv Narayan Chaudhary	Tanmunna 8	
2	Dev Narayan Paswan	Bhaluwa 5	
3	Laxman Sharma	Bhaluwa 5	
4	Rajesh Kumar Sharma	Bhaluwa 5	
5	MutharlalBairagi	Bhaluwa 5	
6	AntaramMajhi	Bhaluwa 5	
7	Koshila Chaudhary	Bhaluwa 5	
8	Surendra Chaudhary	Bhaluwa 5	
9	Sunita Chaudhary	Bhaluwa 5	
10	ShivlalBhagat	Bhaluwa 5	
11	Puranlal Chaudhary	Duhabi 3	
12	Malari Devi Chaudhary		
13	Sashi Narayan Gachhedar		SS10BT3-10, President
14	Mahesh Lal Chaudhary		
15	TiruMajhi		

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and members of the water users association agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 4

S.No.	Name	Address	Remarks
1	Tek Chandra Biswas	Bhaluwa 3	President, WUA
2	Birendra Kumar Paswan	Purbakusaha 1	Secreatry, WUA
3	Ramsebak Yadav	Aamduba 8	Member, WUA
4	Shiv Prasad Dahal	Magheli 1	Member, WUA
5	LaturamMajhi	Simariya 2	Member, WUA
6	KhadgaBahadurKattel	Sonapur 3	Member, WUA
7	Ashok Kumar Majhi	Tanmuna 6	Member, WUA
8	PrahladRaut	Belgachiya 3	Member, WUA
9	Ramkrishna Chaudhary	Purbakusaha 6	Member, WUA

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and water users from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 5

S.No.	Name	Address	Remarks
1	Tek Chandra Biswas	Bhaluwa 3	
2	Nem Narayan Chaudhary	Bhaluwa 2	
3	BircharanTabdar	Bhaluwa 2	
4	ParshuramKhaTharu	Bhaluwa 2	
5	Ramesh Kumar Chaudhary	Bhaluwa 4	
6	Jahadi Devi Kha	Bhaluwa 1	
7	Sonabati Devi Majhi	Bhaluwa 2	
8	Geeta Devi Tamang	Bhaluwa 1	
9	PabitaTabdar	Bhaluwa 2	
10	Sunita Devi Rajbanshi	Bhaluwa 1	
11	Ratani Devi Majhi	Bhaluwa 1	
12	Janaki Devi Majhi	Bhaluwa 1	
13	IshwarbatiMajhi	Bhaluwa 1	
14	ManbharanMajhi	Bhaluwa 2	

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and Dalits people from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 6

S.No.	Name	Address	Remarks
1	Jahadi Devi Kha	Bhaluwa 1	
2	Sonabati Devi Majhi	Bhaluwa 2	
3	Geeta Devi Tamang	Bhaluwa 1	
4	PabitaTabdar	Bhaluwa 2	
5	Sunita Devi Rajbanshi	Bhaluwa 1	
6	Ratani Devi Majhi	Bhaluwa 1	
7	Janaki Devi Majhi	Bhaluwa 1	
8	IshworbatiMajhi	Bhaluwa 1	
9	SugabatiMajhi	Bhaluwa 2	
10	Sakali Devi Majhi	Bhaluwa 2	
11	Saraswoti Devi Rajbanshi	Bhaluwa 2	

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and Indigenous people from the community agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

Table 7

S.No.	Name	Address	Remarks
1	Dev Narayan Kha		
2	Dev Kumar Kha		
3	AasharamRajbanshi		
4	DabbarRajbanshi		
5	JayaramRajbanshi		
6	Ramu Shah		
7	KantalalMajhi		
8	KaldharuKha		
9	RajaramMajhi		
10	GyanBahadurTamang		
11	Jog Narayan Chaudhary		

Original Minutes of Meeting is attached in Annex 6.

Attendance of Mass Meeting

Project:Sunsari-Morang Irrigation System

Location:Biratnagar

Date: 2071/03/07

The meeting held on 7th of Ashad 2071, among the SEMP team members, staffs from irrigation department and members from water users association agreed that they will participate in different stages of irrigation system construction, operation and maintenance works, maintaining the social and environmental aspects of system. The meeting was held in presence of following people:

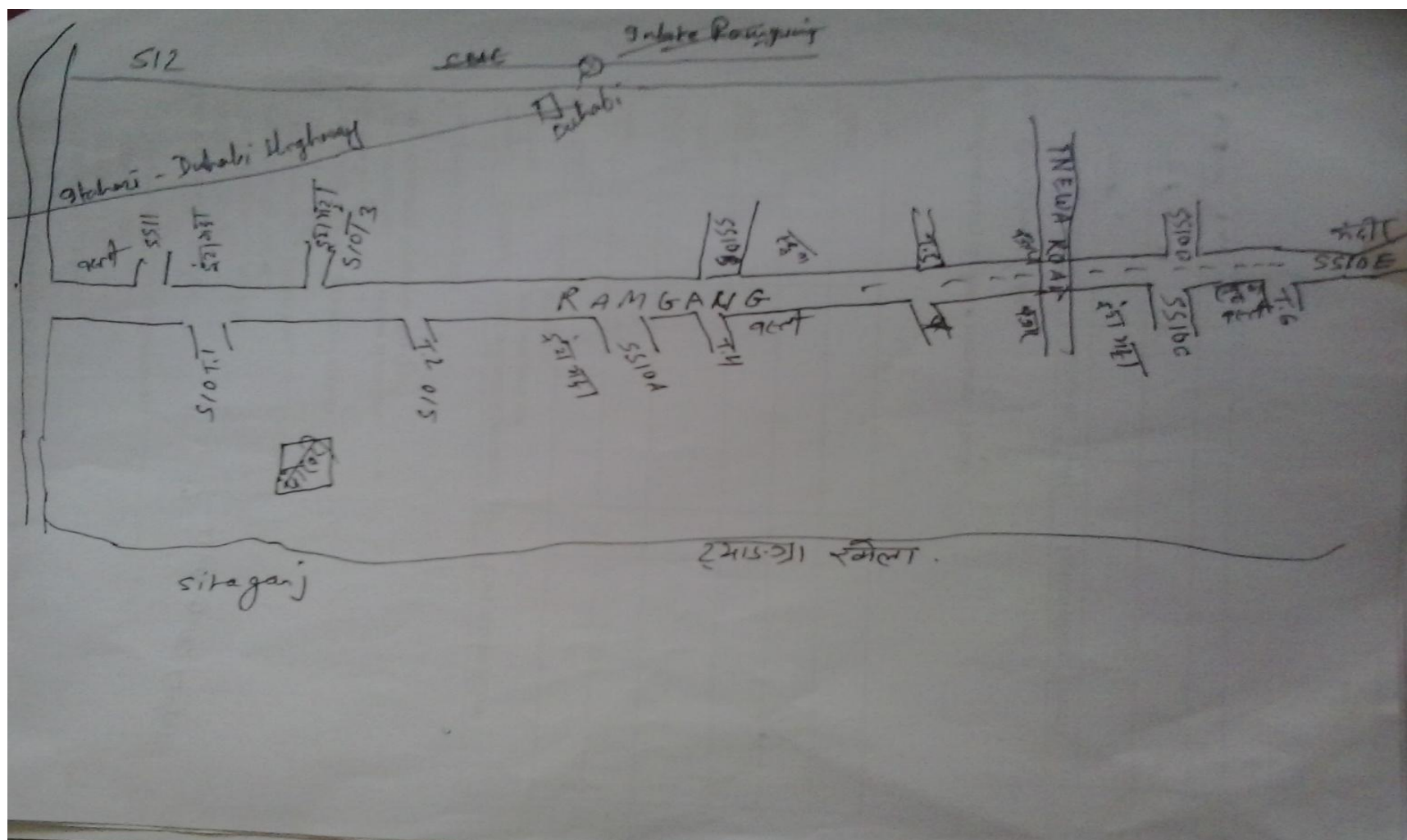
Table 8

S.No.	Name	Address	Remarks
1	TekChanda Biswas		SS10BT1-5
2	Miliram Chaudhary		SS10BT2-1
3	Tarani Prasad Thadar		SS10BT1-7
4	Shiv Prasad Dahal		S10T1-4
5	GyanuDahal		S10T1-4
6	Shivraj Chaudhary		S10T1-5
7	LaturamMajhi		S10T4-5
8	Satya Narayan Gachhadar		S10T5-1
9	KhadgaBahadurKattel		SS11T1-1
10	MegharajDahal		SS11T2-1
11	Ashok Kumar Majhi		SS10AT2-6
12	Aasharam Chaudhary		SS10AT1-5
13	RoshanLal Chaudhary		SS10AT3-3
14	Ramsebak Yadav		SS10ET2-5
15	Gauri Chaudhary		SS10ET1-0
16	Pitambar Sapkota		SS10ET1-1
17	Ram Krishna Chaudhary		S10T6-7
18	Naresh Kumar Kangoi		S10T6-6
19	Dhan Kumar Paswan		SS10DT1-3
20	Birendra Kumar Paswan		SS10DT1-2
21	PrahladRaut		SS10CT1-8
22	Kalam Ansari		SS10CT1-11

Original Minutes of Meeting is attached in Annex 6.

ANNEX 4:

Social Map sketched by Farmers and refined by SEMP team



ANNEX 5: Photographs



Photo 1: Women gathered for the mass meeting



Photo 2: Mass meeting with farmers of Ramgunj Secondary Canal



Photo 3: Mass meeting with Janajati & Dalit farmers of Ramgunj Secondary Canal

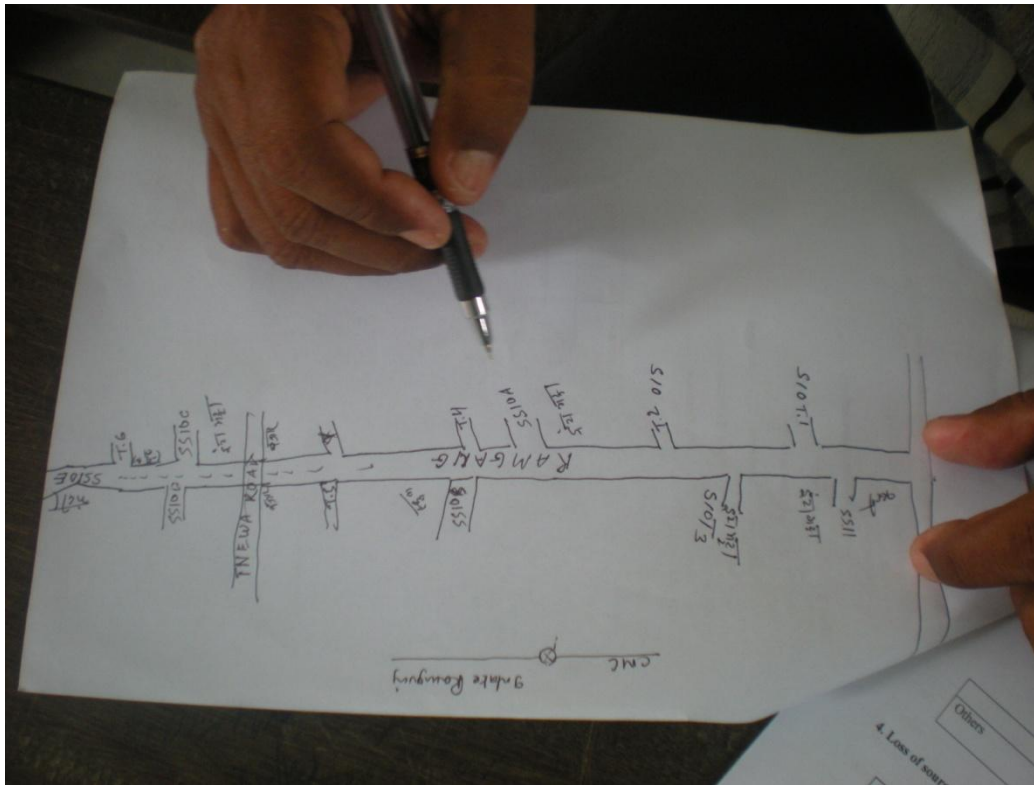


Photo 4: Villagers drawing social map of the project area



Photo 5: SEMP team preparing minute after the interaction meeting with beneficiaries



Photo 6: Waste deposited in the water canal



Photo 7: Staffs preparing the minute



Photo 8: Canal Encroachment



Photo 10: Illegal Pipe connected to canal

ANNEX 6

Minutes of Meeting