

# Initial Environmental Examination Document

Project Number: 33209-01  
June 2009

Nepal: Community -Managed Irrigated Agricultural  
Sector Project

Inгла Khola Irrigation Subproject, Ilam District

Project Proponent: Department of Irrigation  
Prepared by Eastern Irrigation Development Division No. 1 (Jhapa)

This Initial Environmental Examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

## ABBREVIATIONS

ADB	- Asian Development Bank
CMIASP -	Community-Managed Irrigated Agricultural Sector Project
CPMO	- Center Project Management Office
DADO	- District Agriculture Development Office
DB	- Design Branch
DDC	- District Development Committee
DOI	- Department of Irrigation
EB -	Environment Branch
EMP	- Environmental Monitoring Plan
FMIS -	Farmer-managed irrigation systems
ha -	Hectare
IDD	- Irrigation Development Division
IDSD	- Irrigation Development Sub-division
IEE	- Initial Environmental Examination
IPM	- Integrated Pest Management
ISPM	- Institutional Strengthening and Project Management
km -	Kilo Meter
lps	- Liter Per Second
MEQCB	- Monitoring, Evaluation, and Quality Control Branch
MoEST	- Ministry of Environment, Science and Technology
NGO	- Non Governmental Organization
O&M	- Operation and Maintenance
PDMED	- Planning, Design, Monitoring and Evaluation Division
RCC	- Reinforce Concrete Cement
Rs.	- Rupees
SISP	- Second Irrigation Sector Project
SWD	- Surface Water Division
VDC	- Village Development Committee
VRB	- Village Road Bridge
WECS	- Water Energy Commission Secretariat
WUA	- Water User's Association
Zol	- Zone of Influence

## WEIGHTS AND MEASURES

ha -	hectare
km -	kilometer
l -	liter
m -	meter
mo -	month
s -	second
t -	ton
yr -	year

## CURRENCY EQUIVALENTS

(as of 31 March 2009)

Currency Unit - Nepalese Rupee (NR)

NR 1.00	=	\$0.01226
\$1.00 =		NRs 81.54

## NOTE

In this report, "\$" refers to US Dollars.

## **GLOSSARY**

Terai	The southernmost strip of land in Nepal, bordered to the north by Himalayan foothills and to the south by the Ganges River. The area was originally covered with tropical vegetation, but has been almost completely converted to agricultural production. The Terai is now the breadbasket of Nepal and is covered with farms.
Command Area	It is the agriculture or cultivable area which receives assured irrigation through canals, waters, courses, and field channels up to farmers field.

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## I. INTRODUCTION

1. The Community-Managed Irrigated Agricultural Sector Project is designed to improve the agricultural productivity and sustainability of farmer-managed irrigation systems (FMISs) while strengthening the policies, investment plans, and institutions for irrigated agriculture, following the lessons learned during the Loan 1437-NEP: Second Irrigation Sector Project (SISP). The Project is located in the Eastern and Central regions of Nepal and comprises two parts: (i) participatory irrigated agriculture development for FMIS; and (ii) institutional strengthening and project management (ISPM). Under the first part, 210 FMIS will be rehabilitated, resulting in improvements in irrigated agriculture over 34,000 hectares (ha) benefiting about 270,000 people. The second component comprises the development and implementation of improved institutional mechanisms for FMIS development, further improved policies and regulations, strengthening of the key stakeholders agencies and their linkages.

2. An initial environmental examination (IEE) was undertaken for the core subprojects based on data collected during the Detailed Design Period. The overall objective of the IEE is to analyze the adverse environmental impacts arising from site selection, design, construction, and operation of the Project if such effect occurs and its mitigation to acceptable levels through implementation of a set of clearly defined and costed mitigation measures which have been included in the Project cost estimates. For each additional subproject, an IEE, and an environmental impact assessment (EIA) if warranted, will be carried out in accordance with the Bank's guidelines and relevant government's environmental requirements during the preparation of subproject feasibility studies.

3. This Initial Environmental Examination (IEE) Report for the Ingla Khola Irrigation Subproject has been prepared to meet the Asian Development Bank's (ADB) requirements for environmental assessment process and documentation prior to Subproject approval, following the procedures in ADB's Environmental Assessment Guidelines (2003), and the Project's Environmental Assessment and Review Procedures and Arrangements.

## II. DESCRIPTION OF THE SUBPROJECT

4. **Project Location.** The proposed sub-project is located at Ward No 4 of Jamuna VDC, north east of Ilam Bazaar. This subproject area lies within Ingla Khola Basin. Geographically it is located at 27<sup>0</sup>00'50"N latitude and 87<sup>0</sup>58'15"E longitude. The location map is shown in Figure 1.

5. **Accessibility.** The subproject area is accessible from Ilam. There is a seasonal road leading to the project area and takes about 3 hours drive. During the rainy season, one has to take a drive up to Bilate where from s/he has to walk for about 4 hours to reach the project site. Part of the project area lies within Jamuna Bazaar, an important marketing centre of the area. Ilam can be reached through metalled road from Bhirtamode, a town on East-West Highway and take about 3.5 hours' drive. The drive from Kathmandu to Bhirtamode takes about 14 hours. Alternatively, one can take 45 minutes flight from Kathmandu to Bhadrapur and take a drive of 20 minutes to Bhirtamode.

6. **Existing Situation.** Ingla Khola Irrigation canal is an old FMIS constructed over 3 decades before with the farmers own initiative mobilizing farmers of Jamuna VDC ward # 4 for construction. Farmers have dug 2.6 km canal of about 50 lps carrying capacity. They have laid canal at gentle slope to Ch 1+200 m. It is irrigating almost 90 ha land for growing paddy, wheat, maize, potato, cardamom, tea, ginger and others. Farmers' agriculture practice is still traditional producing low yield. Lack of all weather road has also created problems to carry fertilizers and inputs. Also the quality of agriculture extension needs improvement.

7. At present canal is wide and shallow at most spots. At some parts slide had deposited soil on the canal. There are several streams crossing with simple dry wall serving as level crossing with no super passage structure. They cut canal to serve as outlet and there no gated outlet systems. Thus they have to repair time and again in rainy season after rain. Also there is high seepages stretch in the canal and canal need strengthening at some spots.

### 8. **Project Components.**

9. (i) Diversion works/Head works. A double orifice side intake has been proposed at 25 m upstream of existing diversion point in order to place it at safe location permitting to raise canal level slightly so as to dig canal safely little above existing canal. 160 lps design discharge can pass through the gap between two boulders lying on the river bed and so an intake with head wall with 0.36\*0.36 m opening has been proposed.

10. (ii) Conveyance facilities and structures. The main canal has been designed for capacity of 150 lps. The existing canal is a contour canal and its alignment passes through steep side sloped terrain. The earthen canals are in order and needs bank strengthening only. Lined canal sections are proposed in a few stretches to avoid undue losses of water in loose soil, and to avoid scouring of canals.

11. (iii) Super-passage cum Escape. In order to cross streams, simple super passages cum escapes are proposed. These are simple covered canal structures made with RCC wall

topped by 100 mm thick RCC slab cover. Gabion boxes have been provided for upstream and downstream protection. Escapes have been provided in each super-passage to let surplus water drain into stream. Typical super passage detail is given in Drawing no. 7 in the main report. There are altogether 11 number of super passages at different streams.

12. (iv) Branch Off-Takes. Two branch-off takes are proposed to distribute water to branch canal: One at ch 1+160 to deliver water to new canal and another branch off take in old canal at ch . 1+643. There are 2 head regulators having stop-log groove with wooden flashboard.

13. (v) Outlets. 15 Simple pipe outlets have been provided for supplying water directly to command area as well as to deliver water directly to field plots. In general, maximum discharge capacity of 10 lps for each pipe outlet has been adopted.

14. (vi) Road Crossing. Canal crosses 3 roads at 3 places. So to cross road, pipe culverts have been proposed. And to permit crossing canal for foot tracks, two 1 m wide foot bridges are provided.

15. (vii) River Training Works. The proposed intake is located at safe site of the river with minimum cross-section and hard rock on one side. It is stable and so only gabion crate protection works have been proposed along the right bank to safeguard flood spilling beyond . Canal section and protection detail is given in Drawing no. 9 in the main report..

16. (viii) Drainage and Flood control Systems. The land is sloppy and soil is light textured residual soil with high internal drainage. And there are numerous natural drains (streams) in the command area. These natural streams drain runoff and there is no drainage problem. And flooding will not occur in the field either. So no drain has been designed.

17. (ix) On-Farm Facilities. As the land is steep sloppy terrain, bench terrace is narrow and soil is pervious, the area is not suited for surface irrigation. Farmers do not make field channels. Field to field irrigation is practiced delivering small flow causing excessive wastage of water in water application. So pipe delivery is proposed and hence 10 m long HDP pipes are proposed for delivering water to fields. It is hoped that farmers will realize water losses in distribution and will use lay-flat tubes for field distribution. And sprinkler irrigation is recommended to be adopted in field application.

18. It will be appropriate for most crops in the terrain, more effectively for cardamom field plot. It will necessitate less water than presently being used and will let farmers be able to apply more frequently. To promote sprinkler irrigation 13 sets of gravity operated sprinkler irrigation system is proposed to be provided making farmers share part of the cost as well. Sprinkler system is given in Drawing no. 10 in the main report.

19. The salient features of the subproject is presented in Table 1.

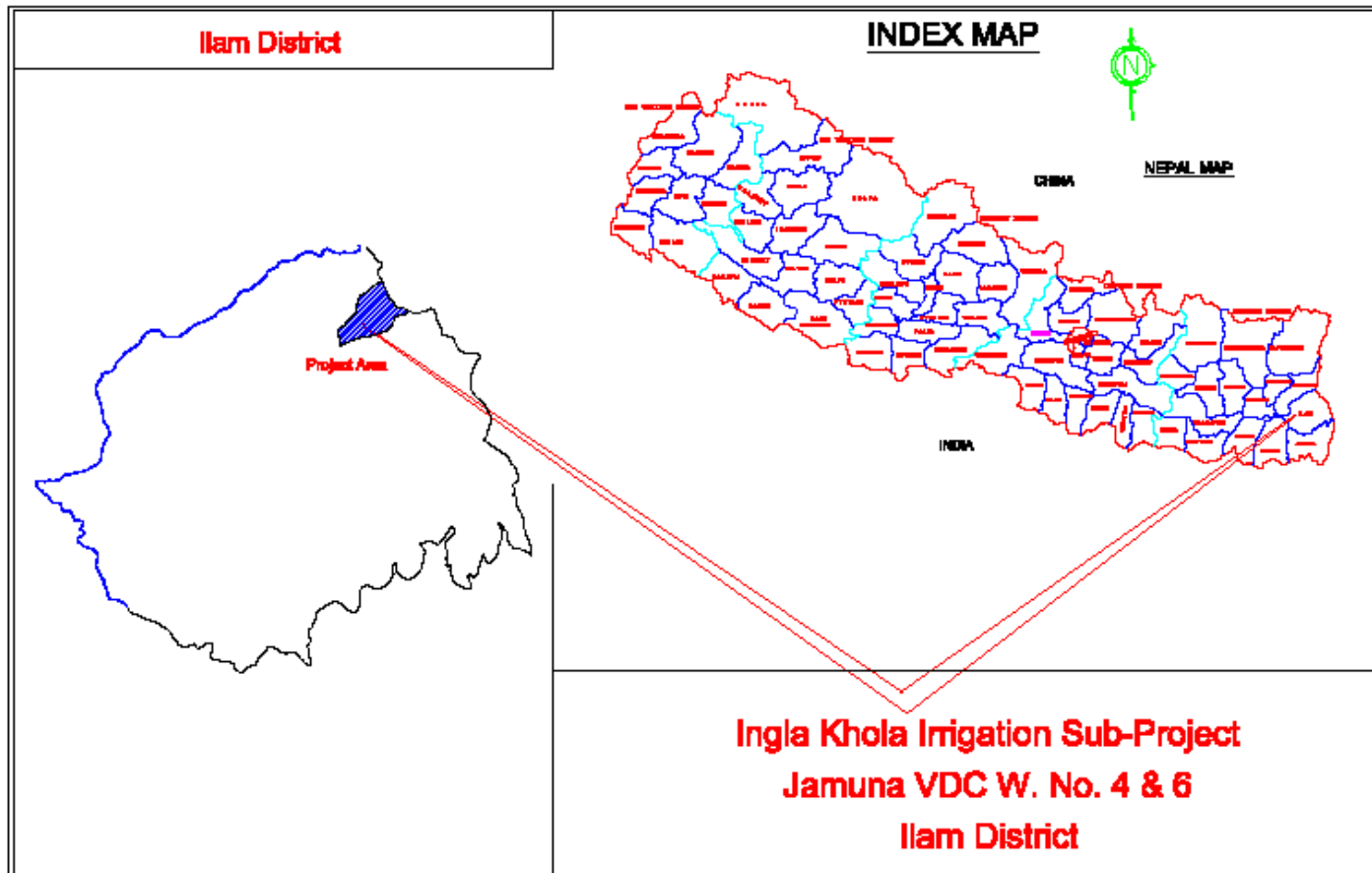


Figure 1: Location Map of the Subproject

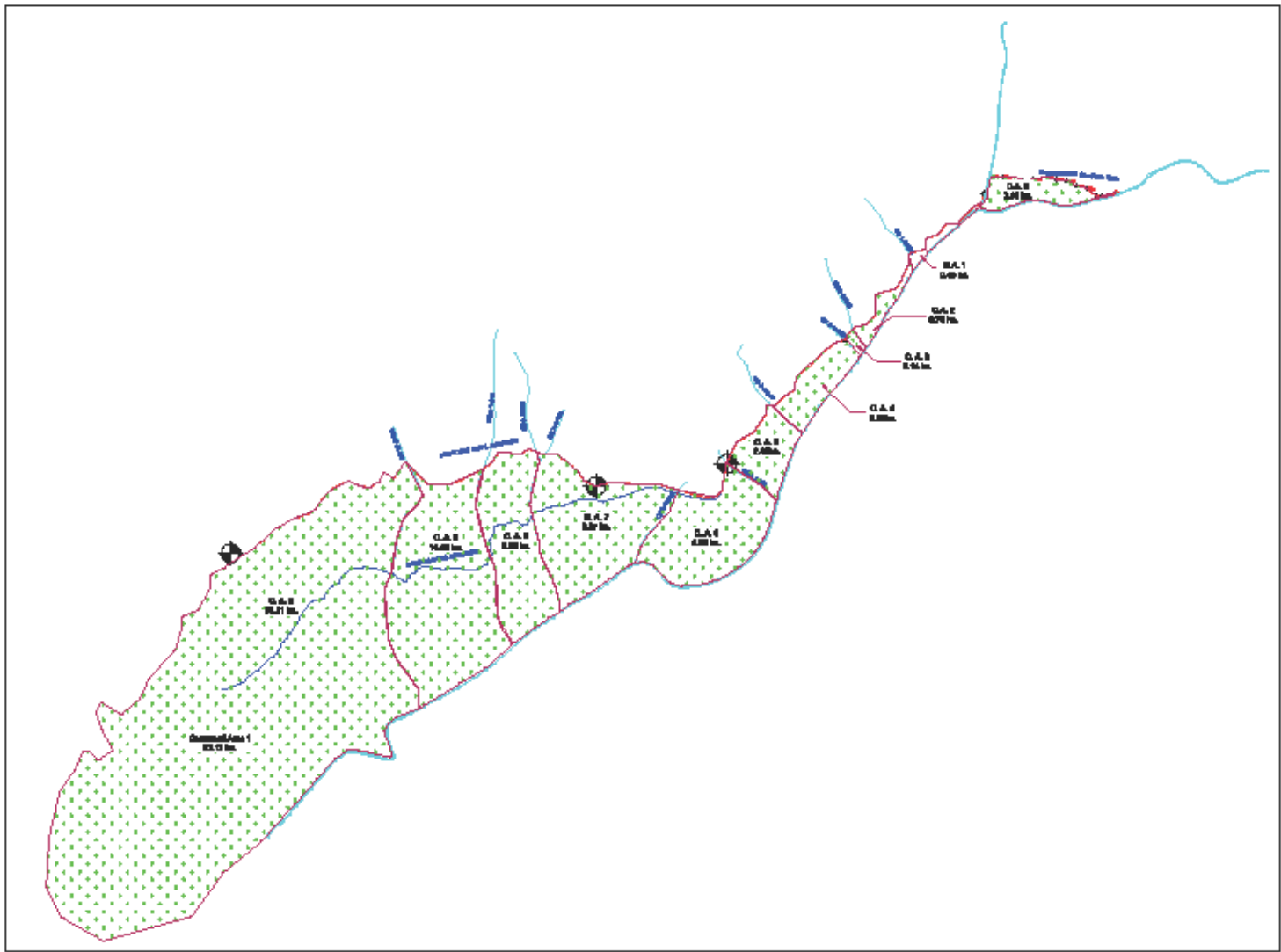


Figure 2: A Layout Map of the Sub project



**Table 1: Salient Features of the Ingla Khola Irrigation Subproject**

1. Name of Subproject	Ingla Khola Irrigation Subproject
2. Subproject Classification	Rehabilitation
3. Location (VDC and Ward No)	Jamuna, Ward No: 4 and 6
4. District	Ilam
5. District Headquarter	Ilam
6. Zone	Mechi
7. Development Region	Eastern
8. Number of Households	200
9. General Elevation of the Subproject Area	1600 msl
10. Slope and Topography of the Subproject Area	undulating to rolling (8 to 18% slope)
11. Population	1,100
12. Total Canal Length	
a) Main Canal	2.6 km
b) Branch Canal	1.4 km
13. Gross Command Area	125 ha
14. Net Command Area	110 ha
15. Name Of Water Source	Ingla Khola
16. Type Of Water Source	Perennial
17. Catchment Area	8.51 km <sup>2</sup>
18. Canal Type	Earthen & Lined canal
19. Canal Discharge	160 liter per second
20. Bed Slope	Shown in the L-Section in Detailed Design
21. Diversion Structure	Dry Stone Wall across Stream
22. Proposed Subproject Interventions	
Headwork/Diversion Structure	Side Intake 1
Escape 1	no.
Slab Culvert	3 nos.
Super passage	11 nos.
Outlet	15 nos.
Foot Bridge	7 nos.
Division Box	1 no.
23. Number of people directly involved during construction (estimate)	Skilled: 814 man days Unskilled: 3,658 man days
24. Construction/Rehabilitation Period (months)	19 months

Notes: VDC = Village Development Committee ; msl = meters above sea level; km = kilometers; ha = hectares; km<sup>2</sup>= square kilometers; RCC = reinforced concrete cement; VRB = Village Road Bridge

### III. DESCRIPTION OF THE ENVIRONMENT

#### Physical Environment

20. **Topography.** The project area lies in the lower belt of Mahabharat Mountain Range of Nepal at elevation of about 1,600 m above mean sea level. The proposed command area is on terraced land on the right bank of the Ingla Khola. Most of the land faces southward sloped less than 30%.

21. **Climate.** Since the sub-project lies in lower Mahabharat region, the area is steep with sharp rise in elevation towards the north. The sub-project area has temperate climate with moderately hot summers and cold winters. The hottest month is August with average monthly temperature 20.6°C. The coldest month is January with average monthly temperature 10.5°C. As in other parts of Nepal, the sub-project area experiences the southeast monsoon, which on average lasts from June to the end of the September.

22. The average annual rainfall of the project area is 2,061 mm. The average monthly relative humidity varies from 58% in March to 92% in August and September. The average monthly sunshine hours are lowest in September with 4.1 hours and highest in March with 8.6 hours.

23. **Soils.** Most of the command area falls under 'Level Terrace Land' category of land capability (LRMP). Moreover, it falls under class III of land capability (LRMP) with sufficient soil depth, which is suitable for irrigation development. Lands in this class are moderately to strongly sloping (slopes of 5-30%). Top soils are 50 to 100 cm deep and well drained. Terracing is mandatory to control erosion when this type of land is used for arable agriculture.

24. **Water Resources.** The Basin Study of Mai Khola basin has assessed the water resources on the total basin including Ingla Khola sub-basin. The entire Mai Khola basin has been divided into 14 blocks primarily on the basis of catchment area division. Ingla Khola sub-basin is delineated as Block No 10 of the basin.

25. The proposed source of water for this sub-project is the Ingla Khola and adjoining Paha Khola. No gauging station has been established in these rivers to measure the discharge. During the field trip of May 2007, the discharge in the Ingla Khola was measured using the float and flume methods, and the discharge was noted from 200 to 165 lps respectively.

#### Ecological Resources

26. **Vegetation and Forest.** Most of the study area is covered by the sub-tropical type of forest. Most prominent is the large clumps of bamboo (*dendrocalamus strictus sp.*). A large number of multi-purpose trees are grown around the homesteads, including fodder and fruit trees. Intact natural forest occurs on the ridge top above the command area and on steep slopes below it, affording protection against erosion in these vulnerable locations.

27. Forest resources within the command area consist mainly of clusters of multi-purpose trees, and are dominated by *Schima wallichiana* and *Castanopsis indica*. Other dominating forest species are *Alnus nepalensis*, *Pinus roxburghii* and *Acacia catechu*. Although less abundant, other species grow in open areas and farmlands. The associated species are *Pinus wallichiana*, *Albizia* spp., *Embelicus officinalis*, *Sauravia nepalensis*, *Rhododendron arborium*, *Juglans regia*, *Bauhinia vallii*, *Ficus lacor*, *Ficus nemoralis*, *Myrica esculenta* and *Anthocephalus cadamba*.

28. Within the command area itself there are no community forests, religious forests or leasehold forests or Government owned forests. Forest product needs (primarily fuelwood, animal fodder, animal bedding, poles and timber) are substantially met from privately owned trees.

29. **Wildlife.**

30. (i) Mammals. Mammals of this area are characteristic of the sub-tropical region. Leopard (*Panthera pardus*), Wild Boar (*Sus scrofa*), Jackal (*Canis lepus*), Barasingha (Muntiacus muntjack), Rhesus monkey (*Macaca mulata*) and Langur monkey (*Presbytis entellus*) are some large mammals found in the area. Small mammals like Squirrel (*Dremomys lokriah*), Common Marten (*Martes fonia*), Indian Pangolin (*Manis crassicaudata*), Indian Hare (*Lepus nigricollis*), Common Mongoose (*Herpestes edwardsi*) and Jungle Cat (*Felis chaus*) also inhabit the area.

31. (ii) Birds. The study area also supports avian fauna characteristic of the sub-tropical region. The majority of the forest birds are Hen Harrier (*Circus cyaneus*), Steppe Eagle (*Aquila nepalensis*), Spotted Owlet (*Athene brama*), Kalij Pheasant (*Lophura leucomelan*) and Blue Throated Barbet (*Megalaima asiatica*).

32. (iii) Reptiles. The common reptiles reported in this area are the Garden Lizard (*Calotes versicolor*), Common Monitor Lizard (*Varanus bengalensis*) and Yellow Monitor Lizard (*Varanus flavescens*). Snakes found in the area include the Mountain Pit Viper (*Tremmeresrus albolabris*), Indian Rat Snake (*Ptyas moco*), and Striped Water Snake (*Natrix stolata*).

## **Socio-economic Environment**

33. **Population, Communities and Occupation.** The total population of the project area is about 1,800. The female population was found to be slightly higher than that of male. The average family size is 7.6 people per family, which is higher than the district average (5.18). In terms of composition of ethnic communities, the project site is a mixed community. The Limbu caste HH alone accounts for 65.7% followed by Bahun/Chhetri (17.4%). Similarly the other castes are Gurung (4.3%), Tamang and remaining 11.5% HH includes Rai, Khas, Magar, Darji and Shrestha (MWH in Association with CMS, 2003).

34. Agriculture is the main occupation in the sub-project area. About 62 percent of the population is engaged in different occupations for their livelihood. Wage laborers (4%), cottage

industry (3%) and service (11%) are other occupations to support their families (MWH in Association with CMS, 2003).

35. **Quality of Life Values.** The proposed sub-project is not expected to adversely affect any cultural or recreational resources but will increase the existing quality of life values due to the improvement in personal, household and community hygiene practices and community health. Following factors are indicative of the quality of life values in the study area.

36. **(i) Basic Amenities.** Basic services such as power, drinking water supply and roads are limited. There is a seasonal earthen road passing through Jamuna bazaar and leading up to Ingra. This results in severe hardship, particularly when emergency access services are needed. A peltric set supplies an intermittent power supply to limited houses in the village.

37. **(ii) Health and Sanitation.** Access to health and education is relatively poor. The common diseases in the area were reported to be gastroenteritis and diarrhea. The main cause may be due to poor hygiene and water quality. Despite the access to toilets in almost every house, open defecation in the field and open spaces could also be a contributing factor. Cases of jaundice and typhoid were found to be reported every year. There is 1 Ayurvedic centre and a health-post in the village.

38. **(iii) Cultural Heritage.** Despite the different ethnic communities, there is a high degree of cultural integrity in the study area. Residents of the area are predominantly Hindu and worship at small temples around the villages.

### 39. **Economic Characteristics**

40. **(i) Agricultural Development.** Agriculture is the main source of employment in the sub-project area. Over 76 percent of population of the irrigated area are engaged in agriculture as the main occupation for survival. Agriculture is the main source of employment and implementation of the proposed irrigation project may further generate employment opportunity to the people of these areas.

41. **(ii) Land Use.** Currently, the total area cultivated by the households in the irrigated area is 90 ha and extendable area is reported to be 20 ha which, at present has no irrigation. Paddy is the pre-predominant crop in the monsoon in the sub-project area. Summer maize, finger millet and ginger are also grown in the sub-project area in summer season. Wheat is the main winter season crop and others are potato, oil crops, vegetables and pulses. Spring maize and spring vegetables are spring season crops.

#### IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS

42. **Delineation of geographical boundary of zone of influence (Zoi).** : The project area will be delineated under three categories (i) high impact area: the permanent impact from the project such as permanent land loss and dewatered zone will be considered as high impact area. Such area will include the area where the project infrastructures will be located such as headworks, canal alignment and canal structures (ii) Moderate impact area: This will cover the area where land loss will be temporary during the construction period only. They will include camp sites, quarry sites; borrow areas, labour camp sites etc. (iii) low impact area: This will cover the adjoining areas within 200 to 500m (depending upon the settlement pattern) from the boundary of the sub project area of the VDC that are likely to be affected.

43. Due to its hilly terrain, the construction of simple side intake does not warrant any inundation in the area. Similarly, the combination of the two streams; Ingla khola and Paha khola does not create any water right problems in the downstream of the streams. The screening of the potential impacts is presented in Table 2.

**Table 2: Screening of Potential Impacts**

SL	Parameters	Impact		Remarks
		Yes	No	
<b>1</b>	<b>Environmental Problems due to Project Location</b>			
1.1	Encroachment into Areas of Conservation Significance		√	The subproject does not fall within any ecologically sensitive areas such as national parks, wildlife sanctuaries or wetlands.
1.2	Impediments to Movements of Wildlife, Livestock and People		√	Being an existing system there won't be any additional impediments.
1.3	Encroachment on Historical and Cultural Sites		√	The area has no significant historical, archaeological, cultural and religious landmarks. However, there is a small patch of burial ground downstream of the proposed intake site.
1.4	Water Resource Conflicts		√	The Subproject irrigation system being in operation for many years, system for water use has been established and no records are available showing any evidence of misunderstanding or conflicts among users.
1.5	Flooding and Drainage Hazards		√	The subproject intervention will not have flooding and drainage hazard as the command area is in steep terrain.
1.6	Displacement of People and Property		√	No land acquisition is needed for the subproject.
<b>2</b>	<b>Environmental Problems related to Project Design</b>			
2.1	Watershed Erosion	√		Due to steep hillsides, some parts of the canal is prone to soil erosion.
2.2	Downstream Water Quality Problems		√	The Subproject is a rehabilitation project therefore no other water sources (e.g. groundwater) will be utilized. Therefore quality of water supply will not change.
2.3	Suitability of Natural Water for Irrigation		√	The water sources have been used prior to rehabilitation works. There will be no changes in water use during the Subproject implementation.
2.4	Over pumping of Groundwater		√	Groundwater will not be used in this Subproject.
2.5	Adequacy of Drainage Planning		√	Command area is on the hill slope. Drainage planning would not be necessary.

SL	Parameters	Impact		Remarks
		Yes	No	
2.6	Disruption of Existing Farmer Cooperative Systems		√	There are no existing farmer's cooperatives within the command area.
2.7	Use of Chemicals in Agriculture and Horticulture	√		Use of chemical fertilizers and pesticides is likely to be increased due to the improved irrigated agriculture practice
2.8	Selection of Pesticides	√		Selection and use of pesticides may be a problem
2.9	Land Use Conflicts		√	The land use within the command area has been established prior to the implementation of the Subproject. No records are available showing misunderstanding or conflicts among different land uses.
2.10	Inadequacies in Water Distribution		√	Though command area is proposed to be extended, water balance study has not shown water shortage.
2.11	Canal Management	√		The operation and maintenance (O&M) of the existing irrigation system has been in place prior to implementation of the Subproject. The (O&M) of the main canal has to be worked out.
2.12	Passageways	√		The existing passageways are not sufficient for movement of people and livestock. The Subproject will construct necessary number of crossings and passageways.
2.13	Scouring Hazards	√		Some of the canals are subjected to seasonal scouring when water flows are high. The strengthening of the canal walls and canal lining has been proposed at different sections. Identification of critical stretches needing bio-engineering works should be identified.
<b>3</b>	<b>Environmental Problems Related to Construction Stage</b>			
3.1	• Excavation	√		Only excavation at structure sites. Being an existing canal no new excavation.
3.2	• Construction material sites (Quarry Sites)		√	The construction work will require 270 m <sup>3</sup> sand 156 m <sup>3</sup> of aggregates and 494 m <sup>3</sup> block stone which can be fulfilled from the local market or local quarry. Operation of quarry site for the subproject may not be feasible.
3.3	• Work camp location and operation	√		The contractor will have to establish work camp for the construction activities
3.4	• Labour camp		√	Total labour requirement will be about 3,658 unskilled and 814 skilled. Assuming actual construction working season of 17 months, the average labour requirement per day would be 10 unskilled and 2 skilled. The most of the unskilled and some of skilled manpower will be fulfilled from the local area. Hence labour camp will not be operated. Some of the outside labour will reside within the work camp itself.
3.5	• Stockpiling of materials	√		The construction material will be stored at the convenient locations for the construction activities.
3.6	• Operation of construction equipment and transport	√		No heavy construction equipments are needed and only small de watering pumps, mixers, vibrators etc will be used which do not contribute major air pollution. Tractors

SL	Parameters	Impact		Remarks
		Yes	No	
				and trucks would be used for material transportation.
3.7	• Occupational health and safety	√		Occupational health and safety of the workers will be addressed.
3.8	Temporary Closure of Irrigation System	√		Construction activities are likely to disturb the supply of irrigation water.
<b>4</b>	<b>Environmental Problems Resulting from Project Operations</b>			
4.1	Effect on downstream water use		√	There is still plenty of water for the downstream users after proposed intervention. Hence effect on downstream users has not been foreseen.
4.2	Adverse soil modifications		√	The proposed subproject is the rehabilitation of the existing irrigation system, adverse soil modification will not occur due to the proposed subproject implementation.
4.3	Changes in groundwater hydrology		√	The subproject command area being in hilly terrain groundwater recharge will be minimal.
4.4	Mosquito Breeding		√	The command area being in hill, mosquito breeding is not a concern.
4.5	Hazards associated with the use of toxic chemicals	√		Use of pesticides for the pest control could be hazardous to the people and live stock
4.6	Hazards associated with the use of mineral fertilizer	√		Increased use of fertilizers likely due to improved irrigation system, These may find its ways to ground water and surface water which could hazardous
<b>5</b>	<b>Realization of Enhancement Potentials</b>			
5.1	Employment to the local people	√		Construction activities will require construction labors. Local people will get opportunity in employment. In addition farmers have to share the construction cost which will be mostly usually in terms of labor force.
5.2	Community water supply in command area		√	The farmers in the command area use stream water. Canal waters are not used for domestic purpose and will not be used as such after Subproject implementation.
5.3	Aquaculture in command area		√	Farmers are not practicing aquaculture within the command area. It is unlikely that this will change during Subproject implementation.
5.4	Livelihood programs for landless households	√		Construction activities will require both skill and unskilled laborers. The Subproject will also provide livelihood trainings to enhance economic conditions of landless households.
5.5	Feasibility of cooperatives	√		The Project will implement institutional development activities to strengthen capacity of water users associations which could function as a cooperative to support the farmers.

44. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. The two activities in which the Subproject interacts physically with the environment are during construction and operation, so these are the two activities which most significant environmental impacts can occur. The Subproject will not cause any

significant adverse environmental impacts because: (i) most of the individual elements of the Subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation; and (iii) mitigation measures are devised for any negative environmental impacts.

45. These potential environmental impacts may be direct or indirect, and reversible or irreversible. The magnitude of the impacts may be high, medium or low and such impacts may be of site-specific, local, regional or of national nature. Furthermore, some impacts may be short-term, particularly related with the upgrading stage, medium-term and long-term duration.



## V. POTENTIAL ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

### Environmental Problem Related to Subproject Design

46. **Watershed Erosion:** There are several old and recent landslides upstream of the proposed intake. Intake protection measures should include the mechanism of debris removal at any time without disrupting the system. As the intake is located on the river section where the cross-section is minimum and the sides are stable, no river training works is required so far. However, some protection works are provided to protect the weir and parent canal at the head works. The intake site should be well protected. Structures associated with bio-engineering techniques should be employed.

47. Due to steep hill sides, some part of the canal is prone to soil erosion. The main canal traverses land with fairly steep slope. The down-slope of the canal needs to be carefully maintained to avoid any landslides and/or slides triggered by the seepage from the canal. Appropriate bio-engineering and suitable trees should be planted around the site to curtail any potential soil erosion. This is a positive impact of high magnitude, local in extent and long term duration.

48. **Use of Chemicals in Agriculture and Horticulture:** The use of chemical fertilizers is likely to increase as the subproject encourages irrigated agricultural practices. Excess use of chemical fertilizers in the field may percolate into the groundwater or run down into surface water along with the runoff. But the excess use of fertilizers would be very rare in practice. Considering the rareness of the occurrence, this impact has been considered of low magnitude, local extent and long term duration.

49. *The agricultural development plan has recommended the optimum dose of required chemical fertilizers for each of the proposed crops.*

50. **Selection of Pesticides:** Majority of farmers of the project area are not aware of the toxicity of the pesticides. As reported, many of them have not undertaken some kind of integrated pest management (IPM) training in their district. The impact associated with the pesticides will be low magnitude, local in extent and long term in duration.

51. *Include IPM training under agriculture development program. The cost of this training will be covered from ADP.*

52. **Canal Management:** The proposed project intends to operate one main canal. The operation and maintenance of the system will be the responsibility of the farmers themselves. The canal system has its own canal management process, which has been practiced for many years. The operation and maintenance of the main canal with extension will have to be worked out, which should not be a problem as they have been practicing such works for many years. Hence this impact has been considered of low magnitude, local extent and long term duration.

53. *Water management plan will be developed for the operation of the system.*

54. **Passageway:** There are some passageways in the existing canals which is not adequate for movement of the people. Hence additional passageways, 3 Slab Culverts and 7 foot bridges have been proposed. This is a positive impact of high magnitude, local in extent and long term duration.

55. **Scouring Hazard:** Some of the canals are subjected to seasonal scouring when water flows are high. The mitigation works include substantial strengthening of the canal walls. Canal lining has been proposed at different sections. Identification of critical stretches needing bio-engineering works should be identified.

#### **Environmental Problems Related to Construction Stage:**

56. The Subproject will use labour-based, environment-friendly, and participatory approach, the important features of which are:

- Use of local people as labour, hand tools and small equipment, rather than heavy machinery for construction.
- Balancing cut and fill and reuse of excavated materials as construction materials, and thus not generating excess spoils as far as possible.
- Use of bio-engineering techniques: integrated use of vegetation, simple civil engineering structures, and proper water management systems for slope protection.

57. Significant adverse negative environmental impacts are not expected during the construction stage mainly because: (i) rehabilitation works can be constructed without causing major disruption to irrigation users; (ii) most construction will be conducted by small teams of farmers working on short lengths at a time so most impacts will be localized and short in duration; and (iii) the overall construction program will be relatively short for a project of this nature, and is expected to be completed in 19 months.

58. During the construction phase most of the potential negative environmental impacts are associated with the activities of the construction contractor(s). By including environmental management clauses in the individual contract documents, the potential for adverse impacts can be significantly reduced.

59. **Excavations.** Major excavation will be at the structures sites which may cause increase in silt run-off, induced erosion, loss of potential cropland, loss of vegetation, and landscape degradation.

60. Mitigation measures include: (i) confine operations to the dry season; (ii) use of silt traps; and (iii) spoils shall be disposed of in locations that will not promote instability and result in destruction of property, vegetation, irrigation and drinking water supply. Disposal near wetlands, protected areas, and other areas that will inconvenience or deprive local residents of their livelihood shall not be allowed. Acidic and saline spoils shall not be spread into agricultural land.

61. **Work Camp Location and Operation.** Potential environmental impacts include (i) temporary air and noise pollution from machine operation; (ii) water pollution from storage and use of fuel, oils, solvents, and lubricants; (iii) unhygienic conditions from laborers.

62. *Mitigation measures include: (i) The Contractor shall consult with WUA and or VDC before locating project offices, sheds, and construction plants; (ii) camps shall not be located near settlements or near drinking water supply intakes; (iii) no trees shall be cut and removal of vegetation shall be minimized; (iv) water and pit latrines facilities shall be provided for laborers; (v) used oil and lubricants shall be recovered and reused or removed from site by the Contractor; (vi) at conclusion of the Subproject, all wreckage, rubbish, or temporary works that are no longer required shall be removed or given to local residents; (vii) all temporary structures, including office buildings, shelters, and latrines shall be removed; (viii) sites shall be restored to near natural or stable conditions; (ix) exposed areas shall be planted with suitable vegetation; and (x) the Subproject proponent shall report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of the works.*

63. **Stockpiling of Materials (Storage of topsoil, fill material, gravel, aggregates, and other construction materials).** Potential environmental impacts include (i) siltation and pollution of surface water resulting from uncontrolled runoff from storage piles; and (ii) disturbance to private property.

64. *Mitigation measures include: (i) stockpiling shall not be permitted during the rainy season unless covered by a suitable material; (ii) stripped material shall not be stored where natural drainage will be disrupted; (iii) protection of materials from erosion prior to rainy season; and (iv) storage on private property will be allowed only if written permission is obtained from the owner or authorized lessee.*

65. **Operation of construction equipment and transport:** Potential environmental impacts include emission of air pollutants, high concentration of airborne dust resulting in deposition and possible damage to vegetation, crops, and water resources; and excessive noise resulting in annoyance and potential hazard to human populations even lead in disruption in livestock and wildlife breeding.

66. Mitigation measures include: (i) stockpiled sand and soil shall be slightly wetted before loading particularly in windy conditions; (ii) vehicles transporting sand and soil shall be covered with a tarpaulin; and (iii) limit and control working practices through contract provisions such as: (a) avoid noise-generating activities at night; (b) consult with local community to inform them of the nature, duration, and likely effects of the construction work; (c) schedule work during dry season

67. **Occupational health and safety:** In the construction sites, there will be movement of local peoples. Despite precautions, possibility of accidents could not be ruled out completely as many types of equipment will be under operation. Hence, construction activities may pose safety concern to local peoples as well as workers. Although the health and safety will be major concern during the construction stage, magnitude of the impacts has been evaluated as low since provision of health and safety measures are mandatory in any of the construction contracts and due to small scale of construction. The extent will be site specific and duration will be of short term.

68. Accidental insurance will be covered for all construction workers and staff. An amount of Rs. 12,000.00 has been allocated for the buying the accident insurance policy of the workers. This cost shall be covered from the environmental management cost. In order to minimize the unwanted accidents and possible effects of dust and gaseous emission to construction workers, the project will ensure adequate safety measures such as provision of helmets, masks, ear plugs, road signs, warning signals etc.

69. **Temporary closure of irrigation system.** The construction activity in the canal system is likely to disturb the supply of the irrigation water. Hence the provision of temporary closure of irrigation system will have to be made in consultation with WUA.

70. **Mitigation Measures:** *The construction activities will be planned in consultation with the WUA members. The headworks construction will be carried out during the dry season and the alternative measures will be made to keep the canal in running conditions if the construction activities will be carried out during the canal operation time. Flexible hosing and/or diversion canals will be used to supply water to affected users. Cost of alternative arrangement for supplying the water will be part of the civil construction cost.*

### **Environmental Problems Resulting from Subproject Operations**

71. **Hazards associated with the Use of Toxic Chemicals.** Pesticides are the toxic chemicals that would be used in the agricultural crops whenever crops are infested by the insects. From the focused group discussion with the farmers, majority of them are not aware of the toxicity of the pesticides. Use of pesticides in the project area is minimum. Farmers need some IPM (integrated pest management) training so as to train the farmers in pest management without the use of pesticides. With this background, it could be assumed that impact associated with the pesticides (toxic chemicals) will be of low magnitude, local in extent and long term in duration.

72. **Hazards associated with the Use of Mineral Fertilizer.** The farmers have been using chemical fertilizers in the crops. But the quantity of usage is less than the recommended dose for the crops. The project intends to carry out training in the crops cultivation to increase the crops yield. Hence the use of chemical fertilizers is going to be increased with the project implementation. But given the proper training programs, the application dose will be optimum for the crops and it would not create any hazard as such. Hence the impact is considered of low magnitude, local in extent and long term in duration.

### **Realization of Enhancement Potentials**

73. **Employment Opportunity to the Local People.** The construction of the subproject would require both skilled and unskilled labour. Semi skilled and unskilled labours are available in the subproject area as well as its vicinity. The subproject would provide employment opportunity to the local people. In addition, the farmers will have to make their contribution, which could be in kind and cash. The farmers preferred to make contribution by providing labour.

74. **Livelihood Programs for Landless Households.** There are ultra poor/landless households in the project area who work as tenants for other households who own the land. The proposed project intends to enhance the economic condition of these households by implementing different livelihood programs.

75. **Feasibility of Cooperatives.** The existing irrigation system is being operated and maintained by the water users association. They have defined rules and regulations, which are followed by all the members. The rules and regulations are socially binding. The proposed CMIASP intends to implement a number of institutional development activities in strengthening capacities of the WUAs in agricultural production, and poverty alleviation of the project area. The WUA will have the key role to play in these activities. For the project implementation, a coordination committee is planned to be formed. The WUA could also function as the cooperatives to support the farmers in terms of making timely availability of agricultural inputs, marketing of the agricultural production, facilitating the micro credits.

## VI. ANALYSIS OF ALTERNATIVES

76. Since the proposed subproject is an existing FMIS, there is no other option for the headworks site. There were options of the type of intake and lining of the canal. A concrete side intake has been proposed in consultation with the WUA members and canal lining has been proposed at required places. The existing diversion structure for the intake is a boulder intake without the provision of intake gates and sluice gates. For the stabilization of the river course up and down stream of the intake some river bank protection works will be required. The protection works will involve the reshaping of the river banks, raising the level of the right side embankment. Gabion mattresses with a geotextile filter will be placed on the reshaped river banks and the raised flood embankments. Downstream protection works will be especially required for protection of the head reach of the main canal. Realignment of canal has been proposed from chainage 0 + 770 as requested by the farmers.

## VII. INSTITUTIONAL ARRANGEMENTS

77. **Institutional requirements.** Nepal has an established legal and policy framework for environmental safeguarding in relation to projects. Environmental protection is overseen by the Ministry of Environment, Science and Technology (MoEST). It holds overall responsibility for environmental policy. The principal legislation for environmental safeguarding is the 1997 Environmental Protection Act (EPA) and its rules 1997, amended in 1999 and amendment in 2008. Implementation of the EPA is the responsibility of the MoEST and the sectoral ministries. For those projects having insignificant environmental impacts, the responsibility of undertaking and approving IEEs and implementing the subsequent environmental monitoring plan (EMP) are delegated to the concerned sectoral ministries. The DOI is under the MOWR. Both DOI and MOWR have environmental sections that liaise with each other. The Environmental Section within DOI was established in 1988 and is located within the Surface Water Irrigation Division (SWID).

78. The revised Schedule 1 of Section 2 of the EPR stipulates the environmental assessment requirements for irrigation schemes. It stipulates that an initial environmental examination (IEEs) is required for the rehabilitation of irrigation schemes which has new headworks or change in the main canal alignment. Since the proposed sub project is a simple rehabilitation of the existing FMIS, a formal IEE in accordance with EPR amendment 2008 will not be required.

79. **Institutional arrangements and responsibilities.** At the DOI headquarters level, a central project management office (CPMO) has been set up with class-I engineer as full time project director, and will be responsible for overall environmental management, under technical support and guidance from Environmental Section in SWID. At the regional level, regional project support unit (RPSU) has been established with director of the Regional Irrigation Directorate as project manager of each region and will be responsible for day-to-day implementation of the Project. RPSU will have an assigned staff to manage environmental activities with the assistance of the consultants. At the field level, subproject management unit (SMU) has been established in each division headed by the chief of the irrigation development division/ subdivision (IDD/IDSD), which will undertake field operations including environmental planning and monitoring under supervision by RPSU. Specific institutional responsibilities during the subproject implementation cycle are stipulated as below.

**Table 3: Institutional Responsibilities for Environmental Management**

Subproject Stage	Responsible Organization	Responsibilities
Overall	ISPM Consultants	Support capacity development of environmental planning, monitoring, and management
	EB in SWID	Guidance for environmental planning, monitoring, and mitigation
	MEQCB in PD MED	Management of monitoring and evaluation data
Screening RPSU/SMU		Screen the project results in light of environmental and other criteria
Planning RPSU/SMU/firms		Prepare IEE (included in SIP), minimize avoidable losses, incorporate mitigation measures, and prepare EMP
	CPMO-EB in SWD	Endorse IEE and SIP
	Subproject Appraisal Subcommittee	Approve IEE and SIP
	Ministry of Water Resources	Approve IEE (which fall under schedule 1,

		section 2 of EPR 1997, amendment, 2008)
WUA formation	RPSU/SMU/NGOs/COs	Strengthen WUA including monitoring capacities
Detailed Design	RPSU/SMU/firms	Assist in preparing RP, incorporate EMP into engineering design and specifications
Construction Contractor		Implement required environmental measures
	RPSU/SMU/firms	Supervise contractor implementation of environmental measures
Agriculture and social support	RPSU/SMU/firms/NGOs Implement	specific environmental mitigation measures incorporated in the agriculture and social development plan.
Operational	DOI	provide budget to undertake annual monitoring and audit
	RPSU/SMU/NGOs (during Project)	Carry-out annual performance audit of completed schemes. Support additional mitigation measures as necessary.
	RID/IDD/IDSD/DDC/DADO (after Project)	Same as above
	WUAs	Monitor agriculture practice and impacts and report them to SMU.

Notes: DB=Design Branch; EB=Environmental Branch; MEQCB=Monitoring, Evaluation, and Quality Control Branch; PDMED=Planning, Design, Monitoring and Evaluation Division; SWD=Surface Water Division

## VIII. ENVIRONMENTAL MANAGEMENT PLAN

80. The Environmental Management Plan (EMP) is prepared to guide implementation of mitigation measures and monitoring requirements. It includes institution and their roles, environmental management activities, environmental management organizational structure and budget for mitigation measures.

81. Essentially, it will be put into operation through data collection at subproject level by SMU with the engagement of private firms as necessary and/or WUA, monitored and supervised by RPSU through regular management review and field confirmation, and processing and analysis by Monitoring and Evaluation Branch of DOI in coordination with DOA. Environmental data will be shared with Environment Division. Monitoring costs have been incorporated into the design of the PPME system for the project. The findings of the monitoring activities will be incorporated in the regular PPME reports prepared by CPMO with the assistance of the consultants engaged under institutional strengthening and project management, and submitted to ADB.

82. Framework for implementing environmental management plan is shown by Table 4.



**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
<b>1</b>	<b>Environmental Problem due project location</b>							
F	flooding and drainage hazards	Provide escape structures and drainage outfalls	Design Office	Include in det. design	No cost	Design team	provision of escape structures and drainage outfall in the design	ISPMC
<b>2</b>	<b>Environmental Problem related to project design</b>							
	Watershed erosion	Provide river training work, PCC core wall	Design Office	Include in det. design	No cost	Design team	provision of river training work, PCC core wall	ISPMC
	Canal management	Prepare sub project specific water management plan and O & M Plan.	Design Office	included in det. design	No cost	Design team	Prepare site specific water management plan	ISPMC
	Passageway P	Provide passageway structures	Design Office	Include in det. design	No cost	Design team	provide passage as agreed with the farmers	ISPMC
H	hazards associated with the use of toxic chemicals	Avoid using pesticide to the extent possible. Use IPM technique to control pest	Design Office	Include in Agriculture Development Plan.	No cost	Design team	Include IPM training package in Agriculture Development Plan (ADP)	ISPMC
<b>3</b>	<b>Environmental Problem related to construction stage</b>							
	Excavation	(i)confine operations in the dry season; (ii) use of silt traps; (iii) spoils shall be disposed of at the designated locations	Within the sub-project	designate the spoil disposal area	Part of civil construction cost	Imp: Contractor Mon: SMU/WUA	spoil disposal sites	SMU/WUA
	Quarry sites							
	<b>Work Camp Location and Operation:</b> (i) temporary air and noise pollution from machine operation; (ii) water pollution from storage and use of fuel, oils, solvents, and	(i) work camp will be located away from the settlement area. (i) no trees shall be cut and removal of vegetation shall be minimized (iii) used oil and lubricants shall be recovered and reused or removed from site. (iv) work camps will not	Within the sub-project		Part of civil construction cost	Contractor	Location of the work camp	SMU/WUA

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
	lubricants; (ii) unhygienic conditions from laborers. (iv) disturbance to wildlife	be allowed in wildlife habitats, restriction and control of wildlife harassment, illegal poaching and hunting by workers.						
		(v) will make own arrangements for water and sanitation	Work camp		Included in environmental cost (Budget: Rs 50,000.00)	Imp: Contractor	disposal and sanitary facilities in the work camp	SMU/WUA
		(vi) Site will be placed back in the original site condition and shall report in writing that site has been restored to pre-project conditions before acceptance of the works.	Within the sub-project		Included in environmental cost (Budget : Rs, 50,000.00)	Imp: Contractor	Condition of the work camp site before the issue of completion certificate	SMU
	<b>Stockpiling of Materials :</b> (i) siltation and pollution of surface water resulting from uncontrolled runoff from storage piles; and (ii) disturbance to private property.	(i) stockpiling will not be permitted during the rainy season unless covered by a suitable material; (ii) stripped material will not be stored where natural drainage will be disrupted; (iii) protection of materials from erosion prior to rainy season; and (iv) storage on private property will be allowed only with the written permission from the owner.	Construction sites	ensure good construction practice	Part of civil construction cost	Imp: Contractor	Inspection of the construction material stocking site.	SMU/WUA
	<b>Operation of construction equipment and transport :</b> emission of air pollutants, high concentration of air borne dust resulting and excessive noise resulting annoyance and potential hazard to human populations	(i) Stockpiled sand and soil shall be slightly wetted before loading particularly in windy conditions; (ii) vehicles transporting sand and soil shall be covered with a tarpaulin; and (iii) limit and control working practices through contract provisions.	Construction site	ensure good construction practice	Part of civil construction cost	Imp: Contractor	SM	U/WUA
	Occupational health and	(i) Buy accident insurance to all	Construction	Provide	Included in	Imp: Contractor	insurance policy	Mon: SMU/WUA

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
	safety	workers. (ii) provide safety gears such as helmets, boots, ear plug, mouth mask to the worker and labours	site ins	insurance & safety gears	environmental cost (Budget Rs. 24,000.00)			
T	temporary closure of irrigation system	Plan the intake construction during dry season	Intake site		No cost	Imp: Contractor	Construction plan	Mon: SMU/WUA
		Make an alternative arrangement to keep the canal running	Canals		Part of civil construction cost	Imp: Contractor	Enquiry on canal closure	Mon: SMU/WUA
<b>Environmental Problems Resulting from Project Operations</b>								
H	Hazards associated with the use of toxic chemicals	Avoid using pesticide to the extent possible. Use IPM technique to control pest	Command area	Pest control by IPM	No cost	Imp: Farmers	Use of pesticide in the crops	Mon: DADO
H	Hazards associated with the use of mineral fertilizer	Use recommended dose of inorganic fertilizers	Command area	Application of fertilizers	No cost	Imp: Farmers	Use of chemical fertilizer in the crops	Mon: DADO
<b>Realization of Enhancement Potentials</b>								
	Employment to the local people	Provide employment to local people in priority	Within Sub project area	Hire local labour to the extent possible	No cost	Imp: Contractor	Payroll of contractor	Mon: WUA
	Livelihood programs for landless households	Provide Livelihood enhancement Program (LEP) training to the targeted people	Within sub project area	Training I	include in LEP cost	Imp: SMU	Training on LEP	Mon: WUA
F	Feasibility of cooperatives	Provide institutional development training	Within sub project area	Training I	include in Institutional development plan cost.	Imp: SMU	Training on Institutional development training	Mon: WUA

## **IX. PUBLIC CONSULTATION AND DISCLOSURE**

83. This IEE report has been prepared in close consultation with WUA members and lead farmers who participated in the walk through survey. The impact and proposed mitigation measures were discussed and agreed with farmers during the SIP endorsement by WUA general body meeting.

84. The walk through survey was carried out from 2<sup>nd</sup> to 3<sup>rd</sup> January 2009 and the WUA endorsement meeting was conducted on 3<sup>rd</sup> January 2009.

## **X. FINDINGS AND RECOMMENDATIONS**

85. The principal findings are that the Subproject provides for inherently environmentally friendly irrigation interventions and contributes to significantly improved living conditions through (i) community emphasis on subproject design and implementation, (ii) extensive technical support in eliciting sustainable practices in irrigated agriculture and (iii) addressing institutional needs for sustained and equitable O&M.

86. The identified adverse environmental impacts will be addressed through proper planning, design, implementation, and O&M while incorporating identified mitigation measures. The screening process carried out in the IEE has not identified any significant negative environmental impacts likely to be caused by the Project. Environmental issues were considered throughout development of the Project and necessary changes were made to the designs to reduce or avoid impacts. Potential negative impacts associated with construction activities can be mitigated by the application of standard health, safety, and environmental clauses in contract documents, close supervision, and close attention to transparency in tendering, and to quality control and supervision on site. Mitigation measures for other impacts are provided in detail in the IEE.

## **XI. CONCLUSION**

87. The project is not expected to give rise to any significant negative environmental impacts, and therefore does not require an ADB Environmental Impact Assessment.

88. The proposed subproject is rehabilitation of existing irrigation system, which is already in operation. Hence, the environmental impact during the operation phase will not be very much different than the existing situation. Rather the existing system lacks basic structures like intake, cross drains, the proposed intervention will be providing basic civil engineering structures for the operation of the canal. From the proposed intervention some adverse impacts of low magnitude have been identified during the construction stage but they are of short-term duration and could be easily mitigated. The proposed intervention will provide round year irrigation to the entire command area. Taking into consideration the adverse impact of low magnitude and extensive positive impacts, this subproject is recommended for implementation on the environmental perspectives. Mitigation of minor adverse environmental impacts can be carried out as an integral part of the Subproject, during both the detailed design and implementation stages. Appropriate measures will be included in the tender documents for the civil works.