

Executive Summary

Project Fact Sheet

Project Name	JALOUR RIVER MULTIPURPOSE PROJECT, STAGE II (JRMP II)
Location	Province of Iloilo
Nature of Project	Reservoir-type Dam, Irrigation, Power and Raw Water Supply
Project Size/Scale	Existing Irrigable Area = 22,340 ha New Area = 12,000 ha
Project Features	Provision of year-round irrigation and increased agricultural production Generation of about 11.50 Megawatts of hydro-electric power Additional supply of quality and potable water for domestic consumption Provision of other intangible benefits to include flood mitigation and promote eco-tourism
Project Proponent	National Irrigation Administration
Proponent Address	National Irrigation Administration, Region VI Brgy. Tacas, Jaro, Iloilo City
Proponent Contact Person	Engr. Gerardo P. Corsiga Regional Irrigation Manager
Proponent Means of Contact	Landline No. (033)-3296596 Mobile Nos. 0919-3094545/0917-2563506 Fax No. (033)3293862 E-mail Address. rimnia6@gmail.com / niaregion6@gmail.com
Brief Profile	The National Irrigation Administration (NIA) is a government-owned and controlled corporation (GOCC) primarily responsible for irrigation development in the Philippines. It is one of the attached agencies and corporations of the Department of Agriculture.
EIA Preparer Name	Sustainable Development Solutions
Preparer Address	9th Floor, Room 904 One San Miguel Avenue Condominium San Miguel Ave. cor. Shaw Blvd., Ortigas Center, Pasig City 1605 Philippines
Preparer Means of Contact	Tel Nos. (63-2) 633-9661, 470-4213 Fax No. (63-2) 470-4213 E-mail Address. tina@sds.com.ph

Process Documentation of the Projects EIA Process

Terms of Reference of the EIA Study

The EIA Study is concerned primarily with assessing the direct and indirect impacts of a project on the biophysical and human environment and ensuring that these impacts are addressed by appropriate environmental protection and enhancement measures. It aims to incorporate environmental considerations in planning the proposed project as well as determine the environment's impact on the project.

The proposed Jalaur River Multi-purpose Project Phase II (JRMP II) is categorized as an Environmentally Critical Project (ECP) pursuant to Sec. 4 of PD 1586, series of 1978. Since the proposed project is presumed to have significant impacts on the quality of the environment, the EIA study conforms to the Environmental Impact Statement (EIS) requirements.

The terms of reference of the study is the EIS Scoping and Procedural Screening Checklist signed on May 7, 2009 after the Public and Technical Scoping.

The EIA study should cover, but not limited to, the following:

- Conduct of preliminary site assessment and review the results of the feasibility study carried out from 2008 to 2009 and other relevant information for the multi-purpose project of the National Irrigation Administration;
- Provide comprehensive description of JRMP II project components including using maps at appropriate scale;
- Generate baseline data on relevant environmental characteristics of the project component area including description of physical environment, biological environment, and socioeconomic and cultural constraints. It should include information on any changes anticipated before the commencement of the construction phase;
- Outline and examine the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of water resources and pollution control, land use control and seawater pollution control, at the national and local level;
- Identify and determine the potential positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts that are unavoidable or irreversible. The assessment of the potential impacts shall include, but not limited to, pollution of ground water aquifer and surface and sea water, landscape impacts of extractions and excavations, loss of nature features, habitats and species by construction and operation, soil contamination impacts, odor substances, noise pollution, waste and sludge disposal, and socio-economic and cultural impacts;
- Prepare and develop an environmental management plan (EMaP) to mitigate the negative impacts, and recommend feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable national level;
- Identify the institutional needs to implement the recommendations of the EIA;
- Prepare a detailed environmental monitoring plan (EMoP) to monitor the implementation of the mitigation measures and the impacts of the project during the construction and operation of project; and
- Carry out public consultations, focus groups discussions, key informants interviews to obtain the views of local community, perception surveys and affected groups and keeping records of meetings and other activities, communications, and comments.

Based on preliminary review and the results of the Focus Group Discussions (FGDs) conducted with the affected Barangays from the Municipalities of Calinog and Lambunao from November, 2008 to December, 2011 and the Checklist of Technical Scoping, the significant issues raised by the stakeholders and the EIA Review Committee were considered in the study. The list of issues is presented in **Table 1**.

Table 1 Summary of Most Significant Issues during the Focus Group Discussions

Module	Significant Issues	How EIA Study Addressed Each Issue
Land	Destruction of the environment	Conducted vegetation and faunal studies on the existing vegetation and wildlife species prevalent in the site
	Impact on crops and domestic animals	Soil was sampled and analyzed.
	Soil erosion	Analysis on the available data was performed to determine the vulnerability of soil to erosion.
Water	Siltation altering the water quality of surface waters	Surface waters were sampled and analyzed for TSS, TDS, TS and 1-hr settle able solids.
	Aggravate flooding on low lying areas	Analysis on the available data was performed to determine the vulnerability of soil to flooding.
	Contamination/Disturbance of spring/source of water	Spring waters were sampled and analyzed for total coliform, fecal coliform, alkalinity, Ca, K, Na, HCO ₃ .
	Wastewater management to prevent incidence of diseases	Grey, sewage and silts will be managed using relevant engineering interventions.
	Sedimentation in coastal waters	Coastal water was sampled and analyzed for pH, temperature and TSS.
Air	Dust emissions from the access road in populated areas	Baseline data on air quality such as TSP, SO ₂ and NO ₂ were sampled and analyzed.
People	Hiring of local workers	Recommendation to prioritize the hiring of qualified local residents is included in the recommendations. The provision is to be embodied in a Memorandum of Agreement between the proponent and Barangays.
	Community safety from hazards	Rigid safety measures will be employed by the proponent.
	Traffic/Road management	The proponent will provide assistance to the host community for the improvement of the road to be used by the proponent during the construction and operation period. This is included in the Social Development Framework and the Memorandum of Agreement between the proponent and Barangays.
	Road safety of residents from passing haul trucks	The proponent will follow the existing traffic resolutions of affected barangays. Alternate route will be constructed if possible, to avoid populated barangays.

EIA Team

For the conduct of Environmental Impact Assessment (EIA) Study for the Proposed Jalaur River Multipurpose Project Stage II located at the Province of Iloilo, NIA Region 6 engaged the services of Sustainable Development Solutions, Inc. (SDS) as its Environmental Consultant.

Henceforth, SDS, Inc. formed the EIA Team composed of various experts in their field of specialization to conduct the EIA of the proposed project. **Table 2** presents the members of the Team and the corresponding modules assigned to them:

Table 2 EIA Team and the Assigned Modules

Team Member	Field of Expertise	Module of Assignment
Engr. Geronimo C. Garcia	Environment Specialist	Team Leader/Overall
Dr. Diomedes A. Racelis	Watershed	Watershed Study
Dr. Lino P. Aldovino	Hydrology	Hydrology Study
Engr. Dennis Tojos	Geology	Geology Study
Engr. Mario M. Gulinao	Irrigation and Drainage	Irrigation and Drainage Study
Ms. Aquilina D. Mendoza	Resettlement/Sociology	RAP/Social Development Plan
Ms. Delia S. Magaña	Anthropology	Anthropology Study
Dr. Amador R. Catacutan	Public Health	Public Health Study
Dr. Hector Sales	Economics	Economics Study
Arch. Mark Roeland Castro	Climate Change	Climate Change Study

Correspondingly, a NIA counterpart team was formed by virtue of Regional Memorandum Order No. 93, series of 2011 consisting of organic personnel from Region VI to work in tandem with the SDS Consultant Team. The Memorandum Order specifically directed the said team to assist in the ***“Formulation of Jalaur River Multipurpose Project II NIA-Regional Office VI Personnel Counterparts to the Social Environmental Impact Study Experts of the Sustainable Development Solutions (SDS)”***.

EIA Study Schedule

In the conduct of the Environmental Impact Assessment Study for the Proposed JRMP II, the EIA Team of SDS, Inc. commenced the study through site reconnaissance of the proposed area.

Socio-economic surveys and focused group discussions were conducted between October to December 2011 to cover affected barangays within the municipalities of Calinog and Lambunao. A sample of the questionnaire used during the socio-economic survey is attached under Annexes.

Primary data gathering on water, flora and fauna aspects were conducted between September to November 2011. The data gathering corresponds to the wet season at the project site, which is also the “worst case scenario” in terms of siltation in the river. **Table 3** shows the EIA study schedule.

The Environmental Impact Study was conducted in accordance with the following schedule:

Table 3 List of Major EIS Activities

Activity		Venue	Duration
1	Pre-Scoping: Screening, Social Preparation, IEC	Iloilo Province	Nov 2008 to May 2009
2	Public Consultations	Iloilo Province	Jan & May 2009
3	Public and Technical Scoping	Punta Villa Resort, Iloilo City	May 2009
4	Environmental Impact Assessment		
4.1	Data Gathering	Iloilo Province	August to November 2011
4.1.1	Socio-Economic & Perception Survey, Field Interview of Sample Respondents	Calinog & Lambunao	Oct to Dec 2011
4.1.2	Field inventory of Flora and Fauna	JRMP II sub-watersheds	Aug – Sept 2011
4.1.3	Field Assessment Freshwater Ecology and Biological study	Iloilo City (Secondary Data)	-do-
4.1.4	Secondary Data Gathering	Iloilo City	Aug – Nov 2011
4.2	Data Synthesis and Analysis	Iloilo/Metro Manila	Dec – Jan 2012
4.3	Report Preparation	Iloilo/Metro Manila	Feb 2012
4.4	Submission of Draft EIS Report	Iloilo City	March 2012
4.5	EIA Report Review & Evaluation Decision on Issuance of ECC		Estimated March 2012

EIA Study Area

The estimated total target area of 34,340 hectares for development is distributed within the 23 municipalities and one component city in the Province of Iloilo. These areas are equitably spread in the southern and northeastern portions of Panay Island and are located centrally in the Western Visayas. About 65% of these areas or 22,340 hectares are planted to rice and are covered by the existing Jalaur, Suage, Aganan, Sta. Barbara and Sibalom River Irrigation Systems. The 9,500 hectares of new area and 2,500 hectares planted to sugarcane are presently rainfed areas to be provided with new irrigation facilities and thus would also be served with year-round irrigation after project completion. Shown in **Figure 1** is the General Lay-out Map showing EIA Study Area and the major structures and facilities proposed under the project.

The EIA study area covers the direct impact areas (primary impact zone area) which include the location of the two (2) high dams and four (4) supplemental dams including the whole stretch of the high line canal and the service areas to be generated and rehabilitated. The indirect impact areas (secondary impact zone area) are those areas to be inundated due to the construction of high dams in Jalaur and Ulian rivers located in the municipalities of Calinog and Lambunao.

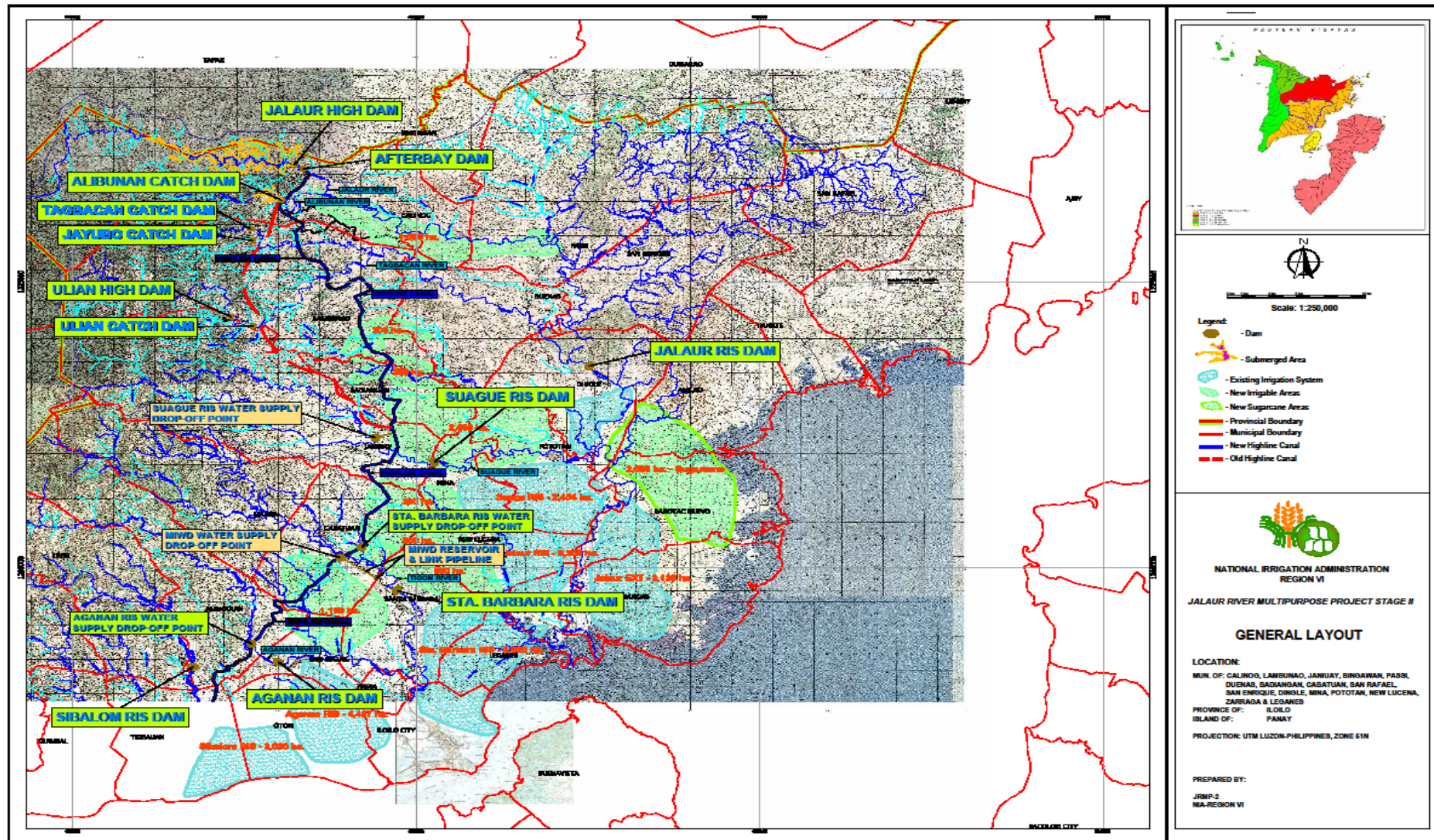


Figure 1 General Lay-out Map Showing EIA Study Area

EIA Methodology

The methodology used in the preparation of the EIS Report was based on the Revised Procedural Manual of DAO 03-30. Requirements for primary and secondary data were consistent with both the Scoping and Procedural Screening Checklist for EIS and issues and concerns raised during the focus group discussions. Activities were conducted in three phases: baseline data gathering; analysis; formulation; and consultation/finalization phases.

Data gathering, involving secondary and primary data were conducted from August, 2011 to November, 2011. Secondary data were obtained from NIA and various institutions and organizations, e.g., PAGASA, DENR, Research Institutions, to name a few. Primary data on flora were conducted through vegetative analysis by quadrat sampling and on fauna thru transect walk. Water quality samplings were undertaken while ambient air sampling utilizes available secondary data. To determine the perception of the people relative to the proposed project, public consultations thru focus group discussions, key informant interviews and random perception surveys were conducted.

The following is the list of data/information sources for the primary and secondary data gathering:

1. Primary Data Gathering:

- a. Conduct of ocular site inspection of the locations where the proposed dams and the different irrigation and drainage structures will be constructed.
- b. To gather information on the land use and classification, soil type and quality, soil sampling in situ was conducted and the samples were analyzed.
- c. To gather information on water quality at the proposed service area, water sampling in situ was conducted and the samples were analyzed.
- d. To gather information on the present status of the physical-biological components of the receiving environment, for the terrestrial biology assessment, the tools used were the Transect Walk which was adopted from the Biodiversity Monitoring System of the DENR for the plants and animals and the Quadrant Method for the invertebrates at sampling sites while for the data required for freshwater ecology assessment sampling method was performed in situ and microscopically examined at the Bureau of Fisheries and Aquatic Resources (BFAR) Regional Freshwater Fisheries Center at Iloilo City.
- e. Walk-through in order to have a general knowledge of the present status of the receiving environment, delineate the impact areas and identify the different stakeholders.
- f. Public Consultation and Focus Group Discussions with the stakeholders to clarify issues and surface opinions concerning the construction of the proposed dam project.
- g. Socio-Economic/Perception Survey through a random sampling of affected households in the inundation area to determine the socio-economic status of the project-affected families/persons (PAFs/PAPs) and their perceptions about the proposed project.
- h. Technical Discussions with the technical staff of the proponent.

2. Secondary Data Gathering:

- a. Philippine Atmospheric, Geophysical & Astronomical Services - (PAGASA), Quezon City for climatic and meteorological data for projections in the Climate Change vulnerability and adaptability as well as Disaster Risk Preparedness Programs .
- b. Bureau of Research and Standards (BRS), Quezon City for stream flow data usage of Hydrologist and Geologist's sedimentation rate and water balance analysis.
- c. National Statistics Office (NSO) Region VI, for demographic data in the projections of beneficiaries and affected families in the project area.
- d. Provincial Planning and Development Office of Iloilo Province and the Local Government Units of Calinog and Lambunao for the Provincial Physical Framework Plan and the CLUPs for baseline assessment activities.
- e. The National Commission on Indigenous Peoples (NCIP) Region VI, Iloilo City for their Ancestral Domain Sustainable Development and Protection Plan (ADSDPP).

- f. The Department of Environment and Natural Resources (DENR) Region VI, Iloilo City for the thematic maps and base resource maps and biodiversity studies.
- g. The National Irrigation (NIA) Region VI, Iloilo City for the Feasibility Studies conducted for the JRMP II and other plans and programs for the existing National Irrigation Systems in the project area.
- h. NGOs and Local Research Institutions including CHED-funded Biodiversity Studies in the Jalaur River including freshwater ecology.

Data analysis across different modules adopted the corresponding suitable statistical designs to arrive at conclusions on existing situation. Overall analysis was guided by the need to establish the potential impacts of the project to the existing situation and/or possible impacts of the environment on the project. Conclusions derived from analysis served as basis for the preparer's formulation of proposed mitigation measures which were discussed with NIA and other stakeholders. Reactions and issues during small group and public consultations held during the study served as inputs for the finalization of proposed measures. The process, baseline assessment and proposed mitigation or enhancement measures are laid out in this report.

Table 4 EIA Modules and Coverage

Module	Coverage
Geology	Geological mapping using GPS and 1:50,000-scale topographic and geologic map.
Hydrology	Secondary data from NAMRIA and NIA; geographic location using GPS; water quality sampling analysis.
Meteorology	Largely secondary data gathered from existing literature; air quality sampling and analysis for TSP, SO ₂ and NO ₂ .
Terrestrial Biology	Vegetation mapping using 1:50,000-scale topographic map and GPS. Quadrat sampling for flora and transect for fauna; fauna were recorded from the transect lines used in floral surveys; birds were identified using binoculars and field guides; bird traps were established within the parcels; insect collections using mist net.
People Module	Review of records/documents, Focus group discussion, key informant interviews and random perception surveys.
Public Health	Review of records/documents, focus group discussion, interviews
Economics	Review of records/documents, focus group discussion, interviews, internet research

EIA Public Participation

The proposed construction of the JRMP II is a felt need of the stakeholder beneficiaries as confirmed during meetings, consultations. Documentations to this effect are available. The project has gained wide public acceptance through a series of stakeholder's consultations. The local officials have endorsed the project considering the positive economic impact it will bring to the target area.

Information from the proponent indicated that proof of acceptance was already endorsed by the Regional Development Council. However, council resolutions from LGUs concerned are still on process.

The following is a list of issues and concerns arising from the stakeholder's conference and the corresponding reaction/s of the consultants.

Issues/Concerns	Reactions
a. Watershed	
Recommendations should include not only reforestation but also suitable management strategies.	It was explained that yes, the watershed management plan must be comprehensive but this would take a longer time and likewise comprehensive basis. It was also clarified that the results of the study could provide some bases for initiating actions towards watershed management planning.
Why not include the indigenous peoples in the protection of the forests?	
Water always diminishes. What are the factors? If we want to restore it, let it be comprehensive.	
There must be along-term plan.	
b. Stability of infrastructure	
How stable is the dam? What if it breaks?	The general concern of stakeholders on the fears of dam breaks, as influenced by natural calamities in Iloilo and in other parts of the country, and the occurrence of earthquake on February 06, 2012. It was explained that: <ul style="list-style-type: none"> - The dam has provision for emergency release facility - A study on the extent of inundation in the very remote case of dam break is included in the design.
c. Geology	
There is information that there is a new fault-line and such is perceived to affect the project.	This shall be validated from the PHIVOLCS.
d. People	
Is the FPIC process considered in the activities?	It was clarified that the FPIC is a NIA-driven activity through the facilitation of the NCIP. It was further clarified that consultations with IPs in 12 barangays (9 in Calinog and 3 in Lambunao) has just been recently completed and the report is underway. It was emphasized that the project adheres to the FPIC process and the Indigenous Peoples' Rights Act (IPRA) in general.
e. Conflicts	
Possible threats to the project include: misconceptions that could lead to resistance and/or adverse actions of some people,	Appropriate countermeasures shall be indicated in the report, subject to more factual information. Considering that these threats need validation, only preliminary measures could be indicated.
f. Stakeholder Roles	
The role of the Philippine Army be clarified.	This shall be considered in the report, particularly on the roles of stakeholders.
What will be the relationship of the project in the ongoing efforts for convergence?	There is already an existing Technical Working Group on convergence in Iloilo from provincial to municipal, level. The consultant finds it to be a good start and would try to consider this in the recommendations. However, caution was that the process of integrating relationships and procedures could take time, so only recommendations could be expected in the study.

Other issues and concerns based on submitted notes by stakeholders:

1. Mitigate the negative impact of the project in the area. In effect, if flooding happens, it will affect the agricultural sector, destroy crops and livelihood.
2. Later on, this flood control project when completed will be beneficial to farmers that will serve as water impounding for the dry season. Considering best practice in disaster management and the Climate Field School, still the dilemma lies on the effect of this project.
3. From Mr. Eugene de Castillo, representing Mayor Golez of Dumangas: “ I would like to air my concern on the JRMP implementation. If you know our Dumangas is located on the tail-end of the Jalaur River, the catch basin for that matter. We experience flooding. At present, four barangays along Jalaur River experience soil erosion which cause residents along the river to transfer their houses and vacate the area. Is it possible to include in your project component the construction of mega dikes and flood control structures?
4. Warning system must be incorporated in the LGU DRRM Plan not only in the risk management emergency response plan of the project (JRMP II).
5. From municipality of Dueñas: What are the barangays affected by your main canal in going to Dingle and Barotac Nuevo?

Brief Project Description

Project Location and Area

The proposed JRMP II is located in the province of Iloilo in Region VI. It is located in Panay Island of Central Visayas, some 450 air-line kilometres (km) south of Manila (See **Figure 2**).

The estimated total target area of 34,340 hectares for development is distributed within the 23 municipalities and one component city in the Province of Iloilo. These areas are equitably spread in the southern and northeastern portions of Panay Island and are located centrally in the Western Visayas. About 65% of these areas or 22,340 hectares are currently planted to rice and are covered by the Jalaur Proper and Extension, Suage, Aganan, Sta. Barbara and Sibalom River Irrigation Systems.

The 9,500 hectares of new area and 2,500 hectares planted to sugarcane (totaling 12,000 ha) are presently rainfed areas to be provided with new irrigation facilities and thus would also be served with year-round irrigation after project completion.

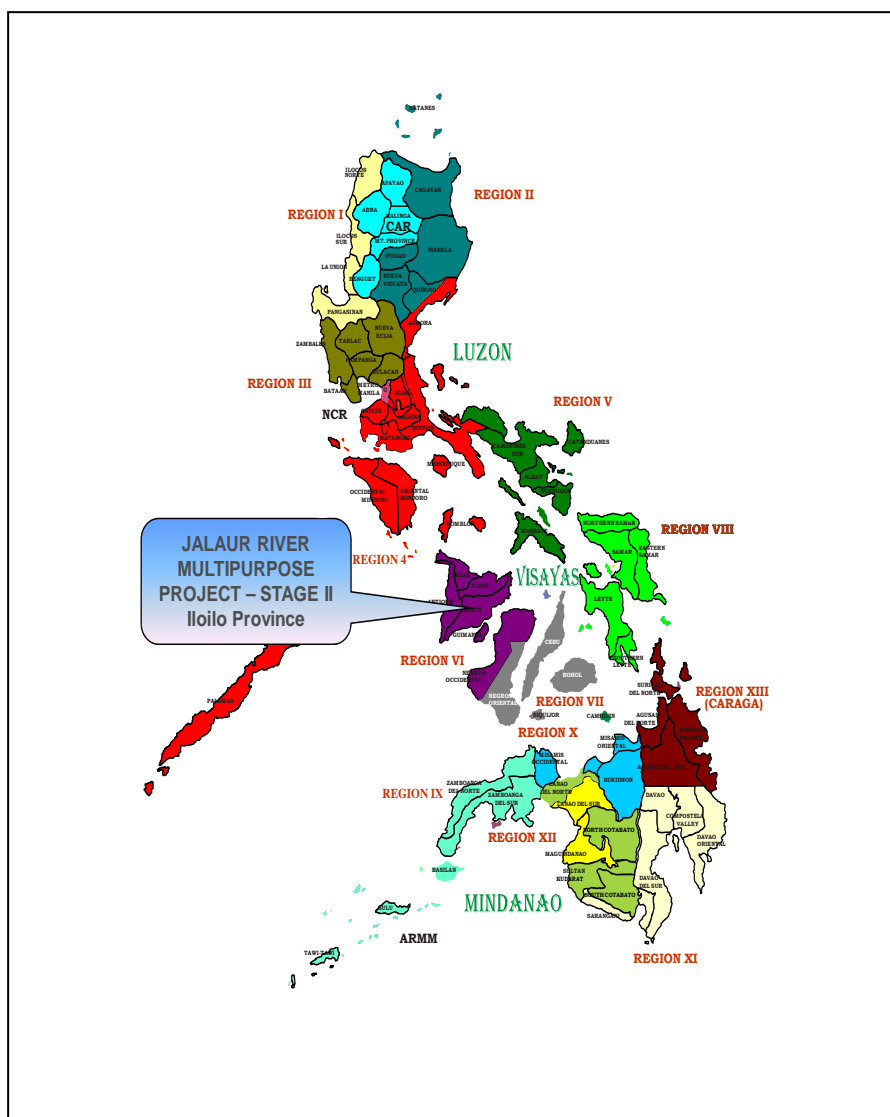


Figure 2 Map of the Philippines Showing Location of JRMP II

Project Components

The overall project scheme involves the construction of two reservoir-type high dams across the Jalaur River and Ulian River. Discharge from the Jalaur High Dam through the power plant will be conveyed to the afterbay dam about 1.8 km downstream to store water to be released for irrigation through an 81-km High Line Canal. Along the high line canal are three (3) catch dams located across Alibunan River, Tagbacan creek and Jayubo creek to supplement the discharge coming from the Jalaur High Dam. Similarly, the Ulian High Dam through the power plant tailrace will release water directly into the high line canal for irrigation water.

A recently planned scheme is to construct the above structures in phases where the first is to construct the Jalaur High Dam, Jalaur Afterbay Dam and Alibunan Catch Dam. The rest shall be constructed eventually and shall be part of the whole project.

Process/Technology Options

The development of the Project considered different technology options geared towards optimum benefits. Economic benefits, sustainability and suitability of operating measures were likewise taken into consideration. The table below shows the technology options considered, resulting in the recent option adopted in the latest FS report.

Results of Previous Studies and Adopted Options

Project Features	1976 PDD FS	1981 Supplemental Study	1984 Detailed Design	2008 RIO Evaluation / Alternative Development Plan	2009 Adopted Development Scheme
Main High Dam/Height	149 meters – Earthfill and Rockfill	141 meters – Rockfill / Concrete Membrane	145 meters- Arch Dam	145 meters High Arch Dam	Jalaur Dam–106 m Ulian Dam – 46 m Hardfill
Reservoir Storage Capacity, MCM	442	364	337	337	Jalaur Dam – 190 Ulian Dam – 60 Total 250
Diversion Main Canal	Low Line with 2 pumping stations of 24m and 9 m head	Low Line with 2 pumping stations of 24m and 9 m head	High Line Canal	High Line Canal	Upper High Line
Power Plant Capacity, MW	24	20	20	20	Jalaur 10.5 Ulian 1.5 Total 11.5
Irrigation Service Area, ha				Jalaur – 17,200 and irrigation water for 18,800 ha shall be used for prawn areas of 2,500 ha	
Existing	22,000 ha	22,000	24,700		22,340
New	14,000 ha	14,000			12,000
Total	36,000 ha	36,000			34,340
Cost (Million)	838.10	1,300.00	2798.00		15,220.00

Summary of Baseline Characterization, Key Environmental Impacts and Management & Monitoring Plan and EMF & EGF

Summary of Baseline Characterization

1. The Land

1.1 Land Use and Classification

Iloilo Province (including Iloilo City) has a total land area of 471,940 ha. These are categorized as classified forest land with 116,145 ha and alienable and disposable (A & D) lands with 355,795 ha. Table below shows the breakdown of A & D lands and Classified Forest lands.

Classification of Land Area, Province of Iloilo (including Iloilo City)

Alienable & Disposable Lands	355,795 ha (75.39%)
Agricultural	341,184 ha
Fishpond	14,611 ha
Classified Forest lands	116,145 ha (24.61%)
Production Forest	7,447 ha
Protection Forest	108,697 ha
Total Land Area	471,940 ha (100%)

1.2 Geology and Geomorphology

The proposed Jalaur Dam, as well as the three Catch Dams along the proposed high line canal, namely those at Alibunan, Tagbacan and Jayubo Rivers, is underlain by volcanic rocks such as greywacke, agglomerate and volcanic breccias. The Ulian Dam and its appurtenant structures, reservoir area and afterbay dam will all be underlain by a sedimentary rock series of siltstone, sandstone, conglomerate and limestone.

1.3 Terrestrial Biology

Thirty four (34) sampling points/quadrats measuring 10m x 10m plot each were established using GPS and topographic map along the transect traversing the areas within, upslope and upstream the areas to be inundated by the proposed reservoir at Jalaur Watershed. Trees above 10 cm DBH (diameter-at-breast-height) including palms and erect pandans were identified and height estimated in meter. All plants below the diameter limit, including grasses, shrubs, wildlings, saplings, seedlings, vines, ferns, herbs, zingibers, fungi, and other plant forms were considered in a 2m x 2m plot set inside the larger plot.

The area is primarily residual forest with a small number of scattered large, medium and small-sized trees. The tree layer is dominated by Mahogany, Himbabalod, and Haguimit with a mean DBH of 17.92 cm, 15.47cm, and 21.62 cm, respectively. The mean population density of the tree layer in Jalaur Watershed is 2.7647 per 100 m². The most dominant species are Mahogany (*Swietenia macrophylla*), Himbabalod (*Barringtonia acutangula*), and Haguimit (*Ficus minahassae*) with Relative Dominance of 16.3833, 15.4109, 14.8563, respectively. In terms of Importance Value, Himbabalod has 50.9379, Mahogany 41.8410, and Haguimit 32.6693. The diversity index is very low with value of 2.6797 and Evenness index of 0.8945.

The fauna survey recorded a total of 30 wildlife species, consisted of 19 bird species belonging to 17 families, 4 species of reptiles (snakes and lizards) in 4 families, 2 ranid frog species and 5 mammalian species (2 bat, 1 each of rat, cat, monkey). Most of these species are known to be common throughout the Philippines and present in disturbed areas or even near human habitation. Among the bird species, 5 are threatened, 10 are vulnerable with the rest considered as still abundant. Data shows that birds are still abundant in the area. For reptiles, 1 threatened, 2 vulnerable, and 1 abundant; for amphibians both are classified as vulnerable; and, for mammalian, 4 are endangered and 1 vulnerable.

A significant number of insects were either captured or seen during the survey. There are still abundant population of arthropods in the watershed. The diversity index is 1.9356 while the evenness index is 0.8072. For arthropod, a total of 11 species were identified with the majority belonging to Hymenoptera and Lepidoptera. The most commonly encountered species is Black Ants, honeybees, and mosquitoes. The average total abundance, Shannon's and Dominance Indices are 1.9356 and 0.8072, respectively.

2. The Water

The proposed project will utilize the water resources potentials of the Jalaur River.

2.1 Hydrology

The four major river systems in Iloilo province are: Jalaur River, with Suage, Ulian-Assig and Lamonan as tributaries; the Tigum River, with Sta. Barbara and Aganan as tributaries; Sibalom River; and the Oya-oy River with the Tumagboc as a tributary. The available streamflows of all the rivers and streams are significantly reduced during the dry season. The current study considers two river basins, the Jalaur River and Ulian River. The two proposed reservoir-type systems are envisioned to be complementary through 17 kms high line canal that will connect the controlled discharges of the two dams from the Jalaur afterbay to Ulian afterbay dams.

2.2 Water Quality

The DENR-EMB Region VI monitors the water quality of rivers and streams in the region. Results of regular monitoring classified the water from major rivers as follows: Iloilo River - Class "C" intended for the propagation and growth of fish and other aquatic resources, for secondary recreational activities (boating) and for manufacturing processes after water treatment; Jaro River - Class "C"; Aganan River - Class "C"; Tigum River at the confluence of the Maasin dam - Class "C", and at the upstream reach of the said dam - Class "A".

2.3 Freshwater Ecology

The Jalaur River system was studied for the quality of its water because water quality is a significant and powerful determinant of the health of aquatic ecosystems. Based on the water quality standard and water classification adopted by DENR, the Jalaur River stretch can be classified as class C and class D. Class C water is for propagation and growth of aquatic resources while class D water is for agriculture, irrigation, livestock watering and industrial cooling and processing. The detected levels of metal contamination, mainly chromium (Cr), and Lead (Pb) in sediments of Jalaur River were found to exceed the geochemical background or threshold values. Cr and Pb were also detected in filamentous algae (lumot), *Azolla* and tilapia sampled at Moroboro sampling site. No organochlorines, organophosphates, carbamates and pyrethroids pesticides were detected at the detection limit of the analyses for both water and sediment samples.

3. The Air

3.1 Air Pollution

Dust generation/Increase of suspended particles during construction can be minimized by keeping the construction area with enough moisture. Increased concentration of gas pollutants (gaseous

emissions from vehicles) can be mitigated by keeping the vehicles' engines in good running condition and ensuring proper maintenance and repair of equipment

3.2 Noise/Vibration

Increase of noise level due to vehicles and to noise/vibration producing vehicles will be minimized by selecting routes that will avoid populated areas and providing silencer for mufflers of vehicles. During the construction phase, elevated noise levels would occur. However, the noise level would not be enough to cause sensory-neural deafness (i.e. more than 85dB). On the other hand, it may cause some localized and short-term annoyance for residents and workers in the community. To minimize noise disturbance, it is recommended that construction be done during the daytime when there is more background noise that tends to mask noise as sound vibrations cancel each other, and when the receptors are less sensitive. Moreover, vehicles need to be fitted with appropriate mufflers to reduce the noise and workers need to wear ear plugs.

4. The People

4.1 Demographic Profile

The province of Iloilo is subdivided into 43 municipalities including one chartered city. Total population was established at 1,691,878 with an annual population growth rate of 1.13 and population density of 4 persons per ha.¹ Number of households was established at 344,869 in the whole province giving an average household size of 4.91. Proportion of dependents, e.g., aged 15 years and below and aged 65 years and over, was 52 %. With an annual per capita poverty threshold of PhP 14,810, poverty incidence of population was recorded at 30.40% and poverty incidence of families at 24.10%.

Within the province, a total of 64,827 Indigenous Peoples (IPs were identified), consisting 4 % of the total population. The IPs belong to two dominant groups – the Panay Bukidnons and Ati. A segregation of IP and Non IP population shows that majority of the IP population (88%) are found in the municipalities covered by the proposed JRMP II.

It is worth noting, further, that majority of the IP population in the province are found in Calinog and Lambunao, the proposed sites for the two high dams (Jalaur and Ulian). About 30% of the IP population are in Calinog and 24% in Lambunao.

4.2 Environmental Health and Sanitation Profile

With a projected population of 1,888,912 for 2010, the mortality rate of the Province of Iloilo was found to be 4 per 1000 population. Maternal mortality accounted for 23 per 100,000 live births, while deaths under 1 year old were 8 per 1,000 live births.

The leading causes of mortality and morbidity showed that the province has a double burden of disease. Pneumonia, septicemia and respiratory type of tuberculosis are the primary causes of deaths among the communicable diseases, while diseases of the heart, cancer, and hypertension leads the non-communicable diseases.

For other public health concerns, Iloilo province was found to be endemic for filariasis and leptospirosis, increasing incidence of sexually transmitted disease and HIV, and high incidence of typhoid and dengue. In 2010, 32 out of 650 cases died of dengue, while 5 out of 109 cases died of leptospirosis.

In October 20, 2011, bacteriologic examination of water samples from 10 faucets in Lambunao, including the Panuran National High School, revealed that the samples were not safe for drinking (total coliform count >8.0/100ml). The results were not surprising, considering that only 20% of the households have access to safe drinking water, only 49% have sanitary toilets, no households have satisfactory disposal of solid waste or basic sanitation facilities. Diarrhea remains to be in the top 10 leading causes of morbidity.

¹ Total population/area. Reference is the Provincial Profile which used sq km. that was converted into hectares (ha) by multiplying the area in sq. km by 100.

The household survey identified this health-related need of the households, i.e., water and sanitation. The sources of water include spring for 52.4% of the households, open dug well for 31.1%, protected (closed) public wells/pumps for 7.9%, pipes into public taps for 4.6%, and pipes into houses for 0.8%. 48.1% of the households use water-sealed latrines, 23.7% open pit toilet, 19.5% antipolo, and 0.4% closed pit toilet. In the management of solid waste, 46.1% of the households do composting, 36.9% individual burning or burying, 12.5% dumping into open area or river, 0.4% garbage truck collection, 0.4% waste segregation, and 0.4% feeding to domestic animals.

In the Direct Impact Areas, the possible threat to public health during construction would be the spread of communicable diseases from migrant workers, increase in solid and liquid waste, generation of noise and health pollutants and solid waste generation and problems of storage and disposal. Since this is short term in nature, these could be mitigated by appropriate measures. Local health resources both in health manpower and health facilities are available to answer the medical and sanitation requirements of the populace.

During the O&M phase of the project, the possible threat to public health would be the creation of habitat for disease vectors/pathogens. These could be mitigated by the proper maintenance of drainage facilities to prevent stagnation of water.

4.3 Water Supply and Demand

As one of the principal purpose of the project is to provide continuous supply of bulk/raw water at the tune of one (1) cubic meter per second (cms) that would translate to around 86,000 cubic meter per day potable water supply.

Ground water from the area and stream flow from the rivers that will supply the three (3) catchment dams and two (2) reservoirs were tested for its quality. However, initial test results indicate the need for water treatment before delivery to consumers or human consumption. These would augment the supply of potable water primarily for the Province of Iloilo.

The annual benefit from the sales of raw water for domestic and industrial consumption is also derived. Assuming that there is an available water of 1.00 cubic meter per second which is equivalent to 31.536 Million cubic meters yearly multiplied by PhP 1.90/cubic meter gives an annual total of PhP 59.92 M or about **PhP 60 Million**.

4.4 Power Supply and Demand

The total installed capacity of the two (2) hydro-electric plants is 11.50 MW (Jalaur = 10 MW and Ulian = 1.5 MW). The benefit from hydropower is the mean annual energy generated from Jalaur (26.217 GWH) and Ulian (7.532 GWH). The resulting figures converted to kilowatts hour and multiplied by PhP 3.744 kwh and PhP 2,777/kwh, respectively give a total of PhP 118,810 M. Applying the load factor of 0.85 and plant factor of 0.95, the annual benefit for hydropower becomes PhP 95.939 M or about **PhP 96.0 M**.

4.5 Socio-Economic Profile of the Project Area

The Project is envisioned to benefit around 14,533 farm households consisting of 9,449² HHs presently served and around 5,084³ HHs in the new areas. Average household size of PAFs account to 4.95 in Calinog affected barangays and 5.47 in Lambunao affected barangays.

4.6 Summary of Findings and Implications

On the Protection of Adversely Affected People: A holistic study to consider the affected people is a key social issue. It was gathered that the target reservoir areas have history of conflict, and that these are ancestral domain areas. The inhabitants must not be merely sacrificed in favor of the project, and

² As per NIA updated IA profile, August 2011

³ Extrapolated at 2.36 ha average landholding in irrigated areas

the affected people must be given opportunity to be well-informed of plans, programs, development and concerns.

Social preparation shall take place at all levels of institutional action. This implies that implementing and assisting organizations alike need to be retooled with a KAP mix (Knowledge-Attitudes-Practices) oriented towards managing social change. The social preparation program shall follow the Awareness-Restructuring-Empowerment (ARE) of community development to ensure that community participation results into meaningful changes that shifts from dependency to self-reliance. Part of the required groundwork is to engage the IPs in these undertakings. Culture-sensitive approaches and materials shall be used.

A major feature is to engage key stakeholders, particularly the PAFs to take part in a Strategic Action Planning exercises which should lead to the creation and empowerment of the committees and sub-committees. The plan should enable the committees to conduct series of consultations to decide on resettlement options.

4.6.1 Displacement of Settlers

The settlers to be displaced include IPs (Pan-ay Bukidnons). By virtue of the IPRA, several processes and considerations on the culture and vulnerabilities of the IPs have to be considered. In the case of Garangan-Masaroy-Agcalaga where there is already an existing ADSDPP, plans for affected IP households need to consider the direction and content of existing ADSDPP. Further, intensive and extensive consultations have to take place.

For the relocation, both the relocatees and the host communities must be ready for the integration of the relocatees to the community.

4.6.2 Local Benefits from the Project

Local benefits from the project shall accrue to employment and income opportunities, improved agricultural production and hence improved yield and income. This would sustain the increase in revenues for the municipalities to be served by irrigation. Social benefits shall accrue to improved domestic water supply and augmentation of power supply. For the adversely – affected communities of Calinog and Lambunao, improved economic activities would in effect cause increase in tax revenues for the LGUs. The project would open opportunities for other livelihood activities including tourism.

4.6.3 Threat to Delivery of Basic Services

In the Direct Impact Areas, the possible threat to the delivery of basic services during construction would be the need for water supply for construction workers which can be supplied by the local water district. In addition, solid waste generation and problems of disposal and the accumulation of domestic waste due to construction activities are expected. These could be mitigated by the adoption of proper waste management system.

During the O & M phase, change in education and health service is contingent with the change in lifestyle. With the increase in farmers' income, they will be able to provide quality education and health services for family members. Likewise, the improved housing facilities and usage due to the increase in farmers' income is probable.