Ministry of Agriculture
Republic of Peru

THE PREPARATORY STUDY
ON
PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU

FINAL REPORT
I-6 SUPPORTING REPORT
ANNEX-11 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS/GENDER (TEMPORARY VERSION)

March 2013

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

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Figure Study Area

ABBREVIATION

Abbreviation	Official Form or Meaning
ANA	Autoridad Nacional del Agua/National Water Authority
ALA	Autoridad Local del Agua/Local Water Authority
B/C	Costo Benefit Ratio/Benefit Cost Ratio
GDP	Gross Domestic Product/Gross Domestic Product
GIS	Geographic Information System/Geographic Information System
DGAA	Dirección General de Asuntos Ambientales/General Directorate of Environmental Affairs
DGFFS	Dirección General de Forestal y de Fauna Silvestre/Directorate General of Forest and Wildlife
DGIH	Dirección General de Infraestructura Hidráulica/Directorate General for Water Infrastructure
DGPI (Paleo-DGPM)	Dirección General de Política de Inversiones/Directorate General of Investment Policy
DNEP	Dirección Nacional de Endeudamiento Público/National Directorate of Public Debt
DRA	Dirección Regional de Aguricultura/Regional Directorate Aguriculture
EIA	Evaluación de Impacto Ambiental/Environmental Impact Assessment
FAO	Agricultura y la Alimentación Organización de las Naciones Unidas/ Food and Agriculture Organization of the United Nations
F/S	Estudio de Factibilidad/ Feasibility Study
GORE	Gobierno Regional/Regional Government
HEC-HMS	Centros de Ingeniería Hidrológica Sistema de Modelación Hidrológica Método /Hydrologic Engineering Centers Hydrologic Modeling System Method
HEC-RAS	Centros de Ingeniería Hidrológica del Río de Análisis del Sistema Método /Hydrologic Engineering Centers River Analysis System Method
IGN	Instituto Geográfico Nacional/National Geographic Institute
IGV	Impuesto General a Ventas/General Sales Tax
INDECI	Instituto Nacional de Defensa Civil/National Institute of Civil Defense
INEI	Instituto Nacional de Estadística/National Institute of Statistics
INGEMMET	Instituto Nacional Geológico Minero Metalúrgico/National Geological and Mining Metallurgical Institute
INRENA	Instituto Nacional de Recursos Naturales/Natural Resources Institute
IRR	Tasa Interna de Retorno (TIR)/Internal Rate of Return
JICA	Japonés de Cooperación Internacional /Japan International Cooperation Agency
JNUDRP	Junta Nacional de Usuarios de Distritos del Perú/National Board of Peru

	Districts Users
L/A	Convenio de Préstamo/Loan Agreement
MEF	Ministerio de Economía y Finanzas/Ministry of Economy and Finance
MINAG	Ministerio de Agricultura/Ministry of Agriculture
M/M	Acta de la reunion/Minutes of Meeting
NPV	Valor Actual Neto (VAN)/NET PRESENT VALUE
O&M	Operación y Mantenimiento /Operation and maintenance
OGA	Oficina General de Administración/General Office of Administration
ONERRN	Oficina Nacional de Evaluación de Recursos Naturales/National Bureau of Natural Resource Evaluation
OPI (OPP)	Oficina de Programación e Inversiones/Programming and Investment Office (Oficina de Planificación e Prespuesto/Office of Planning and Budget)
PBI	Producto Bruto Interno/Gross Domestic Product
PE	Exp. Proyecto Especial (PE) Chira-Piura/ Exp. Special Project Chira-Piura
PES	Pago por Servicos Ambientales (PSA)/Payment for Environmental Services
PERFIL	PERFIL/PROFILE (Preparatory survey of project before investment)
Pre F/S	Estudio de Prefactibilidad /Pre-Feasibility Study
PERPEC	Programa de Encauzamiento de Ríos y protección de Estructura de Captación
PRONAMACHIS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos/National Program of River Basin and Soil Conservation Management
PSI	Programa de Sub Sectorial de Irrigaciones/Program of Sub Irrigation Sector
SCF	Factor de conversión estándar/Standard conversion factor
SENAMHI	Servicio Nacional de Meteorología y Hidrología/ National Service of Meteorology and Hydrology
SNIP	Sistema Nacional de Inversión Pública/National Public Investment System
UF	Unidad formuladora/Formulator unit
VALLE	Valle/Valley
VAT	Impuesto al valor agregado/Value-added tax

THE PREPARATORY STUDY ON PROJECT OF THE PROTECTION
OF
FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD
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CHAPTER 1 ENVIRONMETAL ASSESMENT AND SOCIAL CONSIDERATIONS IN PERU

1.1 The Need to Carry out a Socio Environmental Impact Assessment

In Peru, the National System for Environmental Impact Assessment Law (SEIA, in Spanish) was issued in 2001. This law establishes that it is mandatory for all public and private projects to get the "Environmental Certification", an authorization that is granted after the approval of a relevant Environmental Impact Assessment that matches the probable negative impacts resulting from a project execution. According to the EIA Law, it is the Ministry of the Environment's (MINAM) competence to issue such Environmental Certification; however, it currently lacks the power to do it, as this ministry was just established in 2008. For the time being, relevant environmental affairs entities are in charge of issuing the Environmental Certificate.

The General Environmental Affairs Directorate (DGAA, in Spanish) is the entity that evaluates and approves the Environmental Impact Assessment (EIA), and issues the Environmental Certification, as well. The National Public Investment System (SNIP, in Spanish) Law establishes that an Environmental Impact Assessment is necessary for all public investments.

1.2 Legal Framework

1) Legal Framework related to Environmental Impact Assessments

For the Environmental Certification to be granted, SEIA previously defines the request processes, the EIA instrument revisions and approvals, the project categorizations, based on the extent of negative impacts generated by project executions, the terms of reference for the EIA-semi detailed (EIA-sd) and EIA-detailed (EIA-d) developments, the EIA-sd and EIA-d report revisions, the Civil Participation, and the follow-up to, and control of any negative impacts. In addition, it is MINAM's competence to apply the SEIA. In 2008, SEIA was modified after the establishment of the Ministry of the Environment (MINAM).

The following Table lists the legal documents that are related to the Environmental Impact Assessment.

Table 1.1 **Legal Framework Related to the Environmental Impact Assessment**

Document Name	Year Issued	Description
National Public Investment System Law (Law No. 27293)	2000	This law creates the National Public Investment System that aims at optimizing the use of public resources devoted to investment.
National System for Environmental Impact Assessment Law (Law No. 27446)	2001	This law creates the National System for Environmental Impact Assessment, as a unique and coordinated system that identifies, prevents, supervises, controls, and corrects in advance any negative environmental impacts derived from human actions carried out during the investment project execution.
Rules of the SNIP Law and SNIP Attachments (S.D. No. 221-2006-EF, Policy No. 002-2007-EF/68.01)	2006 / 2007	These are the SNIP law rules.
Changes to SEIA Law statements: Articles 2, 3, 4, 5, 6, 10, 11, 12, 15, 16, 17, 18 (D.L. 1078)	2008	They change statements in SEIA Law Articles 2, 3, 4, 5, 6, 10, 11, 12, 15, 16, 17, 18. The Strategic Environmental Assessment (SEA) has been added. In addition, MINAM is entrusted to assess environmental impact studies.
SEIA Law Rules (S.D. No. 018-2009-MINAM)	2009	These are rules to the SEIA Law, and the following was noted: Article 11 specifies the existing environmental assessment (EIA) levels. Article 51 describes Civil Participation and Environmental Management Plan as requirements in these studies. In addition, Articles 74 and 75 state that a project holder is to be held accountable for all negative impacts that might be brought about by his project.
National Environmental Assessment and Supervision System Law (Law No. 29325).	2009	This law was to create the National Environmental Assessment and Supervision System that is in charge of the Environmental Assessment and Supervision Organism (OEFA, in Spanish) as the ruling entity. This system aims at ensuring the enforcement of the environmental legislation by all individuals or legal entities, as well as supervising and ensuring assessment and supervision, control and sanctioning activities with regard to environmental issues to be carried out in an independent, impartial, swift and efficient way by the various public entities.

Source: JICA Study Team

In 1995, MINAG published its "Guide for Terms of Reference Formulation in Environmental Impact Studies in the Agricultural Sector." In 2001, the SEIA Law was issued, and in 2009, the SEIA Rules were issued, as a foundational legal framework for environmental impact assessments in all sectors. In this sector, the 1995 MINAG Guide is mostly applied, but in case of any disagreements between the "MINAG Guide" and the "SEIA Law and Rules", the latter will prevail as the correct interpretation. It must be pointed out that at present (October 2011), the "1995 MINAG Guide" and the "SEIA Law and Rules" updating is in progress by this sector's DGAA.

Presentation Workshops for Environmental Impact Study Terms of Reference Formulation Guides in the Agricultural Sector

On November 19th, 2010, an Introduction Workshop for Environmental Impact Study Terms of Reference Formulation Guides in the Agricultural Sector was carried out by DGAA. The two DGAA Environmental Impact and Social Considerations Officials participated along with the JICA Study Team consultants.

- **Workshop Objective**: To present the "Environmental Impact Study Terms of Reference Formulation Guides in the Agricultural Sector", and consult the public audience. To determine the guide by including opinions and remarks generated in the workshop.
- **Participants**: MINAG officials and officials from other ministries, environmental impact specialist consultants, NGOs, professors, etc. Around 50 people total.
- **Program** (10:00 – 14:00)
  1. Workshop opening by Ms. Antonieta Noli Hinostroza, Engineer, General Director of Environmental Affairs.
  2. Guide presentation by Mr. Ricardo Gutiérrez Quiros, Biologist, Director of Agriculture Environmental Management
  3. Making up of teams and appointing team representatives

< Coffee Break >

  4. Team work (120 minutes)
  5. Presentations by Work Team Representatives (Input and Suggestions) (60 minutes)
  6. Conclusions and Recommendations
  7. Workshop Closing
- **Comments, Remarks, and Major Suggestions**
  - Terms of Reference are still to be developed. The Guide must be specifically prepared for the Agriculture sector projects.
  - Environmental standards for reference are still to be included.
  - An environmental impact assessment methodology is still to be justified. Assessment needs to be carried out both quantitatively and qualitatively.
  - A specification of the assessment and approval process for the environmental instruments in the Agriculture sector is desirable.

2) Legal Framework Related to Natural Area and Species Conservation.

Natural protected areas, conservation of natural resources, wild fauna and flora were MINAG's competence, until the establishment of the Ministry of the Environment in 2009. At present, natural protected areas and natural resource conservation are MINAM's competence, whereas wild fauna and flora conservation are still to be under the jurisdiction of MINAG's General Forest and Wild Fauna Directorate.

The table below shows the list of legal documents that are relevant to biological conservation.

Table 1.2 **Legal Framework Related to Biological Conservation**

Document Name	Year issued	Description
Framework Law for Private Investment Growth (D.L. 757, November 13th, 1991)	1991	It substantially changes several articles in the Environment and Natural Resource Code, in order to harmonically combine private investment, socioeconomic development, environmental conservation, and natural resource sustainable uses.
1993 Political Constitution of Peru	1993	Article 68 defines the concept of "Natural Protected Areas"
Environmental Impact Assessment for Works and Activities Law (Law No. 26786)	1997	It modifies some articles in D.L. 757, including, for example, Article 1 that points out that the Ministry of the Environment should be given notice by the competent sectoral authorities of any activities to be developed in its sector that might exceed standard or bearable contamination levels, and should be supported by EIAs.
Natural Protected Area Law (Law No. 26834)	1997	On the whole, natural protected areas make up the National System of Natural State - Protected Areas (SINANPE, in Spanish.) This system is managed by public Central Government institutions, decentralized Governments at regional level, and municipalities.

Document Name	Year issued	Description
Law to establish the National Environmental Fund (FONAM, in Spanish) (Law No. 26793)	1997	This law established the National Environmental Fund (FONAM, in Spanish), as an intangible trust that aims at funding plans, programs, projects, and activities leading to environmental protection, environmental management strengthening, and the sustainable use of natural resources and environmental heritage, by means of institutional financial mechanisms.
Organic Law for Natural Resource Sustainable Exploitation (Law No. 26821)	1997	Its major objective is to promote and regulate sustainable exploitation of natural, renewable, and non – renewable resources, by establishing a suitable framework for investment to be encouraged, and a dynamic balance to be kept between economic growth, natural resource and environmental conservation, and people's development.
Law for Biological Diversity Conservation and Sustainable Exploitation Law No. 26839)	1997	This law points out that the State is sovereign, and can adopt measures for biological diversity conservation and sustainable use. This implies preserving the diversity of ecosystems, species and genus, as well as keeping those essential ecological processes the species survival rely on.
Forest and Wild Fauna Law (Law No. 27308)	2000	It establishes conservation of forest and fauna resources, by specifying their rational use regime, by means of transforming and commercializing any resources derived from them.
Rules of the Natural Protected Area Law (S.D. No. 038-2001-AG)	2001	It consolidates the conceptual and legal framework for the development of protected natural areas to contribute to the provision of social, economic, environmental, educational, and cultural benefits to the local population within these areas' scope.
Rules of the Forest and Wild Fauna Law (S.D. No. 014-2001-AG)	2001	This Supreme Decree regulates the Forest and Wild fauna Law. It holds the general principles, definitions, competent organisms relevant t to these resources, as well as all management plans and ways of exploitation that are relevant to them.
National Environmental Management System Framework Law (Law No. 28245)	2004	This law defines the environmental control mechanisms and the role played by CONAM (MINAM) and the regional and local governments with regard to environmental conservation.
General Environmental Law (Law No. 28611)	2005	It defines the use and management of natural resources and environment. Article 25 defines EIA contents.
Categorization of wild fauna endangered species is approved (S.D. No. 034-2004-AG)	2004	Categorization of endangered species is defined by priority order, as follows: Critically endangered (CR), Endangered (EN), In vulnerable situation (VU), and Almost Endangered (NT) species.
Categorization of wild flora endangered species is approved (DC 043-2006-AG)	2006	Categorization of endangered species is defined by priority order, as follows: Critically endangered (CR), Endangered (EN), In vulnerable situation (VU), and Almost Endangered (NT) species.
D.L. that establishes the Ministry of the Environment (D.L. No. 1013, May 14th, 2008)	2008	MINAM's general function is to design, set up, execute, and supervise the environmental national and sectoral policy, by ruling it. Its competences involve the environmental sector, namely, the National Environmental Management System, the National Environmental Assessment System, the National Environmental Information System, and the National System of Natural State – Protected Areas. It also involves management of i) natural resources within its competence scope, ii) biodiversity, iii) climate change, iv) soil, and v) other thematic scopes established by law. The Environmental Assessment and Supervision Organism (OEFA, in Spanish) is established in the Ministry. This organism is in charge of supervision, control, and sanctions to environmental issues.

Source: JICA Study Team

3) Environmental Standards

In Peru, the following environmental standards are in place: The Environmental Quality Standards (EQS) that apply to all sectors, and the Maximum Permissible Limits (MPL) that are defined for each sector.

The EQS are environmental quality indicators: They measure concentration levels of elements, substances, physical, chemical, and biological parameters that are present in the air, water, or soil. At present (February 2011), only EQS for water have been approved. EQS for air, noise, and soil, are still under revision or waiting for their final approval.

The MPL measures concentration levels of elements, substances, physical, chemical, and biological parameters that are present in emissions, effluents, or discharges, as they are generated by a productive activity (mining, hydrocarbons, electricity, etc.). When set levels are exceeded, damages to health, human wellbeing, and environment might occur. Sectors with their own MPL include: The Ministry of Energy and Mines, the Ministry of Transportation and Communications; the Ministry of Housing, Construction and Sanitation; the Ministry of Health; the Ministry of Production (Industry and Fishery), and the Ministry of Agriculture (MINAG.) Ministries still lacking MPL or having MPL approvals in progress make use of the Ministry of Energy and Mines' MPL, as these are most strict.

Table 1.3 **Legal Framework Related to Environmental Standards**

Document Name	Year Issued
The Maximum Permissible Limits (MPL) for liquid effluents (D.R. No. 08-97-EM/DGAA) is approved	1997
Rules for National Environmental Noise Quality Standards (S.D. No. 085-2003-PCM)	2003
National Environmental Water Quality Standards (S.D. No. 002-2008-MINAM)	2008
Environmental Air Quality Standards are approved (S.D. No. 003-2008-MINAM)	2008

Source: JICA Study Team

4) Legal Framework Related to Social Considerations

The following table shows laws and rules related to security for workers, private land expropriations, archaeological remain conservation, and support to women and other vulnerable people. Item 2.1 especially details laws related to expropriations and archaeological remain conservations.

Table 1.4 **Legal Framework Related to Social Considerations**

Document Name	Year issued	Description
Industrial Safety, Security, and Health Rules (S.D. No. 009-2005-TR), Title IV, Chapter I: Employer Rights and Obligations	2005	This chapter explains that the contractor should develop a risk prevention plan for work risk management purposes during works. Both external and internal risks should be taken into account.
Law that regulates land transportation of materials and hazardous wastes (Law No. 28256)	2004	This law aims at regulating activities, processes, and operations for land transportation of materials and hazardous wastes, subject to prevention and people, environment, and property protection principles.
General Expropriation Law (Law No. 27117)	1999	Expropriation consists in forced transference of private property rights that is solely authorized by a specific law on behalf of the State, as issued by the Congress and upon initiative of the Executive, the Regions or Local Governments, and after a payment in cash of the property appraised value, as a compensation for probable damages. The State is the only beneficiary of any expropriations.

Document Name	Year issued	Description
General National Cultural Heritage (Law No. 28296)	2008	This law establishes national policies to defend, protect, promote, hold property of, and the legal regime and destination of those assets that make up the Nation's cultural Heritage.
Archaeological Research Rules (S.R. No. 004 – 2000 – ED)	2000	These Rules set the standards for archaeological research, in all its modalities, of those tangible assets that make up the National Cultural Heritage under the various established categories, as detailed under Article 1 of these Rules. They also point out that for archaeological site or cultural heritage conservation purposes, all investment projects should get the "Non – Existence of Archaeological Remains Certificate (CIRA, in Spanish), as granted by the National Technical Archaeology Commission.
Law 27558 – (Oct. 31st, 2001), Rural Child and Teenager Education Promotion Law	2001	Articles 8, 12, 25, and 27 foresees objectives and implementation actions for gender equality in rural education
Organic Law No. 27779 – Organic Law that changes Ministry organization structures and functions.	2002	This law changed the Executive's ministry structure, and as a result, the MINISTRY OF WOMEN'S AFFAIRS AND SOCIAL DEVELOPMENT – MIMDES – was established. MIMDES objectives include promoting equality between women and men and equal opportunities for women.
Law No. 27867, Organic Regional Government Law (Nov. 18th, 2002), as modified by Law 27902 (Jan. 1st, 2003)	2002	It establishes that Regional Governments should develop policies towards vulnerable population rights promotion.
Law No. 29597 – Ministry of Women's Affairs and Social Development Organization Structure and Functions Law	2010	This law states that MIMDES designs, proposes, and executes social and human development policies, by promoting gender equality and equal opportunities for women, children, senior citizens, and populations living in poverty and extreme poverty, discrimination, and exclusion conditions.

Source: JICA Study Team

5) Sectoral Legal Framework

The table below shows the sectoral legal framework:

Table 1.5 **Sectoral Legal Framework**

Document Name	Year Issued	Description
Law Promoting Investments in the Agricultural Sector (Decree Law No. 653)	1991	This law aims at creating the necessary conditions for private investment development in the agricultural sector. Articles 55, 56, and 57 establish alignments for the appointment of Hydrographic Basin Autonomous Authorities and the need for Master Plans to be prepared. Article 55 authorizes the establishment of Hydrographic Basin Autonomous Authorities for a better use and reclamation of the hydric resources in those basins having a regulated irrigation and/or an intensive and multisectoral water use.
Rules to the Law Promoting Investments in the Agricultural Sector (S.D. No. 048-91-AG)	1991	These rules set out the establishment, functions, powers, and funding of the Hydrographic Basin Autonomous Authorities. Activities of the Hydrographic Basin Autonomous Authorities will be regulated and supervised by the Ministry of Agriculture's General Water and Soil Directorate. Rules also establish functions to be performed by the Irrigation District Technical Administrator and the User Associations.
Ministry of Agriculture Organic Law (Decree Law No. 25902)	1992	This law establishes that it is the Ministry of Agriculture's responsibility to formulate, supervise, and assess the enforcement of nationwide policies, plans, and programs in the Agricultural Sector.
Guide to the formulation of Terms of Reference for Environmental Impact	1995	It aims at guiding the technicians, who are in charge of preparing the TOR, towards the expectations from these studies.

Document Name	Year Issued	Description
Studies in the Agricultural Sector (J.R. No. 021-95-INRENA)		It is convenient to take into account that the EIS is one component within a specific program or project; therefore, it must develop its own TOR. In addition, properly formulated TOR will ensure efficient EIS that will become supporting decision making instruments in the hands of relevant and competent environmental authorities in the sector.
D.L. that establishes the National Hydric Resource System (D.L. No. 1081)	2008	The law aims at articulating the State's actions towards an integrated and multisectoral hydric resource management, including the evaluation, appraisal, arrangement, allotment of the multisectoral, efficient, and sustainable use and reclamation of water as a resource; in this sense, the National Hydric Resource System was established.
D.L. promoting Hydric Resource Efficient Reclamation and Conservation (D.L. No. 1083)	2008	This law establishes a public need and a national interest in hydric resource conservation and efficient reclamation. It aims at establishing the legal framework to promote an efficient reclamation and conservation of hydric resources, by encouraging the development of a culture of efficient resource use among all the public or private hydraulic infrastructure users and operators.
D.L. creating the National Water Authority (D.L. No. 997)	2008	This law is about the establishment of the National Water Authority (ANA, in Spanish) and its objectives, and it also defines the role played by the Administrative Water Authority (AAA, in Spanish), and the Local Water Authority (ALA, in Spanish.)
Hydric Resource Law (Law No. 29338)	2009	The enactment of the Hydric Resource Law strengthens the National Water Authority (ANA, in Spanish), and enhances an efficient use of this resource. This law refers to the Basin Council terms, water rates, and User Associations

Source: JICA Study Team

1.3 Project Categorization by Socio Environmental Impact

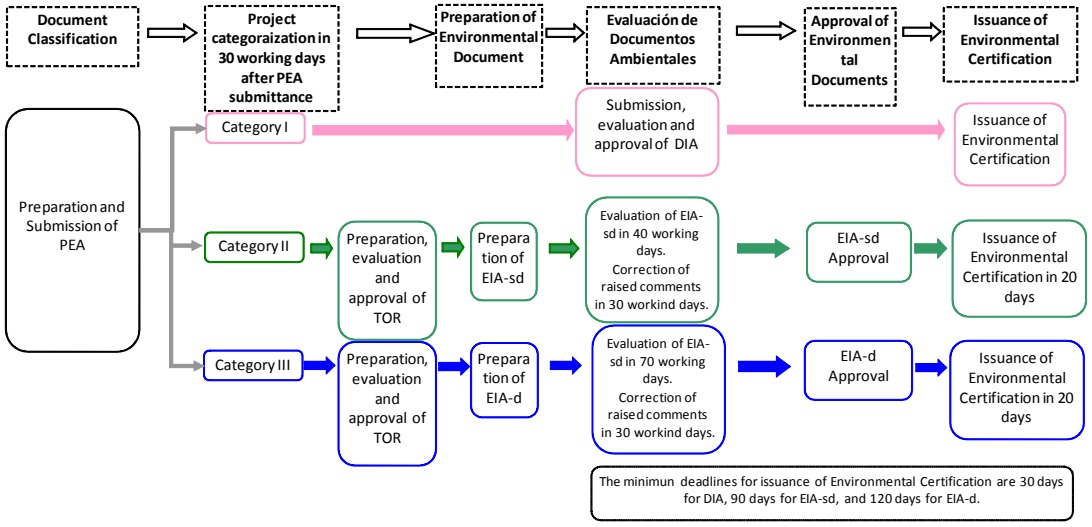
Projects are categorized in three scales, based on the significance level of the negative and positive impacts, and each sector has an independent competence on this categorization. The following table shows the environmental management instruments that are required for each category. The Project holder should submit the Environmental Impact Statement (DIA, in Spanish) for all Projects under Category I. The project holder should prepare an EIA-sd or an EIA-d if the Project is categorized under Category II or III, respectively, to be granted the Environmental Certification from the relevant Ministry Directorate.

Table 1.6 **Project Categorization and Environmental Management Instruments**

	Description	Required Environmental Management Instrument
Category I	It includes those Projects that when carried out, they cause no significant negative environmental impacts whatsoever.	PEA that is considered a DIA after the assessment for this category
Category II	It includes those Projects that when carried out, they can cause moderate environmental impacts, and their negative effects can be removed or minimized through the adoption of easily applicable measures.	Semi-Detailed Environmental Impact Assessment (EIA-sd)
Category III	It includes those Projects than can cause significant quantitative or qualitative negative environmental impacts because of their characteristics, magnitude and/or location. Therefore, a deep analysis is required to revise those impacts and set out a relevant environmental management strategy.	Detailed Environmental Impact Assessment (EIA-d)

Source: Prepared by the JICA Study Team based on the SEIA Law (2001)

The next graph shows the Environmental Document's Classification, the Environmental Document's Assessment, and the Environmental Certification.



Source: Prepared by the JICA Study Team based on the SEIA Regulations (2009)

Figure 1.1 **The Process to Obtain the Environmental Certification**

First, the Project holder applies for the Project classification, by submitting the Preliminary Environmental Assessment (PEA). The relevant sector assesses and categorizes the Project within the next 30 working days after the document's submission. The Project's PEA that is categorized under Category I becomes an EID, and those Projects categorized under Category II or III should prepare an EIA-sd or EIA-d, as applicable. There are cases in which the relevant sector prepares the Terms of Reference for these two studies, and submits them to the holder. There are other cases in which the holder prepares the Terms of Reference and these are approved by the relevant sector, based on the interview with DGAA. Number of working days required for EIA-sd revision and approval is 90, and number of working days required for EIS-d is 120; however, these maximum deadlines may be extended.

1.4 Environmental Impact Assessment

The minimum contents for Environmental Impact Assessment and the methodology based on the SEIA Law and its rules are explained below. It is the holder's responsibility to submit both the Preliminary Environmental Assessments (PEA) and the environmental impact studies to the relevant authority, but only the consulting firms or registered consultants that are registered in the relevant sector, are authorized to prepare these documents.

(1) Preliminary Environmental Assessments (PEA)

The contents of the PEA are detailed in the Table below. The study can be prepared mainly with secondary information (books, previous studies, journals, etc.), carrying out a field study is useful, though not mandatory.

Table 1.7 **PEA Minimum Contents**

I.	General Data
II.	Project Description
	2.1 Project General Data 2.2 Project Characteristics Service Infrastructures, Access Roads, Raw Materials and Inputs, Processes, Prepared Outputs, Effluents and/or Liquid Wastes, Solid Wastes, Hazardous Substance Managements, Atmospheric Emissions, Noise Generation, Radiation Generations, Other Type of Wastes
III.	Aspects in the Physical, Biotic, Social, Cultural, and Economic Environments
IV.	Citizen Participation Plan
V.	Description of the Probable Environmental Impacts
VI.	Prevention, Mitigation, or Correction Measures for Environmental Impacts
VII.	Follow – Up and Control Plan
VIII.	Closure or Abandonment Plan
IX.	Contingency Plans
X.	Execution Schedule
XI.	Implementation Budget

Source: Prepared by the JICA Study Team based on the SEIA Rules (2009)

(2) Semi-Detailed Environmental Impact Assessment (EIA-sd)

With regard to EIA-sd, a field study is mandatory in addition to office work. At the same time, further detailed data on the works plan are required, and an Environmental Management Plan should be taken into account to prevent, avoid, and mitigate any probable negative impacts in the case of programs.

Table 1.8 **EIA-sd Minimum Contents**

1. Executive Summary
2. Project Description a) Project General Background b) Legal and Administrative Reference Framework c) Project Objective and Justification d) Project Geographical and Political Location in UTM Coordinates e) Project Description by Stages f) Project Magnitude. Area of Influence g) Life Time and Estimated Investment Amounts h) Description of Information Gathering Stage i) Description of Construction Stage j) Description of Operation and Maintenance Stage k) Description of Abandonment and Closure / Phasing Out Stage
3. Environmental Baseline a) Project Location, Extension, and Site. Direct and Indirect Areas of Influence. Description of the Physical Component / Meteorology, Climate, and Life Zones / Geology and Geomorphology / Hydrography, Hydrology b) Hydrogeology and Hydric Balance / Soil, Capacity of Land Major Use and current Soil Use / Air, Soil, and Water Quality / Other Existing Activities in the Project Area / Other Aspects to be defined by the Relevant Authority, Description of the Biological Component /the Biological Diversity and its Components / Flora and Fauna / Fragile Ecosystems c) Natural Protected Areas or Buffering Zones / landscape units in the Project area / Aspects or factors that are a threat to the habitat or ecosystem preservations / Other Aspects to be Defined by the Relevant Authority. d) Description of the Social, Economic, Cultural, and Anthropological Component Demographic, Social, Economic, Labor – related and other similar Indices Basic Services and Infrastructure, Quality of Life, and Traditions in communities around the Project area Description and Analysis of the Territory's Current Use Other Aspects to be defined by the Relevant Authority e) Presence of Archaeological, Historical, and Cultural Remains f) Identification of the Vulnerability Aspects g) Preparation of the General Cartography (Location Maps, Theme Maps, etc.)
4. Citizenship Participation Plan
5. Environmental Impact Characterization Identification, Appraisal, Appraisal, and Classification by Order of importance of both Positive and Negative

Environmental Impacts a) Impacts will be identified, by analyzing the baseline's environmental situation, as it is compared to the Project's description. b) Impacts are appraised, as direct, indirect, cumulative, and synergic impacts are prevented; and any induced risks that might generate on the baseline's environmental components are appraised. c) Use of representative variables for both positive and negative impact identifications d) Effective EQS and MPL, as well as international standards, as approved by MINAM, are taken into account. The following will be taken into account for both positive and negative environmental impact identifications and appraisals: The physical environment, the biological environment, social, economic, and cultural aspects (especially those related to quality of life for the affected populations), the inclusion of any arrangement plans for lands or areas that are under official protection, the characterization of the area of influence, with regard to the existing infrastructure; the land potentialities and the soil current use; the landscape and any other tourist aspects, any other aspects with regard to the baseline, to be defined by the relevant authority.
6. Environmental Management Strategy a) Environmental Management Plan (EMP) b) Environmental Vigilance Plan c) Contingency Plan d) Abandonment and Closure / Phasing Out Plan e) Schedule and Budget f) Summary Table Showing Environmental Commitments
7. Introduction of Consulting Firm Names and companies of the practitioners and technicians involved in the sd – EIA preparation
8. Other Technical Considerations to be Defined by the Relevant Authority **Attachments**

Source: Prepared by the JICA Study Team, based on the SEIA Rules (2009)

(3) Detailed Environmental Impact Assessment (EIA-d)

Both office work and field work are required to develop an EIA-d, and the minimum terms for revision and approval are longer than those for the EIA-sd, as the report contents includes further detailed information. Required information for this type of study is primary information. For example, data obtained for the environmental baseline preparation should be gathered in the field work, as this study is being prepared.

Table 1.9 **EIA-d Minimun Contents**

1. Executive Summary
2. Project Description a) Background b) Legal and Administrative Reference Framework c) Project Objective and Justification d) Project Geographical and Political Location in UTM Coordinates e) Project Description by Stages f) Area Required by the Project, in terms of Design g) Definition of both Direct and Indirect Area of Influence, Magnitude, Productive Characteristics, and any Potential Environmental Impacts h) Evaluation of the Project Alternatives from an Environmental, Economic, and Socio Cultural Point of View i) Project Life Time and Estimated Investment Amounts j) Description of Information Gathering Stage k) Description of Construction Stage l) Description of Operation and Maintenance Stage m) Description of Abandonment and Closure / Phasing Out Stage
3. Environmental Baseline a) Project Location, Extension, and Site. Direct and Indirect Areas of Influence. Macro - and Micro - Location Study. b) Description of the Physical Component Meteorology, Climate, and Life Zones Geology and Geomorphology, Stratigraphy, and Geochemistry Hydrography, Hydrology, Hydrogeology and Hydric Balance Soil, Capacity of Land Major Use and current Soil Use Air, Soil, and Water Quality

Other Existing Activities in the Project Area Other Aspects to be defined by the Relevant Authority c) Description of the Biological Component the Biological Diversity and its Components Flora and Fauna Fragile Ecosystems Natural Protected Areas or Buffering Zones Landscape units in the Project area Aspects or factors that are a threat to the habitat or ecosystem preservations d) Description of the Social, Economic, Cultural, and Anthropological Component Territorial Distribution and Spatial Structure of Territorial Relations Demographic, Social, Economic, Labor – related and other similar Indices Basic Services and Infrastructure, Quality of Life, and Traditions in communities around the Project area Description and Analysis of the Territory's Current Use Presence of Productive Activities Other Aspects to be defined by the Relevant Authority e) Presence of Archaeological, Historical, and Cultural Remains f) Vulnerability Aspects and Hazards of a Natural or Anthropogenic Nature g) Preparation of the General Cartography (Location Maps, Theme Maps, etc.)
4. Citizenship Participation Plan
5. Environmental Impact Characterization Identification, Appraisal, Appraisal, and Classification by Order of importance of both Positive and Negative Environmental Impacts. Appraisal should be carried out by using applicable quantitative methods. a) Impacts will be identified, by analyzing the baseline's environmental situation, as it is compared to the Project's description. b) Impacts are appraised, as direct, indirect, cumulative, and synergic impacts are prevented; and any induced risks that might generate on the baseline's environmental components are appraised. An emphasis is put on the relevance of methodologies used in terms of i) the nature of the action taken, ii) the affected environmental variables, and iii) the environmental characteristics in the area of influence. c) The use of representative variables for both positive and negative impact identifications. d) Effective EQS and MPL, as well as international standards, as approved by MINAM, are taken into account. The following will be taken into account for both positive and negative environmental impact identifications and appraisals: The physical environment, the biological environment, social, economic, and cultural aspects (especially those related to quality of life for the affected populations), the inclusion of any arrangement plans for lands or areas that are under official protection, the characterization of the area of influence, with regard to the existing infrastructure; the land potentialities and the soil current use; the landscape and any other tourist aspects, any other aspects with regard to the baseline, to be defined by the relevant authority. In addition, the following will be taken into account for the appraisal: The positive, negative, or neutral character of the impacts. Their extent of disturbance to environment. Their environmental significance, their occurrence risk, their extension, their duration, their reversibility, the chances for biological diversity enhancement.
6. Environmental Management Strategy a) Environmental Management Plan (EMP) b) Environmental Vigilance Plan c) Compensation Plan d) Community Relations Plan e) Contingency Plan f) Abandonment and Closure / Phasing Out Plan g) Schedule and Budget h) Summary Table Showing Environmental Commitments
7. Environmental Impact Economic Appraisal
8. Introduction of Consulting Firm Names and companies of the practitioners and technicians involved in the d – EIA preparation
9. Other Technical Considerations to be Defined by the Relevant Authority **Attachments**

Source: Prepared by the JICA Study Team, based on the SEIA Rules (2009)

1.5 Public Consultation

During the EIA-sd and EIA-d preparation processes, Public Consultations are necessary to be developed and carried out for Projects in the Agricultural Sector. It is the Project holder's responsibility to undertake them. The objective of preparing and carrying out Public Consultation is

to establish suitable communication channels between the Project holder and the community in the area of influence. The minimum requirement for Public Consultation to be carried out is that the attendance of at least one (1) person from the Project's area of influence is ensured, according to the interview with DGAA. The Project holder is to take on all costs generated from the preparation of the Public Consultation. In addition, the Project holder is to strictly follow the preparation procedure for Public Consultation.

Table 1.10 **Procedure to carry out Public Hearings**

No.	Description of the Procedure Prior to a Public Hearing
1	MINAG's DGAA will propose the day, time, and place for the Project holder to support the environmental management instrument (EIA-sd, EIA-d, or EMP) in Public Consultation.
2	The Project holder will make the Consultation publicly known, via a publication in the Official Newspaper, "*El Peruano*", and another newspaper in the Project region, no less than 10 days before the scheduled date for the Public Consultation.
3	The holder should communicate in writing about the public hearing to SENASA, DIGESA, ALA, SERNANP, the Technical Forest and Wild Fauna Administration (ATFFS, in Spanish), the local Municipality, the INC Authorities (Ministry of Cultural Affairs), and the civil organized society.
4	The holder will prepare at least 30 copies of the Environmental Management Instrument's Executive Summary for their handing out during the Public Consultation.
5	People interested in attending the Public Consultation will register at the premises, as defined by the holder, MINAG's DGAA office, and the Institutional email of the DGAA official, who is in charge of the Public Consultation.

Source: Prepared by the JICA Study Team, based on the Terms of Reference for the Public Hearing of the Agricultural Sector's Management Instruments

The Public Consultation starts with a Project's explanation, in terms of the environmental impact it generates, then there are two rounds of questions and answers, and finally, the Public Consultation's Minutes is prepared and subscribed. The Table below shows the Public Consultation Program and an estimated duration of each of its activities. Experts in charge will have to submit the Public Consultation Report, plus all related documents, to MINAG's DGAA within the next 15 working days. MINAG's DGAA will submit a copy of the Public Consultation Report to the Project holder, informing about inputs, suggestions, and remarks made at the Public Consultation. In case there are any remarks, the holder of the environmental management instrument's appraisal will have to submit the relevant Remarks Solution within the next 15 calendar days after acknowledgement of receipt of the Public Consultation Report.

Table 1.11 **Public Consultation Programs**

	Program Description
1	Introduction of the Public Consultation, by MINAG's DGAA Board Chair
2	Project introduction, by the Project holder
3	Project description, by the Consulting Firm that is in charge of the Environmental Management Instrument's preparation
4	Questions and Answers – 1st Round
5	Questions and Answers – 2nd Round
6	Introduction of supplementary documents
7	Preparing and reading the Public Consultation Minutes
8	Subscription of the Public Consultation Minutes

Source: Prepared by the JICA Study Team, based on the Terms of Reference for the Public Hearing of the Agricultural Sector's Management Instruments

1.6 National Public Investment System and EIAs

Under the National Public Investment System (SNIP, in Spanish), the Project is categorized based on its investment amount; therefore, the required information varies. As previously mentioned in this report, an Environmental Certification is necessary for all public investment Projects (The SEIA law). Relevant environmental instruments for each type of SNIP study are explained below.

A study at "Perfil" level is required for all investment Projects amounting less than PEN 10 million. At this stage, the project holder (DGIH in this Program) prepare the PEA (Preliminary Environmental Assessment) based on the SEIA law, and this report approved by the DGAA (in this case) should be attached to the Perfil report. In the case of that the Project is categorized as II or III, the project holder should do EIA-sd or EIA-d and obtain the Environmental Certification until the start of the construction.

A study at "Perfil" level is also required for all investment Projects amounting more than PEN 10 million. Having approved the Perfil report, the F/S study is required to obtain the feasibility of the project. The F/S report should contain the results of the DIA, EIA-sd or EIA-d approved by the corresponding entity.

Table 1.12 **SNIP Study Level and Environmental Assessment**

		PROJECT PIP <10 M	PROJECT PIP >10 M	ENVIRONMENTAL IMPACT
Legal Framework		SNIP	SNIP	SEIA
Stap 1	Nivel of Study	PERFIL	PERFIL	EAP
	Result	FEASIBILITY	Approval of Perfil for F/S Study	ENVIRONMENTAL CATEGORIZATION
Stap 2	Nivel of Study		F/S	DIA / EIA-sd / EIA-d
	Result		FEASIBILITY	ENVIRONMENTAL CERTIFICATION

Source: JICA Study Team

CHAPTER 2 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECTS IN 6 BASINS

2.1 Additional Aspects of the Base-line in all 6 Basins in the Program

Significant points on environmental impacts and social considerations to the general aspects, as detailed in Chapter 2 of the Program Perfil are summarized here.

2.1.1 Natural Protected Areas

Natural Protected Area categories under National Administration, according to their management objectives, include: National Parks, National Sanctuaries, Historical Sanctuaries, National Reserves, Landscape Reserves, Wildlife Sanctuaries, Community Reserves, Protected Forests, Hunting Reserves, and Reserved Zones (RZ). These natural protected areas are under National Administration, and make up the National System of Natural State - Protected Areas (SINANPE, in Spanish.) There are 69 Natural Protected Areas in Peru (as of October, 2010), and their total area is 185,949.91km^2. It must be highlighted that investment points under this Program are not included in these Natural Protected Areas.

2.1.2 Species in the Red List

Endangered species are classified in order of priority and based on the UICN categorization, as follows: Categorization of endangered species is defined by priority order, as follows: Critically endangered (CR), Endangered (EN), In vulnerable situation (VU), and Almost Endangered (NT) species.

The Acacia Macramantha is found in the area of influence along the Chira River. This species is registered in the Red List under the NT categorization. In addition, birds, such as the Andean flamingos / parihuanas (*Phoenicopterus Chiensis*) migrate from the Chira and Piura River basins, from November to March, and are also registered under the NT category. No further flora or fauna appearing in the Red List have been found along the remaining basins in the Program.

Andean flamingos / parihuanas
Source: JICA Study Team (February, 2011. Close to River Chira's km. 97 point)

2.1.3 Indigenous Peoples

In Peru, the National Institute for Andean, Amazon, and African Peruvian Peoples (INDEPA, in Spanish) promotes socioeconomic development for Andean, Amazon, and African Peruvian people. No indigenous communities are found within the area of influence of all 6 basins in the Program.

2.1.4 Land Acquisition

In Peru, the State is the only entitled to acquire private land property for public project executions, according to the General Expropriations Law that defines the process to be followed for land expropriations. Once the Project's need is known, an expropriation law is issued within a 60-day term. Once the term is due, a Resolution is issued for the expropriation's execution. Within the next 5 days, the Project holder sends the National Letter with an offer amounting the land's commercial value plus 5% as a compensation. The land owner may either accept or reject the proposal within the next 15 days. In the event the owner does not accept the proposal, arbitration takes place. If the proposal is accepted, the State should execute payment of the proposed cost within the next 45 days. After the State has paid the total amount, possession takes place. If the State refuses to pay for the compensation, the case goes to Arbitration.

In the event the land is owned by a community, the Project holder must come to an agreement with the community that holds the land, with regard to compensation from an agricultural / farming point of view.

The following two points should be taken into account in the Project:

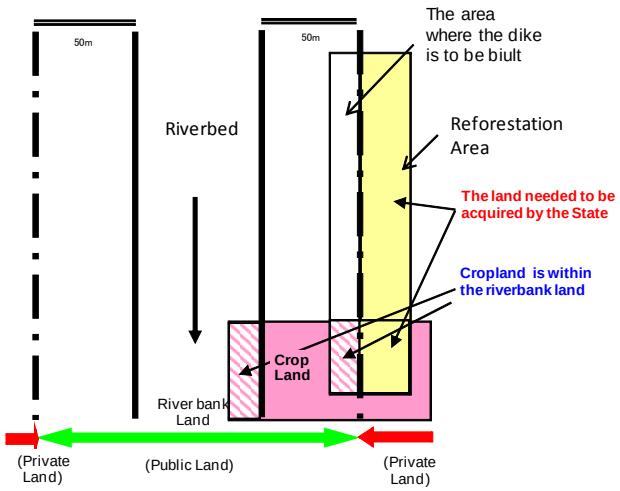
First, the Project site is located in areas where boundaries between riverbank areas and private land are not defined. According to the Rules in the Maritime, River, and Lake Activity Control and Vigilance Law, seashore land on the coast - up to 50 meters measured from the highest sea tide -, and riverbank and lake shore areas along navigable rivers and lakes - up to the highest ordinary measured flood -, all belong to the State. However some Project areas along the 6 basins are located within land used as farming land, and are not within riverbank land boundaries. Riverbank land boundaries that are owned by the State and private land are clearly defined along the Cañete and Chincha River basins. However, there are a few investment points along the Chira and Pisco Rivers in the area with no boundary definitions. There are no available data on the Yauca River basin boundaries. The table below shows the areas with defined riverbank and private land boundaries, as well as those points that fail to be defined either as State or private.

Table 2.1 **Areas with and without Clear Riverbank and Private Land Boundaries**

Basins	Areas with Clear Riverbank and Private and Boundaries	Investment Points Located beyond those Areas with Defined Boundaries.
Chira River	Area from 64.0km to 98.5km	Chira1, Chira2, Chira3
Cañete River	Area from 0.0km to 27.40km	-
Chincha River	Area from 0.0km to 25.00km	-
Pisco River	Area from 0.0km to 34.50km	Pi5, Pi6
Yauca River	No available information.	Ya1, Ya2, Ya3, Ya4, Ya5, Ya6
Majes-Camaná River	No available information.	MC1, MC2, MC3, MC4, MC5, MC6, MC7

Source: JICA Study Team

Second, there are riverbank areas that have been invaded and used up as farming land.



Source: Prepared by the JICA Study Team

Figure 2.1 **An Example of Cropland Located in Riverbank Land**

For example, at the "Mochica" intake point on the Yauca River, between km. 25 and km. 25.7 approximately, a landowner has crossed the land boundary, and has invaded the riverbed with a subsequent illegal progressive river channeling. The River Users' Association has already filed claims, by submitting their meeting minutes at the Mochica Irrigators' Commission, and these documents have already been submitted to the relevant authorities, namely, ALA and ANA. However, no measure for this problem has been taken by ALA and ANA (March, 2012).

Source: JICA Study Team (November 26th, 2010)

2.1.5 Crop Year in the Project Area

The projects sites of this program are located in agricultural area generally. The main crop of each basin and the crop year will be shown in following section, based on the interview with the irrigation associations of each basin and Agricultural Information Office of each regional government. The crop with bold letter is the main crop in each basin. The busy farming seasons in each basin is also shown based according to the information from the irrigation associations. The cultivate type is categorized as permanent, temporary and semi permanent.

(1) The Chira River Basin

The main crop in the Chira river basin is cotton. The busy farming season in this basin is from March to June.

Table 2.2 **Crop year of the Chira River Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun
Chira Basin	Yellow corn	Temporary	5	Sowing												
				Harvest												
	Cotton	Temporary	7	Sowing												
				Harvest												
	Chala corn	Temporary	5	Sowing												
				Harvest												
	Camote	Temporary	5	Sowing												
				Harvest												
	Apple	Permanent	12	Sowing												
				Harvest												
	Vine	Permanent	12	Sowing												
				Harvest												
	Mandarin	Permanent	12	Sowing												
				Harvest												
	Potato	Temporary	5	Sowing												
				Harvest												
	Yuca	Temporary	8	Sowing												
				Harvest												
	Avocado	Permanent	12	Sowing												
				Harvest												

Source: Agricultural Information Office - Piura

Month of low flow
Month of high flow
Month of extraordinary flow

(2) The Cañete River Basin

The main crops in the Cañete river basin are yellow corn and cotton. Camote (sweet potato), vine and apple follows them. The busy farming season in this basin is from March to June.

Table 2.3 **Crop year of the Cañete River Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun
CAÑETE Basin	**Yellow corn**	Temporary	5	Sowing												
				Harvest												
	Cotton	Temporary	7	Sowing												
				Harvest												
	Chala corn	Temporary	5	Sowing												
				Harvest												
	Camote	Temporary	5	Sowing												
				Harvest												
	Apple	Permanent	12	Sowing												
				Harvest												
	Vine	Permanent	12	Sowing												
				Harvest												
	Mandarin	Permanent	12	Sowing												
				Harvest												
	Potato	Temporary	5	Sowing												
				Harvest												
	Yuca	Temporary	8	Sowing												
				Harvest												
	Avocado	Permanent	12	Sowing												
				Harvest												

Source: Agricultural Information Office - Lima

Month of low flow
Month of high flow
Month of extraordinary flow

(3) The Chincha river basin

The main crop in the Chincha river basin is cotton. Corn, alfalfa and artichoke are other important crop in the basin. The busy farming season is from April to July.

Table 2.4 **Crop year of the Chincha River Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun
CHINCHA Basin	**Cotton**	Temporary	8	Sowing												
				Harvest												
	Yellow corn	Temporary	5	Sowing												
				Harvest												
	Vine	Permanent	12	Sowing												
				Harvest												
	Artichoke	Semi-Permanent	12	Sowing												
				Harvest												
	Asparagus	Semi-Permanent	12	Sowing												
				Harvest												
	Alfalfa	Permanent	12	Sowing												
				Harvest												
	Avocado	Permanent	12	Sowing												
				Harvest												
	Camote	Temporary	5	Sowing												
				Harvest												
	Pumpkin	Temporary	5	Sowing												
				Harvest												
	Mandarin	Permanent	12	Sowing												
				Harvest												

Source: Agricultural Information Office - Ica and Pisco

Month of low flow
Month of high flow
Month of extraordinary flow

(4) The Pisco River Basin

The main crop in the Pisco river basin is cotton and the second one is alfalfa. The busy farming season in this basin is from March to July.

Table 2.5 **Crop year of the Pisco river Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun
PISCO Basin	**Cotton**	Temporary	8	Sowing												
				Harvest												
	Alfalfa	Semi-Permanent	12	Sowing												
				Harvest												
	Yellow corn	Temporary	5	Sowing												
				Harvest												
	Choclo corn	Temporary	4	Sowing												
				Harvest												
	Asparagus	Semi-Permanent	12	Sowing												
				Harvest												
	Tangelo	Permanent	12	Sowing												
				Harvest												
	Chili	Temporary	5	Sowing												
				Harvest												
	Tomate	Temporary	5	Sowing												
				Harvest												
	Vine	Permanent	12	Sowing												
				Harvest												
	Beans	Temporary	7	Sowing												
				Harvest												

Source: Agricultural Information Office - Ica and Pisco

Month of low flow
Month of high flow
Month of extraordinary flow

(5) The Yauca River Basin

The main crop in the Yauca river basin is Olive. Alfalfa and other crops are cultivated in the partial agriculture land. The busy farming season in this basin is from April to August.

Table 2.6 **Crop year of the Yauca River Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
YAUCA Basin	**Olive**	Permanent	12	Sowing												
				Harvest												
	Alfalfa	Semi-Permanent	12	Sowing												
				Harvest												
	Cotton	Temporary	9	Sowing												
				Harvest												
	Yellow corn	Temporary	5	Sowing												
				Harvest												
	Camote	Temporary	5	Sowing												
				Harvest												

Source: Regional Government of Arequipa - Agricultural Information Office

Month of low flow
Month of high flow
Month of extraordinary flow

(6) The Majes – Camaná river basin

The Majes – Camaná river basin is the rice producing region. Beans and other crops are cultivated also. The busy farming season in this basin is from January to May.

Table 2.7 **Crop year of the Majes river Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
CAMANA Basin	**Rice**	Temporary	5	Sowing												
				Harvest												
	Bean	Temporary	5	Sowing												
				Harvest												
	Onion	Temporary	4	Sowing												
				Harvest												
	Wheat	Temporary	5	Sowing												
				Harvest												
	Pumpkin	Temporary	4	Sowing												
				Harvest												
	Chala corn	Temporary	4	Sowing												
				Harvest												
	Choclo corn	Temporary	5	Sowing												
				Harvest												
	Potato	Temporary	5	Sowing												
				Harvest												
	Tomate	Temporary	4	Sowing												
				Harvest												
	Watermelon	Temporary	5	Sowing												
				Harvest												

Source: Regional Government of Arequipa - Agricultural Information Office

Month of low flow
Month of high flow
Month of extraordinary flow

Table 2.8 **Crop year of the Camaná River Basin**

	Crop		Vegetative period (month)	Activity	Crop year											
	Item	Type			Jul	Aug	Sep	Oct	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun
MAJES Basin	**Rice**	Temporary	5	Sowing												
				Harvest												
	Wheat	Temporary	5	Sowing												
				Harvest												
	Potato	Temporary	4.5	Sowing												
				Harvest												
	Alfalfa	Semi-Permanent	12	Sowing												
				Harvest												
	Bean	Temporary	5	Sowing												
				Harvest												
	Choclo corn	Temporary	5	Sowing												
				Harvest												
	Chala corn	Temporary	4	Sowing												
				Harvest												
	Purple corn	Temporary	5	Sowing												
				Harvest												
	Onion	Temporary	4	Sowing												
				Harvest												
	Artichoke	Temporary	7	Sowing												
				Harvest												

Source: Regional Government of Arequipa - Agricultural Information Office

Month of low flow
Month of high flow
Month of extraordinary flow

2.1.6 Archaeological Conservations Areas

In Peru, all public and private Projects must get the "Non-Existence of Archaeological Remains Certificate (CIRA, in Spanish) for cultural asset / heritage conservation purposes. It is the Ministry of Cultural Affairs' National Technical Archaeology Commission that grants the CIRA. After the Project sites have been defined, the Project holder should submit the following documents to the Ministry of Cultural Affairs, for the application process for a CIRA grant to get started: 1) Application form, 2) Copies of the location drawings and outline drawings, 3) voucher, 4) Archaeological Assessment Certificate.

2.1.7 Women in all 6 Basins of the Project Area

Under this item, information about women's conditions in all 6 basins will be provided, as well as their participation in the User Associations and Irrigator Commissions and their accessibility to training workshops, as organized by ANA, ALA, and the Regional Governments.

1) The Chira River Basin

Women participate at the Commission meetings on a regular basis. Some women participate at the training workshops; this means they are not excluded from social involvement. However, most women cannot participate at the workshops, as they are immersed in everyday life chores. There are some women (social aid – focused) organizations along the Chira River basin, namely: *Vaso de Leche* (Glass of Milk), Mothers' Committee

2) The Cañete River Basin

Women along the Cañete River basin participate at the commission meetings, but very few participate at the training workshops, as they are not called to them. There are some women (social aid – focused) organizations along the Cañete River basin, namely: *Vaso de Leche*, Mothers'

Committee, etc.

3) The Chincha River Basin

Women along this basin are devoted to farming activities, and participate at the Commission meetings on a regular basis. However, due to a lack of information and because of their everyday chores, very few women have participated at the training workshops. There are some women (social aid – focused) organizations along the Chincha River basin, such as Mother's Clubs, The Chincha Women's Association, *Vaso de Leche*, and the Mothers' Committee.

4) The Pisco River Basin

The women along the Pisco River basin participate at the Commission meetings. However, one of the attendants expressed that little priority is currently being given to women's participation in the workshops, in comparison to how women's participation was viewed in the past. There are some women (social aid – focused) organizations along the Pisco River basin, such as *Vaso de Leche*, Women's Clubs, Sports Clubs, Vigilance Committees, and a Soup kitchen.

Source: JICA Study Team (February 11th, 2010)

5) The Yauca River Basin

Some women participate at the Commission meetings on a regular basis, and other women do not attend at all. Reasons for absence usually include: not being called, and meetings being held during working hours, between 7:00-11:00 and / or 13:00-17:00. There are some women (social aid – focused) organizations along the Yauca River basin, such as a soup kitchen, *Vaso de Leche*, and some church-related (faith-based) organizations.

6) Majes-Camaná River Basin

The men participate the Commission Regular Meeting than the women. That is because the most of land owners are men. However there are women who participate the meeting regularly. In the Mejes-Camaná basin, there are women organizations such as Soup Kichen, *Vaso de Leche*, Mothers' Club.

2.2 Draft Environmental Assessment for all 6 Basins

The JICA Study Team subcontracted a local Consultant (CIDE Ingenieros S.A.),and a Preliminary Environmental Assessment (PEA) was carried out, from December 2010 to January 2011 and from September to October 2011. The PEA Reports for Chira Basin, Cañete Basin, Chincha Basin, and Pisco Basin. The PEA Report of Majes-Canamá Basin ins under the DGAA revision on May 2012.

This item details the DEA results, based on the following reports:

- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Chira River; Sullana-Paita Province, Piura Region" Project;
- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Cañete River; Cañete Province, Lima Region" Project;
- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Chico and Matagente Rivers; Chincha Province, Ica Region" Project;
- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Pisco River; Pisco Province, Ica Region" Project;
- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Yauca River; Caraveli Province, Arequipa Region" Project; and
- Preliminary Environmental Assessment to the "Riverbank Protection Construction for Overflowing and Flooding Controls along the Majes-Camaná River; Castilla y Camaná Province, Arequipa Region" Project.

2.2.1 Works Description

Planned works include: Existing levee improvements, dike setup, riverbed unclogging (silt removal), undermining protection, intake and carrier improvement / repair, and riverbed extension. The table below describes the "Specific Works" ("*Puntos de Obras*") to be taken into account in the Preliminary Environmental Assessment for Environmental Impact on all 6 basins under study.

Table 2.9 **Works Description**

	Work point			Objectives	Measure	Dimensions	Size of constructions
Río Chira	**Chira 1**	0.0k-4.0k	Erosión ribereña	Cultivos Depósito del Gas Natural	Mejoramiento de dique	Altura; 2.0m Gradiente; 1:2 Longitud; 4,000m	0.0km～4.0km (Margen.I.)
	Chira 2	11.75k-12.75k	Erosión ribereña	Carretera		Altura; 2.0m Gradiente; 1:2 Longitud; 1,000m	11.75km～12.75km (M.D.)
	Chira 3	24.5k-27.0k	Erosión ribereña	Cultivos		Altura; 2.0m Gradiente; 1:2 Longitud; 2,500m	24.5km～27.0km (M.D.)
	Chira 4	64.0k-68.0k	Bocatoma	Cultivos	Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,000m	64.0km～68.0km (totalidad)
Río Cañete	**Ca 1**	4.3km	Punto angosto	Puente vial	Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,000m	4.0km～5.0km (totalidad)
	Ca 2	6.8k～8.0k	Punto de inundación	Cultivos(Manzana, uva, algodón, etc)	Conformación de dique	Altura; 2.0m Gradiente; 1:2 Longitud; 1,200m	6.5km～8.1km (M.D.)
	Ca 3	10.25k	Punto angosto		Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,000m	10.0km～11.0km (totalidad)
	Ca 4	24.5k	Bocatoma		Mejoramiento de la bocatoma	Ancho de la presa; 150m Altura de la presa; 3.0m Grosor de la presa; 2.0m	24.25km～24.75km (totalidad)
	Ca 5	25.0k, 26.25k	Erosión ribereña	carretera	Defensa contra la socavación	Altura; 2.0m Gradiente; 1:2 Longitud; 750m	24.75km～26.5km (M.D.)
Ríos Chico y Matagente (Chincha)	**Chico 1**	C-3.5～5.0k	Punto de inundación	Cultivos (algodón, uva) Zonas urbanas	Conformación de dique	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 3,000m (1,500+1,500)	3.0km～5.1km (totalidad)
	Chico 2	C-15k	Bocatoma		Mejoramiento de la bocatoma Ampliación del cauce	Ancho de la presa; 100m Altura de la presa; 3.0m Grosor de la presa; 2.0m	14.8km～15.5km (totalidad)
	Chico 3	C-24k	Estructurareparti dora		Mejoramiento de partidor (reparación de la escructura existente, obras de encausamiento de rio, extensión de muro guia)	Ancho de la presa; 70m Altura de la presa; 3.0m Grosor de la presa; 2.0m	24.2km～24.5km (totalidad)
	Ma 1	M-3.0k～4.5k	Punto de inundación		Conformación de dique	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 3,000m (1,500+1,500)	2.5km～5.0km (totalidad)
	Ma 2	M-8.9k	Punto angosto		Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,200m	8.0km～10.5km (totalidad)
Río Pisco	**Pi 1**	5.5k	Punto de inundación	Cultivos Zonas urbanas	Conformación de dique Mejoramiento de dique	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 2,000m	3.0km～5.0km (hacia M.I.)
	Pi 2	7.0k	Punto angosto		Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,500m	6.5km～8.0km (totalidad)
	Pi 3	13.5k	Punto de inundación		Conformación de dique Mejoramiento de dique	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 1,500m	12.5km～14.0km (hacia M.I.)
	Pi 4	20.5k	Punto de inundación	Cultivos	Conformación de dique	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 2,000m	19.5km～20.5km (M.I.)
	Pi 5	26.5k	Punto angosto		Ampliación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 1,000m	26.0km～27.0km (totalidad)
	Pi 6	34.5k	Bocatoma		Pozo de regulación	Pozo; 1,800m×700m	34.5km～36.5km (totalidad)
Río Yauca	**Ya 1**	4.5k	Punto de inundación	Cultivos (Olivo)	Reparación de diques existentes	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 1,000m	3.5km～7.5km (totalidad)
	Ya 2	4.1k	Punto angosto		Descolmatación del cauce	Ancho de la excavación; 100m Profundidad de la excavación; 1.0m Longitud; 500m	
	Ya 3	4.5-7.0k	Punto de inundación Bocatoma		Reparación de diques existentes	Ancho de la parte superior; 4.0m Altura; 2.0m Gradiente; 1:2 Longitud; 2,500m	
	Ya 4	25.0k	Bocatoma	Cultivos (Olivo)	Reparación de bocatoma	Ancho de la presa; 100m Altura de la presa; 3.0m Grosor de la presa; 2.0m	25.0km～25.7km (totalidad)
	Ya 5	25.0k	Bocatoma	Carretera	Defensa contra la socavación	Altura; 2.0m Gradiente; 1:2 Longitud; 500m	
	Ya 6	41.1k	Bocatoma	carretera	Defensa contra la socavación	Altura; 2.0m Gradiente; 1:2 Longitud; 400m	40.9km～41.3km (hacia M.I.)
Río Majes-Camná	MC 1	0.0k-4.5k (M.I.)	Punto de inundación	Cultivos	Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 4,500m	0.0km-4.5km (hacia M.I.)
	MC 2	7.5k-9.5k (M.I.)	Punto de inundación		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 2,000m	7.5km-9.5km (hacia M.I.)
	MC 3	11.0k-17.0k (M.I.)	Punto de inundación		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 6,000m	11.0km-17.0km (hacia M.I.)
	MC 4	48.0k-50.5k (M.I.)	Punto de inundación		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 2,500m	48.0km-50.5km (hacia M.I.)
	MC 5	52.0k-56.0k (M.I.)	Punto de inundación		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 4,000m	52.0km.-56.0 km. (hacia M.I.)
	MC 6	59.0k-62.5k (M.I.) 59.5k-62.5 (M.D.)	Punto de inundación/Erosión ribereña		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 6,500m	59.0km.-62.5km. (hacia M.I.) 59.5km.-62.5km. (hacia M.D.)
	MC 7	65.0k-66.5k (M.D.) 64.5k-66.5k (M.I.)	Punto de Inundación		Conformación/Mejoramiento de dique	Ancho de la parte superior ; 4.0m Altura ; entre 2.0m y 3.0m Gradiente ; 1:3 Longitud ; 3,500m	65.0 km. - 66.5 km. (hacia M.D.) 64.5km-66.5km (hacia M.I.)

Source: JICA Study Team

2.2.2 Identification of Environmental and Social Impacts

Based on the DEAs for all 6 basins, the following descriptions show the identification of matrices (construction stage and operation stage) for each basin.

1) The Chira River Basin

Table 2.10 **Impact Identification Matrix (Construction and Operation Stage) –Chira River Basin**

Construction Stage			Work	1-4	1-4	1-4	4	1,4	1, 4	1-4	1-4	1-4	1-4	1-4		
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)			N	N	N	N		N	N		N	N	8	0
		Gas emissions			N	N	N	N	N	N	N		N	N	9	0
	Noise	Noise			N	N	N	N	N	N	N	N	N	N	10	0
	Soil	Soil fertility			N					N	N				3	0
		Land Use			N					N	N				3	0
	Water	Calidad del agua superficial				N	N	N		N					4	0
		Cantidad de agua superficial							N			N			2	0
	Physiography	Morfología fluvial				N	N	N		N					4	0
		Morfología terrestre			N						N				2	0
Biotic	Flora	Terrestrial flora			N						N				2	0
		Aquatic flora				N	N	N		N					4	0
	Fauna	Terrestrial fauna			N						N				2	0
		Aquatic fauna				N	N	N		N					4	0
Socio-economic	Esthetic	Visual landscape								N	N				2	0
	Social	Quality of life		P								N	N	N	3	1
		Vulnerability - Security													0	0
	Economic	PEA		P											0	1
		Current land use													0	0
Total				2	8	7	7	7	3	10	9	3	4	4	62	2
Percentage of positive and negative															97 %	3 %

Operation Stage			Works	Dike Point 1,2,3	Riverbed without Silting Point 4	Total Negatives	Total Positives
Environment	Component	Environmental Factors					
Physique	Air	PM-10 (Particulate matter)				0	0
		Gas emissions				0	0
	Noise	Noise				0	0
	Soil	Soil fertility				0	0
		Land Use				0	0
	Water	Calidad del agua superficial				0	0
		Cantidad de agua superficial		P	P	0	2
	Physiography	Morfología fluvial		N	N	2	0
		Morfología terrestre				0	0
Biotic	Flora	Terrestrial flora				0	0
		Aquatic flora				0	0
	Fauna	Terrestrial fauna				0	0
		Aquatic fauna		N	N	2	0
Socio-economic	Esthetic	Visual landscape		P	P	0	2
	Social	Quality of life		P	P	0	2
		Vulnerability - Security		P	P	0	2
	Economic	PEA				0	0
		Current land use		P	P	0	2
Total				7	7	4	10
Percentage of positive and negative						29 %	71 %

N: Negative, P: Positive
Source: Prepared by the JICA Study Team

On the Chira River basin, based on the impact identification results for the construction stage, a total number of 64 interactions have been found. 62 of these interactions (97 %) correspond to impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 14 interactions have been found for the operation stage; 4 of these interactions (29 %) correspond to impacts that will be perceived as negative, and 10 (71 %) correspond to impacts

that will be perceived as positive.

2) The Cañete River Basin

Table 2.11 **Impact Identification Matrix (Construction and Operation Stage) – The Cañete River Basin**

Construction Stage			Work	1-5	1-5	1-5	4,5	1,2,3	2,4,5	1-5	1-5	1-5	1-5	1-5		
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)			N	N	N	N		N	N		N	N	8	0
		Gas emissions			N	N	N	N	N	N	N		N	N	9	0
	Noise	Noise			N	N	N	N	N	N	N	N	N	N	10	0
	Soil	Soil fertility			N					N	N				3	0
		Land Use			N					N	N				3	0
	Water	Calidad del agua superficial				N	N	N		N		N			5	0
		Cantidad de agua superficial							N						1	0
	Physiography	Morfología fluvial				N	N	N		N					4	0
		Morfología terrestre			N						N				2	0
Biotic	Flora	Terrestrial flora			N						N				2	0
		Aquatic flora				N	N	N		N					4	0
	Fauna	Terrestrial fauna			N						N				2	0
		Aquatic fauna				N	N	N		N					4	0
Socio-economic	Esthetic	Visual landscape								N	N				2	0
	Social	Quality of life		P								N	N	N	3	1
		Vulnerability - Security													0	0
	Economic	PEA		P											0	1
		Current land use													0	0
Total				2	8	7	7	7	3	10	9	3	4	4	62	2
Percentage of positive and negative															97 %	3 %

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

Operation Stage			Works	Riverbed without Silting Point 1	Dike-Right Side Point 2	Riverbed without Silting Point 3	Intake Point 4	Protection - Right Side Point 5	Total Negative	Total Positive
Environment	Component	Environmental Factors								
Physique	Air	PM-10 (Particulate matter)							0	0
		Gas emissions							0	0
	Noise	Noise							0	0
	Soil	Soil fertility						P	0	1
		Land Use							0	0
	Water	Calidad del agua superficial					P	P	0	2
		Cantidad de agua superficial		P	P	P	P		0	3
	Physiography	Morfología fluvial		N	N	N			3	0
		Morfología terrestre							0	0
Biotic	Flora	Terrestrial flora							0	0
		Aquatic flora							0	0
	Fauna	Terrestrial fauna							0	0
		Aquatic fauna		N	N	N			3	2
Socio-economic	Esthetic	Visual landscape		P	P	P		P	0	4
	Social	Quality of life		P	P	P	P	P	0	5
		Vulnerability - Security		P	P	P	P	P	0	5
	Economic	PEA							0	0
		Current land use		P	P	P	P	P	0	4
Total				7	7	7	5	6	6	26
Percentage of positive and negative									19 %	81 %

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

On the Cañete River basin, based on the impact identification results for the construction stage, a total number of 64 interactions have been found. 62 of these interactions (97 %) correspond to

impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 32 interactions have been found for the operation stage; 6 of these interactions (19 %) correspond to impacts that will be perceived as negative, and 26 (81 %) correspond to impacts that will be perceived as positive.

3) The Chincha River Basin

Table 2.12 **Impact Identification Matrix (Construction and Operation Stage) – The Chincha River Basin**

Construction Stage			Work	1-5	1-5	1-5	2,3	1,4,5	1-4	1-5	1-5	1-5	1-5	1-5		
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)			N	N	N	N		N	N		N	N	8	0
		Gas emissions			N	N	N	N	N	N	N	N	N	N	9	0
	Noise	Noise			N	N	N	N	N	N	N	N	N	N	10	0
	Soil	Soil fertility			N					N	N				3	0
		Land Use			N					N	N				3	0
	Water	Calidad del agua superficial				N	N	N		N					4	0
		Cantidad de agua superficial							N			N			2	0
	Physiography	Morfología fluvial				N	N	N		N					4	0
		Morfología terrestre			N						N				2	0
Biotic	Flora	Terrestrial flora			N						N				2	0
		Aquatic flora				N	N	N		N					4	0
	Fauna	Terrestrial fauna			N						N				2	0
		Aquatic fauna				N	N	N		N					4	0
Socio-economic	Esthetic	Visual landscape								N	N				2	0
	Social	Quality of life		P								N	N	N	3	1
		Vulnerability - Security													0	0
	Economic	PEA		P											0	1
		Current land use													0	0
Total				2	8	7	7	7	3	10	9	3	4	4	62	2
Percentage of positive and negative															97 %	3 %

Operation Stage										
Environment	Component	Environmental Factors	Works	Dike Chico 1	Intake Chico 2	Partidor Chico 3	Dike Ma 4	Riverbed without Silting Ma2	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)							0	0
		Gas emissions							0	0
	Noise	Noise							0	0
	Soil	Soil fertility							0	0
		Land Use							0	0
	Water	Calidad del agua superficial			P				0	1
		Cantidad de agua superficial		P	P	P	P	P	0	5
	Physiography	Morfología fluvial		N		P	N	N	3	1
		Morfología terrestre							0	0
Biotic	Flora	Terrestrial flora							0	0
		Aquatic flora							0	0
	Fauna	Terrestrial fauna							0	0
		Aquatic fauna		N		N	N	N	4	0
Socio-economic	Esthetic	Visual landscape		P		P	P	P	0	4
	Social	Quality of life		P	P	P	P	P	0	5
		Vulnerability - Security		P	P	P	P	P	0	5
	Economic	PEA							0	0
		Current land use		P	P	P	P	P	0	5
Total				7	5	7	7	7	7	26
Percentage of positive and negative									21 %	79 %

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

On the Chincha River basin, based on the impact identification results for the construction stage, a total number of 64 interactions have been found. 62 of these interactions (97 %) correspond to impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 33 interactions have been found for the operation stage; 7 of these interactions (21 %) correspond to impacts that will be perceived as negative, and 26 (79 %) correspond to impacts that will be perceived as positive.

4) The Pisco River Basin

Table 2.13 **Impact Identification Matrix (Construction and Operation Stage) – The Pisco River Basin**

Construction Stage			Work	1-6	1-6	1,3,4	1-6	5	1-5	1,3,4,6	1,3,4,6	1-6	1-5	1-6	1-6		
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and movement of Land	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)			N	N	N	N	N		N	N		N	N	9	0
		Gas emissions			N	N	N	N	N	N	N	N		N	N	10	0
	Noise	Noise			N	N	N	N	N	N	N	N	N	N	N	11	0
	Soil	Soil fertility			N							N				2	0
		Land Use			N						N	N				3	0
	Water	Calidad del agua superficial				N		N	N		N		N			5	0
		Cantidad de agua superficial								N						1	0
	Physiography	Morfología fluvial				N		N	N		N					4	0
		Morfología terrestre			N		N					N				3	0
Biotic	Flora	Terrestrial flora			N							N				2	0
		Aquatic flora				N		N	N		N					4	0
	Fauna	Terrestrial fauna			N							N				2	0
		Aquatic fauna				N	N	N	N		N					5	0
Socio-economic	Esthetic	Visual landscape			N						N	N				3	0
	Social	Quality of life		P									N	N	N	3	1
		Vulnerability - Security														0	0
	Economic	PEA		P												0	1
		Current land use														0	0
Total				2	9	7	5	7	7	3	9	9	3	4	4	67	2
Percentage of positive and negative																97 %	3 %

Operation Stage											
Environment	Component	Environmental Factors	Works	Dike-Left Side Point 1	Riverbed without Silting Point 2	Dike-Left Side Point 3	Dike-Right Side Point 4	extended Riverbed Punto 5	Well of Control Point 6	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)								0	0
		Gas emissions								0	0
	Noise	Noise								0	0
	Soil	Soil fertility								0	0
		Land Use								0	0
	Water	Calidad del agua superficial								0	0
		Cantidad de agua superficial		P	P	P	P			0	4
	Physiography	Morfología fluvial		N	N	N	N			4	0
		Morfología terrestre								0	0
Biotic	Flora	Terrestrial flora								0	0
		Aquatic flora								0	0
	Fauna	Terrestrial fauna								0	0
		Aquatic fauna		N	N	N	N			4	0
Socio-economic	Esthetic	Visual landscape		P	P	P	P			0	4
	Social	Quality of life		P	P	P	P	P	P	0	6
		Vulnerability - Security		P	P	P	P	P	P	0	6
	Economic	PEA								0	0
		Current land use		P	P	P	P	P	P	0	6
Total				7	7	7	7	3	3	8	26
Percentage of positive and negative										24 %	76 %

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

On the Pisco River basin, based on the impact identification results for the construction stage, a total number of 69 interactions have been found. 67 of these interactions (97 %) correspond to impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 34 interactions have been found for the operation stage; 8 of these interactions (24 %) correspond to impacts that will be perceived as negative, and 26 (76 %) correspond to impacts that will be perceived as positive.

5) The Yauca River Basin

Table 2.14 **Impact Identification Matrix (Construction and Operation Stage) – The Yauca River Basin**

Construction Stage			Work	1-6	1-6	1-6	1-6	4-6	1,2,3	1,3,4,5,6	1-6	1-6	1-6	1-6	1-6	Total Negative	Total Positive
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and movement of Land	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies		
Physique	Air	PM-10 (Particulate matter)			N	N	N	N	N		N	N		N	N	9	0
		Gas emissions			N	N	N	N	N	N	N	N		N	N	10	0
	Noise	Noise			N	N	N	N	N	N	N	N	N	N	N	11	0
	Soil	Soil fertility			N						N	N				3	0
		Land Use			N						N	N				3	0
	Water	Calidad del agua superficial				N		N	N	N	N					5	0
		Cantidad de agua superficial								N			N			2	0
	Physiography	Morfología fluvial				N		N	N		N					4	0
		Morfología terrestre			N		N					N				3	0
Biotic	Flora	Terrestrial flora			N							N				2	0
		Aquatic flora							N		N					2	0
	Fauna	Terrestrial fauna			N							N				2	0
		Aquatic fauna				N		N	N		N					4	0
Socio-economic	Esthetic	Visual landscape									N	N				2	0
	Social	Quality of life		P									N	N	N	3	1
		Vulnerability - Security														0	0
	Economic	PEA		P												0	1
		Current land use														0	0
Total				2	8	6	4	6	7	4	10	9	3	4	4	65	2
Percentage of positive and negative																97 %	3 %

Operation Stage												
Environment	Component	Environmental Factors	Works	Repaired Dike Point 1	Riverbed without Silting Point 2	Repaired Dike Point 3	Intake Point 4	Protection Point 5	Protection - Left Side Point 6	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)								0	0
		Gas emissions								0	0
	Noise	Noise								0	0
	Soil	Soil fertility						P	P	0	2
		Land Use								0	0
	Water	Calidad del agua superficial					P	P	P	0	3
		Cantidad de agua superficial		P	P	P	P			0	4
	Physiography	Morfología fluvial		N	N	N				3	0
		Morfología terrestre								0	0
Biotic	Flora	Terrestrial flora								0	0
		Aquatic flora								0	0
	Fauna	Terrestrial fauna								0	0
		Aquatic fauna		N	N	N				3	0
Socio-economic	Esthetic	Visual landscape		P	P	P		P	P	0	5
	Social	Quality of life		P	P	P	P	P	P	0	6
		Vulnerability - Security		P	P	P	P	P	P	0	6
	Economic	PEA								0	0
		Current land use		P	P	P	P	P	P	0	6
Total				7	7	7	5	6	6	6	32
Percentage of positive and negative										16 %	84 %

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

On the Yauca River basin, based on the impact identification results for the construction stage, a total number of 67 interactions have been found. 65 of these interactions (97 %) correspond to impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 38 interactions have been found for the operation stage; 6 of these interactions (16 %) correspond to impacts that will be perceived as negative, and 32 (84 %) correspond to impacts

that will be perceived as positive.

6) The Majes-Camaná Basin

Table 2.15 **Impact Identification Matrix (Construction and Operation Stage) – The Majes-Camaná River Basin**

Construction Stage			Work	1-7	1-7	1-7	1-7	1-7	1-7	1-7	1-7	1-7		
Environment	Component	Environmental Factors	Activity	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Digging and movement of Land	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)			N	N		N	N		N	N	6	0
		Gas emissions			N	N	N	N	N		N	N	7	0
	Noise	Noise			N	N	N	N	N	N	N	N	8	0
	Soil	Soil fertility			N				N				2	0
		Land Use			N			N	N				3	0
	Water	Calidad del agua superficial					N	N		N			3	0
		Cantidad de agua superficial											0	0
	Physiography	Morfología fluvial						N					1	0
		Morfología terrestre			N	N			N				3	0
Biotic	Flora	Terrestrial flora			N				N				2	0
		Aquatic flora						N					1	0
	Fauna	Terrestrial fauna			N				N				2	0
		Aquatic fauna				N		N					2	0
Socio-economic	Esthetic	Visual landscape						N	N				2	0
	Social	Quality of life		P						N	N	N	3	1
		Vulnerability - Security											0	0
	Economic	PEA		P									0	1
		Current land use											0	0
Total				**2**	**8**	**5**	**3**	**9**	**9**	**3**	**4**	**4**	**45**	**2**
Percentage of positive and negative													**96 %**	**4 %**

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

Operation Stage												
Environment	Component	Environmental Factors	Works	Dike Point 1	Dike Point 2	Dike Point 3	Dike Point 4	Dike Point 5	Dike Point 6	Dike Point 7	Total Negative	Total Positive
Physique	Air	PM-10 (Particulate matter)									0	0
		Gas emissions									0	0
	Noise	Noise									0	0
	Soil	Soil fertility									0	0
		Land Use									0	0
	Water	Calidad del agua superficial									0	0
		Cantidad de agua superficial		P	P	P	P	P	P	P	0	7
	Physiography	Morfología fluvial		N	N	N	N	N	N	N	7	0
		Morfología terrestre		N	N	N	N	N	N	N	7	0
Biotic	Flora	Terrestrial flora									0	0
		Aquatic flora									0	0
	Fauna	Terrestrial fauna									0	0
		Aquatic fauna		N	N	N	N	N	N	N	7	0
Socio-economic	Esthetic	Visual landscape		P	P	P	P	P	P	P	0	7
	Social	Quality of life		P	P	P	P	P	P	P	0	7
		Vulnerability - Security		P	P	P	P	P	P	P	0	7
	Economic	PEA									0	0
		Current land use		P	P	P	P	P	P	P	0	7
Total				**8**	**8**	**8**	**8**	**8**	**8**	**8**	**21**	**35**
Percentage of positive and negative											**38 %**	**63 %**

N: Negative, P:Positive
Source: Prepared by the JICA Study Team

On the Majes-Camana River basin, based on the impact identification results for the construction stage, a total number of 47 interactions have been found. 45 of these interactions (97 %) correspond to impacts that will be perceived as negative, and 2 (3 %) correspond to impacts that will be perceived as positive. In addition, 56 interactions have been found for the operation stage; 21 of these interactions (37.5%) correspond to impacts that will be perceived as negative, and 35 (62.5 %) correspond to impacts that will be perceived as positive.

2.2.3 Methodology

In Peru, environmental impacts are assessed, by using the Leopold – type matrix, and the steps for such assessment are described, as follows:

- Step 1: Impacts are categorized by the several components, namely: Physical (water quality, soil, air, and land morphology), Biological (fauna and flora), and Socioeconomic (quality of life, ways and traditions, scenery, employment, and economic activities.)
- Step 2: Impacts are categorized during the construction, operation, maintenance, and closure / phasing out stages.
- Step 3: Magnitude is estimated as a linear function of intensity, extension, duration, and reversibility. These are detailed below:

Table 2.16 **Evaluation Criterion - Leopold Matrix**

Index		Description	Valuation
"Na" nature		It defines whether change in each action on the means is positive or negative	Positive (+) : beneficial
			Negative (-): harmful
Probability of Occurrence "P.O."		It includes the probability of occurrence of the impact on the component	High (>50 %) = 1.0
			Medium (10 – 50 %) = 0.5
			Low (1 – 10 %) = 0.2
Magnitude	Intensity (In)	It indicates the magnitude of change in the environmental factor. It reflects the degree of disturbance	Negligible (2)
			Moderate intensity (5)
			Extreme Disturbance (10)
	Extension "Ex"	It indicates the affected surface by the project actions or the global scope on the environmental factor.	Area of indirect influence: 10
			Area of direct influence: 5
			Area used up by the works: 2
	Duration "Du"	It refers to the period of time when environmental changes prevail	➢ 10 years: 10
			5 – 10 years : 5
			1 – 5 years: 2
	Reversibility "Rev"	It refers to the system's capacity to return to a similar, or an equivalent to the initial balance.	Irreversible: 10
			Partial return: 5
			Reversible: 2

Source: Prepared based on PEAs of 6 Basins

- Step 4: Total value of impact is obtained from the integration of the pointed out criteria, as follows:

Table 2.17 **Impact Significance Degrees**

SIA	Extent of Significance
≤ 15	Of little significance
15.1 - 28	Significant
≥ 28	Very significant

Source: Prepared based on PEAs of 6 Basins

- Step 5: Prevention and mitigation measures of the impacts that were identified and evaluated in the prior steps should be set out.

2.2.4 Environmental and Social Impact Assessments

Environmental and social impacts, as identified in ***2.2.2 Identification of Environmental and Social Impacts***, are assessed with the methodology that was explained in ***2.2.3 Methodology***. The following tables show the environmental and social assessment results for each basin, during the construction and operation stages.

Table 2.18 **Environmental Impact Assessment Matrix – The Chira River Basin**

			The Chira River Basin												
			Construction Stage											Operation Stage	
Medio	Componente	Acciones del proyecto	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Chi 1, 2 and 3	Chi 4
		Puntos de Obras: / Factores Ambientales	Chi 1 - 4	Chi 1 - 4	Chi 1 - 4	Chi 1 - 4	Chi 1, 2, 3, 4	Chi 1, 2, 3	Chi 1 - 4	Chi 1 - 4	Chi 1 - 4	Chi 1 - 4	Chi 1 - 4		
Physique	Air	PM-10 (Particulate matter)	0.0	-12.0	-12.0	-12.0	-12.0	0.0	-18.0	-18.0	0.0	-12.0	-12.0	0.0	0.0
		Gas emissions	0.0	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	0.0	-11.5	-11.5	0.0	0.0
	Noise	Noise	0.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	0.0	0.0
	Soil	Soil fertility	0.0	-11.5	0.0	0.0	0.0	0.0	-14.2	-14.2	0.0	0.0	0.0	0.0	0.0
		Land Use	0.0	-14.2	0.0	0.0	0.0	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	0.0	-17.5	-12.0	-23.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0
		Cantidad de agua superficial	0.0	0.0	0.0	0.0	0.0	-9.0	0.0	0.0	-15.0	0.0	0.0	26.0	31.0
	Physiography	Morfología fluvial	0.0	0.0	-12.0	-20.0	-31.0	0.0	-23.0	0.0	0.0	0.0	0.0	-25.5	-30.5
		Morfología terrestre	0.0	-33.0	0.0	0.0	0.0	0.0	0.0	-28.0	0.0	0.0	0.0	0.0	0.0
Biotic	Flora	Terrestrial flora	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0
		Aquatic flora	0.0	0.0	-12.0	-14.5	-14.5	0.0	-14.5	0.0	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	-24.2	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	0.0	-12.0	-14.5	-22.5	0.0	-15.0	0.0	0.0	0.0	0.0	-25.5	-30.5
Socio-economic	Esthetic	Visual landscape	0.0	0.0	0.0	0.0	0.0	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0	36.0
	Social	Quality of life	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-17.5	-17.5	-17.5	36.0	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0
	Economic	PEA	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0−15.0	Little significant	0−15.0	Little significant
15.1−28.0	Significant	15.1−28.0	Significant
28.1−	Very significant	28.1−	Very significant

Source: Prepared based on PEAs from 6 Basins

It must be pointed out that in the Chira River basin 15 out of a total of 62 negative impacts have been quantified as significant, and 2 have been quantified as very significant, during the construction stage. Meanwhile, out of a total of 4 negative impacts, 2 have been quantified as significant, and 2 have been quantified as very significant, during the operation stage.

During the construction stage, the works site preparation component will significantly affect the land morphology. During the operation stage, river morphology and aquatic fauna will be significantly affected at point “Chi4”, where the dike will be set up and the river basin will be unclogged.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

Table 2.19 **Environmental Impact Assessment Matrix – The Cañete River Basin**

			The Cañete River Basin															
			Construction Stage											Operation Stage				
Medio	Componente	Acciones del proyecto	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Ca1	Ca2	Ca3	Ca4	Ca5
		Puntos de Obras: / Factores Ambientales	Ca 1-5	Ca 1-5	Ca 1-5	Ca 4 y 5	Ca 1, 2 y 3	Ca 4 y 5	Ca 1-5	Ca 1-5	Ca 1-5	Ca 1-5	Ca 1-5					
Physique	Air	PM-10 (Particulate matter)	0.0	-12.0	-12.0	-12.0	-12.0	0.0	-18.0	-18.0	0.0	-12.0	-12.0	0.0	0.0	0.0	0.0	0.0
		Gas emissions	0.0	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	0.0	-11.5	-11.5	0.0	0.0	0.0	0.0	0.0
	Noise	Noise	0.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0
	Soil	Soil fertility	0.0	-11.5	0.0	0.0	0.0	0.0	-14.2	-14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0
		Land Use	0.0	-14.2	0.0	0.0	0.0	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	0.0	-17.5	-12.0	-23.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	31.0
		Cantidad de agua superficial	0.0	0.0	0.0	0.0	0.0	-9.0	0.0	0.0	-15.0	0.0	0.0	31.0	26.0	31.0	26.0	0.0
	Physiography	Morfología fluvial	0.0	0.0	-12.0	-20.0	-31.0	0.0	-23.0	0.0	0.0	0.0	0.0	-30.5	-25.5	-30.5	0.0	0.0
		Morfología terrestre	0.0	-33.0	0.0	0.0	0.0	0.0	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biotic	Flora	Terrestrial flora	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic flora	0.0	0.0	-12.0	-14.5	-14.5	0.0	-14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	-24.2	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	0.0	-12.0	-14.5	-22.5	0.0	-15.0	0.0	0.0	0.0	0.0	-30.5	-25.5	-30.5	0.0	0.0
Socio-economic	Esthetic	Visual landscape	0.0	0.0	0.0	0.0	0.0	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0	36.0	36.0	0.0	36.0
	Social	Quality of life	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-17.5	-17.5	-17.5	36.0	36.0	36.0	31.0	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	31.0	36.0
	Economic	PEA	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	36.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0−15.0	Little significant	0−15.0	Little significant
15.1−28.0	Significant	15.1−28.0	Significant
28.1−	Very significant	28.1−	Very significant

Source: Prepared based on PEAs from 6 Basins

It must be pointed out that in the Cañete River basin only 15 out of a total of 62 negative impacts have been quantified as significant, and 2 have been quantified as very significant, during the construction stage. Meanwhile, out of a total of 6 negative impacts, only 2 have been quantified as significant, and 4 have been quantified as very significant, during the operation stage.

During the construction stage, the works site preparation component and the DME installation and operation will significantly affect the land morphology. During the operation stage, river morphology and aquatic fauna will be significantly affected at “Ca1” and “Ca3” points, where the river basin will be unclogged.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

Table 2.20 **Environmental Impact Assessment Matrix – The Chincha River Basin**

			The Chincha River Basin																
			Construction Stage											Operation Stage				
Medio	Componente	Acciones del proyecto	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Chico1	Chico2	Chico3	Ma1	Ma2
		Puntos de Obras: / Factores Ambientales	Todos	Todos	Todos	Chico 2 y 3	Chico 1, Ma 1 y 2	Chico 1, 2, 3, Ma1	Todos	Todos	Todos	Todos	Todos					
Physique	Air	PM-10 (Particulate matter)	0.0	-12.0	-12.0	-12.0	-12.0	0.0	-18.0	-18.0	0.0	-12.0	-12.0	0.0	0.0	0.0	0.0	0.0
		Gas emissions	0.0	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	0.0	-11.5	-11.5	0.0	0.0	0.0	0.0	0.0
	Noise	Noise	0.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0
	Soil	Soil fertility	0.0	-11.5	0.0	0.0	0.0	0.0	-14.2	-14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Land Use	0.0	-14.2	0.0	0.0	0.0	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	0.0	-17.5	-12.0	-23.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0
		Cantidad de agua superficial	0.0	0.0	0.0	0.0	0.0	-9.0	0.0	0.0	-15.0	0.0	0.0	26.0	31.0	26.0	26.0	31.0
	Physiography	Morfología fluvial	0.0	0.0	-12.0	-20.0	-31.0	0.0	-23.0	0.0	0.0	0.0	0.0	-25.5	0.0	26.0	-25.5	-30.5
		Morfología terrestre	0.0	-33.0	0.0	0.0	0.0	0.0	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biotic	Flora	Terrestrial flora	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic flora	0.0	0.0	-12.0	-14.5	-14.5	0.0	-14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	-24.2	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	0.0	-12.0	-14.5	-22.5	0.0	-15.0	0.0	0.0	0.0	0.0	-25.5	0.0	-25.5	-25.5	-30.5
Socio-economic	Esthetic	Visual landscape	0.0	0.0	0.0	0.0	0.0	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0	0.0	36.0	36.0	36.0
	Social	Quality of life	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-17.5	-17.5	-17.5	36.0	31.0	36.0	36.0	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	31.0	36.0	36.0	36.0
	Economic	PEA	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	36.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0–15.0	Little significant	0–15.0	Little significant
15.1–28.0	Significant	15.1–28.0	Significant
28.1–	Very significant	28.1–	Very significant

Source: Prepared based on PEAs of 6 Basins

It must be pointed out that in the Chincha River basin only 15 out of a total of 62 negative impacts have been quantified as significant, and 2 have been quantified as very significant, during the construction stage. Meanwhile, out of a total of 7 negative impacts, only 5 have been quantified as significant, and 2 have been quantified as very significant, during the operation stage.

During the construction stage, the works site preparation component will significantly affect the land morphology. At the same time, the Riverbed Excavation and Filling component will affect the "Chico1", "Ma1", and "Ma2" points. During the operation stage, river morphology and aquatic fauna will be significantly affected at the "Ma3" points, where the river basin will be unclogged.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

Table 2.21 **Environmental Impact Assessment Matrix – The Pisco River Basin**

			The Pisco River Basin											
			Construction Stage						Operation Stage					
Medio	Componente	Acciones del proyecto	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Pi1	Pi2	Pi3	Pi4	Pi5	Pi6
		Puntos de Obras: Factores Ambientales	Pi 1,3,4 y 6	Pi 1,3,4 y 6	Pi 1-6	Pi 1-5	Pi 1-6	Pi 1-6						
Physique	Air	PM-10 (Particulate matter)	0.0	-11.5	-18.0	0.0	-11.5	-11.5	0.0	0.0	0.0	0.0	0.0	0.0
		Gas emissions	-11.5	-11.5	-11.5	0.0	-11.5	-11.5	0.0	0.0	0.0	0.0	0.0	0.0
	Noise	Noise	-15.0	-12.0	-15.0	-15.0	-12.0	-12.0	0.0	0.0	0.0	0.0	0.0	0.0
	Soil	Soil fertility	0.0	0.0	-14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Land Use	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	-15.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Cantidad de agua superficial	-9.0	0.0	0.0	0.0	0.0	0.0	26.0	31.0	26.0	26.0	0.0	0.0
	Physiography	Morfología fluvial	0.0	-23.0	0.0	0.0	0.0	0.0	-25.5	-30.5	-25.5	-25.5	0.0	0.0
		Morfología terrestre	0.0	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biotic	Flora	Terrestrial flora	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic flora	0.0	-14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	-15.0	0.0	0.0	0.0	0.0	-25.5	-30.5	-25.5	-25.5	0.0	0.0
Socio-economic	Esthetic	Visual landscape	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0	36.0	36.0	36.0	0.0	0.0
	Social	Quality of life	0.0	0.0	0.0	-18.0	-18.0	-17.5	36.0	36.0	36.0	31.0	41.0	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	31.0	41.0	36.0
	Economic	PEA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	36.0	41.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0–15.0	Little significant	0–15.0	Little significant
15.1–28.0	Significant	15.1–28.0	Significant
28.1–	Very significant	28.1–	Very significant

Source: Prepared based on PEAs of 6 Basins

It must be pointed out that in the Pisco River basin only 12 out of a total of 67 negative impacts have been quantified as significant, and 2 have been quantified as very significant, during the construction stage. Meanwhile, out of a total of 8 negative impacts, only 6 have been quantified as significant, and 2 have been quantified as very significant, during the operation stage.

During the construction stage, the works site preparation component will significantly affect the land morphology. At the same time, the Riverbed Excavation and Filling component will affect the “Pi1”, “Pi2”, “Pi3”, and “Pi4” points. During the operation stage, river morphology and aquatic fauna will be significantly affected at the “Pi2” points, where the river basin will be unclogged.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

Table 2.22 **Environmental Impact Assessment Matrix – The Yauca River Basin**

			The Yauca River Basin																	
			Construction Stage											Operation Stage						
Medio	Componente	Acciones del proyecto	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Diversion of riverbed (Cofferdams)	Digging and refilling in riverside	Digging and refilling in riverbed	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	Ya1	Ya2	Ya3	Ya4	Ya5	Ya6
		Puntos de Obras: / Factores Ambientales	Ya 1-6	Ya 1-6	Ya 1-6	Ya 4-6	Ya 1, 2 y 3	Ya 1, 3, 4, 5 y 6	Ya 1-6	Ya 1-6	Ya 1-6	Ya 1-6	Ya 1-6							
Physique	Air	PM-10 (Particulate matter)	0.0	-15.0	-11.5	-12.0	-12.0	0.0	-18.0	-18.0	0.0	-12.0	-12.0	0.0	0.0	0.0	0.0	0.0	0.0
		Gas emissions	0.0	-11.5	-11.5	-11.5	-11.5	-11.5	-15.0	-11.5	0.0	-11.5	-11.5	0.0	0.0	0.0	0.0	0.0	0.0
	Noise	Noise	0.0	-12.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0
	Soil	Soil fertility	0.0	-14.5	0.0	0.0	0.0	0.0	-14.2	-14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0	31.0
		Land Use	0.0	-14.2	0.0	0.0	0.0	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	0.0	-17.5	-15.0	-23.0	-14.5	-15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	31.0	31.0
		Cantidad de agua superficial	0.0	0.0	0.0	0.0	0.0	-9.0	0.0	0.0	-15.0	0.0	0.0	26.0	31.0	26.0	26.0	0.0	0.0
	Physiography	Morfología fluvial	0.0	0.0	-12.0	-26.0	-31.0	0.0	-23.0	0.0	0.0	0.0	0.0	-25.5	-30.5	-25.5	0.0	0.0	0.0
		Morfología terrestre	0.0	-33.0	0.0	0.0	0.0	0.0	0.0	-28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biotic	Flora	Terrestrial flora	0.0	-24.5	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic flora	0.0	0.0	0.0	0.0	-14.5	0.0	-14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	-24.2	0.0	0.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	0.0	-12.0	-11.5	-17.5	0.0	-14.5	0.0	0.0	0.0	0.0	-25.5	-30.5	-25.5	0.0	0.0	0.0
Socio-economic	Esthetic	Visual landscape	0.0	0.0	0.0	0.0	0.0	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0	36.0	36.0	0.0	36.0	36.0
	Social	Quality of life	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-14.5	-17.5	-17.5	36.0	36.0	36.0	31.0	36.0	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	31.0	36.0	36.0
	Economic	PEA	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	36.0	36.0	36.0	36.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0−15.0	Little significant	0−15.0	Little significant
15.1−28.0	Significant	15.1−28.0	Significant
28.1−	Very significant	28.1−	Very significant

Source: Prepared based on PEAs of 6 Basins

It must be pointed out that in the Yauca River basin only 14 out of a total of 65 negative impacts have been quantified as significant, and 2 have been quantified as very significant, during the construction stage. Meanwhile, out of a total of 6 negative impacts, only 4 have been quantified as significant, and 2 have been quantified as very significant, during the operation stage.

During the construction stage, the works site preparation component and the DME installation and operation component will significantly affect the land morphology. At the same time, the Riverbed Excavation and Filling component will affect the “Ya1”, “Ya2”, and “Ya3” points. During the operation stage, river morphology and aquatic fauna will be significantly affected at the “Ya2” points, where the river basin will be unclogged.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

Table 2.23 **Environmental Impact Assessment Matrix – The Majes-Camaná River Basin**

			The Majes-Camaná River Basin									
			Construction Stage									Operation Stage
Medio	Componente	Acciones del proyecto	Labor Recruitment	Site preparation work (Clearing, land grading, Levelled)	Digging and refilling in riverside	Civil Work (Concreting)	I&O of stone pits and material production plants	DME I&O	Camps work I&O	Carriage Staff	Transportation of machinery, equipment, materials and supplies	MC1-MC7
		Puntos de Obras: Factores Ambientales	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	MC1-MC7	
Physique	Air	PM-10 (Particulate matter)	0.0	-12.0	-12.0	0.0	-18.0	-18.0	0.0	-12.0	-12.0	0.0
		Gas emissions	0.0	-11.5	-11.5	-11.5	-11.5	-11.5	0.0	-11.5	-11.5	0.0
	Noise	Noise	0.0	-15.0	-12.0	-12.0	-15.0	-15.0	-15.0	-15.0	-15.0	0.0
	Soil	Soil fertility	0.0	-11.5	0.0	0.0	-14.2	-14.2	0.0	0.0	0.0	0.0
		Land Use	0.0	-14.2	0.0	0.0	-15.0	-15.0	0.0	0.0	0.0	0.0
	Water	Calidad del agua superficial	0.0	0.0	-12.0	0.0	-15.0	0.0	0.0	0.0	0.0	0.0
		Cantidad de agua superficial	0.0	0.0	0.0	-9.0	0.0	0.0	-15.0	0.0	0.0	26.0
	Physiography	Morfología fluvial	0.0	0.0	0.0	0.0	-23.0	0.0	0.0	0.0	0.0	-25.5
		Morfología terrestre	0.0	-33.0	-15.0	0.0	0.0	-28.0	0.0	0.0	0.0	-25.5
Biotic	Flora	Terrestrial flora	0.0	-28.0	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0
		Aquatic flora	0.0		-14.5	0.0	-14.5	0.0	0.0	0.0	0.0	0.0
	Fauna	Terrestrial fauna	0.0	-24.2	0.0	0.0	0.0	-22.5	0.0	0.0	0.0	0.0
		Aquatic fauna	0.0	0.0	-14.5	0.0	-15.0	0.0	0.0	0.0	0.0	-25.5
Socio-economic	Esthetic	Visual landscape	0.0	0.0	0.0	0.0	-12.0	-12.0	0.0	0.0	0.0	36.0
	Social	Quality of life	17.0	0.0	0.0	0.0	0.0	0.0	-17.5	-17.5	-17.5	36.0
		Vulnerability - Security	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
	Economic	PEA	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Current land use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0

Grade of Positive Impacts		Grade of Negative Impacts	
0–15.0	Little significant	0–15.0	Little significant
15.1–28.0	Significant	15.1–28.0	Significant
28.1–	Very significant	28.1–	Very significant

Source: Prepared based on PEAs of 6 Basins

It must be pointed out that in the Majes-Camaná River basin 11 out of a total of 14 negative impacts have been quantified as significant, and 1 haa been quantified as very significant, during the construction stage. Meanwhile, 3 significant negative impacts have been quantified as during the operation stage.

During the construction stage, the works site preparation component will significantly affect the land morphology. During the operation stage, river morphology and aquatic fauna will be significantly affected all the point, where the dikes will be built.

The Environmental Management Plan will be detailed in 3 Environmental Management Plans for Probable Impacts.

During the construction stage, actions that will generate most significant negative impacts along all 6

basins include: "Site Works Preparation and Clearance", "Riverbed Excavation and Filling", and "Surplus Material Deposits Operation (DME, in Spanish)." "Site works Preparation and Clearance" will bring about a significant modification to the land morphology, whereas "Riverbed Excavation and Filling" will bring about a significant modification to river morphology.

During the operation stage, hydraulic infrastructure works that will bring about most significant negative environmental impacts include "Basin Unclogging" that will cause a modification to the river morphology and subsequently, decreased river habitability conditions that will directly impact the aquatic fauna.

Most significant positive impacts are related to all works to be constructed along the river basins, and are directly related to improve the quality of the lives of the population around the area of influence, improve the "Current Use of land / soil", improve the security conditions, and reduce vulnerability at social and environmental levels.

2.2.5 Priority of all 36 Investment Points from the Environmental and Social Impact Point of View

The matrix below is the outcome of the priority of the investment points from an environmental and social impact point of view, compared to the environmental impact and social values. All 36 investment points along all 6 basins were prioritized, based on the matrix. The least impact value means the least negative impact.

Table 2.24 **Priority of the Investment Points from the Point of View of the Environmental and Social Impacts**

Basin	Investment Points	Evaluation Points of Environmental and Social Impact during the Construction Stage	Evaluation Points of Environmental and Social Impact during the Operation Stage	Total Points	Priority based on the point of view of the Environmental and Social Impacts
Chira	Chira1	-843.8	119.0	-724.8	1
	Chira2	-843.8	119.0	-724.8	1
	Chira3	-843.8	119.0	-724.8	1
	Chira4	-808.3	114.0	-694.3	11
Cañete	Ca1	-808.3	114.0	-694.3	11
	Ca2	-808.3	119.0	-689.3	14
	Ca3	-808.3	114.0	-694.3	11
	Ca4	-813.8	152.0	-661.8	16
	Ca5	-813.8	206.0	-607.8	27
Chincha	Chico1	-843.8	119.0	-724.8	1
	Chico2	-813.8	157.0	-656.8	17
	Chico3	-813.8	170.5	-643.3	18
	Ma1	-843.8	119.0	-724.8	1
	Ma2	-647.1	114.0	-533.1	30

Basin	Investment Points	Evaluation Points of Environmental and Social Impact during the Construction Stage	Evaluation Points of Environmental and Social Impact during the Operation Stage	Total Points	Priority based on the point of view of the Environmental and Social Impacts
Pisco	Pi1	-818.6	119.0	-699.6	9
	Pi2	-556.6	114.0	-442.6	31
	Pi3	-818.6	119.0	-699.6	9
	Pi4	-818.6	109.0	-709.6	8
	Pi5	-426.6	123.0	-303.6	32
	Pi6	-387.8	108.0	-279.8	33
Yauca	Ya1	-834.3	119.0	-715.3	6
	Ya2	-784.3	114.0	-670.3	15
	Ya3	-834.3	119.0	-715.3	6
	Ya4	-800.8	152.0	-648.8	18
	Ya5	-800.8	206.0	-594.8	28
	Ya6	-800.8	206.0	-594.8	28
Majes-Camaná	Mc1	-710.8	93.5	-617.3	20
	Mc2	-710.8	93.5	-617.3	20
	Mc3	-710.8	93.5	-617.3	20
	Mc4	-710.8	93.5	-617.3	20
	Mc5	-710.8	93.5	-617.3	20
	Mc6	-710.8	93.5	-617.3	20
	Mc7	-710.8	93.5	-617.3	20

Source: JICA Study Team

CHAPTER 3 ENVIRONMENTAL MANAGEMENT PLAN FOR PROBABLE IMPACTS

3.1 Follow-Up and Monitoring Plan

The objective of the Socio-Environmental Plans is to internalize both positive and negative significant and very significant environmental impacts that are related to the Project's construction and operation stages, so that prevention and/or mitigation of significant and very significant negative impacts, preservation of environmental heritage, and Project sustainability are ensured.

During the construction stage, Projects of all 6 basins have set out the following measures: "Local Hiring Program", "Works Sites Management and Control Program", "Riverbed Diversion Program", "Riverbank Excavation and Filling Management", "Riverbed Excavations and Filling Management", "Quarry Management", "DME Management", "Camp and Site Residence Standards", and "Transportation Activity Management." During the operation stages, Projects for all 6 basins have considered the development of activities with regard to "Riverbed and Aquatic Fauna Management". These activities should develop riverbed conditioning downstream the intervention points, for erosion probabilities to be reduced, and habitability conditions to be provided for aquatic fauna species. The following are measures related to those negative impacts to be mitigated or those positive impacts to be potentiated. Overall measures have been established for all 6 basins, based on the impacts, as identified in all basins.

Table 3.1 **EMP Summary**

Measure Name	Description	Person / Entity in charge of the execution	Periodicity
Local Hiring Program	Design of a local labor hiring program that maximizes local hand labor hiring benefits. A document with policies and procedures will be developed.	The holder or contractor, in coordination with the municipality and the worker unions.	Prior to the beginning of the construction activities
	The State should request the contractor to execute works, and that over 50 % of its non – qualified hand labor has been hired locally.	The holder	
	The Program will consider the development–prior to the works execution -based on a register of the labor supply in the Project's area of direct influence. This register will include the following data: Full name, DNI (ID) No., age, gender, No. of depending family members, occupation, etc., place of residence. Based on the gathered data, a list of local hirable labor will be prepared; this list will prioritize those applicants having less economic income and a larger number of dependent family members.	The Project holder or a specialist third party under the holder's supervision.	
Work Sites Management and Control Program	The Contractor will prepare a policy and procedure document, in response to the impact on land morphology caused by permanent works construction, as this is an inevitable impact. In this way, only mitigation will be accomplished.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	

Measure Name	Description	Person / Entity in charge of the execution	Periodicity
	Measure consists in carrying out strict control and follow – up to those areas to be intervened, as a part of the works execution. Thus, areas or areas that have not been foreseen in the Project formulation should not be unnecessarily damaged.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	During the construction period.
	The Contractor should make a commitment to affect up to a maximum of 110 % of the areas contemplated in the engineering designs for works execution purposes (both temporary and permanent)	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	In addition, those areas affected by the works should be restored once the construction period is over (see Closure Plan)	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Riverbed Diversion Program	Works construction activities should be scheduled during the low tide season.	The contractor in coordination with the holder.	
	As much as possible, water diversion will be carried out through pipes, so that soil and sediment contact with water is reduced.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Prior to the riverbed diversion activities (cofferdams), all necessary considerations should be taken into account for earth movements in contact with the water course to be prevented.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	In the case of earth diversion structures, these should be compacted enough to prevent any sediment inputs to the water body.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Riverbank Excavations and Filling Management	Riverbank excavation and filling activities should be scheduled during the low tide season to reduce any impact occurrence probabilities.	The contractor in coordination with the holder	Prior to the beginning of the construction activities.
	Intervention areas should be suitably delimited during the construction from those areas that have been defined in the engineering studies, so that damages to river morphology are limited as much as possible.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	During the construction period
	Surplus excavated and / or removed material should be transported to the material disposal sites, and shall not be left and / or abandoned on the Yauca River bed.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	In addition, intervention areas should have a preventive surface runoff control and management system, when faced with such an occurrence.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Riverbed Excavations and Filling Management	Riverbed excavation and filling activities should be scheduled during the low tide season	The contractor in coordination with the holder	Prior to the beginning of the construction activities
	Activities will be progressively developed, as the Yauca River's natural circulation is prevented from being disrupted at all times.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	During the construction period.
	The riverbed diversion during the unclogging activities should be carried out in such a way that the river's natural course during this time is limited only in	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	

Measure Name	Description	Person / Entity in charge of the execution	Periodicity
	the intervention sectors, thus, preventing downstream impacts.		
Quarry Management	Prior to the quarry exploitation activities, the Contractor should submit an exploitation plan that must be previously approved by the supervision. This plan shall include all necessary measures for the quarry closure and the surface morphology restoration	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	Prior to the construction activities
	Quarry exploitation areas will have a catchment and surface runoff drainage to prevent any material – sediments – input to the river course.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	During the construction period
	In addition, an access area for the materials' carriers (loading yard) will be set up with all the necessary soil safety / security and protection measures.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	The material exploitation areas will be permanently moisture to prevent any dust scattering, etc. The moisturizing level will be just the necessary, thus preventing any laminar flow generations.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Transportation of material will be carried out with the use of protection sheets to prevent dust scatterings.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
DME Management	Prior to the works execution, the Contractor will submit to the Supervision a surplus material disposal plan. This plan will identify the location of the material disposal areas and the disposal system.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	Prior to the beginning to the construction activities.
	In addition, the disposal plan will include an analysis for a disposal site selection and a description of their environmental characteristics. The purpose of this is to ensure that fragile flora ecosystems, if any, are not affected.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Areas for materials' disposal will be permanently moisturized to prevent any dust scatterings, etc. The moist level will only be the necessary one, thus preventing any laminar flow generations.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision.	During the construction period
	Once surplus material is disposed of, closure and restoration of these areas will take place.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Restoration will involve planting vegetation coverage with local fast growing species.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Transportation activities Management	The use of car horns, sirens, and other annoying noise – generating devices will be forbidden to all vehicles running along the Project area.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Vehicles will strictly follow the established route, and shall not be allowed to run along non - authorized routes or sites.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Vehicle speed will be strictly defined for vehicles with and without load. Vehicles	Of the execution: The Contractor Of the supervision: The Project	

Measure Name	Description	Person / Entity in charge of the execution	Periodicity
	without load can make use of their less weight to speed up and / or pass other vehicles on the way.	holder or a specialist third party under the holder's supervision	
	Heavy machinery traffic will warned by a vehicle running ahead, for road clearance purposes.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Vehicles carrying material will insure their load, in compliance with each vehicle's established capacity.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	All transportation vehicles must be duly registered, and will park at the pre – established parking spaces in front of each works site.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	When any of the trucks breaks down, material being carried by it must be totally moved to another truck, so that no material is left behind on the way, where the first truck broke down.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Camp and Works Site Residence Standards	Staff residence in the works camp will be subject to coexistence standards. These standards will be communicated t o the staff and workers when hired.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
	Contractor will establish a Code of Conduct that will be effective in camps. Once hired, a worker must comply with the rules, as established in such Code.	Of the execution: The Contractor Of the supervision: The Project holder or a specialist third party under the holder's supervision	
Riverbed and Aquatic Fauna Management	Riverbed conditioning actions downstream the intervention points should be developed (towards erosion probability reductions and enhanced habitability conditions or aquatic fauna species)	The Project holder or a specialist third party under the holder's supervision.	During the operation period
	A regular monitoring to aquatic fauna downstream the intervention points should be carried out.	The Project holder or a specialist third party under the holder's supervision.	

Source: JICA Study Team

The table below shows the Environmental Management Plans for each one of the investment points in all 6 basins.

Table 3.2 **EMP Relevant to each Program Point**

Environmental Management Program	Intervention Points														Stage
	The Chira river basin				The Cañete river basin					The Chincha river basin					
	Chira1	Chira2	Chira3	Chira4	Ca1	Ca2	Ca3	Ca4	Ca5	Chico1	Chico2	Chico3	Ma1	Ma2	
Local employment Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction
Worksite Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
Riverbed Descavacion Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	During the construction stage
River Side Escavacion Program								●	●		●	●			Before starting the construction and during the construction stage
River Side Escavacion and Land Filling Program	●	●	●	●	●	●	●			●			●	●	Before starting the construction and during the construction stage
Quarry Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
DWE Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
Campping Site Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	During the construction stage
Transportation Activities Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	During the construction stage
Aquatic Biota Monitoring Program	●	●	●	●	●	●	●			●		●	●	●	During the operation stage

Environmental Management Program																			Stage
	The Pisco river basin						The Yauca river basin						The Majes-Camaná river basin						
	Pi1	Pi2	Pi3	Pi4	Pi5	Pi6	Ya1	Ya2	Ya3	Ya4	Ya5	Ya6	MC1	MC2	MC3	MC4	MC5	MC6	MC7	
Local employment Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction
Worksite Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
Riverbed Descavacion Program	●		●	●			●	●	●	●	●	●								During the construction stage
River Side Escavacion Program					●					●	●	●								Before starting the construction and during the construction stage
River Side Escavacion and Land Filling Program	●	●	●	●			●	●	●											Before starting the construction and during the construction stage
Quarry Management Program	●		●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
DWE Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Before starting the construction and during the construction stage
Campping Site Management Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	During the construction stage
Transportation Activities Program	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	During the construction stage
Aquatic Biota Monitoring Program	●	●	●	●			●	●	●				●	●	●	●	●	●	●	During the operation stage

Source: Prepared by the JICA Study Team

3.2 Follow – Up and Monitoring Plan

The follow-up and control plan involves 2 types of activities:

1) Follow-up: These are activities that check the set out management measures.
2) Control: These are monitoring and measurement activities towards compliance with the environmental regulations, either Environmental Quality Standards (EQS) or Maximum Permissible Limits (MPL).

The Project holder or a third party under the holder's supervision is to be held accountable for follow-up and control, as the General Environmental Law's (Law No. 28611) Articles 74 and 75 establish that all Project operations holders are to be held accountable for emissions, effluents, discharges, and any other negative impacts generated on the environment, health, and natural resources, as a result of their activities, and must adopt in advance all risk and environmental damage prevention measures on all the sources that generate these negative impacts. Such responsibility includes all environmental risks and damages that might be generated by action or omission.

3.2.1 Construction Stage

During the Project construction stage to be developed for all 6 basins, the Follow-up and Control Plan will be focused on checking i) the compliance with all measures that have been designed as part of the Environmental Management Plan and ii) the compliance with all the environment – related standards and regulations that exist in the Peruvian Legislation. The following monitoring parameters are highlighted:

1) Water Quality and Biological Parameters:

Control should be carried out on water quality and biological parameters, nearby waters, and at intervention points. ***Table 3.3*** shows specifications to be followed:

Table 3.3 **Monitoring to Water Quality and Biological Parameters**

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards
pH	pH			"National Standard for Water Quality" D.S. No. 002-2009 MINAM
TSS	mg/l			
BOD/COD	mg/l			
DO	mg/l			
Total Nitrogen	mg/l			
Heavy Metals	mg/l			
Temperature	^{o}C			
Biological Diversity indices: Shannon; Pielou; richness and abundance				

[Measurement Points]
-50 meters upstream the intervention points
-50 meters downstream the intervention points
-100 meters downstream the intervention points
[Frequency]
Quarterly
[Person in charge of Implementation]
DGIH-MINAG, or a third party under the project holder's supervision
Source: JICA Study Team

2) Air Quality:

Impact analyses in the Projects to be developed for all 6 basins did not register any significant impacts on the hydraulic infrastructure works activities; however, work area, and subsequently, health of workers and local population are always affected by dust generation and atmospheric contaminant emissions. Thus, air quality monitoring is set out as an essential aspect in the Control Plan. ***Table 3.4*** below shows details for such monitoring.

Table 3.4 **Monitoring to Air Quality**

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Peruvian Standards (D.S. No 074-2001-PCM)	Referred International Standards
SO^2				"National Standard for Air Quality" D.S. No.074-2001-PCM	National Ambient Air Quality Standards (NAAQS) (Updated in
NO^2					
CO					
O^3					

PM-10					2008)
PM-2.5					

[Measurement Points]
*02 stations per monitoring point: Windward and downwind (upwind and against the wind direction)
-1 point at the working zones
-1 point at a quarry, away from the river (the largest and / or the closest point to a populated area)
-1 point at a D.M.E. (the largest and / or the closest point to a populated area)
[Frequency]
Quarterly
[Person in charge of the Implementation]
DGIH-MINAG, or a third party under the project holder's supervision
Source: JICA Study Team

3) Noise Quality

Likewise, monitoring to noise quality is set out at the potential receivers that are located around the noise generating points per work front. The Table below (***Table 3.5***) shows specifications to follow:

Table 3.5 **Monitoring to Noise Quality**

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards
Noise level	LAeqT (dB(A))			National Environmental Quality Standards for noise (EQS) - S.N. N° 085-2003-PCM	-IEC 651/804 – International -IEC 61672- New Law: Replaces IECs 651/804 -ANSI S 1.4 – America

[Measurement Point]
Monitoring to acoustic contamination levels will be carried out at the potential receivers that are located around the noise emission points per work front.
01 point per potential receiver will be monitored.
[Frequency]
Every two months during construction phase
[Person in charge of the Implementation]
DGIH-MINAG, or a third party under the project holder's supervision
Source: JICA Study Team

3.2.2 Operation Stage

Operation stages in all Projects especially recommend a follow – up to biological parameters and water quality downstream the intervention points that negatively affect aquatic morphology and aquatic fauna. The Table below (***Table 3.6***) shows these details:

Table 3.6 **Monitoring to Water Quality (Operation Stage)**

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards
pH	pH			"National Standard for Water Quality" D.S. No. 002-2009 MINAM
TSS	mg/l			
BOD/COD	mg/l			
DO	mg/l			
Total Nitrogen	mg/l			
Heavy Metals	mg/l			
Temperature	^{o}C			
Biological Diversity indices: Shannon; Pielou; richness				

and abundance				

[Measurement Points]
-50 meters upstream the intervention points
-50 meters downstream the intervention points
-100 meters downstream the intervention points
[Frequency]
Quarterly in first two years of operation phase
[Person in charge of Implementation]
DGIH-MINAG, or a third party under the project holder's supervision
Source: JICA Study Team

3.3 Closure or Abandonment Plan

Closure or abandonment plans have been carried out for each basin. These plans will be implemented at the completion of the construction activities, and involve dismantling all temporary works and restoring intervened areas and / or areas that were affected by the works execution. Restoration involves removing contaminated soils, final disposal of waste materials, restoration of soil morphology, and restoration of vegetation coverage in the intervened sites.

3.4 Civil Participation

Civil Participation Plans have been prepared for each basin. These plans are to be implemented before and during the construction, and at the works completion stage. Recommended activities would include:

- Before the construction activities:
  - Dissemination workshops in the communities around the area of influence to share about the Project and the benefits it would bring to the local population.
  - In addition, posters would be placed in public areas informing about the Project execution period, its major objectives, and beneficiaries.
- During the construction:
  - Dissemination of progress made during works construction, in coordination with the local population in assemblies or other communication / informational spaces.
  - Identification and enforcement of solution proposals to probable complaints from the population that might emerge during the works execution. Proposed solution measures should be previously agreed upon with the population.
- Upon completion of works:

Workshops to inform about the works completion. Local authorities and general public will be invited, and assets / facilities will be handed over, that is, completed works will be handed over to the population.

3.5 Cost of Environmental Management Plan

Next table shows the cost of Environmental Management Plan for this program. The cost (1) is per one work site and (2) is per basin.

Table 3.7 **Cost of Environmental Management Plan**

CHAPTER 4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

According to the Preliminary Environmental Appraisals to all 6 basins, most impacts identified during the construction and operation stages were found out to be of little significance. Significant and very significant negative impacts can be controlled or mitigated, as long as suitable Environmental Management Plans are carried out. In addition, the Project will be implemented in the short term, as environmental conditions will be quickly restored. However, the execution of a follow – up and monitoring plan is important, and in the event that unexpected impacts are generated, immediate mitigation measures must be taken.

In addition, significant positive impacts are also present, especially during the operation stage. These positive impacts include: An enhanced security / safety and a decreased vulnerability at social and environmental levels; an improved quality of life among the population in the area of influence, and an improved “Current use of land / soil”.

The following table shows a summary of all probable impacts and their mitigation measures.

Table 4.1 **Check List of Environmental and Social Considerations**

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) Y/N (c) N (d) N	All 36 points.	(a) The 6 PEA were elaborated and submitted to the DGAA. (b) The DGAA issued the DIA (Environmental Permission) for Chira, Chincha, Cañete and Pisco basins on Decembre 2011. The DIA for Majes-Camana basin will be issued on May 2012. (c) There is no aditional condition for the approval of PEA. (d) There are no other required environmental permits in addition to the DIA.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	All 36 points.	(a) The stakeholders meeting took place in 6 basins, and the environmental and social considerations were explained in each. (b) The JICA Study Team did not receive the comments related in environmental and social impacts.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	All 36 points.	(a) The 36 alternatives have been examined and, they have been prioritized based on the results of the 6 PEAs.
2. Pollution Control	(1) Water Quality	(a) Is there a possibility that changes in river flow downstream (mainly water level drawdown) due to the project will cause areas that do not comply with the country's ambient water quality standards?	(a) N	All 36 points.	(a) That is because there is few possibility of the increment of the water level.
	(2) Wastes	(a) In the case of that large volumes of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	(a) Y	Chira4, Chira6, Ca1, Ca3, Ma2, Pi2, Ya2, Chico2, Pi5, Pi6	(a) The construction will use the exiting material in the place where the work is realized. Therefore there is few possibility of the generation of large volumes of excavated materials. In the case of YES, the excavated materials will be treated properly and disposed in accordance with Peruvian standards. It is not foreseen that the excavated materials would contain heavy metal, according to the interviews which are conducted to the irrigation associations of 6 basins and regional government officials. Also the JICA Study Team carried out field survey and did not see any sign of pollution by heavy metal. Yauca basin is the only basin which can

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
					have pollution by heavy metal because there is one informal mine in its headwaters. However, it is not foreseen the pollution by that mine because the mine is located in northeast about 40km from the river and the flow and the river width are enough big and wide so high concentrated pollution is not foreseen. On the other hand, the project of Yauca basin was rejected by OPI according to the results of socioeconomic evaluation. Therefore the JICA Study Team proposes that the soil quality survey should be carried out on its EAP when the project will be realized in future.
			(a) N	The other points.	(a) The large volumes of excavated will not generate.
	(3) Subsidence	(a) Is there a possibility that the excavation of waterways will cause groundwater level drawdown or subsidence? Are adequate measures taken, if necessary?	(a) N	All 36 points.	(a) The characteristic of the geological layer is gravel and does not contain the clay in the Cañete, Chincha, Pisco y Yauca rivers. Therefore, the groundwater level will not be affected by the Project.
3. Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	All 36 points.	(a) There is no Natural Protected Area in the influence area of the 36 points.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that hydrologic changes, such as reduction of the river flow, and seawater intrusion up the river will adversely affect downstream aquatic organisms, animals, vegetation, and ecosystems? (e) Is there a possibility that the changes in water flows due to the project will adversely affect aquatic environments in the river? Are adequate measures taken to reduce the impacts on aquatic environments, such as	(a) N (b) Y (c) Y (d) N (e) Y	All 36 points.	(b) The Acacia Macracantha grows in the Chira river basin, which is in the IUCN Red List (NT Category), but it is not planned to cut them by the project. Also, the flamingos (Phoenicopterus Chilensis) come to the basin from November to March. It is recommended to carry out the earth work during dry season when the flamingos are not in the basin, though the project site is not the same area where the flamingos come. (c) The adequate mitigation plan is developed to not generate the significant ecological impact. (e) The direct influence area is so small that the impact can be recovered easily after the construction. However, the Mitigation Plan should be run in the Construction Stage.

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		aquatic organisms?			
3. Natural Environment	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	(a) Y	Chira4, Chira6, Ca1, Ca3, Ma2, Pi2, Ya2.	(a) The direct influence area is so small that the impact can be recovered easily after the construction. However, the Mitigation Plan should be run in the Construction Stage.
			(a) N	The other points.	
	(4) Topography and Geology	(a) Is there a possibility that excavation of rivers and channels will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas?	(a) N	All 36 points.	
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) - (c) - (d) - (e) - (f) - (g) - (h) - (i) - (j) -	All 36 points.	(a) The involuntary resettlement does not cause by the project.

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect the downstream fisheries and other water uses? (c) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?	(a) Y (b) N (c) N	All 36 points.	(a) Some owner will lost a part of their actual land located near to the river, which can be illegal. In the Detailed Design Stage, the DGIH, as a titular of this project, should 1) determinate the line of the river basin area of each basin; 2) identificate the areas which will be bought by the Peruvian Government; 3) take the process of land acquisition according to the General Expropriation Law.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	All 36 points.	(a) There is no archeological, historical, cultural and religious heritage in the influence area of the Project. However, every project is needed to obtain the CIRA in Peru, so DGIH should take the process for that before starting the construction.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	All 36 points.	(a) There is no important land escape in the project area.
4. Social Environment	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(a) N(b) -	All 36 points.	(a) There is no indigenous community in the project area.(b)

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	All 36 points.	(a) The Industry Safety, Security and Health Rules should be considered in the TOR of the Constructor. (b) The Industry Safety, Security and Health Rules should be considered in the TOR of the Constructor. (c) The Transportations Activity Plan should be considered in the TOR of the Constructor. (d) The security guards should be considered in the TOR of the Constructor.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	All 36 points.	(a) This point should be considered in the TOR of the Contract for the Construction Stage. (b) The installations of safety equipment is considered in the Construction Stage. (c) They are considered in the Environmental Mitigation Plan.

Category	Environmental Item	Main Check Items	Yes: Y No: N	The name of the corresponding points.	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) - (d) Y	All 36 points.	(a) The water quality monitoring, the biodiversity monitoring, the air quality and noise monitoring will be taken place in the construction stage. (b) Based on the National Environmental Water Quality Standards (S.D. No. 002-2008-MINAM), Environmental Air Quality Standards are approved (S.D. No. 003-2008-MINAM), and Rules for National Environmental Noise Quality Standards (S.D. No. 085-2003-PCM). (c) The monitoring system will be constructed by the Constructor. (d) Yes.

Souce: JICA Study Team

4.2 Recommendations

We mainly recommend that the beginning of the construction activities coincides with the beginning of the dry seasons in the region (May to November) when the level of water is very low or the river dries up. Each river characteristics / features should be taken into account, that is, that the Chira and Cañete Rivers are year - round rivers, and that the Chico, Matagente, Pisco, and Yauca Rivers are seasonal rivers. At the same time, the crop season cycle in the areas of direct influence should be taken into account, so that traffic jams caused by the large trucks and farming machinery is prevented.

Second, it must be taken into account that flamingo birds migrate to the Chira River basin from November to March; therefore, works execution during that period should be prevented, so that any negative impacts on these birds and the surrounding aquatic fauna are mitigated.

Third, it is recommended that the Project holder (DGIH) should define the limit of river area during detailed design stage, and identify the people who live within the river area illegally. Continually the DGIH should carry on the process of land acquisition based on the Land Acquisition Low, which are; Emission of Resolution for land acquisition by the State, Proposition of land cost and compensation for land owner, Agreement of the State and land owner, Payment, archaeological assessment certification.

Fourth, the DGIH has to proceed the process to obtain the CIRA in the detail design stage. The process to be taken is 1) Application form, 2) Copies of the location drawings and outline drawings, 3) voucher, 4) Archaeological Assessment Certificate.

Fifth, the participation of the women in the workshops can be promoted through the existing women group such as *Vaso de Leche*.

Finally, the DGAA submitted the resolutions (Environmental Permissions) for four basins (Chira, Cañete, Chincha y Pisco). The four projects have been categorized as “Category I”, which means that these four projects are not required to carry out neither EIA-sd nor EIA-d. The EAP report of Majes-Camana Basin is under revision by DGAA-MINAG. The submission of the resolution of categorization will be on June 2012.

Ministry of Agriculture
Republic of Peru

THE PREPARATORY STUDY
ON
PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU

FINAL REPORT
I-6 SUPPORTING REPORT
ANNEX-12 TECHNICAL ASSISTANCE
(TEMPORARY VERSION)

March 2013

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

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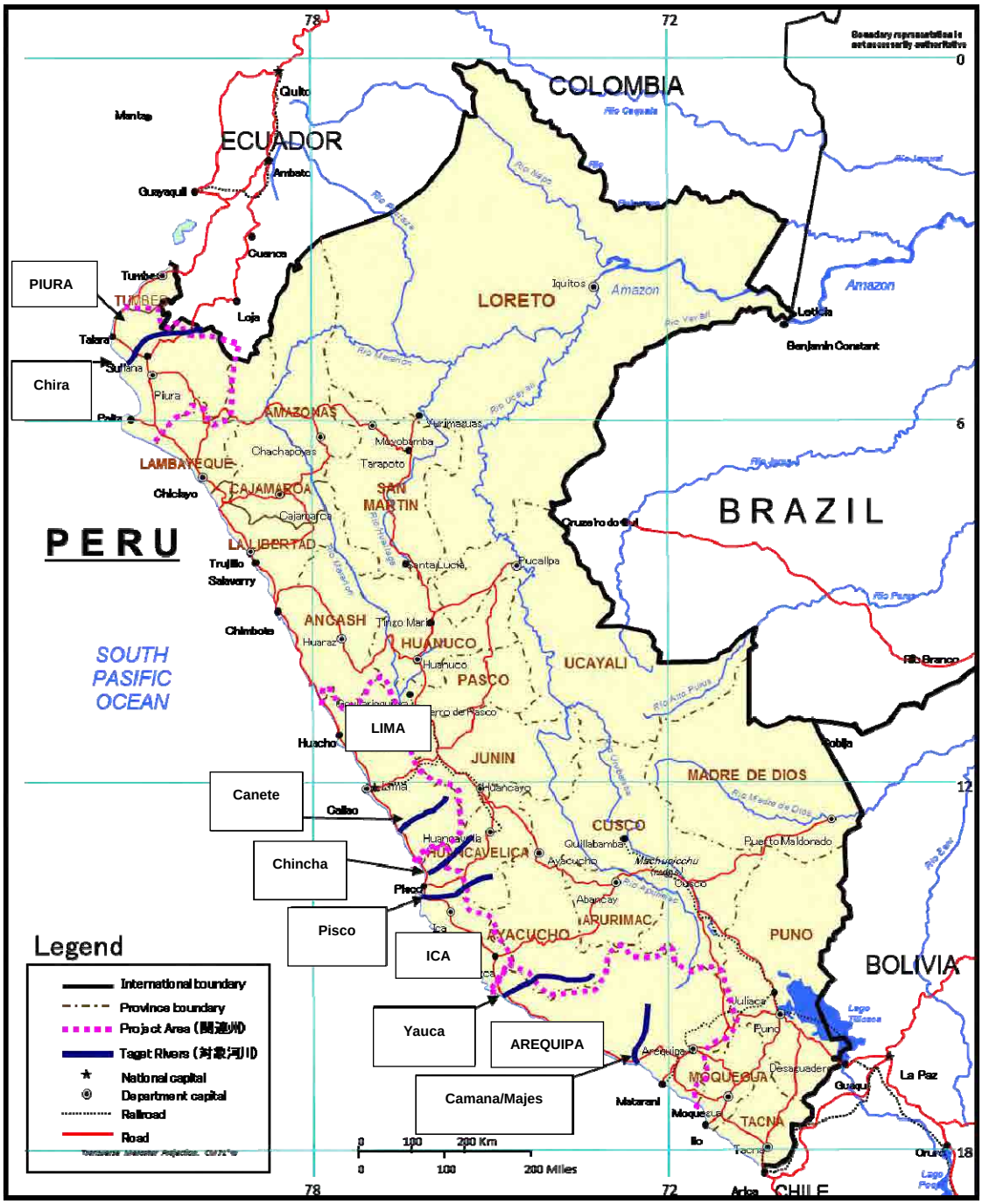

PERU
ECUADOR
COLOMBIA
BRAZIL
BOLIVIA
CHILE
SOUTH PASIFIC OCEAN
PIURA
Chira
LIMA
Canete
Chincha
Pisco
ICA
Yauca
AREQUIPA
Camana/Majes
TUMBES
LAMBAYEQUE
AMAZONAS
CAJAMARCA
SAN MARTIN
LA LIBERTAD
ANCASH
HUANUCO
PASCO
UCAYALI
JUNIN
MADRE DE DIOS
CUSCO
HUANCAVELICA
AYACUCHO
APURIMAC
PUNO
MOQUEGUA
TACNA
LORETO
Legend
International boundary
Province boundary
Project Area (開通州)
Target Rivers (対象河川)
National capital
Department capital
Railroad
Road
0 100 200 Km
0 100 200 Miles

Study Area

ABBREVIATION

Abbreviation	Official Form or Meaning
ANA	Autoridad Nacional del Agua/National Water Authority
ALA	Autoridad Local del Agua/ Local Water Authority
B/C	Costo Benefit Ratio/Benefit Cost Ratio
GDP	Gross Domestic Product/Gross Domestic Product
GIS	Geographic Information System/ Geographic Information System
DGAA	Dirección General de Asuntos Ambientales/General Directorate of Environmental Affairs
DGFFS	Dirección General de Forestal y de Fauna Silvestre/Directorate General of Forest and Wildlife
DGIH	Dirección General de Infraestructura Hidráulica/Directorate General for Water Infrastructure
DGPI (Paleo-DGPM)	Dirección General de Política de Inversiones/Directorate General of Investment Policy
DNEP	Dirección Nacional de Endeudamiento Público/National Directorate of Public Debt
DRA	Dirección Regional de Aguricultura/Regional Directorate Aguriculture
EIA	Evaluación de Impacto Ambiental/Environmental Impact Assessment
FAO	Agricultura y la Alimentación Organización de las Naciones Unidas/ Food and Agriculture Organization of the United Nations
F/S	Estudio de factibilidad/Feasibility Study
GORE	Gobierno Regional/Regional Government
HEC-HMS	Centros de Ingeniería Hidrológica Sistema de Modelación Hidrológica Método / Hydrologic Engineering Centers Hydrologic Modeling System Method
HEC-RAS	Centros de Ingeniería Hidrológica del Río de Análisis del Sistema Método/Hydrologic Engineering Centers River Analysis System Method
IGN	Instituto Geográfico Nacional/National Geographic Institute
IGV	Impuesto General a Ventas/General Sales Tax
INDECI	Instituto Nacional de Defensa Civil/ National Institute of Civil Defense
INEI	Instituto Nacional de Estadística/National Institute of Statistics
INGEMMET	Instituto Nacional Geológico Minero Metalúrgico/National Geological and Mining Metallurgical Institute
INRENA	Instituto Nacional de Recursos Naturales/Natural Resources Institute
IRR	Tasa Interna de Retorno (TIR)/ Internal Rate of Return
JICA	Japonés de Cooperación Internacional /Japan International Cooperation Agency
JNUDRP	Junta Nacional de Usuarios de Distritos del Perú/National Board of Peru Districts Users
L/A	Convenio de Préstamo/Loan Agreement
MEF	Ministerio de Economía y Finanzas/Ministry of Economy and Finance
MINAG	Ministerio de Agricultura/Ministry of Agriculture
M/M	Acta de la reunion/Minutes of Meeting
NPV	Valor Actual Neto (VAN)/NET PRESENT VALUE
O&M	Operación y mantenimiento/Operation and maintenance
OGA	Oficina General de Administración/General Office of Administration
ONERRN	Oficina Nacional de Evaluación de Recursos Naturales/National Bureau of Natural Resource Evaluation
OPI (OPP)	Oficina de Programación e Inversiones/Programming and Investment Office (Oficina de Planificación e Prespuesto/Office of Planning and Budget)
PBI	Producto Bruto Interno/Gross Domestic Product
PE	Exp. Proyecto Especial (PE) Chira-Piura/Exp. Special Project Chira-Piura
PES	Pago por Servicos Ambientales (PSA)/Payment for Environmental Services
PERFIL	PERFIL/PROFILE (Preparatory survey of project before investment)
Pre F/S	Estudio de Prefactibilidad/Pre-Feasibility Study
PERPEC	Programa de Encauzamiento de Ríos y protección de Estructura de Captación

PRONAMACHIS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos/ National Program of River Basin and Soil Conservation Management
PSI	Programa de Sub Sectorial de Irrigaciones/Program of Sub Irrigation Sector
SCF	Factor de conversión estándar/Standard conversion factor
SENAMHI	Servicio Nacional de Meteorología y Hidrología/National Service of Meteorology and Hydrology
SNIP	Sistema Nacional de Inversión Pública/National Public Investment System
UF	Unidad formuladora/Formulator unit
VALLE	Valle/Valley
VAT	Impuesto al valor agregado/Value-added tax

PHOTOS

Interview with the Water Users Association in Pisco

Workshop in Pisco

Workshop in Chira

Interview with Farmer in Pisco

Local Women in Caniete

Interview with Farmers in Chincha

Estudio Local con Junta de Usuario de Majes

Junta de Usuarios de Camana

THE PREPARATORY SURVEY ON PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU
FEASIBILITY STUDY REPORT
SUPPORTING REPORT

Annex-12
Technical Assistance
(Temporary Version)

Pages

LIST OF TABLES

Pages

Attachment

CHAPTER 1 EXECUTIVE SUMMARY

1.1 Name of the Public Investment Project

"TRAINING TO AWARENESS RAISING OF THE VULNERABLE POPULATION ON FLOODING RISK MANAGEMENT IN SIX (6) VALLEYS IN THE PERU"

1.2 Project Objectives

Primary Objective

Primary problem, as identified in the cause- problem – effect tree is:

"Lack of a suitable capability by farmers and technicians to apply risk management towards reducing damages caused by floodings."

1.3 Supply – Demand Balance

Estimated demand is made up of the vulnerable population that will be served by the Investment Program. This is identified in the table under "demanding population."

Current supply is made up of the population served by interventions from institutions such as INDECI, the Regional Governments, Water Users Associations, AGRORURAL, etc.

(1) The Demand Gap

The table below shows information on supply and demand in all six (6) valleys under study, and allows for establishing the unmet demand or the demand gap resulting from a difference between the demand and the supply.

Table 1.1 **Balance of Supply - Demand**

Year	Demanding Population	Actual Supply	Unsatisfied Demand
2009	47,839	3,048	44,791
2010	48,604	3,097	45,508

Source: PERPEC-MINAG

(2) Target Population

Vulnerable areas have been defined in the Investment Program profile, by simulating flooding, establishing the vulnerable areas in each valley, and identifying their relevant populations that are the target population to be served.

Table 1.2 **Target Population by Valleys**

Valley	Region	Fammilies	Population
CHIRA	PIURA	9,240	46,200
CAÑETE	LIMA	5,596	27,980
CHINCHA	ICA	3,274	16,370
PISCO	ICA	5,638	28,190
YAUCA	AREQUIPA	576	2,880
MAJES-CAMANA	AREQUIPA	2,211	9,947
TOTAL		**26,535**	**130,567**

Source: PERPEC, Equipo Estudio JICA

1.4 Technical Description of PIP

The Project is made up of four (4) components, and its proposal is primarily focused on training on, and awareness raising of risk management knowledge and implementation, via participatory workshops with local leaders and water users associations, as their leadership and call capabilities are best used for an efficient replication effect.

Component 1: Knowledge of River Bank Protection in consideration of Agriculture and Natural Enviornment

Course	a) River Bank Operation and Maintenance b) River Bank Plant Management c) Erosion Prevention and Mitigation Natural Resource Management
Objectives	a) In this project, local populations learn suitable technology to operate and give maintenance to constructions and works from prior projects. b) Local populations learn suitable technology on river bank plants and vegetation for flooding control purposes. c) Local populations learn suitable technology on erosion and natural resources for flooding control purposes.
Participants	a) Engineers and / or technicians from local Governments b-c) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	a) 12 times in all (every six (6) hours) b) 12 times in all (every five (5) hours) c) 26 times in all (every three (3) hours)
Lecturers	a) Contractors of constructions and works, Engineers from MINAG and / or the Regional Government b-c) Engineers from MINAG and / or the Regional Government, College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Suitable operation and maintenance technology for constructions and works from prior projects a-2) Suitable operation and maintenance technology for constructions and works in this project b-1) River bank protection with the use of plants b-2) The importance of river bank vegetation in flooding control b-3) Types of river bank plants and their characteristics c-1) Evaluation of the erosion conditions c-2) Evaluation of natural resource conditions c-3) Erosion approach for flooding control c-4) Natural resource approach for flooding control c-5) Environmental consideration approach c-6) Use of water resourceS c-7) Alternatives for suitable farming crops

Component 2: Preparation of Commnity Disaster Management Plan for Flood Control

Course	a) Risk management Plan Formulation b) Detailed Risk management Plan Formulation c) Early Warning System for Flood Control
Objectives	a) Local populations gain knowledge and learn technology to prepare a flooding control plan b) Ditto c) Implementation of early warning system with local participation
Participants	a-c) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	a) 19 times in all (every four (4) hours) b) 34 times in all (every five (5) hours) c) 24 times in all (every five (5) hours)
Lecturers	a-b) Engineers from MINAG and / or the Regional Government, Community Development Expert, Facilitator (local participation)
Contents	a-1) Flooding control plan preparation manuals a-2) Current condition analyses for flooding control a-3) Community development alternatives by means of local participation a-4) Workshop for flooding control plan preparation b-1) Communy activity planning in consideartion of ecological zoning b-2) Risk management b-3) Preparation of community disaster management plan c-1) Risk management and Early warning system c-2) Joint activity with local governments, users' association, etc.

Component 3: Basin Management for Anti – River Sedimentation Measures

Courses	a) Hillside (damaged areas in the middle – upper reaches) Conservation Techniques b) Forest Seedling Production c) Forest Seedling Planting d) Forest Resource Management and Conservation
Objectives	a) Local populations learn suitable technology on hillside conservation for flooding control purposes in the damaged areas of the middle – upper reaches b) Local populations learn suitable technology on forest seedling production c) Local populations learn suitable technology on forest seedling planting d) Local populations learn suitable technology on forest resource management and conservation
Participants	a-d) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives, and local people
Times	a) 12 times in all (every five (5) hours) b-d) 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)
Lecturers	a-d) Engineers from MINAG and / or the Regional Government, College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Soil characteristics and conservation on hillsides a-2) Hillside agroforestry system a-3) Animal herding system on hillsides in the damaged area of middle – upper reaches a-4) Reforestation with traditional vegetation and plants a-5) Hillside conservation and alleviation alternatives in the damaged area of middle – upper reaches b-1) A selection of plants that are suitable to the local characteristics b-2) Forest seedling production technology b-3) Control carried out by the local population's involvement c-1) Candidate areas for forestation

	c-2) Forest plantation control technology c-3) Forest plantation soil technology c-4) Control carried out by the local population's involvement d-1) Forestation for flooding control purposes d-2) Forest plantation control technology d-3) Forest plantation output technology d-4) Control carried out by the local population's involvement

Component 4: Information Networks on Flooding Risk management

Courses	a) Risk management and Forecasting and Warning Usefulness (using existing system) b) Workshop – Meeting with Local Authorities (using existing system)
Objectives	a) Local populations learn suitable technology on risk management and forecasting and warning usefulness. b) Cooperation preparedness between local Governments, Water Users Associations, communities, and local populations for flooding control purposes.
Participants	a-b) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	a) 12 times in all (every five (5) hours b) 12 times in all (every five (5) hours
Lectures	a-b) Engineers from MINAG and / or the Regional Government, Forecasting and warning usefulness contractors and College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Disaster risk conditions and forecasting and warning usefulness a-2) Comprehensive risk management technology for flooding control a-3) Forecasting and warning usefulness technology a-4) Forecasting and warning usefulness control carried out by the local population's involvement b-1) Setting up an information network for Disaster risk conditions and forecasting and warning usefulness b-2) Local cooperation set up for forecasting and warning usefulness b-3) Preparation of a disaster risk plan that includes Forecasting and warning usefulness

1.5 Cost

As previously explained, in this case, the incremental costs are equivalent to "with project" costs, as "without project" costs are zero; this means, the incremental costs amount S/. xxxxxx Nuevos Soles.

1.6 Benefits

Major benefit generated by the Project is social – focused, as it primarily serves the population in terms of training and awareness raising.

This type of benefits cannot be appraised in monetary terms, but can be quantified through a social appraisal, namely, the Cost Effectiveness methodology.

a) Benefits in the "Without Project"

As no activities that are focused on improving the population's capability to apply risk management are carried out or scheduled in the "without project " situation, benefit will be equal to zero.

b) Benefits in the "With Project"

The training service to be set up will primarily provide qualitative benefits, namely:

- Bank protection works sustainability is ensured through a suitable maintenance.
- Population is prone to contribute with hand labor and other means to bank protection works construction, and to play an active role in the other actions.
- Beneficiaries know about actions to be taken before, during, and after the emergencies for overflows and floodings.
- Criteria to identify spaces that are most vulnerable to overflows and floodings, and to set up most convenient measures are identified.
- Non structural measures are set up to reduce overflow and flooding risks, thus ensuring compliance with participation and citizen vigilance.
- Knowledge on formulations and evaluations in irrigation infrastructure project is confirmed for risk management to be applied on these projects.
- River silting up is reduced, as the population in the higher and middle parts of the basin is made aware of the application of forestation and soil conservation techniques.
- Forecasting and warning systems are known for human losses and, as much as possible, material damages to be prevented, and also, for prevention measures to be applied.
- Damages to the river bank vegetation are reduced, as the population settled in the valleys is made aware.

1.7 Sustainbility

Sustainability analysis aims at foreseeing that, once the Project investments are completed, capabilities developed in the beneficiaries and the institutionality that brings them together, along with the local and regional entities, will carry on with awareness raising activities on behalf of the population.

(1) Institutional Arrangements

The OGA-MINAG gets in charge of the Investment Program's execution, with the support of the Regional Agriculture Directorates. Therefore, these offices will be in charge of keeping the coordination links between the beneficiaries and the local and regional Governments, INDECI, etc.

Tasks to be carried out by these institutions include training the population for disaster prevention purposes.

In this sense, institutional alliances will be important. These alliances will become formal, as a result of the meetings held with the local governments to formulate the risk management plan that aims at strengthening risk management institutionality. These meetings are led by the Civil Defense Committees that include local population, local and regional governments, and other institutions.

The major aspect for river bank protection's institutionality strengthening is the RISK MANAGEMENT PLAN consolidation and implementation that will be formulated in this Project, and involves all the interested organizations and institutions the aim at soil, crop, infrastructure, and population protections. These organizations and institutions include INDECI, AGRORURAL, etc.

Another important aspect that ensures the project's sustainability is the regional Government's institutional strengthening via training to their professional staff on: Ecological Zoning, Risk management, Resource Management, and Project Formulation. This will come along with a commitment to carry on raising awareness of those vulnerable populations within their intervention scopes.

Local Government will be essential for the participation of operation and maintenance in river bank protection infrastructure. Forestation and soil conservation on hillsides and river banks will be carried out in close coordination with AGRORURAL, as this institution's tasks involve carrying on with awareness raising to the identified population.

(2) Management Capacity

For training actions to be given sustainability, local and regional Governments will be engaged, and beneficiary users, grassroots organizations, and community representatives will be articulated. In addition, NGOs are foreseen to participate, so that once the project intervention is completed, these institutions carry on with the training actions.

The MINAG is in charge of executing organization and has rich experience of ex-PERPEC with broad experience in river bank protection project executions.

1.8 Environmental Impact

Due to its nature, the project does not generate any negative environmental impacts; it rather contributes to environmental protection, as training actions focus on ensuring a suitable maintenance of the riverbed. Thus, the project's environmental impact is positive: The agricultural activity's climatologically information service conditions will be improved, and the population's sanitation conditions will not be affected, namely, the project will significantly improve the living conditions.

a) Environmental Ecological Impacts

Environmental, soil, air, and sociocultural climate are improved, as the river bank vegetation protection and natural resource conservation in the middle and high parts of the basin are promoted. This will allow for awareness raising among the population that resource depredations affecting the environment should be prevented.

b) Socioeconomic Impacts

Job Generations

A first major change, as a result of training offered to counter floodings that directly affect agricultural sector, is the safe investments that encourage employment in agricultural activities; therefore, this is a positive impact.

Improvements to the Local Population's Economy and Well – Being

Indirectly benefited population is basically devoted to farming as a livelihood; therefore, assurance granted to farming investments makes farming development to be sustainable. Upon that basis, improvements to the agricultural sector will allow for farming activity and hand labor employment increases, and a population's subsequent living improvement.

Reappraisal of Farming Soil

With regard to the agricultural sector, farming land economic value will increase, based on the certainty that land will not get flooded, and farming investments will not get lost. This is a significant effect, as farmers will be able to access further investment opportunities, bank loans, and technical assistance.

Cultural Impacts

The protection of culture will become strengthened, as a natural vegetation protection will be encouraged, and a rational riverbed management, an aggregate balanced extraction, and a rational forest exploitation will be consolidated.

1.9 Organization and Management

According to the effective law, formulation and execution of this clear Public Investment Project responds to the Ministry of Agriculture's inherent competence. As a public entity, the Ministry of Agriculture is committed to interact with other public entities that carry out a specific task during the formulation, execution, and post – investment stages, with regard to this type of projects.

The following operative scheme has been foreseen for this project's implementation:

- The Executing (or Implementation) Unit (MINAG's Central Administration) will coordinate with the National Hydraulic Infrastructure Directorate to pay out the disbursements that are relevant to the Regions included in the project, for a timely execution of the foreseen activities.

- Based on the program coordinations in each region, the Regional Agriculture Directorates will execute the project. In this sense, the relevant training plans and specific schedules will be prepared with the support of the consultant – facilitators' support.
- The logistical support will be provided by means of PSI's coordination. For this to be carried out, third party services will be hired with the project resources, as stipulated under the overhead item.
- Courses will be coordinated with the regional Governments, especially with the Civil Defense Directorates and other interested entities, such as the National Water Authority (ANA), AGRORURAL, etc.
- In such locations where works are being executed, works residents and administrators will support the call by means of the Water Users Associations.

1.10 Conclusions

1. This project will allow for making the beneficiary population aware for execution and maintenance of both structural and non structural measures for river bank protection.
2. Risk management Plans will be available, and will allow for guiding grassroots organizations' management and dealing with floodings, in close coordination with the public and private institutions.
3. Institutional capabilities will be strengthened among local and regional governments. This will lead to carry on training the vulnerable population. In addition, professional staff will be duly trained on formulation and appraisal of projects that consider risk management as a significant evaluation element.
4. Project investment cost is S/. 879,180 at market price, to be executed in 2 years.
5. Finally, project execution is recommended, as project proves to be technically, socially, and environmentally viable.

1.11 Lografame Matrix

The Logframe Matrix for the chosen alternative is shown in the table below.

	OBJECTIVES	INDICATORS	SOURCES	ASSUMPTIONS
END	To contribute to the intervention scope's sustainable and competitive growth			There are no changes in Agriculture – related Government policies.
PUROSE	Farmers' and technicians' suitable capability to apply Risk management towards reducing flooding damages	By the end of the project, around 26,535 family heads will have been made aware and trained on Overflow and Flooding Risk management techniques.	Reports from technical coordinators in the relevant DRAs (Regional Agriculture Directorates) where the project is executed.	There are no obstacles that prevent, or interfere in the project execution.
COMPONENTS	1. River bank protection knowledge.	1. 48 training events throughout six (6) valleys, located in the same number of regions, will be developed.	Monthly progress reports by the executing (implementation) unit.	
	2. Organizational capability for disaster prevention and care	2. 52 training events throughout six (6) valleys will be developed. 18 of these events, on Risk management Plan formulation, are addressed to community leaders in the chosen scopes, 34 events are addressed to project – involved professional staff, and 24 events are addressd to local people.	Idem	The executing (implementation) unit foresees the whole organization for a smooth project execution
	3. Hillside management actions for river silting up	3. 60 training events throughout six (6) valleys will be developed, and posters and three (3) page leaflets will be disseminated throughout Peru's scope.	Idem	Funds devoted to the project are provided to the relevant executing (implementation) units.
	4. Risk management instruments	4. 4 training events and 2 workshop meetings will be developed with local authorities	Idem	Project beneficiaries participate in an active and committed way.

	ACTIVITIES	INDICATORS	RESOURCES	ASSUMPTIONS
ACTIVITIES	Workshop course: Works Operation and Maintenance	12 developed training events	S/. 55,800	
	Workshop course on river bank plant management	12 developed events.	S/. 55,800	
	Courses on erosion prevention and mitigation and natural resource management	24 developed events.	S/. 111,600	
	Workshop meetings for Risk management Plan formulation	18 developed events.	S/. 50,220	
	Courses to increase Overflow and Flooding Risk management institutional capabilities to local and regional Government professional staff within the project scope.	34 developed events.	S/. 407,225	The Executing (Implementation) Unit has available qualified technical staff for planning, organization, direction, monitoring, and evaluation of each one and all of the training events.
	Field actions (in days) on hillside conservation techniques	12 developed events.	S/ 59,520	
	Courses on forest seedling productions; installation, management, and conservation of forest resources..	36 developed events.	S/. 142,200	
	Handing out of posters and three (3) page leaflets	10,000 units of disseminating material handed out throughout six (6) valleys	S/. 21,600	
	Course on Risk management and usefulness of forecasting and warning systems	2 developed events.	S/. 9,300	
	Workshop meetings with local authorities	2 developed events.	S/. 5,580	

CHAPTER 2 GENERAL ASPECTS

2.1 Name of the Public Investment Project

"TRAINING TO AWARENESS RAISING OF THE VULNERABLE POPULATION ON FLOODING RISK MANAGEMENT IN SIX (6) VALLEYS OF THE COUNTRY"

2.2 Formulating and Executing (Implementation) Unit

2.2.1 Formulating Unit (FU)

The General Hydraulic Infrastructure Directorate (DGIH) - PERPEC, Ministry of Agriculture (MINAG) is a public sector entity that, in keeping with its promoting organism policy, is in charge of carrying on with, and supporting farming campaigns, as well as setting up risk management in execution and maintenance of intakes, irrigation channels, etc., so that farming investment is ensured, both for the areas adjacent to the bank strips and the areas irrigated by the hydraulic infrastructure. With this goal in mind, actions that promote and carry on with, and support productive activities are being carried out nationwide for rural population's quality of life enhancement / improvement.

Sector	:	Agriculture
Statement by	:	Ministry of Agriculture - MINAG
Name of FU	:	General Hydraulic Infrastructure Directorate
Person in charge of FU	:	
E-mail	:	
Address	:	Av. Benavides N° 395-Miraflores
Telephone No.	:	(511) 6148100

2.2.2 Executing / Implementation Unit (EU)

<u>General Executing / Implementation Unit:</u>

Program's executing / implementation unit is the Ministry of Agriculture – Central Administration.

Sector	:	Agriculture
Statement by	:	Ministry of Agriculture
Name	:	Ministry of Agriculture – Central Administration
Person in charge	:	
E-mail	:	
Address	:	Av. Alameda El Corregidor N° 155 – La Molina
Telephone No.	:	(511) 6135800

Responsibility of the Investment Project execution, in terms of coordination, management, and control, is shared at a central level with the participating organisms. This involves all actions that allow for meeting objectives and goals, as set out in the Project.

On the other hand, the Ministry of Agriculture's General Administration Office (OGA – MINAG) is to be held accountable for the Project's financial and administrative performance.

Project executors / implementation agency:

Regional Agriculture Directorates of: Piura, Lima, Ica, Arequipa, and San Martin will be in charge of executing the Project training and awareness raising actions.

Physical execution and control of, and follow – up to the Project will be carried out by the Regional Agriculture Directorates, via their Technical Coordination Office under the PSI with River Channeling and Intake Structure Protection Program – Ex-PERPEC.

The Technical Coordinator will be in charge of supervising all training and awareness raising actions.

Under the set out scheme, the Formulating Unit has the technical and logistical capability to taken on the Project's execution.

2.3 Participation of Involved Entities and Beneficiaries

Institutions engaged and participating in the investment program's development and implementation include:

2.3.1 National Government Entities

- **Ministry of Economy and Finances (MEF)**

The national government entity in charge of designing, proposing, executing, and evaluating, with efficiency and transparency, the country's economic and financial policy that will lead to achieving growth as a basic condition towards steady economic development, thus implying the population's accomplished overall wellbeing. MEF's involvement consists in arranging the allotment of those economic resources from the Treasury to the Ministry of Agriculture's River Channeling and Intake Structure Protection Program – PERPEC.

- **Ministry of Agriculture (MINAG)**

The national government institution is in charge of promoting the development of farming producers, who are organized in productive chains within the basin framework. It carries out this action as the natural resource management unit for a developed agriculture to be accomplished in terms of economic, social and environmental sustainablitiy.

In order to effectively and efficiently contribute to meeting its objectives, MINAG has launched, since 1999 and on a regular basis, the River Channeling and Intake Structure Protection Program – PERPEC. By means of this program, funds are provided to the regional Governments for river bank protection project executions.

MINAG Offices with a relevant participation in the PERPEC include:

- MINAG's General Administration Office, MINAG - OGA
  In charge of the Program's administrative and budgetary execution
  In charge of establishing the administrative and financial alignments.
- MINAG's General Agricultural Planning Office, MINAG - OGPA.
  In charge of follow – up to the budgetary management.
  In charge of negotiating funding for necessary resources for Program execution.
- General Hydraulic Infrastructure Directorate (DGIH)
  In charge of suggesting the new policies, strategy and plans towards encouraging the hydraulic infrastructure development, in accordance with the National Hydric Resource Policy and the National Environment Policy, the development of the Hydraulic Infrastructure involves studies, works, operation, maintenance, and risk management during the construction, refurbishment / upgrading, improvement, and extension of dams, intakes, river channels, irrigation channels, drains, meters, small intakes, groundwater wells, and plot irrigation upgrading.
- National Water Authority (ANA)
  The highest technical law issuing authority in charge of promoting, supervising, and controlling the policies, plans, programs, projects, and laws on the sustainable use of hydric resources nationwide.

Functions developed by this entity are directed towards: Promoting a refined technical, legal, and law issuing framework for the hydric resources' sustainable management; supervising and evaluating actions carried out by the local water local authorities; preserving and promoting the hydric resources' sustainable exploitation, territorial arrangement, and the formulation of master negotiation / management plans; and carrying out studies and projects with both domestic and international economic technical cooperation.

2.3.2 Regional Government Entities

- **Regional Governments (GORE)**

The top regional level of authority in charge of promoting comprehensive, sustainable regional development, by promoting public and private investment and employment, ensuring full exertion of rights and equal opportunities for their populations, in compliance with the national, regional, and local development plans and programs.

- **Regional Agriculture Directorates (DRAs)**

The Regional Agriculture Directorate is led by a Regional Director, who is appointed by the Regional President, and its major functions include:

- Formulating, approving, evaluating, leading, controlling, and managing the regional agriculture plans and policies, in accordance with the domestic policies, the sectoral plans, and the promotional propositions for rural development set out by the rural municipalities.
- Administrating and supervising agricultural service activities' management, in keeping with the policy and laws in the relevant sectors and the regional potentialities.
- Participating in the sustainable management of hydric resources within the basin entities' framework and the National Water Authority policies.
- Promoting the transformation, commercialization, exports, and consumption of regional natural and agribusiness products.
- Promoting and executing projects and irrigation works, irrigation improvements, suitable hydric resource and soil management and conservation.
- Ensure a suitable compliance with the laws that are relevant to the farming, environment, and natural resource sectors, in accordance with the domestic policies and sectoral plans.

2.3.3 Beneficiaries

- **Water Users Associations**

Beneficiary population involvement implies the presence of the Water Users Associations in the Chira, Cañete, Chincha, Pisco, Yauca and Majes-Camana valleys.

Table 2.1 **Commissions of Water Users Association**

CHIRA VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	Nª de Beneficiarios	Rio
Miguel Checa	Miguel Checa	9998.00	5579.00	Chira
El Arenal	El Arenal	3549.00	1625.00	
Poechos - Pelados	Poechos - Pelados	4450.00	1848.00	
Cieneguillo	Cieneguillo	7903.00	1192.00	
Margen Derecha	Margen Derecha	7205.00	2365.00	
Margen Izquierda	Margen Izquierda	3805.00	1117.00	
TOTAL		**36,910.00**	**13,726.00**	

Source: JICA Study Team

CAÑETE VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	Nª de Beneficiarios	Rio
Roma Rinc. La Huerta Lateral A Cantera Almenares Lateral B Lateral T Túnel Grande Quebrada Ihuanca Cantagallo-U Campesina Caltopa Caltopilla	Canal Nuevo Imperial	8015	2254	Cañete
Casa Pintada Sn Isidro Cerro Alegre Huaca Chivato Conde Chico Ungara Josefina Sta. Gliceria	Canal Viejo Imperial	3689	1022	
Tres Cerros Montejato La Quebrada Hualcara Cerro de Oro Chilcal	Canal María Angola	1815	472	
Montalván-Arona-La Qda.-T Lúcumo - Cuiva - Don Germ Lateral 74-La Melliza-Sta Bá Casa Blanca - Los Lobos	Canal San Miguel	3686	881	
Lúcumo - Cuiva - Don Germ Huanca Media Huanca Baja Huanca Alta	Canal Huanca	2305	424	
Gr.9.2 lateral 4 Gr.9.1 lateral 3 Gr.8.2 lateral 2 Gr.8.1 lateral 1 Gr.7 compuerta 10 Y 11 Gr.6 compuerta 9 Gr.5 compuerta 6,7 Y 8 Gr.4 compuerta 5 Gr.3 compuerta 4 Y 12 Gr.2 compuerta 2 Y 3 Gr.11 Basombrio Gr.10 Pachacamilla Vieja Gr.1 compuerta 1	Canal Pachacamilla	946	233	
Palo Herbay Alto	Canal Palo Herbay	2011	568	
TOTAL		**22,467.00**	**5,854.00**	

Source: JICA Study Team

CHINCHA VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	Nª de Beneficiarios	Rio
La Pampa	Chochocota	1,464.59	412.00	Matagente
	Belen	1,183.91	263.00	Matagente
	San Regis	1,262.99	329.00	Matagente
	Pampa Baja	3,293.66	681.00	Matagente
Chincha Baja	Matagente	1,944.70	430.00	Matagente
	Chillon	1,630.19	443.00	Matagente
	Rio Viejo	1,500.80	377.00	Matagente
	Chincha Baja	1,036.97	242.00	Matagente
Chincha Alta	Rio Chico	298.29	105.00	Chico
	Cauce Principal	1,145.64	467.00	Chico
	Pilpa	117.54	545.00	Chico
	Ñoco	639.46	1890.00	Chico
	Aceqia Grande	589.52	1475.00	Chico
	Irrigacion Pampa de Ñoco	2,658.62	875.00	Chico
TOTAL		**18,766.88**	**8,534.00**	

Source: JICA Study Team

PISCO VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	Nª de Beneficiarios	Rio
Pisco	Casalla	2,273.00	515.00	Pisco
Pisco	El Pueblo Figueroa	757.00	138.00	
Pisco	Caucato	1,612.00	325.00	
Independencia	Agua Santa - El Porvenir	463.00	63.00	
Independencia	Francia	931.00	125.00	
Pisco	Chongos	447.00	76.00	
Chacarilla	Condor	1,970.00	318.00	
Dadelso				
Jose Olaya				
Mencia				
San Jacinto				
Urrutia				
Cabeza de Toro	Cabeza de Toro	6,118.00	633.00	
Independencia	Montalván	1,596.00	275.00	
Independencia	Manrique	1,555.00	289.00	
Murga	Murga - Casaconcha	1,345.00	268.00	
Humay	San Ignacio	333.00	66.00	
Murga	La Floresta	303.00	51.00	
Murga	Bernales	1,319.00	305.00	
Humay	Montesierpe	449.00	118.00	
Humay	Pallasca Tambo Colorado	145.00	65.00	
Murga	Miraflores	129.00	35.00	
Humay	Huaya Letrayoc	238.00	57.00	
Murga	Chunchanga	456.00	76.00	
TOTAL		**22,439.00**	**3,798.00**	

Source: JICA Study Team

YAUCA VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	Nª de Beneficiarios	Rio
Yauca	Yauca	523.00	384.00	YAUCA
Mochica	Mochica	454.00	63.00	
Jaqui	Jaqui	635.00	200.00	
TOTAL		**1,612.00**	**647.00**	

Source: JICA Study Team

MAJES – CAMANA VALLEY

Sectores de Riego	Comision de regantes	Areas Bajo Riego (Has)	No de Beneficiarios	Rio
Majes	Majes	8,046.43	2,342	Majes
Camana	Camana	7,087.88	3,425	Camana
Total		**15,134.31**	**5,767**	

Fuente: Equipo del Estudio JICA

These boards that represent the organized users in the above mentioned valleys have decided to take on the cost for the Works proposed in the Investment Program. In addition, they will carry out operation and maintenance to the river bank protection works, once the works are completed. Therefore, the execution of the program's training and awareness raising components, as detailed in this project, is critical to guarantee i) the beneficiaries' input commitment becoming effective and ii) the project's sustainability at the operation stage, as the organized users, local and regional authorities get involved. The table below shows the matrix of the involved parties:

Table 2.2 **Matrix of The Involved Parties**

GRUPOS	INTERESES	PROBLEMAS PERCIBIDOS	RECURSOS Y MANDATOS
Comision de Regantes	Tener conocimientos necesarios para afrontar los riesgos de inundación, haciendo un uso adecuado de las obras de protección a sus cultivos y canales.	Las avenidas de los rios generan inundaciones de los canales y campos de cultivo de los pobladores de las zonas, debido a la vulnerabilidad de las riberas de los rios	Participación activa en coordinacion con las entidades involucradas en el sector agrario y proteccion de estructuras en los rios
Junta de Usuarios	Tener la seguridad que sus cultivos y cosechas no seran afectados por las avenidas de los rios	Las Avenidas de los rios afectan a los canales de riego generando problemas de deterioro, y mayor gasto de mantenimiento, debido a la falta de seguridad y proteccion de las riberias del rio	Apoyo al proyecto en virtud que se protegeran los campos de cultivo y las cosechas
Autoridad Local de Agua	Cumplir con su mision de resguardar la preservacion, conservacion y uso racional del recurso hidrico, forestal y de los demas recursos naturales	La infraestructura de riego, los cultivos y poblaciones en riesgo de inundación y colapso ante las avenidas extraordiinarias del rio	Supervision de las obras a realizar, en coordinacion directa con la DRA.
Agencia Agraria	Cumplir con su mision de promover y orientar el desarrollo agrario en la region hacia una agricultura sostenible y competitiva, bajo las estrategias de manejo de cuencas y cadenas productivas	Las inundaciones producidas por las avenidas de los rios generan la perdida de cultivos de los agricultores, generando problemas en la comercializacion del los productos agricolas	Ejecutar con el personal tecnico y administrativo, el proyecto de inversion
Programa de Encauzamiento de Rios y Proteccion de Estructuras de Captacion - PERPEC	Cumplir con su objetivo de disminuir los riesgos de desbordes de los rios de erosion de los terrenos agricolas y colapso de las obras de captacion y conduccion	Escasa proteccion de las riberas del rio, observando ademas escasas acciones de forestacion y cobertura vegetal.	Efectuar la supervision, Coordinacion, Monitoreo, Seguimiento y Apoyo a la ejecucion de las obras de proteccion en las reberasde los rios
Gobierno Local	Cumplir con las normas de seguridad de la poblacion pertenecientes a la zona del proyecto, considerando que son parte activa del comité de Defensa Civil.	En la actualidad las poblaciones de la zonas no cuentan con medidas de seguridad y proteccion contra las avenidas de los rios	Brindar apoyo para que se cumplan las normas de seguridad para el beneficio de los pobladores de las zonas

Source: JICA Study Team

Both the state entities and the beneficiaries are absolutely interested in having the flooding damage risks removed. Beneficiaries are interested in the execution of actions leading to flooding risk reductions, thus, they commit themselves to participate along with the Government through the PERPEC that will, in turn, step in to reduce vulnerability in its croplands along the river bank areas.

2.4 Reference Framework

Agriculture in Peru is an activity carried out under high risk and vulnerability conditions, when faced with effects that have been brought about by climatic phenomena. Some of these phenomena can be prevented or mitigated, though.

The natural phenomena causing the greatest social and economic impact on the agricultural sector are the seasonal and extraordinary precipitations that bring about floodings with the river flow increases. Side effects of these phenomena are very significant, as they include damages and losses of great value that affect production, farmlands, and productive agricultural infrastructure (intakes, channels, etc.)

Adaptation measures to reduce flooding risks include structural and non structural measures that will be set up with the Investment Program and this training project. In this context, there is an international concern for natural disaster reduction, as the FAO 2008 report shows that floodings are the major cause for these disasters around the world. On the other hand, the U.S. National Ocean Atmosphere Administration Office (NOAA), the World Meteorological Organization (WMO), and the International Center for the El Niño Phenomenon Research have forecasted a high probability of occurrence for the El Niño Phenomenon for 2009; this situation would give a top priority or emergency status to set up this project.

Damages to yields and property deepen the poverty situation of small and middle – size farmers located along the river Banks. In addition, these damages affect people using the river water that is impounded from an intake for irrigation purposes, as floods flowing into an unprotected intake damage or destroy it (and silt it up, as well), and thus, it is no longer operative, and water cannot be carried through the main channel for its subsequent diversion to croplands.

- **National Prevention Plan**

Care to farming activity needs is framed within the Ministry of Agriculture's Third Sectoral Policy Strategic Objective, namely: "To contribute to natural resource sustainable exploitation, aiming at environmental protection, and turning the environment into an important asset for the rural population that will generate suitable conditions for economic and social development within the National Prevention Plan." This contribution will lead to decrease farming activity development risks, as agriculture in our country is a productive activity that is carried out under high risk and climatic vulnerability conditions that in many cases can be foreseen and mitigated.

- **Article 3º of the Ministry of Agriculture's Organic Law**

Article 3º of the Ministry of Agriculture's Organic Law states that the agriculture sector's scope involves riverbeds, river channels, river banks, water from rivers, lakes, and other aquifer sources for farming use…" This assertion precisely states that work on the river beds or channels, as well as hydirc resource management for agricultural purposes, are the agricultural sector's responsibility.

- **Agriculture Policy Alignments for Perú – 2002**

Title 10, Sectoral Policy, of the "2002 Agricultural Policy Alignments for Peru" (as prepared by the Ministry of Agriculture's Policy Office), states that "Agriculture is a productive activity that is carried out under high risk and climatic vulnerability conditions that can be foreseen and mitigated…;" in addition, it states that "The cost of damages to infrastructure, harvests, cattle, etc.

involved, becomes a limiting factor to the agriculture development, as a result of an increasing deterioration of the local, regional, and national living conditions."

As these are recurring, hard – to – foresee, and significantly major events, a great need of protection is required. In addition, the execution capacity and the budget are limited; therefore, these works must be carried out on an ongoing and scheduled way through multi annual action plans that are in compliance with the sector work plans, for trust and security to be provided during the development of the productive activities.

The execution of river channeling and river bank protection works by the Ministry of Agriculture are framed within, and are supported by the following functions that are inherent to the sector, and are carried out for the irrigation infrastructure (intakes and aqueduct canal) and farmland to be protected:

a. Keeping and / or restoring channel conditions, river adjacent lands, and nearby vegetation, on behalf of farmers and the local scenery.

b. Assuring water supply for the crops is the State's responsibility. This is carried out through the local water authority. Therefore, its involvement includes performance as a responsible authority, and contributes to a rational hydric resource exploitation during dry season.

The Agriculture Multi Annual Sectoral Strategic Plan 2007 – 2011 establishes six (6) strategic objectives, including:

- Increasing the water management efficiency and the hydric resource sustainable uses, by promoting, among other actions, disaster risk management when faced with hydric resource irregular behavior. In this sense, prevention measure formulations, contingency care, and rehabilitation are set out as strategies for loss risk reduction of farming surface land, productive infrastructure, and natural resources, in coordination with the relevant levels of authorities, and the participation of the RG and LG in the implementation of the suggested measures.
- Focusing on the public sector's intervention on poverty areas, mainly the Andes and the jungle, under a territorial and multisectoral approach, by organizing the populations around a program that supports productive and capacity building activities, increasing agriculture public investment in poverty and extreme poverty areas. This will involve agreements, projects, and programs aiming at territorial management capacity building for regional and local Government rural development.

1. Prevention works construction
2. Training and awareness raising
3. Forestation and reforestation
4. Time and climate remote monitoring

c. This work is coordinated with the government plans, and allows for fulfilling the commitments that were established by means of commercial agreements, such as the FTA. In this sense, farming production and the fulfillment of commercial commitments should be assured.

d. Supervision and preservation of riverbeds is part of the local water authorities' (former ATDR) performance; part of their competences involve authorizing the execution of works in the riverbeds.

e. Investment in preventive measures for farmland protection represents a low cost, compared to the rehabilitation and reclamation costs for this land. Therefore, it is important to prioritize protection works, as they are less costly, offer further benefits to the country, and provide savings to the State (Article 49 of the "Water Law Rules.")

During the El Niño Phenomenon's occurrence in 1997 – 1998, the Central Government launched the El Niño Emergency Plan - Stages 1 and 2, for the rehabilitation of the hydraulic infrastructure that was affected by this phenomenon. This plan was carried out by the Ministry of Agriculture.

The above mentioned experience and the goal involving mitigating the devastating effects of extraordinary, regular, and seasonal floods during the first months of the year (January – March) have prompted the Ministry of Agriculture to execute, since 1999 and on a regular basis, prevention actions leading to prevent river overflowing and damages to yields and farmland surface, under the "River Channeling and Intake Structure Protection Program" – PERPEC.

The General Hydraulic Infrastructure Directorate (DGIH) is in charge, among other functions, of preparing the operative plans for the "River Channeling and Intake Structure Protection Program" – PERPEC,, upon the basis of the information supplied by the Regional Agriculture Directorates, in coordination with the ALAs (Local Water Authorities) and the participation of the Water Users Associations.

In that sense, and aiming at improving the result of the river bank protection and channeling works, it has been deemed convenient to schedule progressive works in the valleys, for these interventions to be led towards a comprehensive riverbed treatment to the valleys of Peru, supplemented with reforestation and training activities.

As a result of the river random behavior that causes changes in the priority for scheduled protection works execution (with a greater incidence on those changes to take place in future years), there is an emergence of areas in more critical or urgent situations than those originally proposed. This makes it necessary for the initial programming to be modified. In this sense, a conglomerate of river bank protection works is proposed for 2011 and 2012, with an open portfolio. This will allow for works scheduled in the Investment Program to be replaced by other viable options, as the approved budget is kept.

On the other hand, in compliance with the general agriculture policy alignments, it is stated that there must be "risk prevention, based on an agreement with the private sector on irrigation and

drainage infrastructure vulnerability decrease, and a risk management institutionalization, by means of preventing disaster mitigation." According to the irrigation - related environmental measures: A joint agreement must be prioritized with other sectors on soil conservation in those areas where sediments damage assets and irrigation infrastructure.

All of this is based on "institutionalizing risk management, as a key strategy on disaster prevention and mitigation." This situation could become a reality by means of strong awareness raising activities on behalf of the beneficiaries, the local and regional authorities, for them to take on their roles as promoters and regulators.

CHAPTER 3 IDENTIFICATION

3.1 Diagnostic of The Current Situation

3.1.1 Description of Current Situation

Erosion and floodings caused by the river overflows are the phenomena that occur most frequently in nature, and affect both fields and towns. They cause significant economic losses, and generate situations that pose high health risks. River floods are undoubtedly a threat occurring on a regular basis and are especially serious in the agricultural sector. They cause: Yield losses, damages to farming surfaces, erosion and devastation of croplands, damages to irrigation and production infrastructures.

As a result of yield and farmland losses caused by river overflows and floodings, and in keeping with its policy as a promoter agent that looks for continuity and support of agricultural campaigns in the valleys, the Ministry of Agriculture carries out coordinations with the Regional Agriculture Directorates and the Water User Organizations on a yearly basis. The purpose for this is that actions to be executed between January and December are defined.

According to the PERPEC 2007, there is a limited knowledge of works and prevention actions against floodings in the valleys identified in this program, in spite of the fact that there is a high awareness among the users of the flooding dangers, as shown in the following table:

Table 3.1 **Diagnostics for 2008 – 2010 Training**

Region	**Piura**	**Lima**	**Ica**		**Arequipa**
Valley	**Chira**	**Cañete**	**Chincha**	**Pisco**	**Yauca**
Perception on the flood mechanism	High	High	High	High	High
Perception of vulnerable area for flood	High	High	High	High	Middle
Perception of flood control	High	High	High	Middle	Middle
Participation in flood control projects and workshops	Middle	Middle	Middle	Middle	Middle

Source: PERPEC

3.1.2 The Component's Objective

The main reason that generates the program's proposal is to prevent any damages caused by the overflows and floodings in the irrigation sectors around the program scope that create "social instability" every year during the rainy season, when faced with the possibility for a new major hydrological event that produces a water mass that exceeds the drainage capacity.

Such "social instability" experienced in the affected area does not only represent a significant economic loss, but an obstacle to economic and social development, as it becomes a significant risk factor for new investments.

Since the launching of the River Channeling and Intake Structure Protection Program – PERPEC, river bank protection works have been carried out in those areas representing a critical risk for agriculture, as identified by users and local irrigation authorities.

3.1.3 Affected Areas and Population

Affected populations are located within the jurisdiction scope of all six (6) regions – Regional Agriculture Directorates in the regions of: Piura, Lima, Ica and Arequipa. The table below shows the information on location at district, provincial, and regional level. Area to give care to is both rural agricultural and urban, as it is located within the area of influence of the valleys subject to intervention.

Table 3.2 **Charactrics of the Affected Zones and Population**

Region	Province	District	Affected Area and Population		
			No. of Families	Low irrigated superficies with the flood risk (ha)	Superficies with risk of water shortage by damaged irrigation (ha)
PIURA	SULLANA-PAITA	Multidistrital	9,240	6,796	14,354
LIMA	CAÑETE	Multidistrital	5,596	390	20,302
ICA	CHINCHA	Multidistrital	3,274	2,178	13,867
ICA	PISCO	Multidistrital	5,638	496	17,905
AREQUIPA	CARAVELI	Yauca-Yaqui	576	239	1,052
AREQUIPA	CASTILLA-CAMANA	Multidistrital	2,211	4,525	14,615
TOTAL			**26,535**	**14,624**	**82,095**

Source: MINAG

Due to the economic activities developed in these areas, population / farmers have expressed their concern to the district, provincial, and regional authorities.

- **Population by Gender, Urban, and Rural Area**

The table below shows the information about the total population settled in the target area in this diagnostics. This includes both the directly and indirectly affected population that corresponds to the population in the areas within the program scope.

Table 3.3 **Population in the Influenced Areas of the Program**

Region	Province	District	Population		TOTAL
			Male	Female	
PIURA	SULLANA	SULLANA	75,934	80,667	156,601
		IGNACIO ESCUDERO	9,136	8,706	17,862
		MARCAVELICA	13,291	12,740	26,031
		QUERECOTILLO	12,361	12,091	24,452
		SALITRAL	3,072	3,025	6,097
	PAITA	AMOTAPE	1,210	1,095	2,305
		COLAN	6,304	6,028	12,332

		LA HUACA	5,664	5,203	10,867
		TAMARINDO	2,263	2,139	4,402
TOTAL			**129,255**	**131,694**	**260,949**
LIMA	CAÑETE	SAN VICENTE DE CAÑETE	22,877	23,587	46,464
		CERRO AZUL	3,525	3,368	6,893
		IMPERIAL	18,014	18,326	36,340
		NUEVO IMPERIAL	9,414	9,612	19,026
		SAN LUIS	5,941	5,999	11,940
TOTAL			**59,771**	**60,892**	**120,663**
ICA	CHINCHA	CHINCHA ALTA	29,195	30,379	59,574
		ALTO LARAN	3,184	3,036	6,220
		CHINCHA BAJA	6,129	6,066	12,195
		EL CARMEN	5,861	5,864	11,725
		TAMBO DE MORA	2,331	2,394	4,725
	PISCO	PISCO	27,768	27,229	54,997
		SAN CLEMENTE	9,650	9,674	19,324
		TUPAC AMARU INCA	7,328	7,348	14,676
		SAN ANDRES	6,835	6,316	13,151
		HUMAY	2,823	2,614	5,437
		INDEPENDENCIA	6,504	5,886	12,390
TOTAL			**107.60**	**106.80**	**214.414**
AREQUIPA	CARAVELI	YAUCA	75,934	80,667	156,601
		JAQUI	9,156	8,706	17,862
	CASTILLA	MAJES	19,568	17,546	37,114
	CAMANA	CAMANA	27,750	25,315	53,065
TOTAL			**132,408**	**132,234**	**264,642**
TOTAL			**381.724**	**388.765**	**770.489**

Source: Censo de Población y Vivienda 2007 – INEI

- **Education**

The table below shows the education levels in the areas. Over 12 % of the population has not graduated from elementary school, and 43 % of the population has not graduated from high school. Educational levels in the districts of Piura and Arequipa are especially low: 48 % have not graduated from high school in Sullana, Piura, 61 % have not graduated from high school in Paita, Piura, and 65 % have not graduated from high school in Caravelí, Arequipa.

Based on the situation, the contents levels for this component should be taken into account:

Table 3.4 **Population by Education Level**

REGION	PROVINCE	Nivel de Educacion Alcanzado								
		Total	None	Initial Education	Primary	Secundary	Superior no University (incomplete d)	Superior no University (completed)	Superior no University (incomplete d)	Superior University (completed)
PIURA	SULLANA	216265	24547	7012	71766	68461	100387	16299	8195	9598
	PAITA	27991	4559	725	11711	7594	1151	1266	419	567
LIMA	CAÑETE	113129	10097	3115	31584	41983	7205	9000	4459	5686
ICA	CHINCHA	88444	5698	2530	25573	34354	5152	7130	3008	4999
	PISCO	112559	8065	2896	31182	44587	6623	10173	3693	5340
AREQUIPA	CARAVELI	3199	335	86	1082	1165	142	117	107	165
	CASTILLA	36178	5212	1074	11400	11998	1723	2256	811	1704
	CAMANA	50221	4605	1492	13714	16988	3604	4288	2139	3391
TOTAL		677986	63118	18930	218012	237130	35991	50528	22831	31450

Source: Censo de Población y Vivienda 2007 - INEI

- **Dwelling Type**

It is relevant to mention that population in this diagnostics target area are settled in the rural area. 90 % of this population have semi – rustic dwellings that are predominantly adobe built, with concrete or plaster finishings, and a coat of mud and straw. Dwellings are independent.

Table 3.5 **Type of Dwellings in the Target Area**

REGION	PROVINCE	Type of Dwellings								
		Total	House Independientl y	Departament	Quinta	Negihbor house	Cottage	Improvised house	Local no dest. Para hab. Humana	Others
PIURA	SULLANA	54839	54289	251	68	56	47	93	31	4
	PAITA	7771	7712	0	6	36	8	4	5	0
LIMA	CAÑETE	35473	31949	455	378	230	905	1378	77	101
ICA	CHINCHA	25240	20707	408	283	329	835	2473	41	160
	PISCO	33431	25876	273	312	202	506	6054	42	166
AREQUIP A	CARAVELI	1411	1343	0	14	15	23	16	0	0
	CASTILLA	14701	13296	28	71	454	779	29	39	5
	CAMANA	18691	16251	274	134	236	1540	203	17	36
TOTAL		191557	171423	1689	1266	1558	4643	10250	252	472

Souce: Censo de Población y Vivienda 2007 – INEI

- **Beneficiary**

Major economic livelihood activity is agriculture, agro-export crops are especially grown both for exports and the domestic market.

On the whole, it can be said that a farmer's income generated from farming activities amounts S/. 500.00 Nuevos Soles per month. In addition, average daily wages in the area amount S/. 20.00 Nuevos Soles.

Poverty indicators by FONCODES in the target areas are shown in the table below.

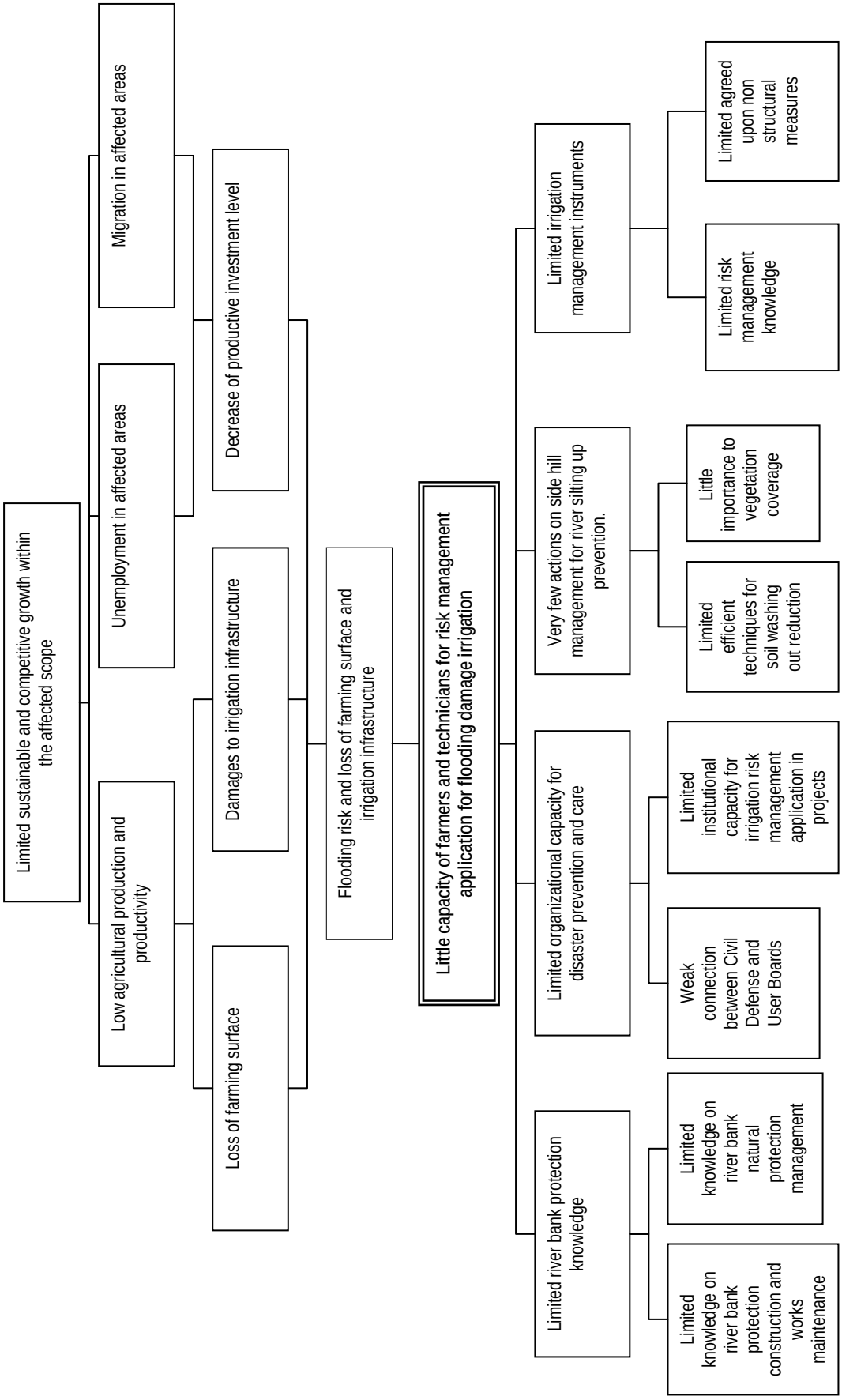
Indicators	PIURA		LIMA	ICA		AREQUIPA		
	SULLANA	PAITA	CAÑETE	CHINCHA	PISCO	CARAVELI	MAJES	CAMANA
Population 2007	231043	29906	120663	94439	106824	174463	37,114	53,065
Carencias Indicator	0.1181	0.1758	0.0998	0.0774	0.0687	0.1859		
Quintil Indicator	3	3	3	3	3	3	2	3
% of Population without:								
without Water (%)	30	27	30	22	22	38	22	19
without Sewage (%)	15	27	16	11	18	35	22	12
without Electricity (%)	17	20	18	20	17	32	23	21
Analfabetismo (women) (%)	9	9	8	5	5	10	15	7
(0-12 years old) (%)	26	29	27	26	26	27	26	24
Malnutrition 1999 (%)	21	26	19	20	14	17	17	8
UNDP-Indicator of Human Development 2006	0.5936	0.58	0.6525	0.6421	0.6525	0.6183	0.6044	0.6305

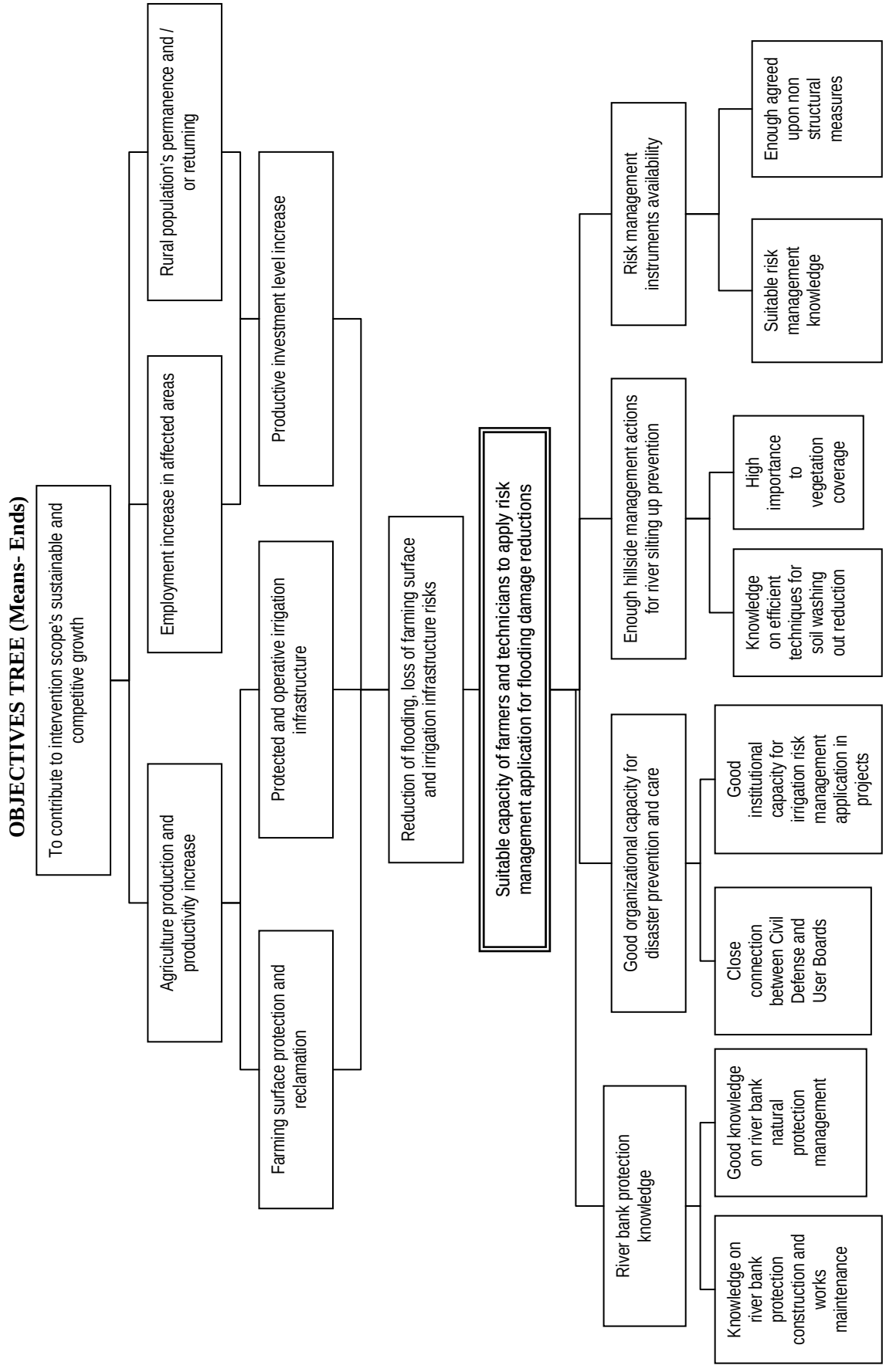
ɹrce: Censo de Poblacion y Vivienda 2007-INEI, Censo de Talla Escolar 1999 - MINEDU

Definition of Problem and it is Causes

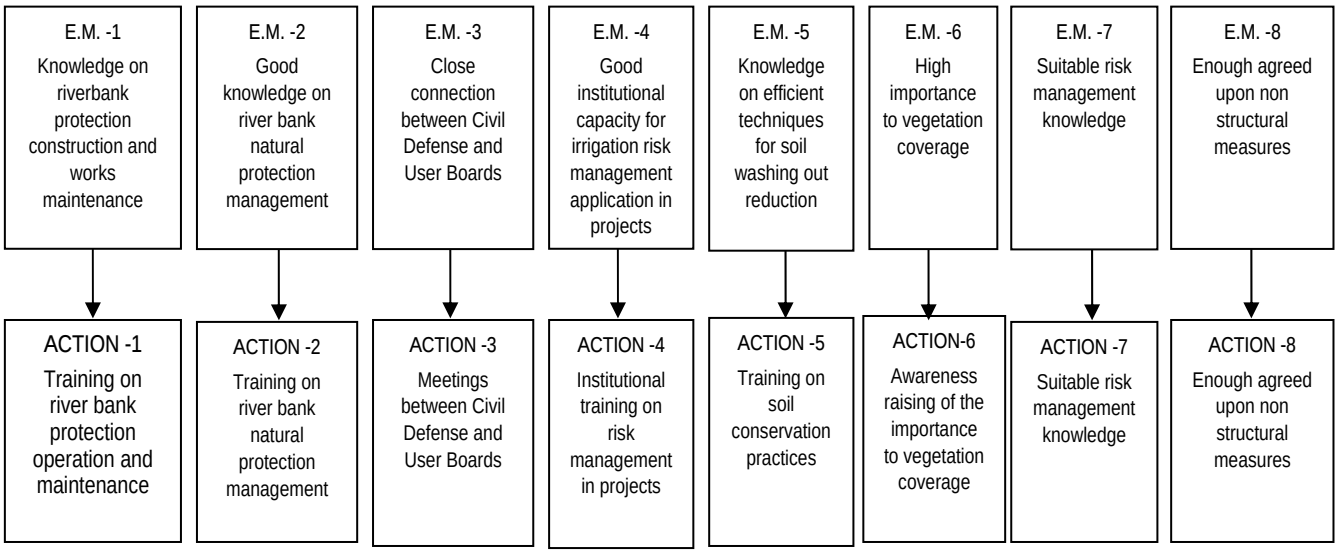
Definition of the problem and its causes has been formulated upon the basis of the diagnostics analysis. In this sense, the problem set out by i) the December 2007 Investment and Base Diagnostics Program for Training and Awareness Raising of PERPEC Users and ii) the November 2010 – February 2011 JICA Study workshops and surveys have been used as a basis. The Problem Tree and the Objectives Tree are shown below.

PROBLEM TREE (Cause Effect)




OBJECTIVES TREE (Means- Ends)
To contribute to intervention scope's sustainable and competitive growth
Agriculture production and productivity increase
Employment increase in affected areas
Rural population's permanence and / or returning
Farming surface protection and reclamation
Protected and operative irrigation infrastructure
Productive investment level increase
Reduction of flooding, loss of farming surface and irrigation infrastructure risks
Suitable capacity of farmers and technicians to apply risk management application for flooding damage reductions
River bank protection knowledge
Knowledge on river bank protection construction and works maintenance
Good knowledge on river bank natural protection management
Good organizational capacity for disaster prevention and care
Close connection between Civil Defense and User Boards
Good institutional capacity for irrigation risk management application in projects
Enough hillside management actions for river silting up prevention
Knowledge on efficient techniques for soil washing out reduction
High importance to vegetation coverage
Risk management instruments availability
Suitable risk management knowledge
Enough agreed upon non structural measures

The following scheme shows actions relevant to each essential means; their fulfillment assures the project objective's fulfillment.



3.2 Setting Out of All Alternatives

Alternatives proposed for the project basically differ in their training and awareness raising methodologies that show particular aspects with regard to the suggested activities, as shown in the following matrices:

a) Alternative 1

Item	ESSENTIAL MEANS	ACTIVITIES ALTERNATIVE 1
1.00	Knowledge on river bank protection actions	
1.1	Knowledge on river bank protection construction and works maintenance	Workshop course on works operation and maintenance
1.2	Good knowledge on river bank natural protection management	Workshop courses on river bank plant management
		Prevention and mitigation of types of erosion
		Natural resource management
2.00	Preparation of Commnity Disaster Management Plan for Flood Control	
2.1	Close connection between Civil Defense and Water Users Associations	Workshop meetings for Risk management Plan formulation
2.2	Good institutional capacity for project risk management application	
		Communy activity planning in consideartion of ecological zoning
		Risk management
		Resource Management
		Preparation of community disaster management plan
2.3	Early Warning System (Simple method)	Risk management and Early warning system
		Joint activity with local governments, users' association, etc.
3.00	Hillside Management for River silting up Prevention	
3.1	Knowledge on efficient techniques for soil washing out reduction	Field actions (in days) for hillside conservation technique executions.
		Forest seedling productions
		Forest plantation setting up
		Forest resource management and conservation
3-2	High importance to vegetation coverage	Poster and 3 – page leaflet dissemination
4.00	Risk management Information and Instruments	
4.1	Suitable risk management treatment knowledge	Course on Risk management and forecasting and warning usefulness
4.2	Enough agreed upon non structural measures	Workshop meetings with local authorities

b) Alternative 2

Item	ESSENTIAL MEANS	ACTIVITIES ALTERNATIVE 2
1.00	Knowledge on river bank protection actions	
1.1	Knowledge on river bank protection construction and works maintenance	Radio Program on works operation and maintenance
1.2	Good knowledge on river bank natural protection management	Radio Program on river bank plant management
		Prevention and mitigation of types of erosion
		Natural resource management
2.00	Preparation of Commnity Disaster Management Plan for Flood Control	
2.1	Close connection between Civil Defense and Water Users Associations	Workshop meetings for Risk management Plan formulation
2.2	Good institutional capacity for project risk management application	
		Communy activity planning in consideartion of ecological zoning
		Risk management
		Resource Management
		Preparation of community disaster management plan
		Risk management and Early warning system
		Joint activity with local governments, users' association, etc.
3.00	Hillside Management for River silting up Prevention	
3.1	Knowledge on efficient techniques for soil washing out reduction	Field actions (in days) for hillside conservation technique executions.
		Forest seedling productions
		Forest plantation setting up
		Forest resource management and conservation
3-2	High importance to vegetation coverage	Poster and 3 – page leaflet dissemination
4.00	Risk management Information and Instruments	
4.1	Suitable risk management treatment knowledge	Course on Risk management and forecasting and warning usefulness
4.2	Enough agreed upon non structural measures	Workshop meetings with local authorities

It can be noticed that differences between both alternatives lies in the activity executions: Alternative 1 proposes to train and sensitize people by means of a direct training to the water users association leaders based on participatory workshops, whereas Alternative 2 proposes the dissemination of radio programs with the project – proposed themes.

CHAPTER 4 FORMULATION AND EVALUATION

The project has a 15 – year evaluation period, in compliance with the return period that has been calculated for the river bank protection infrastructure and MEF recommendations. During this time, the investment program's sustainability will be evaluated.

4.1 Demand Analysis

The Investment Program profile has defined the vulnerable areas in each and all of the valleys, by simulating floods, and establishing the relevant populations that make up the target population to be served.

Table 4.1 **Target Population by Valley**

VALLEY	REGION	FAMILIES	POPULACION
CHIRA	PIURA	9,240	46,200
CAÑETE	LIMA	5,596	27,980
CHINCHA	ICA	3,274	16,370
PISCO	ICA	5,638	28,190
YAUCA	AREQUIPA	576	2,880
MAJES-CAMANA	AREQUIPA	2,211	9,947
TOTAL		**26,535**	**131,567**

Source: PERPEC, JICA Study Team

There is a limit with regard to the total number of participants in the Component. Participating candidates include Water Users Association, local Government, and Community representatives.

Participants must define knowledge on the Component to the local populations by means of meetings, seminars, and workshops in each organization.

And gender balance should be considered, especially with regard to women's participation.

4.2 Supply Analysis

At present, most service supplies to make flooding – vulnerable population to get trained and sensitized towards implementing Risk management and reducing existing vulnerability have not been supplied. Major suppliers include:

- The Water Users Associations promoted some training endeavors, as mentioned in the Base Diagnostics for the PERPEC 2007 as shown in the table below.

Table 4.2 **Realized Capacitation Course in the User's Association**

VALLEY	REGION	COURSE(*)	FAMILIES
CHIRA	PIURA	0	0
CAÑETE	LIMA	0	0
CHINCHA	ICA	7	210
PISCO	ICA	0	0
YAUCA	AREQUIPA	0	0
MAJES-CAMANA	AREQUIPA	0	0
TOTAL			**210**

Source: Diagnóstico base para capacitación y Sensibilización a Usuarios del PERPEC – 2007

- INDECI has carried out a series of training actions with the regional Governments that are mainly aimed at the urban areas; therefore, training to brigade members is the only training endeavor being contemplated, as reflected in the table below.

Table 4.3 **Realized Capactiation Course by INDECI**

REGION	Course (*)	Capacitated Population
PIURA	31	974
LIMA	5	260
ICA	4	300
AREQUIPA	13	660
TOTAL		**2,194**

Source: Compendio Estadístico de atención y prevención de desastres 2007

- On the other hand, AGRORURAL (former PRONAMACHCS) has been training on forestation and soil conservation in the high parts of the basins, and, according to their official statistics, around 30 % of the rural population would have been covered. Therefore, it is presumed that 1994 people (that is, 399 families) out of a total population identified in the investment program (6674 people) have been offered this knowledge.

4.3 Supply – Demand Balance

- **The Demand Gap**

The table below shows information on supply and demand in all six (6) valleys under study, and the unmet demand or demand gap resulting from a difference between the demand and the supply, will be established.

Table 4.4 **Balance of Supply - Demand**

Year	Demanding Population	Actual Supply	Unsatisfied Demand
2009	47,839	3,048	44,791
2010	48,604	3,097	45,508

Source: JICA Study Team

4.4 Technical Plans

Two alternatives are presented as below:

a) Alternative 1

Component 1: Knowledge on River Bank Protection Actions in consideration of Agriculture and Natural Enviornment

Course	d) River Bank Operation and Maintenance e) River Bank Plant Management

	f) Erosion Prevention and Mitigation Natural Resource Management
Objectives	d) In this project, local populations learn suitable technology to operate and give maintenance to constructions and works from prior projects. e) Local populations learn suitable technology on river bank plants and vegetation for flooding control purposes. f) Local populations learn suitable technology on erosion and natural resources for flooding control purposes.
Participants	b) Engineers and / or technicians from local Governments b-c) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	d) 12 times in all (every six (6) hours) e) 12 times in all (every five (5) hours) f) 26 times in all (every three (3) hours)
Lecturers	b) Contractors of constructions and works, Engineers from MINAG and / or the Regional Government b-c) Engineers from MINAG and / or the Regional Government, College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Suitable operation and maintenance technology for constructions and works from prior projects a-2) Suitable operation and maintenance technology for constructions and works in this project b-1) River bank protection with the use of plants b-2) The importance of river bank vegetation in flooding control b-3) Types of river bank plants and their characteristics c-1) Evaluation of the erosion conditions c-2) Evaluation of natural resource conditions c-3) Erosion approach for flooding control c-4) Natural resource approach for flooding control c-5) Environmental consideration approach c-6) Use of water resourceS c-7) Alternatives for suitable farming crops

Component 2: Preparation of Commnity Disaster Management Plan for Flood Control

Course	a) Risk management Plan Formulation b) Detailed Risk management Plan Formulation
Objectives	a) Local populations gain knowledge and learn technology to prepare a flooding control plan b) Ditto
Participants	a-c) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	a) 19 times in all (every four (4) hours) b) 34 times in all (every five (5) hours) c) 24 times in all (every five (5) hours)
Lecturers	a-c) Engineers from MINAG and / or the Regional Government, Community Development Expert, Facilitator (local participation)
Contents	a-1) Flooding control plan preparation manuals a-2) Current condition analyses for flooding control a-3) Community development alternatives by means of local participation a-4) Workshop for flooding control plan preparation b-1) Communy activity planning in consideartion of ecological zoning b-2) Risk management b-3) Resource management c-1) Preparation of community disaster management plan c-2) Joint activity with local governments, users' association, etc.

Component 3: Basin Management for Anti – River Sedimentation Measures

Courses	e) Hillside Conservation Techniques f) Forest Seedling Production d) Forest Seedling Planting e) Forest Resource Management and Conservation
Objectives	c) Local populations learn suitable technology on hillside conservation for flooding control purposes d) Local populations learn suitable technology on forest seedling production f) Local populations learn suitable technology on forest seedling planting g) Local populations learn suitable technology on forest resource management and conservation
Participants	a-d) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives and Local People
Times	b) 12 times in all (every five (5) hours) b-d) 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)
Lecturers	a-d) Engineers from MINAG and / or the Regional Government, College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Soil characteristics and conservation on hillsides a-2) Hillside agroforestry system a-3) Animal herding system on hillsides a-4) Reforestation with traditional vegetation and plants a-5) Hillside conservation and alleviation alternatives b-1) A selection of plants that are suitable to the local characteristics b-2) Forest seedling production technology b-3) Control carried out by the local population's involvement c-1) Candidate areas for forestation c-2) Forest plantation control technology c-3) Forest plantation soil technology c-4) Control carried out by the local population's involvement d-1) Forestation for flooding control purposes d-2) Forest plantation control technology d-3) Forest plantation output technology d-4) Control carried out by the local population's involvement

Component 4: Information Networks on Flooding Risk management

Courses	c) Risk management and Forecasting and Warning Usefulness d) Workshop – Meeting with Local Authorities
Objectives	c) Local populations learn suitable technology on risk management and forecasting and warning usefulness. d) Cooperation preparedness between local Governments, Water Users Associations, communities, and local populations for flooding control purposes.
Participants	a-b) Engineers and / or technicians from local Governments and Water Users Associations, Community representatives
Times	c) 12 times in all (every five (5) hours d) 12 times in all (every five (5) hours
Lectures	a-b) Engineers from MINAG and / or the Regional Government, Forecasting and warning usefulness contractors and College professors (From universities, institutes, NGOs, etc.)
Contents	a-1) Disaster risk conditions and forecasting and warning usefulness a-2) Comprehensive risk management technology for flooding control a-3) Forecasting and warning usefulness technology a-4) Forecasting and warning usefulness control carried out by the local population's

	involvement b-1) Setting up an information network for Disaster risk conditions and forecasting and warning usefulness b-2) Local cooperation set up for forecasting and warning usefulness b-3) Preparation of a disaster risk plan that includes Forecasting and warning usefulness

Table 4.5 **Activity Matrix for Alternative 1**

Item	ESSENTIAL MEANS	ACTIVITIES ALTERNATIVE 1	Measurement Unit	No of Valleys	No of Repetitions	Total Events
1.00	**Knowledge on river bank protection actions**					
1.1	Knowledge on river bank protection construction and works maintenance	Workshop course on works operation and maintenance	Event	6	2	12
1.2	Good knowledge on river bank natural protection management	Workshop courses on river bank plant management	Event	6	2	12
		Prevention and mitigation of types of erosion	Event	6	2	12
		Natural resource management	Event	6	2	12
2.00	**Good organizational capacity to set up prevention measures and disaster care**					
2.1	Close connection between Civil Defense and Water Users Associations	Workshop meetings for Risk management Plan formulation	Event	6	3	18
2.2	Good institutional capacity for project risk management application					
		Communy activity planning in consideartion of ecological zoning	Event	6	1	6
		Risk management	Event	6	1	6
		Resource management	Event	6	1	6
		Preparation of community disaster management plan	Event	6	1	6
		Risk management and Early warning system	Event	1	5	6
		Joint activity with local governments, users' association, etc.	Event	1	5	6
3.00	**Enough hillside management actions for river silting up prevention**					
3.1	Knowledge on efficient techniques for soil washing out reduction	Field actions (in days) for hillside conservation technique executions.	Event	6	2	12
		Forest seedling productions	Event	6	2	12
		Forest plantation setting up	Event	6	2	12
		Forest resource management and conservation	Event	6	2	12
3-2	High importance to vegetation coverage	Poster and 3 – page leaflet dissemination	Millar	6	2	12
4.0	**Risk management information and instruments availability**					
4.1	Suitable risk management treatment knowledge	Course on Risk management and forecasting and warning usefulness	Event	1	2	2
4.2	Enough agreed upon non structural measures	Workshop meetings with local authorities	Event	1	2	2

Source: JICA Study Team

b) Alternative 2

Component 1: Knowledge of River Bank Protection Actions in consideration of Agriculture and Natural Enviornment

This component involves two (2) activities that will allow people in flooding vulnerability situation to carry out a suitable maintenance to river bank protection Works that are executed under the

Valley and Vulnerable Population Protection and Prevention Infrastructure Program or any other public or private funding source. In addition, it will allow this population to be aware and duly trained, in order to i) prevent depredation and subsequent lack of protection of natural vegetation along the river banks, and ii) participate in the introduction of suitable vegetable species along the different vulnerable areas. With this in mind, "Radio Programs" have been scheduled, as detailed in Attachment No. 01. These activities involve works operation and maintenance, and river bank vegetation handling for flooding protection purposes.

Component 2: Preparation of Commnity Disaster Management Plan for Flood Control

This component's execution will allow for local population and institutions to be duly strengthened by means of a Local Risk management Plan that must comply with the existing local and regional plans, and it must be formulated with the participation of the local population, as it is represented by local and regional leaders and authorities with a decision – making capacity. Three (3) workshop meetings will be held for agreements and commitments to be made for the Local Risk management Plan to be prepared.

On the other hand, the Water Users Association and the local and regional Governments require to be strengthened, as they are in charge of project formulations and approvals. In addition, they must consolidate their risk management application knowledge on public investment projects, by stressing the irrigation infrastructure projects that are part of SNIP, but with a very restricted current application. With this in mind, four (4) training courses are set out for each of the five (5) regions: Ecological Zoning, Risk management, Resource Management, and Project Formulation. The sole exception for this is the Piura Region (where the meteorological monitoring and forecasting and warning system will be set up): Two (2) courses, five (5) sessions each, are foreseen to be carried out there.

Component 3: Actions in Hillside Management for River Silting Up Prevention.

As the washout of the eroded soils on the hillsides contribute to the silting up of the river beds, training and awareness raising actions on behalf of the populations settled on the middle and lower parts of the basin are necessary for soil conservation activities to be carried out in coordination with the Investment Program and AGRORURAL. In this sense, field actions (in days) are set out for activity learning purposes; in addition, posters, almanacs, full color three – page leaflets, and other presentation materials are produced for technique dissemination purposes.

Component 4: Risk Management Instruments

Implementation of Risk management to reduce vulnerability in spaces and among populations that have been previously identified requires operative instruments that contribute to this objective; in that sense, it is first necessary to agree on non structural measures that help towards reducing river bank vulnerability and increasing bed stability, as they are related to bank strip protections, aggregate technical and rational extraction, controlled river bank forest exploitation, etc. These measures adjust to the effective laws, and there is a formal commitment for their implementation

by local authorities, and their mandatory compliance via civil vigilance. For this to be accomplished, two (2) agreement workshop meetings are set out for local authorities, community, and Water Users Association leaders. On the other hand, the population must have all necessary knowledge on risk management i) to set up prevention measures, as forecasting and warning systems are used wherever they are already in place, and other new forecasting and warning systems are set up; ii) to suitably respond in case of flooding emergencies; and iii) to know how to deal with reconstruction once the disaster has occurred. In order to achieve this, risk management training is set out with the participation of the water users association leaders in vulnerable conditions.

Table 4.6 **Activity Matrix for Alternative 2**

Item	ESSENTIAL MEANS	ACTIVITIES ALTERNATIVE 2	Measurement Unit	No of Valleys	No of Repetitions	Total Events
1.00	**Knowledge on River Bank Protection Actions in consideration of Agriculture and Natural Enviornment**					
1.1	Knowledge on river bank protection construction and works maintenance	Radio Programs on works operation and maintenance	Event	6	2	12
1.2	Good knowledge on river bank natural protection management	Radio Programs on river bank plant management	Event	6	2	12
		Prevention and mitigation of types of erosion	Event	6	2	12
		Natural resource management	Event	6	2	12
2.00	**Preparation of Commnity Disaster Management Plan for Flood Control**					
2.1	Close connection between Civil Defense and Water Users Associations	Workshop meetings for Risk management Plan formulation	Event	6	3	18
2.2	Good institutional capacity for project risk management application					
		Communy activity planning in considearion of ecological zoning	Event	6	1	6
		Risk management	Event	6	1	6
		Resource management	Event	6	1	6
		Preparation of community disaster management plan	Event	6	1	6
		Risk management and Early warning system	Event	1	5	6
		Joint activity with local governments, users' association, etc.	Event	1	5	6
3.00	**Enough hillside management actions for river silting up prevention**					
3.1	Knowledge on efficient techniques for soil washing out reduction	Field actions (in days) for hillside conservation technique executions.	Event	6	2	12
		Forest seedling productions	Event	6	2	12
		Forest plantation setting up	Event	6	2	12
		Forest resource management and conservation	Event	6	2	12
3-2	High importance to vegetation coverage	Poster and 3 – page leaflet dissemination	Millar	6	2	12
4.0	**Risk management information and instruments availability**					
4.1	Suitable risk management treatment knowledge	Course on Risk management and forecasting and warning usefulness	Event	1	2	2
4.2	Enough agreed upon non structural measures	Workshop meetings with local authorities	Event	1	2	2

Source: JICA Study Team

4.5 Costs

The project costs of Alternative 1 and 2 are as follows. The unit prices are applied the actual prices in the PERPEC projects.

Table 4.7 **Project Cost (Alternative 1)**

Table 4.8 **Project Cost (Alternative 2)**

4.6 Benefits

Major benefit generated by the Project is social – focused, as it primarily serves the population in terms of training and awareness raising.

This type of benefits cannot be appraised in monetary terms, but can be quantified through a social appraisal, namely, the Cost Effectiveness methodology.

Benefits in the "Without Project"

As no activities that are focused on improving the population's capability to apply risk management are carried out or scheduled in the "without project " situation, benefit will be equal to zero.

Benefits in the "With Project"

The training service to be set up will primarily provide qualitative benefits, namely:

- Bank protection works sustainability is ensured through a suitable maintenance.
- Population is prone to contribute with hand labor and other means to bank protection works construction, and to play an active role in the other actions.
- Beneficiaries know about actions to be taken before, during, and after the emergencies for overflows and floodings.
- Criteria to identify spaces that are most vulnerable to overflows and floodings, and to set up most convenient measures are identified.
- Non structural measures are set up to reduce overflow and flooding risks, thus ensuring compliance with participation and citizen vigilance.
- Knowledge on formulations and evaluations in irrigation infrastructure projects is confirmed for risk management to be applied on these projects.
- River silting up is reduced, as the population in the higher and middle parts of the basin is made aware of the application of forestation and soil conservation techniques.

- Forecasting and warning systems are known for human losses and, as much as possible, material damages to be prevented, and also, for prevention measures to be applied.
- Damages to the river bank vegetation are reduced, as the population settled in the valleys is made aware.

4.7 Sustainability Analysis

Sustainability analysis aims at foreseeing that, once the Project investments are completed, capabilities developed in the beneficiaries and the institutionality that brings them together, along with the local and regional entities, will carry on with awareness raising activities on behalf of the population.

Institutional Arrangements

The OGA-MINAG gets in charge of the Investment Program's execution, with the support of the Regional Agriculture Directorates. Therefore, these offices will be in charge of keeping the coordination links between the beneficiaries and the local and regional Governments, INDECI, etc. Tasks to be carried out by these institutions include training the population for disaster prevention purposes.

In this sense, institutional alliances will be important. These alliances will become formal, as a result of the meetings held with the local governments to formulate the Risk management Plan that aims at strengthening risk management institutionality. These meetings are led by the Civil Defense Committees that include local population, local and regional governments, and other institutions.

The major aspect for river bank protection's institutionality strengthening is the RISK MANAGEMENT PLAN consolidation and implementation that will be formulated in this Project, and involves all the interested organizations and institutions the aim at soil, crop, infrastructure, and population protections. These organizations and institutions include INDECI, AGRORURAL, etc.

Another important aspect that ensures the project's sustainability is the regional Government's institutional strengthening via training to their professional staff on: Ecological Zoning, Risk management, Resource Management, and Project Formulation. This will come along with a commitment to carry on raising awareness of those vulnerable populations within their intervention scopes.

Local Government will be essential for the particiapation in operation and maintenance in river bank protection infrastructure. Forestation and soil conservation on hillsides and river banks will be carried out in close coordination with AGRORURAL, as this institution's tasks involve carrying on with awareness raising to the identified population.

Management Capacity

For training actions to be given sustainability, local and regional Governments will be engaged, and beneficiary users, grassroots organizations, and community representatives will be articulated. In addition, NGOs are foreseen to participate, so that once the project intervention is completed, these institutions carry on with the training actions.

The Hydraulic Infrastructure Directorate is in charge of PERPEC, an organization with broad experience in river bank protection project executions.

4.8 Environmental Impact

Due to its nature, the project does not generate any negative environmental impacts; it rather contributes to environmental protection, as training actions focus on ensuring a suitable maintenance of the riverbed. Thus, the project's environmental impact is positive: The agricultural activity's climatologically information service conditions will be improved, and the population's sanitation conditions will not be affected, namely, the project will significantly improve the living conditions.

a) Environmental Ecological Impacts

Environmental, soil, air, and sociocultural climate are improved, as the river bank vegetation protection and natural resource conservation in the middle and high parts of the basin are promoted. This will allow for awareness raising among the population that resource depredations affecting the environment should be prevented.

b) Socioeconomic Impacts

Job Generations

A first major change, as a result of training offered to counter floodings that directly affect agricultural sector, is the safe investments that encourage employment in agricultural activities; therefore, this is a positive impact.

Improvements to the Local Population's Economy and Well – Being

Indirectly benefited population is basically devoted to farming as a livelihood; therefore, assurance granted to farming investments makes farming development to be sustainable. Upon that basis, improvements to the agricultural sector will allow for farming activity and hand labor employment increases, and a population's subsequent living improvement.

Reappraisal of Farming Soil

With regard to the agricultural sector, farming land economic value will increase, based on the certainty that land will not get flooded, and farming investments will not get lost. This is a significant effect, as farmers will be able to access further investment opportunities, bank loans, and technical assistance.

Cultural Impacts

The protection of culture will become strengthened, as a natural vegetation protection will be encouraged, and a rational riverbed management, an aggregate balanced extraction, and a rational forest exploitation will be consolidated.

4.9 Selection of Alternative

Alternative 1 is chosen because of the following reasons:

- Local populations could participate in Alternative 1 activities more than in Alternative 2 activities.
- There are no environmental impacts caused by neither Alternative 1 nor Alternative 2.
- Total cost amount for Alternative 1 is less than for Alternative 2.

4.10 Implementation Plan

Following its schedule, the project implementation plan should be carried out in two (2) years, by proportionally distributing the events and training activities, during Project years 1 and 2.

The relevant schedule is shown below.

Table 4.9 **Implementation Plan**

4.11 Organization and Administration

According to the effective law, formulation and execution of this clear Public Investment Project responds to the Ministry of Agriculture's inherent competence. As a public entity, the Ministry of Agriculture is committed to interact with other public entities that carry out a specific task during the formulation, execution, and post – investment stages, with regard to this type of projects.

The following operative scheme has been foreseen for this project's implementation:

- The Executing (or Implementation) Unit (MINAG's Central Administration) will coordinate with the National Hydraulic Infrastructure Directorate to pay out the disbursements that are relevant to the Regions included in the project, for a timely execution of the foreseen activities.
- Based on the program coordinations in each region, the Regional Agriculture Directorates will execute the project. In this sense, the relevant training plans and specific schedules will be prepared with the support of the consultant – facilitators' support.
- The logistical support will be provided by means of PERPEC's coordination. For this to be carried out, third party services will be hired with the project resources, as stipulated under the overhead item.

- Courses will be coordinated with the regional Governments, especially with the Civil Defense Directorates and other interested entities, such as the National Water Authority (ANA), AGRORURAL, etc.
- In such locations where works are being executed, works residents and administrators will support the call by means of the Water Users Associations.

4.12 Conclusiones

1) This project will allow for making the beneficiary population aware for execution and maintenance of both structural and non structural measures for river bank protection.
2) Risk management plans will be available, and will allow for guiding grassroots organizations' management and dealing with floodings, in close coordination with the public and private institutions.
3) Institutional capabilities will be strengthened among local and regional governments. This will lead to carry on training the vulnerable population. In addition, professional staff will be duly trained on formulation and appraisal of projects that consider risk management as a significant evaluation element.
4) Project investment cost is S/. 831,125 at market price, to be executed in 2 years.
5) Finally, project execution is recommended, as project proves to be technically, socially, and environmentally viable.

4.13 Logframe Matrix for the Selected Alternative

The Logframe Matrix for the selected alternative is shown below.

	OBJECTIVES	INDICATORS	SOURCES	ASSUMPTIONS
END	To contribute to the intervention scope's sustainable and competitive growth			There are no changes in Agriculture – related Government policies.
PUROSE	Farmers' and technicians' suitable capability to apply Risk management towards reducing flooding damages	By the end of the project, around 26,535 family heads will have been made aware and trained on Overflow and Flooding Risk management techniques.	Reports from technical coordinators in the relevant DRAs (Regional Agriculture Directorates) where the project is executed.	There are no obstacles that prevent, or interfere in the project execution.
COMPONENTS	1. River bank protection knowledge.	1. 48 training events throughout six (6) valleys, located in the same number of regions around the, will be developed.	Monthly progress reports by the executing (implementation) unit.	
	2. Organizational capability for disaster prevention and care	2. 52 training events throughout six (6) valleys will be developed. 18 of these events, on Risk management Plan formulation, are addressed to community leaders in the chosen scopes, and 34 events are addressed to project – involved professional staff, and 24 for addressed to local people.	Idem	The executing (implementation) unit foresees the whole organization for a smooth project execution
	3. Hillside management actions for river silting up	3. 60 training events throughout six (6) valleys will be developed, and posters and three (3) page leaflets will be disseminated throughout Peru's scope.	Idem	Funds devoted to the project are provided to the relevant executing (implementation) units.
	4. Risk management instruments	4. 4 training events and 2 workshop meetings will be developed with local authorities	Idem	Project beneficiaries participate in an active and committed way.

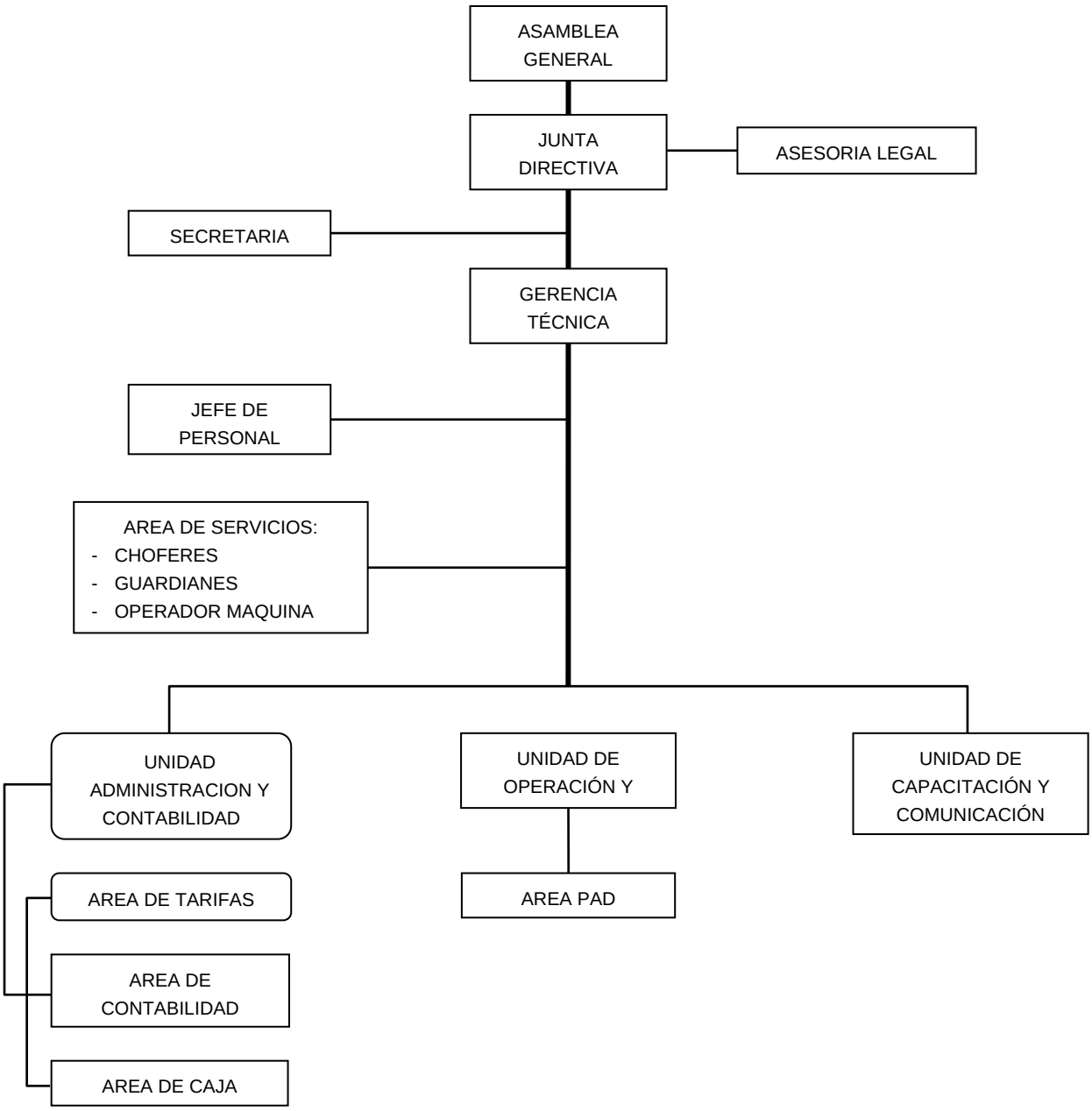
	ACTIVITIES	INDICATORS	RESOURCES	ASSUMPTIONS
ACTIVITIES	Workshop course: Works Operation and Maintenance	12 developed training events	S/. 55,800	
	Workshop course on river bank plant management	12 developed events.	S/. 55,800	
	Courses on erosion prevention and mitigation and natural resource management	24 developed events.	S/. 111,600	
	Workshop meetings for Risk management Plan formulation	18 developed events.	S/. 50,220	
	Courses to increase Overflow and Flooding Risk management institutional capabilities to local and regional Government professional staff within the project scope.	34 developed events.	S/. 407,225	The Executing (Implementation) Unit has available qualified technical staff for planning, organization, direction, monitoring, and evaluation of each one and all of the training events.
	Field actions (in days) on hillside conservation techniques	12 developed events.	S/ 45,000	
	Courses on forest seedling productions; installation, management, and conservation of forest resources.	36 developed events.	S/. 142,200	
	Handing out of posters and three (3) page leaflets	10,000 units of disseminating material handed out throughout six (6) valleys	S/. 21,600	
	Course on Risk management and usefulness of forecasting and warning systems	2 developed events.	S/. 9,300	
	Workshop meetings with local authorities	2 developed events.	S/. 5,580	

ATTACHMENT

Attachment-1:

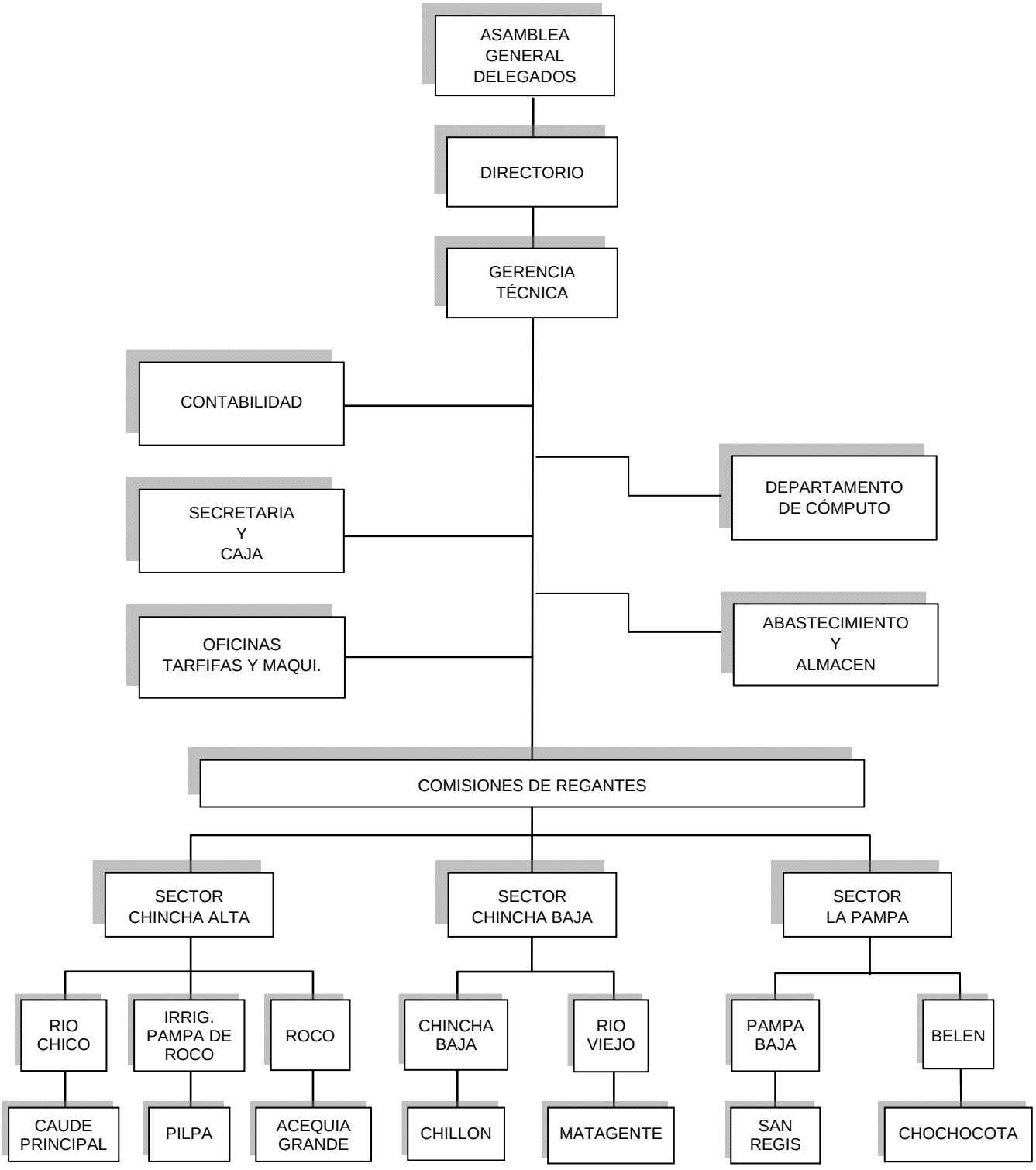
Organizational Chart

ORGANIZATIONAL CHART OF JUNTA DE USUARIOS CHIRA

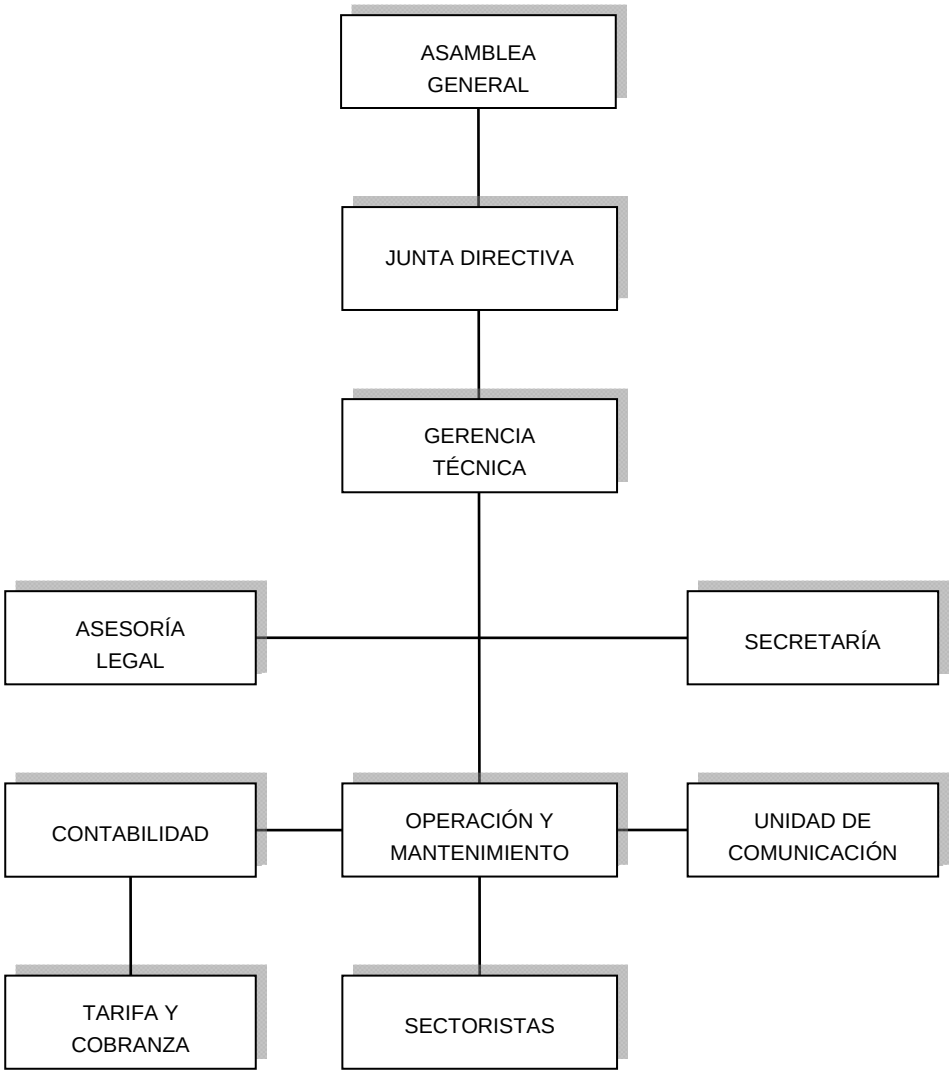


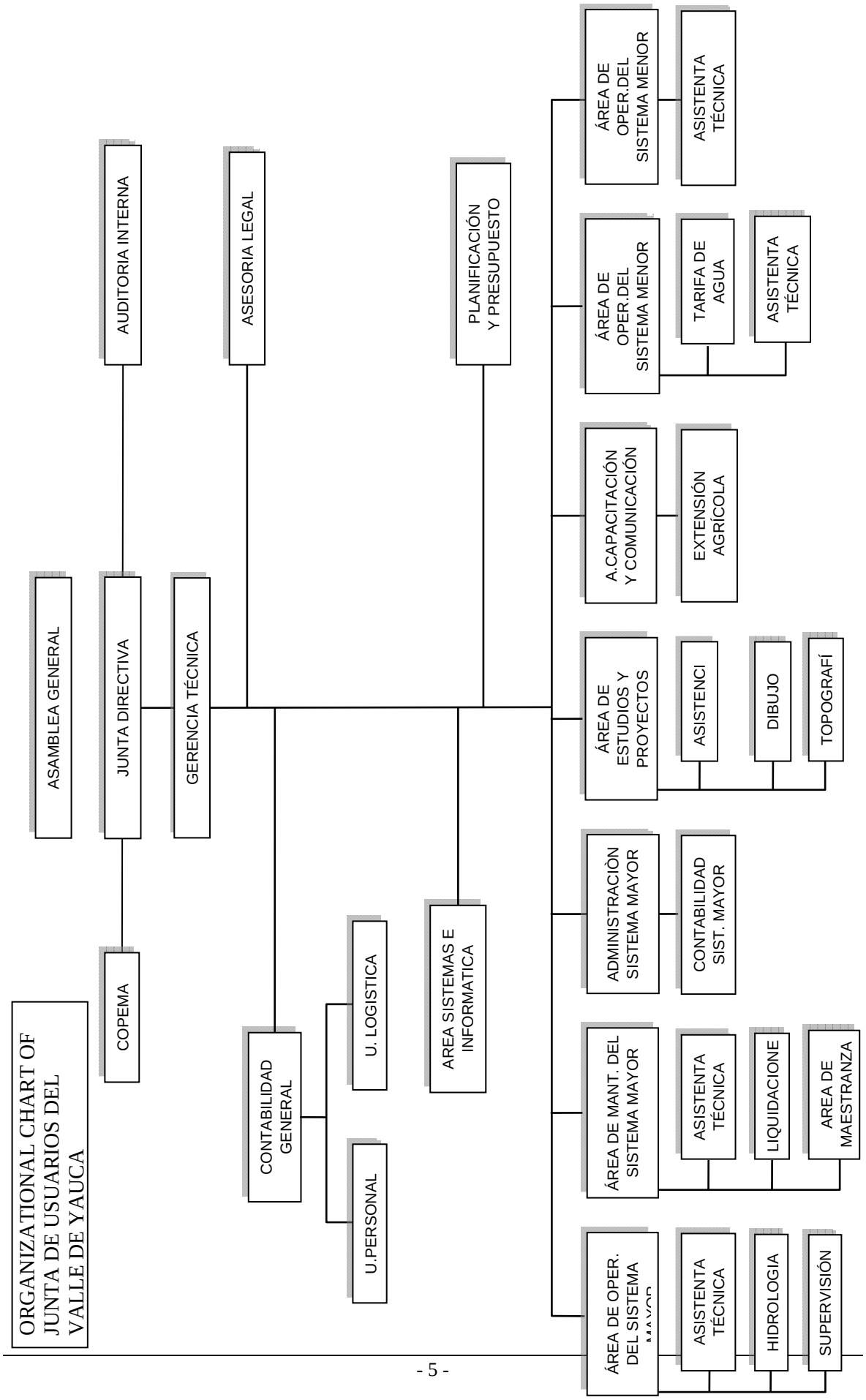
ORGANIZATIONAL CHART OF LA JUNTA DE USUARIOS CAÑETE

ORGANIZATIONAL CHART OF USUARIOS DEL VALLE DE CHINCHA

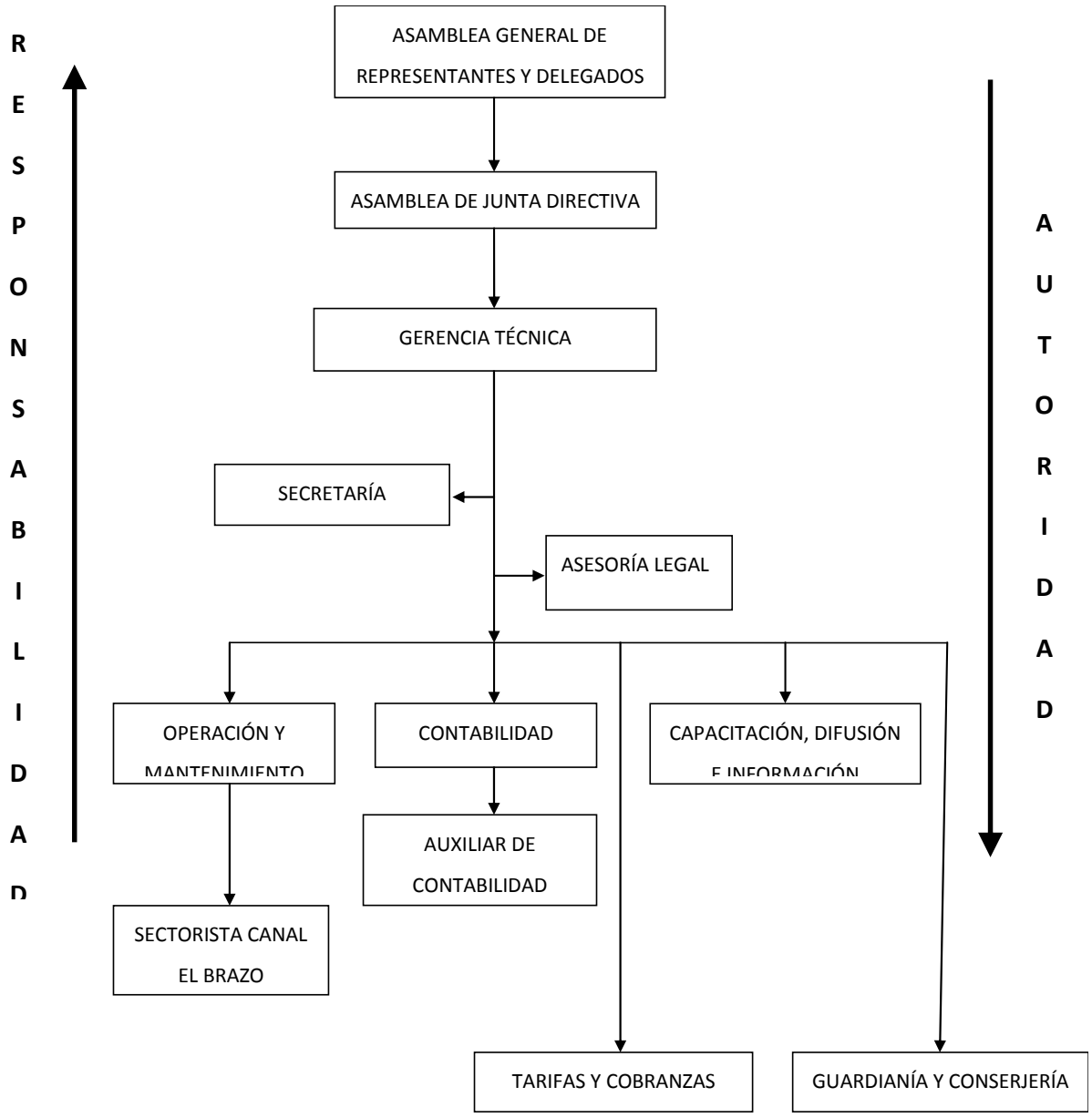


ORGANIGRAMA JUNTA DE USUARIOS DEL VALLE DE PISCO




ORGANIZATIONAL CHART OF JUNTA DE USUARIOS DEL VALLE DE YAUCA
ASAMBLEA GENERAL
JUNTA DIRECTIVA
GERENCIA TÉCNICA
AUDITORIA INTERNA
ASESORIA LEGAL
PLANIFICACIÓN Y PRESUPUESTO
COPEMA
CONTABILIDAD GENERAL
U. LOGISTICA
U.PERSONAL
AREA SISTEMAS E INFORMATICA
ÁREA DE OPER.DEL SISTEMA MENOR
ASISTENTA TÉCNICA
ÁREA DE OPER.DEL SISTEMA MENOR
TARIFA DE AGUA
ASISTENTA TÉCNICA
A.CAPACITACIÓN Y COMUNICACIÓN
EXTENSIÓN AGRÍCOLA
ÁREA DE ESTUDIOS Y PROYECTOS
ASISTENCI
DIBUJO
TOPOGRAFÍ
ADMINISTRACIÒN SISTEMA MAYOR
CONTABILIDAD SIST. MAYOR
ÁREA DE MANT. DEL SISTEMA MAYOR
ASISTENTA TÉCNICA
LIQUIDACIONE
AREA DE MAESTRANZA
ÁREA DE OPER. DEL SISTEMA
ASISTENTA TÉCNICA
HIDROLOGIA
SUPERVISIÓN

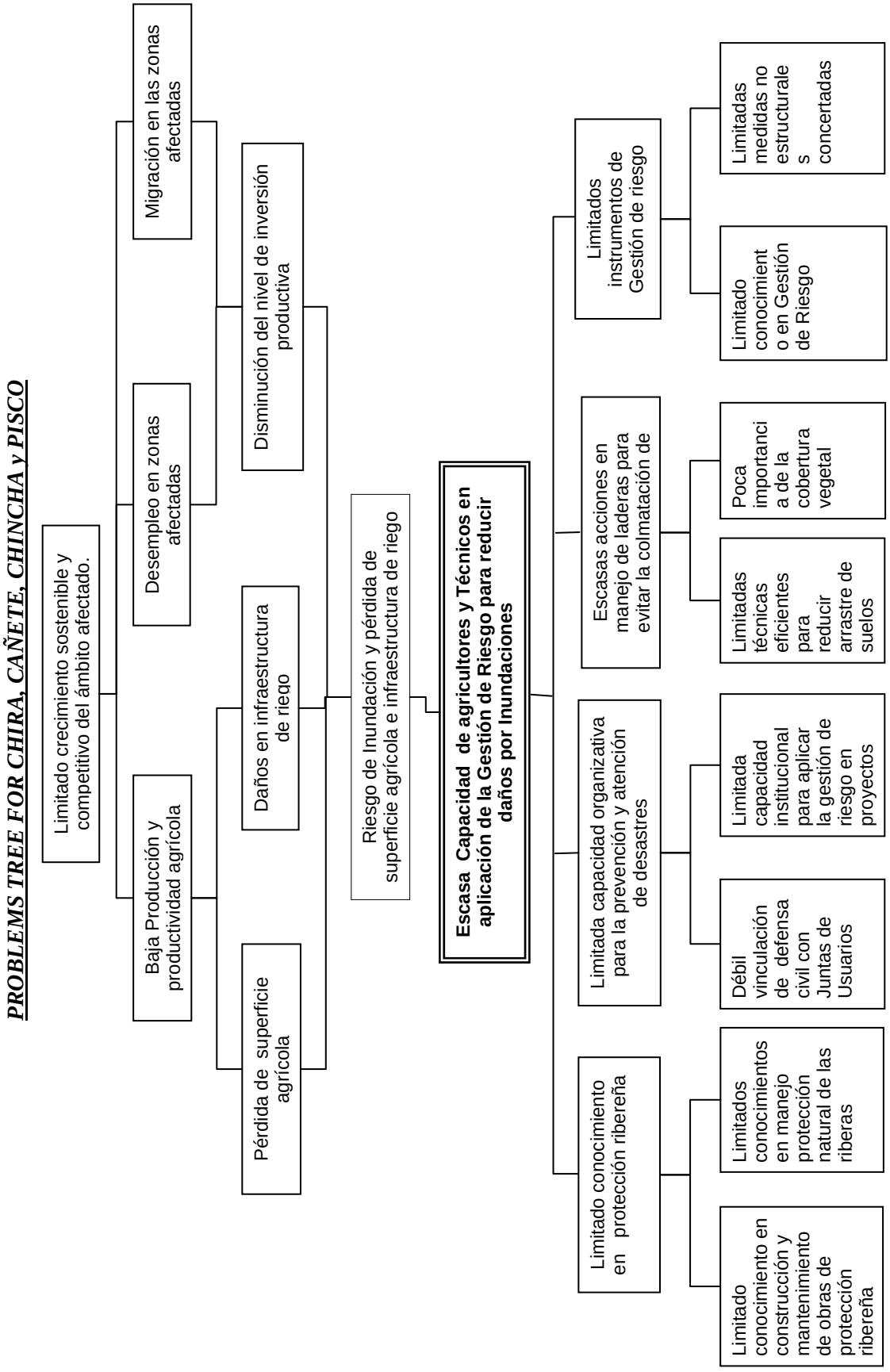
ORGANIZATIONAL CHART OF JUNTA DE USUARIOS DEL VALLE DE MAJES-CAMANA



Attachment-2:

Problems Tree

PROBLEMS TREE FOR CHIRA, CAÑETE, CHINCHA y PISCO



PROBLEMS TREE FOR YAUCA

Propuesta Publica para el desarrollo de las infraestructuras Hidráulicas de uso común

El valle de Yauca de considera como el primer de aceitunas en nuestro país. En los últimos años la producción está bajando debido a la falta de una adecuada infraestructura hidráulica de riesgo ahondado por los problemas del desborde del rio en periodo de creciente de aguas que destruyen bocatomas, servidumbres de derivación y arrasan áreas de cultivos

PROBLEMA:
INFRAESTRUCTURA HIDRAULICA DE USO COMUN

CONCLUSION;
La presente propuesta pública tiene validez absoluta en la forma que se existencia se haga efectiva que ha de redundar no solo, en beneficio de quienes hacemos uso de los recurso hídricos sino de la colectividad entera, porque debe ser objetivo de la junta de usuario y comisiones de usuarios que la integran otorgar prioridad al desarrollo del sector agrario del valle yauca.

ESTO EVIDENCIA LO CRÍTICO DEL PROBLEMA

ORIGEN:
1. Los huaycos y los desbordes de los ríos son fenómenos naturales.
2. Falta de medidas preventivas que hagan frente a la devastación que originan las impredecibles fuerzas de la naturaleza.

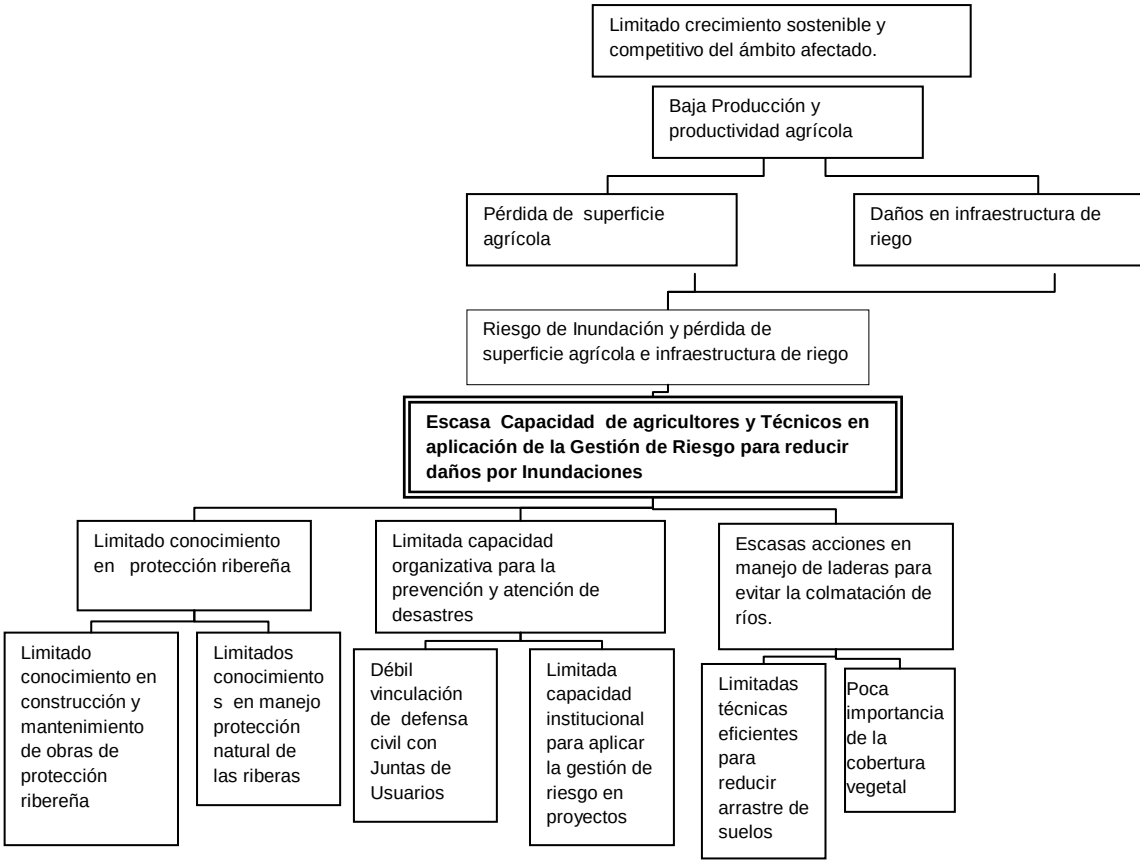
Características de los sistemas hidráulicos de uso común
1. Area servida, aprox.3500 hectáreas.
2. Están comprendidas por más de 160 bocatomas.
3. La captación del agua del cauca del río se realiza mediante encausamiento con colocación de “caballos”. “champas” mantas de material plástico.
4. Bocatomas y servidumbres de derivación son casi todas de material rústico.
5. Carecen de defensa naturales vivas y artificios de protección.

ANALISIS DEL PROBLEMA:
1. Ocurrencia de grandes avenidas y torrentes de huaycos.
2. No se ejecutan programas de “Defensas Ribereñas y Encausamiento de Río.
3. No hay decisión de ejecutar un Plan de Desarrollo Estratégico e Integrado de las Infraestructuras Hidráulicas de uso común.
4. Depredacion y queda de las defensas naturales vivas desarrolladas en las fajas marginales y en terrenos ganados en el rio por variación de su causa.

Propuesta Inmediatas:
1. Plan de desarrollo estratégico e integrado de las infraestructuras hidráulicas de uso común.
2. Plan de defensas ribereñas y encausamiento de rio
3. Plan de desarrollo de proyecto orientado a la protección y conservación de suelos y defensas naturales, así como el medio ambiente.
4. Plan de aprovechamiento racional de los recursos hídricos del rio en época de creciente y bajada de la presa

PROBLEM TREE FOR MAJES

PROBLEMS TREE FOR CAMANA


Limitado crecimiento sostenible y competitivo del ámbito afectado.
Baja Producción y productividad agrícola
Pérdida de superficie agrícola
Daños en infraestructura de riego
Riesgo de Inundación y pérdida de superficie agrícola e infraestructura de riego
Escasa Capacidad de agricultores y Técnicos en aplicación de la Gestión de Riesgo para reducir daños por Inundaciones
Limitado conocimiento en protección ribereña
Limitada capacidad organizativa para la prevención y atención de desastres
Escasas acciones en manejo de laderas para evitar la colmatación de ríos.
Limitado conocimiento en construcción y mantenimiento de obras de protección ribereña
Limitados conocimientos en manejo protección natural de las riberas
Débil vinculación de defensa civil con Juntas de Usuarios
Limitada capacidad institucional para aplicar la gestión de riesgo en proyectos
Limitadas técnicas eficientes para reducir arrastre de suelos
Poca importancia de la cobertura vegetal

Attachment-3:

Questionnaire

QUESTIONNAIRE ANSWERED IN CHIRA

1. What essential means do you consider to be important.List them from most important to least important, according to your criterion.

(3) Knowledge on river bank protection

(2) Good organizational training for prevention measure and disaster care

(1) Enough hillside management for river silting up prevention

(4) Information and Management instruments availability

( ) Other: _____

2. From the esssential means, which activities do you consider to be the most important under knowledge on river bank protection measures; list them from most important to least important.

(3) Works operation and maintenance

(5) River bank plant management

(4) Prevention and mitigation of types of erosion

(2) Natural resource management

( ) Other: _____

3. From the esssential means, which activities do you consider to be the most important under good organizational capacity for disaster prevention and care measures; list them from most important to least important.

(5) Workshop meetings for risk management plan

(4) Risk zoning

(2) Risk management

(1) Resource management

(3) Project formulation

(7) Meteorological station management

(6) Hydrological station management

( ) Other: _____

4. From the esssential means, which activities do you consider to be the most important under enough actions on hillside management for river silting up prevention; list them from most important to least important

(6) Field actions (in days) for hillside conservation technique

(4) Forest seedling productions

(3) Forest plantation setting up

(5) Forest resource management and conservation

(2) Poster and 3 – page leaflet dissemination

(1) Spots in radio programs

( ) Other: _____

5. From the esssential means, which activities do you consider to be the most important under risk management information and instruments availability; list them from most important to least important

(3) Course on risk management and forecasting & warning usefulness

(2) Workshop meetings with local authorities

(1) Other: _____

QUESTIONNAIRE ANSWERED IN CAÑETE

1. What essential means do you consider to be important.List them from most important to least important, according to your criterion.

(1) Knowledge on river bank protection

(3) Good organizational training for prevention measure and disaster care

(4) Enough hillside management for river silting up prevention

(2) Information and Management instruments availability

( ) Other: _____

2. From the esssential means, which activities do you consider to be the most important under knowledge on river bank protection measures; list them from most important to least important.

(1) Works operation and maintenance

(3) River bank plant management

(4) Prevention and mitigation of types of erosion

(2) Natural resource management

( ) Other: _____

3. From the esssential means, which activities do you consider to be the most important under good organizational capacity for disaster prevention and care measures; list them from most important to least important.

(1) Workshop meetings for risk management plan

(3) Risk zoning

(4) Risk management

(5) Resource management

(2) Project formulation

(6) Meteorological station management

(7) Hydrological station management

( ) Other: _____

4. From the esssential means, which activities do you consider to be the most important under enough actions on hillside management for river silting up prevention; list them from most important to least important

(1) Field actions (in days) for hillside conservation technique

(5) Forest seedling productions

(6) Forest plantation setting up

(2) Forest resource management and conservation

(3) Poster and 3 – page leaflet dissemination

(4) Spots in radio programs

( ) Other: _____

5. From the esssential means, which activities do you consider to be the most important under risk management information and instruments availability; list them from most important to least important

(2) Course on risk management and forecasting & warning usefulness

(1) Workshop meetings with local authorities

( ) Other: _____

QUESTIONNAIRE ANSWERED IN CHINCHA

1. What essential means do you consider to be important.List them from most important to least important, according to your criterion.

(3) Knowledge on river bank protection

(1) Good organizational training for prevention measure and disaster care

(2) Enough hillside management for river silting up prevention

(4) Information and Management instruments availability

( ) Other: _____

2. From the esssential means, which activities do you consider to be the most important under knowledge on river bank protection measures; list them from most important to least important.

(1) Works operation and maintenance

(2) River bank plant management

(4) Prevention and mitigation of types of erosion

(3) Natural resource management

( ) Other: _____

3. From the esssential means, which activities do you consider to be the most important under good organizational capacity for disaster prevention and care measures; list them from most important to least important.

(1) Workshop meetings for risk management plan

(2) Risk zoning

(5) Risk management

(4) Resource management

(3) Project formulation

(7) Meteorological station management

(6) Hydrological station management

( ) Other: _____

4. From the esssential means, which activities do you consider to be the most important under enough actions on hillside management for river silting up prevention; list them from most important to least important

(4) Field actions (in days) for hillside conservation technique

(3) Forest seedling productions

(1) Forest plantation setting up

(2) Forest resource management and conservation

(6) Poster and 3 – page leaflet dissemination

(5) Spots in radio programs

( ) Other: _____

5. From the esssential means, which activities do you consider to be the most important under risk management information and instruments availability; list them from most important to least important

(1) Course on risk management and forecasting & warning usefulness

(2) Workshop meetings with local authorities

( ) Other: _____

QUESTIONNAIRE ANSWERED IN PISCO

1. What essential means do you consider to be important.List them from most important to least important, according to your criterion.

(3) Knowledge on river bank protection

(7) Good organizational training for prevention measure and disaster care

(2) Enough hillside management for river silting up prevention

(1) Information and Management instruments availability

( ) Other: _____

2. From the esssential means, which activities do you consider to be the most important under knowledge on river bank protection measures; list them from most important to least important.

(4) Works operation and maintenance

(1) River bank plant management

(2) Prevention and mitigation of types of erosion

(3) Natural resource management

( ) Other: _____

3. From the esssential means, which activities do you consider to be the most important under good organizational capacity for disaster prevention and care measures; list them from most important to least important.

(7) Workshop meetings for risk management plan

(5) Risk zoning

(4) Risk management

(3) Resource management

(6) Project formulation

(1) Meteorological station management

(2) Hydrological station management

( ) Other: _____

4. From the esssential means, which activities do you consider to be the most important under enough actions on hillside management for river silting up prevention; list them from most important to least important

(6) Field actions (in days) for hillside conservation technique

(1) Forest seedling productions

(3) Forest plantation setting up

(2) Forest resource management and conservation

(5) Poster and 3 – page leaflet dissemination

(4) Spots in radio programs

( ) Other: _____

5. From the esssential means, which activities do you consider to be the most important under risk management information and instruments availability; list them from most important to least important

(1) Course on risk management and forecasting & warning usefulness

(2) Workshop meetings with local authorities

( ) Other: _____

QUESTIONNAIRE ANSWERED IN YAUCA

1. What essential means do you consider to be important.List them from most important to least important, according to your criterion.

   (4) Knowledge on river bank protection

   (2) Good organizational training for prevention measure and disaster care

   (3) Enough hillside management for river silting up prevention

   (1) Information and Management instruments availability

   (5) Other: PONER EN EJECUCION PONER LOS CUATRO PUNTOS ANTERIORES

2. From the esssential means, which activities do you consider to be the most important under knowledge on river bank protection measures; list them from most important to least important.

   (1) Works operation and maintenance

   (2) River bank plant management

   (4) Prevention and mitigation of types of erosion

   (3) Natural resource management

   (5) Other: PROGRAMA DE LIMPIEZA, ENCAUSAMIENTO, CAUCE RIO

3. From the esssential means, which activities do you consider to be the most important under good organizational capacity for disaster prevention and care measures; list them from most important to least important.

(3) Workshop meetings for risk management plan

(7) Risk zoning

(4) Risk management

(6) Resource management

(5) Project formulation

(1) Meteorological station management

(8) Hydrological station management

( ) Other: _____

4. From the esssential means, which activities do you consider to be the most important under enough actions on hillside management for river silting up prevention; list them from most important to least important

(3) Field actions (in days) for hillside conservation technique

(4) Forest seedling productions

(7) Forest plantation setting up

(6) Forest resource management and conservation

(2) Poster and 3 – page leaflet dissemination

(1) Spots in radio programs

(5) Other: EJECUCION ACCIONES PROTECCION, DEFENSAS NATURALES

5. From the esssential means, which activities do you consider to be the most important under risk management information and instruments availability; list them from most important to least important

(1) Course on risk management and forecasting & warning usefulness

(2) Workshop meetings with local authorities

(1) Other: FINANCIAMIENTO Y EJECUCION PREVENTIVA DE RIEGO

QUESTIONNAIRE ANSWERED IN MAJES

1. Que medios fundamentales le parece importante.Enumere de mayor si le parece mas importante a menor si le parece menos importante .

(2) Conocimiento de acciones de protección de las márgene de los rios

(1) Buena capacidad organizativa para implementar medidas de prevención y atención de desastres.

(3) Suficiente acciones en manejo de laderas para evitar la colmatación de ríos

(4) Se cuenta con información e instrumentos de gestión

(5) Otros:__

2. Del medio fundamental, conocimiento de accciones de pritección de las margenes de los rios , cual actividad le parece mas importante enumere de mayor a menor.

(1) Programa sobre operación y mantenimiento de obras

(3) Programa de manejor de plante ribereñas

(2) Prevención y mitigación de tipos de erosión

(4) Manejo de recursos naturales

(5) Otros:__

3. Del medio fundamental , buena capacidad organizativa para implementar medidas de prevención y atención de desastres , cual acitvidad le parece mas importante enumere de mayor a menor.

(2) Reuniones taller para formular el plan de getión de riesgo

(1) Zonificación de Riesgo

(5) Gestión de Riesgo

(6) Gestión de Recurso

(3) Formulación de Proyectos

(7) Manejo de estaciones Meteorológicas

(4) Manejo de estaciones Hidrológicas

( ) Otros: _____

4. Del medio fundamental, superficie acciones en manejo de laderas para evitar la colmatación de ríos, cual le parece màs importante enumere de mayor a menor.

(4) Días de campo en ejecución de técnicas de conservación de laderas

(3) Producción de plantones forestales

(2) Instalaciones de plantones forestales

(1) Manejo y conservación de recursos forestales

(5) Difusión de afiches y tripticos

(6) Difusión de spot publicitario en programas radiales

(7) Otros: _____

5. Del medio fundamental,se cuenta con información e instrumentos de gestión de riego, que actividad le parece más importante enumere de mayor a menor.

(2) Curso sobre gestión y riesgo y utilidades de alerta temprana

(1) Reuniones taller con autoridades locales

( ) Otros: _____

QUESTIONNAIRE ANSWERED IN CAMANA

1. Que medios fundamentales le parece importante.Enumere de mayor si le parece mas importante a menor si le parece menos importante .

(1) Conocimiento de acciones de protección de las márgene de los rios

(3) Buena capacidad organizativa para implementar medidas de prevención y atención de desastres.

(2) Suficiente acciones en manejo de laderas para evitar la colmatación de ríos

(4) Se cuenta con información e instrumentos de gestión

( ) Otros:__

2. Del medio fundamental, conocimiento de accciones de pritección de las margenes de los rios , cual actividad le parece mas importante enumere de mayor a menor.

(1) Programa sobre operación y mantenimiento de obras

(3) Programa de manejor de plante ribereñas

(2) Prevención y mitigación de tipos de erosión

(4) Manejo de recursos naturales

( ) Otros:__

3. Del medio fundamental , buena capacidad organizativa para implementar medidas de prevención y atención de desastres , cual acitvidad le parece mas importante enumere de mayor a menor.

(5) Reuniones taller para formular el plan de getión de riesgo

(3) Zonificación de Riesgo

(2) Gestión de Riesgo

(4) Gestión de Recurso

(1) Formulación de Proyectos

(7) Manejo de estaciones Meteorológicas

(6) Manejo de estaciones Hidrológicas

( ) Otros: _____

4. Del medio fundamental, superficie acciones en manejo de laderas para evitar la colmatación de ríos, cual le parece màs importante enumere de mayor a menor.

(4) Días de campo en ejecución de técnicas de conservación de laderas

(6) Producción de plantones forestales

(2) Instalaciones de plantones forestales

(1) Manejo y conservación de recursos forestales

(5) Difusión de afiches y tripticos

(7) Difusión de spot publicitario en programas radiales

( ) Otros: _____

5. Del medio fundamental,se cuenta con información e instrumentos de gestión de riego, que actividad le parece más importante enumere de mayor a menor.

(1) Curso sobre gestión y riesgo y utilidades de alerta temprana

(2) Reuniones taller con autoridades locales

( ) Otros: _____

Attachment-4:

Contents of Activities

Knowledge on River Bank Protection Actions in consideration of Agriculture and Natural Enviornment:

River Bank Operation and Maintenance

I. *OBJECTIVES:*

In this project, local populations learn suitable technology to operate and give maintenance to constructions and works from prior projects.

II. *TARGET PARTICIPANTS:*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations

III. *VENUES AND TIMES:*

- Water Users Association headquarters and / or public facilities.
- 12 times in all (every six (6) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Manuals for constructions and works from prior projects
- Manuals for constructions and works relevant to this project
- Materials handed out by the speakers

V. *TOPICS:*

- Suitable operation and maintenance technology for constructions and works from prior projects
- Suitable operation and maintenance technology for constructions and works in this project

VI. *SPEAKERS:*

- Contractors of constructions and works from prior projects
- Contractors of constructions and works in this project
- Engineers from MINAG and / or the Regional Government

Knowledge on River Bank Protection Actions in consideration of Agriculture and Natural Enviornment:

River Bank Plant Management

I. *OBJECTIVES*

Local populations learn suitable technology on river bank plants and vegetation for flooding control purposes.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities.
- 12 times in all (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- River bank protection with the use of plants
- The importance of river bank vegetation in flooding control
- Types of river bank plants and their characteristics

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.)

Knowledge on River Bank Protection Actions in consideration of Agriculture and Natural Enviornment:

Erosion Prevention and Mitigation Natural Resource Management

I. *OBJECTIVES:*

Local populations learn suitable technology on erosion and natural resources for flooding control purposes.

II. *TARGET PARTICIPANTS:*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities.
- 26 times in all (every three (3) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- Evaluation of the erosion conditions
- Evaluation of natural resource conditions
- Erosion approach for flooding control
- Natural resource approach for flooding control
- Environmental consideration approach
- Use of water resources
- Alternatives for suitable farming crops

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.)

Preparation of Commnity Disaster Management Plan for Flood Control:

Risk management Plan Formulation

I. *OBJECTIVES:*

Local populations gain knowledge and learn technology to prepare a flooding control plan.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities.
- 19 times in all (every four (4) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- Flooding control plan preparation manuals
- Current condition analyses for flooding control
- Community development alternatives by means of local participation
- Workshop for flooding control plan preparation

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- Community Development Expert
- Facilitator (local participation)

Preparation of Commnity Disaster Management Plan for Flood Control

Detailed Risk management Plan Formulation

I. *OBJECTIVES:*

Local populations gain knowledge and learn technology to prepare a flooding control plan

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities.
- 34 times in all (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- Ecological zoning
- Risk management
- Resource management
- Project formulation
- Meteorological station management
- Hydrological station management

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- Community Development Expert
- Facilitator (local participation)

Preparation of Commnity Disaster Management Plan for Flood Control

Early Warning System for Flood Control

I. *OBJECTIVES:*

Local populations learn suitable technology on early warning system for flooding control purposes.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives
- Local people

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities.
- 24 times in all (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
  Materials handed out by the speakers

V. *THEMES:*

- Early warning system for flooding control
- Joint training using the early waring system with participation of local governments, water users union and local people

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- Community development expert
- Facilitators (community participation)

Hillside Management for River silting up Prevention

Hillside Conservation Techniques

I. *OBJECTIVES:*

Local populations learn suitable technology on forest seedling production.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or forest area offices
- 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers
- Materials on forest seedlings

V. *THEMES:*

- A selection of plants that are suitable to the local characteristics
- Forest seedling production technology
- Control carried out by the local population's involvement

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.

Hillside Management for River silting up Prevention

Forest Seedling Production

I. *OBJECTIVES:*

Local populations learn suitable technology on forest seedling planting.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or forest area offices
- 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers
- Materials on forest seedlings

V. *THEMES:*

- Candidate areas for forestation
- Forest plantation control technology
- Forest plantation soil technology
- Control carried out by the local population's involvement

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.)

Hillside Management for River silting up Prevention

Forest Seedling Planting

I. *OBJECTIVES:*

Local populations learn suitable technology on forest resource management and conservation.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or forest area offices
- 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- Forestation for flooding control purposes
- Forest plantation control technology
- Forest plantation output technology
- Control carried out by the local population's involvement

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.

Hillside Management for River silting up Prevention

Forest Resource Management and Conservation

I. *OBJECTIVES:*

Local populations learn suitable technology on forest resource management and conservation.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or forest area offices
- 40 times in all for three (3) "Courses on Basin Management for Anti - River Sedimentation Measures" (every five (5) hours)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *TOPICS:*

- Forestation for flooding control purposes
- Forest plantation control technology
- Forest plantation output technology
- Control carried out by the local population's involvement

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- College professors (From universities, institutes, NGOs, etc.)

Course to Information Networks on Flooding Risk management
Risk management and Forecasting and Warning Usefulness

Risk management and Forecasting and Warning Usefulness
(using existing system)

I. *OBJECTIVES:*

Local populations learn suitable technology on risk management and forecasting and warning usefulness.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Las oficinas de Junta de Usuarios y/o facilidades publicas en Chira
- 12 veces en total (cada 5 horas)

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *THEMES:*

- Disaster risk conditions and forecasting and warning usefulness
- Comprehensive risk management technology for flooding control
- Forecasting and warning usefulness technology
- Forecasting and warning usefulness control carried out by the local population's involvement

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- Forecasting and warning usefulness contractors
- College professors (From universities, institutes, NGOs, etc.)

Course to Information Networks on Flooding Risk management Workshop – Meeting with Local Authorities

Workshop – Meeting with Local Authorities (using existing system)

I. *OBJECTIVES:*

Cooperation preparedness between local Governments, Water Users Associations, communities, and local populations for flooding control purposes.

II. *TARGET PARTICIPANTS*

- Engineers and / or technicians from local Governments
- Engineers and / or technicians from Water Users Associations
- Community representatives

III. *VENUES AND TIME:*

- Water Users Association headquarters and / or public facilities in Chira.
- 12 times in all (every five (5) hours

IV. *MATERIALS:*

- Existing materials (those prepared by PERPEC, audio-visual materials, etc.)
- Materials handed out by the speakers

V. *THEMES:*

- Setting up an information network for Disaster risk conditions and forecasting and warning usefulness
- Local cooperation set up for forecasting and warning usefulness
- Preparation of a disaster risk plan that includes Forecasting and warning usefulness

VI. *SPEAKERS:*

- Engineers from MINAG and / or the Regional Government
- Forecasting and warning usefulness contractors
- College professors (From universities, institutes, NGOs, etc.)

Attachment-5:

Costs

Ministry of Agriculture
Republic of Peru

THE PREPARATORY STUDY
ON
PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU

FINAL REPORT
I-6 SUPPORTING REPORT
ANNEX-13 STAKEHOLDER MEETING

March 2013

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

YACHIYO ENGINEERING CO., LTD.
NIPPON KOEI CO., LTD.
NIPPON KOEI LATIN AMERICA –
CARIBBEAN Co., LTD.

Figure Study Area

ABBREVIATION

Abbreviation	Official Form or Meaning
ANA	Autoridad Nacional del Agua/National Water Authority
ALA	Autoridad Local del Agua/Local Water Authority
B/C	Costo Benefit Ratio/Benefit Cost Ratio
GDP	Gross Domestic Product/Gross Domestic Product
GIS	Geographic Information System/Geographic Information System
DGAA	Dirección General de Asuntos Ambientales/General Directorate of Environmental Affairs
DGFFS	Dirección General de Forestal y de Fauna Silvestre/Directorate General of Forest and Wildlife
DGIH	Dirección General de Infraestructura Hidráulica/Directorate General for Water Infrastructure
DGPI (Paleo-DGPM)	Dirección General de Política de Inversiones/Directorate General of Investment Policy
DNEP	Dirección Nacional de Endeudamiento Público/National Directorate of Public Debt
DRA	Dirección Regional de Aguricultura/Regional Directorate Aguriculture
EIA	Evaluación de Impacto Ambiental/Environmental Impact Assessment
FAO	Agricultura y la Alimentación Organización de las Naciones Unidas/ Food and Agriculture Organization of the United Nations
F/S	Estudio de Factibilidad/ Feasibility Study
GORE	Gobierno Regional/Regional Government
HEC-HMS	Centros de Ingeniería Hidrológica Sistema de Modelación Hidrológica Método /Hydrologic Engineering Centers Hydrologic Modeling System Method
HEC-RAS	Centros de Ingeniería Hidrológica del Río de Análisis del Sistema Método /Hydrologic Engineering Centers River Analysis System Method
IGN	Instituto Geográfico Nacional/National Geographic Institute
IGV	Impuesto General a Ventas/General Sales Tax
INDECI	Instituto Nacional de Defensa Civil/National Institute of Civil Defense
INEI	Instituto Nacional de Estadística/National Institute of Statistics
INGEMMET	Instituto Nacional Geológico Minero Metalúrgico/National Geological and Mining Metallurgical Institute
INRENA	Instituto Nacional de Recursos Naturales/Natural Resources Institute
IRR	Tasa Interna de Retorno (TIR)/Internal Rate of Return
JICA	Japonés de Cooperación Internacional /Japan International Cooperation Agency
JNUDRP	Junta Nacional de Usuarios de Distritos del Perú/National Board of Peru Districts Users
L/A	Convenio de Préstamo/Loan Agreement
MEF	Ministerio de Economía y Finanzas/Ministry of Economy and Finance

MINAG	Ministerio de Agricultura/Ministry of Agriculture
M/M	Acta de la reunion/Minutes of Meeting
NPV	Valor Actual Neto (VAN)/NET PRESENT VALUE
O&M	Operación y Mantenimiento /Operation and maintenance
OGA	Oficina General de Administración/General Office of Administration
ONERRN	Oficina Nacional de Evaluación de Recursos Naturales/National Bureau of Natural Resource Evaluation
OPI (OPP)	Oficina de Programación e Inversiones/Programming and Investment Office (Oficina de Planificación e Prespuesto/Office of Planning and Budget)
PBI	Producto Bruto Interno/Gross Domestic Product
PE	Exp. Proyecto Especial (PE) Chira-Piura/ Exp. Special Project Chira-Piura
PES	Pago por Servicos Ambientales (PSA)/Payment for Environmental Services
PERFIL	PERFIL/PROFILE (Preparatory survey of project before investment)
Pre F/S	Estudio de Prefactibilidad /Pre-Feasibility Study
PERPEC	Programa de Encauzamiento de Ríos y protección de Estructura de Captación
PRONAMACHIS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos/National Program of River Basin and Soil Conservation Management
PSI	Programa de Sub Sectorial de Irrigaciones/Program of Sub Irrigation Sector
SCF	Factor de conversión estándar/Standard conversion factor
SENAMHI	Servicio Nacional de Meteorología y Hidrología/ National Service of Meteorology and Hydrology
SNIP	Sistema Nacional de Inversión Pública/National Public Investment System
UF	Unidad formuladora/Formulator unit
VALLE	Valle/Valley
VAT	Impuesto al valor agregado/Value-added tax

THE PREPARATORY STUDY ON PROJECT OF THE PROTECTION
OF
FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD
IN THE REPUBLIC OF PERU
FEASIBILITY STUDY REPORT
SUPPORTING REPORT

Annex-13
Stakeholder Meeting

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CHAPTER 1 OUTLINE OF STAKEHOLDER MEETING

1.1 Objective of the Meeting

Regarding the targeted six (6) river basins, the stakeholder meetings were held with participation of local governments, agricultural water users' association, citizen organizations to identify the protected areas against the flood disaster (inundation, bank erosion, etc.) Moreover, the clarification of applicable measures for flood management in the protected areas and prioritization of the protected areas were supported.

1.2 Organizer

Host organizer: Direction General of Hydraulic Infrastructure (DGIH), Ministry of Agriculture

1.3 Schedule of Meeting

The stakeholder meetings were held in accordance with the following schedules.

Table 1.1 **Schedule of Stakeholder Meetings**

No.	Date	River Basin
1	5 February, 2011, 9:00～	Chincha River Basin
2	6 February, 2011, 9:00～	Canete River Basin
3	11 February, 2011, 9:00～	Pisco River Basin
4	12 February, 2011, 9:00～	Yauca River Basin
5	19 February, 2011, 9:00～	Chira River Basin
6	1 December, 2011, 18:30～	Majes-Camana River Basin (Camana River)
7	2 December, 2011, 18:30～	Majes-Camana River Basin (Majes River)

1.4 Agenda of Meetings

The agenda of the meetings is shown in ***Table 1.2***.

Table 1.2 **Agenda of Meeting**

1	Opening Address by Representative in the River Basin
2	Opening Address by Representative of Direction General of Hydraulic Infrastructure (DGIH), Ministry of Agriculture
3	Opening Address by Representative by JICA (at Chincha River Basin only)
4	Presentation by JICA Study Team (contents of presentation) (1) Objective (2) Targeted River Basins (3) Study Schedule (4) Probable Flood Runoff Volume (5) Inundation Area (6) Water Demand and Supply Balance in the Basin (Excluded Majes-Camana River Basin) (7) Outline of Flood Control Facility (8) Rough Cost Estimation (9) Economic Analysis (10) Initial Environmental Examination (Excluded Majes-Camana River Basin) (11) Priority of Flood Control Facilities (Excluded Majes-Camana River Basin) (12) Further Schedule
5	Coffee Break
6	Questions and Answers
7	Closing Address by Representative in the River Basin

CHAPTER 2 RECORD OF EACH STAKEHOLDER MEETING

The participants and results of questions and answers are summarized below.

2.1 Chincha River Basin

Participants of Organizer:

DGIH: Sr. Gustavo Ocampo Ochoa
JICA: Ph. D. Hitoshi Baba (Senior Advisor)
JICA STUDY TEAM: Mr. Yoshio Nakagawa, Mr. Tamotsu Shingu, Mr. Hiroshi Shimoosako

Table 2.1 **List of Participants (Chincha River Basin)**

Name	Title
Sra. Guillermina Jorges de Sierra	Secretaria Junta de Usuarios
Sra. María Luisa Farfan	Secretaria
Sra. Luisa Fon de Díaz	Jefe de Tarifa J.U.
Sr. José La Rosa Tasayco Munaro	Tesorero GRSSIRP
Sra. Rosa Magallanes Carrillo	Contador Público C.R.S.S. RCH – IRR – Chillón Palpa
Sra. Marita Dávalos Gálvez	Personal Administrativo C.R.S.S. Cauce Principal.
Sr. Benito Saavedra León	Unidad Capacitación Junta de Usuarios
Sr. Lucio Ulmos Soldevilla	Presidente Junta de Usuarios
Sr. Eugenio Canelo Q.	Presidente Chincha Baja
Sr. Eusebio Napón García	Presidente Río Viejo
Sr. César Rafael Cusira	Ala Chincha Pueblo
Sr. Angelino Hucma	Presidente Matagente
Sr. Humberto Vilca M.	Agricultor – Alto
Sr. Teófilo Napa S.	El Comercio La Noticia
Sra. Rosa Rojas P.	Agricultor Irrigación Puente Nuevo
Sr. Víctor Gonzales Napa	Agricultor
Sr. Gustavo Ramos Mayurí	Gerencia Sub Regional Chincha GORE Ica
Sr. César Cotel M.	Comisión R. San Reg.
Sr. Alberto Apari Jayo	Comisión R. Viejo
Sr. Luis Conde Cruzate	Agencia Agraria Chincha
Sr. Víctor Trillo Castillo	
Sra. Élida Magallanes	Gerente Junta de Usuarios Chincha
Sr. José Saravia Teo	CU. Irrigación Pampa Ñoco
Sr. Mario Mendoza Quispe	Chincha Baja
Sr. José Luis Sotelo Sotelo	CU. Acequia Grande
Sr. Juan Felipe Jayo Ramos	DRA – Ica - OPA
Sr. Luis Reyes Aponte	Comisión Río Ufe
Sra. Emilia Gladys Ramos Cabrera	Sector Wiracocha Ronceros Bajo
Sr. Guillermo Aguirre G.	Agricultor Wiracocha
Sr. Víctor Ruiz S.	S. Principal
Sr. Santos Abarca Guerra	Comisión Río Viejo
Sr. J. Magallanes	Tesorero Junta Usuarios Chincha

Table 2.2 **Remarked Results of Questions and Answers (Chincha River Basin)**

Question	Answer
What is the reason the measures in Pisco river are less than those in Chincha river although the catchment area of Pisco river is larger?	Even though the measures are less, the inundation area will be small through the implementation of proposed measures.
Why is the project cost for Pisco river bigger than that of Chincha river?	The estimated project cost of Pisco river is bigger. However, the priority of the projects is low, so it is not sure whether the proposed projects are approved or not.
By implementing the proposed five (5) alternatives, are all the river basins protected from the flood disasters?	It is not said that all the basins will be protected by carrying out the priority projects. The protection of all the basins from the flood will require enormous costs and long time. In the Study, the plan for flood management with 50-year return period will be formulated and considerable and priority projects are selected. Since the implementation of all the considerable projects for flood management need huge budgets and long period, the priority projects are explained among projects.
Did you examine the effectiveness for flood control and water utilization by regulating the discharge volume of dam (lake in highland of Andes)?	The objective of the Study is on flood control. Therefore, measures related to the integrated river basin management are not included.
Do you have any plan to construct the flood control dam in the highland of Andes?	Since the project cost for dam construction will be enormous, the dam construction is not examined in the Study.
It is concerned to prevent from the taking of water to paddy fields if the dyke is constructed.	In this study stage, the condition of water intake is not identified in detail. However, in the detailed design stage, it will be examined not to disturb the water intake to the paddy fields.
What is the schedule for the construction of revetment?	This is the study stage, and the procedures for SNIP shall be conducted. Therefore, at the moment, it is not clearly stated on when the construction work will be started.
The agricultural fields at the surrounding areas of Chico2 are important to be protected since the productivity of cotton fields and grape cultivation is high. Therefore, it is assumed that the construction of the dyke in the downstream of existing diversion weir is necessary.	During the course of the study, it was examined the scale of flood inundation in the downstream of existing diversion weir is small, and it is not necessary to construct the dyke there. Therefore, the new dyke is not necessarily to be constructed and rehabilitation of existing irrigation weir and widening of river channel are applicable.
Is it possible to add the other critical points?	It is not sure to add the others, but we are appreciated if you could provide the information on the other points.

Figure 2.1 **Stakeholder Meeting (Chincha River Basin)**

2.2 Canete River Basin

Participants from Organizer:

DGIH: Sr. Gustavo Ocampo Ochoa

JICA STUDY TEAM: Mr. Yoshio Nakagawa, Mr. Tamotsu Shingu

Table 2.3 **List of Participants (Canete River Basin)**

Name	Title
Sr. Teodoro Ayllón V.	Vocal Canal San Miguel
Sr. Valencia Saldaña Nicolás	Secretario Técnico Defensa Civil Imperial
Sr. Pedro Celestino Asencio Boga	Secretario Palo Herbay Alto
Sr. Eleodoro Peña Espino	Delegado Canal Viejo Imperial C.V.I.
Sr. Santos Santiago Ricardo Inga	Presidente de la Junta de Usuarios del Sub-Distrito de Riego de Cañete
Sr. Bonifacio Portugal Sánchez	Secretario Comisión de Regantes Canal San Miguel.
Sr. Jehová Laura Aliaga	Primer Vocal Comisión de Regantes María Angola.
Sr. Misael Hércules Marthans – Patroni	Delegado Comisión Nuevo Imperial
Sr. Antonio Saravia Mejía	Delegado Canla Palo Herbay
Sr. Miguel Zapallanay Villasana	Delegado Comisión Regantes Palo Herbay
Sra. Eusebia Moscoso de Beas	Vocal Comisión Huauca
Sr. Lorenzo Navarro Nolazco	Delegado de la Comisión Canal Viejo Imperial.
Sr. Jorge Pérez Mattos	Presidente C.R.P.H.
Sr. Pedro Mariátegui F.	Delegado Canal Nuevo Imperial
Sr. Lorenzo Navarro Nolazco	Delegado de la Comisión C.V.J.
Sr. Manuel y. Carrillo Díaz	Gerente Técnico Junta Usuarios Cañete
Sr. Máximo Palomino Vargas	Vocal Canal San Miguel
Sr. Carlos Ramírez Mendoza	Vicepresidente JUC
Sr. Berly Francia Núñez	Jefatura Provincia Defensa Civil
Sra. Juana Luy Maldonado	Junta de Usuarios Cañete
Sra. Benedicta Espinoza	C.S.M.
Sra. María Luyo Calvo	C. María Ángela
Sr. Alberto Llona Álvarez	Gobierno Regional
Sr. César García Solano	Defensa Civil Gobierno Regional de Lima
Ing. Manuel Y. Carrillo Díaz	Gerente Técnico Junta Usuarios Cañete
Ing. Miguel Melgarejo Escudero	Director Agraria Cañete.

Table 2.4 **Remarked Results of Questions and Answers (Canete River Basin)**

Question	Answer
Does 50-year return period mean from which year it is started to be counted?	50-year return period means the flood disaster occurring once for fifty (50) years. Therefore, it is not forecasted when it will be occur.
Last Tuesday, it was observed that the dyke at the upstream of Imperial Diversion Weir seems to be collapsed with discharge volume of 180 m^3/s. Therefore, it is suspended the dike will be broken with water discharge volume of 1/50.	It will be collapsed without rehabilitation.
It is understood that the projects are supposed to be conducted under the Japan's fund. Is it financed to the central government or local government?	In principle, the fund will come to central government.
There is example for flood measures by paving the stone at the revetment. Is it concerned to extend the pavement of stones?	It is not examined.
In the Study, the excavation of riverbed is planned near the Pan Americana area. In this area, the sedimentation is observed every year due to the floods every year. Is it assumed to dredge theriverbed every year in your plan?	The maintenance work is important, and the implementation of emergency excavation is recommended. Even though the revetment is constructed, the effects for flood control will be small since the riverbed is rising every year. Periodical excavation is effective, so it shall be conducted every year. Moreover, since the height of bridge is fixed, the excavation is one of the most effective way of flood control.
Is the sedimentation volume examined?	The riverbed fluctuation analysis has been conducted. As a result of this, the future sedimentation and erosion sections will be analyzed.
Is it considered in the dry season, sand waste materials are disposed at the bridge?	It is not considered in the Study. Its disposal shall be regulated by the other laws. It is assumed that the disposal volume is not seriously compared with the sediment volume from the upstream.
Even though the law is enacted, the local governments do not regulate based on the law. Therefore, it is expected that this issue will be pointed out in the JICA report to promote the regulation by the local governments.	The issue you pointed out can be mentioned in the report.
Is the flood forecasting and warning system established in Chira River?	In accordance with the contract with JICA, the flood forecasting and warning system will be established in Chira River.
It is concerned the flood forecasting and warning system is necessary in Canete River. How many hours before is the occurrence of flood predicted?	There is no flood forecasting and warning system except for Chira River. It is assumed that installation of flood forecasting and warning system is implemented in Chira river as a pilot study, and the installation will be expanded into other river basins. (personal view by JICA Study Team). It is difficult to answer how many hours before on the prediction of flood occurrence. In general, the observed rainfall data and water level will be transferred to the central control center, and the warning will be issued when the rapid increase of water level is observed. It can be said that the flood occurrence will be forecasted three to four

Question	Answer
	hours before the occurrence.
Is it necessary to conduct regular dredging where the dyke exists?	The riverbed fluctuation analysis has been carried out, and it is necessary to excavate the riverbed periodically if the result of analysis shows the sedimentation in the section.
	In the Study, the components of enhancement of public awareness on flood disaster and flood fighting are included. Therefore, the active participation is highly expected. Through these activities, disaster education and enhancement of flood management capacity will be conducted.
Even though the necessity of paving stones on the dyke on either bank near Pan Americana area, there is no budget allocation for water utilization associations and local governments.	Currently, the riverbed is remarkably rising. By excavation of riverbed, the impacts on dyke will be mitigated.
Who (which agency) has responsibility on river maintenance? (question from JICA)	According to the water law, water utilization association is responsible for it. The maintenance of river is under the responsibility of national government, and river infrastructure such as dyke is under water utilization association. The cost for routine maintenance is burdened by union contributions by association members. In case of disaster, the rehabilitation is conducted by national or local government budget.
When the dyke is constructed, will the cost for the construction be partly burdened by the water utilization association? (question from JICA)	The cost will be partly shared.
When is the project supposed to be commenced?	It depends on the procedures of SNIP. Therefore, it is not clear yet.
Currently, the association possesses only 1 (one) construction machinery. Due to the starting of the project, will the additional equipment be procured and provided to this basin?	The contractor will procure the necessary equipment and will not provide it after the completion of the project.

Figure 2.2 **Stakeholder Meeting (Canete River Basin)**

2.3 Pisco River Basin

Participants from Organizer:

DGIH: Sr. Guillermo Maguiña López

JICA STUDY TEAM: Mr. Yoshio Nakagawa, Mr. Hiroshi Shimoosako, Mr. Masafumi Ikeno

Table 2.5 **List of Participants (Pisco River Basin)**

Name	Title
Sr. Vicente Lagos Herrera	Tesorero C.R.G.P.
Sr. Aquilino Vásquez	Agricultor
Sra. Alcira Ñañez Altamirano	Presidenta C.R.H.P.
Sr. Orlando Franco Ferreyra	Delegado
Sra. Cinthya Monroy Huamán	Regidora San Clemente
Sra. Rosario M. Angulo	Jefe D.C. S.C.
Sr. Ismael Mazo Pozo	Presidente Comisión CHUN CHANGA
Sr. José Huayta Berrocal	CR Manrique
Sr. Víctor Astovilca Farpe	CR Manrique
Sr. Jorge Luis I. Condori	Tesorero CR Manrique
Sr. Fausto Tunaja Porro	Secretario
Sr. Rigoberto Pachas Almeyda	Jefe Oficina de Defensa Civil
Sr. Guillermo AyayoD.	Manrique
Sr. Abraham Loayza Albitez	Cabeza de Toro
Ing. Juan Jayo Ramos Ing. Juan C. Villanueva	Director OPA Resp. Prom Agraria
Sr. Pedro Zúñiga Enciso	Regidor
Sr. Vicente Del Río	ALA Pisco
Sr. Leonidas Gamboa Luque	ALA Chincha Pisco
Sra. Pascuala Bendezú S.	Tesorero J.U.P.
Sra. Giovanna Pizarro Osorio	Consejero Regional
Sr. Julio Quispe Cury	Regidor
Sr. Luis Rivas	Usuario
Sr. David Llerena	Presidente
Sr. Luis Pariona Rojas	Usuario
Sr. Luciano Paco Flores	Presidente
Sr. Florentino Fernández	Tesorero
Sr. Hermengildo Maldonado	Comisión de Regantes
Sr. Félix Campos Fernández	Presidente CR Pueblo Figeroa
Sr. Daniel Ayquipa Ampuero	Gerente
Sr. Eduardo Chacaliaza Barrientos	Presidente C.R.S.S.C.
Sr. Luciano Maldonado Berrocal	C.R. Francia
Sr. Jorge Godoy García	Presidente C.R.
Sr. Miguel Ormeño Vizcarra	Parcelero
Sr. Richard Palma Guillén	Jefe de Fundo
Sr. Robert Lava Sandoval	Presidente C.R.
Sr. Custaguio Salvador García	Parcelero

Table 2.6 **Remarked Results of Questions and Answers (Pisco River Basin)**

Question	Answer
Do you have any plan of the flood measures in the other locations?	The proposed measures will be conducted in the priority locations. The proposed locations were determined in consideration with the result of riverbed fluctuation analysis and rising conditions of riverbed.
	The dyke is planned to be constructed every 2 km section.
	The excavation materials of riverbed can be utilized as the construction materials for dyke. If the big stone is necessary, it will be procured from the other location.
About the paddy fields at the flood control area	The scale of flood control area will be approximately 1.8km×0.7km. so far, the detail condition of paddy fields is not examined, but the land acquisition condition will be examined in the next feasibility study stage.
About inundation in Yauca river basin	Yauca River basin is a small basin, but the inundation is occurred. Since the Ministry of Agriculture, the government of Peru requested to examine the river basin, Yauca River basin is included as a target area in the Study.
About the inundation in Pisco river basin	Even though the four (4) flood facilities are constructed, the flood inundation cannot protected in overall basin area. The flood will be prevented at the locations where the facilities are constructed, but the other locations will suffer from the flood even the damage will be mitigated. In the Study, the important areas are selected. For the protection of all the areas, the dyke shall be constructed all along the river, which requires the huge cost and long period. The long-term plan for the flood management in overall the basin will be formulated and the necessary project cost will be estimated. However, it is obvious to conduct all the measures in this project. In Japan, the overall master plan is formulated and the several projects are conducted based on the priority. More than 100 years have been implemented for the flood control plan in Japan, but so far, 40 % of necessary measures have been carried out.
How much is the necessary cost?	The total cost is estimated as 70mil S./ for six (6) projects.

Figure 2.3 **Stakeholder Meeting (Pisco River Basin)**

2.4 Yauca River Basin

Participants from Organizer:

DGIH: Sr. Guillermo Maguiña López

JICA STUDY TEAM: Mr. Yoshio Nakagawa, Mr. Hiroshi Shimoosako

Table 2.7 **List of Participants (Yauca River Basin)**

Name	Tittle
Sr. Julio Vicente Salas	Gerente Regional Agricultura Arequipa
Sr. José Cárcamo Neyra	Concejero Regional por Caravelí
Sr. Santiago Neyra Guzmán	Alcalde de la Provincia Caravelí
Sr. Telésforo Revilla Medina	Director de la Gerencia Agraria
Sr. José Enrique Arana Huamán	Administrador Local de Agua Cha.
Sr. Arturo Montesinos Neyra	Alcalde del Distrito de Yauca
Sr. Jesús Cárcamo Quispe	Presidente de la Comisión Regional de Yauca.
Sr. Fernando Quintanilla Machuca	Presidente de la Comisión Regional Jaqui
Sr. Jorge de La Torre Cárcamo	Secretario de la Comisión Regional Yauca
Sr. Braulio Huamaní Valdivia	Segundo Vocal Comisión Reg. Yauca
Sr. Roberto de La Torre Cárcamo	Primer Delegado ante la Junta de Usuarios.
Sr. Víctor Alfredo Briceño Ramos	Primer Delegado ante la Junta de Usuarios.
Sr. Arturo Peve Guerra	Secretario de la Comisión Regional Jaqui
Sr. Pedro Pablo Rojas Rojas	Segundo Delegado ante la Junta de Usuarios.
Sr. Carlos Cárcamo Cárcamo	Usuario de la Comisión Regional Yauca
Sr. Segundo de La Torre Briceño	Usuario de la Comisión Regional Yauca
Sr. Biaggio de La Torre Márquez	Usuario de la comisión Regional Mochi
Sr. Basilio M. Sandoval Canales	Presidente A.A.P.Y
Sr. Marco García	Usuario
Sr. Néstor G. Montoya Gonzales	Usuario
Sr. Emiliano U. Mendoza	Usuario
Sr. E.	Usuario
Sr. Víctor Mendoza Salas	Usuario
Sr. Roberto Zárate Ramírez	Usuario
Sra. Rosalía Paredes Carhuas	Concejo Distrital
Sr. Rolando	Usuario
Sr. Miguel Ramírez Quispe	
Sr. César de La Torre E.	Usuario
Sra. Iris	usuario
Sr. Neptalí de La Torre Neyra	Usuario

Table 2.8 **Remarked Results of Questions and Answers (Yauca River Basin)**

Question	Answer
Is the location of Ya-6 at 35 km from the river mouth (is the location correct)?	The location will be confirmed based on the topographic survey result (as a result of confirmation, it is correct as 41 km).
Why will the two (2) measures be conducted at the same location?	The different measures will be conducted, that is, rehabilitation of diversion weir and revetment work.
Is it correct the value smaller is higher priority?	It is correct the value smaller is higher priority.
There is a location where the water flow changes. Is it possible to modify your plan based on this change of water flow?	Since the Study has almost finished, it is difficult to consider this change of water flow in this study.
Is the design discharge examined based on the existing discharge volume and rainfall data?	The design discharge is analyzed based on the existing observed data for both.
Is the impacts in climate change considered on the analysis of design discharge?	The flood in 1983 and 1998 during El Nino is approximately equivalent to 1/50 discharge scale. Therefore, our measures are based on 1/50. However, the next flood might be exceeded 1/50. The proposed structural measures are not effective to the extraordinary flood, so the appropriate evacuation shall be conducted by learning through disaster education and capacity development. The unpredictable extraordinary flood will not completely prevented only by the structural measures, so it is necessary to mitigate the flood damages through the non-structural measures including education for disaster prevention.
Is it recommended to organize the community organization for supporting the evacuation of the public?	The organizing the community organization is included in the technical support of the proposed project. After commencement of the project, the assistance for the establishment of community organization for flood management will be conducted.
It seems the population of beneficiaries is smaller than the population of statistic data.	The available statistic data consists of the population in the village. The population of beneficiaries shown is composed of the population in the inundation area, not in the village.
It seems the damage cost is small.	Since the damage cost was estimated by examining the crops, etc., it is said that the estimated damage cost is reasonable.
Where is the location of inundation area with 90ha?	The location of inundation area with 90ha is indicated as colored location in the flood analysis map.
The project cost of Ya-3 is the most expensive. Does it mean the inundation area for this project is the biggest?	This cost is for the construction of measures. Therefore, it is not related to the scale of inundation area.
It seems the inundation area is small.	This is the result of analysis with the same method of five (5) river basins.
It is expected to confirm the damage cost with existing documents.	The social and economic team in our study team examines the damage cost in detail.

Figure 2.4 **Stakeholder Meeting (Yauca River Basin)**

2.5 Chira River Basin

Participants from Organizer:

DGIH: Sr. Gustavo Ocampo Ochoa

JICA STUDY TEAM: Mr. Yoshio Nakagawa, Mr. Hiroshi Shimoosako, Mr. Masafumi Ikeno

Table 2.9 **List of Participants (Chira River Basin)**

Name	Title
Junta de Usuarios de Distrito de Riego de Chira	
Sr. Zuriel Guardado Cruz	Presidente
Sr. Pedro Castillo Palacios	Vice - Presidente
Sr. Walter Pangalima Álvarez	Secretario
Sr. Victorino González Zegarra	Delegado
Vicente Socola Carrasco	Jefe de Operación y Mantenimiento
Municipalidad Provincial de Sullana	
Sr. Manuel Enrique Núñez Ato	Gerente de Defensa Civil
Municipalidad Distrital de La Huaca	
Sr. Manuel Palomino Palacios	Regidor
Municipalidad Distrital de Amotape	
Sr. Efraín Iván Vilela Mogollón	Regidor
Representantes de Usuarios de Riego	
Sr. Simón More Torres,	Comisión Margen Derecha
Sr. Valerio Vásquez Rosales	Comisión Canal Miguel Checa
Sr. Leonardo Ramos	Comisión El Arenal
Sr. Arturo Roa Olaya	Comisión Margen Izquierda
Sra. Basilia Castillo Carlín	Comisión Canal Miguel Checa
Sr. Porfirio Imán Prado	Comisión Margen Derecha
Sr. Ido Távara Núnjar	Comisión Canal Miguel Checa
Sr. Hugo Ávila Ruíz	Comunidad Campesina Tamarindo
Sr. Victorio Gonzales Zegarra	Comisión Canal Miguel Checa
Sr. Tomás Socola Benites	Comunidad Campesina Amotape
Sr. Alcedo Carreño Rosales	Comisión Canal Miguel Checa
Sr. Wilmer Cevallos Sanjinez	Comisión Canal Miguel Checa
Sr. Florentino Sandoval Chapoñán	Comisión Canal Migue Checa
Sr. Javier Flores Vílchez	Comisión El Arenal
Sr. Miguel Juárez Moran	Comisión Margen Derecha
Sr, Wilfredo Gutiérrez	Comisión Canal Miguel Checa
Otras Instituciones	
Sr. Jaime Zapata Gutiérrez	Proyecto Especial Chira Piura
Sr. Elser Rodríguez Espinola	Autoridad Administrativa del Agua – Jequetepeque – Zarumilla.
Sr. Carlos Enrique Gástelo Villanueva	Administrador Local de Agua Chira
Sr. Hugo Ruíz Soto	Dirección Regional de Defensa Civil Piura
Sr. Gerardo Cossío García	Dirección Regional Agricultura.

Table 2.10 **Remarked Results of Questions and Answers (Chira River Basin)**

Question	Answer
In addition to the proposed locations in the Study, the several critical points are identified.	We understand there are other critical points except for the proposed 28 locations. However, it is said that the budget is over even for these 28 locations. Moreover, in consideration with the inter-basin balance, the measures are proposed. It is necessary to examine the measures at the other locations in the further studies.
At the other location, the serious erosion is observed. Is it possible to add the location to be examined?	We will examine it, so the provision of information with drawings is highly appreciated.
	If the design discharge made to be large, the safety will be improved. On the other hand, the construction cost will also increase. The balance cost and safety is important.
	The measures against the over discharge exceeding the design discharge shall be conducted by non-structural measures such as education for disaster prevention. The safety scale (1/50) is planned to be secured in five (5) basins. The measure against extraordinary is under examination and will be stated in the report.
It is expected to include the projects which are already approved in SNIP procedure.	If the projects have passed the SNIP procedure, such projects can be implemented compared with our proposed projects. The commencement of our proposed projects is expected two to three years later.
The erosion of left bank of Chira4 is observed.	The fixed weir exists on the right bank, and due to the sedimentation, the water flow is going to the left bank. In case of big flood, there is possibility the gate of the weir is collapsed. Therefore, it is necessary to normalize the water flow spreading overall the weir and mitigate the concentration of water flow on the left bank by excavating the sedimentation on the right bank. Even though the dyke is constructed in the left bank, this new dyke will be broken by the flood. It is important to normalize the riverbed in the right bank.
The erosion on the right bank in upstream of Chira4 is observed. Is it possible to make the additional measures?	Since the interval between river bank and waterway is 500m, the priority is low. It is important to observe the erosion condition without the construction.
What is the mechanism the sedimentation at Sullana Weir?	It is considered the operational problem leads the sedimentation. It might be improved by the gate operation during the flood.
The erosion is observed at the right bank of Chira1. Is it possible to make the additional measures?	The study team did not conduct site reconnaissance. After the site reconnaissance, the possibility of additional measures will be examined. The provision of information such as drawings is highly

	appreciated.
Why the flood occurred even though the Poechos dam exists?	The dam has flood control function, but the flood control function will not effective when the dam is filled with the water. Moreover, the dam cannot contribute to the flood control in the basin where the water inflow at the downstream of the dam. If the flood control function of the dam is enhanced, the allocation of water utilization volume shall be reallocated to flood control.
Currently, it is identified that unregulated river sand mining is the serious problem.	Since our scope is for flood management, the examination of legal regulation on sand mining is out of our scope.
At Chira1, the excavation for gas field along the river is reaching to the river channel. Is it a problem?	It was confirmed by the Study Team. However, it is a matter between central and local governments.
The inhabitants are identified in the river.	It is a matter between central and local governments.
When will the construction work start?	It is assumed that construction will be started two to three years later after the approval of SNIP. It is estimated the total loan amount will be 70 to 80% of total project cost.

Figure 2.5 **Stakeholder Meeting (Chira River Basin)**

2.6 Camaná River Basin

Participants of Organizer

DGIH：Sr. Gustavo Vivanco Mackie

JICA STUDY TEAM：Mr. Yoshio Nakagawa, Mr. Hiroshi Shimoosako

Table 2.11 **List of Participants (Camaná River Basin)**

Name	Title
Sr. Carlos Yañez Febres	Alcalde del Distrito de Nicolás de Piérola
Sr. Arcadio Llerena	Comisión La Deheza
Sr. Celso Carpio	Comisión El Medio
Sr. Manuel Huayta	Tesorero Comisión La Deheza
Sr. Guido Andia Cáceres	Comisión Socso Sillan
Sra. Maggi Morales Montoya	Comisión de Arroz
Sra. Carmen Lira de Carnero	Secretaria Comisión de Arroz
Sr. Andrés Ancasi	Presidente Comisión Sonay
Sr. Edwin Farfán G.	Representante del Consejo Regional
Sr. Rafael Díaz	Reporter Estación de Radio La Exitosa
Sr. Rolando Uyen	Director Agencia Agraria MINAG
Sr. Walter Céspedes	Presidente Asc. Extractores Procesadores Productos Mediobiológicos Quilca
Sr. Américo Flores	Presidente Comisión Characato
Sr. Henry Alarcón	Tesorero Comisión El Medio
Sra. Lucio Hau Mendoza	B-35 bomberos
Sr. Augusto Aybar Rodríguez	Gerente Técnico Defensa Civil de Distrito Nicolás de Pierola
Srta. Carla Castilla Mamani	ONG. Labor
Sr. Alonso Ortiz	Abogado - ONG. Labor
Srta. Gabriela Herrera	Bióloga - ONG. Labor
Sr. Pablo	Tesorero Comisión Cusco
Sra. Juana Torres	Presidente Comisión Huacapuy
Sr. H. Jesús Vargas Aybar	Jefe del Departamento de Producción de la Provincia de Camaná
Sr. Nurmy Monrroy	Comisión Huacapuy
Sr. Miguelino Sona	Comisión Huacapuy
Sr. Emilio Tito M.	Segundo Delegado Comisión Pucchun
Sr. Guillermo Yana Huamani	Gerente Técnico Defensa Civil de Distrito Mariscal Cáceres
Sr. Juan Alexis Luque Uchuchoque	Promotor de Predes

Table 2.12 **Main Points of Questions and Answers (Camaná River Basin)**

Question	Answer
(Staff of Fire Department of Camaná Province) In case of a collapse of the Condoroma dam in the upstream of the river basin, are measures against the flood also assumed?	The unusual flood is not considered for the target. The usual flood with design flood 1/50 is aimed at in our study.
(Secretary of an irrigation association) I heard and expected to be measures against floods at the time of the seminar held on October,2011. However, I am now disappointed. No measures is taken into consideration in the vicinity of 16-60km from the mouth of the river. However, there is inundation at the 30km mark of the Camaná River every year. And farmers have been repairing the bank by themselves. S/.50 million is expensive for the embankment work only. And this is the amount which the Peru people have to repay.	When banks are made to all rivers, B/C ratio becomes 1.0 or less, it is evaluated that there is no economic value, and project implementation cannot be performed. Therefore, only the measures at high effective places are coped with as important facilities. Even if it is embankment, in order to construct the strong dike which is not washed away by a flood, the project cost like this will be required.
Are there possible measures other than the measures proposed now?	(DGIH reply) The contribution from users goes into the present government project. S/.210 million is initial budgets to the last, and may be expanded in the FS phase. The rate of contribution is known in the FS phase. For the moment, the budget of MEF cannot change. As a solution of MEF, this project shall be the first phase, and It is possible to cope the second phase and the third phase gradually. This is the project which put in not only the Camaná - Majes River basins but six river basins across the country. Yauca and Kumbasa River were also excluded according to B/C ratio.
(ALA persons concerned) The river boundary line was not decided in the Camaná - Majes River basins. Now, in the Ministry regulation (around 2002 to 2003), 10m area from the outer wall of dike in the Camaná River and 25m area from the outer wall of dike in the Majes River are decided to be the inviolability zone. However, it is not obeyed in fact. There are also lands entered in land ownership acquisition campaign. Although abandonment of vested rights cannot be performed, there is also the method of prohibiting use of the places.	(Question asked from the Study Team) Aren't there any data of land ownership boundary?
I want you to make the survey data prepared by the Study Team use for river boundary settlement.	Since data are submitted to DGIH, it is possible for you to receive them from DGIH.
I think that S/.50 million is high to embankment revetment. What kind of stones for revetment do you use? Are stones only placed for the revetment?	The measures of revetment are performed combining big stones.
There is a temporary intake weir. Can't those improvements be performed?	(DGIH reply) Ministry of Agriculture has made the agreement with the Arequipa Regional government. It is possible to decide upon a project based on it. The same case is working in the Junin Region in the central Andes. Although the reduced budget ordinance had come out, it was terminated. And so, MOA can also perform such a survey work.

	Even if not direct request from an irrigation association, it is possible to request to MOA through the Regional Government or the Assembly member of district election pass.
(NGO persons concerned) It is called water shortage by the climate change. The water volume for each return period is predicted. Is there difference between the change affected by climate change in this river basin and other basins? How does it reflect to the measures?	Discharge analysis and flood analysis are conducted by the same approaches at all river basins. The analytic model for the climate change is not generally established. Since freeboard is made for in bank height, I think that the increase of discharge by climate change can be coped with in the freeboards.
(The Arequipa Regional Government persons concerned) The budget which the Regional Government applies to embankment work is S/.1000 per unit, and the foot protection work of the dike is also performing exactly. Why has this embankment work taken more than twice as for the Regional Government's budget?	Is the standard section the same? Do not the thickness and the slope of the wall of embankment differ from the Regional Government standard? The existing bank has erosion and decay at every flood. We have proposed the strong dike which does not break even if flood occurs. Therefore, the cost is different.
(The Arequipa Regional Government persons concerned) Many banks have received erosion in the foot portion by old rising of water. Then, since the design of dike of 17.25m for bases, 4m for crests, and 3-4 m for foot protection is constructed, you should also hear the opinion from the Regional Government's engineer. I want you also to take the size of stones into consideration.	The shape of dike is considered to change according to whether the flow velocity is fast or slow at the sections in the river. It shall take into consideration at the time of detailed design.
(Irrigation association persons concerned) The riverbed of the Camaná River becomes high in 1.0-1.5 m every year caused by stones and muds which flow from the upper stream. Isn't riverbed excavation or control of riverbed fluctuation contained in this study?	By the river, riverbed excavation is added as proposed measures. According to calculation of riverbed fluctuation during 50 years from now on, there are some places which riverbed go up or fall down. It is presumed that the amount of riverbed fluctuation of the Camaná River rises by an average of 20cm on the whole. Riverbed excavation is responsible for O&M.
It is said that the riverbed excavation is necessary to carry out just in annual O&M. Does that budget come out from this project or irrigation associations' budgets? Although it is said that the survey of 500m pitch was performed, isn't the 500m pitch too large space?	Riverbed excavation does not go into the measures against the Camaná - Majes River basins. The project contains 6 river basins. Since there is also a limitation in the budget, the whole river was surveyed by 500m pitch. Target sites proposed for measures were surveyed by 100m pitch. The survey budget for six river basins had required 500,000 dollars (50 million yen).

Figure 2.6 **Stakeholder Meeting (Camaná River Basin)**

2.7 Majes River Basin

Participants of Organizer

DGIH：Sr. Gustavo Vivanco Mackie
JICA STUDY TEAM：Mr. Yoshio Nakagawa, Mr. Hiroshi Shimoosako

Table 2.13 **List of Participants (Majes River Basin)**

Name	Title
Ing. Ramiro Pastor Baldárrago	Director Agencia Agraria Castilla
Sr. Asunto Huamani Ordóñez	Comisión Huancarqui
Sr. Ramiro Fritz Válcarcel Talavera	Presidente Comisión Querulpa
Sr. Carlos Palma Rodríguez	Comisión Huancarqui
Sra. Rosa Díaz Valladares	Comisión El Monte Los Puros
Sra. Flor López Arias	Comisión Huancarqui
Sr. Juan Del Carpio Del Carpio	Vicepresidente Comisión Ongoro
Sr. Manuel Echevarria Vargas	Presidente Comisión Uraca
Sr. Augusto Salinas Medina	Comisión Aplao
Sr. Euler Quispe Soriano	Supervisor de Gestión de la Construcción de Agencia Agraria
Sr. Víctor Del Carpio Ludeña	Comisión La Real
Sra. Juana Heredia Llerena	Presidente Comisión Cantas Pedregal
Sr. Obdulio Andia Ibárcena	Comisión Cantas Pedregal
Sr. Jorge Herrera Del Carpio	Presidente Comisión El Monte Los Puros
Sr. Enrique Llerena Salinas	Comisión Sogiata
Sra. Anyela Zúñiga Yañez	Secritaria Junta de Usuarios de Majes
Sra. Carmen Aragón	Comisión Aplao
Sr. Adalberto Tovar Acosta	Presidente Comisión Aplao
Sr. Tito Estremadoyro Martínez	Presidente Comisión Beringa
Sr. Elard Alvarez Yagua	Presidente Comisión San Vicente
Sr. Berly Cruz Neyra	Comisión Querulpa
Sr. Mariano Zamata Huamani	Comisión Uraca
Sr. Demetrio Lazo Acosta	Comisión La Real
Sra. Benedicta Montes	Comisión El Monte
Sr. Miguel Llerena Quijandría	Presidente Comisión Pitis
Sra. Rosa Ochoa	Comisión Uraca
Sr. Rolando Arenas	Gerente de Autodema

Table 2.14 **Main Points of Questions and Answers (Majes River Basin)**

Question	Answer
There are some places where the existing groins have broken also other than banks. Are those repairs included in this project?	In this plan, embankment revetment is scheduled to be carried out. Groin does not contain.
Four important places are chosen. Are not the measures against other sections carried out?	In this project, it is not scheduled to carry out other than four important sections.
The Andamayo River flows together, and becomes the Majes River. The river extension is about 78km. Why wasn't the Majes River seen from the upper stream? What kind of criteria did you apply to choose the critical points?	The places were chosen based on 1) Local request, 2) Flood analysis, 3) Discharge capacity and 4) Economical efficiency. (President of irrigation association) The irrigation association called to the member, and held the meeting, and guided the Study Team. We went round from the confluence in the Andamayo River to the vicinity of boundary with the Camaná River from early morning till afternoon without lunch.
Did you choose the measures according to the budget currently assigned to each river basin?	B/C ratio of the oveall flood control plan is evaluated as 0.39. NPV is also greatly negative. Construction of dikes to all the rivers is not realized as the project. Sections which effectiveness is likely to go up were selected and the construction plan was designed. As the result, in the present measures, B/C ratio is calculated as 1.35, NPV becomes plus, and IRR reaches also 16%. If the project budgets are raised more, economical efficiency falls and this river basin may be excluded from the project. In addition, the expenses of the measures against the Majes - Camaná River basins have accounted for 40% of the overall project cost.
The height of the bank is 2m. Isn't it too low? On this river, 2 m3/s of discharge flowed and the bank height has usually set as 3m.	It is the height of preliminary level to the last. The height of the every section shall be changed based on the survey. The project cost is calculated based on detailed data. Survey with 100m interval shall be carried out in the planed area.
How much is the river width of the sites which constructs dikes on both sides?	River width has a difference by a site. Now, we cannot answer the exact river width here. However, the river width (channel cross section) is secured so that the design flood discharge can flow.
Although it has come out from the target in this time, there are places which overflowed in the past. Will this project continue from now on? Is this grant-aid-project?	It is dependent on the view of the Peru Government. The Study Team has decided upon the flood measures plan of the whole river. (DGIH reply) Although it is best to limit to one river basin, and to conduct river improvement of the selected river basin consistently, there are conditions of MEF. It is in a Pre-FS phase now, and will go into loan negotiations with Japan in FS phase. This is not the last budget. We will be able to understand whether there will be any increase of the loan from now on according to MEF. This is a loan and must be repaid in the future. In the example of other places, the Central Government, the Regional Government, the Provincial Government and the beneficiaries also

	pay their shares assigned to O&M, etc.
Is the foot protection taken into consideration in the dike? How much is the width of the dike?	We designed for foot protection about the depth of 1.7m. Width changes depend on the height. As 4m of crest width, the foot width is understood if height is decided.
Do you place concrete for revetment or place stones? The vicinity of APLA0 has already eroded because of fast flow velocity.	The revetment is constructed combining big stones with diameter about 80cm-1m. The size of stones is decided due to the flow velocity. Bigger stones are used at places where the flow velocity is high.

Figure 2.7 **Stakeholder Meeting (Majes River Basin)**

Ministry of Agriculture
Republic of Peru

THE PREPARATORY STUDY
ON
PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU

FINAL REPORT
I-6 SUPPORTING REPORT
ANNEX-14 IMPLEMENTATION PROGRAM OF LOAN PROJECT (TEMPORARY VERSION)

March 2013

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

YACHIYO ENGINEERING CO., LTD.
NIPPON KOEI CO., LTD.
NIPPON KOEI LATIN AMERICA –
CARIBBEAN Co., LTD.

ABBREVIATION

Abbreviation	Official Form or Meaning
ANA	Autoridad Nacional del Agua/National Water Authority
ALA	Autoridad Local del Agua/Local Water Authority
B/C	Costo Benefit Ratio/Benefit Cost Ratio
GDP	Gross Domestic Product/Gross Domestic Product
GIS	Geographic Information System/Geographic Information System
DGAA	Dirección General de Asuntos Ambientales/General Directorate of Environmental Affairs
DGFFS	Dirección General de Forestal y de Fauna Silvestre/Directorate General of Forest and Wildlife
DGIH	Dirección General de Infraestructura Hidráulica/Directorate General for Water Infrastructure
DGPI (Paleo-DGPM)	Dirección General de Política de Inversiones/Directorate General of Investment Policy
DNEP	Dirección Nacional de Endeudamiento Público/National Directorate of Public Debt
DRA	Dirección Regional de Aguricultura/Regional Directorate Aguriculture
EIA	Evaluación de Impacto Ambiental/Environmental Impact Assessment
FAO	Agricultura y la Alimentación Organización de las Naciones Unidas/ Food and Agriculture Organization of the United Nations
F/S	Estudio de Factibilidad/ Feasibility Study
GORE	Gobierno Regional/Regional Government
HEC-HMS	Centros de Ingeniería Hidrológica Sistema de Modelación Hidrológica Método /Hydrologic Engineering Centers Hydrologic Modeling System Method
HEC-RAS	Centros de Ingeniería Hidrológica del Río de Análisis del Sistema Método /Hydrologic Engineering Centers River Analysis System Method
IGN	Instituto Geográfico Nacional/National Geographic Institute
IGV	Impuesto General a Ventas/General Sales Tax
INDECI	Instituto Nacional de Defensa Civil/National Institute of Civil Defense
INEI	Instituto Nacional de Estadística/National Institute of Statistics
INGEMMET	Instituto Nacional Geológico Minero Metalúrgico/National Geological and Mining Metallurgical Institute
INRENA	Instituto Nacional de Recursos Naturales/Natural Resources Institute
IRR	Tasa Interna de Retorno (TIR)/Internal Rate of Return
JICA	Japonés de Cooperación Internacional /Japan International Cooperation Agency
JNUDRP	Junta Nacional de Usuarios de Distritos del Perú/National Board of Peru Districts Users

L/A	Convenio de Préstamo/Loan Agreement
MEF	Ministerio de Economía y Finanzas/Ministry of Economy and Finance
MINAG	Ministerio de Agricultura/Ministry of Agriculture
M/M	Acta de la reunion/Minutes of Meeting
NPV	Valor Actual Neto (VAN)/NET PRESENT VALUE
O&M	Operación y Mantenimiento /Operation and maintenance
OGA	Oficina General de Administración/General Office of Administration
ONERRN	Oficina Nacional de Evaluación de Recursos Naturales/National Bureau of Natural Resource Evaluation
OPI (OPP)	Oficina de Programación e Inversiones/Programming and Investment Office (Oficina de Planificación e Prespuesto/Office of Planning and Budget)
PBI	Producto Bruto Interno/Gross Domestic Product
PE	Exp. Proyecto Especial (PE) Chira-Piura/ Exp. Special Project Chira-Piura
PES	Pago por Servicos Ambientales (PSA)/Payment for Environmental Services
PERFIL	PERFIL/PROFILE (Preparatory survey of project before investment)
Pre F/S	Estudio de Prefactibilidad /Pre-Feasibility Study
PERPEC	Programa de Encauzamiento de Ríos y protección de Estructura de Captación
PRONAMACHIS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos/National Program of River Basin and Soil Conservation Management
PSI	Programa de Sub Sectorial de Irrigaciones/Program of Sub Irrigation Sector
SCF	Factor de conversión estándar/Standard conversion factor
SENAMHI	Servicio Nacional de Meteorología y Hidrología/ National Service of Meteorology and Hydrology
SNIP	Sistema Nacional de Inversión Pública/National Public Investment System
UF	Unidad formuladora/Formulator unit
VALLE	Valle/Valley
VAT	Impuesto al valor agregado/Value-added tax

THE PREPARATORY STUDY ON PROJECT OF THE PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOOD IN THE REPUBLIC OF PERU

FEASIBILITY STUDY REPORT

SUPPORTING REPORT

Annex-14
Implementation Program of LOAN Project
(Temporary Version)

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CHAPTER 1 INTRODUCTION

1.1 Background of Project

Peru is country where a natural disaster risk is high, such as an earthquake and tsunami, its flood disaster risk is high, and the year to which El Nino generated especially the cycle of several years happens is said for the flood and earth-and-sand disaster by a heavy rain to occur frequently in various places. Although El Nino has received serious damage also in recent years in 1982 to 1983, and 1997 to 1998, It is the rainy season from 1997 to 1998 when El Nino occurred that whose damage was especially the most serious, and it suffered the damage of no less than 3,500 million US dollars from a flood, excess sediment disaster, etc. in the whole country. It is fresh in memory that the disaster which near world heritage MACHU PICCHU was hit by local severe rain, and the railroad and the road were cut off as the latest flood disaster at the end of January, 2010, and was isolated in about 2000 people (tourists) occurred.

The central government carried out "1st and 2nd terms urgent measure plan against [El Nino]" for the basis of such a background, and 1997 to 1998 years. This plan is a thing for restoration of the water supply infrastructure which suffered the damage of El Nino, and Ministry of Agriculture was having jurisdiction plan. Moreover, Ministry of Agriculture (MINAG) Dirección General de Infraestructura Hidráulica (DGIH), In order to protect a colony, farmland, a farmstead, etc. which exist in a flood risk area from the damage of a flood flood, river channel improvement and water intake structure protection program (PERPEC) were established in 1999, and financial support for the riverbank protection maintenance to a state government has been carried out. In the many-years plan of PERPEC by 2007 - 2009, enforcement of the riverbank protection of 206 locations was proposed in the whole country. Although those projects are planned by the 50-years probability discharge, since they are enterprises with a local small-scale riverbank protection etc. and do not serve as radical and integrative river improvement maintenance, it has been a subject that damage occurs at a place which is different in the scale of a flood.

Then, Ministry of Agriculture planned the "The Project of the Protection of Flood Plain and Vulnerable Rural Population against Floods in the Republic of Peru " aiming at the measure against a flood for 5 state 9 valley, and determined to undertake an enterprise as a yen loan enterprise based on the result of the investigation before investment by JICA of 2010-2011.

1.2 Projects' Objective

1.2.1 Higher Rank Target

The purpose of a project is to promote and contribute the development of social economy to the flood of a ravine area (Valles) and a local resident.

1.2.2 Purpose of Project

This project is constituted by the following component and the purpose of a project is attained by carrying each out.

- Structural Measures
- Non-Structural Measures
- Technical Assistance (Disaster Prevention Education and Capacity Development）
- Consulting Services

(1) Structural Measures

According to "The flood in farmland or a city area and the guideline of the prevention project from a flood" (Guia-Metodologica-paraProyectos de) of public sector many-years degree Planning Bureau (DGPM) establishment of the economic Ministry of Finance (MEF) (Guia Metodologica para Proyectos de Proteccion y/o Control de Inundaciones en Áreas Agricolas o Urbanas）, Since the research zone of this project belongs to a district part and farmland, the choice of the occurrence probability of the flood for a plan becomes ten years, 25 years, and 50 years, but It is considered as the maximum probability 50-year flood of a guideline, and suppose that safety is ensured in consideration of a bank, clearance height of bank protection, or structure also to the flux at the time of El Nino generating etc.

The purpose and type of structure is classified as follows.

Purpose	Type of Structure
Flood Prevention	Dike, Riverbank protection, Riverbed Excavation, Rivercourse normalization
Rehabilitation of Exisitng Water Intake Structures	Dike, Riverbank Protectio, Rehabilitation of exisitng weir
Protection of Exisitng Irringation Channel	Dike, Groyne
Protection of Public Road and River Cloosing Bridge	Dike, Groyne

(2) Non-Structural Measures

As a Non-Structural measures, afforestation / vegetation recovery is carried out, the afforestation plan in an object valley needs the period of 14 years - 98 years, and a cost of construction also selects the following the afforestation / measures against vegetation recovery that are shown from this thing in this project, and it carries it out.

i) Afforestation Plan Along Propose River Structure

When a design water level is exceeded and a river structure is overtopped with the unexpected amount of river discharge and obstacle, the influence is able to reduce with the afforestation belt.

(3) Technical Assistance (disaster prevention education / capacity development)

The purpose of technical assistance is to aim at improvement in the suitable capability by local residents, and technology as a measure against crisis management for mitigation of the flood damage in the region, and carries out technical support which complements these measures based on the technical assistance which was mentioned above and which relates to the non-structural measures. It is aimed at 4 ravine valley of Canete, Chincha, Pisco, and Majes-Camana river which is target valley. Individual enforcement is carried out for every valley in order to aim at realization of the training based on the characteristic of each valley.

(4) Consulting Services

In order to carry out technical assistance for the detail design of the planned structures of each valley, and bid assistance for selection of eligible constructor, construction supervision during each component period, and technical assistance, an enforcement organization projects by supplying a consultants.

1.3 Project Location

Making the region for a project into four valleys of Canete, Chincha, Pisco, and Majes-Camana river, the location is shown in ***Figure 1.1***.

(1) Canete River Valley

The Canete river is located about 130km to the south of Lima which is a capital, and it is a river nearest to Lima in object 5 river. Catchment area of the river basin is about 6,100km2.

(2) Chincha River Valley

The Chincha river is located about 170km to the south of capital Lima, and adjoins the valley of the Canete river and the Pisco river which are other object rivers. Catchment area of the river basin is smallest among the target basins, about 3,300km2.

(3) Pisco River Valley

The Pisco river is located about 200km to the south of capital Lima, and adjoins the Chincha river valley on the north side. Catchment area of the river basin is about 4300km2.

(4) Majes-Camana River Valley

Majes-Camana river is located about 700km to the south of capital Lima. It is a south direction most among target rivers, and belongs to the State of Arequipa. Catchment area of the river basin is about 17,000km2.

Figure 1.1 **Location of Target River Basin (Project)**

CHAPTER 2 PROJECT JUSTIFICATION

2.1 Past Flooding Records

(1) Scale of Past Flooding Disasters

The situation of the flood damage of the whole country for five years in 2003 -2007 is recorded as shown in ***Table 2.1***.

Table 2.1 **Flood Damage Situation**

	2003	2004	2005	2006	2007	Total
Flood damage situation (times)	470	234	134	348	272	1,458
Disaster victim (person)	118,433	53,370	21,473	115,648	64,535	373,459
House loss person (person)	29,433	8,041	2,448	6,328	4,517	50,767
Death (Person)	24	7	2	9	4	46
The number of disaster houses (house)	17,928	8,847	2,572	12,501	8,308	50,156
The number of collapsed houses (house)	3,757	1,560	471	1,315	848	7,951

Data Source：Compedio estadisticos de SINADECI

The damage in the heavy rain by El Nino of 1982-1983 whose damage was recent years the most serious, and 1997-1998 is shown in ***Table 2.2***. As for about 6,000,000 persons and the amount of damage, in 1982-1983, the number of disaster victims of about 502,461 persons and the amount of damage reached US$1,800,000,000 US$1,000,000,000 and 1997-1998. In addition, owing to the damage of 1982-1983, GNP was damage to the extent that it is downed 12%.

Table 2.2 **Damage Situation by El Nino**

Damaged Situation	1982-1983 Year	1997-1998 Year
House loss person (person)	1,267,720	Unknown
Disaster victims (person)	6,000,000	502,461
injuries (person)	Unknown	1,040
Dead (person)	512	366
Missing (person)	Unknown	163
The number of disaster houses	Unknown	93,691
The number of collapsed houses	209,000	47,409
Dameged School education institution	Unknown	740
Collapsed School education institution	Unknown	216
Dameged Hospital Clinic	Unknown	511
Collapsed Hospital Clinic	Unknown	69
Disaster farmland (ha)	635,448	131,000
Number of disaster livestock	2,600,000	10,540
Bridge	Unknown	344
Road (km)	Unknown	944
Amount of damage ($)	1,000,000,000	1,800,000,000

(2) The number of Disaster in Each River Basin

The past number of disaster is summarized by Office for National Statistics. The number of disaster generating of the national level were summarized to ***Table 2.3***. Disaster in the national level is classified by a mudslide, alluvium, collapse, a landslide, and flash flood.

There is much flood generating by flash flood in the target river basins, but landslide disaster having occurred mostly in the national level. ***Figure 2.1*** shows such dasater occurrence rate.

Table 2.3 **The Past Number of Disaster Occurrence**

Natinal level

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Mean
ALUD (Mudslide)	2		1	2	1				3	1		1			1	3	15	
ALUVION (Alluvium)	3	2	1	8	3	1		1	2	6	15	4	2	5	5	12	70	
DERRUMBE (Collapse)					1	1	2	3	53	18	61	160	67	68	99	85	618	
DESLIZAMIENTO (Landslide)	9	19	18	38	27	74	75	32	138	100	99	158	126	128	116	99	1256	
HUAYCO (Flushflood)	37	17	54	134	57	55	39	28	69	50	48	73	53	50	64	59	887	
Sum of Sediment Disater Number	51	38	74	182	89	131	116	64	265	175	223	396	248	251	285	258	2846	178
Sum of Flood Occurrence Number	30	53	224	358	292	208	239	136	470	234	134	348	272	242	219	229	3688	231

Lima State

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Mean
ALUD (Mudslide)																	0	
ALUVION (Alluvium)																	0	
DERRUMBE (Collapse)									14	4	17	32	15	22	10	23	137	
DESLIZAMIENTO (Landslide)	1	3	1	4	2	1	3	4	5	4	2	1	5	5	2	7	50	
HUAYCO (Flushflood)	6		2	17	17	4	2	11	8	4	0	7		3	3	3	87	
Sum of Sediment Disater Number	7	3	3	21	19	5	5	15	27	12	19	40	20	30	15	33	274	17
Sum of Flood Occurrence Number	2	2	1	23	21	9	15	5	13	11	7	10	11	4	4	0	138	9

Ica State

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Mean
ALUD (Mudslide)																	0	
ALUVION (Alluvium)																	0	
DERRUMBE (Collapse)											2						2	
DESLIZAMIENTO (Landslide)									2	1				1			4	
HUAYCO (Flushflood)	2		2		5	2				2	1	1	3	1		1	20	
Sum of Sediment Disater Number	2	0	2	0	5	2	0	0	2	3	3	1	3	2	0	1	26	2
Sum of Flood Occurrence Number	4	4	0	13	14	1	2	0	0	1	1	0	4	6	1	0	51	3

Arequipa State

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Mean
ALUD (Mudslide)																1	1	
ALUVION (Alluvium)											5						5	
DERRUMBE (Collapse)						1	1	1								1	4	
DESLIZAMIENTO (Landslide)		1		1	1	2	1	1	4	3	4	2			1	2	23	
HUAYCO (Flushflood)	6	1	7	14	3	2	4				2	2	1		9	3	54	
Sum of Sediment Disater Number	6	2	7	15	4	5	6	2	4	3	11	4	1	0	10	7	87	5
Sum of Flood Occurrence Number	3	1	42	6	44	2	15	3	1	2	2	3	0	1	3	3	131	8

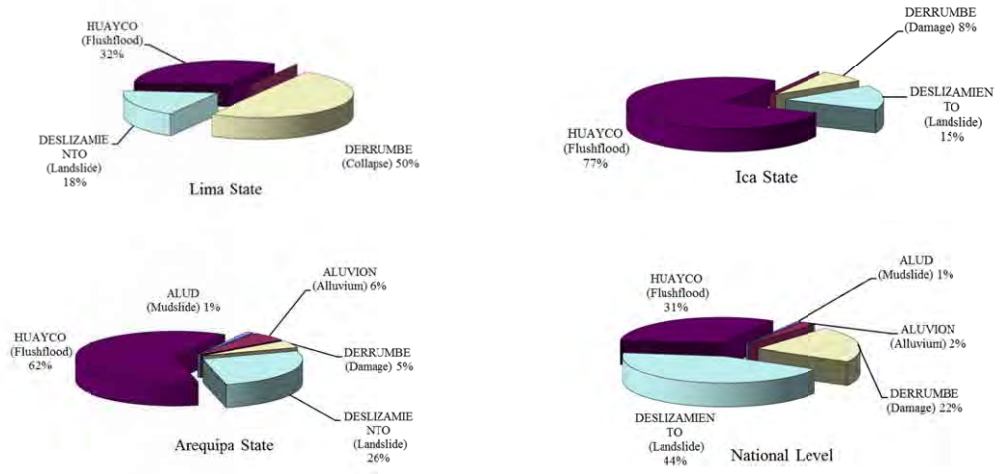


Figure 2.1 **Rate Occurrence of Disaster in National Level and Target River Basis**

(1995－2010 Year：16 years)

2.2 Problem in Measure Against Flood in Present Condition

The problem on the measure against a flood in four (4) rivers of the project area and the candidate for preservation relevant to these are as shown in ***Table 2.4***.

Table 2.4 **Measure Against a Flood and Preservation**

Problems		Inundation			Erosion of Dike	Lateral Erosion	No function of intake facility	No Function of Diversion Intake
		No-Dike	Riverbed Sediment	River width contraction				
Preservation	Farm land	○	○	○	○	○	○	○
	Irrigation Channel					○	○	
	Residence Area	○		○				○
	Road					○		
	Road Bridge		○					

(1) Damage Predicted by Direct / Indirect Cause

The main problems on the measure against a flood in the project area are in the high brittleness over the flood of a ravine area and a local resident, the direct cause and the indirect cause were shown in ***Table 2.5***, and the damage predicted by these causes was shown in ***Table 2.6***. The final result depended on main problems is prevention of the socioeconomic development of the area influenced by follows.

Table 2.5 **The Direct Cause and Indirect Cause of Main Problems**

Direct Couse	1.Excessive Flood Discharge	2. Inundation	3. Insufficient in Control of Maintenance of Flood Measure	4. Prevention of Floods Activity of the Area is Insufficient
Indirect cause	1.1 Frequent Occurrence of Abnormal Weather, Such as El Nino	2.1 Flood measure institutions are un-fixing	3.1 The knowledge capability of control of maintenance is insufficient.	4.1 Shortage of the knowledge capability of prevention-of-floods activities
	1.2 Anomalous rainfall of the upper and a middle stretch	2.2 Lack of financial of facility maintenance	3.2 The shortage of training of control of maintenance	4.2 Shortage of training of prevention-of-floods activities
	1.3 There is almost no vegetation of the upper and a middle class region	2.3 The river improvement plan of valleys is insufficient.	3.3 Maintenance repair of banks or a riverbank is insufficient.	4.3 Lack of a flood warning system
	1.4 The sediment discharge from the upper and a middle class region is large.	2.4 Insufficient in maintenance of banks	3 3.4 Maintenance repair of diversion weirs is insufficient.	4.4 Shortage of observation and collection of hydrological data
	1.5 Reduction of the flow capability by riverbed slope change	2.5 Shortage of river-channel width	3.5 Formation of illegal farmland of riverbed	
		2.6 Earth-and-sand deposition of stream beds	3.6 Shortage of administrative and maintenance expenses	
		2.7 River width in bridge section is narrow		
		2.8 The rise of the riverbed in bridge parts		
		2.9 Erosion of Dike or a riverbank		
		2.10 Lack of ability of facility designs		

Table 2.6 **Damage Predicted**

Direct Effect	1. Agricultural-related Damage	2. Residents' Direct Damage	3. Damage of Social Infrastructure	4. Other Damages over Economy
Indirect Effect	1.1 Damage of Agricultural Products and Livestock	2.1 Damage of House and Private Property	3.1 Destruction of Road	4.1 Interception of Traffic
	1.2 Flooding of Farmland	2.2 Damage of Place of Business and Inventory Property	3.2 Washout of Bridge	4.2 Cost of Prevention-of-Floods Activity and Refuge
	1.3 Destruction of Irrigation channel/canal	2.3 Loss of Accident and Human Life	3.3 Water Service, Electric Power, Gas, Communicative Damage	4.3 Restoration and Emergency-Measures Cost
	1.4 Destruction of intake and Diversion Weir	2.4 Operating Loss		4.4 Local Resident's Job Losses
	1.5 Erosion of Dike and Riverbank			4.5 Reduction of Local Resident's Income
				4.6 Decrease of Life Quality
				4.7 Decrease of Economic Activity

2.3 Present Condition of Project Area

The river basin for a project formes the Andean Cordilleras a head, erodes deeply the mountain range covered by volcano lava, and valley with a width of 100m-500m which formed of sediment sandand gravel, and rivers flows into the Pacific Ocean through the alluval plain. Riverbed slopes are about 1 / 100 to 1/300, and a steep slope in 1 / 30 - 1/100, and a fan in a ravine part. Along a river, agriculture is performed in almost all zones. Moreover, by a river channel sedimetation conveyance from the Andean Cordilleras, the complex sandbar is formed, and a channel is not fixed, but the stream bed is assuming the very unstable aspect. The river of Peru country has caused serious damage the flood of unusual and periodic seasonality (December - March) under the influence of the diversity of a climate condition, the irregular nature of a river flow rate, a steep riverbed slope, El Nino, etc.

The feature of each valley is as being shown in ***Table 2.7***. Moreover, the outline of each river is as being shown below.

Table 2.7 **Feature of River in the Project**

State	River	Catchment Area (km^2)	River Stretch Length of Project area (km)	Mean Riverbed slope	Mean River Discharge (m^3/s)	Specific Discharge ($m^3/s/km^2$)
Lima	Canete	6,066	33	1/90	63.0	0.0103
Ica	Chincha	3,304	50	1/80	-	-
	Pisco	4,272	45	1/90	23.5	0.0055
Arequipa	Majes-Camana	17,049	115	1/125	-	-
Total		30,691	243	-	-	-

2.3.1 Canete River Basin

(1) Natural Conditions

When its attention is paid to the form of a valley, the width of a downstream reach is thin and the rate that a middle reach and an upper reach occupy is large. Therefore, the area exceeding the altitude of 4,000m forms about 50% of the whole stretch of river, and area with an altitude of 1,000m or less has become about 10%. In the downstream reach which is the project area, the river slope of 1/90 and river width is about an average of 200 m in general. The annual precipitation of the Canete river basin changes greatly with altitude. For example, although there is annual rainfall with 1,000 mm by the altitude of 4,000m or more, if it becomes the altitude of 500 m or less, it is very small in every year and 20 mm or less, and has become a climate condition which is easy to desertify. However, the catchment area is comparatively large and flux is comparatively abundant.

Most middle and upper reachs of vegetation of a valley are prairies. On the other hand, although the circumference of a river of a downstream reach is farmland, the rate that on the whole a desert

occupies is large. Farmland is prosperous in cultivation of a grape or an apple. In addition, the sightseeing activity such as rafting, a canoe, etc., also develop prawn-fishing.

(2) Social Conditions

1) Administrative District

A part for an administrative district around the Canete river valley consists of State Canete and Lima in five (5) cities/town as it is shown in ***Table 2.8***.

Table 2.8 **Administrative District in the Canete River Basin**

State	City	Region	Area (km2)
Lima	Cañete	San Vicente de Cañete	513.15
		Cerro Azul	105.17
		Nuevo Imperial	329.3
		San Luis	38.53
		Lunahuaná	500.33

2) Population and Poverty Distribution

As for the population in 2007, by 120,663 persons, 85% of them of 102,642 persons reside in urban areas, and 15% of 18,021 persons reside in a district part. Population is increasing the every place region. However, in urban areas, while population is increasing for 2.7% of the average year exceeding an average of a country, as for a district part, -0.1% and population are decreasing.

41,840 persons who hit to 34.7% of all the local residents are the poor and needy, and 3,793 persons of the rate of poverty who hit to 3.1% are the poor and needy of a degree very much.

Especially as for the Nuevo Imperial area, the rate of poverty is high rather than the area of 4.6% and others. The rate of poverty is shown in ***Table 2.9***.

Table 2.9 **Rate of poverty of the Canete River Basin (2007 Year)**

Description	Canete Region	
	Whole	%
Population	120,663	100
Poor	41,840	34.7
Very Poor	3,793	3.1

3) Labor Occupation

The pursuer of primary industry has 27.9 to 56.5%, and a ratio with a high every place region.

2.3.2 Chicha River Basin

(1) Natural Condition

The form of a river basin has the wide width of a middle class basin, and width is narrow in the

upper and lower sides. Therefore, the area exceeding the altitude of 4,000m is about 15% of the whole. In the downstream reach, the river has branched from the mouth of a river to two forks by diversion weir in the about 25km upper stream, and these are called Rio Chico and a Matahente river from the north side. In general, a river slope is 1/80 and river width is about 100-200m. Annual rainfall is similar with the Canete river, and it is very small in every year and 20mm or less by the altitude of 3,000m or more in 1,000mm and the area not more than altitude 500m.

As for vegetation, the upper half of the valley is occupied by Puna grass and shrubberies, and about 80 percent is a desert and twenty percent of a lower half is farmland. Farmland is prosperous in cultivation of a cotton and a grape.

(2) Social Conditions

1) Administrative District

A part for an administrative district around the Chincha river basin consists of Ica state Chincha Region in five (5) cities/towns as it is shown in ***Table 2.10***.

Table 2.10 **Administrative District in the Chincha River Basin**

State	City	Region	Area (km2)
Ica	Chincha	Chincha Alta	238.34
		Alto Laren	298.83
		Chincha Baja	72.52
		El Carmen	790.82
		Tambo de Mora	22.00

2) Population and Poverty Distribution

As for the population in 2007, by 94,439 persons, 82% of them of 77,695 persons reside in urban areas, and 18% of 16,744 persons reside in a district part. However, in Chincha Baja and El Carmen, the ratio of 58%, 57%, and a district part of the rate of the district part is high. In addition, population is increasing the every place region. 14,721 persons who hit to 15.6% of all the local residents are the poor degree, and 312 persons of the rate of poverty who hit to 0.3% are the very poor degree. As for Chincha Baja, the rate of the rate of poverty is low rather than the area of 0.2% and others. The rate of poverty is shown in ***Table 2.11***.

Table 2.11 **Rate of Poverty of Chincha River Basin (2007 year)**

Description	Chincha Region	
	Whole	%
Population	94,439	100
Poor	14,721	15.6
Very Poor	312	0.3

3) Labor Occupation

In Chincha Alta with a high population rate of urban areas, and Tambo de Mora, the ratio of a primary industry labor is low, and the ratio of the primary industry labor is high in other towns.

2.3.3 Pisco River Basin

(1) Natural Condition

On the whole, the form of a basin is thin, and the area exceeding the altitude of 4,000m is about 20% of the whole. In the downstream reach, riverbed slope is about 1/90 and river width are compared with 200-600m, without the Chincha river and the Canete river, they are comparatively wide. Annual rainfall is about 10mm by about 500mm and the altitude of 1,000m or less in the altitude of 4,000m or more. Therefore, river discharge is small comred with Canete rivers.

As for vegetation, most upper areas serve as a prairie, the middle-lower reaches serves as a desert area, and the downstream riverbank is utilized as farmland.

(2) Social Conditions

1) Administrative District

A part for an administrative district around the Pisco river basin consists of Ica state Pisco region in six (6) cities/towns as shown in ***Table 2.12***.

Table 2.12 **Administrative District in Pisco River Basin**

State	City	Region	Area (km^2)
Ica	Pisco	Pisco	24.92
		San Clemente	127.22
		Tupac Amaru	55.48
		San Andres	39.45
		Humay	1,112.96
		Independencia	273.34

2) Population and Poverty Distribution

As for the population in 2007, by 119,975 persons, 89% of them of 106,394 persons reside in urban areas, and 11% of 13,581 persons reside in a district part. Although the whole population is increasing the every place region, the population of a district part is decreasing in the town except Humay and Independencia. 22,406 persons who hit to 18.7% of all the local residents are the poor degree, and 493 persons of the rate of poverty who hit to 0.4% are the very poor degree. As for Pisco, the rate of the rate of poverty is low rather than the area of 0.3% and others. The rate of poverty is shown in ***Table 2.13***.

Table 2.13 **Rate of Poverty in Pisco River Valley (2007 year)**

Description	Pisco Region	
	Whole	%
Population	119,975	100
Poor	22,406	18.7
Very Poor	493	0.4

3) Labor Occupation

In Humay and Independencia, 70% or more and the ratio of the primary industry labor are high.

2.3.4 Majes-Camana River Basin

(1) Natural Condition

The rate with an altitude of 4,000m or more of occupying reaches 60 percent of the whole. On the other hand, the river mouth to about 100km upper river section is 2,000m or less in altitude in general, and occupies about 20 % of all the valleys.

The boundary of a Majes river and the Camana river is the about 40km upper stream from a river mouth, the lower stream is called as Camana river and the upper stream is called as Majes river. A riverbed slope forms about 1/100 for Majes river and about 1/200 for the Camana river, respectively. A river width is 200-500 m for Majes and 100-200 m for the Camana river. The tendency for rainfall to increase about annual rainfall as high altitude is remarkable, and is 500mm or more by about 50mm and the altitude of 4,000m or more in the altitude of 1,000m or less. Amount of river discharge is much and a surface runoff water exists in the dry season.

Although the moist prairie spreads out in the area with an altitude of 4,000m or more where vegetation occupies 60 percent of basin, the altitude of 2,000m or less forms as a desert area. In addition, most flat area of the riverbank are utilized as farmland, and paddy rice is mainly grown.

(2) Social Condition

1) Administrative District

A administrative district around a Majes-Camana river basin consists of two (2) of the Arequipa State/ Castilla region as shown in ***Table 2.14***.

Table 2.14 **Administrative District in Majes-Camana River Basin**

State	City	Region	Area (km2)
Arequipa	Castilla	Uraca	713.83
		Aplao	640.04
		Huancarqui	803.65
	Camaná	Camaná	11.67
		Nicolas de Piérola	391.84
		Mariscal Caceres	579.31
		Samuel Pastor	113.4
		Jose Maria Quimper	16.72

2) Population and Poverty Distribution

As for the population in 2007, by 44,175 persons, 91% of them of 40,322 persons reside in urban areas, and 9% of 3,853 persons reside in a district part. Population is increasing the every place region. However, in urban areas, while population is increasing for 2.8% - 3.4% of the average year exceeding an average of a country, as for a district part, minus 1.3%-minus 6.6% and population are decreasing. 25% - 27% of local residents are the poor degree, and 3.8% - 4.4% are the very poor degree.

Especially as for the Huancarqui area, the rate of the rate of poverty is high rather than the area of 6.9% and others. The rate of poverty is shown in ***Table 2.15***.

Table 2.15 **Rate of Poverty of Majes-Camana River Basin (2007 year)**

	Castilla		Camana	
	Whole	%	Whole	%
Population	17,478	100	44,175	100
Poor	4,364	25	11,823	26.8
Very Poor	761	4.4	1,684	3.8

3) Labor Occupation

The labor of primary industry has 54 to 65% in Castilla region.

2.4 Present Condition of Irrigation Association (District Water Users)

There is the irrigation association (District Water Users) which carries out management and control of maintenance of the existing irrigation institution in the irrigation sector which exists in each river basin. The outline of the irrigation association of each river basin is shown in ***Table 2.16***, and the budget for each irrigation association of fiver (5) years is shown in ***Table 2.17***.

Moreover, the rate of the administrative and maintenance expense occupied to the annual appropriation of the irrigation association of each river basin in 2008 occupies about 11.5% at the

whole 5 river basins as shown in ***Table 2.18***.

Table 2.16 **Outline of Irrigation Association**

River Basin	Sector Number	Groupe Number (groupe)	Irrigated Area (ha)	Beneficiary (Person)
Canete	42	7	22,242	5,843
Chincha	3	14	25,629	7,676
Yauca	3	3	1,614	557
Majes	45	17	7,505	2,519
Camana	38	17	6,796	3,388

Data Source: Elaboración Equipo de estudio JICA, Junta de Usuarios, 2010 nd 2011

Table 2.17 **Budget of Irrigation Association**

(Unit:S)

River	Annual Budget			
	2007	2008	2009	2010
Canete	2,355,539.91	2,389,561.65	2,331339.69	2,608,187.18
Chincha	1,562,928.56	1,763,741.29	1,483,108.19	
Yauca	1,648,019.62	1,669,237.35	1,725,290.00	1,425,961.39
Majes-Camana		1,867,880.10	1,959,302.60	1,864,113.30
Total	5,755,792.18	9,526,298.10	15,536,928.01	5,898,261.84

Note） The Majes-Camana' irrigation association budget in notes 2008 does not have data of a Majes river budget.
2008 Camana river budget (1,122,078. 40) + 2009 Majes river budget (745,810. 70) and assumption

Ratio of the administrative and maintenance expense to the ratio and the amount of annual average damage deduction to the working expenses of the irrigation association in 2009. It is as being shown in ***Table 2.18***.

Table 2.18 **Ratio to the Irrigation Association Working Expenses and Damage Deduction of Administrative and Maintenance Expense**

River Basin	Annual Budget (x 1,000 S/)	Annual Maintenance Budget (x 1,000 S/)	Ratio of Annual Maintenance Budget (%)	Annual Mean Dameged Deduction Amount (x 1,000 S/)	Ratio of Annual Maintenance Budget (%)
	(1)	(2)	(3)=(2)/(1)	(4)	(5)=(2)/(4)
Canete	2,331	260	11.1	12,274	2.1
Chincha	14,831	435	2.9	20,532	2.1
Yauca	1,725	383	22.2	17,844	2.1
Majes-Camana	1,959	710	36.2	17,704	4.0
Total	15,537	1,788	11.5	68,354	2.6

2.5 Main Agricultural Products

(1) Main Agricultural Products of Each River Basin

The agricultural products from the 1st place to the 5th place being shown in order with the large planted area at each river basin in 2008 to 2009 is summarized as shown in ***Table 2.19***.

Table 2.19 **Agricutural Product at Each River Basin (2007－2008 year)**

River basin	Main agricultural products：Order with the large planted area				
	1st	2nd	3rd	4th	5th
Canete	Yellow Maize	Cotton	Sweet potato	Grape	Corn
Chincha	Cotton	Yellow Maize	Grape	Artichoke	Asparagus
Pisco	Cotton	Alfalfa	Yellow Maize	Corn	Asparagus
Majes-Camana	Rice	Kidney bean	Onion	Wheat	Pumpkin

(2) Crop Yields and The Amount of Harvest of Each River Basin

The annual crop yields in recent years and amount of harvest of main agricultural products of each river basin are summarized to ***Table 2.20***. The largest valley of the planted area is the Canete river basin. On the other hand, the first place of the amount of harvest per 1 ha is 14,422 S./ of Majes-Camana river basin.

Table 2.20 **Annual Crop Yields and the Amount of Harvest**

River Basin	Harvest Area (ha)	Product Volume (1,000 tons)	Product Amount (Million S/.)	Unit Product Amount (S./ha)
Canete	32,564	451	219	6,728
Chincha	23,000	220	242	10,533
Pisco	22,045	216	133	6,011
Majes-Camana	13,077	178	188	14,422

2.6 Outline of Existing Infrastructure

In river basin, the infrastructure which made the irrigation institution and the road the subject is fixed as shown in ***Table 2.21***.

Table 2.21 **Summary of Existing Infrastructure**

River Basin	Length of Public Road (km)		Irrigation Canal Length (km)	Drainage Length (km)	Multi-purpose Dam (number)	Main Intake Weir (location)
	National	Regional				
Canete	266	557	1,232	120	-	4
Chincha	81	372	unknown	unknown	-	3
Pisco	unknown	unknown	unknown	unknown	-	3
Majes	283	208	167	unknown	0	Intake：58、Direct Intake：79
Camana	144	366				

2.7 Present Condition of Vegitation in Each River Basin

(1) Canete, Chincha, PiscoRiver Bain

According to the "1995 vegetation classification figure" published by the INRENA forest head office in 1995, Canete, Chincha, and the Pisco river basin, vegetation distribution has characterized with altitude in general.

Vegetation is very scarce up to near the altitude of about 2,500m. Rain conditions are good up to near the altitude of 2,500m-3,500m. Vegetation does not grow up easily for low temperature by the altitude beyond it. The typical vegetation of three 83) river basin is shown in ***Table 2.22***.

Table 2.22 **Typical Vegitation in Each River Basin**

Type	Name	Altitude	Rainfall	Typical Vegetation
1)Cu	Farmland of an area along the shore	Area along the shore		Farmland of an area along the shore
2)Dc	Dezart area along the shore	0～1,500m	Almont zero	Almont Non vegitation
3)Ms	Dry Plant	1,500～3,900m	120～220mm	Cactuses、Plant/tree
4)Msh	Subhumid plant Area	North:900～3,500m Andes Area:2,000～3,700m	220～1,000mm	evergreens、less 4 m tree high
5)Mh	Humid Plant Area	North:2,500～3,400m South:3,000～3,900m	500～2,000mm	evergreens、less 4 m tree high
6)Cp	Andes Plant Area	3,800m	—	
7)Pj	Grassy Plain	3,200～3,300m Middle South:till 3,800m	South:less 125mm East Slope: over 4,000mm	Grass weed
8)N	Snow-capped mountain area		—	—

(2) Majes-Camana River Basin

Although vegetation distribution of a Majes-Camana River Basin is the same as that of other three river basin, the difference in typical vegetation is the following three points. i) There is no Cu (farmland of an area along the shore), ii) There is Lo (Lomas),iii) There is Bf (moist prairie). Although it exists in a Majes-Camana River Basin, the vegetation classification which is not in other three river basin is shown in ***Table 2.23***.

Table 2.23 **Typical Vegetation of Majes-Camana River Basin**

Type	Name	Altitude	Description	Typical Vegitation
1)Lo	Lomas : Sershore Area	0m-1,000m	The fog comes from winter (May – September), and this unique vegetation zone appear.	Tillandsia spp、tara (Caesalpinea spinosa)、Ismene amancae、Haageocereus spp.、Oxalis spp.、Solanum spp.
2)Bf	Humid Plant Area	3,900m-4,800m	The surface water from a glacier and springwater has come out, and since the groundwater level is high, surface water is, without permeating the ground.	The distributed vegetation is low high grass tree.

(3) Change and the Afforestation Record of Forest Area

According to the national afforestation plan (Plan Nacional de Reforestacion Peru 2005-2024) by INRENA, afforestation area is decreasing in every area, and its record between 1994 to 2003 is shown in ***Table 2.24***.

Especially, forest area decrease in the Junin region is equivalent to 14% of the whole area, and subsequently 2.3% is decreasing in the Ayacucho prefecture. Although 1994 have much afforestation area, afforestation area is decreasing rapidly after that. Moreover, there are few places which can be afforested and their demand is low since Arequipa, a cuttlefish, and the Lima region.

Table 2.24 **Record of Deforestation and Afforestation in the River Basins**

Region Name	Area（ha）	Accumulation deforestation area（ha）	Decrease Ratio (%)	Afforestation Area（1994－2003 year） (ha)
Arequipa	6,286,456	-	-	7,408
Ayacucho	4,326,169	97,992	2.3	52,647
Huancavelia	2,190,402	11,112	0.5	34,015
Ica	2,093,457		-	2,750
Junin	4,428,375	628,495	14.2	61,656
Lima	3,487,311		-	12,381
Piura	3,580,750	9,958	0.3	37,640

2.8 Selection of Measure Against Floods

(1) Selection of Design Flood Discharge

In according to the section 3.1.1 Project life (Horizonte de Proyectos）on "The flood in farmland or a city area and the guideline of the prevention project from a flood" Guia Metodologica para Proyectos de Proteccion y/o Control de Inundaciones en Áreas Agricolas o Urbanas, the occurrence of probability of the flood applied to 25 years for the urban area, 50 years and 100 years for regional area, 10 years, 25 years, and 50 years in a district part and farmland is recommended.

This project belongs to a district part and farmland, therefore 10 - 50 years design discharge will be applied. It seems that there is no necessity of fixing partially to the flood more than the previous maximum flood since river maintenance is hardly progressing in the case of Peru. Therefore, as a maintenance target of each river, it is considered as 1 / 50-year probability scale which is the flood discharge of a record high level.

(2) Selection of Type of Measure Against a Flood

The measure against a flood is classified into the following component.

No.	Component	Type of Measure
1)	Structure measure	Dike, Riverbank protection, Groyne, Normalization of river width, riverbed, diversion, dam, pocket, diversion weir, intake facilities, training dike, Sabo dam, etc.
2)	Non-Structure Measure	Afforestation and tree planting of mountain land, the prevention from slope erosion, the afforestation along a riverbank, a flood forecast, an alarm, etc.
3)	Technical Cooperation	Capacity building; District personnel, man-power development, education, training which carry out a resident pair, etc.

2.9 Selection of Structure Measure

(1) Criteria for Selection of Priority Facility

The following item was taken into consideration for selection of the priority.

- A local resident's request place (request based on the past flood damage)
- Lack of flow capacity in the river channel

- Condition of houses, farm lands
- Condition of inundation area and its scale (based on results of computed simulation)
- Social-environmental condition (public facilities, etc.)

Comprehensive evaluation was carried out about the above-mentioned five items based on the request of the local government, the past flood damage condition, etc., and the measure on river improvement selected in each river. The evaluation criteria summarizes as shown in ***Table 2.25***.

Table 2.25 **Evaluation Criteria**

Item	Content	Criteria
Item requested by Local Residence	● Past record of flood damage ● Request from farmer and resident	● Occurrence of past large flood, high priority（2 point） ● Requested place by local（1point）
Flow Capacity of River Section	● Possibility of Overtopping disaster ● Possibility of lateral erosion and collapse of dike	● Lack of flow capacity (probable flood discharge less 1/10 year）（2 point） ● Lack of flow capacity (probable flood discharge less 1/25 year）（1 point）
Condition along River Course	● Scale of farmland area ● Resident area ● Public facilities	● Large scale of farmland（2 point） ● Farmland and resident area, large scale of residence area（2 point） ● Less scale compared with above（1 point）
Inundation Record	● Scale of Inundation	● Inundation area is large（2 point） ● Inundation area is rather small (1 point）
Social-Environmental Condition	● Irrigation channel and water supply, weir, etc. ● National road (Pan-American road), bridge, other road	● Priority facilities（2 point） ● Other facilities（rural road、small scale of intake structure, etc. (1 point）

(2) Selection of Structure Measure

As the design / construction method, construction material supply considered the measure against a structure selected based on the above-mentioned evaluation criteria and a grading standard there using site generated material from the river course and ability of contractors. The selected structural measure at each river basin is shown in ***Table 2.26***.

Table 2.26 **Selection of Structure Measure**

River Basin	Structure Type/Work Item	Effect
Canete	Dike, bank protection, riverbed excavation, rehabilitation of intake weir	Increase flow capacity, water level decrease, reduction of bank erosion, sediment inflow control at intake weir
Chincha	Dike, bank protection, riverbed excavation, diversion weir	Increase flow capacity, water level decrease, reduction of bank erosion, sediment inflow control at intake weir, diversion of flood discharge
Pisco	Dike, bank protection, riverbed excavation, rehabilitation of intake weir	Increase flow capacity, water level decrease, reduction of bank erosion, sediment inflow control at intake weir
Majes-Camana	Dike, bank protection	Increase flow capacity, water level decrease

(3) Selection Due to Probable Flood Occurrence

The design flood discharge in this project considers as the maximum probability 50-year flood, and decides to ensure safety in consideration of free board height in consideration of El Nino. ***Table 2.27*** shows design flood discharge of each river basin.

Table 2.27 **Design Flood Discharge of Each River Basin**

(m^3/sec)

	Probable Year			
River Basin	10 year	25 year	50 year	100 year
Canete	822	1,496	2,175	2,751
Chincha	580	807	917	1,171
Pisco	451	688	855	963
Majes-Camana	1,007	1,566	2,084	2,703

2.10 Selection of Non-Structure Measure

2.10.1 Measure Against Afforestation

(4) Necessity for the Measure Against Afforestation

It can classify into the afforestation along 1) river structure, and the afforestation in 2) upper stream region as an afforestation/planting plan corresponding to the purpose of this project. The former has a direct effect in flood prevention, and an effect discovers it in the short term. Although the latter can expect an indirect effect to flood prevention, a long period of time is required to discovery of an effect. Each objective and effect are shown in ***Table 2.28***.

Table 2.28 **Purpose and Effect**

Afforestation/planting plan	Purpose	Effect
i) Afforestation plan along river structure	It aims at the defense about the flood which exceeds a design water level with the unexpected flood discharge and other obstacle.	When a flood is overtopped from river structure, influence is reduced with the afforestation belt.
ii) Afforestation plan in upper reaches	The soil infiltration capacity of the area used as increased, and reducing surface runoff discharge, the amount of intermediate flow and groundwater are made to increase.	Reduce of a flood peak discharge, and the increase in the amount of water-resources potential capacity of mountain land, and contributes to flood prevention and mitigation.

(5) Selected Afforestation Plan

In this project, the afforestation plan along the river structure which demonstrates a function as a buffer belt at the time of a flood shall be carried out at four (4) river basin. Moreover, the afforestation plan in an upper reaches shall consider it as a medium-to-long term plan, and the measure against afforestation along the river structure which can expect an effect in the short-term shall be adopted with this project.

2.11 Technical Assistance

In this project, in order to increase capability by local residents, and proposed measures against flood mitigation plan, the technical assistance component is carried out as shown in ***Table 2.29***.

Table 2.29 **Outline of technical Assistance Component**

No.	Description	Details
1.	Target Basin	Canete, Chincha, Pisco, Majes-Camana River (4 river basins)
2.	Support Candidate	The representative of the irrigation association of each river basin, a local government office personnel, a village representative, local residents, etc. are assumed.
3.	Contents of activity	The following three training is carried out. **1)** Protection of rivercourse activity, knowledge of agriculture, natual environmental **2)** Community Disaster-Prevention-Planning against floods **3)** River sedimentation measures and maintenance of river channel

CHAPTER 2 PROJECT JUSTIFICATION

CHAPTER 3 PROJECT COMPONENT

3.1 Structure Measure

The following structure measures are applied to each river basin.

3.1.1 Canete River Basin

(1) Present Condition

Present condition of Canete river basin is summarized in ***Table 3.1***.

Table 3.1 **Present Condition of Canete River Basin**

Present Condition	Main Preservation Item	Considerable Measures
・ Large damaged to agricultural product by collapse of dike in 1998. ・ Excess sediment inflow to existing intake facilities ・ Many public road exists along river course, so that easy to collapse the bank side. ・ Crossing point of national road is narrow section, and easy to overtop during flood occurrence. ・ Training dike is not facilitated in the whole section.	・ Farmlands (Maize, Cotton, Sweet potato) ・ Regional road ・ National Road (Pan-American) ・ Existing irrigation intake weir	・ Provision of diversion weir in order to divert a flood discharge. ・ Measure for erosion using groyne structure ・ Riverbank protection work, and dike for the riverbank erosion ・ Riverbed excavation (normalization) to increase flow capacity of river section

(2) Proposed Facilities

The following facilities are proposed in the project. ***Table 3.2*** shows the propose structure scale and feature, and Figure-3.1.1shows its propose location.

- Riverbed Excavation: Excavation length 1,070 m
- Riverbank Protection Work : Total length 8,160 m

Table 3.2 **Summary of Propose Structure in Canete River**

River	Locatio		Critical Point	Main Protection Objects	Measure	Feature of Work	
Rio Canete	Ca-1	4..2-5.2 km	Narrow Section	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	1,100 m 5,430 m3 9,920m3
	Ca-2	6.7～8.3 km	Innnuded Point		Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	3,200 m 113,700 m3 28,200 m3
	Ca-3	10.1-11.2 km	Narrow Section		Riverbed excavation, Dike with bank Protection	Riverbed excavation Dike with bank Protection Large Boulder Riplap	L=700 m, V=80,270m3 1,630 m 16,730 m3
	Ca-4	24.6-25.0 k	Existing Intake weir (w:150m, i: 1:2, crest w:2.0m)	Existing Intake weir、Agrictural lands	Riverbed excavation、Dike with bank Protection	Riverbed excavation Dike with bank Protection Large Boulder Riplap	L=370 m, V=34,400 m3 L=710m, V=20,150 m3 7,300 m3
	Ca-5	25.1-26.6 k	Narrow Section	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	1,520 m 95,125 m3 14,000 m3

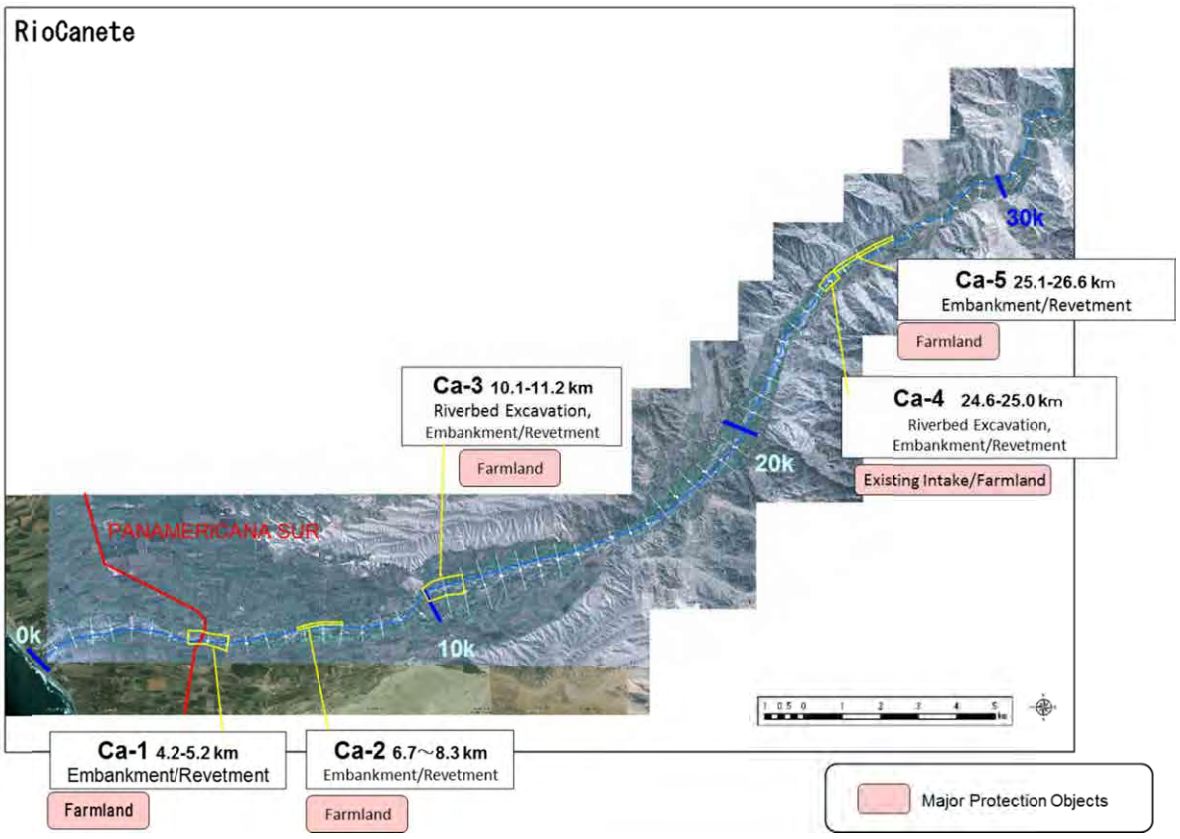


Figure 3.1 **Location of Proposed Structure Measures in Canate River**

3.1.2 Chincha River Basin

(1) Present Condition

Present condition of Chincha river basin is summarized in ***Table 3.3***.

Table 3.3 **Present Condition in Chincha River**

Present Condition	Main Preservation Item	Considerable Measures
・ Flood occurs in December-March in every year. average 10 times. Duration 3-12 hours. Max discharge during El-Nino is about 1,200m3/s ・ Existing intake weir is damaged and possible to collapse in next flood. ・ Sedimentation near intake facilities and irrigation channel, rehabilitation is required.	・ Farmlands (cotton, corn, grape) ・ Resident area ・ Existing irrigation intake weir (2 location) ・ National road (Pan-American)	・ Strengthening and Rehabilitation of existing irrigation intake weir ・ Extension of training dike in upper reach ・ Modification of section alignment of intake channel ・ Widening of existing water channell

(2) Proposed Facilities

The following facilities are proposed in the project. ***Table 3.4*** shows the propose structure scale and feature, and ***Figure 3.2*** shows the propose location.

- Dike and Riverbank Protection Work : Total length 13,440m
- Rehabilitation of Existing Intake Weir : 1 location
- Constriction of groundsill : 1 location
- Riverbed Excavation : Excavation length 3,040m

Table 3.4 **Summary of Propose Structure in Chincha River**

River	Locatio		Critical Point	Main Protection Objects	Measure	Feature of Work	
Rio Chincha	Chico-1	2.9-5.0 km	Innnuded Point	Agricultural lands、Existing Intake weir	Dike with bank Protection	Length	3,150 m
						Dike with bank Protection	60,160 m3
						Large Boulder Riplap	23,700 m3
	Chico-2	14.7-15.3 km	Existing Intake weir (w:100m, H:3.0m, crest w:2.0m)		Riverbed excavation、Dike with bank Protection	Riverbed excavation	L=540 m, V=20,000 m3
						Dike with bank Protection	L=850 m, V=5,500 m3
						Large Boulder Riplap	23,700 m3
	Chico-3	24.0-24.4 km	Existing Intake weir (w:70m, H: 3.0m, crest w:2.0m)		Existing Intake Weir, Dike with bank Protection	Groundsill and Diversion Weir	Groundsill 1 set, V=5,200 m3, Diversion weir 1 set V=4,300 m3
						Dike with bank Protection	L=730 m, V=20,350 m3
						Large Boulder Riplap	7,400 m3
	Ma-1	2.5-5.0 km	Innnuded Point		Dike with bank Protection	Length	4,630 m
						Dike with bank Protection	49,900 m3
						Large Boulder Riplap	37,000 m3
	Ma-2	8.0-10.5km	Narrow Section		Riverbed excavation、Dike with bank Protection	Riverbed excavation	L=2,500 m, V=123,500 m3
						Dike with bank Protection	L=4,080 m, V=37,700 m3
						Large Boulder Riplap	32,200 m3

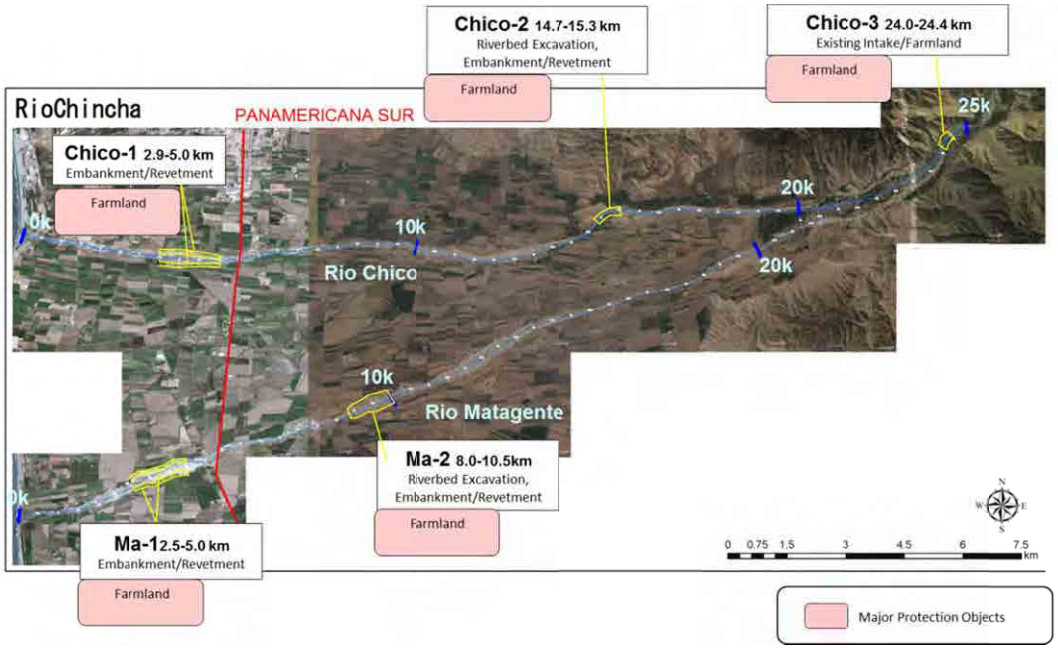


Figure 3.2 **Location of Proposed Structure Measures in Chincha River**

3.1.3 Pisco River Basin

(1) Present Condition

Present condition of Pisco river basin is summarized in ***Table 3.5***.

Table 3.5 **Present Condition in Pisco River**

Present Condition	Main Preservation Item	Considerable Measures
・ In 1998, Pisco town suffered by El Nino floods. Existing intake facilities and irrigation canal has damaged by sedimentation. ・ Riverbed rise in resent 40 years with 3m height	・ Farmlands (cotton, Alfalfa, corn) ・ Resident area	・ New dike and riverbank protection works ・ Rehabilitation of existing irrigation weir ・ Channel widening of irrigation canal ・ Detention pond at upper reach of existing irrigation weir

(2) Propose Structures

The following facilities are proposed in the project. ***Table 3.6*** shows the propose structure scale and feature, and ***Figure 3.3*** shows the propose location.

- Dike and Riverbank Protection Work : Total length 16,630m
- Riverbed Excavation : Excavation length 3,700m
- Detention Pond : 1 location

Table 3.6 **Summary of Propose Structure in Pisco River**

River	Locatio		Critical Point	Main Protection Objects	Measure	Feature of Work	
Rio Pisco	Pi-1	3.0-5.0 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	4,120 m
						Dike with bank Protection	92,900 m3
						Large Boulder Riplap	32,200 m3
	Pi-2	6.5-7.9 km	Narrow Section		Riverbed excavation、Dike with bank Protection	Riverbed excavation	L=1,200 m, V=74,900 m3
						Dike with bank Protection	L=2,950 m, V=42,520 m3
						Large Boulder Riplap	25,000 m3
	Pi-3	12.4-13.9 km	Innnuded Point		Dike with bank Protection	Length	1,500 m
						Dike with bank Protection	33,900 m3
						Large Boulder Riplap	12,600 m3
	Pi-4	19.5-20.5 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	1,010 m
						Dike with bank Protection	17,400 m3
						Large Boulder Riplap	8,060 m3
	Pi-5	25.8-26.4 km	Narrow Section		Riverbed excavation、Dike with bank Protection	Riverbed excavation	L=600 m, V=67,600 m3
						Dike with bank Protection	L=1,250 m, V=29,900 m3
						Large Boulder Riplap	10,600 m3
	Pi-6	34.5-36.4 km	Existing Intake weir (Sediment Retuding Basin 1,800 x 700m)		Riverbed excavation・Dike with bank Protection	Riverbed excavation	L=1,900 m, V=496,000 m3
						Outer Dike with bank protection	L=2,050 m, V=103,600 m3
						Large Boulder Riplap	19,900 m3
						Inner Dike with bank protection	L=3,750 m, V=114,000 m3
						Large Boulder Riplap	63,100 m3

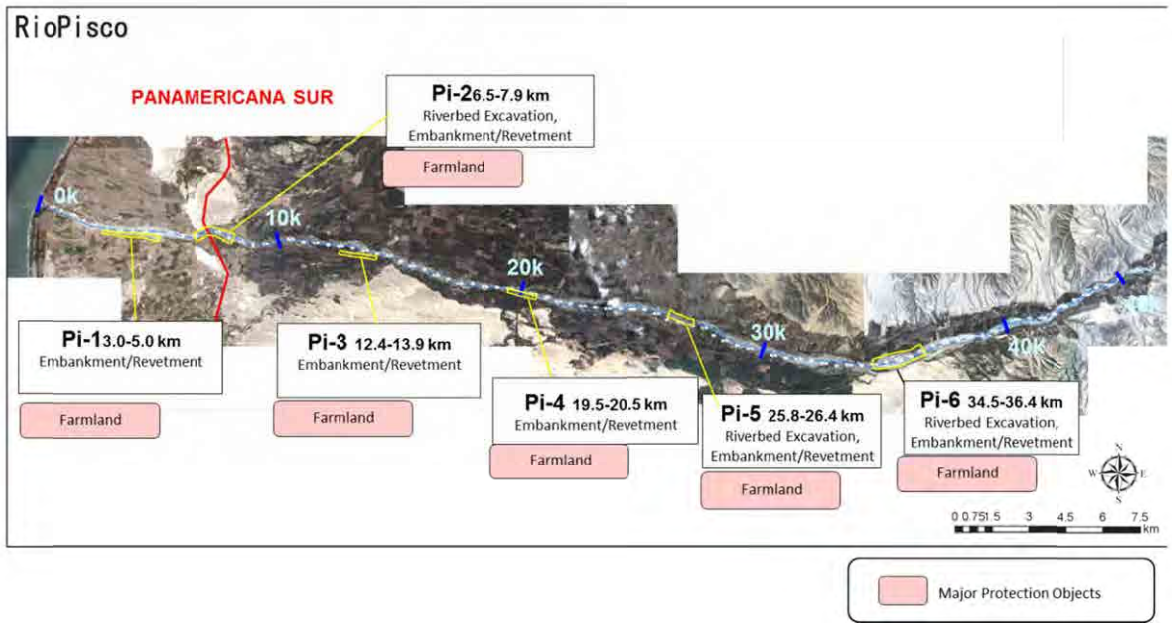


Figure 3.3 **Location of Proposed Structure Measures in Pisco River**

3.1.4 Majes-Camana River Basin

(1) Present Condition

Present condition of Majes-Camana river basin is summarized in ***Table 3.7***.

Table 3.7 **Present Condition in Majes-Camana River Basin**

Present Condition	Main Preservation Item	Considerable Measures
・ There many erosion spot in the existing dike. ・ At the point of 13k, intake for water supply facility. It is necessary to rehabilitate the facility against the future erosion.	・ Farmlands (rice, beans, onion, etc.) ・ Camana resident area	・ Heightening of existing dike and its erosion measure. ・ Rehabilitation of existing water supply intake.

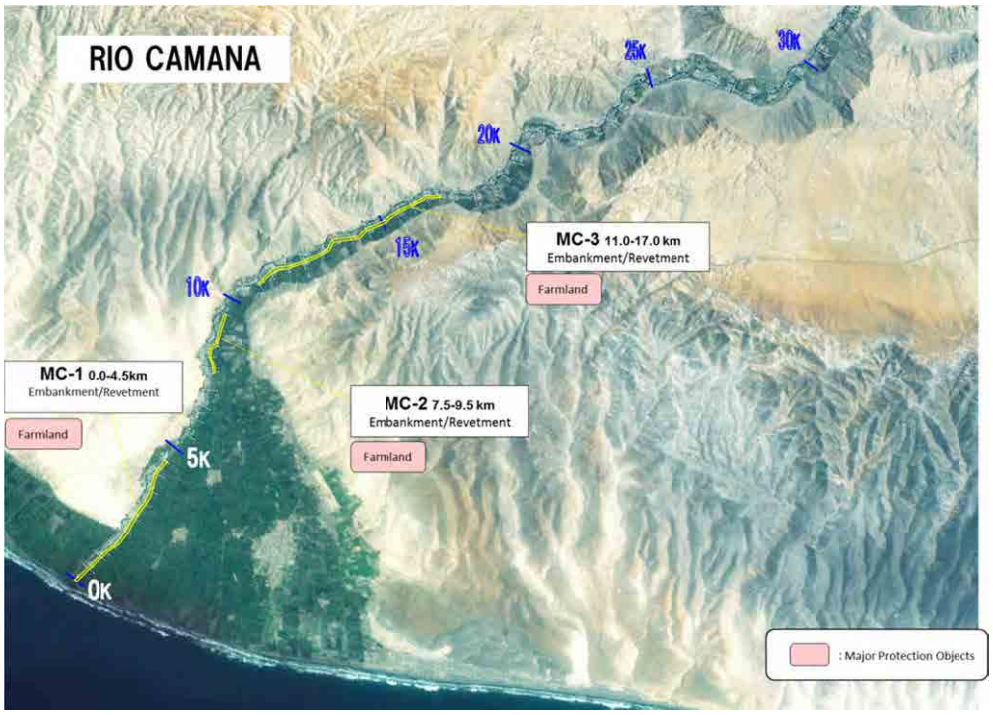
(2) Propose Structures

The following facilities are proposed in the project. ***Table 3.8*** shows the propose structure scale and feature, and ***Figure 3.4*** shows the propose location.

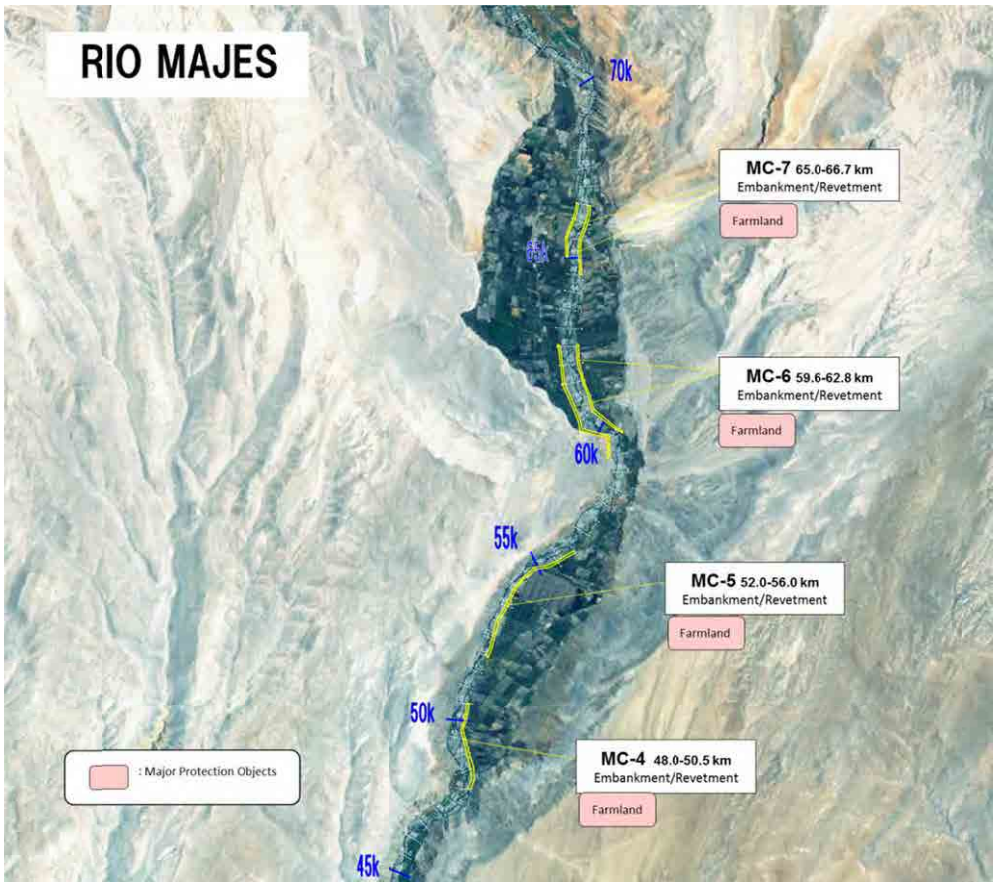
- Dike and Riverbank Protection Work : Total Length 28,400m

Table 3.8 **Summary of Propose Structure in Majes-Camana River**

River	Locatio		Critical Point	Main Protection Objects	Measure	Feature of Work	
Rio Camana	MC-1	0.0-4.5km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	4,500 m 155,700 m3 44,300 m3
	MC-2	7.5-9.5 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	2,000 m 43,100 m3 18,300 m3
	MC-3	11.0-17.0 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	6,000 m 169,000 m3 59,000 m3
Rio Majes	MC-4	48.0-50.5 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	2,500 m 75,200 m3 17,700 m3
	MC-5	52.0-56.0 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	4,300 m 179,000 m3 39,400 m3
	MC-6	59.6-62.8 km	Innnuded Point, local erosion	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	6,200 m 235,000 m3 51,400 m3
	MC-7	65.0-66.7 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length Dike with bank Protection Large Boulder Riplap	2,900 m 32,300 m3 27,500 m3



< Location of Proposed Structure in Camana River>



< Location of Proposed Structurein Majes River>

Figure 3.4 **Location of Proposed Structure Measures in Majes-Camana River**

3.2 Non-Structure Measure

3.2.1 Afforestation

(1) Enforcement Scale

The afforestation carried out in this project shall be carried out at riverbank protection works, dike and detention pond which are proposed as the structure measure.

(2) Afforestation Along A River Structure

In riverbank protection work, the dike, and detention pond which are constructed along a river course, propose afforestation belt is formed as shown in Figure-3.2-1. Planting arrangement makes type A planting width 11m, a type B waterway, and parallel with an about 1m interval as two types, respectively. In detention pond, it proposes to plant inside, but the place is not influence by river water. The afforestation / vegetation recovery quantity according to object valley are shown in ***Table 3.9***.

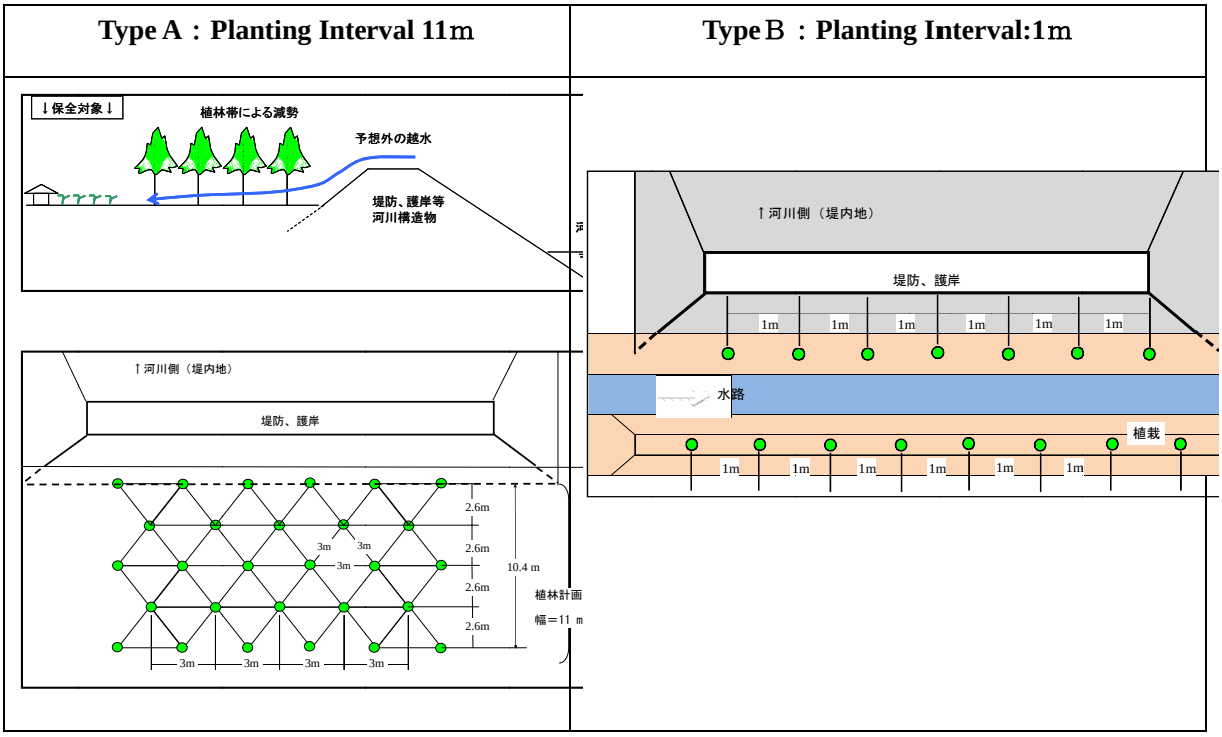


Figure 3.5 **Layout image of Afforestation Along A River Structure (Type A and B)**

Table 3.9 **Scale of Afforestation along River Structure**

River Basin	No. of Propose Structure	Location	Length (m)	Width (m)	Area (ha)	Planting number (number)	Planting Type
Canete	Ca-1	-	-	-	-	-	Type A (width 11m)
	Ca-2	Right Bank	1,600	11	1.8	5,328	
	Ca-3	-	-	-	-	-	
	Ca-4	-	-	-	-	-	
	Ca-5	Right Bank	1,750	11	1.9	5,624	
	Sub-total	-	3,350	-	3.7	10,952	
Chincha	Chico-1	Both Side	2,100	22	4.6	13,616	Type A (width 11m)
	Chico-2	-	-	-	-	-	
	Chico-3	-	-	-	-	-	
	Ma-4	Both Side	2,500	22	5.5	16,280	
	Ma-5	-	-	-	-	-	
	Sub-total	-	4,600	-	10.1	29,896	
Pisco	Pi-1	Left bank	2,000	11	2.2	6,512	Type A (width 11m)
	Pi-2	-	-	-	-	-	
	Pi-3	Left bank	1,500	11	1.7	5,032	
	Pi-4	Left bank	1,000	11	1.1	3,256	
	Pi-5	-	-	-	-	-	
	Pi-6	whole	1,450	11	1.6	4,736	
	Sub-total	-	5,950	-	6.6	19,536	
Majes-Camana	MC-1	Left bank	1,500	-	-	3,000	Type B (width 11m)
		Left bank	3,000	-	-	6,000	
	MC-2	whole	2,000	-	-	4,000	
	MC-3	Left bank	6,000	-	-	12,000	
	MC-4	Left bank	2,500	11	2.8	8,288	Type A (width 11m)
		Left bank	4,000	11	4.4	13,024	
	MC-6	Right Bank	3,500	11	3.9	11,544	
		Left bank	3,000	11	3.3	9,768	
	MC-7	Right Bank	1,500	11	1.7	5,032	
		Left bank	2,000	11	2.2	6,512	
	Sub-total	-	29,000	-	18.3	79,168	
Total			42,900		38.7	139,552	

For every river basin, the tree kind afforested has many planting records, and shows the high demand of a local irrigation association in ***Table 3.10***.

Table 3.10 **Propose Plant Tree in Each River Basin**

River Basin	Propose Plant Tree
Canete, Chincha, Pisco River Basins	Eucalyptus, Acacia Huarango, Beefwood
Majes-Camana River Basin	Willow, Beefwood

3.3 Implementation of Technical Assistance

(1) Training Program for Technical Assistance

In this project, in order to increase capability by local residents, and proposed structure measure along river course for the flood mitigation, the following training for technical assistance are proposed. ***Table 3.11*** shows contents of each trainng.

Table 3.11 **Contents of Technical Assistance Training**

No.	Training Activity	Contents	Frequency (times)
1.	Training : increase the knowledge to protect river courseand agriculture and national envioronment	・ Maintenance of River Structure ・ Knowledge of river vegetation ・ Reduction of riverbank erosion ・ Maintenance of related natural resources	50
2.	Training: Comuunity risk management against floods	・ Risk Management ・ Ecological regional plan ・ Crisis management plan ・ Resource control plan ・ Activity plan decision ・ Simple flood warning system	53
3.	Training: maintenance of river course against sedimentation	・ Hillside, bank protection techniques ・ Cultivation technic for afforestation ・ Seeding technic ・ Forest resource management and preservation ・ Distribution of data, such as pamphlet	52

(2) Important Matter about Enforcement

In enforcement of this component, the DGIH-MINAG which is an enforcement organization of this work cooperates with the related many organizations of each river basin, such as a state government agricultural office (DRA) and an irrigation association, and bears a central role. In order to realize smooth active conduct of work, it is necessary to care about the contents shown in ***Table 3.12***.

Table 3.12 **Item of an Enforcement Organization in its Duty**

Item	Important Points
Implementation Structure	・ Cooprate with related central agricultural administration bureau and DRA
Management	・ Proceed with PSI which has much experiences with the similar works ・ DGIH-MINAG needs to aim at adjustment which does not have the previous plan and disagreement in each basin in cooperation with INDECI, regional government and local committtee. ・ An irrigation association supports smooth activity on an on-site, obtaining the cooperation of a local self-governing body in each basin.
Training lecture and others	・ It will be carried out by experts and consultants through state government, ANA、AGRORURAL, INDECI.

CHAPTER 4 PROJECT COST

4.1 Composition of Project Cost

Compositions of project costs are different from SNIP and Japanese loan project as summarized in ***Table 4.1***.

Table 4.1 Composition of Project Cost

	SNIP	Japanese Loan
(1)	Construction Cost：S./xxxxxxxxx ● Structural Measures including Compensation Work Cost of S./2,162,119 ● (Estimated by locations and items of works such as riverbed excavation, dyke and revetment) ● Vegetation Works ● (Estimated by locations) ● Environmental Measures ● (Estimated by locations) ● Disaster Education/Capacity Building ● (Estimated by locations) ● Indirect Cost: Direct Cost x 15% ● Utility: Direct Cost x 10% ● Tax: (Direct Cost + Indirect Cost + Benefit) x 18%	Construction Cost: S./xxxxxxxxx ● Structural Measures including Compensation Work Cost of S./2,162,119 ● (Estimated by locations and items of works such as riverbed excavation, dyke and revetment) ● Vegetation Works ● (Estimated by locations) ● Environmental Measures ● (Estimated by locations) ● Disaster Education/Capacity Building ● (Estimated by locations) ● Indirect Cost: Direct Cost x 15% ● Utility: Direct Cost x 10%
(2)	Tax: (S./xxxxxxxx) Included in Construction Cost	Tax: S./xxxxxxxx 18 % of following items. ● Construction Cost (Japanese Loan) ● Consulting Service Cost ● Price Escalation ● Physical Contingency ● Land Acquisition Cost
(3)	Consulting Service Cost: S./xxxxxxxx ● Detailed Design ● Supervision Remuneration and Direct Cost is estimated. Escalation and contingency are not included. Tax is included.	Consulting Service Cost: S./xxxxxxxx ● Detailed Design ● Supervision Remuneration and Direct Cost is estimated. Escalation and contingency are included. Tax is not included.
(4)	Land Acquisition Cost：S./xxxxxxx	Land Acquisition Cost: S./xxxxxxx Escalation and contingency are included.

	SNIP	Japanese Loan
(5)	Administration (PMU)：S./xxxxxxx Following personnel and office expenses is estimated. ● PMU Personnel ● Audit Cost ● Capacity Building Cost ● Supervision Cost ● Office Necessity Cost ● Travel Cost	Administration (PMU): S./xxxxxxxx 5 % of the following items. ● Construction Cost ● Consulting Service Cost ● Price Escalation ● Contingency ● Land Acquisition
(6)	Price Escalation: Not included.	Price Escalation：S./xxxxxxxx Estimated applying the following ratios to Japanese loan construction cost. Price escalations for consulting services and land acquisition/ compensation are included in particular items. ● Foreign Currency: 2.1％ ● Local Currency: 2.0%
(7)	Physical Contingency: Not included.	Physical Contingency：S./xxxxxxx 5 % of Japanese loan construction cost. Physical contingencies for consulting services and land acquisition/ compensation are included in particular items.
(8)	Interest during Construction: Not included.	Interest during Construction：S./xxxxxxx Following annual rate is applied to disbursement amount in each year. ● Construction (incl. Escalation & Contingency)：1.7% ● C/S(incl. Escalation & Contingency)：0.01%
(9)	Commitment Charge: Not included.	Commitment Charge：S./xxxxxx 0.1 % of undisbursed loan amount in every year.

4.2 Project Cost Estimate

(1) Conditions of Cost Estimate

The following conditions are applied for cost estimate.

- Unit cost as of xxxxxx, xxxx is applied for direct cost of construction.
- Base Year for Estimate: xxxxxx xxxx
  Exchange Rate：xxxxx = xxxxx = xxxx
  xxxx = xxxx
- Currency : Local Currency Portion (LC): Sol
  Foreign Currency Portion (FC): JPY
- Price Escaration Rate: FC 2.1％、LC 2.0%
- Billing Rate of Consultant
  International (Pro-A) ： xxx xxxxxxx

Local (Pro-B) : x xxxxxx

Supporting Staff : x xxxxx

- Physical Contingency Rate: xx % for both Construction and Consulting Services
- VAT : xx %
- Import Tax: xx %
- Administration Cost: xx %
- Interest duing Construction: Construction xx %, Consulting Services: xxx %
- Commitment Charge: xx %

(2) Packaging

The construction works are divided into 4 civil work packages by river basins considering the estimated construction cost. International Competitive Bidding (ICB) will be applied.

(3) Project Cost for SNIP

Project cost based on SNIP procedure is summarized in ***Table 4.2***.

Table 4.2 Project Cost based on SNIP Procedure

(4) Project Cost for Japanese Loan

Project cost estimated based on JICA guideline is summarized in ***Table 4.3*****.** It is consistent with requested amount from the Government of Peru, US$ xx xxxx (equivalent to JPY xxx xxxx with exchange rate xxxxxxx assuming the demarcation between local portion and JICA portion for construction cost with ratio of xxx % and xxx %.

Table 4.3 Project Cost for Yen Loan (Equivalent JPY)

Table 4.4 Project Cost for Yen Loan (Equivalent Sol.)

4.3 Financial Sources

(1) Japanese Yen Loan

The following conditions for Japanese Yen Loan will be applied.

Interest	1.70%
Commitment Charge	0.10%
Maturity Period	25 years
Grace Period	7 years

(2) Financing Plan

Loan ratio for local portion among central government (Ministry of Agriculture: MINAG), provincial government and water user association is 80%:15%:5%. Total shares of each organization including JICA portion are summarized in ***Table 4.5***.

Table 4.5 Financing Plan

CHAPTER 5 IMPLEMENTATION PLAN OF PROJECT

5.1 Implementation Procedure

Process of project implementation is as follows.

- Pre-Investment : 1) Completion of Pre-F/S and Feasibility Study and SNIP approval
  2) Loan Agreement
- Investment : 3) Selection of Consultant
  4) Consulting Services (Detailed Design, Preparation of Tender Document)
  5) Selection of Contractors
  6) Construction
- Post-Investment : 7) Completion of Construction and Inauguration to Water User Associations
  8) O&M

5.1.1 National Public Investment System (SNIP)

National Public Investment System (SNIP) was established based on Law No. 27293 issued on June 28, 2000. The objective of SNIP is effective use of public resources in public investment projects. SNIP states principles, process, methods and technical regulations which executing agencies shall adhere in public investment plans and projects.

As shown in ***Figure 5.1,*** SNIP obligates the appraisal procedure in each project cycle, i.e. pre-investment, investment and post-investment stages.

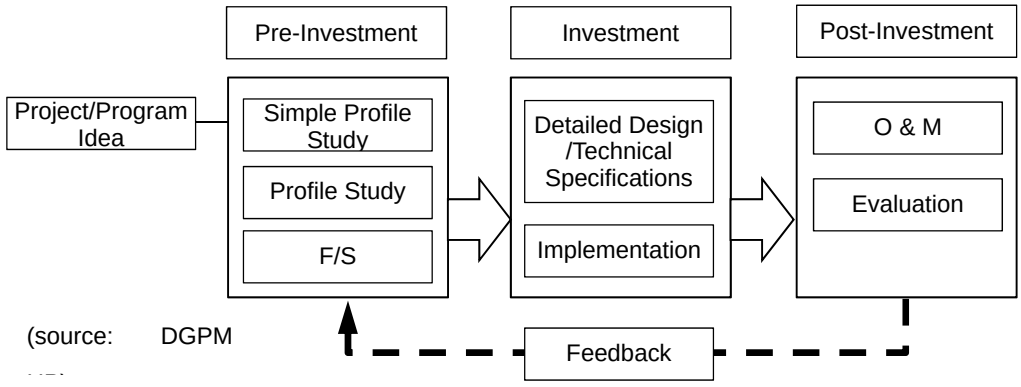


Figure 5.1 **SNIP Project Cycle**

5.1.2 Related Agencies and Organizations

For the implementation of project, involvement of the following agencies and organizations is required.

(1) Related Agencies

The following agencies shall take principal role for the project. Expected tasks of MINAG, MEF and Water User Association in each river basin are summarized in ***Table 5.1***.

- Ministry of Agriculture (Ministerio de Agricultura: MINAG)
- Ministry of Economy and Finance (Ministerio de Economía y Finanzas:MEF)
- Provincial Government
- Water User Associations including communities

Table 5.1 **Tasks of Related Agencies**

No.	Agency	Main Tasks
1.	Ministry of Agriculture (MINAG)	● Responsible Ministry is MINAG as formulating unit (UF) and executing unit (UE). Directorate General of Hydraulic Infrastructure (Dirección General de Infraestructura Hidráulica: DGIH) is the executing agency who conduct administration and supervision of investment the program. ● In the during-investment stage, Irrigation Sub-sector Program (Programa Subsectoral de Irrigaciones: PSI) of MINAG will implement cost estimate, detailed design and construction supervision while Directorate of Research will implement project formulation studies and planning. ● Investment Program Office (Oficina de Programación e Inversiones: OPI) of MINAG is responsible agency for examination of Pre-F/S and F/S in the pre-investment stage, and implement application for approval of Pre-F/S and F/S to Directorate General of Investment Policy (Dirección General de Política de Inversiones: DGPI, former DGPM) of MEF. ● General Administration Office (Oficina General de Administración: OGA) of MINAG will conduct financial management in cooperation with Directorate General of Debt and Treasury (Dirección General de Endeudamiento y Tesoro Público: DGETP, former DNEP) of MEF. Besides, OGA will conduct budget execution such as bidding, work order, contract and procurement. ● Directorate General of Environmental Matters (Dirección General de Asuntos Ambientales: DGAA) will conduct appraisal and approval for EIA in the pre-investment stage.
2.	Ministry of Economy and Finance (MEF)	● DGPI has the authority for approval of F/S and loan agreement. Besides, DGPI will give technical comments in investment stage. ● DNEP will conduct financial management in cooperation with OGA of MINAG. ● DNEP will aslo conduct expenditure control in investment and post-investment stage.
3.	Water User Associations	● Water User Association will conduct O&M in post-investment stage.

Relation among the relevant agency in the investment and post-investment stages are summarized in ***Figure 5.2*** and ***Figure 5.3***.

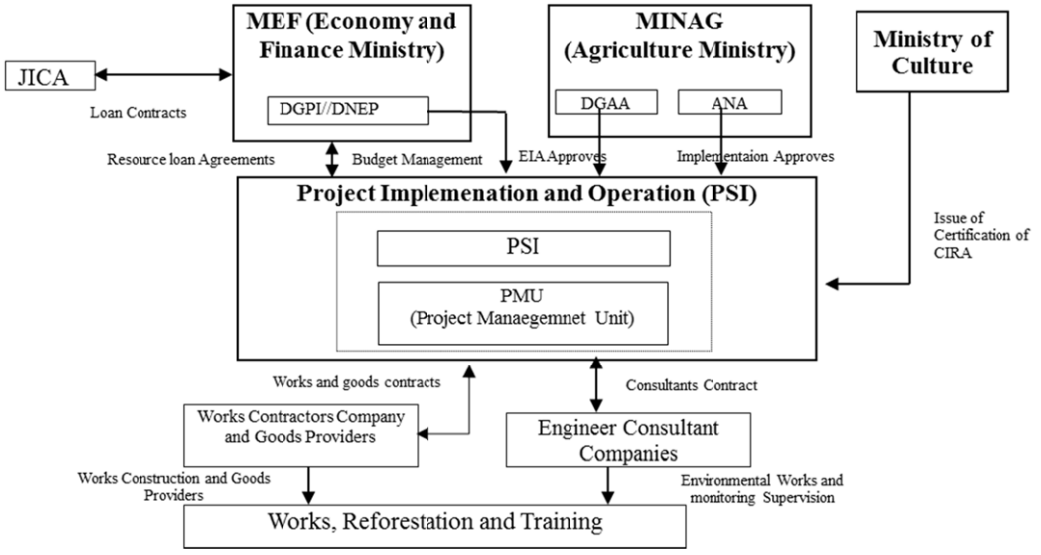


Figure 5.2 **Related Agencies (Investment Stage)**

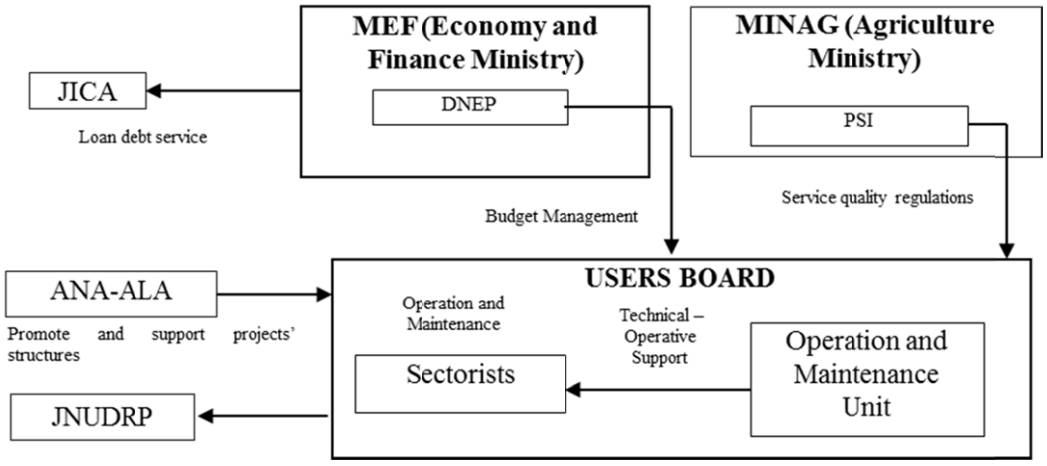


Figure 5.3 **Related Agencies (Post-Investment Stage)**

(2) Related Organization

For implementation of the Project, the following organizations are required to be participated. Expected tasks of organizations are summarized in ***Table 5.2***.

- Project Management Unit (PMU)
- Consultant (CS)
- Contractors
- NGO (if necessary)

Table 5.2 **Tasks of Related Organizations**

No.	Organization	Main Tasks
1.	Project Management Unit (PMU)	● PMU belongs to the executing agency and take responsible for project implementation. ● PMU consists of technical, administration and social section, and will conduct project implementation, reporting to relevant agencies, monitoring and evacuation and supervision of technical cooperation. ● PMU should have and authority to approve contract between consultant or contractors as the representative of executing agency. ● PMU will conduct quality control of consultant and contractors. ● Besides, PMU shall facilitate related district agencies, water user associations and NGO's. ● PMU will conduct progress control of consulting services.
2.	Consultant	● Consultant will conduct detailed design, tender assistance for selection of contractors such as PQ, tender and evacuation. ● Consultant will conduct construction supervision for structural measures, non-structural measures and technical cooperation.
3.	Contractor	● Contractor will conduct construction works with facilitating of participation of local resources as labor. ● Contractor will conduct O&M of plantation and facilities. ● Contractor will conduct environmental monitoring during construction under the instruction of PMU.
4.	NGO (If necessary)	● NGO will conduct plantation program such as training to communities, formulation of detailed plantation plan, organizing of plantation team, and training of production of seedling. ● NGO will coordinate of meetings with beneficially in downstream area about plantation program in upstream and will conduct watershed management activity for sustainable preservation of forest and establishment of flood control function by forest.

5.2 Implementation Schedule

5.2.1 General

For commencement of the Project, SNIP appraisal and approval, loan agreement between the government of Peru and Japan, and selection of consultant are required. Necessary periods for each process after the loan agreement are summarized in ***Table 5.3***.

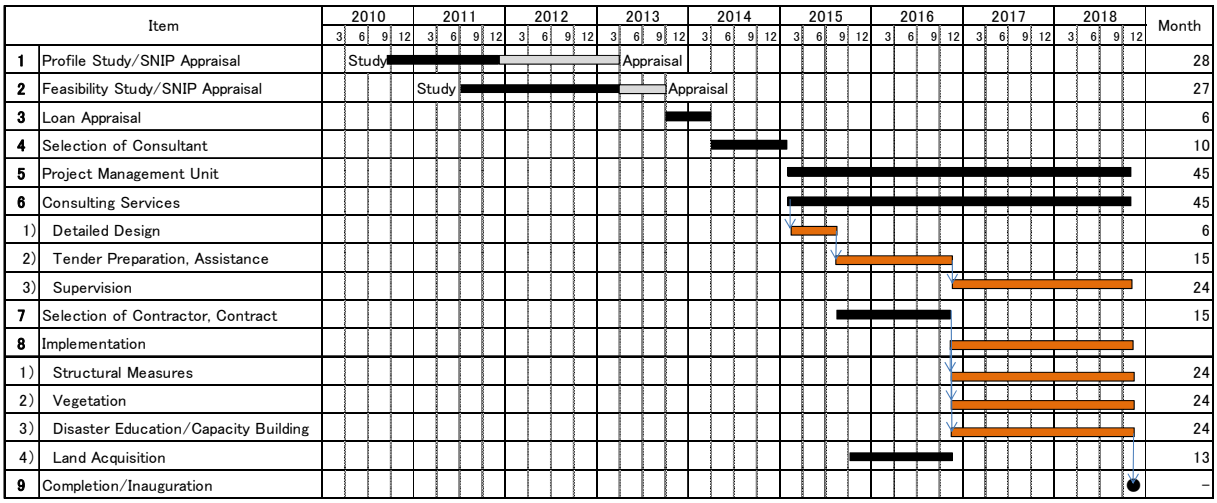
Table 5.3 **Necessary Period of Work Stage**

No.	Stage/Component	Periods	Work Contents
1.	Selection of Consultant	10months	Selection of consultant for optimal consulting services
2.	Detailed Design	6months	Detailed design of structural and non-structural measures.
3.	Selection of Contractor	15months	From preparation of tender documents, to PQ, tendering, evacuation and to contract with selected contractors.
4.	Construction	24months	Construction period of structural measures in each river basin.
5.	Disaster Education/ Capacity Building	24months	Preparation and implementation of disaster education/capacity building
6.	Land Acquisition/ Compensation	13 months	Survey, socialization, negotiation and payment period for land acquisition/compensation
7.	Completion and Inauguration	-	Completion of facilities and inauguration to water user associations

5.2.2 Implementation Schedule

Implementation schedule of the Project is shown in ***Table 5.4***.

Table 5.4 **Implementation Schedule**



5.3 Procurement Methods

(1) Selection of Consultant

Since the Project is financed by Japanese Yen loan, international consultant who has enough international and technical experiences and qualification shall be selected properly and promptly in accordance with consultant procurement guideline of JICA.

(2) Selection of Contractor

For the selection of contractors for construction works and non-structural measures, International Competitive Bidding (ICB) is recommended considering scale of works, economical efficiency, fairness and compliance of tendering. Since the scale of construction works is more than JPY 500 million for each package, prequalification (PQ) shall be conducted to screen the applicants with experiences, financial capability, personnel, equipment and facility capability. All the passed applicant with PQ can participate in the tender.

5.4 Operation and Effective Indicators

For evaluation of loan project, the following operation and effective indicators is to be set by the Government of Peru and JICA, and the executing agency shall observe these indicators for monitoring of the Project effect. 7 years after the project completion, JICA will conduct post evaluation of loan project, and these indicators are also used for the evaluation. The operation and effective indicators of proposed Project are summarized in ***Table 5.5***.

- Operation Indicator : Quantitative Indicator showing the conditions of operation of facilities
- Effective Indicator : Quantitative Indicator showing the Project effects

Table 5.5 **Operation and Effective Indicators for Each River Basin**

River Basin	Indicator	Indicator	Original (Yr 2008)	Target (Yr 2015)
Canete Basin	Operation	Annual maximum discharge	1,033 m^3/s (daily discharge)	2,175 m^3/s (Design Discharge: Q50)
	Effect	Flood inundation area	1,200ha	167 ha (50-year return period)
Cinca Basin	Operation	Annual maximum discharge	500m^3/s (daily discharge)	917 m^3/s (Design Discharge: Q50)
	Effect	Flood inundation area	2,352 ha	1,020 ha (50-year return period)
Pisco Basin	Operation	Annual maximum discharge	364m^3/s (daily discharge)	855 m^3/s (Design Discharge: Q50)
	Effect	Flood inundation area	859 ha	312 ha (50-year return period)
Mehes-Camavana Basin	Operation	Annual maximum discharge	1,313m^3/s (daily discharge)	2,084 m^3/s (Design Discharge: Q50)
	Effect	Flood inundation area	3,098 ha	545 ha (50-year return period)

Besides, as described in Chapter 6, the Project effect can be evaluated with the following two indicators by analyzing agricultural product and occurrence of traffic obstacle.

1) Stable agricultural products are expected due to protection of irrigation intakes in 4 rivers.
2) Road collapse will not occure resulting controibution to stable ditribution system and daily life of residents.

CHAPTER 6 PROJECT EVALUATION

6.1 Balance between Demand and Supply

Most of flood hazard area is farm land. Based on instruction and discussion with OPI of MINAG, difference between proposed dyke elevation and existing dyke/land elevation is set as the indicator showing balance between demand and supply. Priority of flood control works in each river basin is summarized in ***Table 6.1*** with basic social data such as irrigation area, number of farm household and beneficially.

Table 6.1 **Balance between Demand and Supply**

Item \ Basin		Canete	Chinca		Pisco	Majes-Camana	Total
			Chico	Matahente			
No. of Water User Association		7	14		19	83	123
Irrigation Area (Beneficial Area) (ha)		22,242	25,629		22,468	14,301	84,640
No. of Farm Household		5,843	7,676		3,774	5,907	23,200
Beneficially		26,294	34,542		16,983	26,581	104,400
50 years' Probable Flood (Demand)	Design Discharge (m3/sec)	2,175	459	459	855	2,084	-
	Design High Water Level (EL.m)	188.77	144.00	132.21	214.82	398.84	-
	Free board (m)	1.20	0.80	0.80	1.00	1.20	-
	Necessary Dyke Elv.(EL.m)	185.97	144.80	133.01	215.82	400.04	-
Current Condition (Supply)	Existing Dyke Level, Left(EL.m)	188.40	144.81	133.72	219.82	401.90	-
	Existing Dyke Level, Right(EL.m)	184.10	145.29	133.12	217.26	405.19	-
Balance	Left (m)	1.18	0.40	0.29	0.63	0.85	-
	Right (m)	2.03	0.45	0.36	0.76	0.65	
Priority based on Balance		A	D	D	C	B	-

Notes: 1) Family number per household is assumed as 4.5/household.
2) Demand and Supply are averages of calculation and survey data for whole section.
3) If existing dyke level is higher than necessary dyke elevation, value of balance becomes 0.

6.2 Benefit of Flood Control Project

(1) Estimation of Damage

Benefit of flood control project is damage reduction by implementation of the project based on damages with the project and without the project. Assuming the project life of 50 years, annual average damage reduction cost is estimated calculating damage by probable floods (2 to 50 years) and their occurrence probabilities. ***Table 6.2*** shows estimated major damage by 50 years' probable floods based on the inundation analysis conducted in 2010.

Table 6.2 **Estimated Damage by 50 years' Probable Floods**

River Basin	Inundation Area (ha)			Farmland Erosion (ha)	Irrigation Intake (Nos.)	Road Damage (Location)
	Farm Land (ha)	Residential Area (ha)	Total (ha)			
Canete	1,200.1	56.9	1,256.9	202.0	2	3
Chinca	2,352.0	39.0	2,391.0	133.0	2	3
Pisco	859.0	74.6	933.6	98.0	4	1
Majes-Macana	3,097.6	52.8	3,150.4	1,318	13	1
Total	7,508.69	223.30	7,732.0	1,751	21	8

(2) Estimated Damage Cost by Probable Floods

Estimated damage costs by probable floods occurrence with and without the projects are summarized in ***Table 6.3***. Without the project, damage costs by 50 years' probable flood are estimated at s /648,216,000 as total.

Without the project, damage costs by 50 years' probable flood are S/. 225,586,000 for Canete, S/.133,108,000 for Chinca, S/.87,899,000 for Pisco and S/.201,622,000 for Majes-Camana.

Table 6.3 **Estimated Damage Costs**

s/1,000

Case (Caso)	Year (t)	Economic Price (Precios Sociales)				
		Cañete	Chincha	Pisco	Majes-Camana	Total
With Project (Sin Proyecto)	2	2,711	16,758	17,099	317	36,885
	5	11,180	44,275	22,817	48,503	126,775
	10	110,910	74,539	54,702	78,738	318,889
	25	153,056	101,437	64,250	113,789	432,533
	50	225,586	133,108	87,899	201,622	648,216
Without Project (Con Proyecto)	2	293	456	310	0	1,060
	5	1,077	4,859	433	8,540	14,909
	10	10,834	6,955	3,243	17,867	38,900
	25	15,524	18,932	8,543	31,916	74,915
	50	21,787	34,979	11,643	54,564	122,973

(3) Project Benefit

The project benefit in the project life of 50 years from commencement of project is summarized in ***Table 6.4***.

Table 6.4 **Project Benefit**

(4) Expected Benefit

The following benefits are expected by the Project implementation.

1) Farmland of 5,465 ha is protected in the whole 4 river basins.
2) Annualy, soil erosion of the farmland of 1,830ha and an outflow are protected by the river improvement work in the whole 4 river basin.
3) By preserving 21 intake weirs, the stable cultivation of land becomes possible.
4) In eight road collapse, contributes to the stability of life and market.
5) In the whole river basins, it is expected that annual benefit can be obtained 68,242,000 s./, and 1,023,620,000 s./ for 15 years evalutation period.

6.3 Economic Evaluation

The objective of economic evaluation in the Project is to examine the effectiveness of investment to flood control measures in the aspect of national economy by cost-benefit analysis. As indicators for evaluation, benefit-cost ratio, net present value and economic internal rate of return are applied.

As same as the project cost based on SNIP, social cost of Japanese loan project is calculated based on the Guideline of National Public Investment System (Directorial Resolution No. 003-2011-EF/68.01, Annex SNIP 10-V3.1) (Refer to Annex-10). Social cost based on Japanese loan project is summarized in ***Table 6.5***.

Table 6.5 **Social Cost of Japanese Loan Project**

The result of economic evaluation is shown in ***Table 6.6***. As shown below, the project is evauluated as feasible and it is expected that the project contributes to regional economic growth.

- Benefit-Cost Ratio (B/C): 3.59
- Net Present Value (NPV): s./ 422,785,042
- Economic Internal Rate of Return (EIRR): 30.6%

Table 6.6 **Result of Economic Evaulation**

6.4 Sustainability of Public Investment Plan

The project is to be implemented in cooperation with national governemnt (DGIH), water user associations and local governments and the project cost is shared by them. Besides, O&M of facilities is conducted by the water user associations. Therefore, sustainabiliy of project is evaluated by profitability and capacity the water user associations for O&M.

(1) Profitability

As described in Annex-10, IERR of each river basin estimated using SNIP project costs is exceeds 10 %. It is judged that economic efficiency of the project is remarkably high.

(2) O&M Cost

Necessary O&M cost after completion of the project, ratio of O&M cost to annual budget of water user associations in 2009, ratio of O&M cost to average annual average damage redution cost are summarized in ***Table 6.7***.

Ratio of O&M cost to annual budget of water user associations in 2009 is the highest in Majes-Macana, 2nd highest in Pisco and low in Canete and Chinca. Ratio of O&M cost to average annual average damage redution cost is low in all basins, 2-4%. Thus, it is estimated that water user associations afford to bear O&M cost.

Besides, as tehnical aspect, O&M by water user associations with asistances by DGIH and local governments is available since the facilties to be constructed by the project such as dyke and weir are familiar by them.

Table 6.7 **Ratios of O&M Cost to Annual Budget of Water User Associaions and to Average Annual Damage Reduction Cost**

River Basin	Annual Budget (x 1,000 S/)	Annual Maintenance Budget (x 1,000 S/)	Ratio of Annual Maintenance Budget (%)	Annual Mean Dameged Deduction Amount (x 1,000 S/)	Ratio of Annual Maintenance Budget (%)
	(1)	(2)	(3)=(2)/(1)	(4)	(5)=(2)/(4)
Canete	2,331	260	11.1	12,274	2.1
Chincha	1,483	435	29.3	20,532	2.1
Yauca	1,725	383	22.2	17,844	2.1
Majes-Camana	1,959	710	36.2	17,592	4.0
Total	7,499	1,788	23.8	68,242	2.6

6.5 Environmental Evaluation

In Peru, project is categorized into 3 categories based on expected scale of socio environmental

impacts generated by project inplementation. This classification is conducted by Directorate General of the section in charge of competent ministry.

Executing agency provides IEE (Evaluación Ambiental Preliminar: EAP) Report to Directorate General of Environmental Matters (Dirección General de Asuntos Ambientales: DGAA) with application of classification. DGAA examine the EAP Report and categorized a proposed project. No more envirnmental study is required if a project is catogorized into Category I.

EAP on the project was conducted by a local consultant (CIDES Ingenieros S.A.) in December, 2010 to January 2011 for Canete, Chinca and Pisco, and in September to October, 2011 for Majes-Camana.

DGAA has completed evaluation of EAP for Canete, Chinca anc Pisco on December 6 to 28, 2011 and the the project for this 3 river basin is catogorized into Category I. Besides, evacuation of EAP for Majes-Camana was completed on Agusust 16, 2012 that Majes-Camana is also categorized into Category I.

According EAP, most of environmental impacts generated by the project during and after construction is evaluated as not so significant. Some significant impacts also can be prevent or mitigated by application of proper implementation of environmental management plan.

Attachment-1 :
TOR for Consulting Services

<u>Attachment-2:</u>
Project Cost Estimate

<u>Attachment-3:</u>
Examination of Cost Reduction

Attachment-4:
Environmental Check List