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

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FEASIBILITY STUDY REPORT
SUPPORTING REPORT

Annex-13
Stakeholder Meeting

TABLE OF CONTENTS

Pages

LIST OF TABLES

Pages

LIST OF FIGURES

Pages

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

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

TABLE OF CONTENTS

Pages

CHAPTER 3 PROJECT COMPONENT

CHAPTER 4 PROJECT COST

CHAPTER 5 IMPLEMENTATION PLAN OF PROJECT

CHAPTER 6 PROJECT EVALUATION

ATTACHMENT

LIST OF TABLES

Pages

LIST OF FIGURES

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

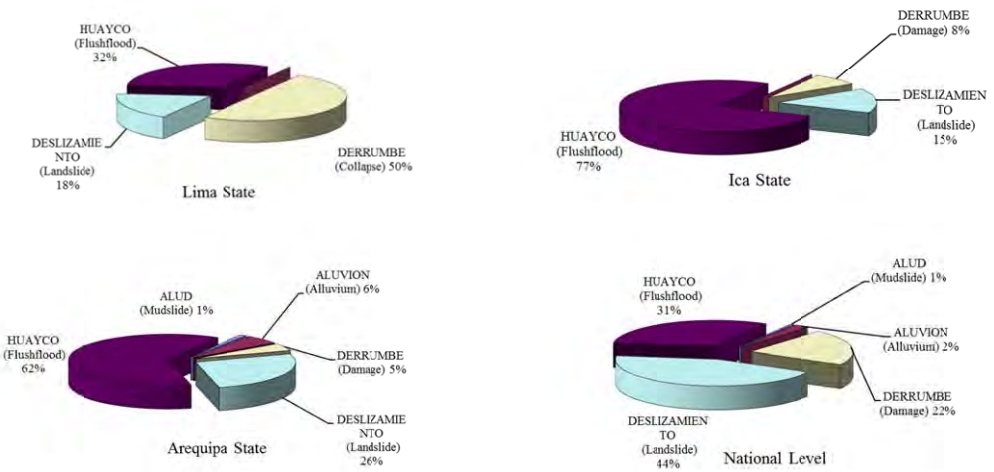


Figure 2.1 **Rate Occurrence of Disaster in National Level and Target River Basis**

(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 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	1,100 m
						Dike with bank Protection	5,430 m3
						Large Boulder Riplap	
							9,920m3
	Ca-2	6.7～8.3 km	Innnuded Point		Dike with bank Protection	Length	3,200 m
						Dike with bank Protection	113,700 m3
						Large Boulder Riplap	28,200 m3
	Ca-3	10.1-11.2 km	Narrow Section		Riverbed excavation, Dike with bank Protection	Riverbed excavation	L=700 m, V=80,270m3
						Dike with bank Protection	1,630 m
						Large Boulder Riplap	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	L=370 m, V=34,400 m3
						Dike with bank Protection	L=710m, V=20,150 m3
						Large Boulder Riplap	7,300 m3
	Ca-5	25.1-26.6 k	Narrow Section	Agrictural lands	Dike with bank Protection	Length	1,520 m
						Dike with bank Protection	95,125 m3
						Large Boulder Riplap	14,000 m3

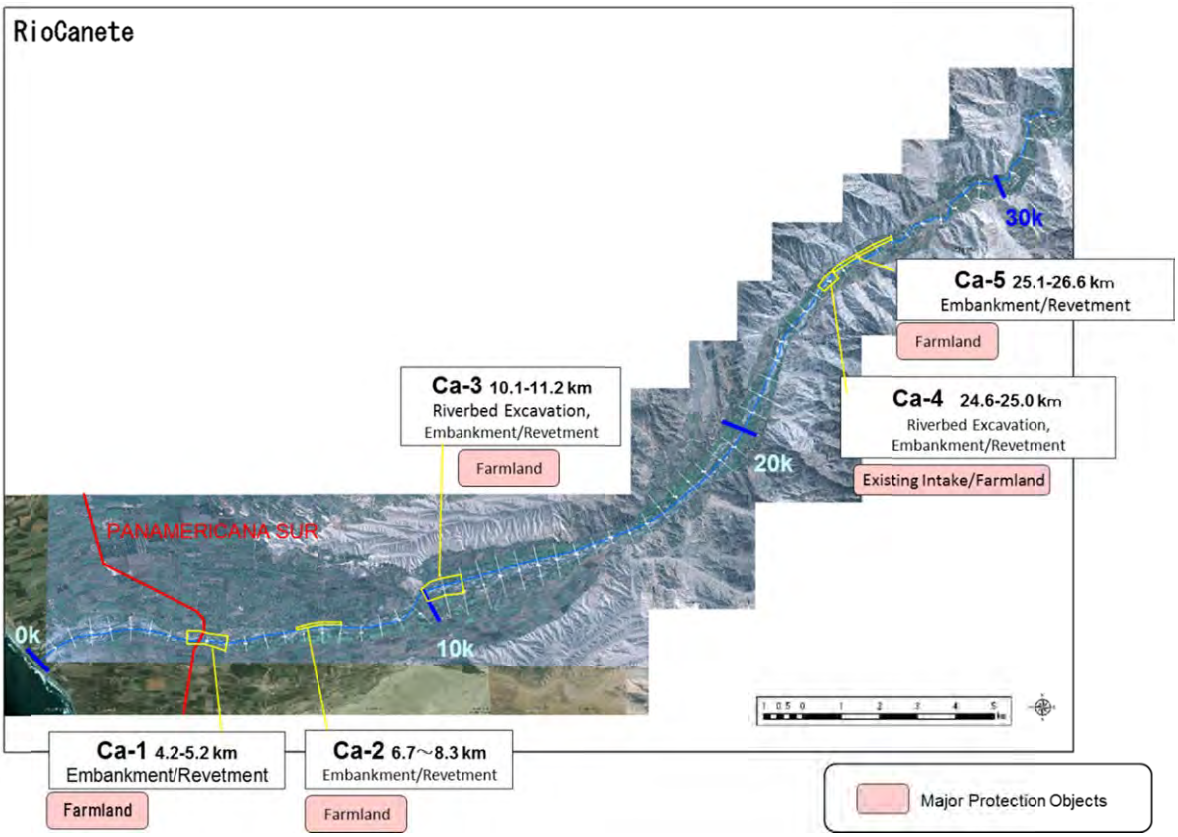


Figure 3.1 **Location of Proposed Structure Measures in Canate River**

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 channel

(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

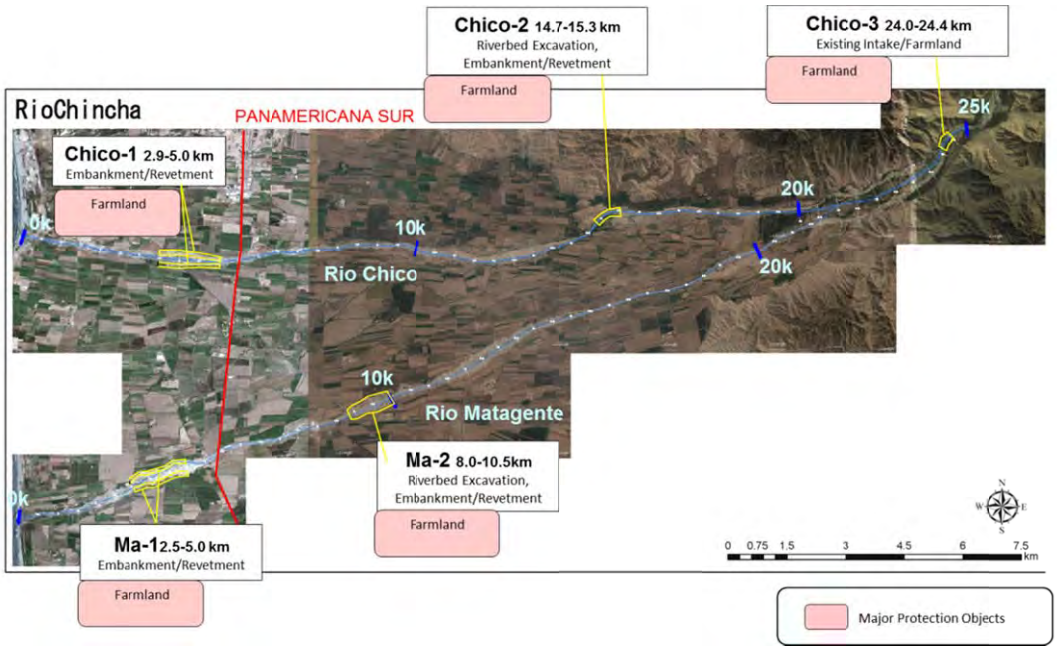


Figure 3.2 **Location of Proposed Structure Measures in Chincha River**

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

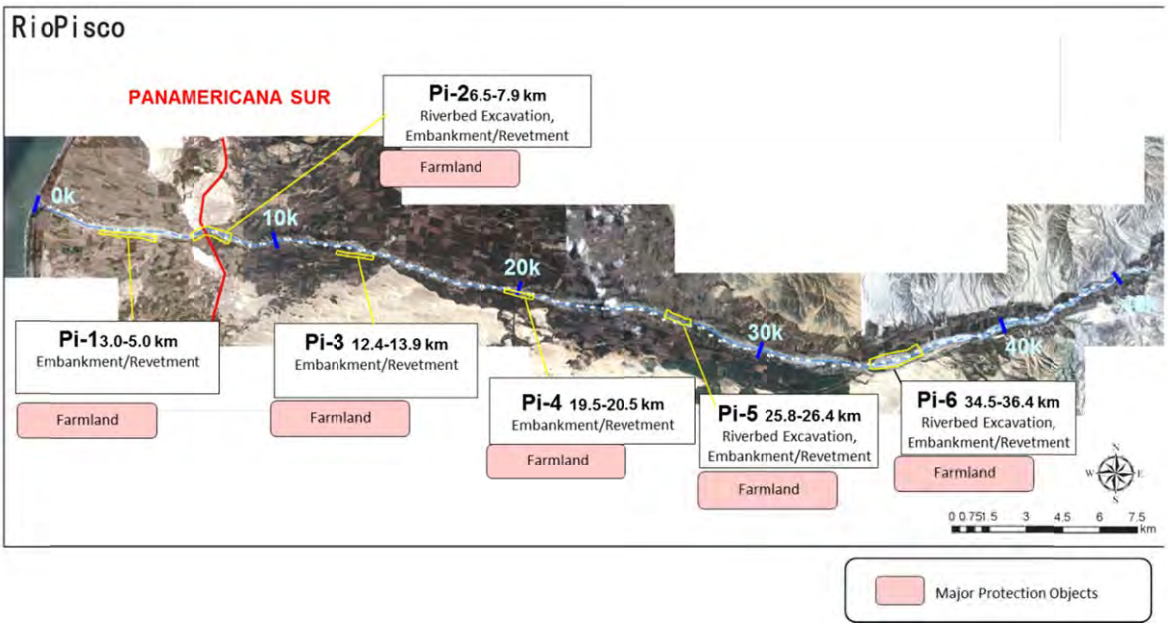


Figure 3.3 **Location of Proposed Structure Measures in Pisco River**

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.

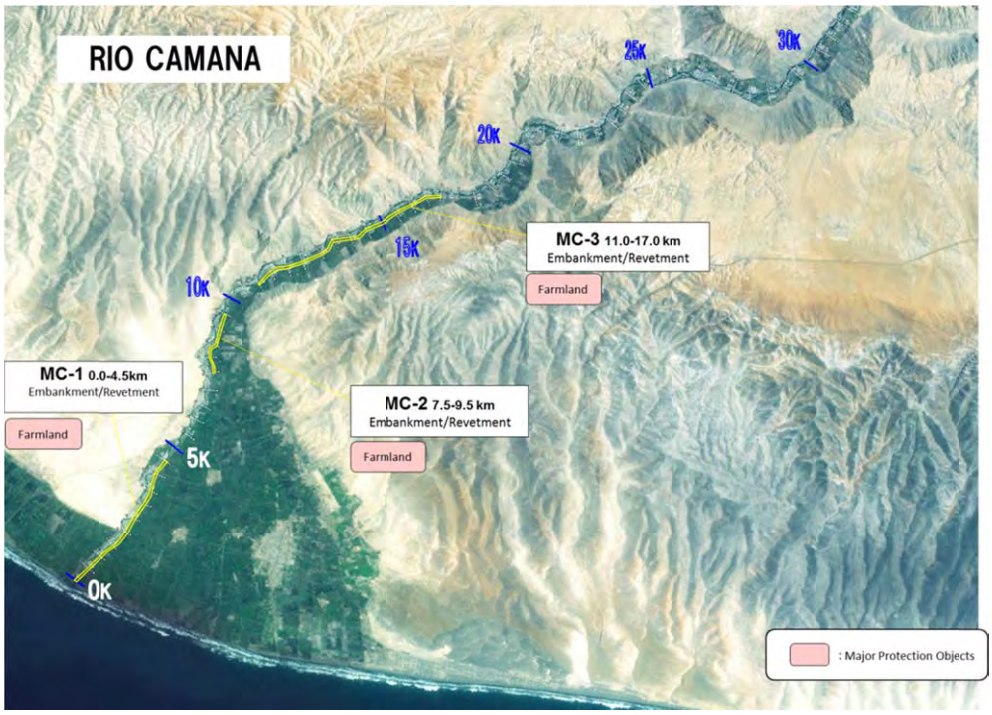
(2) Propose Structures

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.

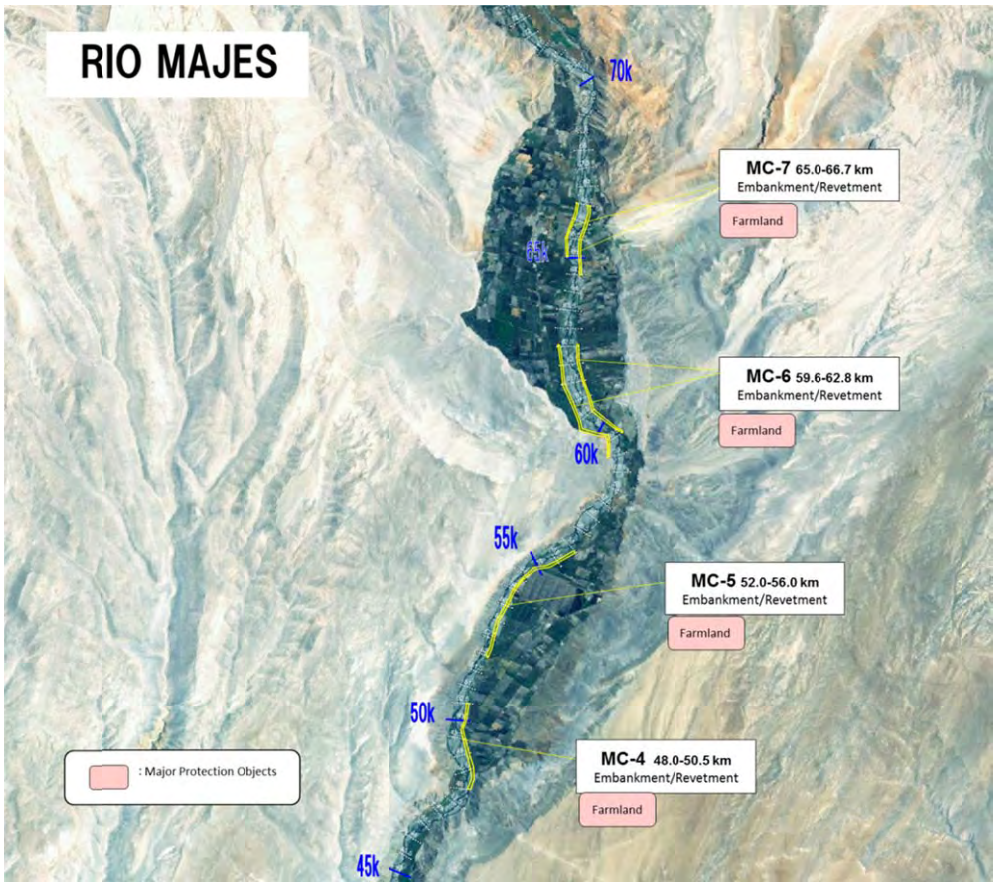
➢ Dike and Riverbank Protection Work : Total Length 28,400m

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	4,500 m
						Dike with bank Protection	155,700 m3
						Large Boulder Riplap	44,300 m3
	MC-2	7.5-9.5 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	2,000 m
						Dike with bank Protection	43,100 m3
						Large Boulder Riplap	18,300 m3
	MC-3	11.0-17.0 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	6,000 m
						Dike with bank Protection	169,000 m3
						Large Boulder Riplap	59,000 m3
Rio Majes	MC-4	48.0-50.5 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	2,500 m
						Dike with bank Protection	75,200 m3
						Large Boulder Riplap	17,700 m3
	MC-5	52.0-56.0 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	4,300 m
						Dike with bank Protection	179,000 m3
						Large Boulder Riplap	39,400 m3
	MC-6	59.6-62.8 km	Innnuded Point, local erosion	Agrictural lands	Dike with bank Protection	Length	6,200 m
						Dike with bank Protection	235,000 m3
						Large Boulder Riplap	51,400 m3
	MC-7	65.0-66.7 km	Innnuded Point	Agrictural lands	Dike with bank Protection	Length	2,900 m
						Dike with bank Protection	32,300 m3
						Large Boulder Riplap	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***.

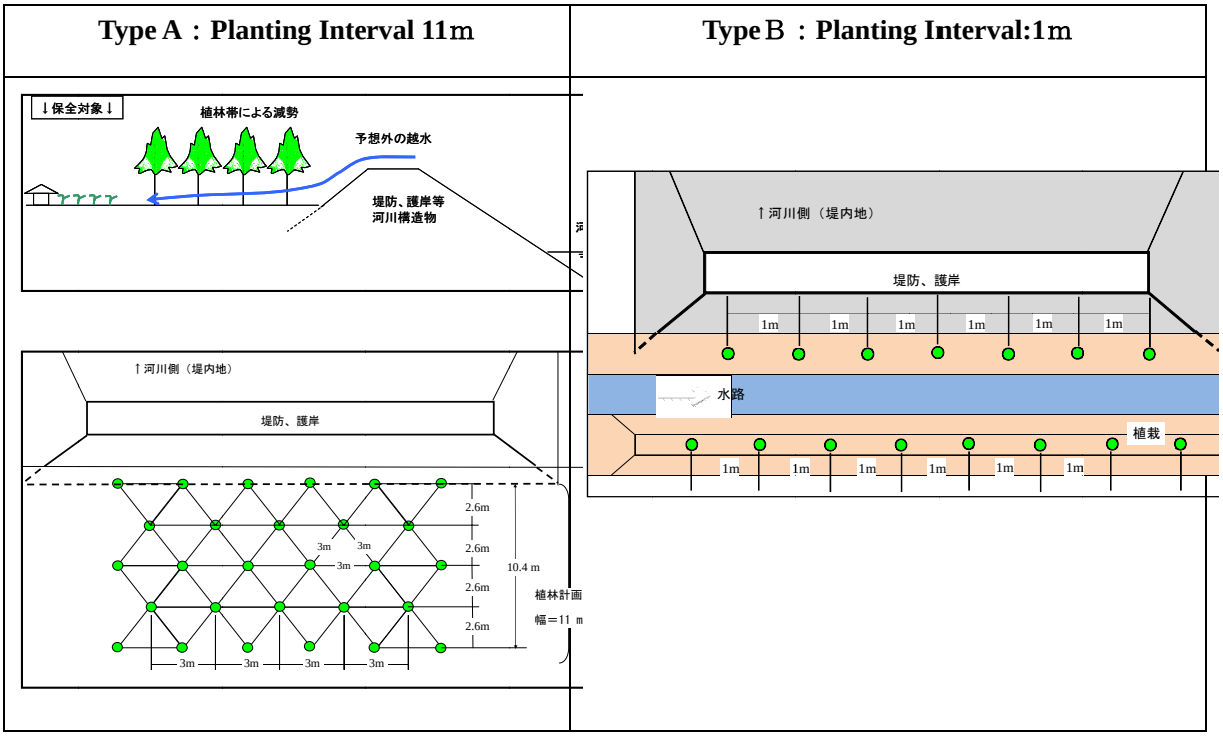


Figure 3.5 **Layout image of Afforestation Along A River Structure (Type A and B)**

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./199,550,699 ● 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./169,110,763 ● 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./30,439,937) Included in Construction Cost	Tax: S./39,973,080 18 % of following items. ● Construction Cost (Japanese Loan) ● Consulting Service Cost ● Price Escalation ● Physical Contingency ● Land Acquisition Cost
(3)	Consulting Service Cost: S./24,219,940 ● Detailed Design ● Supervision Remuneration and Direct Cost is estimated. Escalation and contingency are not included. Tax is included.	Consulting Service Cost: S./21,814,445 ● Detailed Design ● Supervision Remuneration and Direct Cost is estimated. Escalation and contingency are included. Tax is not included.
(4)	Land Acquisition Cost：S./7,185,491	Land Acquisition Cost: S./8,292,338 Escalation and contingency are included.

	SNIP	Japanese Loan
(5)	Administration (PMU)：S./8,518,170 Following personnel and office expenses is estimated. ● PMU Personnel ● Audit Cost ● Capacity Building Cost ● Supervision Cost ● Office Necessity Cost ● Travel Cost	Administration (PMU): S./11,518,250 5 % of the following items. ● Construction Cost ● Consulting Service Cost ● Price Escalation ● Contingency ● Land Acquisition
(6)	Price Escalation: Not included.	Price Escalation：S./21,611,356 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./9,536,106 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./2,171,136 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./506,143 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 August 1, 2011 is applied for direct cost of construction.
- Base Year for Estimate: October 2011
  Exchange Rate: US$1= S./2.59 = ¥ 83.6
  S./1 = ¥ 32.3
- 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) : JPY 2,500,000.-
Local (Pro-B) : S./10,000.-
Supporting Staff : S./4,000.-

- Physical Contingency Rate: 5.0 % for both Construction and Consulting Services
- VAT : 18 %
- Import Tax: 0.0%
- Administration Cost: 5.0%
- Interest duing Construction: Construction: 1.7%, Consulting Services: 0.01%
- Commitment Charge: 0.1%

(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

Item	Package-1 CAÑETE (Soles)	Package-2 CHINCHA (Soles)	Package-3 PISCO (Soles)	Package-4 MAJES-CAMANA (Soles)	Total (Soles)	Rquivalent Yen (Rounddown) (Yen)
Construction Cost						
(1) Structural Measures	16,372,964	27,034,915	38,153,595	48,631,459	130,192,933	4,205,231,000
(2) Vegetation Works	26,746	76,593	947,940	268,196	1,319,475	42,619,000
(3) Environmental Measures	585,576	798,096	772,915	1,043,414	3,200,002	103,360,000
(4) Disaster Education/Capacity Building	144,050	144,050	144,050	144,050	576,200	18,611,000
Direct Cost	17,129,336	28,053,654	40,018,500	50,087,119	135,288,610	4,369,822,000
(5) Indirect Cost 15 %	2,569,400	4,208,048	6,002,775	7,513,068	20,293,291	655,473,000
(6) Benefit 10 %	1,712,934	2,805,365	4,001,850	5,008,712	13,528,861	436,982,000
Sub-total	21,411,671	35,067,068	50,023,125	62,608,899	169,110,762	5,462,277,000
(7) Tax 18 %	3,854,101	6,312,072	9,004,162	11,269,602	30,439,937	983,209,000
Total	25,265,771	41,379,140	59,027,287	73,878,501	199,550,699	6,445,487,000
Consulting Service Cost						
(1) Detailed Design	1,236,604	2,025,254	2,889,022	3,615,898	9,766,778	315,466,000
(2) Supervision	1,829,962	2,997,030	4,275,259	5,350,910	14,453,162	466,837,000
Total	3,066,566	5,022,284	7,164,281	8,966,808	24,219,940	782,304,000
(1) Land Acquisition Cost	1,263,432	622,981	352,567	4,946,510	7,185,491	232,091,000
(2) Administration (PMU)	1,078,514	1,766,341	2,519,683	3,153,633	8,518,170	275,136,000
Ground Total	30,674,283	48,790,746	69,063,818	90,945,452	239,474,300	7,735,018,000
Equivalent Yen	990,779,000	1,575,941,000	2,230,761,000	2,937,538,000	7,735,019,000	
				Exchange Rate :	32.3 Yen/S.	

(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$ 25 million (equivalent to JPY 2.09 billion with exchange rate JPY 83.6/US$), assuming the demarcation between local portion and JICA portion for construction cost with ratio of 79.3% and 20.7%.

Table 4.3 Project Cost for Yen Loan (Equivalent JPY)

S./ 1 = 32.3 Yen

Item	Yen Portion			Local Currency Portion			Total		
	Total	JICA	Peru	Total	JICA	Peru	Total	JICA	Peru
Package-1: Canete River Improvement Work	357,555,000	74,014,000	283,541,000	334,046,600	69,154,300	264,892,300	691,597,000	143,161,000	548,436,000
Package-2: Chica River Improvement Work	514,475,000	106,496,000	407,978,000	618,189,700	127,972,600	490,217,100	1,132,666,000	234,462,000	898,204,000
Package-3: Pisco River Improvement Work	836,724,000	173,202,000	663,522,000	779,011,400	161,273,900	617,769,800	1,615,747,000	334,460,000	1,281,287,000
Package-4: Majes-Camana River Improvement Work	1,046,391,000	216,603,000	829,788,000	975,879,900	202,004,200	773,875,700	2,022,267,000	418,609,000	1,603,658,000
Price Escalation	361,040,000	74,735,000	286,304,000	337,018,200	69,768,000	267,250,200	698,047,000	144,496,000	553,551,000
Physical Contingency	155,809,000	32,253,000	123,557,000	152,197,600	31,492,500	120,705,100	308,016,000	63,759,000	244,257,000
Consulting Services	401,851,000	401,851,000	0	302,747,900	302,747,900	0	704,607,000	704,607,000	0
Land Acquisition	0	0	0	267,831,600	0	267,831,600	267,843,000	0	267,843,000
Administration Cost	0	0	0	372,031,400	0	372,031,400	372,039,000	0	372,039,000
VAT	0	0	0	1,291,127,900	0	1,291,127,900	1,291,130,000	0	1,291,130,000
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	70,128,000	0	70,128,000	0	0	0	70,128,000	0	70,128,000
Commitment Charge	16,348,000	0	16,348,000	0	0	0	16,348,000	0	16,348,000
Total	3,760,321,000	1,079,154,000	2,681,166,000	5,430,082,200	964,413,400	4,465,701,100	9,190,435,000	2,043,554,000	7,146,881,000

Table 4.4 Project Cost for Yen Loan (Equivalent Sol.)

S./ 1 = 32.3 Yen

Item	Yen Portion			Local Currency Portion			Total		
	Total	JICA	Peru	Total	JICA	Peru	Total	JICA	Peru
Package-1: Canete River Improvement Work	11,069,805	2,291,450	8,778,355	10,341,866	2,140,766	8,201,100	21,411,671	4,432,216	16,979,455
Package-2: Chica River Improvement Work	15,928,011	3,297,098	12,630,913	19,139,057	3,961,785	15,177,272	35,067,068	7,258,883	27,808,185
Package-3: Pisco River Improvement Work	25,904,767	5,362,287	20,542,480	24,118,358	4,992,500	19,125,858	50,023,125	10,354,787	39,668,338
Package-4: Majes-Camana River Improvement Work	32,396,021	6,705,976	25,690,045	30,212,878	6,254,066	23,958,812	62,608,899	12,960,042	49,648,857
Price Escalation	11,177,695	2,313,783	8,863,912	10,433,661	2,159,768	8,273,893	21,611,356	4,473,551	17,137,805
Physical Contingency	4,823,815	998,530	3,825,285	4,712,291	975,444	3,736,847	9,536,106	1,973,974	7,562,132
Consulting Services	12,441,207	12,441,207	0	9,373,237	9,373,237	0	21,814,445	21,814,445	0
Land Acquisition	0	0	0	8,292,338	0	8,292,338	8,292,338	0	8,292,338
Administration Cost	0	0	0	11,518,250	0	11,518,250	11,518,250	0	11,518,250
VAT	0	0	0	39,973,080	0	39,973,080	39,973,080	0	39,973,080
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	2,171,136	0	2,171,136	0	0	0	2,171,136	0	2,171,136
Commitment Charge	506,143	0	506,143	0	0	0	506,143	0	506,143
Total	116,418,601	33,410,331	83,008,270	168,115,017	29,857,566	138,257,451	284,533,617	63,267,897	221,265,720

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

	Percentage to Peru Portion	Percentage to Total Project Cost	Total (JPY million equivalent)	Total (SOL million equivalent)	Total (US$ million equivalent)
	(%)	(%)			
JICA		22.24%	2,044	63.27	24.43
MINAG	80.00%	62.21%	5,718	177.01	68.34
Provincial Government	15.00%	11.66%	1,072	33.19	12.81
Water User Association	5.00%	3.89%	357	11.06	4.27
Total	100.00%	100.00%	9,190	284.53	109.86

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.

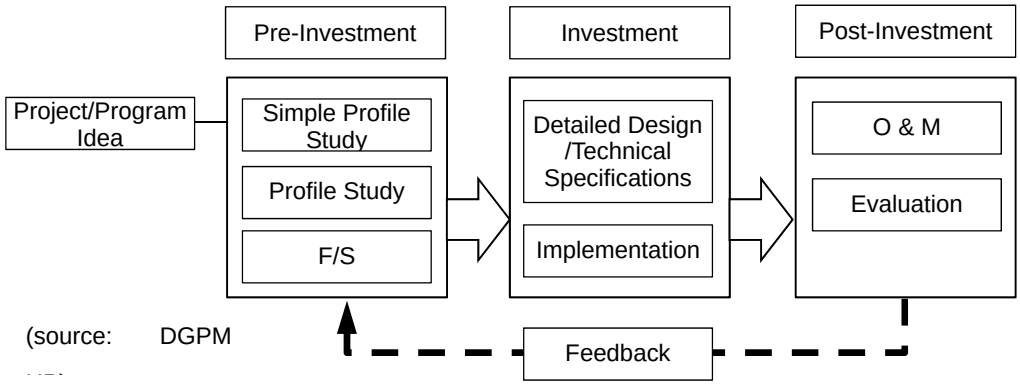


Figure 5.1 **SNIP Project Cycle**

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***.

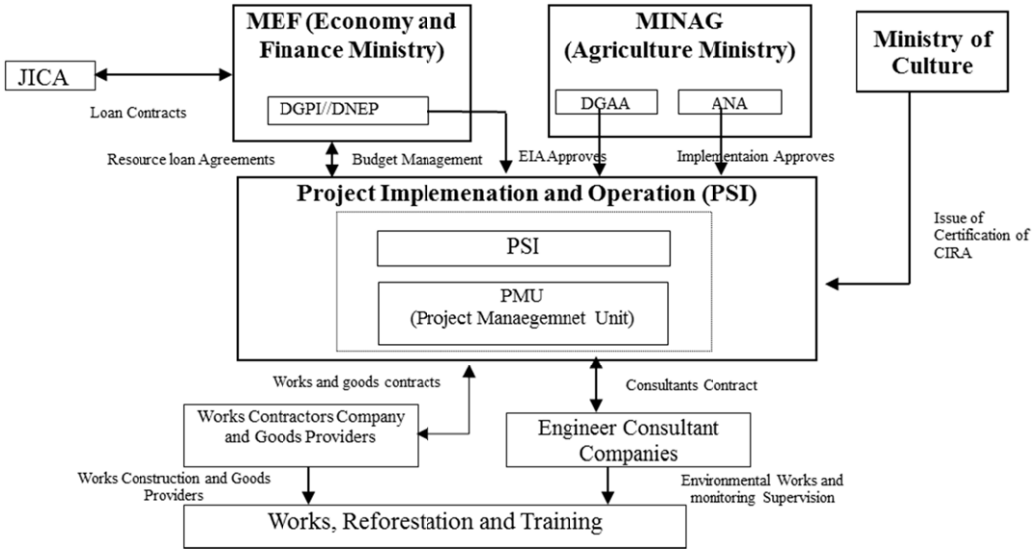


Figure 5.2 **Related Agencies (Investment Stage)**

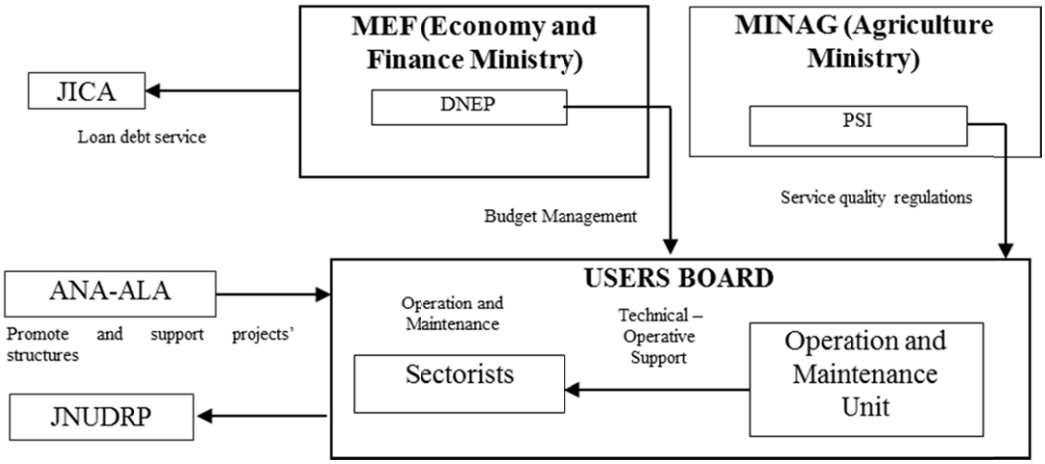


Figure 5.3 **Related Agencies (Post-Investment Stage)**

(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**

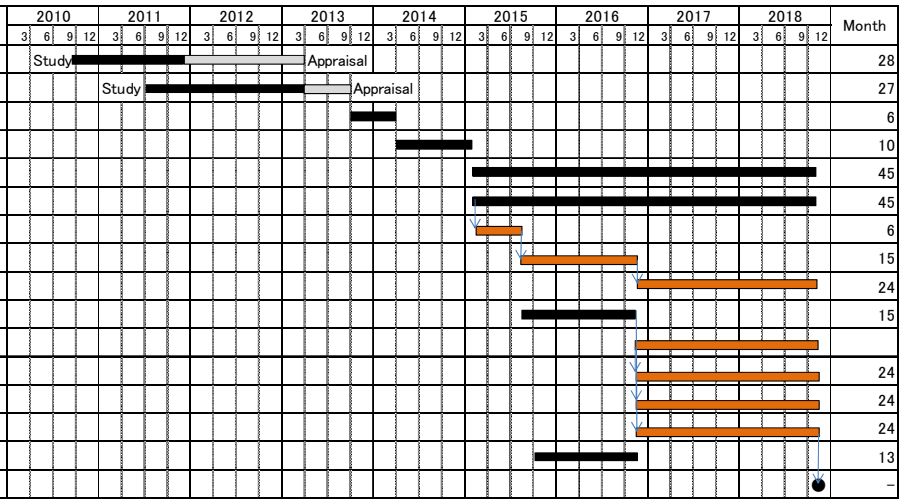
No.	Stage/Component	Periods	Work Contents
1.	Selection of Consultant	10months	Selection of consultant for optimal consulting services
2.	Detailed Design	6months	Detailed design of structural and non-structural measures.
3.	Selection of Contractor	15months	From preparation of tender documents, to PQ, 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**

	Item	Month
1	Profile Study/SNIP Appraisal	28
2	Feasibility Study/SNIP Appraisal	27
3	Loan Appraisal	6
4	Selection of Consultant	10
5	Project Management Unit	45
6	Consulting Services	45
1)	Detailed Design	6
2)	Tender Preparation, Assistance	15
3)	Supervision	24
7	Selection of Contractor, Contract	15
8	Implementation	
1)	Structural Measures	24
2)	Vegetation	24
3)	Disaster Education/Capacity Building	24
4)	Land Acquisition	13
9	Completion/Inauguration	–



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**

s/1000

River Basin	Return Period	Probability	Damage Cost: Without Project ① / Sin Proyecto ①	Damage Cost: With Project ② / Con Proyecto ②	Damage Cost: Reduction Cost ③=①−② / Daños mitigados ③=①−②	Interval Average Damage ④ Promedio de Daños	Interval Probability ⑤ Valor incremental de la probabilidad	Annual Average Damage ④×⑤ Valor Promedio del Flujo de Da ños	Accumulation of Annual Average Damage = Annual Average Damage Redcution Daño Medio Anual
CAÑETE	1	1.000	0	0	0			0	0
	2	0.500	2,711	293	2,418	1,209	0.500	605	605
	5	0.200	11,180	1,077	10,103	6,261	0.300	1,878	2,483
	10	0.100	110,910	10,834	100,076	55,090	0.100	5,509	7,992
	25	0.040	153,056	15,524	137,532	118,804	0.060	7,128	15,120
	50	0.020	225,586	21,787	203,799	170,665	0.020	3,413	18,533
CHINCHA	1	1.000	0	0	0			0	0
	2	0.500	16,758	456	16,302	8,151	0.500	4,075	4,075
	5	0.200	44,275	4,859	39,417	27,859	0.300	8,358	12,433
	10	0.100	74,539	6,955	67,583	53,500	0.100	5,350	17,783
	25	0.040	101,437	18,932	82,505	75,044	0.060	4,503	22,286
	50	0.020	133,108	34,979	98,129	90,317	0.020	1,806	24,092
PISCO	1	1.000	0	0	0			0	0
	2	0.500	17,099	310	16,788	8,394	0.500	4,197	4,197
	5	0.200	22,817	433	22,384	19,586	0.300	5,876	10,073
	10	0.100	54,702	3,243	51,459	36,922	0.100	3,692	13,765
	25	0.040	64,250	8,543	55,708	53,583	0.060	3,215	16,980
	50	0.020	87,899	11,643	76,257	65,982	0.020	1,320	18,300
MAJES-CAMANA	1	1.000	0	0	0			0	0
	2	0.500	317	0	317	159	0.500	79	79
	5	0.200	48,503	8,540	39,962	20,140	0.300	6,042	6,121
	10	0.100	78,738	17,867	60,871	50,417	0.100	5,042	11,163
	25	0.040	113,789	31,916	81,872	71,372	0.060	4,282	15,445
	50	0.020	201,622	54,564	147,058	114,465	0.020	2,289	17,735
4 River Basins 4 Cuencas	1	1.000	0	0	0			0	0
	2	0.500	36,885	1,060	35,826	17,913	0.500	8,956	8,956
	5	0.200	126,775	14,909	111,866	73,846	0.300	22,154	31,110
	10	0.100	318,889	38,900	279,990	195,928	0.100	19,593	50,703
	25	0.040	432,533	74,915	357,618	318,804	0.060	19,128	69,831
	50	0.020	648,216	122,973	525,243	441,430	0.020	8,829	78,660

(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**

S./ 1 = 32.3 Yen

Item	Yen Portion			Local Currency Portion			Total		
	Total	JICA	Peru	Total	JICA	Peru	Total	JICA	Peru
Package-1: Canete River Improvement Work	9,202,570	1,904,932	7,297,638	8,615,525	1,783,414	6,832,111	17,818,095	3,688,346	14,129,750
Package-2: Chica River Improvement Work	13,128,717	2,717,644	10,411,072	15,806,149	3,271,873	12,534,276	28,934,866	5,989,517	22,945,349
Package-3: Pisco River Improvement Work	21,354,486	4,420,379	16,934,107	19,911,748	4,121,732	15,790,016	41,266,234	8,542,110	32,724,123
Package-4: Majes-Camana River Improvement Work	26,938,815	5,576,335	21,362,480	25,150,434	5,206,140	19,944,295	52,089,249	10,782,475	41,306,774
Price Escalation	0	0	0	0	0	0	0	0	0
Physical Contingency	3,531,229	730,964	2,800,265	3,474,193	719,158	2,755,035	7,005,422	1,450,122	5,555,300
Consulting Services	9,989,206	9,989,206	0	7,914,223	7,914,223	0	17,903,429	17,903,429	0
Land Acquisition	0	0	0	6,575,206	0	6,575,206	6,575,206	0	6,575,206
Administration Cost	0	0	0	8,579,625	0	8,579,625	8,579,625	0	8,579,625
VAT	0	0	0	0	0	0	0	0	0
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	0	0	0	0	0	0	0	0	0
Commitment Charge	0	0	0	0	0	0	0	0	0
Total	84,145,022	25,339,460	58,805,563	96,027,104	23,016,539	73,010,564	180,172,126	48,355,999	131,816,127

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

EVALUACIÓN ECONOMICA (PRECIOS SOCIALES) Economic Evaluation (Economic Price)

Period (Etapas)		Year (Años)		Benefit (B) (BENEFIT)		Cost						Remain Value salvage value ⑨ Valor Residual	費用便益比 (CBR) ⑩ (Costo/Benef.)	純現在価値 (NPV) ① (VAN)	内部収益率 (Internal rate of return) ② (Tasa Interna de Retorno)	
				Annual Mean Damage Reduction Amount (b) Daño Medio Anual ①	Benefit (B) PV ② Actualización del Daño Medio Anual (S/.)	Project Cost (Costo del Proyecto)		Ope&Maintenace Fee (Costo de Mantenimiento)		Cost (C) (Total de Costos)						
						Cost ③ (Costo)	Present Value (PV) ④ Actualización del Costo	Cost ⑤-1 (Costo)	Present Value (PV) ⑥-1 Actualización del Costo	Cost (Total Cost) ⑦	Total Present Value (CPV) ⑧ Costo total Actualizado		B/C Σ②／Σ(⑧—⑨)	NPV (②—⑧) (VAB-VAC)	b-C (①—⑦)	IRR (TIR)
Period	Design (Diseño)	0	2012	0	0	0	0	0	0	0	0	0		0	0	
		0	2013	0	0	0	0	0	0	0	0	0		0	0	
		0	2014	0	0	7,654,000	7,654,000	0	0	7,654,000	7,654,000	0		-7,654,000	-7,654,000	
	Construction (Construcción)	1	2015	0	0	53,132,000	48,301,818	0	0	53,132,000	48,301,818	0		-48,301,818	-53,132,000	
		2	2016	0	0	82,292,000	68,009,917	0	0	82,292,000	68,009,917	0		-68,009,917	-82,292,000	
		3	2017	0	0	37,095,000	27,870,023	0	0	37,095,000	27,870,023	0		-27,870,023	-37,095,000	
Evaluation Period after Competion of Facilities (Análisis de Proyección en 50 años después de la culminación de las obras)		4	2018	78,659,812	53,725,710	0	0	1,520,670	1,038,638	1,520,670	1,038,638	0		52,687,072	77,139,142	
		5	2019	78,659,812	48,841,555	0	0	1,520,670	944,217	1,520,670	944,217	0		47,897,338	77,139,142	
		6	2020	78,659,812	44,401,413	0	0	1,520,670	858,379	1,520,670	858,379	0		43,543,035	77,139,142	
		7	2021	78,659,812	40,364,921	0	0	1,520,670	780,344	1,520,670	780,344	0		39,584,577	77,139,142	
		8	2022	78,659,812	36,695,383	0	0	1,520,670	709,404	1,520,670	709,404	0		35,985,979	77,139,142	
		9	2023	78,659,812	33,359,439	0	0	1,520,670	644,913	1,520,670	644,913	0		32,714,527	77,139,142	
		10	2024	78,659,812	30,326,763	0	0	1,520,670	586,284	1,520,670	586,284	0		29,740,479	77,139,142	
		11	2025	78,659,812	27,569,784	0	0	1,520,670	532,986	1,520,670	532,986	0		27,036,799	77,139,142	
		12	2026	78,659,812	25,063,440	0	0	1,520,670	484,532	1,520,670	484,532	0		24,578,908	77,139,142	
		13	2027	78,659,812	22,784,946	0	0	1,520,670	440,484	1,520,670	440,484	0		22,344,462	77,139,142	
		14	2028	78,659,812	20,713,587	0	0	1,520,670	400,440	1,520,670	400,440	0		20,313,147	77,139,142	
		15	2029	78,659,812	18,830,534	0	0	1,520,670	364,036	1,520,670	364,036	0		18,466,497	77,139,142	
		16	2030	78,659,812	17,118,667	0	0	1,520,670	330,942	1,520,670	330,942	0		16,787,725	77,139,142	
		17	2031	78,659,812	15,562,425	0	0	1,520,670	300,856	1,520,670	300,856	0		15,261,568	77,139,142	
		18	2032	78,659,812	14,147,659	0	0	1,520,670	273,506	1,520,670	273,506	0		13,874,153	77,139,142	
		19	2033	78,659,812	12,861,508	0	0	1,520,670	248,642	1,520,670	248,642	0		12,612,866	77,139,142	
		20	2034	78,659,812	11,692,280	0	0	1,520,670	226,038	1,520,670	226,038	0		11,466,242	77,139,142	
		21	2035	78,659,812	10,629,345	0	0	1,520,670	205,489	1,520,670	205,489	0		10,423,856	77,139,142	
		22	2036	78,659,812	9,663,041	0	0	1,520,670	186,808	1,520,670	186,808	0		9,476,233	77,139,142	
		23	2037	78,659,812	8,784,583	0	0	1,520,670	169,826	1,520,670	169,826	0		8,614,757	77,139,142	
		24	2038	78,659,812	7,985,984	0	0	1,520,670	154,387	1,520,670	154,387	0		7,831,598	77,139,142	
		25	2039	78,659,812	7,259,986	0	0	1,520,670	140,352	1,520,670	140,352	0		7,119,634	77,139,142	
		26	2040	78,659,812	6,599,987	0	0	1,520,670	127,593	1,520,670	127,593	0		6,472,395	77,139,142	
		27	2041	78,659,812	5,999,988	0	0	1,520,670	115,993	1,520,670	115,993	0		5,883,995	77,139,142	
		28	2042	78,659,812	5,454,535	0	0	1,520,670	105,448	1,520,670	105,448	0		5,349,086	77,139,142	
		29	2043	78,659,812	4,958,668	0	0	1,520,670	95,862	1,520,670	95,862	0		4,862,806	77,139,142	
		30	2044	78,659,812	4,507,880	0	0	1,520,670	87,147	1,520,670	87,147	0		4,420,733	77,139,142	
		31	2045	78,659,812	4,098,073	0	0	1,520,670	79,225	1,520,670	79,225	0		4,018,848	77,139,142	
		32	2046	78,659,812	3,725,521	0	0	1,520,670	72,023	1,520,670	72,023	0		3,653,498	77,139,142	
		33	2047	78,659,812	3,386,837	0	0	1,520,670	65,475	1,520,670	65,475	0		3,321,362	77,139,142	
		34	2048	78,659,812	3,078,943	0	0	1,520,670	59,523	1,520,670	59,523	0		3,019,420	77,139,142	
		35	2049	78,659,812	2,799,039	0	0	1,520,670	54,112	1,520,670	54,112	0		2,744,927	77,139,142	
		36	2050	78,659,812	2,544,581	0	0	1,520,670	49,192	1,520,670	49,192	0		2,495,388	77,139,142	
		37	2051	78,659,812	2,313,255	0	0	1,520,670	44,720	1,520,670	44,720	0		2,268,535	77,139,142	
		38	2052	78,659,812	2,102,959	0	0	1,520,670	40,655	1,520,670	40,655	0		2,062,304	77,139,142	
		39	2053	78,659,812	1,911,781	0	0	1,520,670	36,959	1,520,670	36,959	0		1,874,822	77,139,142	
		40	2054	78,659,812	1,737,983	0	0	1,520,670	33,599	1,520,670	33,599	0		1,704,384	77,139,142	
		41	2055	78,659,812	1,579,984	0	0	1,520,670	30,545	1,520,670	30,545	0		1,549,440	77,139,142	
		42	2056	78,659,812	1,436,350	0	0	1,520,670	27,768	1,520,670	27,768	0		1,408,582	77,139,142	
		43	2057	78,659,812	1,305,772	0	0	1,520,670	25,244	1,520,670	25,244	0		1,280,529	77,139,142	
		44	2058	78,659,812	1,187,066	0	0	1,520,670	22,949	1,520,670	22,949	0		1,164,117	77,139,142	
		45	2059	78,659,812	1,079,151	0	0	1,520,670	20,862	1,520,670	20,862	0		1,058,288	77,139,142	
		46	2060	78,659,812	981,046	0	0	1,520,670	18,966	1,520,670	18,966	0		962,080	77,139,142	
		47	2061	78,659,812	891,860	0	0	1,520,670	17,242	1,520,670	17,242	0		874,618	77,139,142	
		48	2062	78,659,812	810,782	0	0	1,520,670	15,674	1,520,670	15,674	0		795,108	77,139,142	
		49	2063	78,659,812	737,074	0	0	1,520,670	14,249	1,520,670	14,249	0		722,825	77,139,142	
		50	2064	78,659,812	670,068	0	0	1,520,670	12,954	1,520,670	12,954	0		657,114	77,139,142	
		51	2065	78,659,812	609,152	0	0	1,520,670	11,776	1,520,670	11,776	0		597,376	77,139,142	
		52	2066	78,659,812	553,775	0	0	1,520,670	10,706	1,520,670	10,706	0		543,069	77,139,142	
		53	2067	78,659,812	503,432	0	0	1,520,670	9,732	1,520,670	9,732	0		493,699	77,139,142	
合計 (Total)				3,932,990,621	585,948,496	180,173,000	151,835,758	76,033,510	11,327,696	256,206,510	163,163,454	0	3.59	422,785,042		30.6%
					VAB						VAC					

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

Ministerio de Agricultura

REPUBLIC OF PERU
MINISTRY OF AGRICULTURE
DIRECTORATE GENERAL OF WATER RESOURCES AND INFRACTRUCTURE

TERMS OF REFERENCE
FOR
CONSULTING SERVICES
FOR
PROJECT OF PROTECTION OF FLOOD PLAIN AND VULNERABLE RURAL POPULATION AGAINST FLOODS IN THE REPUBLIC OF PERU

JANUARY 2013

TABLE OF CONTENTS

TERMS OF REFERENCE FOR CONSULTING SERVICES FOR PROJECT OF PROTECTION OF FLOOD PLAIN AND VULUNERABLE RURAL POPURATUION AGAINST FLOODS IN THE REPUBLIC OF PERU

1. Background of the Project

The Republic of Peru (hereinafter referred to as "Peru") is one of the most vulnerable countries against natural disasters such as earthquake, tsunami and flood. Risk of flood disaster is high, especially the country suffers from floods and sediment disasters in many places during El Nino period which happens in several year cycle. In 1990s, damage by flood disasters was high in 1982-1983 rainy season and 1997-1998 rainy season. The damage cost in 1997-1998 rainy season was estimated at US$ 3.5 billion. As a recent disaster, southern part of the country hit by torrential rainfall in the end of January, 2010 causing heavy damages such as about two thousands residents and tourists to Machupicchu were isolated due to severed railway and main roads.

The Peru government implemented the Urgent Program for El Nino Phenomena Stage I and II in 1997 and 1998, consisting of rehabilitation of water utilization infrastructure by the Ministry of Agriculture (hereinafter referred to as "MINAG"). Besides, Directorate General of Water Resources Infrastructure (hereinafter referred to as "DGIH") of MINAG established the River Improvement and Intake Facility Protection Program (PERPEC) in 1999 in order to protect residential area, farmland and agricultural facilities in flood prone areas, and conducted financial support to provincial governments for implementation of river improvement works. Under the multi-year plan of PERPEC in 2007-2009, 206 river improvement works are proposed in whole country. The target of these proposed projects are 50 years' return period floods, however, these projects are not fundamental or comprehensive river improvement works but small projects such as local revetment works, resulting that flood disaster is not eliminated.

Under these circumstances, the Government of Peru has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the "Project of Protection of Flood Plain and Vulnerable Rural Population against Floods in the Republic of Peru" based on the results of preparatory study conducted by JICA in 2010-2011, which is to mitigate vulnerability against floods in valley area, thus contributing to the improvement of regional economy.

the Ministry of Agriculture decided to implement a JICA loan project named "Project of Protection of Flood Plain and Vulnerable Rural Population against Floods in the Republic of Peru", based on the results of preparatory study conducted by JICA in 2010-2011.

2. Outline of the Project

2.1 Objective

The objective of the Project is to mitigate vulnerability against floods in valley area, thus

contributing to the improvement of regional economy.

2.2 Project Area

The Project area consists of the following 4 (four) river basins.

(1) Canete River Basin in Lima Province (C.A. = 6,100 km^2)
(2) Chincha River Basin in Ica Province (C.A. = 3,300 km^2)
(3) Pisco River Basin in Ica Province (C.A. = 4,300 km^2)
(4) Majes-Camana River Basin in Arequipa Province (C.A. = 17,000 km^2)

2.3 Project Component

The proposed components of the Project are described below.

(1) Structural Measures
The following river improvement works are conducted.

River	Work Component
Canete	Riverbed Excavation: 2,000m Bank Protection: 1,200m Diversion Weir: 1 location
Chincha	Dyke: 6,000m Bank Protection: 6,000m Rehabilitation of Existing Intake Weir: 1 location Improvement of Existing Diversion Weir: 1 location Riverbed Excavation: 1,200m
Pisco	Dyke with Bank Protection: 5,500m Bank Protection: 5,500m Riverbed Excavation: 1,500m Channel Widening: 1,000m Retention Pond: 1 location
Majes-Camana	Dyke: 29,000m Bank Protection: 29,000m

(2) Non-structural Measure
As a non-structural measure, tree planning works is conducted along dyke, bank protection works and retention pond.

River	Length	Area
Canete	3,350m	3.7ha
Chincha	4,600m	10.1ha
Pisco	6,500m	125.0ha
Majes-Camana	29,000m	18.3ha
Total	43,450m	157.1ha

(3) Disaster Prevention Education and Capacity Building Program
The following disaster prevention education and capacity building programs are conducted to the water user association, regional government and representatives of residents.
- Training on maintenance of river facility and protection of river bank
- Training on flood disaster prevention and emergency relief activity
- Training on watershed management

2.4 Executing Agency

The executing agency of Project is Directorate General of Water Resources and Infrastructure (DGIH), Ministry of Agriculture (MINAG). As the executing agency, DGIH will provide the following arrangements and services for smooth implementation of Consulting Services.

1) Report and Data

Make available to the Consultant existing reports and data related to the Project.

2) Cooperation and Counterpart Staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services.

3) Assistance and Exemption

Use its best efforts to ensure that the assistance and exemption will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents
- clearance through customs;
- instructions and information to officials, agent and representatives of related agencies;
- exemption from any requirement for registration to practice their profession;

3. Scope of the Services

The objectives of the consulting services are to facilitate the implementation of the Project by assisting Irrigation Sub-sector Program (PSI) of MINAG in detailed design, tendering, supervision of construction works and disaster prevention education and capacity building.
The consulting services will be provided by an international consulting firm (hereinafter referred to as "the Consultant") in association with national consultants in compliance with the Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012.
The Consultant will ensure that all of the procurement under the civil works contracts of the Project comply with the Guidelines for Procurement under Japanese ODA Loans, April 2012.
During the construction supervision stage, the Consultant shall act as the Engineer for the purposes of the contracts for civil works as stated in Paragraph (1), Section 4.04 of the Guidelines for Procurement under Japanese ODA Loans, April 2012. The Consultant will perform his duties and authorities in compliance with Clause 3.1 Engineer’s Duty and Authority, Section VII General Conditions of the Standard Bidding Documents under Japanese ODA Loans (Procurement of Works), October 2012.

3.1 Detailed Design of Structural and Non-structural Measures

1) Field Investigation, Collection and Analysis of Data and Information

To prepare the basic data for detailed design, the following data and information will be collected by field investigation, data collection and analysis.

- Topographical survey
- Geological investigation
- Hydrology and meteorology
- Land use and development
- Existing river facilities
- Environment
- Related development programs
- Socio-economy
- Related design standards and criteria
- Others being necessary

2) Review of River Course Plan and Facility Plan

Based on the above investigation and analysis, river course plan and facility plan will be reviewed.

3) Detailed Design of Proposed Facilities

Detailed design of proposed facilities and tree planting works will be conducted.

- Review of previous design by JICA preparatory survey 2011
- Comparison and selection of alternative design
- Examination of environmental mitigation measure
- Structure analysis
- Detailed design of structures
- Detailed design of vegetation/planting works such as selection of species and layout

4) Unit Price Analysis and Cost Estimation

5) Construction Planning

6) Formation of Vegetation/Planting Plan

7) Formulation of Environmental Monitoring Plan

8) Preparation of detailed design report, drawings, PQ documents and tender documents

3.2 Tendering Process

The Consultant shall assist PSI for the tender process such as following works.

- To prepare pre-qualification documents
- To assist pre-qualification process
- To prepare pre-qualification evaluation report
- To prepare draft and final tender documents
- To assist owners' cost estimate
- To assist tender process
- To prepare tender evaluation report

3.3 Supervision of Construction Works

The Consultant shall perform his duties during the construction period in accordance with the contracts to be executed between the Employer and the contractors. FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the

Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the civil works of the Project.
The following works are to be done by the Consultant for the assistance in supervision of construction works primarily at the project site.

- Technical guidance for construction works and methods
- Engineering advice for the efficient progress of works, including inspection of construction and as-built drawings to be prepared by contractors
- Administrative support to PSI
- Preparation of project completion report (PCR)
- Additions and revisions to design works, if necessary
- Issuance of Performance Certificates, Payment Certificates and a Taking-Over Certificate in a timely manner
- To prepare monthly certificate for the each work in accordance with implementation schedule

3.4 Disaster Prevention Education and Capacity Building Program

The Consultant shall formulate the disaster prevention education and capacity building program, and supervise program implementation assisting PSI.

3.5 Investigation

The following investigations will be conducted to facilitate the consulting services mentioned above, but not limited to.

- Detailed topographic survey for proposed facility sites
- Geotechnical investigation for proposed facilities
- Environmental study for proposed facilities
- Implementation of Technical Meetings and PCMs for the Project components

4. Transfer of Knowledge

The Consultant shall conduct the transfer of knowledge on the related field to the related government's personnel during the whole services period. Transfer of knowledge shall be conducted through appropriate training programs such as on the job training, technical meeting, seminar, and workshops.

5. Reports

The following reports will be prepared and submitted in accordance with the work progress.

1) Inception Reports (25 copies)

   To be submitted by the end of the second (2) months after the commencement of services, which contains overall work schedule, work plan, administrative arrangement, results of review of existing data and design during inception period

2) Monthly and Quarterly Progress Reports (25 copies in each)

To be submitted at a monthly and quarterly intervals, which contains expert mobilization and demobilization, man-months consumed, summary of work progress during the reporting intervals, problems encountered, its measure to be taken, quality control, monitoring of works and others

3) Detailed Design Reports (25 copies)

To be prepared at the completion of detailed design stage

4) Pre-qualification Documents (25 copies)

To be prepared immediately after commencement of detailed design stage

5) Tender Documents (25 copies)

To be prepared immediately after completion of detailed design stage

6) Project Completion Report (25 copies)

To be prepared immediately after the completion of the Project

In addition to the above, the Consultants shall submit from time to time as required reports/notes such as technical notes on specific technical subjects, technical manuals for construction works, guidance report or manual regarding transfer of knowledge.

6. Implementation Schedule and Required Experiences and Expertise for Consulting Services

The consulting services period is estimated at 45 months. The total required expertise staff man-months (M/M) for the consulting services are estimated at 331 man-months. The required experiences and expertise for consulting services are as follows. Major tasks and duties of professional personnel, and assignment schedule of professional personnel are shown in Annex-2 and Annex-3, respectively.

Professional A

(1) Team Leader

Professional A with at least 18 years of experiences in study, detailed design, and/or construction supervision of river works. He/she shall have experiences as project manager or team leader in similar study, detailed design and/or construction supervision at least three (3) projects.

(2) River Structural Design Engineer (1) and (2)

Professional A with at least 10 years of experiences in study and detailed design of river works.

(3) Watershed Specialist

Professional A with at least 10 years of experiences in survey, investigation and study for watershed management.

(4) Hydrology & Hydraulic Engineer (1) and (2)

Professional A with at least 10 years of experiences in hydrological and hydraulic analysis.

(5) Construction Planner & Cost Estimator

Professional A with at least 8 years of experiences in construction plan and cost estimate for civil works.

(6) Disaster Education Specialist

Professional A with at least 8 years of experiences in disaster education or participatory rural development program.

(7) Social Environmentalist

Professional A with at least 10 years of experiences in social environmental study.

(8) Spec Writer & Bid Specialists

Professional A with at least 8 years of experiences in preparation of bidding document and procurement assistance for the civil works project under loan projects.

(9) Construction Engineer (1) and (2)

Professional A with at least 12 years of experiences in detailed design and construction supervision of civil works.

Professional B

(1) Co-Team Leader

Professional B with at least 15 years of experiences in study, detailed design, and/or construction supervision of river works.

(2) Design Engineer (1), (2), (3) and (4)

Professional B with at least 12 years of experiences in study and detailed design of river works.

(3) Hydrology & Hydraulic Engineer (1) and (2)

Professional B with at least 10 years of experiences in hydrological and hydraulic analysis.

(4) Construction Planner & Cost Estimator (1), (2) and (3)

Professional B with at least 10 years of experiences in construction plan and cost estimate for river works.

(5) Disaster Education Specialist

Professional B with at least 8 years of experiences in disaster education or participatory rural development program.

(6) Social Environmentalist (1) and (2)

Professional B with at least 12 years of experiences in social environmental study.

(7) Spec Writer & Bid Specialists (1) and (2)

Professional B with at least 10 years of experiences in preparation of bidding documents and procurement assistance for the civil works project.

(8) Construction Engineer (1), (2), (3) and (4)

Professional B with at least 12 years of experiences in detailed design and construction supervision of civil works.

7. Compliance with the JICA Guidelines for the Consulting Services

7.1 Securing Safety during Construction

(1) When reviewing bid documents for procurement of works, the Consultant will ensure to meet the requirements as follows:

Bidding documents for procurement of works require that:

(a) The personnel for key positions to be proposed by bidders shall include an accident prevention officer. (Refer to Clause 1.1.2 Personnel, Section III. Evaluation and Qualification Criteria (following prequalification) or Clause 1.1.2 Personnel, Section III. Evaluation and Qualification Criteria (without prequalification) of the Standard Bidding Documents under Japanese ODA Loans (Procurement of Works), October 2012)

(b) Bidders shall furnish a safety plan. (Refer to Clause 16. Documents Comprising the Technical Proposal, Section I Instructions to Bidders of the Standard Bidding Documents under Japanese ODA Loans (Procurement of Works), October 2012).

(c) Contractors shall include concrete safety measures in the programme stipulated in the Clause 8.3 Programme, Section VII General Conditions of the Standard Bidding Documents under Japanese ODA Loans (Procurement of Works), October 2012 (hereinafter referred to as “the Programme”), reflecting the contents of safety plan mentioned above.

(2) The Consultant shall review the safety plans submitted by the bidders from the point of view of securing the safety during the construction. (Refer to Paragraph (2), Section 4.02 Scope of the Project and of the Consulting Services of the Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012).

(3) The Consultant shall monitor the strict adherence to the safety plan during construction as follows;

i) The Consultant shall review the Programme submitted by contractors from the point of views of securing the safety during construction and require them to submit further details, if necessary.

ii) During the supervision of construction works, the Consultant shall confirm that an accident prevention officer proposed by contractor is duly assigned at the project site and that construction works are carried out according to the safety plan as well as the safety measures prescribed in the Programme. If the

Consultant recognizes any questions regarding the safety measures in general including the ones mentioned above, the Consultant shall require contractors to make appropriate improvements.

7.2 Special Provisions in the Guidelines for Employment of Consultants

In compliance with the JICA Guidelines for the Employment of Consultants under the Japanese ODA Loans, April 2012, the following sections will be applied:

Section 2.02 Responsibilities of Consultants

(3) In the case of a difference of opinion between DGIH and the Consultant on any important matters involving professional judgment that might affect the proper evaluation or execution of the project, DGIH shall allow the Consultant to submit promptly to DGIH a written report and, simultaneously, to submit a copy to JICA. DGIH shall forward the report to JICA with its comments in time to allow JICA to study it and communicate with DGIH before any irreversible steps are taken in the matter. In cases of urgency, a Consultant shall have the right to request DGIH and/or JICA that the matter be discussed immediately between DGIH and JICA. This provision shall be stated in the contract between DGIH and the Consultant.

Section 2.05 Monitoring by JICA

(1) DGIH is responsible for supervising the Consultant's performance and ensuring that the Consultant carries out the assignment in accordance with the contract. Without assuming the responsibilities of DGIH or the Consultant, JICA may monitor the work as necessary in order to satisfy itself that it is being carried out in accordance with appropriate standards and is based on acceptable data.

(2) As appropriate, JICA may take part in discussions between DGIH and the Consultant. However, JICA shall not be liable in any way for the implementation of the project by reason of such monitoring or participation in discussions. Neither DGIH nor the Consultant shall be released from any responsibility for the project by reason of JICA's monitoring or participation in discussions.

Annex-1: Project Area

Annex-1: Major Tasks and Duties of Professional Personnel

Professional A

(1) Team Leader

- To assume overall responsibility of the Consultant's team in the field for the satisfactory completion of the Project from technical, managerial, administrative and financial point of view based on the contract for consulting services
- To execute an overall project management in terms of technical and managerial aspects and coordination for the smooth project implementation among DGIH in Jakarta, the project office, JICA and other agencies
- To organize Consultant's team to achieve efficient assistance to the project office through smooth implementation in terms of engineering, institutional and financial aspects
- To prepare a memorandum agreement or an addendum to the contract from time to time to adjust the consulting services to actual situation for efficient services
- To prepare work schedule of the consulting services
- To finalize and submit all the required reports such as progress report, study report, design report, tender document and completion report
- To assist DGIH and the project office to monitor tender process, contract, physical and financial progress to be generated by construction works
- To assist the project office and DGIH for preparation of implementation schedule and annual budgetary arrangement
- To assist DGIH to initiate the donor coordination for successful project implementation and for maximizing output of the Project

(2) River Structural Design Engineer (1) and (2)

- To review the design standards and necessary technical data for detailed design of facility
- To review facility plan of each river basin based on latest site conditions
- To carry out layout design of proposed facility,
- To carry out the detailed design works for all proposed facility with related engineers.
- To verify the construction plan and cost estimate
- To prepare the detailed design report (supporting report, Q'ty estimation, construction plan) and design drawings (tender drawings)

(3) Watershed Specialist

- To collect and review the available data and previous investigation reports
- To conduct hazard sediment analysis
- To study current land use and identify the conditions
- To carry out site reconnaissance survey
- To identify present condition and issue

- To conduct determination of surface erosion loss
- To prepare monitoring plan and evaluation method for capacity building stage
- To prepare the study reports

(4) Hydrology & Hydraulic Engineer (1) and (2)

- To collect and analyze the hydrological data river basin
- To update the existing hydrological database
- To review previous determination of design discharge
- To arrange the data necessary for the debris flow forecasting
- To prepare the study report

(5) Construction Planner & Cost Estimator

- To study the proposed construction works
- To prepare the construction program including construction schedule
- To collect and analyze the available data and information on construction facilities, materials and labor force locally available for project implementation and their prices
- To prepare unit price schedules
- To prepare the bill of quantities
- To estimate of the construction cost

(6) Disaster Education Specialist

- To prepare material for PCM (Public Consultation Meeting), monitor PCM and analyze results of PCM
- To prepare the disaster education program including institution establishment schedule and implementation schedule
- To facilitate and monitor progress and effect of the disaster education programs

(7) Social Environmentalist

- To collect and review the available data and previous investigation reports
- To carry out site reconnaissance survey
- To identify environmental and social issues likely to be caused by the construction works
- To formulate the social environment monitoring plan and management plan for anticipated negative impacts
- To monitor the construction works in accordance with the above plans
- To prepare the social environment monitoring report

(8) Spec Writer & Bid Specialists

- To study the proposed construction works

- To prepare the pre-qualification documents
- To prepare the tender documents including technical specifications of construction works and procurement of equipment
- To assist the DGIH to conduct the procurement of contractors
- To assist the DGIH to prepare the bid evaluation reports

(9) Construction Engineer (1) and (2)

- To supervise the construction works implemented by the contractor to monitor and review the construction method, quality assurance and safety program
- To review all necessary analyses and calculations for permanent facilities prepared by the contractor
- To review detailed time programmes submitted by the contractor
- To recommend and advise the adjustment and modification of the engineering design to actual field conditions, when necessary
- To check, approve and file the civil construction drawings of permanent structures prepared by the contractor
- To supervise the whole site activities by the contractor to ensure that the actual condition being exposed and intension of the engineering design are satisfactorily considered and that, where necessary, appropriate to the design of the permanent works is made
- To issue Performance Certificates, Payment Certificates and a Taking-Over Certificate in a timely manner
- To prepare monthly progress reports, quarterly progress reports and annual report

Professional B

(1) Co-Team Leader

- To organize Consultant team for the satisfactory completion of the Project from technical, managerial and administrative viewpoints in collaboration with the Team Leader, based on the contract for consulting services
- To prepare work schedule of the consulting services by assisting Team Leader
- To prepare all progress reports
- To compile all required study report, design report, tender document and completion report
- To assist project manager and DGIH for preparation of implementation schedule and annual budgetary arrangement
- To monitor tender progress, contracts, physical and financial progress including status of employment generated by construction works, and prepare a regular progress report
- To super intend environmental monitoring works and to assist DGIH to submit environmental monitoring report to Provincial office and JICA

(2) Design Engineer (1), (2), (3) and (4)

- To review the existing study regarding detailed design
- To review and justify the location and technical specifications of the proposed structures
- To conduct the field investigation to examine the sites for construction
- To review the existing detailed design
- To prepare the design report and design drawings

(3) Hydrology & Hydraulic Engineer (1) and (2)

- To collect and analyze the hydrological data river basin
- To update the existing hydrological database
- To review previous determination of design discharge
- To arrange the data necessary for the debris flow forecasting
- To prepare the study report

(4) Construction Planner & Cost Estimator (1), (2) and (3)

- To study the proposed construction works
- To prepare the construction program including construction schedule
- To collect and analyze the available data and information on construction facilities, materials and labor force locally available for project implementation and their prices
- To prepare unit price schedules
- To prepare the bill of quantities
- To estimate of the construction cost

(5) Disaster Education Specialist

- To prepare material for PCM (Public Consultation Meeting), monitor PCM and analyze results of PCM
- To prepare the disaster education program including institution establishment schedule and implementation schedule
- To facilitate and monitor progress and effect of the disaster education programs

(6) Social Environmentalist (1) and (2)

- To collect and review the available data and previous investigation reports
- To carry out site reconnaissance survey
- To identify environmental and social issues likely to be caused by the construction works
- To formulate the social environment monitoring plan and management plan for anticipated negative impacts
- To monitor the construction works in accordance with the above plans
- To prepare the social environment monitoring report

(7) Spec Writer & Bid Specialists (1) and (2)

- To study the proposed construction works
- To prepare the pre-qualification documents
- To prepare the tender documents including technical specifications of construction works and procurement of equipment
- To assist the DGIH to conduct the procurement of contractors
- To assist the DGIH to prepare the bid evaluation reports

(8) Construction Engineer (1), (2), (3) and (4)

- To supervise the construction works implemented by the contractor to monitor and review the construction method, quality assurance and safety program
- To review all necessary analyses and calculations for permanent facilities prepared by the contractor
- To review detailed time programmes submitted by the contractor
- To recommend and advise the adjustment and modification of the engineering design to actual field conditions, when necessary
- To check, approve and file the civil construction drawings of permanent structures prepared by the contractor
- To supervise the whole site activities by the contractor to ensure that the actual condition being exposed and intension of the engineering design are satisfactorily considered and that, where necessary, appropriate to the design of the permanent works is made
- To issue Performance Certificates, Payment Certificates and a Taking-Over Certificate in a timely manner
- To prepare monthly progress reports, quarterly progress reports and annual report

Annex-2: Assignment Schedule of Professional Personnel

		Position	2015												2016												2017												2018												Total
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
A	1	Team Leader/River Engineer		1	1	1	1	1	1	1				1	1	1				1	1	1			1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1	1			33
A	2	River Structure Design Engineer (1)			1	1	1	1	1																																										5
A	3	River Structure Design Engineer (2)			1	1	1	1	1																																										5
A	4	Watershed Specialist				1	1	1																	1	1																				1	1				7
A	5	Hydrology & Hydraulic Engineer (1)		1	1	1																																													3
A	6	Hydrology & Hydraulic Engineer (2)		1	1	1																																													3
A	7	Construction Planner & Cost Estimator				1	1	1	1																																										4
A	8	Disaster Education Sprcialist					1	1	1																1																					1					5
A	9	Social Enviromentalist (1)						1	1																1																					1	1				5
A	10	Spec Writter & Bid Specialist						1	1	1				1	1	1				1	1																														8
A	11	Construction Engineer (1)																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
A	12	Construction Engineer (2)																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
																																																				0
B	1	Co-Team Leader		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			45
B	2	Design Engineer B-1			1	1	1	1																																											4
B	3	Design Engineer B-2			1	1	1	1																																											4
B	4	Design Engineer B-3			1	1	1	1																																											4
B	5	Design Engineer B-4			1	1	1	1																																											4
B	6	Hydrology & Hydraulic Engineer B-1		1	1	1																																													3
B	7	Hydrology & Hydraulic Engineer B-2		1	1	1																																													3
B	8	Construction Planner & Cost Estimator B-1			1	1	1	1	1																																										5
B	9	Construction Planner & Cost Estimator B-2			1	1	1	1	1																																										5
B	10	Construction Planner & Cost Estimator B-3			1	1	1	1	1																																										5
B	11	Disaster Education Sprcialist				1	1	1																	1																						1				5
B	12	Social Enviromentalist B-1						1	1																1																						1				4
B	13	Social Enviromentalist B-2						1	1																1																						1				4
B	14	Spec Writter & Bid Specialist B-1						1	1					1	1	1					1	1																														7
B	15	Spec Writter & Bid Specialist B-2						1	1					1	1	1					1	1																														7
B	16	Construction Engineer B-1																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
B	17	Construction Engineer B-2																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
B	18	Construction Engineer B-3																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
B	19	Construction Engineer B-4																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24
																																																				0
																																																				0
		[Total of Pro-A]	**40**												**19**												**34**												**33**												**126**
		[Total of Pro-B]	**61**												**31**												**60**												**53**												**205**
		[Total of Pro-A+Pro-B]	101												50												94												86												331

Attachment-2:
Project Cost Estimate

Precondition

Common terms for Appraisal

Name of Local Currency

			Soles	
(1)	Yen/$	US$ 1 =	83.6	Yen
(2)	LC/$	US$ 1 =	2.59	Soles
(3)	Yen/Soles	Soles 1 =	32.3	Yen

Price Escalation

(1)	FC	2.1%	LC	2.0%

Physical Contingency

Construction	5.0%	Consultant	5.0%

Base Year for Cost Estimation: 2011/10

Schedule

Start	2012/7	End	2019/7

Billing Rate of Consultant

	FC Yen	LC Soles
Pro-(A)	2,500,000	0
Pro-(B)	0	10,000
Supporting Staff	0	4,000

Others

Rate of Tax

VAT	18.0%	Import Tax	0.0%

Rate of Administration Cost

5.0%

Rate of Interest During Construction

Construction	1.70%	Consultant	0.01%

Rate of Commitment Charges

0.1%

Payment Method for Interest during construction and Commitment charge

not loan_covered

Fiscal Year

Jan – Dec

Cost Breakdown for Package

US $	=yen	83.6
Soles	=yen	32.3

item		Unit / Items	Q'ty	Unit Price	Local	Total
					S./	yen
Land Acquisition Cost	Canete River	ha	2.17	582,227	1,263,432	40,808,857
	Chinca River	ha	3.82	163,084	622,981	20,122,294
	Pisco River	ha	20.27	17,394	352,567	11,387,917
	Majes-Camana Rive	ha	11.33	436,585	4,946,510	159,772,283
	Sub-Total (1)		37.59		7,185,491	232,091,352
Land Compensation Cost	Canete River	Intake, Canal, Road	1.00	-	0	0
	Chinca River	Reserver, Intake	1.00	-	0	0
	Pisco River	Canal	1.00	-	0	0
	Majes-Camana Rive	Reservoir, Intake, Cana	1.00	-	0	0
	Sub-Total (2)				0	0
Total (1) + (2)					7,185,491	232,091,352

Package-1 : Canete River Improvement Work 借款対象率 20.7%

item	unit	Quantity	Unit Price		Cost		Total
			Foreign	Local	Foreign	Local	
			yen	Soles	yen	Soles	yen
Ca-1	LS	1			47,857,341	1,262,148	88,624,705
Ca-2	LS	1			120,793,445	3,185,700	223,691,565
Ca-3	LS	1			82,651,467	2,179,777	153,058,272
Ca-4	LS	1			35,307,321	931,164	65,383,928
Ca-5	LS	1			70,945,112	1,871,044	131,379,838
No-Structural	LS	1			0	912,033	29,458,650
Total					357,554,687	10,341,866	691,596,958

Pckage-2 : Chica River Improvement Work 借款対象率 20.7%

item	unit	Quantity	Unit Price		Cost		Total
			Foreign	Local	Foreign	Local	
			yen	Soles	yen	Soles	yen
Chico-1	LS	1			74,094,445	2,586,790	157,647,755
Chico-2	LS	1			29,106,813	1,016,179	61,929,390
Chico-3	LS	1			180,913,286	6,316,056	384,921,885
Ma-1	LS	1			101,784,385	3,553,503	216,562,521
Ma-2	LS	1			128,575,829	4,488,847	273,565,595
Non-Structural	LS	1			0	1,177,683	38,039,145
Total					514,474,759	19,139,057	1,132,666,291

Package-3 : Pisco River Improvement Work 借款対象率 20.7%

item	unit	Quantity	Unit Price		Cost		Total
			Foreign	Local	Foreign	Local	
			yen	Soles	yen	Soles	yen
Pi-1	LS	1			122,408,239	3,360,703	230,958,941
Pi-2	LS	1			112,456,024	3,087,466	212,181,177
Pi-3	LS	1			42,921,425	1,178,402	80,983,821
Pi-4	LS	1			25,082,152	688,627	47,324,815
Pi-5	LS	1			59,009,033	1,620,086	111,337,797
Pi-6	LS	1			474,847,091	13,036,867	895,937,908
Non-Structural	LS	1			0	1,146,207	37,022,470
Total					836,723,963	24,118,358	1,615,746,929

Package-4 : Majes-Camana River Improvement Work 借款対象率 20.7%

item	unit	Quantity	Unit Price		Cost		Total
			Foreign	Local	Foreign	Local	
			yen	Soles	yen	Soles	yen
MC-1	LS	1			176,720,982	4,851,852	333,435,815
MC-2	LS	1			59,712,245	1,639,392	112,664,613
MC-3	LS	1			226,591,666	6,221,046	427,531,446
MC-4	LS	1			63,857,679	1,753,205	120,486,187
MC-5	LS	1			157,733,697	4,330,559	297,610,750
MC-6	LS	1			197,775,394	5,429,899	373,161,121
MC-7	LS	1			163,999,826	4,502,595	309,433,634
Non-Structural	LS	1			0	1,484,331	47,943,875
Total					1,046,391,491	30,212,878	2,022,267,442

Implementation Schedule

	2012	2013	2014	2015	2016	2017	2018	2019	Month
									0
Pledge		1							1
Signing of Loan Agreement			1						1
Selection of Consultants			1 1 1 1 1 1 1 1 1 1	1					10
Consulting Services				1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1		45
Detailed Design Work				1 1 1 1 1 1					6
Assistance in PQ and Tender (ICB packages)				1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1				15
Construction Supervision						1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1		24
Construction of Structure Measures						1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1		24
Formulation of Non-Structure Measures (incl. PMU)				1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1		45
Clear Payment and Completion Reporting							1 1		2
									0
									0
									0
									0
									0
									0
Land Acquisition	0	0		3 1 1 1 1 1 1 1 1 1 1 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	0	0	0	13
Package-1 : Canete River Improvement Work	0	0		0	2 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	0	24
Pckage-2 : Chica River Improvement Work	0	0	0	0	2 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	0	24
Package-3 : Pisco River Improvement Work	0	0	0	0	2 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	0	24
Package-4 : Majes-Camana River Improvement Work	0	0	0	0	2 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	# 1 1 1 1 1 1 1 1 1 1 1 1	0	24

Cost Breakdown for the Consulting Services

Whole Stage

US $ = yen 83.6
Soles = yen 32.3

	Unit	Qty.	Foreign Portion (Yen) Rate	Foreign Portion (Yen) Amount ('000)	Local Portion Soles Rate	Local Portion Soles Amount ('000)	Combined Total ('000) Yen
A Remuneration							
1 Professional (A)	M/M	126	2,500,000	315,000	0	0	315,000
2 Professional (B)	M/M	205	0	0	10,000	2,050	66,215
3 Supporting Staffs	M/M	648	0	0	4,000	2,592	83,722
Subtotal of A				315,000		4,642	464,937
B Direct Cost							
1 International Airfare		25	1,057,200	26,430		0	26,430
2 Domestic Airfare (Duty Trip)		45		0	1,036	47	1,506
3 Domestic Travel				0		0	0
4 Accommodation Allowance (Pro A)	Month	126		0	5,180	653	21,082
(Pro.B)	Month	205		0	2,590	531	17,150
5 Per Diem for Duty Trip	Day	135		0	130	17	565
6 Vehicle Rental	Month	130		0	5,180	673	21,751
7 Office Rental	M/M	141		0	259	37	1,180
8 International Communications	M/M	45		0	2,590	117	3,765
9 Domestic Communications	M/M	45		0	1,295	58	1,882
10 Office Supply	M/M	45		0	518	23	753
11 Office Furniture and Equipment	L.M	1		0	51,800	52	1,673
12 Report Preparation							
1) Detailed Design	Volume	12		0	52	1	20
2) Bid Documents	Volume	16		0	52	1	27
3) Monthly and Quaterly Progress R	Volume	57		0	52	3	95
4) Completion Report	Volume	5		0	52	0	8
5) Other Notes and Documents	Volume	10		0	52	1	17
13 Sub-Contracting Work						0	0
Topographic Survey	Site	4		0	129,500	518	16,731
Geotechnical Investigation	Site	4		0	77,700	311	10,039
Environmental Monitoring	Site	4		0	64,750	259	8,366
14 Technical & PCM	time	10		0	7,770	78	2,510
Subtotal of B				26,430		3,378	135,548
Total				341,430		8,020	600,485

Breakdown of Detailed Design and Tendering Assistance

	Unit	Qty.	Foreign Portion		Local Portion		Combined Total
			(Yen)		0		
			Rate	Amount ('000)	Rate	Amount ('000)	('000) Yen
A Remuneration							
1 Professional (A)	M/M	21	2,500,000	52,500	0	0	52,500
2 Professional (B)	M/M	33	0	0	10,000	330	10,659
3 Supporting Staffs	M/M	128	0	0	4,000	512	16,538
Subtotal of A				52,500		842	79,697
B Direct Cost							
1 International Airfare		17	1,057,200	17,972	0	0	17,972
2 Domestic Airfare (Duty Trip)		4		0	1,036	4	134
3 Domestic Travel				0	0	0	0
4 Accommodation Allowance (Pro A)	Month	21		0	5,180	109	3,514
(Pro.B)	Month	33		0	2,590	85	2,761
5 Per Diem for Duty Trip	Day	12		0	130	2	50
6 Vehicle Rental	Month	0		0	5,180	0	0
7 Office Rental	M/M	0		0	259	0	0
8 International Communications	M/M	4		0	2,590	10	335
9 Domestic Communications	M/M	4		0	1,295	5	167
10 Office Supply	M/M	4		0	518	2	67
11 Office Furniture and Equipment	L.M	1		0	51,800	52	1,673
12 Report Preparation					0		
1) Detailed Design	Volume	12		0	52	1	20
2) Bid Documents	Volume	16		0	52	1	27
3) Monthly and Quaterly Progress R	Volume	16		0	52	1	27
4) Completion Report	Volume	5		0	52	0	8
5) Other Notes and Documents	Volume	10		0	52	1	17
13 Sub-Contracting Work					0	0	0
Topographic Survey	Site	4		0	129,500	518	16,731
Geotechnical Investigation	Site	4		0	77,700	311	10,039
Environmental Monitoring	Site	4		0	64,750	259	8,366
14 Technical & PCM	time	4		0	7,770	31	1,004
Subtotal of B				17,972		1,391	62,911
Total				70,472		2,233	142,608

Breakdown of Construction stage

	Unit	Qty.	Foreign Portion (Yen) Rate	Foreign Portion (Yen) Amount ('000)	Local Portion 0 Rate	Local Portion 0 Amount ('000)	Combined Total ('000) Yen
A Remuneration							
1 Professional (A)	M/M	105	2,500,000	262,500	0	0	262,500
2 Professional (B)	M/M	172	0	0	10,000	1,720	55,556
3 Supporting Staffs	M/M	520	0	0	4,000	2,080	67,184
Subtotal of A				262,500		3,800	385,240
B Direct Cost							
1 International Airfare		8	1,057,200	8,458	0	0	8,458
2 Domestic Airfare (Duty Trip)		41		0	1,036	42	1,372
3 Domestic Travel		0		0	0	0	0
4 Accommodation Allowance (Pro A)	Month	105		0	5,180	544	17,568
(Pro.B)	Month	172		0	2,590	445	14,389
5 Per Diem for Duty Trip	Day	123		0	130	16	514
6 Vehicle Rental	Month	130		0	5,180	673	21,751
7 Office Rental	M/M	141		0	259	37	1,180
8 International Communications	M/M	41		0	2,590	106	3,430
9 Domestic Communications	M/M	41		0	1,295	53	1,715
10 Office Supply	M/M	41		0	518	21	686
11 Office Furniture and Equipment	L.M	0		0	51,800	0	0
12 Report Preparation					0		
1) Detailed Design	Volume	0		0	52	0	0
2) Bid Documents	Volume	0		0	52	0	0
3) Monthly and Quaterly Progress R	Volume	41		0	52	2	69
4) Completion Report	Volume	0		0	52	0	0
5) Other Notes and Documents	Volume	0		0	52	0	0
13 Sub-Contracting Work		0			0	0	0
Topographic Survey	Site	0		0	129,500	0	0
Geotechnical Investigation	Site	0		0	77,700	0	0
Environmental Monitoring	Site	0		0	64,750	0	0
14 Technical & PCM	time	6		0	7,770	47	1,506
Subtotal of B				8,458		1,987	72,637
Total				270,958		5,787	457,877

Manning Schedule for the Consulting Services

		Position	2015												2016												2017												2018												Total	Trip Number
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
A	1	Team Leader/River Engineer		1	1	1	1	1	1	1				1	1	1				1	1	1			1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1			1	1	1	1			33	6
A	2	River Structure Design Engineer (1)			1	1	1	1	1																																										5	1
A	3	River Structure Design Engineer (2)			1	1	1	1	1																																										5	1
A	4	Watershed Specialist				1	1	1																	1	1																			1	1				7	3
A	5	Hydrology & Hydraulic Engineer (1)		1	1	1																																													3	1
A	6	Hydrology & Hydraulic Engineer (2)		1	1	1																																													3	1
A	7	Construction Planner & Cost Estimator				1	1	1	1																																										4	1
A	8	Disaster Education Sprcialist					1	1	1																1																					1					5	3
A	9	Social Enviromentalist (1)						1	1																1																					1	1				5	3
A	10	Spec Writter & Bid Specialist						1	1	1				1	1	1				1	1																														8	3
A	11	Construction Engineer (1)																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
A	12	Construction Engineer (2)																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
																																																			0	
B	1	Co-Team Leader		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			45	1
B	2	Design Engineer B-1			1	1	1	1																																											4	1
B	3	Design Engineer B-2			1	1	1	1																																											4	1
B	4	Design Engineer B-3			1	1	1	1																																											4	1
B	5	Design Engineer B-4			1	1	1	1																																											4	1
B	6	Hydrology & Hydraulic Engineer B-1		1	1	1																																													3	1
B	7	Hydrology & Hydraulic Engineer B-2		1	1	1																																													3	1
B	8	Construction Planner & Cost Estimator B-1			1	1	1	1	1																																										5	1
B	9	Construction Planner & Cost Estimator B-2			1	1	1	1	1																																										5	1
B	10	Construction Planner & Cost Estimator B-3			1	1	1	1	1																																										5	1
B	11	Disaster Education Sprcialist				1	1	1																	1																						1				5	3
B	12	Social Enviromentalist B-1						1	1																1																						1				4	3
B	13	Social Enviromentalist B-2						1	1																1																						1				4	3
B	14	Spec Writter & Bid Specialist B-1						1	1					1	1	1					1	1																													7	3
B	15	Spec Writter & Bid Specialist B-2						1	1					1	1	1					1	1																													7	3
B	16	Construction Engineer B-1																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
B	17	Construction Engineer B-2																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
B	18	Construction Engineer B-3																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
B	19	Construction Engineer B-4																							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			24	1
																																																			0	
																																																			0	
		[Total of Pro-A]	**40**												**19**												**34**												**33**												**126**	**25**
		[Total of Pro-B]	**61**												**31**												**60**												**53**												**205**	**29**
		[Total of Pro-A+Pro-B]	101												50												94												86												331	
		Total Cost of FC for Each Month(Pro-A)	100,000,000												47,500,000												85,000,000												82,500,000												315,000,000	
		Total Cost of FC for Each Month(Pro-B)	0												0												0												0												0	
		Total Cost of LC for Each Month(Pro-A)	0												0												0												0												0	
		Total Cost of LC for Each Month(Pro-B)	610,000												310,000												600,000												530,000												2,050,000	
																																																			0	
C	1	Assistance Engineer (Design Engineer)		20	20	20	20	20	20																																										120	
C	2	Assistance Engineer (Progress Monitoring)		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4				176	
C	3	Administration Supporting Staff		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				352	
																																																			0	
																																																			0	
																																																			0	
																																																			0	
																																																			0	
		[Total of Supporting Staff]	**252**												**144**												**144**												**108**												**648**	**0**
		Total Cost of LC for Each Month(SS)	1,008,000												576,000												576,000												432,000												2,592,000	
		Grand Total	**353**												**194**												**238**												**194**												**979**	

Annural Distribution of Cost

Item	Total			2012			2013			2014			2015			2016			2017			2018			2019		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
Package-1 : Canete River Improvement Work	100%	100%	0%	0%	0%		0%	0%		0%	0%		0%	0%		29%	29%		50%	50%		21%	21%		0%	0%	
Pckage-2 : Chica River Improvement Work	100%	100%	0%	0%	0%		0%	0%		0%	0%		0%	0%		29%	29%		50%	50%		21%	21%		0%	0%	
Package-3 : Pisco River Improvement Work	100%	100%	0%	0%	0%		0%	0%		0%	0%		0%	0%		29%	29%		50%	50%		21%	21%		0%	0%	
Package-4 : Majes-Camana River Improvement Work	100%	100%	0%	0%	0%		0%	0%		0%	0%		0%	0%		29%	29%		50%	50%		21%	21%		0%	0%	
Land Acquisition					0%			0%			0%			23%			77%			0%			0%			0%	
Consultant	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	32%	33%	0%	15%	17%	0%	27%	27%	0%	26%	23%	0%	0%	0%	0%

Annual Fund Requirement

Base Year for Cost Estimation: Oct, 2011 — FC & Total: million JPY
Exchange Rates: Soles = Yen 32.3 — LC : million Soles
Price Escalation: FC: 2.1% LC: 2.0%
Physical Contingency: 5%
Physical Contingency for Consultant: 5%

Item	Total			2012			2013			2014			2015			2016			2017			2018			2019		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																											
Ⅰ) Procurement / Construction	677	20	1,339	0	0	0	0	0	0	0	0	0	0	0	0	193	6	381	339	10	670	145	4	287	0	0	0
Package-1 :Canete River Improvement Work	74	2	143	0	0	0	0	0	0	0	0	0	0	0	0	21	1	42	37	1	72	16	0	30	0	0	0
Package-2: Chica River Improvement Work	106	4	234	0	0	0	0	0	0	0	0	0	0	0	0	31	1	68	53	2	117	22	1	49	0	0	0
Package-3: Pisco River Improvement Work	173	5	334	0	0	0	0	0	0	0	0	0	0	0	0	50	1	97	87	2	167	36	1	70	0	0	0
Package-4: Majes-Camana River Improvement Wor	217	6	419	0	0	0	0	0	0	0	0	0	0	0	0	63	2	121	108	3	209	45	1	88	0	0	0
Base cost for JICA financing	570	17	1,131	0	0	0	0	0	0	0	0	0	0	0	0	165	5	328	285	9	565	120	4	237	0	0	0
Price escalation	75	2	144	0	0	0	0	0	0	0	0	0	0	0	0	18	1	35	38	1	73	19	1	36	0	0	0
Physical contingency	32	1	64	0	0	0	0	0	0	0	0	0	0	0	0	9	0	18	16	0	32	7	0	14	0	0	0
Ⅱ) Consulting services	402	9	705	0	0	0	0	0	0	0	0	0	123	3	221	60	2	112	110	3	192	109	2	180	0	0	0
Base cost	341	8	600	0	0	0	0	0	0	0	0	0	108	3	194	51	1	97	93	2	161	89	2	149	0	0	0
Price escalation	41	1	71	0	0	0	0	0	0	0	0	0	9	0	16	6	0	10	12	0	21	14	0	23	0	0	0
Physical contingency	19	0	34	0	0	0	0	0	0	0	0	0	6	0	11	3	0	5	5	0	9	5	0	9	0	0	0
Total (Ⅰ + Ⅱ)	1,079	30	2,044	0	0	0	0	0	0	0	0	0	123	3	221	253	7	493	449	13	862	254	7	468	0	0	0
B. NON ELIGIBLE PORTION																											
a Procurement / Construction	2,595	78	5,129	0	0	0	0	0	0	0	0	0	0	0	0	738	22	1,460	1,299	39	2,569	557	17	1,101	0	0	0
Package-1: Canete River Improvement Work	284	8	548	0	0	0	0	0	0	0	0	0	0	0	0	82	2	159	142	4	274	60	2	115	0	0	0
Package-2: Chica River Improvement Work	408	15	898	0	0	0	0	0	0	0	0	0	0	0	0	118	4	260	204	8	449	86	3	189	0	0	0
Package-3: Pisco River Improvement Work	664	19	1,281	0	0	0	0	0	0	0	0	0	0	0	0	192	6	372	332	10	641	139	4	269	0	0	0
Package-4: Majes-Camana River Improvement Wor	830	24	1,604	0	0	0	0	0	0	0	0	0	0	0	0	241	7	465	415	12	802	174	5	337	0	0	0
Base cost for Local financing	2,185	66	4,332	0	0	0	0	0	0	0	0	0	0	0	0	634	19	1,256	1,092	33	2,166	459	14	910	0	0	0
Price escalation	286	8	554	0	0	0	0	0	0	0	0	0	0	0	0	69	2	134	145	4	280	72	2	139	0	0	0
Physical contingency	124	4	244	0	0	0	0	0	0	0	0	0	0	0	0	35	1	70	62	2	122	27	1	52	0	0	0
b Land Acquisition	0	8	268	0	0	0	0	0	0	0	0	0	0	2	61	0	6	207	0	0	0	0	0	0	0	0	0
Base cost	0	7	232	0	0	0	0	0	0	0	0	0	0	2	54	0	6	179	0	0	0	0	0	0	0	0	0
Price escalation	0	1	23	0	0	0	0	0	0	0	0	0	0	0	4	0	1	19	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	13	0	0	0	0	0	0	0	0	0	0	0	3	0	0	10	0	0	0	0	0	0	0	0	0
c Administration cost	0	12	372	0	0	0	0	0	0	0	0	0	0	0	14	0	3	108	0	5	172	0	2	78	0	0	0
d VAT	0	40	1,291	0	0	0	0	0	0	0	0	0	0	1	40	0	11	352	0	19	618	0	9	282	0	0	0
e Import Tax	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
Total (a+b+c+d+e)	2,595	138	7,060	0	0	0	0	0	0	0	0	0	0	4	115	738	43	2,126	1,299	64	3,358	557	28	1,462	0	0	0
TOTAL (A+B)	3,674	168	9,104	0	0	0	0	0	0	0	0	0	123	7	335	991	50	2,620	1,749	77	4,220	811	35	1,929	0	0	0
C. Interest during Construction	70	0	70	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7	18	0	18	23	0	23	23	0	23
Interest during Construction(Const.)	70	0	70	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	18	0	18	23	0	23	23	0	23
Interest during Construction (Consul.)	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
D. Commitment Charge	16	0	16	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
GRAND TOTAL (A+B+C+D)	3,760	168	9,190	2	0	2	2	0	2	2	0	2	125	7	337	999	50	2,628	1,769	77	4,240	836	35	1,954	25	0	25
E. JICA finance portion (A)	1,079	30	2,044	0	0	0	0	0	0	0	0	0	123	3	221	253	7	493	449	13	862	254	7	468	0	0	0

Administration Cost = 5%
VAT= 18% of the expenditure in local currency of the eligible portion
Import Tax= 0%

Breakdown of Cost	Foreign Currency Portion			Local Currency Portion			Total		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Package-1: Canete River Improvement Work	358	74	284	10	2	8	692	143	548
Package-2: Chica River Improvement Work	514	106	408	19	4	15	1,133	234	898
Package-3: Pisco River Improvement Work	837	173	664	24	5	19	1,616	334	1,281
Package-4: Majes-Camana River Improvement Work	1,046	217	830	30	6	24	2,022	419	1,604
Price Escalation	361	75	286	10	2	8	698	144	554
Physical Contingency	156	32	124	5	1	4	308	64	244
Consulting Services	402	402	0	9	9	0	705	705	0
Land Acquisition	0	0	0	8	0	8	268	0	268
Administration Cost	0	0	0	12	0	12	372	0	372
VAT	0	0	0	40	0	40	1,291	0	1,291
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	70	0	70	0	0	0	70	0	70
Commitment Charge	16	0	16	0	0	0	16	0	16
Total	3,760	1,079	2,681	168	30	138	9,190	2,044	7,147

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S./ 1 = 32.3 Yen

Item	Yen Portion			Local Currency Portion			Total		
	Total	JICA	Peru	Total	JICA	Peru	Total	JICA	Peru
Package-1: Canete River Improvement Work	11,069,805	2,291,450	8,778,355	10,341,866	2,140,766	8,201,100	21,411,671	4,432,216	16,979,455
Package-2: Chica River Improvement Work	15,928,011	3,297,098	12,630,913	19,139,057	3,961,785	15,177,272	35,067,068	7,258,883	27,808,185
Package-3: Pisco River Improvement Work	25,904,767	5,362,287	20,542,480	24,118,358	4,992,500	19,125,858	50,023,125	10,354,787	39,668,338
Package-4: Majes-Camana River Improvement Work	32,396,021	6,705,976	25,690,045	30,212,878	6,254,066	23,958,812	62,608,899	12,960,042	49,648,857
Price Escalation	11,177,695	2,313,783	8,863,912	10,433,661	2,159,768	8,273,893	21,611,356	4,473,551	17,137,805
Physical Contingency	4,823,815	998,530	3,825,285	4,712,291	975,444	3,736,847	9,536,106	1,973,974	7,562,132
Consulting Services	12,441,207	12,441,207	0	9,373,237	9,373,237	0	21,814,445	21,814,445	0
Land Acquisition	0	0	0	8,292,338	0	8,292,338	8,292,338	0	8,292,338
Administration Cost	0	0	0	11,518,250	0	11,518,250	11,518,250	0	11,518,250
VAT	0	0	0	39,973,080	0	39,973,080	39,973,080	0	39,973,080
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	2,171,136	0	2,171,136	0	0	0	2,171,136	0	2,171,136
Commitment Charge	506,143	0	506,143	0	0	0	506,143	0	506,143
Total	116,418,601	33,410,331	83,008,270	168,115,017	29,857,566	138,257,451	284,533,617	63,267,897	221,265,720

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S./ 1 = 32.3 Yen

Item	Yen Portion			Local Currency Portion			Total		
	Total	JICA	Peru	Total	JICA	Peru	Total	JICA	Peru
Package-1: Canete River Improvement Work	357,555,000	74,014,000	283,541,000	334,046,600	69,154,300	264,892,300	691,597,000	143,161,000	548,436,000
Package-2: Chica River Improvement Work	514,475,000	106,496,000	407,978,000	618,189,700	127,972,600	490,217,100	1,132,666,000	234,462,000	898,204,000
Package-3: Pisco River Improvement Work	836,724,000	173,202,000	663,522,000	779,011,400	161,273,900	617,769,800	1,615,747,000	334,460,000	1,281,287,000
Package-4: Majes-Camana River Improvement Work	1,046,391,000	216,603,000	829,788,000	975,879,900	202,004,200	773,875,700	2,022,267,000	418,609,000	1,603,658,000
Price Escalation	361,040,000	74,735,000	286,304,000	337,018,200	69,768,000	267,250,200	698,047,000	144,496,000	553,551,000
Physical Contingency	155,809,000	32,253,000	123,557,000	152,197,600	31,492,500	120,705,100	308,016,000	63,759,000	244,257,000
Consulting Services	401,851,000	401,851,000	0	302,747,900	302,747,900	0	704,607,000	704,607,000	0
Land Acquisition	0	0	0	267,831,600	0	267,831,600	267,843,000	0	267,843,000
Administration Cost	0	0	0	372,031,400	0	372,031,400	372,039,000	0	372,039,000
VAT	0	0	0	1,291,127,900	0	1,291,127,900	1,291,130,000	0	1,291,130,000
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	70,128,000	0	70,128,000	0	0	0	70,128,000	0	70,128,000
Commitment Charge	16,348,000	0	16,348,000	0	0	0	16,348,000	0	16,348,000
Total	3,760,321,000	1,079,154,000	2,681,166,000	5,430,082,200	964,413,400	4,465,701,100	9,190,435,000	2,043,554,000	7,146,881,000

資金調達計画

	Percentage to Peru Portion	Percentage to Total Project Cost	Total (JPY million equivalent)	Total (SOL million equivalent)	Total (US$ million equivalent)
	(%)	(%)			
JICA		22.24%	2,044	63.27	24.43
MINAG	80.00%	62.21%	5,718	177.01	68.34
Provincial Government	15.00%	11.66%	1,072	33.19	12.81
Water User Association	5.00%	3.89%	357	11.06	4.27
Total	100.00%	100.00%	9,190	284.53	109.86

Breakdown of Cost	Total	JICA Portion	Others
2012	2	0	2
2013	2	0	2
2014	2	0	2
2015	337	221	117
2016	2,628	493	2,135
2017	4,240	862	3,378
2018	1,954	468	1,487
2019	25	0	25
Total	9,190	2,044	7,147

経済評価用円借款事業費（S./1,000）

Breakdown of Cost	Total	JICA Portion	Others
2012	63	0	63
2013	63	0	63
2014	63	0	63
2015	10,441	6,828	3,613
2016	81,372	15,274	66,098
2017	131,261	26,690	104,571
2018	60,500	14,476	46,024
2019	770	0	770
Total	284,533	63,268	221,265

Attachment-3:

Examination of Cost Reduction

Form A(Loan)

Project Name: Project of Protection of Flood Plain and Vulnerable Rural Population against Flood in the Republic of Peru
F/S Period: August, 2010 - March, 2012
Initial Project Cost Estimate: JPY 7.47 billion (248,900,000 s/.)
Project Cost with Cost Reduction Measures : JPY 6.975 billion

List of Cost Reduction Measures in Planning/Design Stage:

No.	Cost Reduction Measures	Cost Reduction (JPY million)	Ref. No.
1) Optimal Planning and Design ① Construction Methods			
1-①-1	Reuse of boulders of existing revetment	315 million	
1-①-2	Review of backfill material for revetment works	50 million	
1) Optimal Planning and Design ② Construction Technology			
1-②-1			
1) Optimal Planning and Design ③ Contract Method			
1-③-1	Integration of Components	130 million	
2) Review of Planning & Design of Incidental Facilities			
2-1			
3) Review of Project Planning			
3-1			
4) Proper Construction Period			
4-1			
4-2			
Total		495 million	
Reduction Ratio		7.1%	

Form 2 (Common)
No. 1-①-1

Cost Reduction Item: Reuse of boulders of existing revetment

Project Name: Project of Protection of Flood Plain and Vulnerable Rural Population against Flood in the Republic of Peru

Summary :

80% of direct cost for flood control works in dyke construction section is construction cost of revetment works. And 45% of revetment cost is hauling cost of boulder material from quarry site. By reusing boulder materials generated by demolishing existing revetment and groin works, construction cost can be reduced.

【Review of Planning/Design】

1) Initial Plan/Design :

All the boulder material for revetment is corrected at quarry site by plastering and conveyed. Distance between quarry site and construction site is assumed 20km.

2) Review Plan/Design :

10% of revetment material is corrected from demolished waste of old river works or corrected from riverbed.

【Reduction Cost】

Direct Cost: Approx. JPY 214 million

Construction Cost (incl. indirect cost): Approx. 315 million

【Effect】

Cost is reduced by correcting reusable materials. (JPY 318 million reduction out of initial project cost: JPY 7.47 billion → JPY 6.795 billion, reduction rate: 4.6%)

【Comparison Table】

	Q' ty (m^3)	Correcting and Hauling Cost (JPY thousand)	Construction Cost (JPY thousand)	Remarks
Before	939,000	2,141,000	3,150,000	
After	845,000	1,927,000	2,832,000	
Difference	94,000	214,000	318,000	

Form 2 (Common)
No. 1-①-２

Cost Reduction Item: Review of backfill material for revetment works

Project Name: Project of Protection of Flood Plain and Vulnerable Rural Population against Flood in the Republic of Peru

Summary：

In the initial design, boulder material is used for backfill works for the safety against local scouring. By conducting scouring survey in detailed design stage, backfill by riverbed material can be applied at low scouring section resulting that correcting and hauling cost of boulder can be reduced.

【Review of Planning/Design】

１) Initial Plan/Design：

All the backfill material for backfill is corrected at quarry site by plastering and conveyed. Distance between quarry site and construction site is assumed 20km.

２) Review Plan/Design：

20% of backfill material is corrected from riverbed material.

【Reduction Cost】

Direct Cost: Approx. JPY 28.7 million

Construction Cost (incl. indirect cost): Approx. JPY 50 million

【Effect】

Cost is reduced by using riverbed materials. (JPY 50 million reduction out of initial project cost: JPY 7.47 billion → JPY 6.795 billion, reduction rate: 0.7%)

【Comparison Table】

	Q' ty (m^3)	Correcting and Hauling Cost (JPY thousand)	Construction Cost (JPY thousand)	Remarks
Before	630,000	1,436,000	2,510,000	
After	504,000	1,149,000	2,010,000	
Difference	126,000	287,000	500,000	

Form 2 (Common)
No. 1-③-1

Cost Reduction Item: Integration of Components

Project Name: Project of Protection of Flood Plain and Vulnerable Rural Population against Flood in the Republic of Peru

Summary :

General Cost varies from 10-15% depending on direct cost. In the initial plan, 15% is applied considering safety factor. However, it can be reduced by integrating project components to one package for one river basin.

【Review of Planning/Design】

1) Initial Plan/Design :

15% of direct cost is estimated as general cost.

2) Review Plan/Design :

12% of direct cost is estimated as general cost with integration of civil work packages.

【Reduction Cost】

Direct Cost: JPY 0

Construction Cost (incl. indirect cost): Approx. JPY 134 million

【Effect】

Cost is reduced by integrating project components to one package for one river basin. (JPY 134 million reduction out of initial project cost: JPY 7.47 billion → JPY 6.795 billion, reduction rate: 1.9%)

【Comparison Table】

		Direct Cost (JPY million)	General Cost (JPY million)	Construction Cost (JPY million)	Remarks
Before		4,270	640	6,932	
After	Canete	484	73	785	
	Chinca	1,003	120	1,560	
	Pisco	1,088	130	1,757	
	MAjes-Camana	1,695	203	2,696	
	計	4,270	526	6,798	
Difference		0	114	134	

Attachment-4:
Environmental Check List

ENVIRONMENTAL CHECK LIST

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) N (c) N (d) N	All 36 points.	(a) The 6 PEA has been developed and now are under the DGAA review. (b) After the approval of the 6 PEAs by DGAA, the DIA will be issuranced. (c) There are 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 environemntal and social considerations were explained in each. (b) The JICA Study Team did not receive the comments relaied 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 has been examined and, they have been priopitized 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 posibility 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 posibility of the generation of large volumes of excavated materials. In the case of YES, the excavated materials will be treated properly and eisposed in acoordance with Peruvian standards.
			(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 caracteristic 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 afected 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 aquatic organisms?	(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). Also, the framingos (Phoenicopterus Chilensis) come to the basin from November to March. (c) The adequate mitigation plan is reveloped 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.
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	(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)
		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?			
	(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 Detalied 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 Goverment; 3) take the process of land acquisition acoording 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 are no archeologic, 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 scape 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)
	(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, Scurity and Health Rules should be considered in the TOR of the Constructor. (b) The Industry Safety, Scurity and Health Rules should be considered in the TOR of the Constructor. (c) The Transportacion 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 instlallation of safety equipment is considered in the Construction Stage. (c) They are considered in the Environmental Mitigation Plan.
	(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