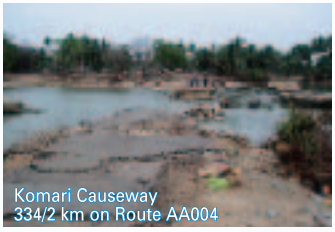
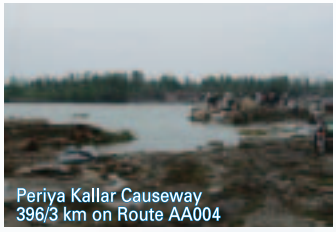
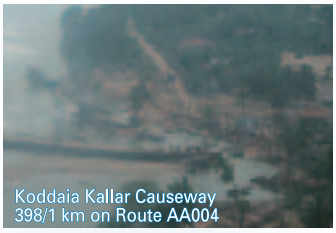
ROAD DEVELOPMENT AUTHORITY
MINISTRY OF HIGHWAYS
THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

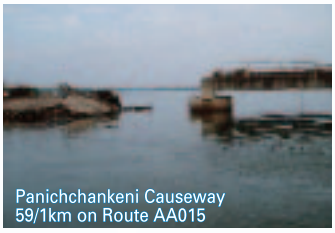
No.

JAPAN INTERNATIONAL
COOPERATION AGENCY(JICA)


Komari Causeway
334/2 km on Route AA004


Periya Kallar Causeway
396/3 km on Route AA004


Koddaia Kallar Causeway
398/1 km on Route AA004


Panichchankeni Causeway
59/1km on Route AA015

RECOVERY, REHABILITATION AND DEVELOPMENT PROJECT FOR TSUNAMI AFFECTED TRUNK ROADS ON THE EAST COAST IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

FINAL REPORT
EXECUTIVE SUMMARY

1 of 3

May 2006


Route AA004 – AA015
AkkaraipattuÂ˜Trikkandimadu


Kallady Bridge
Batticaloa on Route AA004

ORIENTAL CONSULTANTS CO., LTD.
in association with
NIPPON KOEI CO., LTD.
JAPAN ENGINEERING CONSULTANTS CO., LTD.

SD
JR
06-048(1/3)

The following foreign exchange rates are applied in the Project:

JPY 1.00 = 0.921 Rs. (as of April 2005) for Emergency Recovery Project

JPY 1.00 = 0.901 Rs. (as of August 2005) for Rehabilitation Project

PREFACE

In response to the request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct the Recovery, Rehabilitation and Development Project for Tsunami Affected Trunk Roads on the East Coast and entrusted the Project to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Dr. Masaaki TATSUMI of Oriental Consultants Co., Ltd. and consist of Oriental Consultants Co., Ltd. in association with Nippon Koei Co., Ltd. and Japan Engineering Consultants Co., Ltd. to Sri Lanka, between March 2005 and February 2006.

The team held discussions with the officials concerned of the Government of Sri Lanka and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report in May 2006.

I hope that this report will contribute to the rehabilitation of Sri Lanka, and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Sri Lanka for their close cooperation extended to the Project.

May 2006

Kazuhisa MATSUOKA
Vice President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

May 2006

Mr. Kazuhisa MATSUOKA,
Vice President
Japan International Cooperation Agency (JICA)
Tokyo, JAPAN

We are pleased to submit to you the Final Report of the Recovery, Rehabilitation and Development Project for Tsunami Affected Trunk Roads on the East Coast.

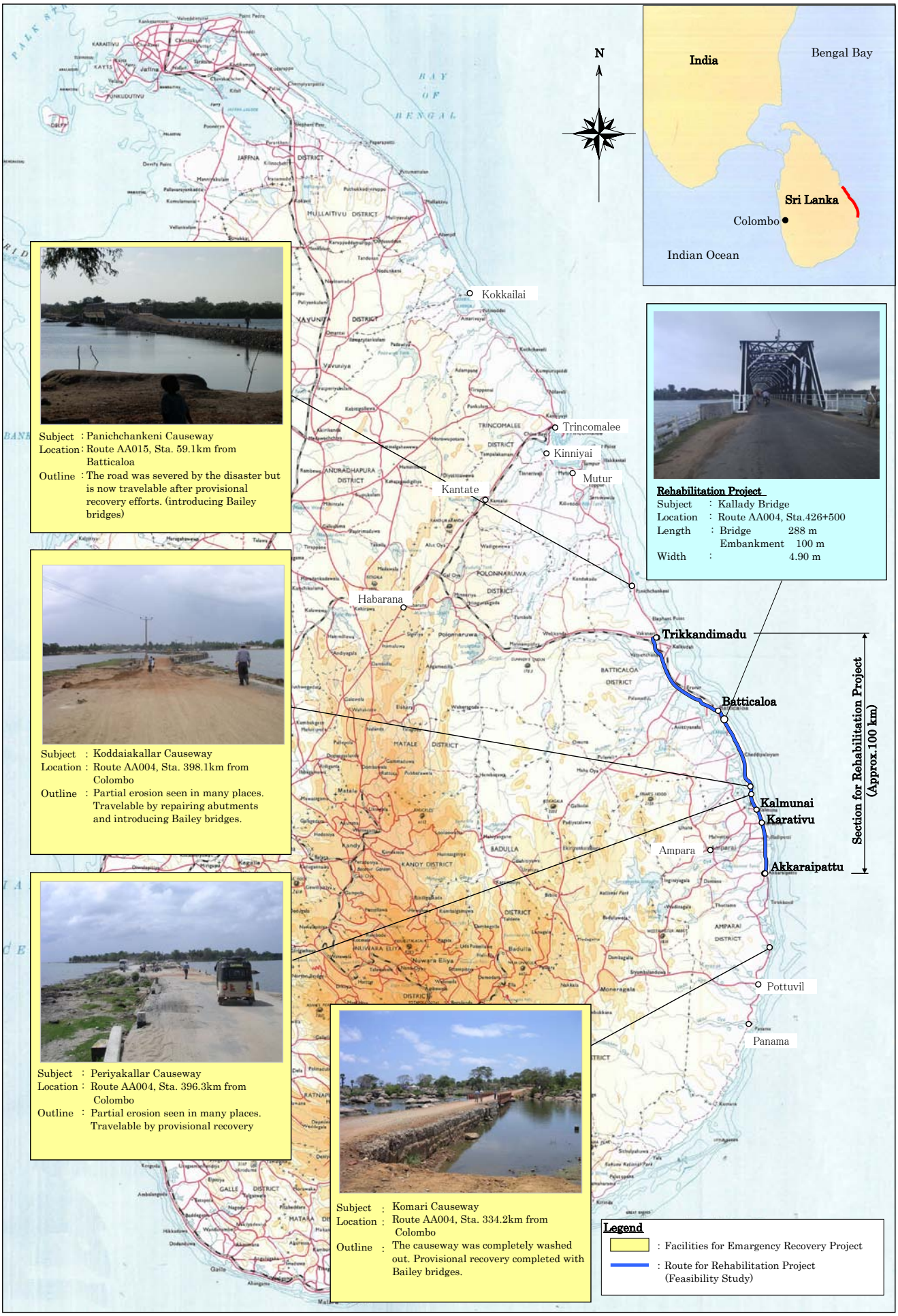
This Project was conducted by Oriental Consultants Co., Ltd. in association with Nippon Koei Co., Ltd. and Japan Engineering Consultants Co., Ltd. under a contract to JICA, during the period from March 2005 to May 2006. In conducting the Project, we have completed the Emergency Recovery Project and the Rehabilitation Project.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, Ministry of Foreign Affairs of Japan, Japan International Cooperation Bank, Ministry of Highway of Sri Lanka, Road Development Authority, JICA Sri Lanka Office, JBIC Representative Office in Colombo and Embassy of Japan in Sri Lanka for their cooperation assistance throughout the Project.

Finally, we hope this report will contribute to further cooperation of Sri Lanka.

Very truly yours,

Masaaki TATSUMI
Team Leader,
Study Team of the Recovery, Rehabilitation and
Development Project for Tsunami Affected Trunk
Roads on the East Coast



Subject : Panichchankeni Causeway
Location : Route AA015, Sta. 59.1km from Batticaloa
Outline : The road was severed by the disaster but is now travelable after provisional recovery efforts. (introducing Bailey bridges)

Subject : Koddaiakallar Causeway
Location : Route AA004, Sta. 398.1km from Colombo
Outline : Partial erosion seen in many places. Travelable by repairing abutments and introducing Bailey bridges.

Subject : Periyakallar Causeway
Location : Route AA004, Sta. 396.3km from Colombo
Outline : Partial erosion seen in many places. Travelable by provisional recovery

Subject : Komari Causeway
Location : Route AA004, Sta. 334.2km from Colombo
Outline : The causeway was completely washed out. Provisional recovery completed with Bailey bridges.

Rehabilitation Project
Subject : Kallady Bridge
Location : Route AA004, Sta.426+500
Length : Bridge 288 m
Embankment 100 m
Width : 4.90 m

Location Map

PROJECT OUTLINE

1. COUNTRY	Democratic Socialist Republic of Sri Lanka
2. NAME OF STUDY	Recovery, Rehabilitation and Development for Tsunami Affected Trunk Roads on the East Coast in the Democratic Socialist Republic of Sri Lanka
3. COUNTERPART AGENCY	Road Development Authority (RDA) of the Ministry of Highways
4. OBJECTIVE OF STUDY	● To prepare draft tender documents and preliminary designs for the reconstruction of the four causeways damaged by the tsunami of 26th December 2004 as part of an Emergency Recovery Project. ● To carry out a feasibility study on trunk roads on the East Coast damaged by the tsunami as part of a Rehabilitation Project (including the New Kallady Bridge).

1. STUDY AREA Project components for the Project road AA004 and AA015 are as follows:

- Four Causeways: Komari (Km 334/2 on AA004), Periya Kallar (Km 396/3 on AA004), Koddaia Kallar (Km 398/1 on AA004), Panichchaankeni (Km59/1 on A0015)
- The 100 km section of road on the East Coast from Akkaraipattu to Trikkandimadu on AA004 and AA015 (including the Kallady Bridge).

2. SCOPE OF STUDY

Emergency Recovery Project (Preliminary Design & Draft Tender Document Preparation for Four Causeways)

1) Execution of natural condition surveys
2) Preparation of preliminary designs
3) Preparation of construction plan & cost estimates
4) Preparation of draft tender documents
5) Preparation of community support program

Rehabilitation Project (FS & Preliminary Design of East Coast Road including the New Kallady Bridge)

1) Execution of natural condition surveys
2) Execution of traffic surveys
3) Execution of initial environmental examination (IEE)
4) Forecast of traffic demand
5) Establishment of appropriate design standards and criteria
6) Development of preliminary engineering design and cost estimation
7) Economic evaluation of the Project road and the New Kallady Bridge as a single undertaking
8) Development of community support program
9) Preparation of a road maintenance plan for rehabilitated road
10) Economic analysis and evaluation
11) Preparation of Project implementation plan

3. EMERGENCY RECOVERY PROJECT (Preliminary Design & Draft Tender Document Preparation for 4 Causeways)

The Emergency Recovery Project, together with executing the necessary natural condition surveys, prepared a preliminary design including a construction plan and cost estimate for the four causeways. Moreover, in the draft tender documents for this Project, employment opportunities for tsunami affected people are described.

4. REHABILITATION PROJECT (FS & Preliminary Design of East Coast Road including the New Kallady Bridge)

Regarding the Project road's preliminary design, geological, topographical, and high water level surveys were executed and reflected in the planning of the road and its drainage facilities. Project road alignment was then designed with the goal of keeping to the existing alignment as much as possible to minimize social impacts. Pavement structure, after in-depth discussions with RDA, was set with the assumption that road design life is 10 years. After considering cost effectiveness, it was proposed that urban areas receive an overlay only while widening and overlay work applying an aggregate base course be implemented for the other sections of the Project road. Regarding the New Kallady Bridge, its preliminary design was carried out and is to be constructed in parallel to the existing structure. A construction plan and cost estimate for Project road rehabilitation and the New Kallady Bridge's construction was then prepared.

Project evaluation was carried out based on forecasts of traffic demand using data from roadside OD surveys as well as other traffic surveys. The calculation of the EIRR for 10-, 15-, and 20-year periods resulted in values of 7.76%, 9.40%, and 10.10%. In terms of economic justification, an EIRR of at least 10% is desirable, which is obtained if a 20-year evaluation period is applied.

As for environmental impacts, it was deemed that these are minor via an IEE and that an EIA was unnecessary. In the case of social measures, it is recommended that community support be carried out via revitalization of Kalmunai Town and that jobs be provided to local people in the construction of the Project road (including the New Kallady Bridge).

Finally, the Project is to adopt a design-build method and is to start in April 2007 and continue for 30 months till September 2009.

5. CONCLUSIONS & RECOMMENDATIONS:

Recommendations are only for the Rehabilitation Project, as the Emergency Recovery Project is already in progress.

1) Detailed design should be based on the conceptual designs in this report. However, when the design of a particular piece of infrastructure is not clearly indicated, the Contractor should prepare his design based on sound engineering principles.
2) This report carried out a careful analysis to determine the most cost-effective pavement structure. Therefore, it is important that due attention is paid to the Project's design and materials in order to ensure costs are approx. in line with preliminary design estimates.
3) As part of the overall support system for tsunami affected people, the Contractor for the Project is to exert his efforts to provide income-earning opportunities for both skilled and unskilled workers.
4) The Project's road's design life is 10 years and it is therefore necessary that routine maintenance, together with functional and structural overlay work to be performed 10 and 20 years after Project completion, be diligently executed. For this reason, it is recommended that the Sri Lanka Road Fund be implemented as intended.

Summary of Project

Project Period: March 2005 – May 2006
Implementation Agency: Road Development Authority of the Ministry of Highways

1 Project Background & Objectives

The Recovery, Rehabilitation and Development Project for Tsunami Affected Trunk Roads on the East Coast is an undertaking that will implement a preliminary design and prepare draft tender documents for the reconstruction of four causeways on AA004 and AA015 on the country's East Coast, as well as carry out a feasibility study on the rehabilitation of AA004 and AA015 between Akkaraipattu and Trikkandimadu (including the New Kallady Bridge).

2 Emergency Recovery Project

2.1 Outline of Emergency Recovery Project

The facilities considered by the Emergency Recovery Project consist of the following four causeways, which are at present under construction. The design conditions and outline of the preliminary design for the causeways are as shown in Table 2.1.1.

① Komari Causeway
② Periya Kallar Causeway
③ Koddaia Kallar Causeway
④ Panichchankeni Causeway

Table 2.1.1. Causeway Design Conditions & Preliminary Design Outline

Item		Komari	Periya Kallar	Koddaia Kallar	Panichchankeni
Road/Km		A4, KM334/2	A4, KM396/3	A4, KM398/1	A15, KM59/1
Road Class		A	A	A	A
Design Speed (km/hr)		70	70	70	70
Effective Road Width (m)		10.0	13.6	13.6	10.0
Estimated Present Traffic Volume (ADT: PCU/day)		500	7,070	7,070	500
Pavement Type	Causeway Road	Concrete	Concrete	Concrete	Concrete
	Approach Road	Asphalt Concrete or DBST	Asphalt Concrete or DBST	Asphalt Concrete or DBST	Asphalt Concrete or DBST
Design Water Level (m)		1.6	1.8	1.8	1.9
Opening for Canal	Required Structure	Bridge	Bridges/Culverts	Bridge/Culvert	Bridge
	Total Opening	48m	136m	41m	127m
Opening for Bridge (preliminary	Superstructure	Pre-cast Pre-tensioned Beam	Pre-cast RC Concrete Slab	Pre-cast RC Concrete Slab	Pre-cast Pre-tensioned Beam

design)	Substructure	Reversed T-shape & Wall Type	Reversed T-shape	Reversed T-shape	Pile Bent Type
	Foundation	Spread Foundation on Gneiss Rock Base	Spread Foundation on Sandstone	Spread Foundation on Sandstone	Cast-in-situ RC Concrete Pile Embedded in Coarse Sand
Causeway (preliminary design)		Random Rubble Masonry Filling with Crushed Stone	Retaining Wall	Retaining Wall	Random Rubble Masonry Filling with Crushed Stone
Incidental Facilities	Sidewalk	Mounted up with Concrete Curb for all Causeways			
	Handrail	Typical Type of Pre-cast Concrete Handrails & Uprights for all Causeways			
	Duct for Utility cable	Two Ducts for Future Utilities to be Contained Inside Mounted up Sidewalks			
	End Pilasters	Both Ends of Handrails to Have Commemorative Plates			
	Guard Rail	Outside of Embankment Shoulders on Approach Roads			
	Road Marking	Center-line & Edge Lines			
	Reflective Road Studs	Center-line on Causeway Roads & Bridges			
	Relocation of Utility	No	Electric Line	Telephone Line Electric Line	No

Note that the preliminary designs for the road and bridge sections of the causeways in the Emergency Recovery Project are for cost estimation purposes and would have to be re-examined when detailed design work is carried out.

2.2 Community Support Program & Social Environmental Considerations for Emergency Recovery Project

As for the community support program, the draft tender documents contain a mechanism to employ as many local residents as possible affected by the tsunami who have lost their means of earning a living. On the other hand, due to the urgent nature of the Project, a detailed environmental study was not executed. For this reason, the draft tender documents clearly indicate that causeway construction activities should be conducted carefully and all appropriate measures necessary taken in regards to protecting the ecosystem of seaside lagoons.

3 Rehabilitation Project

3.1 Outline of Rehabilitation Project

As for medium- and long-term rehabilitation programs for the trunk roads on the East Coast, the section of AA004 from Akkaraipattu to Batticaloa and AA015 from Batticaloa to Trikkandimadu, as well as the Kallady Bridge on AA004 to the south of Batticaloa, were selected. The vertical alignment on these sections is almost flat, and the horizontal alignment has few curves, meaning that it is possible to have a curvature radius with a design speed of 50 km/hr to 60 km/hr. Presently, the existing pavement structure is macadam, and the road surface is experiencing numerous types of damage such as cracking and pot holes at both the center and edge of the carriageway.

As for the New Kallady Bridge, on the other hand, its length and span arrangements will be the same as the existing Kallady Bridge and will be located 20m to the south.

3.2 Natural Condition Survey

According to a soil survey, the sub-base and base of the existing road, which are located underneath the surface layer, are about 40cm in thickness. In addition, the high water level for the Batticaloa Lagoon is 1.35m for a 50-year return period and for the Valachchenai Lagoon 3.30m for the same return period. These results are useful in determining the necessary elevation of the proposed road alignment and the placement of culverts.

3.3 Traffic Demand Forecast

As there was no existing traffic data for the Project area, the following traffic surveys were executed: 1) a roadside origin-destination survey (passenger & freight vehicles), 2) traffic volume survey, 3) bus passenger survey, 4) bus terminal survey, 5) road condition survey, 6) travel speed survey, 7) turning movement survey, and 7) rail terminal survey.

Based on the results of the above surveys, the area near Kalmunai has the largest daily traffic flow for a total of 8080 vehicles per day (vpd). Note that the average vpd for the Project road is about 4120, with about 16% of this traffic being heavy vehicles (i.e., large buses, medium trucks, and large trucks). In terms of passenger car units (pcu), the relatively busy Kalmunai area has a daily flow of 7070 pcu, with the average daily pcu flow for the Project road being about 3770, indicating that the there is a large number of small-sized vehicles such as motorcycles. In fact, 72% of existing traffic is has a pcu of 1.00 or smaller (i.e., passenger cars, 3 wheelers, and motorcycles).

The traffic evaluation criteria of daily vehicle-kilometers (Veh-km), vehicle-hours (Veh-hr), and average area speed are used to assess the impact of the rehabilitation of the Project road. In 2025, travel speeds without rehabilitation range from a low of 53 km/h to a high of about 56 km/h, while with rehabilitation speeds would be in the range of 64 km/h to 68 km/h, indicating that improvement of the Project road would have a significant impact on vehicle operation speeds in the Project area.

3.4 Environmental & Social Considerations

After a general examination, both the Project road and the New Kallady Bridge were determined to have impacts classified as "*Category B*", which indicate that these impacts on the environment and society are insignificant and normal mitigation measures can be designed readily.

Note that an initial environmental examination (IEE) has been conducted and it was

deemed that there would be no significant impacts. Note the Sri Lankan Government does not require an IEE for this Project.

3.5 Preliminary Design for Rehabilitation of Eastern Trunk Road

The Project road shall basically keep to the existing alignment in order to minimize social and environmental impacts. However, for sections experiencing inundation during the rainy season, these sections shall be raised so as to be higher than inundation levels based on the guidelines of the RDA.

The standard ROW is basically 11.0m wide with a pavement width of 10.0m, while the minimum ROW will be 9.0m with a pavement width of 8.0m in the case of narrow sections bordered by structures. Note that the existing ROW in urban areas with a width greater than 11.0m shall be maintained in its current state. The composition of land use along the Project road is such that urban (ROW>11.0m), rural (ROW≧11.0m), paddy field and lagoon (ROW≧11.0m), and narrower urban sections (ROW=9.0m) account for 24%, 58%, 14% and 4% of the Project road length, respectively. The quantities to be compensated for are 773m of parapet wall, 77.1m of wire fence, and 510.88m^2 of land.

In regards to the most economical design for pavement, this was decided in discussions with RDA and it was deemed unnecessary to reconstruct the existing road and that overlay work would be sufficient. Moreover, it was determined that it would be economical only to carry out overlay work for urban areas and overlay work together with an aggregate base course (ABC) for other sections of the Project road.

3.6 Preliminary Design for Rehabilitation of New Kallady Bridge

The outline for the design of the New Kallady Bridge is as shown in the table below.

Table 3.6.1. Design Outline of the New Kallady Bridge

Items				Plan
Improvement Method				The bridge will be constructed in parallel with the existing bridge
Bridge Design	Length	Bridge Length		289.5m
		Span Arrangements		6 x 48.05m
	Type	Superstructure		6 Spans Continuous PC Box Girder (Extruded Construction)
		Abutments		RC Reversed-T Type
		Piers		RC Wall and Pile Cap (Oval Shape)
		Foundation	Pier	Cast-in-Situ Protrusion RC Pile with Steel Tubular Pipe (dia. 1.2m)
			Abutment	Cast-in-Situ RC Pile (dia. 1.2m)
		Pavement	Carriageway	Asphalt Concrete
			Cycle Lane	Cast-in-Situ Concrete

			Sidewalk	Pre-cast Concrete Panel
	Accessory	Expansion Joint		Steel Finger Type Joint on A1 and A2 Abutments
		Bearing		Elastic Rubber Type Bearings
Riverside Protection		Bank Protection		A1 Side : Soil Embankment A2 Side : Grouted Riprap
		Riverbed Protection		Non
Approach Road		Length		Kalmunai Side : approx. 145m Batticaloa Side : approx. 105m
		Pavement		Asphalt Concrete
		Bank Protection		A1 Side : Soil Embankment A2 Side : Wet Masonry (grouted riprap)
		Safety Barriers		Steel Guard Rail for embankments higher than 2m

3.7 Project Evaluation

Project costs and benefits (including the New Kallady Bridge) are first evaluated over the period of 2006 to 2020 using least cost analysis to confirm the cost-effectiveness of the selected road design, which is based on a design life of 10 years adopted after careful consideration and discussions with RDA. On the other hand, a 10-year period is too short to sufficiently consider benefits that will flow from the improvement of the Project road. Therefore, 15- and 20-year periods of time for economic evaluation are taken up.

Benefit cost analysis is next carried out for the three evaluation periods of 10, 15, and 20 years in order to check the economic viability of the Project road. Note that the longer the evaluation period the larger the economic internal rate of return (EIRR) becomes. In the case of a 10-year period, the EIRR is only 7.76%. On the other hand, the EIRR for the 15- and 20-year periods is 9.40% and 10.10%. In terms of economic justification an EIRR of at least 10% should be obtained, meaning that the Project satisfies the minimum if a longer evaluation period is applied.

3.8 Community Support Program for Rehabilitation Project

In the Rehabilitation Project community support takes two forms: ① the Kalmunai Township Redevelopment program and ② the provision of work directly to tsunami affected persons via the construction work of the Project road and bridge.

3.9 Plan for Maintenance of Rehabilitated Road Facilities

The minimal road maintenance that should be considered is pavement maintenance, shoulder maintenance, bridge maintenance, and traffic operation maintenance. Annual O&M costs (including the costs for functional and structural overlays) are as indicated in Table 3.9.1.

Table 3.9.1. Road Maintenance Cost after Rehabilitation

Type of Work Content Classification		Cost (Rs.)
Annual O&M	① Maintenance	9,000,000
	② Operation	1,350,000
	Total	≒10,500,000
Overlay	③ Functional Overlay (after 10 years)	618,000,000
	④ Structural Overlay (after 20 years)	1,120,000,000

①: Based on actual Baseline Road maintenance expenditures; ②: 15% of ①; ③: Based on data from RDA's RMBEC; ④: Twice the value of ③.

Note, however, given the current lack of funding for maintenance, it is suggested that the Sri Lanka Government implement the planned Road Fund as quickly as possible.

3.10 Project Implementation Plan

Upon receiving a strong request from the Sri Lankan Government for the earliest possible commencement of the civil works, it has been decided that the period for pre-construction procedures be minimized. The Sri Lankan and Japanese sides have therefore planned to carry out in parallel the selection of the contractor, who will also be responsible for the detailed design work, and the supervising consultant. Thus, construction is scheduled to start in April 2007 and be completed 30 months later in September 2009.

3.11 Conclusions & Recommendations

The conclusions and recommendations for the Rehabilitation Project are as follows:

- Detailed design should be based on the conceptual designs in this report. However, when the design of a particular piece of infrastructure is not clearly indicated, the Contractor should prepare his design based on sound engineering principles.
- This report carried out a careful analysis to determine the most cost-effective pavement structure. Therefore, it is important that due attention is paid to the Project's design and materials in order to ensure costs are approx. in line with preliminary design estimates.
- As part of the overall support system for tsunami affected people, the Contractor for the Project is to exert his efforts to provide income-earning opportunities for both skilled and unskilled workers.
- The Project's road's design life is 10 years and it is therefore necessary that routine maintenance, together with functional and structural overlay work to be performed 10 and 20 years after Project completion, be diligently executed. For this reason, it is recommended that the Sri Lanka Road Fund be implemented as intended.

Recovery, Rehabilitation and Development Project for Tsunami Affected Trunk Roads on the East Coast in The Democratic Socialist Republic of Sri Lanka

FINAL REPORT

Table of Contents

■1 OF 3: EXECUTIVE SUMMARY

Abbreviations

ABC	:	Aggregate Base Course
AC	:	Asphalt Concrete
ADB	:	Asian Development Bank
ADT	:	Average Daily Traffic
AFD	:	French Development Agency
ASTM	:	American Society for Testing and Materials
BC Analysis	:	Benefit Cost Analysis
BIQ	:	Basic Information Questionnaire
BM	:	Benchmark
BS	:	British Standard
CBO	:	Community Based Organization
CBR	:	California Bearing Ratio
CCD	:	Coast Conservation Department
CEA	:	Central Environmental Authority
CIF	:	Cost Insurance and Freight
CW	:	Causeway
DBST	:	Double Bituminous Surface Treatment
DCP	:	Dynamic Cone Penetration
DS	:	District Secretaries
DWL	:	Design Water Level
EC	:	European Community
EF	:	Equivalence Factor
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
ERD	:	Department of External Resources, Ministry of Finance and Planning (of Sri Lanka)
ESA	:	Equivalent Standard Axle
ESAL	:	Equivalent Standard Axle Load
FFPO	:	Fauna and Flora Protection Ordinance
FIDIC	:	International Federation of Consulting Engineers
GDP	:	Gross Domestic Product
GN	:	Grama Niladari
GOSL	:	Government of Sri Lanka
GPS	:	Global Positioning System
HDI	:	Human Development Index
HEC	:	Hydrological Engineering Center (US Army Corps of Engineers)
HSR	:	(Sri Lanka) Highway Schedule of Rates
HWL	:	High Water Level
ICTAD	:	Institution for Cooperation Training and Development
IDP	:	Internally Displaced Population
IEE	:	Initial Environmental Examination
INGO	:	International Non-Governmental Organization
IRI	:	International Roughness Index
JBIC	:	Japan bank for International Cooperation
JEC	:	Japan Engineering Consultants Company Limited
JICA	:	Japan International Cooperation Agency
JICS	:	Japan International Cooperation System

JPY	:	Japanese Yen
KEL	:	Knife Edge Load
kmp	:	kilometer post
KTR	:	Kalmunai Township Redevelopment
LC Analysis	:	Least Cost Analysis
LTTE	:	Liberation Tigers of Tamil Eelam
MSL	:	Mean Sea Level
NEA	:	National Environmental Act
NFL	:	Normal Flood Level
NGO	:	Non-Governmental Organization
NK	:	Nippon Koei Company Limited
NPV	:	Net Present Value
OC	:	Oriental Consultants Company Limited
O&M	:	Operation & Maintenance
PC	:	Prestressed Concrete
pcu	:	passenger car unit
PI	:	Preliminary Information
RC	:	Reinforced Concrete
RCDC	:	Road Construction and Development Co. (Pvt) Ltd. (in Sri Lanka)
RDA	:	Road Development Authority
RDA-EPO	:	Road Development Authority - Eastern Provincial Office
RMBEC	:	Road Maintenance Budgeting and Expenditure Control
ROW	:	Right of Way
Rs.	:	(Sri Lankan) Rupees
SN	:	Structural Number
SPT	:	Standard Penetration Test
TAFOR	:	Task Force for Relief
TAFREN	:	Task Force for Rebuilding Nation
TRL	:	UK Transport Research Laboratory
UDL	:	Uniformly Distributed Load
UK	:	United Kingdom
UNDP	:	United Nations Development Programme
US$	:	United States Dollars
USAID	:	United States Agency for International Development
VAT	:	Value Added Tax
Veh-hr	:	Vehicle-hour
Veh-km	:	Vehicle-kilometer
vpd	:	vehicles per day
WG	:	Working Group

PART 1 GENERAL

1 Introduction

A devastating tsunami caused by an undersea earthquake off of Indonesia's Sumatra Island on 26th December 2004 hit many coastal areas of the countries on the Indian Ocean Rim. In Sri Lanka, 85% of its 2,825 km of total coastline was affected, and more than 30 thousand people were killed and about 800 thousand people displaced. In addition, public utilities, private property, and infrastructure (including highways) were severely damaged. Compared with other sectors, the road sector, which is to be urgently restored, is relatively neutral to the ethnic issues peculiar to Sri Lanka and early commencement of recovery work has been possible. Moreover, coordination between donors has progressed relatively smoothly since the disaster. Thus, emergency repairs have been completed and the main focus of the recovery work is shifting from temporary repairs to the construction of permanent structures and to the future development of the area beyond its original state before the disaster.

The Project described in this report consists of two components: an "Emergency Recovery Project" and a "Rehabilitation Project". The former is concerned with the preliminary design and preparation of draft tender documents for the reconstruction of four causeways on national roads AA004 and AA015 on the East Coast, and the results of this work were first given in a Progress Report submitted in May 2005. Note that the Emergency Recovery Project is being conducted under a Japanese Non-Project Grant Aid fund. As for the Rehabilitation Project, it is concerned with the implementation of a feasibility study to examine the restoration and improvement of the 100km section of road between Akkaraipattu and Trikkandimadu on AA004 and AA015, which includes construction planning for a New Kallady Bridge south of Batticaloa (this work added later during the course of the Project). Detailed results of the Rehabilitation Project were first given in a Draft Final Report submitted in February 2006.

This report presents the final results on the Emergency Project and Rehabilitation Project, with the overall work flow as shown in Figure 1.1.

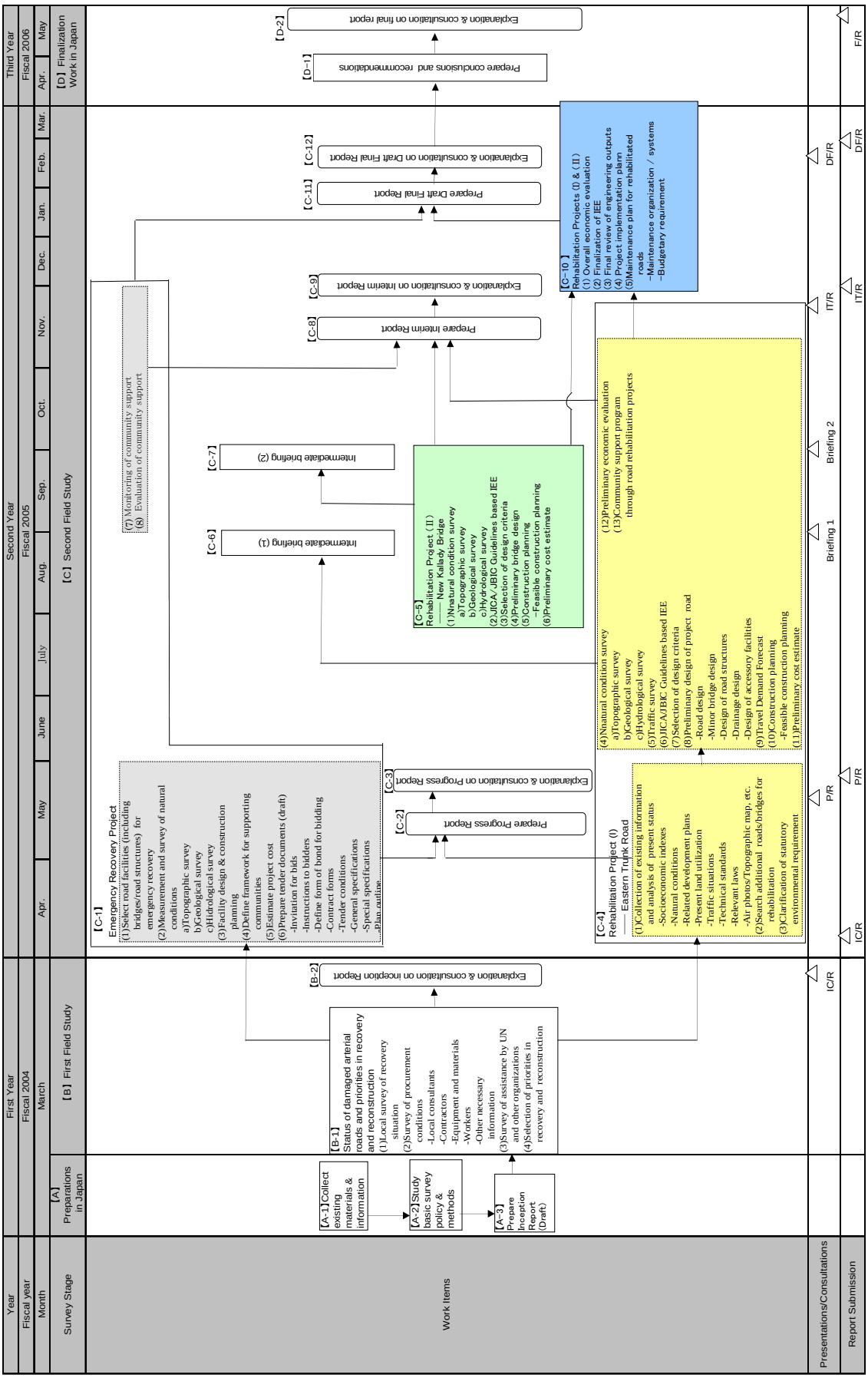


Figure 1.1. Project Work Flow

2 Overview of Project Area

2.1 Overall Socioeconomic Situation & Road Profile of Sri Lanka

Despite two decades of ethnic conflict, Sri Lanka's economy has grown steadily since liberalization began in 1978 with the rate of growth reaching 5.3% in 2003 and an estimated 5.4% in 2004. In fact, for the first time in Sri Lanka's history, per capita income exceeded US $1,000 in 2004. Despite this, about 20% - 25% of the population still lives below the poverty line. Note that while much of this poverty is rural based there is also some severe urban poverty. Sustainability, particularly in the context of unresolved ethnic conflicts, will depend significantly on social and political stability, continued policy reform, environmental protection and conservation.

There is a total of about 99thousand kilometers of road in Sri Lanka. Of this, about 27,100km is classified and the remaining 72,000km unclassified. The classified road network represents the country's core road network, and the RDA is in charge of the maintenance and improvement of the important national roads (or Class A and B roads), totaling about 12,000km. The nine Provincial Councils, on the other hand, are responsible for Class C and D roads that total about 13,400km, while the Local Authorities supervise the Class E roads (approx. 1,700km) that make up the remainder of the classified road network (see Table 2.1.).[1]

Table 2.1. Overview of Classified Road Network & Entities

Road Class	Road Category	Road Function	Administrative Entity	Implementation Entity
A	National	Inter-provincial trunk road connecting major cities & ports	Ministry of Highways	Road Development Authority (RDA)
B		Intra-provincial arterial road connecting major urban areas		
C	Provincial	Major feeder road & road for connecting settlements with markets, etc.	Ministry of Provincial Councils & Local Government	Provincial Road Development Authority (PRDA) of relevant Provincial Council
D		Minor feeder road & road for connecting settlements with markets, etc.		
E	Local	Local road to provide access to specific locations	Ministry of Provincial Councils & Local Government	In-house Road Maintenance Unit of Municipal/Urban Council or Local Authority

[1] Based on information from the *Economic and Social Statistics of Sri Lanka, Central Bank of Sri Lanka, 2003* and the *UN Economic and Social Commission for Asia and the Pacific, Asian Highway Handbook, 2003*

2.2 Natural & Environmental Conditions of Project Area

A coastal belt about 30 meters above sea level encompasses the island. Much of the coast consists of scenic sandy beaches punctuated by coastal lagoons. In the northeast and east where the Project area is located, as well as in the southwest of the country, the coast cuts across strata of crystalline rock creating rocky cliffs, bays, and offshore islands.

Due to Sri Lanka's location (i.e., between 5 and 10 degrees north latitude), it is endowed with a warm climate moderated by ocean winds and considerable moisture. The average yearly temperature for the whole country ranges from around 26˚ to 28˚C, but the mean temperature in Trincomalee is 29˚C, which is the highest in the country. Rainfall patterns are influenced by the monsoon winds of the Indian Ocean and Bay of Bengal and are marked by four seasons. Humidity is typically lower in the northeast and east areas, but is dependent on the seasonal patterns of rainfall.

As for the natural vegetation of the dry zone, which experiences variations from flooding to drought, it consists of scrub forest interspersed with bushes and cactuses in the driest areas. The coastal belt encircling the island contains a settlement pattern that has evolved from older fishing villages. Separate fishing settlements expanded laterally along the coast, linked by a coastal highway and a railway. Note that in the Eastern Province, there are several wild reserves such as the Gal Oya National Park.

2.3 Road Profile of Project Area

In the Project area, which is located in Eastern Province, the total length of the classified road network is 2,847 km, or 10.2% of the national total. The development of trunk roads on the Eastern Coast, where traffic volumes are low, is not that advanced and the quality not high. Note that according to motor vehicle registration statistics, the number of registered vehicles per capita in Eastern Province is low for all vehicle types except for land vehicles (agricultural and construction vehicles). The fact that the ownership of land vehicles is comparatively high in this region evidently describes how the region and its road system are less developed in this area.

2.4 Pre-Tsunami Socioeconomic Conditions of Project Area

Both Ampara and Batticaloa, two coastal districts in the Eastern Province, have historically had low populations as well as low levels of development investment. In 1981, Batticaloa District had an ethnic mix of 72% Tamils, 24% Muslims and 3% Sinhalese, while Ampara

had 20% Tamils, 42% Muslims and 38% Sinhalese. Batticaloa has a total land area of 2,610 sq. km. and 244 sq. km. of inland water, while Ampara has 4,222 sq. km. of land and 193 sq. km. of inland water. Given this, the population densities of these districts are relatively low, or 205 and 143 persons per sq. km., respectively.

The dominant economic sectors of the Eastern Province have been agriculture and fisheries, and, to a lesser but significant extent, services driven by tourism. The Eastern Province's contribution to National GDP has been around 5%, illustrating the underdeveloped state of the province. The average household income per month for the Eastern Province is Rs.7640 (the national average is Rs.12,803 while the average for the more affluent Western Province is Rs.17,732). More than 50% of the population is earning less than Rs.5500 per month.

2.5 Impact of Tsunami on the Socioeconomic Conditions of Project Area

Along the eastern coastline of the Project area, inhabitants and property in 8 of the 13 DS divisions in Batticaloa and in 11 of the 20 divisions in Ampara were severely affected by the tsunami. It is evident that the coastal areas of these two districts took the brunt of the tsunami's savage force. In fact, nowhere else in Sri Lanka has the destruction to lives and property been as severe. For example, damage to houses, either wholly or partially, has made nearly 160,000 persons homeless and asset-less. Impacts on institutions such as hospitals, schools, and places of worship have also been large.

2.6 Tsunami Damage to Road Facilities & Recovery Status in Project Area

According to TAFOR and TAFREN, the tsunami damaged 1,615 km of road in Sri Lanka, including 135 km of RDA road, 300 km of provincial road, and 1,180 km of Local Authority road, as well as 22 bridges, including 2, 15 and 6 bridges in the Northern, Eastern and Southern Provinces, respectively. Within two weeks after the disaster, all damaged roads had been temporarily repaired and made passable, and all damaged bridges bypassed with temporary Bailey bridges and made functional. In Eastern Province, which contains the Project area, RDA assessed that 29sections/points on trunk roads were damaged. Note that a considerable number of road sections were washed away or damaged, and some culverts and bridges had been damaged or collapsed. The approximate total cost for these emergency repairs and short-term rehabilitation (i.e., Stages 1 and 2) was estimated at Rs. 434 Million. All emergency repairs had been completed in a few weeks, and all sections recovered to a passable state with a minimum requirement.

PART 2 EMERGENCY RECOVERY PROJECT

3 Overview of Emergency Recovery Project

3.1 Selected Road Facilities for Emergency Recovery

Road facilities selected for the Emergency Recovery Project consist of the following four causeways, which due to their destruction are causing serious disruptions to traffic:

(See Location Map)

- Komari Causeway at Km 334/2 on AA004
- Periya Kallar Causeway at km 396/3 on AA004
- Koddaia Kallar Causeway at km398/1 on AA004
- Panichchankeni Causeway at km59/1 on AA015

3.2 Causeway Damage & Status of Emergency Repair Work

1) Komari Causeway

The total length of this causeway was about 80m, which was completely washed away by the tsunami. The emergency repair work for this causeway consisted of constructing a 48.5m embankment section with a 4m wide gabion mat, together with a gabion mat for the substructure and a Bailey bridge for the superstructure of a 33m long bridge section, for a total length of 81.5m. This work secured the minimum requirements necessary for the safe passage of traffic.

2) Periya Kallar Causeway

The total length of this causeway was about 700m, and of this approximately 630m included a retaining wall. A 120m section extending from the center of the structure to the north, which included an opening, was either washed away or badly damaged. In addition, parts of a 360m long area of the southern side were destroyed as well. Emergency repairs were carried out and consisted of providing a temporary embankment for the destroyed sections of the causeway that was consistent with its original width of 5.3m; thereby, securing a safe passageway for traffic.

3) Kodaia Kallar Causeway

The total length of this causeway was about 490m and of this a 13m section with a

retaining wall was completely washed away on the northern side. Moreover, 160m of the southern side having a retaining wall had its shoulder portion damaged. Emergency repair work consisted of using a 4.0m wide gabion mat for the substructure and a Bailey Bridge for the superstructure for the washed out section to secure a passageway for traffic. As for the southern side, the damaged portions of shoulder were repaired to ensure safety.

4) Panichchankeni Causeway

The total length of this causeway is about 280m and of this there is a 66m long center bridge section with 6 spans, with the superstructure of 1 span on the southern side and the superstructure of 2 spans and a bridge pier on the northern side completely washed away. In addition, there is one bridge pier that was not washed away but that was tilted to the side, and as a result it is impossible to use the superstructure on that section. Emergency repair work consisted of using a gabion mat for the substructure and a Bailey Bridge for the superstructure in order to secure passage for traffic.

3.3 Natural Condition Survey for Emergency Recovery

A topographic survey, geological survey and hydrological survey have been conducted to assess existing topographic, geographic and hydrologic conditions in order to determine design condition for the four tsunami-affected causeways. The main features of these surveys are described below.

1) Topographic Survey

Work items consist of establishing benchmarks and executing plane, centerline and cross section surveys.

2) Geological Survey

A summary of the geological survey on the basis of the standard penetration test (SPT) and core sampling is as shown in Table 3.1.

Table 3.1. Summary of Analysis for SPT

Causeway	Riverbed layer	Bearing layer	Test Boring
Komari	• Top 0~2m layer is silty sand • 2nd layer is highly weathered rock (sand) layer; N-value is more than 50	• 3rd layer is gneissic base rock - Depth: GL-3-5m~ - RQD: 23~86% - Compressive strength: Weathered rock at BH-3 Depth: 3.4-3.56m 20N/mm^2 Fresh rock at BH-3 Depth: 5.0-5.15m	• BH-1 Onshore • BH-2 Onshore • BH-3 Offshore at existing Bridge

		68N/mm^2	
Periya Kallar	• Top layer is mostly sandy soil or sandstone - Depth: from GL-0-1.5m~ - Thickness: 3~4m - RQD: 23~73%	• Highly weathered rock in sand or silty sand layer - Area: GL-5~15m - N-Value: 2~50 - Area: GL-15m~ - N-Value: More than 50	• BH-1 Onshore • BH-2 Onshore • BH-3 Onshore • BH-4 Onshore
Koddaia Kallar	• Top layer is mostly sandstone - Depth: GL-0-5m~ - Thickness: 1.5~3m - RQD: 18~100% - Compressive strength: Sandstone at BH-1 Depth: 0.05-0.2m 25 Mpa	• Highly weathered rock in sand or silty sand layer - Area: GL-3~15m - N-Value: 4~50 - Area: GL-15m~ - N-Value: More than 50	• BH-1 Onshore • BH-2 Onshore • BH-3 Offshore at existing Bridge
Panichchankeni	• Top layer is sand - N-value: 2~50 - Layer thickness 0~6m deep from ground/riverbed level	• Highly weathered and decomposed rock - Depth: GL-3-7m~ - N-Value: More than 50 • Base rock layer not encountered at max. depth of boring 12m	• BH-1 Onshore • BH-2 Onshore • BH-3 Onshore • BH-4 Offshore at existing Bridge

3) Hydrological Survey

A summary of the hydrological survey on the basis of a hydrological/hydraulic analysis is as shown in Table 3.2.

Table 3.2. Design High Water Levels at Four Causeways

Description	Bridge/Causeway			
	Komari	Periya Kallar	Koddaia Kallar	Panichchankeni
Total Required Opening Length (m)	48.0	136.0	41.0	127
Design High Water Level (from M.S.L.)	1.6	1.8	1.8	1.9

3.4 Principles for Project Implementation

As the goal of the Emergency Recovery Project is the urgent restoration of the four tsunami-affected causeways, it is important that this work be completed as early as possible. For this reason, it was agreed upon in discussions between the Government of Sri Lanka and the Government of Japan, in a steering committee established by the Sri Lankan Ministry of Finance & Planning, for it to be carried out via a design-build contract. Note that design-build is a method where the design and construction processes are bid out as a single integrated package. The major reason for this method being adopted is to shorten construction time, as it would be possible for a contractor awarded the job to execute detailed design while making preparations for construction; thereby, resulting in a more efficient management of scheduling. Furthermore, quality would be ensured by having a

consultant under a separate contract to verify the detailed design and oversee the construction process.

4 Facility Design for Emergency Recovery

4.1 Causeway Design Policy

Design policy for the causeways and their approach roads are described below.

- Causeway facilities shall be planned economically, meaning that local materials and manufactured goods should be utilized whenever possible.
- Causeway facilities shall be properly planned so that the elements and widths of the cross section and alignment satisfy Class A road standards and present traffic conditions.
- The elevations of the causeway, road, and approach road sections shall be planned so as to be higher than the high water level of the lagoons. This means that vehicles and pedestrians will be able to use the causeways throughout the year.
- Causeway openings that connect the seaside and landside of lagoons shall be planned so as to be sufficient in terms of hydrology.
- Approach road alignment and width shall be planned without land acquisition.
- Mounted-up sidewalks, handrails, road markings and reflective road studs shall be utilized to ensure vehicle and pedestrian safety.

4.2 Effective Causeway Road Width

The effective road width of a causeway section is 7.0m (2 Lane x 3.5m) with mounted-up sidewalks on either side. Moreover, cycle lanes are added to the sides of the carriageways at the Periya Kallar and Koddaia Kallar causeways due to the large volume of traffic. The typical causeway cross sections are as shown in Figure 4.1. and Figure 4.2.

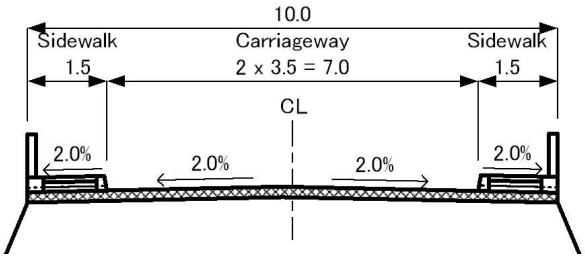


Figure 4.1. Komari & Panichchankeni Causeways

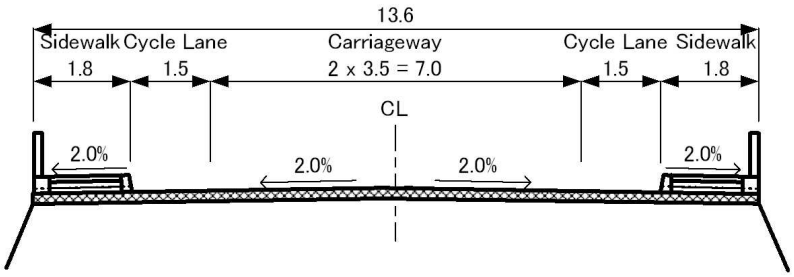


Figure 4.2. Periya Kallar & Koddaia Kallar Causeways

4.3 Design Conditions & Facility Plans

The design conditions and required components for the causeways are described in Table 4.1.

Table 4.1. Description of Required Facility Plans

Item		Komari	Periya Kallar	Koddaia Kallar	Panichchankeni
Road/Km		A4, KM334/2	A4, KM396/3	A4, KM398/1	A15, KM59/1
Road Class		A	A	A	A
Design Speed (km/hr)		70	70	70	70
Effective Road Width (m)		10.0	13.6	13.6	10.0
Estimated Present Traffic Volume (ADT pcu/day)		ADT for temporary use for cost estimate			
		500	7,070	7,070	500
Pavement Type	Causeway Road	Concrete	Concrete	Concrete	Concrete
	Approach Road	Asphalt Concrete or DBST	Asphalt Concrete Or DBST	Asphalt Concrete or DBST	Asphalt Concrete Or DBST
Design High Water Level (m) (Above MSL)		1.6	1.8	1.8	1.9
Opening for Canal	Required Structure	Bridge	Bridge/Culvert	Bridge/Culvert	Bridge
	Total Opening	48m	136m	41m	127m
Opening for Bridge (Preliminary design)	Superstructure	Pre-cast Pre-tensioned Beam	Pre-cast RC Concrete Slab	Pre-cast RC Concrete Slab	Pre-cast Pre-tensioned Beam
	Substructure	Reversed T-shape &Wall Type	Reversed T-shape	Reversed T-shape	Pile Bent type
	Foundation	Spread Foundation on Gneiss Rock Base	Spread Foundation on Sandstone	Spread Foundation on Sandstone	Cast-in-situ RC Concrete Pile Embedded in Coarse Sand
Causeway (Preliminary design)		Random Rubble Masonry Filling with Crushed Stone	Retaining wall	Retaining wall	Random Rubble Masonry Filling with Crushed Stone
Incidental Facilities	Sidewalk	Mounted up with Concrete Curb for all Causeways			
	Handrail	Typical Type of Pre-cast Concrete Handrails & Uprights for all Causeways			
	Duct for Utility Cables	Two Ducts for Future Utilities to be Contained Inside Mounted up Sidewalks			
	End Pilasters	Both Ends of Handrails to Have Commemorative Plates			
	Guard Rail	Outside of Embankment Shoulders on Approach Roads			
	Road Marking	Center-line & Edge Lines			
	Reflective Road Studs	Center-line on Causeway Roads & Bridges			
	Relocation of Utilities	No	Electric Line	Telephone Line Electric Line	No
Public Detour Road		None	None	None	None
Temporary Ferry for Public Transport in Lagoon		No	No	No	No
Existing Temporary Bailey Bridge		Dismantle & Transport to RDA Stockpile	No	Dismantle & Transport to RDA Stockpile	Dismantle & Transport to RDA Stockpile

Note that the preliminary designs for the road and bridge sections of the causeways in the Emergency Recovery Project are for cost estimation purposes and would have to be re-examined when detailed design work is carried out.

5 Construction Planning & Cost Estimate for Emergency Recovery

5.1 Construction Planning

1) Construction Area

The Project area is located on the east coast of Sri Lanka and requires a full day's travel from Colombo to reach by using the AA004 and AA011 roads. The surface conditions of these roads are not good in most parts of the Eastern region. Hence, the haulage of construction materials and equipment to the Project area is somewhat difficult. The climatic conditions of the area can be divided into two seasons as follows:

Rainy Season	:	From mid October to mid January
Dry Season	:	From mid January to mid October

Water levels at causeways rise more than 1.0 m to 1.5 m above normal levels during the rainy season. Moreover, the water level rises about 30 cm above the road surface of existing causeways during the period of mid-December to mid-January every year. Therefore, causeway construction work should be planned so that no major work is carried out during times of flooding.

2) Construction Method

During construction it is necessary to avoid any hindrance to traffic and therefore diversion roads will be constructed. In addition, cofferdams will be built in order to construct the retaining walls and bridge substructures of causeways. Taking into consideration existing road width and the required width of the new structures, the diversion and temporary cofferdams are planned as follows:

(a) Periya Kallar & Koddaia Kallar

The road sections at the Periya Kallar and Koddaia Kallar causeways shall be built via staged construction, with each half of a causeway's road section being constructed in two stages as shown below. Diversion roads shall be provided where construction is ongoing.

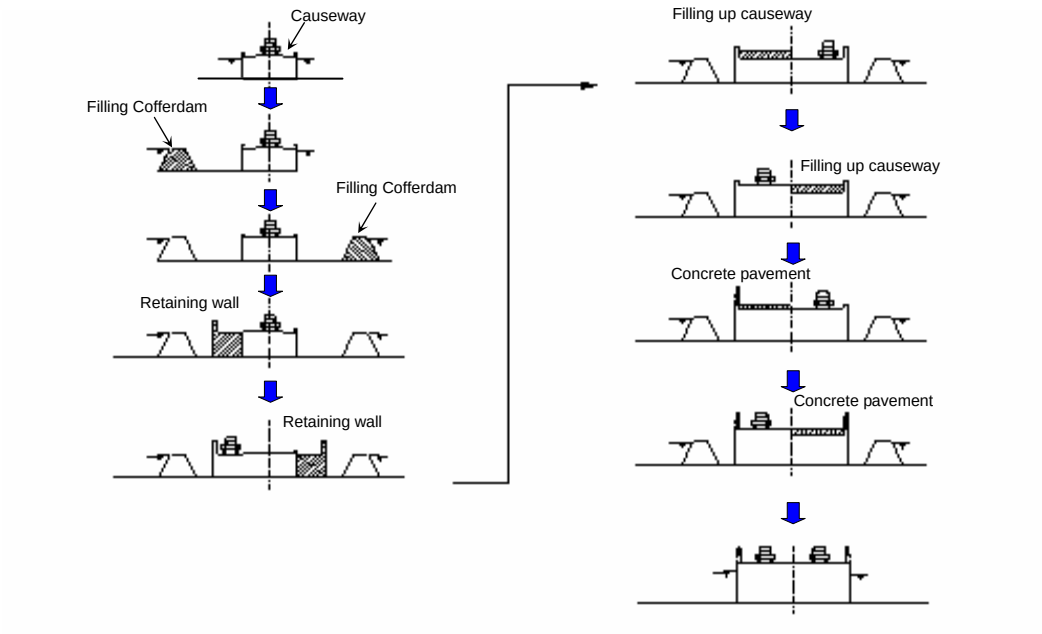


Figure 5.1. Staged Construction for Periya Kallar & Koddaia Kallar

(b) Komari & Panichchankeni

Due to the existing width of the causeways and the piling work involved in the Panichchankeni Causeway, diversion roads shall be provided for the entire length of these two causeways as shown below, with the diversion road to be used as one of two cofferdams that shall be on either side.

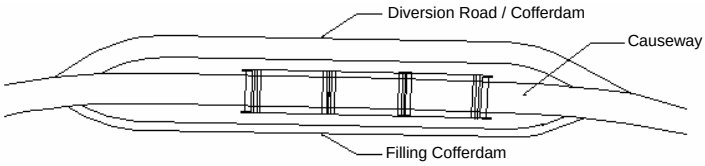
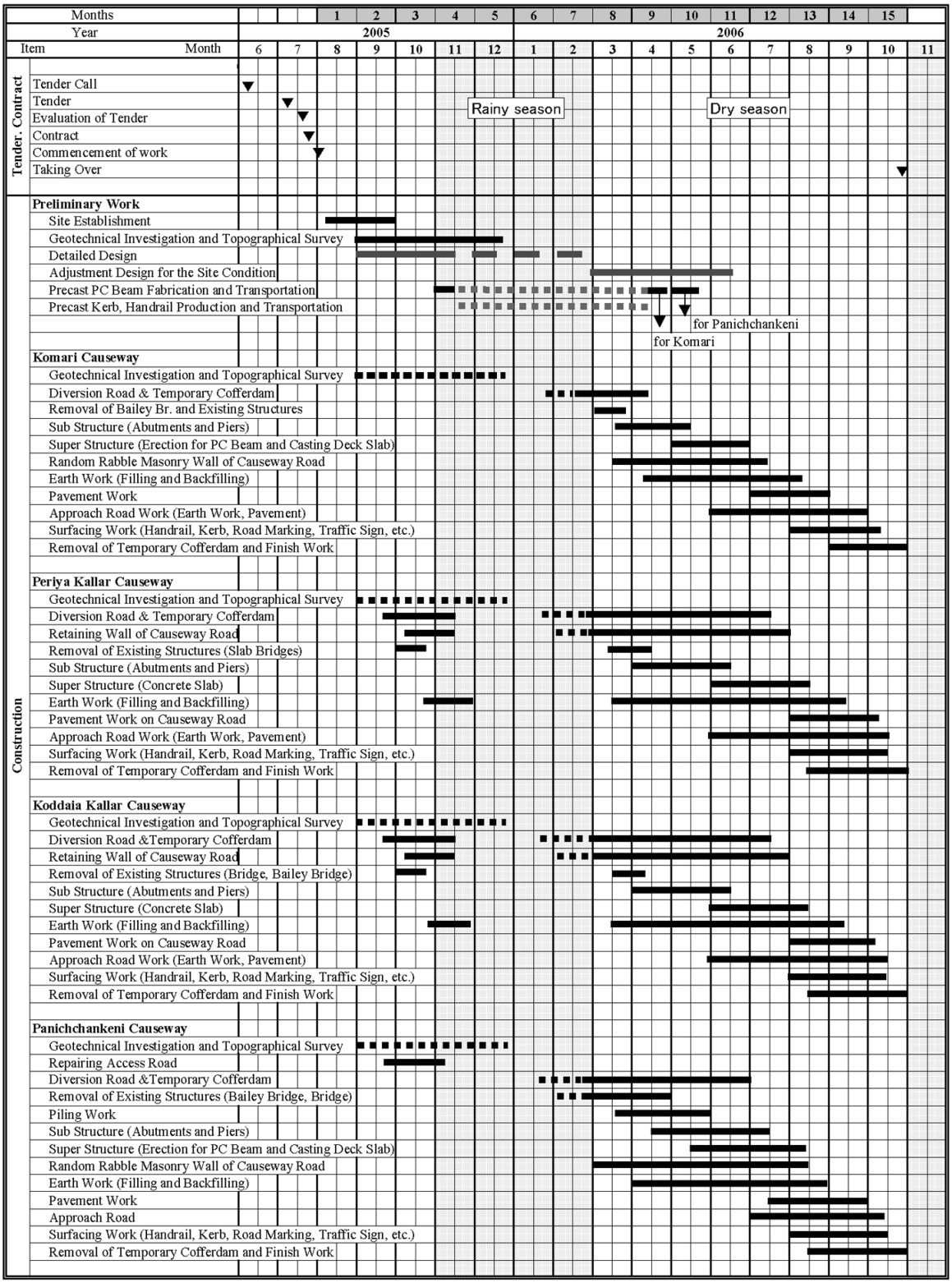


Figure 5.2. Diversion & Cofferdam Plan for Komariand & Panichchankerni

3) Construction Schedule

Taking into account the weather, water levels, and urgency of causeway rehabilitation, the construction period was set at 15 months for the Project as shown in Table 5.1.

Table 5.1. Construction Time Schedule



5.2 Cost Estimate

Project cost is estimated for the four causeways based on the results of the preliminary design and construction implementation plan. To arrive at total Project cost, unit rate components were prepared applying the Sri Lanka Highway Schedule of Rates (HSR) and the Japanese Cost Estimate Standard. When these two were not applicable, consultations were held with the relevant contractors to obtain accurate unit-cost information. In addition, a comparison with the costs for recent major road construction projects funded by international donor agencies in Sri Lanka was carried out to confirm their reliability. Note that total construction cost includes costs for the relocation of public utilities (electricity and telephone lines) in the provisional sums item. The basic assumptions and methods for estimating Project costs are as follows:

- Private contractor(s) carries out all construction work.
- Unit cost of each cost component is estimated by applying the HSR for fiscal year 2003, the Japanese Civil Work Estimate Standard of 2004, the Japanese Bridge Erection cost estimates of 2003, and information collected from interviews with relevant contractors.
- When the HSR and Japanese standards are inadequate for providing the unit cost for a particular item, then interviews were held with local contractors to gather the necessary data to determine the appropriate cost.
- Currency exchange rate: JPY 1 = Rs. 0.921 (average for April 2005).
- Taxation: 15% VAT.

After the completion of the preliminary design, construction plan and preparation of the cost estimate, the total project cost and its breakdown is estimated as shown in Table 5.2.

Table 5.2. Total Project Cost

Item	Cost (Rs. Million)	Cost* (JPY Million)
Earthwork & Removal Existing Structures	36.9	40.1
Pavement & Base & Sub-base courses	74.3	80.7
Structures (including temporary work)	450.6	489.2
Incidentals (road furniture & drainage)	47.9	52.0
Preliminary & Provisional sums	138.1	150.0
Construction Cost Total	747.8	812.0

*: Cost in Japanese yen given as a reference.

6 Preparation of Draft Tender Documents for Emergency Recovery Project

The Study Team prepared draft tender documents for the Emergency Recovery Project and, based on the urgency, scale, etc. of the recovery works, proposed to the Sri Lankan Government after referring to JICA's procurement guidelines a prequalification and bidding methodology. Note that the basic principles for the preparation of the draft tender documents are as summarized below.

- The Project will be implemented as a design-build system.
- Tender will be limited to Japanese contractors who are registered with the Japanese Commerce and Industry Association in Sri Lanka. This decision was based on discussions among the relevant organizations (MOH, RDA, JICA), with the MOH stating its desire to have the construction of the Project to begin as quickly as possible and to be processed as a Japan Grant Aid scheme. Usually, this type of Project would not be a Japanese-tied scheme, but it was decided that the wishes of the Sri Lankan Government be respected and that the bidding be restricted to Japanese contractors.
- Employment of tsunami victims, local contractors as subcontractors, and local products and services to the maximum extent possible will be required.
- In order to shorten the time for bidding and to begin construction as soon as possible, prequalification is not carried out. Moreover, a two-envelope tender system is applied, with the first envelope to contain a technical proposal and the second envelope to contain the bidding amount.
- The Contract will be concluded on a lump sum fixed price basis.
- All taxes and duties will be borne or reimbursed by the Owner to the Contractor.
- Tender and contract forms will follow the formats provided in JICA's sample tender documents. The conditions of contract will be mainly based on the FIDIC Short Form of Contract - Edition 1999, applicable for small-scale and design-build projects. The general specifications will essentially refer to Standard Specifications for Road and Bridge Works published by RDA - Edition 2003.

Based on the preceding, the Study Team prepared draft tender documents and submitted them to JICA on 19th May 2005.

7 Community Support Program & Social Environmental Considerations via the Emergency Recovery Project

7.1 Rationale for Incorporating Community Support to the Tsunami Victims in the Emergency Recovery Project

The Study Team intends to devise a mechanism to employ as many local residents as possible affected by the tsunami, who lost their means of livelihood for the emergency recovery works, to be contained in a statement of prioritized employment in the draft tender documents that is both tangible and that will enable these residents to be economically independent.

7.2 Objectives of Support Programs in Emergency Recovery Project

The support programs conceived for this Project would have the following objectives:

- Give those willing tsunami victims in the vicinity of the four causeway Project sites in need of immediate income support an opportunity to earn such an income by providing skilled or unskilled labor for the four construction jobs.
- As a result of the preceding, to stimulate the local economy via income generation for residents together with promoting as a first step the revitalization of the surrounding community.

7.3 Method of Recruiting Tsunami Victims for Emergency Recovery Works

Step 1 - Assessment of Labor Availability:
Interested individuals register at a nominated office. Let us assume the number registering to be X.

Step 2 - Assessment of Labor Requirements:
Let us assume this number to be Y.

Step 3- Assessment of Labor Suitability:
A facilitator would assess the suitability of those who have registered to work. Let us assume the number suitable to be Z.

Step 4 – Recruitment of Labor for Emergency Recovery Works:

The following simple formula should/could be used every time recruiting is initiated - whether, daily, weekly or on longer terms.

The hiring and deployment of staff for this Project is to be carried out as listed below on either a daily or weekly basis or for a period of time longer than that:

- If Y (no. of jobs) > X (no. of registered applicants) > Z (no. of suitable applicants), then 100% of Z should be recruited.
- If Y (no. of jobs) < X (no. of registered applicants) and Y (no. of jobs) > Z (no. of suitable applicants), then 100% of Z should be recruited.
- If Y (no. of jobs) < X (no. of registered applicants) and Y (no. of jobs) < Z (no. of suitable applicants), then 100% of Y should be recruited.

7.4 Potential Risks & Risk Management

Pricing of Labor:

Contractors bidding for the emergency recovery works should be appropriately directed in the draft tender documents to give due consideration to the already implemented INGOs' "cash-for-work" projects and price labor accordingly. Some guidelines on existing conditions may be provided as appropriate.

External Influence while Engaging Labor:

Likely undue pressure could be prevented by engaging the services of an appropriate facilitator who is well respected within the community to mediate and negotiate on behalf of the community.

7.5 Intended Community Support in the Emergency Recovery Project

A vast majority of those affected by the devastation of the tsunami belonged to the fishing community and had been living on the coastal belt when the tsunami hit. The international and national donor communities active in the region have been slowly but steadily providing material assistance to get several households to recommence their economic activities. However, there are those who either do not belong to the fishing community or those whose traumatic experience had been such that the sea poses more a threat than a hope and, consequently, have been seeking alternative employment. It is those households that this Project has targeted in the community support component of the Project. The approach adopted in this Project is to provide, for those willing and able amongst the

tsunami-affected, opportunities in the construction sector. This is perceived as not only providing livelihood opportunities in the short-term, but also providing the chance to acquire relevant skills that could be used over the long term in the construction industry.

7.6 Instruction on Community Support in Draft Tender Documents

In the "Instructions to the Tenderers" in the draft tender documents for the construction of the four causeways, the following is stipulated in order to aggressively promote the employment of people affected by the tsunami as well as to prevent their exploitation from wage underpricing:

> "To encourage local tsunami victims to participate in the Project construction works as much as possible, the wage rates to be paid to them shall be equal to or higher than those applied by international relief organizations and agencies in the sites concerned."

7.7 Monitoring of Community Support

In order to ensure that the community support in the Project is implemented as intended, appropriate monitoring and evaluation mechanisms have been incorporated in the Project. The Contractor has provided this Team with information such as the actions to be taken to maximize the involvement of tsunami victims in construction work, the number and percentage of tsunami victims in the Contractor's labor pool, and wage rates paid or to be paid. The Contractor expects to employ around 150 persons at any one time during the Construction. The selection of this labor force would be expected to follow policy that is compliance with JICA requirements.

7.8 Evaluation of Community Support

While the monitoring would be an on-going activity, a Project-life evaluation has been designed to assess if intended objectives are achieved and whether any unintended impacts will arise out of the project. In order to facilitate the monitoring and evaluation, a set of indicators to be evaluated at the end of the Project have been suggested. These indicators are grouped under the following five categories:

Economic Indicators will assess the increased level of earnings of the tsunami victims engaged in the Projects and estimate to what extent this income has impacted on their

lifestyles.

Social Indicators will inform if the program is being implemented without any bias towards or against any particular groups.

Operating and Organizational Indicators are required to monitor if the engagement of tsunami victims in all the recovery projects are in accordance with recruitment guidelines and are consistently applied across all four project sites and at all times.

Technical Indicators will be useful in assessing work progress, especially with respect to the quantity and quality of work provided by the tsunami victims.

Environmental Indicators will be required to monitor what health and psycho-social impacts the Project has on the tsunami victims employed on the Project as well as their families. On the other hand, any impact on the environment brought about by the work ethics and practices of the tsunami victims on the Project would also be monitored.

7.9 Social Environmental Consideration for Emergency Recovery

An environmental study for the Project has not been carried out in detail due to its urgent nature. However, given the vulnerability of the ecosystem of seaside lagoons through which the causeways pass, the construction activities should be conducted carefully with appropriate mitigation measures for anticipated negative impacts. From the viewpoint of social impacts, involuntary resettlement should be avoided through sufficient consideration in the design stage of the approach roads.