

**MINISTRY OF TRANSPORT  
THE SOCIALIST REPUBLIC OF VIETNAM**

**PREPARATORY STUDY REPORT  
ON  
THE PROJECT  
FOR  
RECONSTRUCTION OF BRIDGES IN THE CENTRAL  
DISTRICT (PHASE 2)  
IN  
THE SOCIALIST REPUBLIC OF VIETNAM**

**MAY 2010**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ORIENTAL CONSULTANTS CO., LTD.**

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<b>JR</b>
<b>10-095</b>

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## PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory study on the Project for Reconstruction of Bridges in Central District (Phase II) in the Government of the Socialist Republic of Vietnam.

JICA sent to Vietnam a study team from November 22 to December 21, 2009.

The team held discussions with the officials concerned of the Government of Vietnam, and conducted a field study at the study area. After the team returned to Japan, further studies were made. And as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the Project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Socialist Republic of Vietnam for their close cooperation extended to the teams.

May, 2010

Kiyofumi Konishi  
Director General, Economic Infrastructure Department  
Japan International Cooperation Agency

## SUMMARY

The Government of the Socialist Republic of Vietnam (GOV) has various modes of transport, including road, rail, waterway, and air, with road transport accounting for approximately 70% and 80% of freight and passenger traffic, respectively. Total road network length is approximately 251,787km and road density is 0.78km/m<sup>2</sup>, which is relatively higher than that of neighboring countries. However, investment in the road sector has concentrated up till now on trunk roads rather than rural roads.

As for bridge investment, although it has focused since 1975 on the rehabilitation of bridges damaged in the war, it has been obliged to replace them with temporary structures due to the lack of a sufficient budget. Those temporary bridges are now suffering from insufficient capacity and cannot handle heavy vehicles, and their relatively low height sometimes results in flooding and closure. These phenomena are hampering rural development in Vietnam.

Considering this situation, the Eighth 5-Year National Development Plan, covering period 2006 to 2010, has described the alarming and widening disparity of living between urban and rural areas in Vietnam. This agenda was originally include in the Sixth 5-Year National Plan and, together with the revitalization of rural villages, is considered an essential issue for national development.

In light of the foregoing, the Ministry of Transport has established in 1998 the “Strategy for Transport Development in Vietnam by the Year 2020”, focusing on the development of three road network areas, to wit: (1) the northern mountainous area, (2) the central mountainous area, and (3) the Mekong Delta area.

The Government of Japan (GOJ), in response to a request from the GOV, has been supporting the rural development of Vietnam by providing projects for the reconstruction of rural bridges via Japan’s Grant Aid scheme, including “The Project for Reconstruction of Bridges in the Northern Area (1995-98)” and “The Project for Reconstruction of Bridges in the Mekong Delta (2001-03)”.

Subsequent to the above, the GOV requested that the reconstruction of 84 high-priority bridges in the central 18 provinces of the country to be developed through Japan’s Grant Aid Scheme. In response to the request, the GOJ then conducted a basic design study (the BD study) for *The Project for Reconstruction of Bridges in the Central District in 2001*. Base on the result of the BD study, 45 bridges were selected for construction and/or renewal of small to medium bridges in 18 provinces of the central region of Vietnam under Japan’s Grant Aid Scheme to ensure safety and smooth passage of rural road traffic. Among the 45 bridges, 22 bridges were to be newly constructed by the Facility Construction type and 23 bridges were to be improved with the Girder Supply type. Note that the work for the 23 bridges was completed in Phase 1 of the Project, and the work for 14 of the 22 bridges was completed in 2006 under Terms 1 and 2 of Phase 2.

As for the remaining 7 bridges (1 bridge was withdrawn in 2003) which are to be taken up in Term 3 of Phase 2, Japan International Cooperation Agency (JICA) conducted an Implementation Review

Study in 2006, 4 years after the BD was pursued in 2001, but the study was suspended. JICA then decided to carry out the current Preparatory Survey in order to consider adjustments due to changes on site and/or to the socio-economy, as well as to recent hikes in steel and oil product prices worldwide by undertaking additional site reconnaissance and re-estimating project cost.

It is informed in this connection that the Tan Van Bridge in Lam Dong Province was dropped from the list of bridges to rehabilitated/reconstructed, for a total of 6 bridges in 4 provinces, (see Appendix 4: Minutes of Discussions)

Considering this situation, JICA dispatched a Study Team to Vietnam from November 22 to December 21, 2009. The Study Team confirmed the need for changes in Project content through a meeting with the Vietnamese side, and changes in site conditions. Based on the results of site reconnaissance, the Study Team executed a review of the Implementation Review Study, the detailed level design work, verification of the appropriateness of Project implementation, and a re-estimation of project cost. At the time of the discussion, the Study Team confirmed the progress of various undertakings by the Vietnamese side, including land acquisition and resettlement.

The Study confirmed that the remaining 6 bridges should still be implemented via Japan's Grant Aid scheme, because firstly their importance grew since the BD stage due to an increase in traffic volume as well as to the improvement in access roads to the proposed bridges, and secondly because there is no assistance planned for rehabilitating these bridges by other donors or the GOV.

As for the design standard/specifications for the new bridges, although the basic concept of bridge improvement established in the BD stage is still to be applied, partial specification modification, at the request of the Vietnamese side, is necessary due to changes in site conditions that include the establishment of a regional plan, an increase in traffic volume, the improvement of access road conditions, etc. For example, bridge formation was widened to have a dual carriageway in response to increases in traffic in order to secure the smooth and safe passage of vehicles. Furthermore, the live-load level was raised for several bridges having a high ratio of heavy vehicles carrying agricultural products with no alternative routes to provincial centers in order to prevent damage from heavy loads. The project cost was re-estimated to reflect present conditions after examining the construction and procurement plans. In consideration of the improvement in the procurement conditions of the domestic market as a result of the development of the industrial sector, changes to the source of procurement for both materials and equipment, together with changes to the type of materials, was made.

Study results are as shown in the table below. Note that enclosed values indicate revisions to previous study values. In addition to the contents of the table, the adoption of soft soil treatment for one bridge is to be incorporated.

Bridge Name Location : Province	Bridge Length (Span Arrangement) (m)	Clear Width (m)	Super- structure	Found ation	Live Load Level	Approach Road (m)	
						RB	LB
Da Dung Bridge Binh Thuan Province	92.3(3x30)	9.0	PC Tgirder	Spread	HL93x80%	152	172
Tran Brige Binh Thuan Province	65.3(3x21)	5.5	Ditto	Ditto	HL93x80%	117	120
Tam Ngan Bridge Ninh Thuan Province	71.3(21+27+21)	5.5	Ditto	Ditto	HL93x65%	23	187
Ea Soup Bridge Dac Lak Province	59.3(18+21+18)	7.0	Ditto	Ditto	HL93x80%	125	98
Krong K'Mar Bridge Dac Lak Province	71.3(21+27+21)	7.0	Ditto	RC pile	HL93x80%	126	117
Ngoi Ngan Bridge Khanh Hoa Province	49.5(2x24)	7.0	Ditto	RC pile	HL93x65%	95	93

Note) RB: Right Bank, LB: Left Bank

In the case that the Project is implemented with Japan's Grant Aid scheme, total Project cost is estimated at approximately JY1.150 billion, with the GOJ to bear JY1.118 billion and the GOV JY32.22 million. The Project implementation period is estimated to be about 22 months (including tendering).

Although Project Management Unit 2 (PMU2) is responsible for managing the implementation of the construction of the proposed 6 bridges, the relevant Provincial Department of Transport (PDOT) will be responsible for the operation and maintenance of all bridges after completion. Major maintenance activities are assumed to include:

- (1) Routine maintenance of both bridges and approach roads
- (2) Periodic overlays for the approach roads approximately every 7 years

Based on observations of actual bridge maintenance, it is expected that these activities will be carried out properly by each PDOT. In addition, it has been judged that the necessary maintenance budget for the proposed bridges can be secured, as the average maintenance cost for a new bridge in a province accounts only for 0.7-3.5 percent of the total road maintenance budget.

The following direct and indirect positive impacts are expected with the implementation of the Project. The beneficiaries of the Project are expected to consist of people living within the districts where the proposed bridges are located, and it is estimated that this will be approximately 600 thousand people.

(1) Direct Positive Impacts

- ① Reduction in the amount of time the proposed bridges are closed due to flooding from approximately 1 week per year to zero.

- ② Reinforcement of the transport capacity of the proposed bridges. For instance, at maximum, from a one-way structure with a 2.5-ton limit to a two-way structure with a 30-ton limit.

(2) Indirect Positive Impacts

- ① Revitalization of regional economic activities.
- ② Reduction in the maintenance cost of the proposed bridges.

Note that the validity of the Project was re-confirmed at the Study same as at the previous study from the viewpoint of contributing to the effectiveness of the regional road network, economic development, and the improvement of the standard of living of potential beneficiaries.

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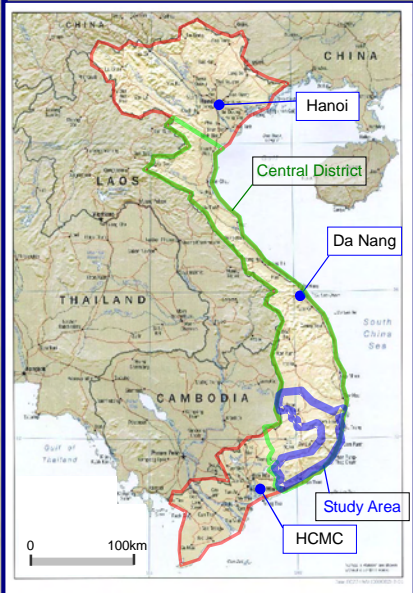
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# Socialist Republic of Viet Nam

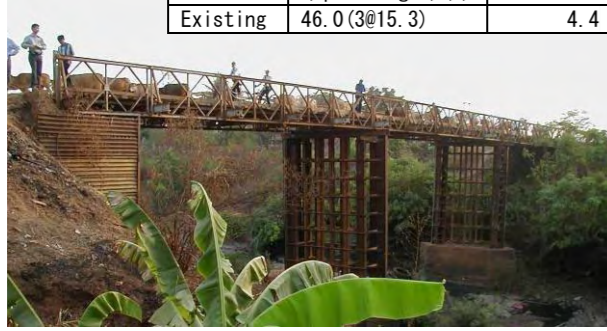
Project Location Map



# LOCATION MAP OF STUDY BRIDGES & PHOTOS

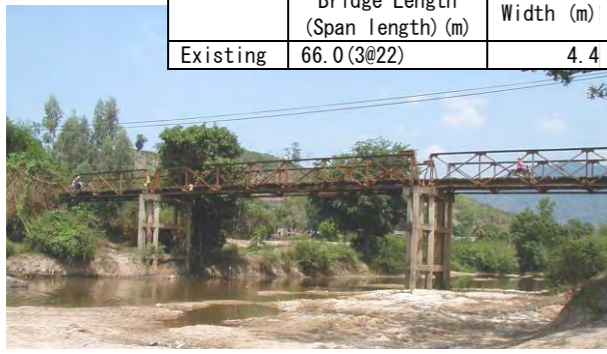
No.52 EA SOUP BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	46.0 (3@15.3)	4.4



No.56 KRONG K'MAR BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	66.0 (3@22)	4.4



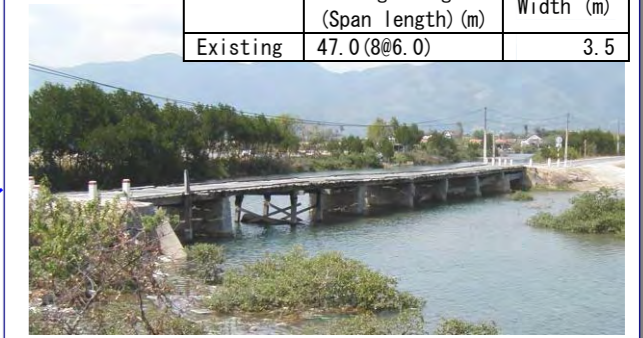
No.36 DA DUNG BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	73.0 (13+3@20)	4.4



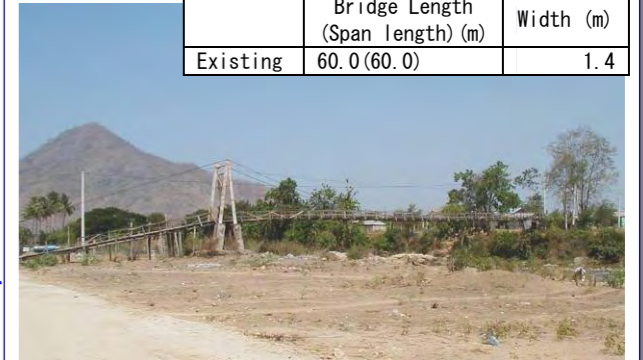
No.83 NGOI NGAN BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	47.0 (8@6.0)	3.5



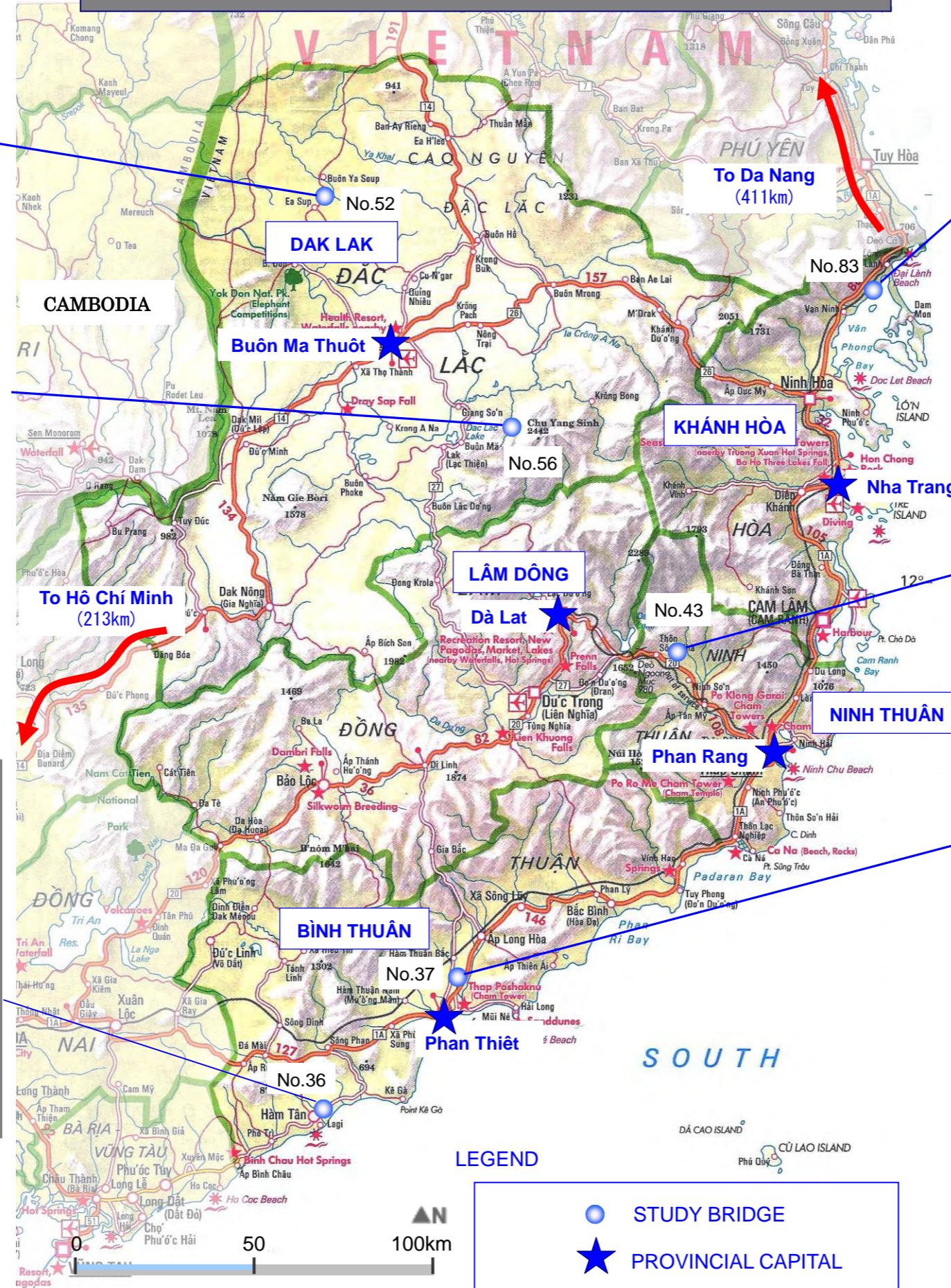
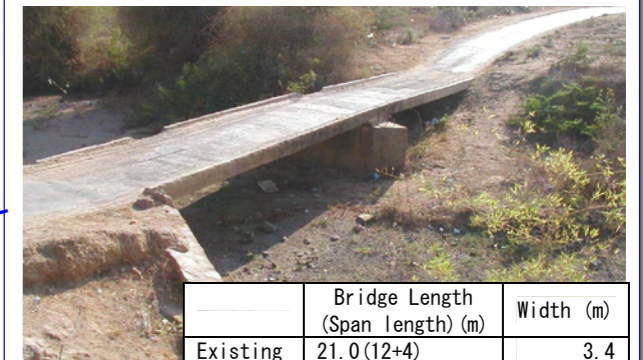
No.43 TAM NGAN BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	60.0 (60.0)	1.4



No.37 TRANG BRIDGE

	Bridge Length (Span length) (m)	Width (m)
Existing	21.0 (12+4)	3.4



LEGEND

- STUDY BRIDGE
- ★ PROVINCIAL CAPITAL



**(Perspectives of the Bridge)**

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## Abbreviation

AASHTO	American Association of State Highway and Transportation Officials
ADB	Asian Development Bank
BD	Basic Design Study
CAS	Country Assistant Strategy
CPRGS	Comprehensive Poverty Reduction and Growth Strategy
CSP	Country Strategy and Program
DBST	Double Bituminous Surface Treatment
DD	Detailed Design
DFID	Department of International Development
E/N	Exchange of Notes
G/A	Grant Agreement
FS	Feasibility Study
HWL	High Water Level
LWL	Low Water Level
IMF	International Monetary Fund
JBIC	Japan Bank for International Development
JICA	Japan International Cooperation Agency
MOT	Ministry of Transport
MP	Master Plan
PBD	Plastic Board Drain
PC	Pre-stressed Concrete
PCU	Passenger Car Unit
PDOT	Provincial Department of Transport
PMU	Project Management Unit
RRMU	Regional Road Maintenance Unit
VRA	Vietnam Road Administration
WB	World Bank

## **CHAPTER 1**

### **BACKGROUND OF THE PROJECT**



## Chapter 1 Background of the Project

Since 1975, the Government of the Socialist Republic of Vietnam (hereinafter referred “GOV”) has been rehabilitating rural bridges that were mainly damaged by the war, with temporary bridges sometimes being used due to the lack of a sufficient budget. The temporary bridges, however, are insufficient for heavy vehicles and their lower levels sometimes result in the bridges being closed during the rainy season. Consequently, this situation has been hampering rural development in Vietnam.

Given the above, the Government of Japan (hereinafter referred “GOJ”) has been providing Grant Aid to support the improvement of those temporary bridges via the projects listed below:

- “The Project for Reconstruction of Bridges in the Northern Area (1995-98)”: Consists of 8 material procurement type bridges (steel girders supplied) and 21 facility construction type bridges.
- “The Project for Reconstruction of Bridges in the Mekong Delta Area (2001-03)”: Consists of 17 material procurement type bridges and 20 facility construction type bridges.

Followed by those two projects, in March 2001, the GOV made a request to the GOJ for Grant Aid for “the Project for Reconstruction of Bridges in the Central District (the Project)”. The GOJ then entrusted the Japan International Cooperation Agency (JICA) to execute a study to examine the viability of the Project. Note that JICA is the official agency for implementing the Japanese Government’s technical assistance and expediting the proper execution of Japan's Grant Aid.

In response to the above, JICA decided to conduct a basic design study (hereafter referred to as the BD study) and sent a study team to Vietnam from August 2001. The study team eventually selected 45 bridges and steel girders for 23 bridges (steel girder supply type) were supplied in Phase 1. 14 of the 22 facility construction type bridges were completed in 2006 under Term 1 and 2 of Phase 2.

As for the remaining 7 bridges (1 bridge was withdrawn in 2003) which are to be taken up in Term 3 of Phase 2, JICA conducted an Implementation Review Study in 2006, 4 years after the BD study was pursued in 2001, but the study was suspended. JICA then decided to carry out the current Preparatory Survey.

It is informed in this connection that the Tan Van Bridge in Lam Dong Province was dropped from the list of bridges to rehabilitated/reconstructed, for a total of 6 bridges in 4 provinces, (see Appendix 1: Minutes of Discussions)

## **CHAPTER 2**

### **CONTENTS OF THE PROJECT**

## Chapter 2 Contents of the Project

### 2.1 Basic Concept of the Project

#### 2.1.1 Overall Goal & Purpose

The eighth 5-Year National Development Plan, covering the period 2006 to 2010, has described the alarming and widening disparity in the standard of living between urban and rural areas in Vietnam. This agenda was originally include in the sixth 5-Year National Plan and, together with the revitalization of rural villages, is considered an essential issue for national development.

In light of the foregoing, the Ministry of Transport (MOT) has established the 1998 “Strategy for Transport Development in Vietnam by the Year 2020”, focusing on the development of three road network areas, to wit: (1) the northern mountainous area, (2) the central mountainous area, and (3) the Mekong Delta area.

Among the policies involved, the Vietnamese Government has identified the reconstruction of high-priority bridges in the central area of the country to be developed through Japan’s Grant Aid Scheme. In response to the request, the Japanese Government then conducted the BD study for *the Reconstruction of Bridges in the Central District Vietnam* in 2001. Based on the result of BD study, 45 bridges were selected from among 84 candidate bridges for construction and/or renewal of small to medium bridges in 18 provinces of the central region of Vietnam under Japan’s Grant Aid Scheme to ensure safety and smooth passage of rural road traffic. Among the 45 bridges, 22 bridges were to be newly constructed by the Facility Construction type and 23 bridges were to be improved with the Girder Supply type. Note that the work for the 23 bridges was completed in Phase 1 of the Project, and the work for 14 of the 22 bridges was completed in 2006 under Terms 1 and 2 of Phase 2.

As for the remaining 7 bridges (1 bridge was withdrawn in 2003) which are to be taken up in Term 3 of Phase 2, Japan International Cooperation Agency (JICA) conducted an Implementation Review Study in 2006, 4 years after the BD was pursued in 2001, but the study was suspended. JICA then decided to carry out the current Preparatory Survey.

In Term 3 of Phase 2 of the Project (hereafter referred to as the Project), the same overall goal and purpose hitherto is applied in consideration of consistency and their importance. Accordingly, the Project defines its overall goal as “improving the standard of living of rural inhabitants in the central area and narrowing the disparity in poverty levels between urban and rural areas”, with the Project purpose being the “reconstruction of all-weather bridges that will continuously provide safe and smooth passage for road traffic throughout a year”.

It is informed in this connection that the Tan Van Bridge in Lam Dong Province was dropped from the list of bridges to rehabilitated/reconstructed, for a total of 6 bridges in 4 provinces, (see Appendix 1: Minutes of Discussions)

## 2.1.2 Objective Bridges

In order to achieve the objectives of the Project, the narrow existing temporary bridges in the central part of Vietnam, with frequently subjected to closures due to incidences of numerous flooding, will be replaced with permanent bridges of more than 5.5m wide, higher live loads and passable even with the past flood levels. Similarly, the Project will be implemented through Japan's Grant Aid Scheme with a Japanese national as the prime contractor.

This Preparatory Survey (hereafter referred to as "the Study") was executed a review of the Implementation Review Study in 2006, which was produced in 2006 in order to reflect the results in a detailed design of the proposed bridges together with re-estimating Project cost. The condition of the existing bridges and the results of the Implementation Review Study are shown in Table 2.1.1.

**Table 2.1.1 Condition of Existing Bridges & Implementation Review Study Results**

Bridge No & Name	Location (Province)	Existing Condition (m)		Preparatory Survey Results (m)	
		Br. L (Span)	Width	Br. L (Span)	Width
Da Dung Br.	Binh Thuan	73.0 (13+3x20)	4.4	92.3 (3x30)	7.0
Tran Br.	Ditto	21.0 (12+9)	3.4	65.3 (3x21)	5.5
Tam Ngan Br.	Ninh Thuan	60.0 (60.0)	1.4	71.3 (21+27+21)	5.5
Ea Soup Br.	Dac Lak	46.0 (3x15.3)	4.4	59.3 (18+21+18)	7.0
Krong K'Mar Br	Ditto	66.0 (3x22))	4.4	71.3 (21+27+21)	7.0
Ngoi Ngan Br.	Khanh Hoa	47.0 (8x6.0)	3.5	49.5 (2x24)	5.5

## 2.2 Basic Design of the Japanese Assistance

### 2.2.1 Design Policy

#### (1) Basic Concept

The basic concept, which is based on site investigation results, as well as discussions with the Vietnamese Government, is as follows:

- The 6 bridges shown in Table 2.1.1 were confirmed as part of the implementation program of Japan's Grant Aid Scheme, because their importance has increased due to the improvement in access roads and because there is no improvement plan for the proposed bridges by other donors or the Vietnamese Government.
- The request for revisions from the Vietnamese Government of the 2006 Implementation Review Study results will be included in the Study if those are confirmed as appropriate from technical viewpoint considerations and the Japan's Grant Aid Scheme viewpoint.

## **(2) Natural Condition Policy**

The central area of Vietnam often experiences damage from flooding due to heavy rainfall. Accordingly, appropriate bridge length and clearance should be set to secure sufficient capacity of water discharges during flood occurrence.

The design high water level (HWL) was established based on interviews with inhabitants living in nearby areas due to the absence of records about the level of water discharge during flood occurrence. The maximum HWL was also estimated based on previous rainfall data to confirm the results of the interviews. Relative thereto, the Study confirmed that no severe flooding after completion of the BD study in 2002 and for this reason, the design HWL in the BD study will be adopted for the detailed design.

As protection against scouring during flood occurrence, embankment slopes and adjacent abutments will be provided with riprap or gabion. Piers that are located in areas of swift current will also be provided with boulders or gabion mattress. Protection work however will not be provided in areas of shallow bedrock in accordance with geotechnical survey result.

The Study area is mainly covered with metamorphic rock, igneous rock, or sedimentary rock, with the lower plain near the sea being covered with alluvial sedimentary rock. The bearing strata at the proposed bridge sites are located 3-22m deep near abutments, and 0-17m deep around piers, consisting of gravel or the rock layers just mentioned. Note basically that a spread foundation is applied at places where there is a shallow bearing stratum and a pile foundation at places where there is a deep bearing stratum.

Countermeasures against soft ground will be planned for the high embankment adjacent to the abutment at Krong K'Mar Bridge, as the embankment will cause either consolidation settlement or sliding failure of the existing ground.

As for earthquakes, as no severe earthquake has been recorded in the southern area of the Indochina Peninsula, only minimum effects will be considered in the design of the bridge structures.

## **(3) Social Policy**

The issues of resettlement and land acquisition for the proposed bridges were found to be minor. Land acquisition and resettlement work were practically completed in 2006. The Study team has confirmed that the Vietnamese Government will complete remaining temporary houses and lot under an agreement with affected people by May 2010.

The site investigations of the Study found that access from houses to new approach roads of bridges should be provided with embankment because the road elevation rises due to an increase in bridge elevation. Furthermore, drainage facilities should be provided along new approach roads at the toes of embankment slopes in order to catch water from the roads (as shown in Table 2.2.7).

#### **(4) Construction Policy in Vietnam**

It is necessary for Project implementation to obtain approval from the Vietnamese Government, but since this has already been achieved in the BD stage, it is no longer required.

New design standards and specifications will be applied for the detailed design of the Study.

The capacity of local contractors has improved regarding bridge construction due to their experience with donor-funded projects or projects funded by the Vietnamese Government. As a result, it has been determined that they are capable of constructing small- to medium-sized bridges with little problem. However, on-site Study Team visits of Phase I bridges found that there is still a problem with quality control, such as the smoothness of the bridge's road surface and the linkage of mortar paste on girders when slab concrete is placed. Accordingly, Japanese engineers dispatched on site for this Project will train the engineers of the local sub-contractor in quality control throughout the construction.

Construction equipment and materials for the Project should be procured from the domestic market as much as possible.

Careful attention should be given to the use of oil products and reinforcement materials, which have experienced drastic price hikes in recent years, as this will have a significant impact on Project cost.

#### **(5) Local Contractor Policy**

The Japanese contractor who has worked in Terms 1 and 2 of the Phase2 Project has actively utilized local contractors, and this practice should continue in Term 3. The Japanese contractor is expected to transfer skills and knowledge in construction site quality control and safety management.

#### **(6) Operation & Maintenance Policy**

Project Management Unit 2 (PMU2) under Vietnam Road Authority (VRA) will be the implementing agency of the Project for the tendering and construction stages of the 6 bridges. After the completion of construction, the facilities will be turned over to relevant Provincial Department of Transport (DOT) Offices for operation and maintenance.

The basic procedure for road and bridge maintenance consists of the provincial DOTs periodically inspecting the relevant roads and bridges, providing annual maintenance plans based on the inspection results, and submitting a maintenance budget plan to the provincial government. After funds are allocated, the provincial DOTs will contract the works to specialty semi-government firms for maintenance works. It is informed in this connection that each province there is about one or two semi-governmental road maintenance companies.

The Study Team has deemed the provincial DOTs capable of maintaining the system of roads and structures for the proposed bridges, given that the maintenance system at the provincial level has been standardized with support from foreign donors and that maintenance work itself does not require a high level of skill.

However, it is necessary for the Japanese side to monitor the performance of the maintenance activities of the provincial DOTs and to institute the importance of maintenance works considering that the Vietnamese Government has been struggling for many years for the needs of proper road maintenance.

## **(7) Facility Grade Setting Policy**

The Project will involve the construction of 6 bridges and approach roads with the needed associated facilities.

Although the grade of these facilities will basically be the same as those determined in the 2006 Implementation Review studies shown hereunder, other requests from the Vietnamese Government through this Study will be incorporated into the Project scope if the request is determined to be appropriate from both a technical and Japan Grant Aid Scheme viewpoint.

- Design Standard: Vietnamese Design Standards and Specifications
- Live Load: HL93x65% (equivalent to H-13) or HL93x80% (equivalent to H-18)
- Bridge Clearance Width: 5.5m, 7.0m or 9.0m
- Road Class: Class III, IV & V

## **(8) Construction Methodology & Scheduling Policy**

A review will be undertaken of both the bridge erection method and construction yard in the previous study. The former will be examined on the basis of experience in Terms 1 and 2 of the Project. As for the latter item, all bridges can be utilized as planned in the previous study, and it has been confirmed with the Vietnamese Government that land acquisition has almost completed without hindrance.

Careful attention will be given to the natural conditions, work items and movement of equipment on site for the preparation of an appropriate construction schedule. Firstly, the duration of the rainy season and rainfall intensity should be considered, because the rainy season in the Project area, which is mountainous, is slightly different from that of the coastal area. Although the rainy season in both areas continues from May to November, the rain in the mountain side of the Project area is heavier. Secondly, some items of work for the substructure, embankment and soft ground treatment can only be undertaken during the dry season. Finally, the efficient movement of equipment and machineries from site to site for girder fabrication and erection works should be carefully considered, as the Project bridges are located over a wide area and the amount of equipment procured has a significant impact on Project cost.