

**DRAFT INITIAL ENVIRONMENTAL  
IMPACT ASSESSMENT ON THE  
URGENT BRIDGES REHABILITATION  
PROGRAM**



## Draft Initial Environmental Impact Assessment (IEIA)

### 1 Introduction

This Draft Initial Environmental Impact Assessment (IEIA) has been prepared as a part of the Study on the Road Network Development in the Kingdom of Cambodia. Through the study, the "Urgent Bridge Rehabilitation Program in Cambodia (Phase I: Southeast Block)" has been selected as a high priority project. A pre-feasibility study has been conducted for the project as part of the JICA Study. This draft IEIA has been prepared for the Urgent Bridge Rehabilitation Program in Cambodia (Phase I: Southeast Block).

The feasibility study includes a topographic survey, geotechnical survey, preliminary design including road, bridge and pavement, construction plan and schedule, and cost estimate.

The decision for the project to be implemented had not yet been made at the time when this draft IEIA was prepared. Therefore the draft IEIA has to be finalized when the decision is made by the government. Due to the social and administrative constraints, the IEIA could not include information relating to public awareness of the project and other social aspects. The supplementary survey and other necessary steps will need to be promptly conducted after the decision has been made by the government.

### 2 Environmental Laws and Regulations in Cambodia

The following laws and regulations relate to the natural environment in Cambodia:

**Table 2.1 Laws and Regulations relating to the Natural Environment in Cambodia**

| Title   | Date of Enactment | Note                       |
|---|-------------------|----------------------------|
| <b>I. Law</b>   |                   |                            |
| 1. Law on Environmental Protection and Natural Resources Management               | Dec.24, 1996      |                            |
| 2. Law on Forestry  | Sep.30, 2002      |                            |
| <b>II. Royal Decree</b>   |                   |                            |
| 3. Royal Decree on Creation and Protection of Protected Area                      | Nov.,1993         |                            |
| <b>III. Sub-Decree</b>  |                   |                            |
| 4. Sub-Decree on Environmental Impact Assessment Process                          | Aug.11, 1999      | No.72 Council of Ministers |
| 5. Sub-Decree on Water Pollution Control  | Apr.6, 1999       | No.27 Council of Ministers |
| 6. Sub-Decree on Solid Waste Management   | Apr.27, 1999      | No.36 Council of Ministers |
| 7. Sub-Decree on Air and Noise Pollution Control                                  | Jul.10, 2000      |                            |
| <b>IV. Declaration</b>  |                   |                            |
| 8. Declaration on Guideline for Conducting Environmental Impact Assessment Report | Mar.9, 2000       | No.49 MOE                  |
| 9. Declaration No.1033 on Protected Area  | Jun.3, 1994       | No.1033 MOE                |

The requirements for an Environmental Impact Assessment (EIA), including an Initial Environmental Impact Assessment (IEIA), are stipulated in the Sub-Decree on the Environmental Impact Assessment Process (Aug.11, 1999). According to the sub-decree, the following items relate to road and bridge construction projects:

- An EIA shall be conducted for a road construction of more than 100 km;
- An EIA shall be conducted for a bridge construction of more than 30 tons weight;
- Standard for air and noise pollution;
- Protected areas (MOE);
- Protected forests (MAFF).

There are 23 protected areas in four (4) categories stipulated by MOE and eight (8) protected forests stipulated by the Ministry of Agriculture, Forestry and Fishery (MAFF) from the viewpoint of conservation of the natural environment and ecosystems. These areas are shown below.

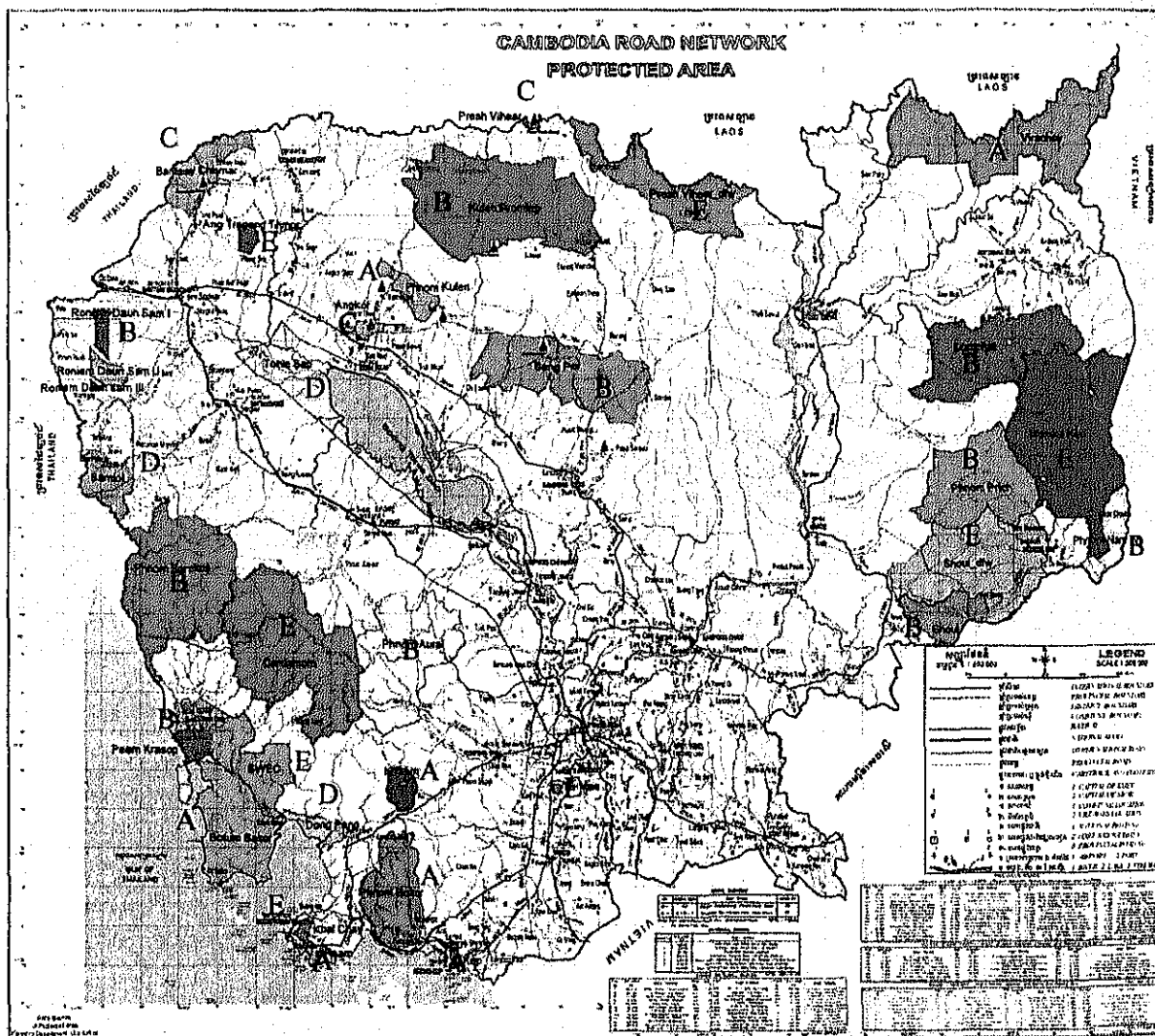


Figure 2.1 Protected Area and Protected Forest

**Table 2.2 List of Protected Areas and Protected Forests**

| No.                            | Names of the Protected Areas/Forests | Land Area Covered (ha) | Provinces Where the Protected Areas/Forests are Located         |
|--------------------------------|--------------------------------------|------------------------|---|
| <b>A. National Parks</b>       |                                      |                        |   |
| 1                              | KIRIRUM                              | 35,000                 | Kampong Speu and Koh Kong                                       |
| 2                              | BOKOR                                | 140,000                | Kampot  |
| 3                              | KEP                                  | 5,000                  | Kampot  |
| 4                              | REAM                                 | 15,000                 | Sihanouk Ville  |
| 5                              | BOTUM SAKOR                          | 171,250                | Koh Kong  |
| 6                              | PHNOM KOULEN                         | 37,500                 | Siem Reap   |
| 7                              | VIRAK CHEY                           | 332,500                | Stung Treng and Rattanak Kiri                                   |
| <b>B. Wildlife Sanctuaries</b> |                                      |                        |   |
| 8                              | PHNOM ORAL                           | 253,750                | Koh Kong, Pursat, Kampong Chhnang                               |
| 9                              | PEAM KRASOP                          | 23,750                 | Koh Kong  |
| 10                             | PHNOM SAMKOS                         | 333,750                | Koh Kong  |
| 11                             | RONEAM DONSAM                        | 178,750                | Battambang  |
| 12                             | KOULEN PRUM TEP                      | 402,500                | Siem Reap and Preah Vihear                                      |
| 13                             | BENG PER                             | 242,500                | Kampong Thom  |
| 14                             | LUMPHAT                              | 250,000                | Rattanak Kiri and Mondul Kiri                                   |
| 15                             | PHNOM PRICH                          | 222,500                | Mondul Kiri and Kratie  |
| 16                             | PHNOM NAMLEAR                        | 47,500                 | Mondul Kiri   |
| 17                             | SNUOL                                | 75,000                 | Kratie  |
| <b>C. Protected Landscapes</b> |                                      |                        |   |
| 18                             | ANGKOR                               | 10,800                 | Siem Reap   |
| 19                             | BANTEAY                              | 81,200                 | Banteay Mean Chheay   |
| 20                             | PREAH VIHEAR                         | 5,000                  | Preah Vihear  |
| <b>D. Multiple Use Areas</b>   |                                      |                        |   |
| 21                             | DONG PENG                            | 27,700                 | Koh Kong  |
| 22                             | SAMLOT                               | 60,000                 | Battambang  |
| 23                             | TONLE SAP                            | 316,250                | Kampong Chhnang, Kampong Thom, Siem Reap, Battambang and Pursat |
| <b>E. Protected Forests</b>    |                                      |                        |   |
| 1                              | SWEC                                 | 144,000                | Koh Kong  |
| 2                              | TA MOA                               | 2,400                  | Kandal  |
| 3                              | CARDAMOM                             | 401,000                | Pursat, Koh Kong, Kampong Speu                                  |
| 4                              | KBAL CHAY                            | 6,350                  | Shianoukville   |
| 5                              | SNOUL dfw                            | 298,000                | Mondul Kirri, Kratie  |
| 6                              | PREAH VIHEAR dfw                     | 190,000                | Preah Vihear  |
| 7                              | MONDUL KIRRI                         | 429,000                | Mondul Kirri  |
| 8                              | ANG TRAPENG THMOR                    | 13,000                 | Banteay Meanchey  |

Source: (I-IV) Royal Decree on the Protection of Protected Areas, November 1, 1993

(V) The Forestry Administration, Ministry of Agriculture, Forestry and Fisheries

Terminology:

1. National Park: Areas reserved for nature and scenic views to be protected for scientific, educational and entertainment purposes.
2. Wildlife Sanctuary: Natural areas preserved in their natural conditions in order to protect wildlife, vegetation and ecology balance.
3. Protected Landscapes: Areas to be maintained as scenic views for pleasure and tourism.
4. Multiple Use Areas: Areas necessary for the stability of water, forestry, wildlife, and fisheries resources, for pleasure, and for the conservation of nature with a view to assuring economic development.
5. Protected Forests: Areas to be maintained primarily for the protection of the forest ecosystems and natural resources therein.

There are several laws and regulations relating to the social environment, such as resettlement and compensation, as shown below.

**Table 2.3 Laws and Regulations Relating to Resettlement and Compensation**

| Title  | Date of Enactment | Note                   |
|--|-------------------|------------------------|
| The Constitution of Cambodia (Article 44)                        | Sep.21, 1993      | Right of expropriation |
| Land Law   | Sep.20, 2001      | Land Ownership         |
| Prakas (Announcement) on Measurement of Illegal Occupant of Land | Sep.27, 1999      | Width of ROW           |

The widths of ROW for each type of road are stipulated in Prakas (Announcement) on the Measurement of Illegal Occupant of Land as follows:

**Table 2.4 Width of ROW**

| Types of Road   |                            | Width of ROW |
|-----------------|----------------------------|--------------|
| National Road   | NR.1,4,5                   | 60m          |
|                 | NR.2,3,6,7 (one digit)     | 50m          |
|                 | NR.11,22,64,78 (two digit) | 50m          |
| Provincial Road |                            | 40m          |
| Commune Road    |                            | 30m          |

Source: Prakas No.06 on Measurement of Illegal Occupant of Land, Sep.27, 1999

### 3 Description of the Project

#### 3.1 Project Summary

- a. **Project Owner:** Ministry of Public Works and Transport (MPWT),  
The Government of Cambodia
- b. **Project Title:** Urgent Bridge Rehabilitation Program in Cambodia  
(Phase I: Southeast Block)
- c. **Sector:** Road Transport Sector
- d. **Project Type:** Bridge Construction
- e. **Project Components:** 8 Bridges
  - No.1: NR.3
  - No.2: NR.3
  - No.3: NR.7
  - No.4: NR.11
  - No.5: NR.11
  - No.6: NR.11
  - No.7: NR.11
  - No.8: NR.33
- f. **Project Site:** Kandal, Kampot, Prey Veng and Kratie Province

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>g. Project Cost:</b> | Japanese Yen 1.2 billion (8 bridges) |
| <b>h. Schedule :</b>    | Basic design : FY 2006               |
|                         | Detailed design : FY 2007            |
|                         | Construction : FY 2007-FY2008        |

## 3.2 Background of the Project

### 3.2.1 Relationship between this Program and the Government Development Plan

In order to ensure efficient and sustainable socio-economic development and poverty reduction, the Royal Government of Cambodia (hereinafter referred to GOC) has been intensively formulating and implementing the key national strategic policy framework, which focuses on the governance action plan and improving the quality of life for the people.

The GOC has prepared two development guidelines in the past, consisting of:

- Socio-Economic Development Plan II (2001-2005), and
- National Poverty Reduction Strategy 2003-2005 (NPRS)

In 2004, the GOC handed down a new socio-economic development vision, i.e. the "Rectangular Strategy", with an emphasis on economic growth, employment opportunities, equity and an efficient government. In addition, the GOC consolidated the existing guidelines into one plan entitled the "National Strategic Development Plan: 2006-2010 (NSDP)", which was approved by the Government of Cambodia in January 2006. It is noteworthy that the policy focus has shifted from "rehabilitation" to "economic development" and that Cambodia is now at a stage of making a new foundation of growth by aligning all of the development participants, both domestically and internationally.

### 3.2.2 Relationship between this Program and the Sector Development Plan

The transportation system in Cambodia is composed of the road network, railway, inland waterway and airway. The road network plays a major part in the transportation system. The road network in Cambodia is 30,258 km in total length, out of which 1-digit and 2-digit roads, which form the national road network in the country, are 2,052 km and 2,643 km in length respectively. Most of the roads constructed in the period from 1920 to 1930, were destroyed as a result of the civil war that continued for over 20 years from 1970. Furthermore, traffic overloading and periodic floods have caused major damage to these roads, resulting in the current serious condition of the road network in Cambodia.

In order to cope with this situation, a concerted effort by the MPWT and the donor community including Japan, ADB, WB and other donors began to restore the road network in the early 1990s, focusing on development efforts to rehabilitate the primary road network.

As a result, the restoration of the country's basic infrastructure, consisting of the 1-digit road

network, has progressed successfully. However, other work still remains to be done, especially in relation to the rehabilitation of bridges in the completed sections.

Moreover, many sections of the 2-digit roads have not yet been rehabilitated or improved to a standard that will allow them to function as 2-digit national highways. In 2005, the pavement ratio was only 30% for the 2600 km of 2-digit roads and 85% of the existing bridges were temporary or narrow bridges.

Since the road network cannot function to its full capacity without improving the bridges, the MPWT seeks to strengthen the road network giving the highest priority to bridge rehabilitation, especially on the 1-digit and 2-digit roads.

### 3.3 Objectives and Necessity

Although most of the 1-digit, and some of the 2-digit, roads have already been rehabilitated and improved by different donor countries and the efforts of the government, many of the temporary bridges still remain in narrow and poor condition in the completed sections of the 1-digit and 2-digit roads.

The collapse of a bridge on a major road would result in a major impact and loss in terms of the local socio-economic activities. Consequently, the master plan on "The Study on the Road Network Development in the Kingdom of Cambodia" conducted by JICA in 2006, gave the highest priority to the rehabilitation of bridges on major roads.

The main objective of the program is to ensure the safety of the bridges against the risk of collapse. Other objectives are to ensure the stability of the road network to enhance traffic volumes and traffic safety.

The master plan recommended the implementation of bridge rehabilitation works under the "Urgent Bridge Rehabilitation" program and advised dividing the country into four blocks for the purpose of implementation, taking into account the appropriate magnitude of the project as follows:

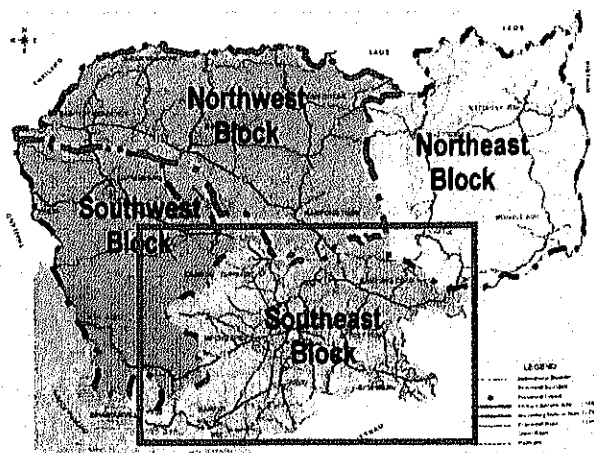
#### \* Southeast Block;

11 provinces with a population of 9.7 million

(Kampong Cham(1.7), Kampong Speu(0.7), Kampot(0.6), Kampong Chhnang(1.7), Shianoukville(0.2), Takeo(0.9), Kandal(1.2), Phonm Penh(1.0), Prey Veng(1.1), Svay Rieng(0.5), Kaep(0.1)), and a part of Kratie

#### \* Northeast Block;

4 provinces with a population of 0.6





million

(Monduli Kiri(0.1), Rattanakiri(0.1), Stung Treng(0.1), Kratie(0.3))

**\* Northwest Block;**

5 provinces with a population of 2.3 million

(Kampong Thom(0.6), Preah Vihear(0.1), Oddar Menchey(0.1), Siem Reap(0.8), Banteay Meanchey(0.7))

**\* Southwest Block;**

4 provinces with a population of 1.5 million

(Pailin(0.1), Battambang(0.9), Pursat(0.4), Koh Kong(0.1))

In order to implement the project, a priority order was evaluated for each block, taking into account the regional economy, traffic safety and the number of bridges with a high risk of collapse.

The southeast block was selected as the top priority for the program due to the following reasons:

1. The southeast block, covering 11 provinces, is an area with a large population and has the highest economic potential out of all of the blocks.
2. The traffic demand in the southeast block is very large because of the capital city of Phnom Penh and hence the economic loss would be huge if a road was to be closed due to a bridge collapse.
3. Many poor and narrow temporary bridges still exist on the 1-digit and 2-digit national roads.

As a result, the following implementation schedule was recommended in the master plan;

Short-term plan (2006 -2010)

Phase I: Southeast Block covering 11 provinces (2006 – 2008)

Phase II: Northwest Block covering 5 provinces (2008 – 2010)

Medium term (2011-2015)

Phase III: Southwest Block covering 4 provinces (2011 – 2013)

Phase IV: Northeast Block covering 4 provinces (2013 – 2015)

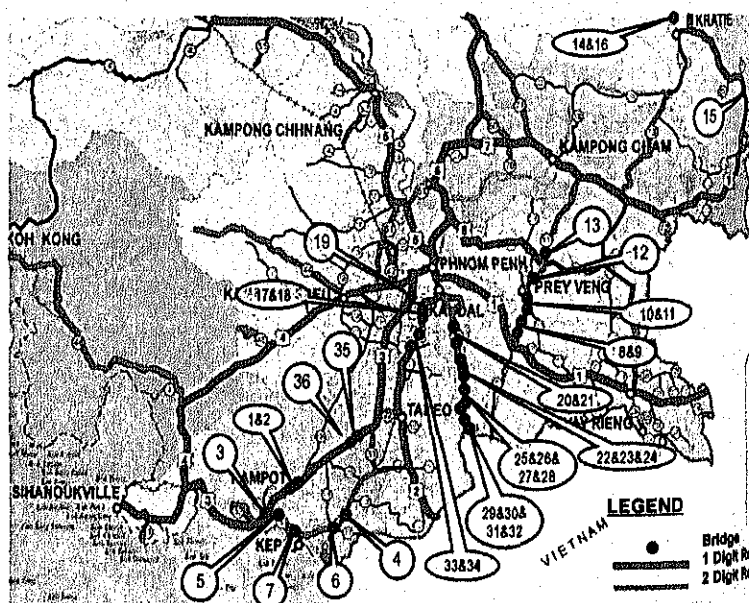
In the southeast block, there are many temporary bridges which have been left untouched along the completed road sections. The long list of bridges to be included in the master plan (as prepared by the MPWT), is shown in **Table 3.1**.

**Table 3.1 List of Urgent Bridge Rehabilitation Required (as prepared by the MPWT)  
(Southeast Block)**

| Code No. | Rd. No. | STA.    | Prov.     | Type            | W (m) | L (m)  | Con-dition | Others                                      |
|----------|---------|---------|-----------|-----------------|-------|--------|------------|---|
| 1        | 3       | 105+985 | Kampot    | Bailey          | 4.20  | 48.00  | Poor       |   |
| 2        |         | 107+000 |           | Bailey          | 4.20  | 18.00  | Poor       |   |
| 3        |         | 148+600 |           | Steel+Concrete  | 4.50  | 277.60 | -          | Under construction on the new route section |
| 4        | 31      | 120+000 |           | Concrete        | 4.20  | 55.00  | Poor       |   |
| 5        | 33      | 005+050 | Kep       | Compact 200     | 4.50  | 87.00  | -          | Collapsed on Jan. 27, 2006                  |
| 6        |         | 036+540 |           | Bailey          | 4.20  | 30.00  | Poor       |   |
| 7        | 33      | 160+250 |           | Concrete        | 7.00  | 11.00  | Poor       |   |
| 8        | 11      | 083+811 | Prey Veng | I-Steel         | 5.40  | 42.20  | Poor       | New concrete substructure by ADB            |
| 9        |         | 084+900 |           | I-Steel         | 5.40  | 42.20  | Poor       |   |
| 10       |         | 088+094 |           | I-Steel         | 5.40  | 84.20  | Poor       |   |
| 11       |         | 089+060 |           | I-Steel         | 4.90  | 54.00  | Poor       |   |
| 12       |         | 103+475 |           | I-Steel         | 4.85  | 48.00  | Poor       |   |
| 13       |         | 127+100 |           | I-Steel         | 4.85  | 24.10  | Poor       |   |
| 14       | 7 (Old) | 340+200 | Kratie    | I-Steel+Wooden  | 4.50  | 36.00  | Poor       |   |
| 15       | 7       | 277+200 |           | Bailey+Concrete | 4.50  | 130.00 | Poor       |   |
| 16       | 7 (Old) | 355+300 |           | Bailey+Wooden   | 4.50  | 92.00  | Poor       |   |
| 17       | 2       | 022+608 | Kandal    | Compact         | 7.00  | 15.00  | Poor       |   |
| 18       |         | 028+180 |           | Compact         | 7.00  | 18.00  | Poor       |   |
| 19       | 3       | 025+927 |           | Bailey          | 4.50  | 37.00  | Poor       |   |
| 20       | 21      | 024+414 | Kandal    | Compact 100     | 4.10  | 18.00  | Poor       |   |
| 21       |         | 031+684 |           | Concrete        | 3.50  | 7.50   | Poor       | Khmer Rouge Regime                          |
| 22       |         | 036+671 |           | Concrete        | 5.10  | 24.00  | Poor       | Khmer Rouge Regime                          |
| 23       |         | 039+812 |           | I-Steel         | 4.10  | 24.00  | Poor       | Khmer Rouge Regime                          |
| 24       |         | 040+554 |           | I-Steel         | 4.10  | 24.00  | Poor       | Khmer Rouge Regime                          |
| 25       |         | 045+801 |           | Concrete        | 3.60  | 11.80  | Poor       | Khmer Rouge Regime                          |
| 26       |         | 052+436 |           | Concrete        | 3.50  | 14.20  | Poor       | Khmer Rouge Regime                          |
| 27       |         | 054+477 |           | Compact 100     | 4.10  | 54.00  | Poor       | Khmer Rouge Regime                          |
| 28       |         | 056+430 |           | Concrete        | 3.80  | 8.50   | Poor       | Khmer Rouge Regime                          |
| 29       |         | 060+051 |           | Compact 100     | 4.10  | 27.00  | Poor       |   |
| 30       |         | 061+407 |           | Compact 100     | 4.10  | 48.00  | Poor       |   |
| 31       |         | 068+042 |           | Compact 100     | 4.10  | 27.00  | Poor       |   |
| 32       |         | 074+875 |           | Compact 100     | 4.10  | 48.00  | Poor       |   |
| 33       | 2       | 034+190 | Takeo     | Steel           | 4.00  | 8.20   | Poor       |   |
| 34       |         | 046+700 |           | Steel           | 4.00  | 8.00   | Poor       |   |
| 35       | 3       | 091+552 |           | Bailey          | 4.20  | 12.00  | Poor       |   |
| 36       |         | 094+002 |           | Concrete        | 7.00  | 16.00  | Poor       |   |

This long list was evaluated and screened during the pre-feasibility study for the JICA study, taking into consideration the following criteria:

- 1) Bridge lengths of more than 30 m may need technical assistance from Japan.
- 2) If the improvement of basic human needs can be expected for a large number of people in





### 3.5 Implementation Schedule and Requested Amount

| Urgent Bridge Rehabilitation Program<br>(Phase I: Southeast Block) | Proposed Implementation Schedule |                   |              |
|--|----------------------------------|-------------------|--------------|
|  | 2006                             | 2007              | 2008         |
| Re-construction of 8 bridges                                       | Basic Design                     | DD & Construction |              |
|  | -                                | ¥600 million      | ¥600 million |

## 4 Social and Environmental Conditions around the Project Sites

### 4.1 Bridge No.1

#### 4.1.1 Current Conditions around the Project Site

##### (1) Location

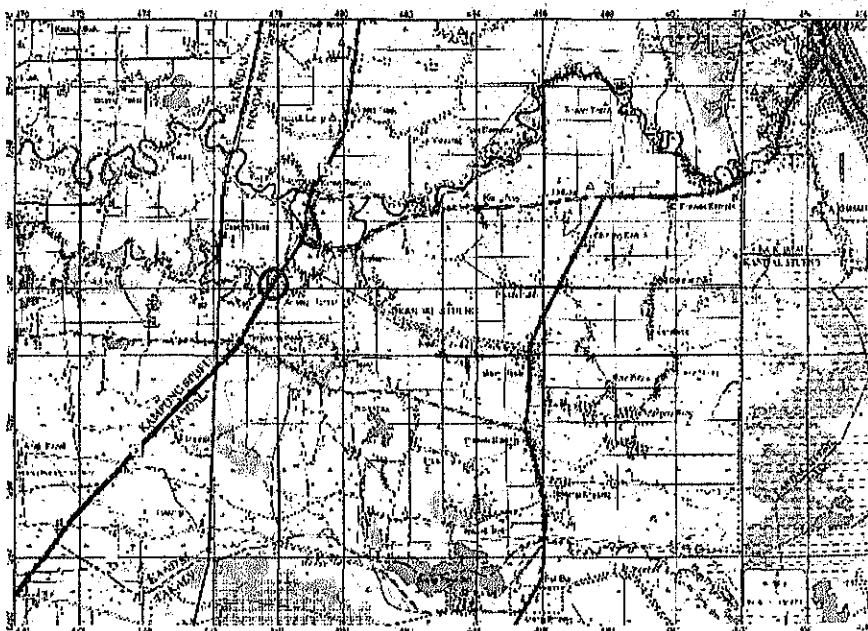
The location of bridge No.1 is shown in the table below.

**Table 4.1 Location of Bridge No.1**

|          |               |
|----------|---------------|
| Province | Kandal        |
| District | Kandal Stung  |
| Commune  | Anlong Romiet |
| Village  | Daeum Trang   |
| Road No. | NR.3          |

##### (2) Topography

NR.3 runs from Phom Penh to Sihanoukville. The bridge crosses the Stueng Touch River. The area in the vicinity of the project site is flat land as shown in the following figure.



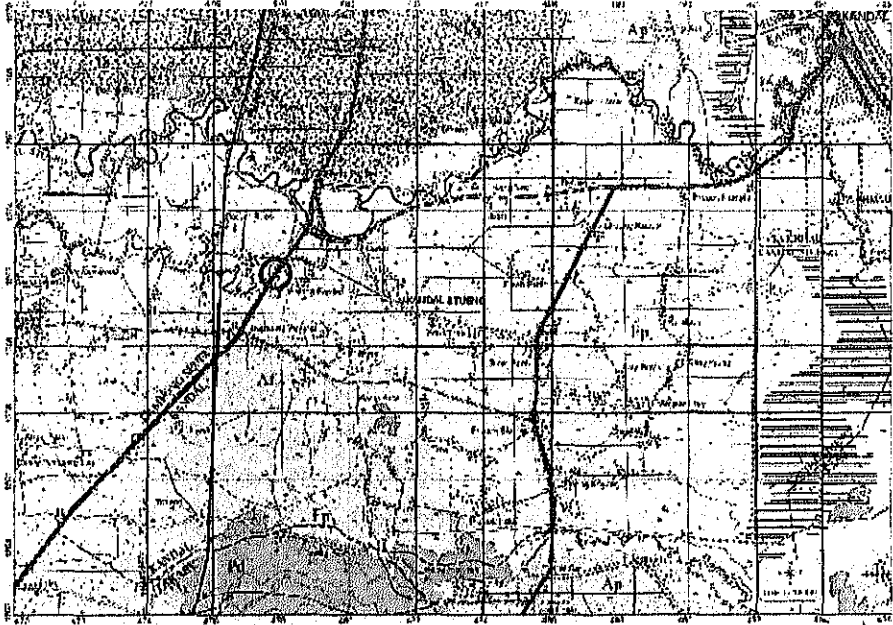
##### (3) Geology

The geology of Cambodia is roughly classified into three (3) soil types; 1) alluvial plan/pediments formed in the Quaternary, which are spread over Tonle Sap Lake and the Mekong River areas, 2) sandstone of the Mesozoic Jurassic-Cretaceous age in the southwestern part of the country, and 3) sandstone/basaltic plateau deposits in the eastern part of the country.

The geology in the project area is classified as follows:

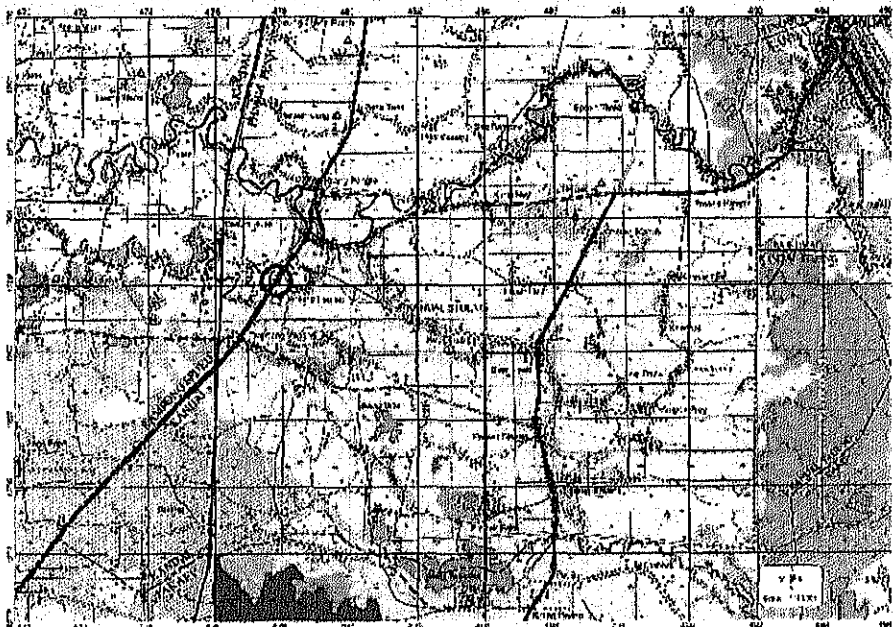
- 1) Terrace alluvial (Ta) and floodplains (Ap) in the north;

- 2) Alluvial plains (Ap) and floodplains (Fp) in the east;
- 3) Floodplains (Fp), pediments (Pd) and alluvial fans (Af) in the south; and,
- 4) Alluvial fans (Af) in the west.



#### (4) Land Use

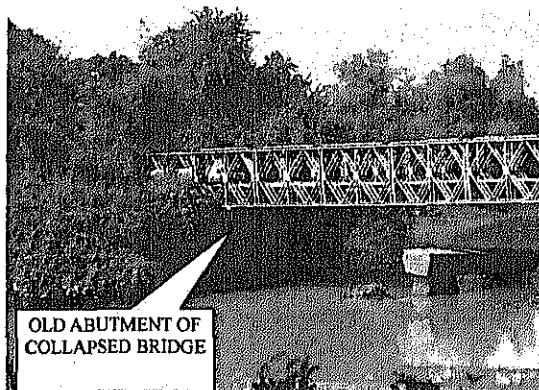
The land use around the project site is categorized as paddy fields, as shown in the land use map below. Most of the people use the land for rice cultivation in the rainy season and other land near the village is used for fruit trees and vegetables.



#### 4.1.2 Current Conditions at the Project Site and Bridge Plan/Design

##### (1) Condition of the Existing Bridge and Outline of the Proposed Bridge

The existing bridge is in a poor condition. The width of the bridge is only 4.5 m and allows for only one way traffic. Therefore traffic has to wait for traffic from the opposite direction to pass before proceeding. This situation is dangerous for motorbikes and pedestrians due to the narrow bridge width. The bridge is at risk of collapse because of old abutment of collapsed bridge.



NR.3 Km 25+927

An outline of the existing bridge and the proposed bridge is shown in the table below.

**Table 4.2 Outline of Existing and Proposed Bridge**

|          | Capacity                | Existing Bridge |           |                          | PCU Traffic | Existing Condition |
|----------|-------------------------|-----------------|-----------|--------------------------|-------------|--------------------|
|          |                         | Length (m)      | Width (m) | Superstructure           |             |                    |
| Existing | Bridge Capacity ( ton ) | 37              | 4.5       | Bailey + Steel Deck      | 2005        | Poor               |
| Designed | Design Live Load        |                 |           |                          | 2020        |                    |
| Existing | 15                      |                 |           |                          | 5,169       |                    |
| Designed | T 44<br>L 44<br>HLP 240 | 60.6            | 12.5      | PCDG<br>(AASHTO Type IV) | 19,426      | -                  |

##### (2) Bridge Plan/Design

An outline of the bridge design is shown below.

**Table 4.3 Outline of Bridge Design**

|                  |             |  |
|------------------|-------------|--|
| Bridge No.       | 1           |  |
| Road No.         | NR.3        |  |
| Station          | 025+900.000 |  |
| Deck Elev. (m)   | 15.40       |  |
| Total Length (m) | 60.6        |  |
| Superstructure   | Type        | PCDG (AASHTO Type IV)                              |
|                  | Spans (m)   | 3 @ 20   |
| Substructure     | Pier        | Column Pier on RC Driven Pile (0.4x0.40m)          |
|                  | Abutment    | Seat Type Cantilever on RC Driven Pile (0.4x0.40m) |

### **(3) Environmental Conditions**

There are no environmental protection areas or protected forests around the bridge. There are no forests or habitats for rare species because the land in the vicinity of the bridge basically consists of paddy fields and residential areas along NR.3.

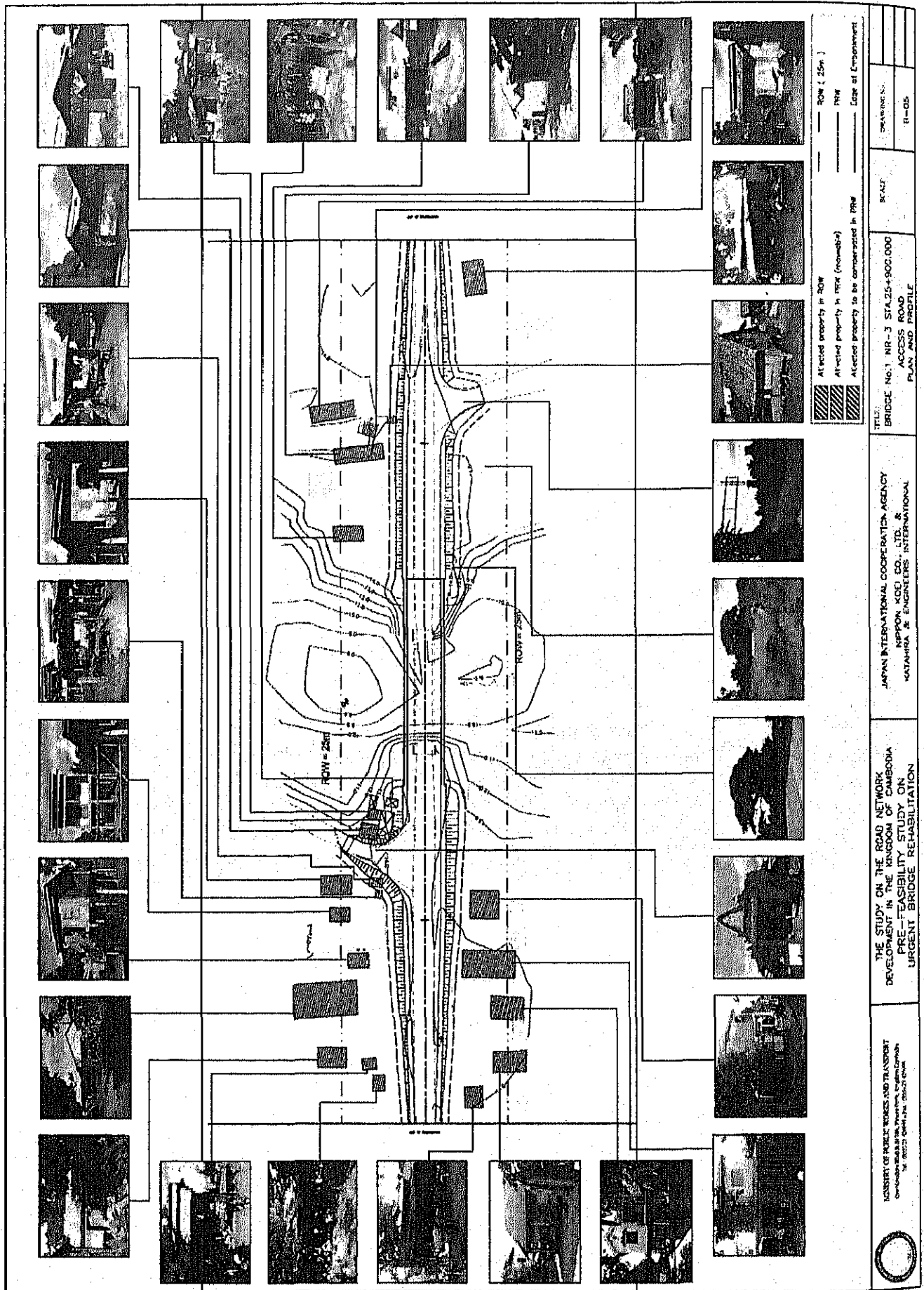
Noise, vibrations and air pollution should be considered due to the proximity of the residential area. Noise and vibrations will occur during the construction period due to the machines and earthworks. Dust will appear during the earthworks and along the detour route.

The situation in the project area is shown in the next page figure.

### **(4) Social Conditions**

The project site is within a residential area. There are 25 houses and cottages in the ROW (25 m from the center of the road) and in the section 100 m from the bridge edge. There is one (1) house, two (2) shops, two (2) cottage shops and one (1) cottage, giving a total of six (6) properties within the provisional road width (PRW). These houses/cottages have to be resettled.

The Toul Sala Pagoda is located along the river and the gate of the pagoda is located in the PRW. It is recommended that some structural measures should be undertaken, such as a retaining wall, to avoid reconstruction of the gate.





## 4.2 Bridge No.2

### 4.2.1 Current Conditions around the Project Site

#### (1) Location

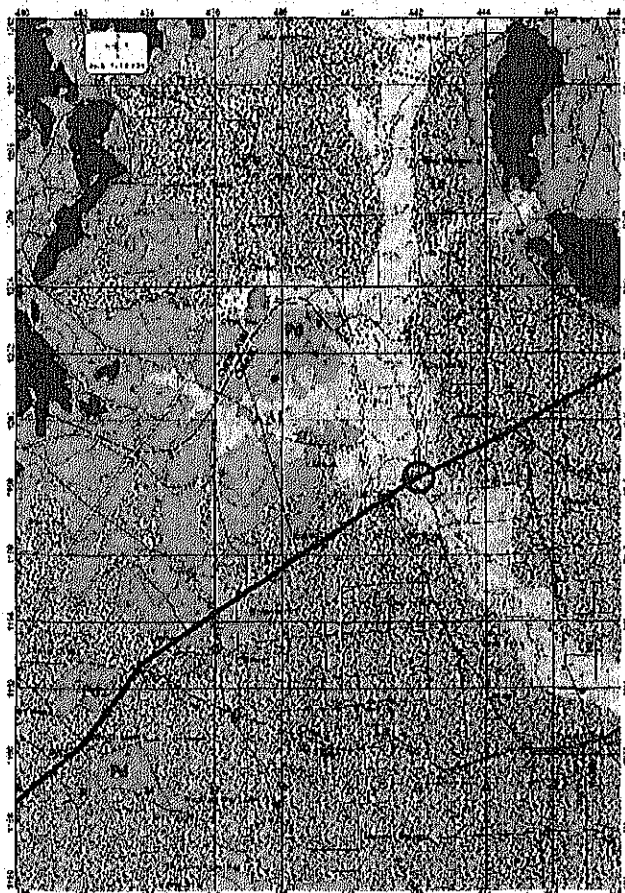
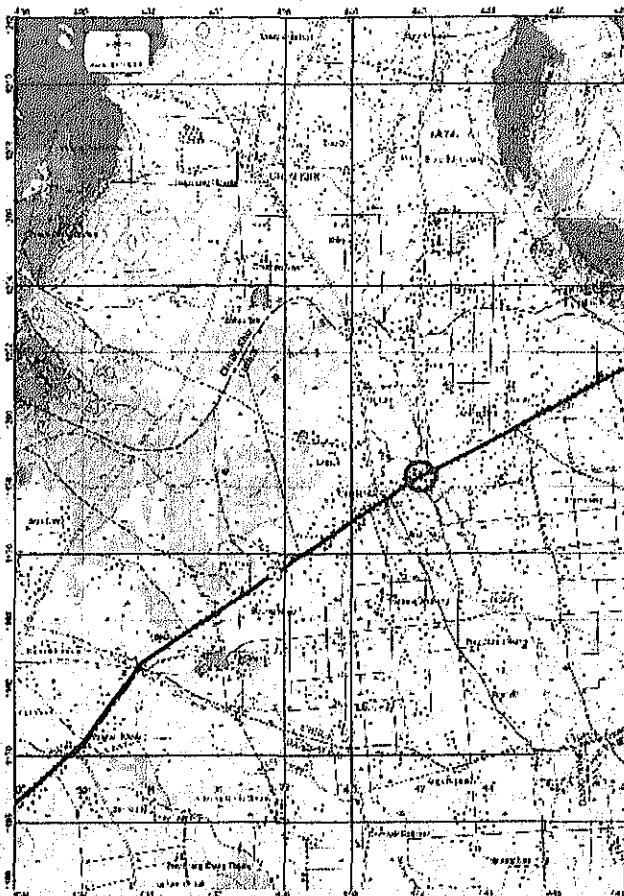
The location of bridge No.2 is shown in the table below.

**Table 4.4 Location of Bridge No.2**

|          |                          |
|----------|--------------------------|
| Province | Kampot                   |
| District | Chhuk                    |
| Commune  | Krang Sonay              |
| Village  | Damnak Toap Khang Tboung |
| Road No. | NR.3                     |

#### (2) Topography

NR.3 runs from Phom Penh to Sihanoukville. The bridge crosses the Stueng Kra River. The land in the vicinity of the project site is flat, as shown in the right above figure.



#### (3) Geology

The geology in the project area is roughly classified into three (3) types:

- 1) Terrace alluvial (Ta) in the east;
- 2) Alluvial fans (Af), pediments (Pd), and terrace alluvial (Ta) in the north;
- 3) Alluvial fans (Af) and pediments (Pd) in the west; and
- 4) Pediments (Pd) and terrace alluvial (Ta) in the south.

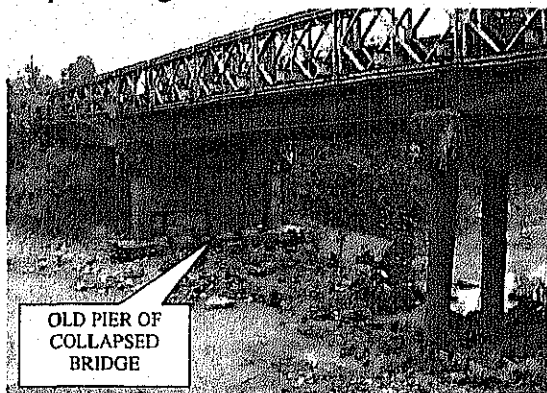
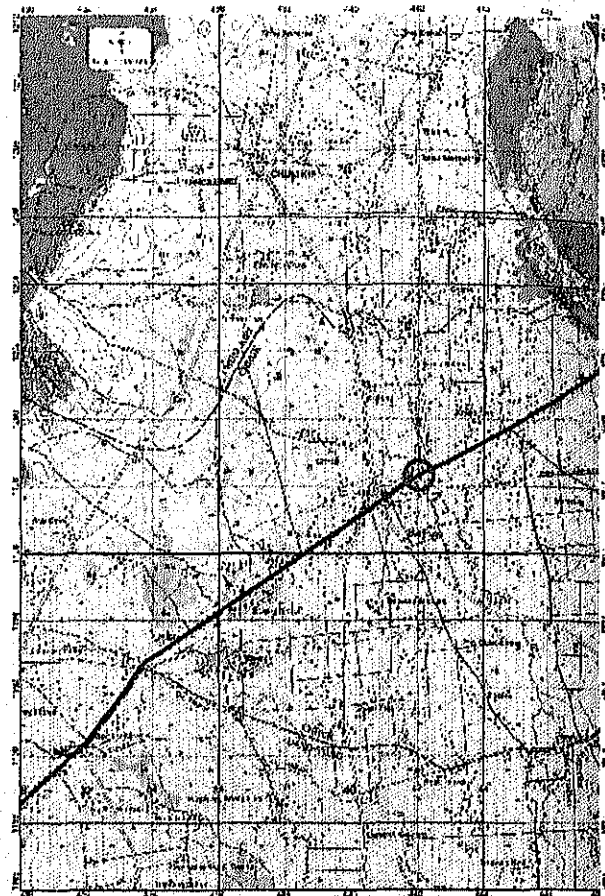
**(4) Land Use**

The land use around the project site is categorized as paddy fields and villages as shown in the right side land use map.

**4.2.2 Current Conditions at the Project Site and Bridge Plan/Design**

**(1) Condition of the Existing Bridge and Outline of the Proposed Bridge**

The existing bridge is in a poor condition. The width of the bridge is only 4.2 m and allows for only one way traffic. Therefore traffic has to wait for traffic from the opposite direction to pass before proceeding. This situation is dangerous for motorbikes and pedestrians due to the narrow bridge width. The bridge is at risk of collapse because of the old pier of the collapsed bridge.



NR.3 Km105+985

An outline of the existing bridge and the proposed bridge is shown in the table below.

**Table 4.5 Outline of Existing and Proposed Bridge**

| Existing | Capacity                | Existing Bridge |           |                | PCU Traffic | Existing Condition |
|----------|-------------------------|-----------------|-----------|----------------|-------------|--------------------|
|          | Bridge Capacity (ton)   | Length (m)      | Width (m) | Superstructure | 2005        |                    |
| Designed | Design Live Load        |                 |           |                |             |                    |
| Existing | 15                      | 48              | 4.2       | Bailey         | 3,090       | Poor               |
| Designed | T 44<br>L 44<br>HLP 240 | 54.6            | 12.5      | RCDG (D=1100)  | 8,400       | -                  |

## (2) Bridge Plan/Design

An outline of the bridge design is shown below.

**Table 4.6 Outline of Bridge Design**

|                  |             |  |
|------------------|-------------|--|
| Bridge No.       | 2           |  |
| Road No.         | NR.3        |  |
| Station          | 105+958.442 |  |
| Deck Elev. (m)   | 30.00       |  |
| Total Length (m) | 54.6        |  |
| Superstructure   | Type        | RCDG (D=1100)                                      |
|                  | Spans (m)   | 3 @ 18   |
| Substructure     | Pier        | Column Pier on RC Driven Pile (0.4x0.40m)          |
|                  | Abutment    | Seat Type Cantilever on RC Driven Pile (0.4x0.40m) |

## (3) Environmental Conditions

There are no environmental protection areas or protected forests around the bridge. There are no forests or habitats for rare species because the land in the vicinity of the bridge basically consists of paddy fields and residential areas along NR.3.

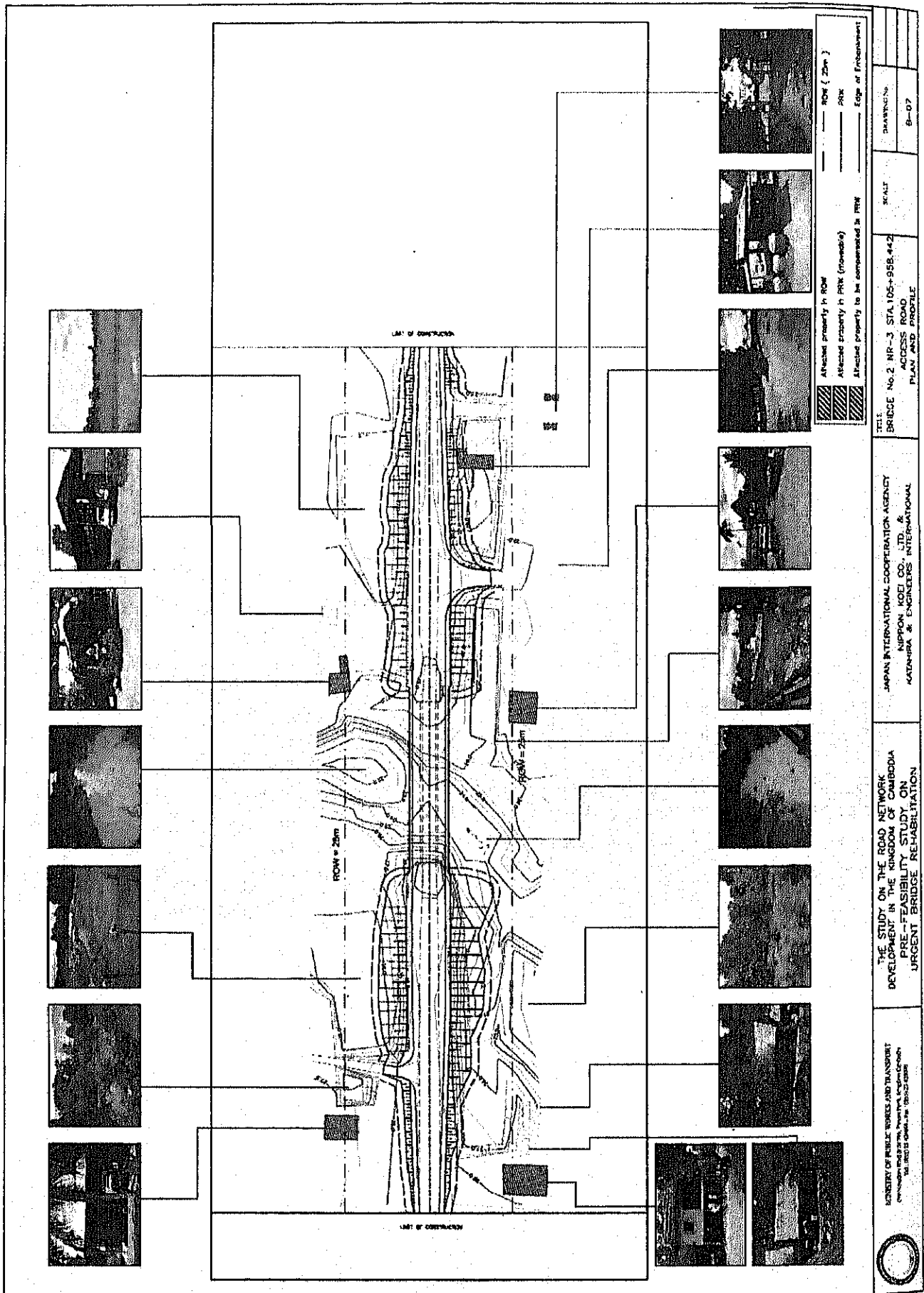
Noise, vibrations and air pollution should be considered due to the proximity of the residential area. Noise and vibrations will occur during the construction period due to the machines and earthworks. Dust will appear during the earthworks and along the detour route.

The situation in the project area is shown in the next page figure.

## (4) Social Conditions

The project site is within a residential area. There are five houses and cottages in the ROW (25 m from the center of the road) and in the section 100 m from the bridge edge. There is one (1) house located within the provisional road width (PRW). This house has to be resettled.

The Botom Brangsy Ratanaram Pagoda is located beside the road and the river. The wall of the pagoda is located within the PRW. It is recommended that some structural measures should be undertaken, such as a retaining wall, to avoid reconstruction of the gate.



### 4.3 Bridge No.3

#### 4.3.1 Current Conditions around the Project Site

##### (1) Location

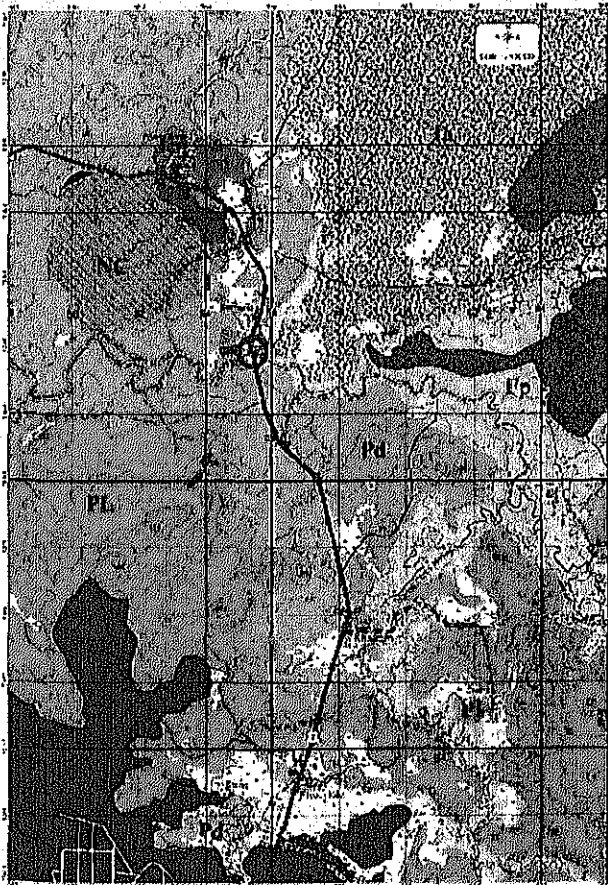
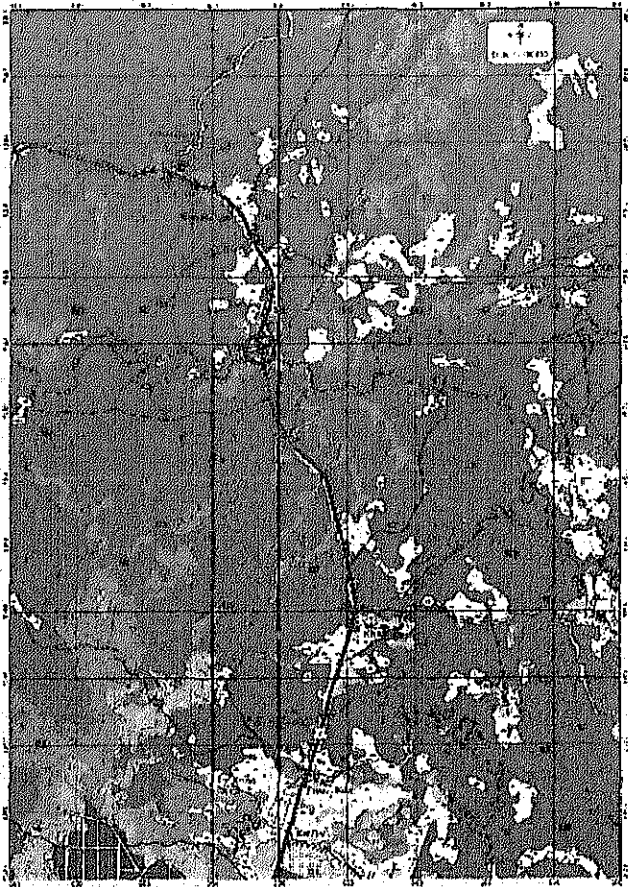
The location of bridge No.3 is shown in the table below.

**Table 4.7 Location of Bridge No.3**

|          |            |
|----------|------------|
| Province | Kratie     |
| District | Snoul      |
| Commune  | Snoul      |
| Village  | Preak Kdei |
| Road No. | NR.7       |

##### (2) Topography

The bridge is on NR.7 and is located between Komponcham and Kratie. The bridge crosses Preak Chhloung River. The land in the vicinity of the project site consists of gentle hills as shown in the right side figure.



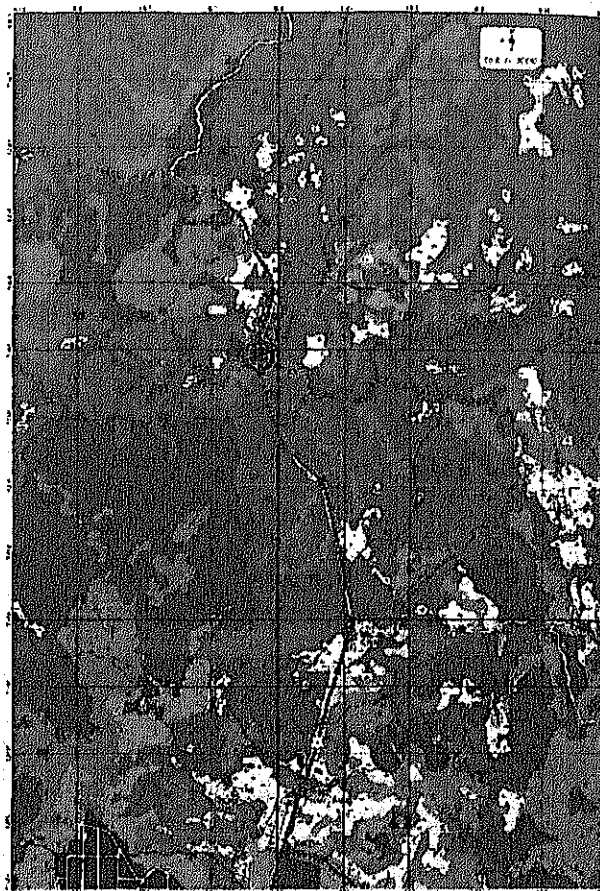
##### (3) Geology

The geology in the project area is classified into seven (7) types:

- 1) Terrace alluvial deposits (Ta), sandstone (Jcg), and granodiorite (Gd) in the north;
- 2) Floodplains (Fp) and pediments (Pd) in the east;
- 3) Pediments (Pd) and penplain laterite deposits (Pl) in the south; and
- 4) Penplain laterite deposits (Pl), and no classified rock (Nc) in the west.

**(4) Land Use**

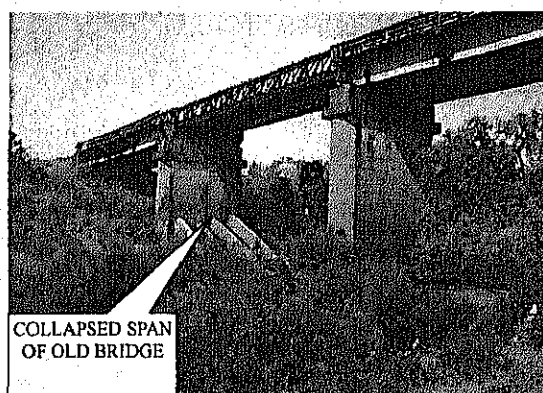
The land use around the project site is categorized as shrub-lands and forest cover as shown in the right side land use map .



**4.3.2 Current Conditions at the Project Site and Bridge Plan/Design**

**(1) Condition of the Existing Bridge and Outline of the Proposed Bridge**

The existing bridge is in a poor condition. The width of the bridge is only 4.5 m and allows for only one way traffic. Therefore traffic has to wait for traffic from the opposite direction to pass before proceeding. This situation is dangerous for motorbikes and pedestrians due to the narrow bridge width. The bridge is at risk of collapse as there is a collapsed span on the old bridge.



NR.7 Km 277+200

An outline of the existing bridge and the proposed bridge is shown in the table below.

**Table 4.8 Outline of Existing and Proposed Bridge**

|          | Capacity                | Existing Bridge |           |                       | PCU Traffic | Existing Condition |
|----------|-------------------------|-----------------|-----------|-----------------------|-------------|--------------------|
|          |                         | Length (m)      | Width (m) | Superstructure        |             |                    |
| Existing | Bridge Capacity ( ton ) | 130             | 4.5       | Bailey                | 2005        | -                  |
| Designed | Design Live Load        |                 |           |                       | 2020        |                    |
| Existing | 15                      | 130             | 4.5       | Bailey                | 2,099       | Poor               |
| Designed | T 44<br>L 44<br>HLP 240 | 140.8           | 12.5      | PCDG (AASHTO Type VI) | 3,372       | -                  |

**(2) Bridge Plan/Design**

An outline of the bridge design is shown below.

**Table 4.9 Outline of Bridge Design**

|                  |             |   |
|------------------|-------------|---|
| Bridge No.       | 3           |   |
| Road No.         | NR.7        |   |
| Station          | 277+129.970 |   |
| Deck Elev. (m)   | 63.25       |   |
| Total Length (m) | 140.8       |   |
| Superstructure   | Type        | PCDG (AASHTO Type VI)                       |
|                  | Spans (m)   | 4 @ 35                                      |
| Substructure     | Pier        | Column Pier on Spread Footing               |
|                  | Abutment    | Seat Type Cantilever on RC CIP Pile (fl.0m) |

**(3) Environmental Conditions**

There are no environmental protection areas or protected forests around the bridge. The situation in the project area is shown in the next page figure.

**(4) Social Conditions**

There is one (1) cottage in the ROW, however it is not residential. Therefore the social impact is very limited.

