

KINGDOM OF THAILAND
MINISTRY OF COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

FEASIBILITY STUDY

FOR

PHETCHABUN - CHAI BADAN
HIGHWAY PROJECT

FINAL REPORT

March 1979

VOLUME 1 - TEXT

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

S.D.F.



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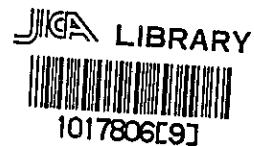
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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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PREFACE

In response to the request of the Government of the Royal Kingdom of Thailand, the Government of Japan decided to conduct a feasibility study on the Phetchabun Chaibadan Highway Project in the north-eastern region of Thailand, and the Japan International Cooperation Agency (JICA) carried it out.


Noting that the Phetchabun Chaibadan Highway Project has a vital bearing on the development and the future road transportation system in this area, the agency dispatched a preliminary survey team to the Thailand in February, 1978 for planning and preparation of the feasibility study, and further sent, from July to October, 1978, a 4-member supervisory group headed by Mr. Shigeki Uchiyama, Director of the Sobu National Road Construction Office, Ministry of Construction and a 7-member survey team headed by Mr. Masahiko Tohi.

The Study, undertaken by the team, was carried out smoothly as scheduled over a period of about three months with the close co-operation of the competent Thai authorities. After its return to Japan, the team made further studies and analyses and compiled this report.

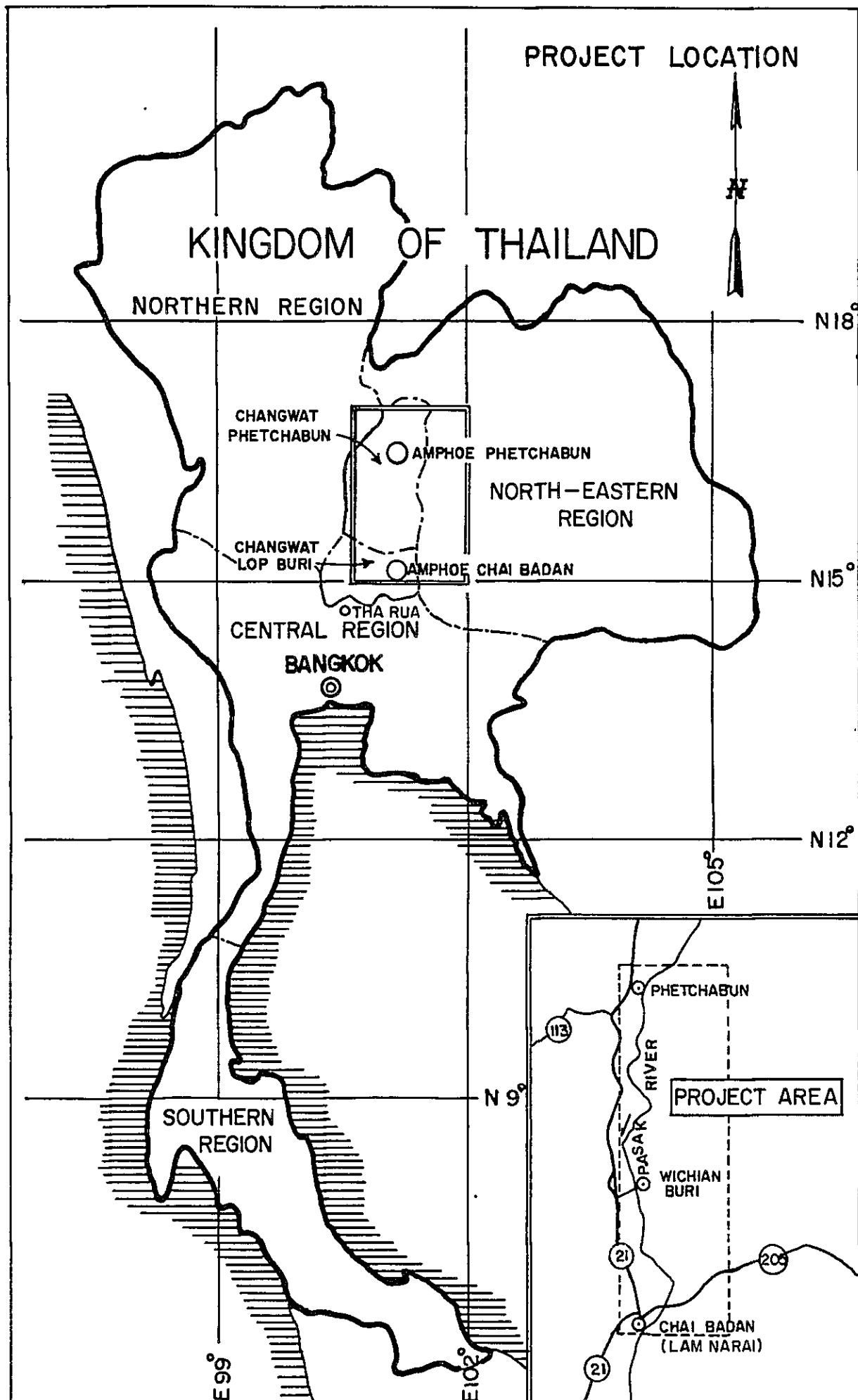
I sincerely hope that this study would be found useful for the socio-economic development of the region and serve for the enhancement of the friendly relations now existing between our two countries.

I avail myself of this opportunity to express my heartfelt appreciation to the competent Thai Authorities and officials concerned for the valuable assistance offered to the team throughout the survey period.

March, 1979



Shinsaku Hogen
President
Japan International
Cooperation Agency



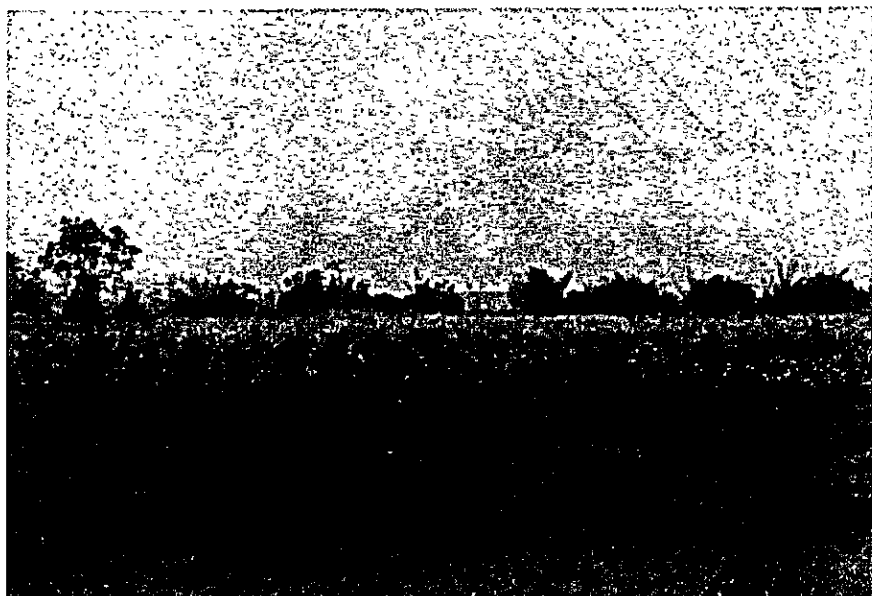




NATIONAL HIGHWAY ROUTE 21



NATIONAL HIGHWAY ROUTE 205



MAIZE FIELD ALONG ROUTE 21

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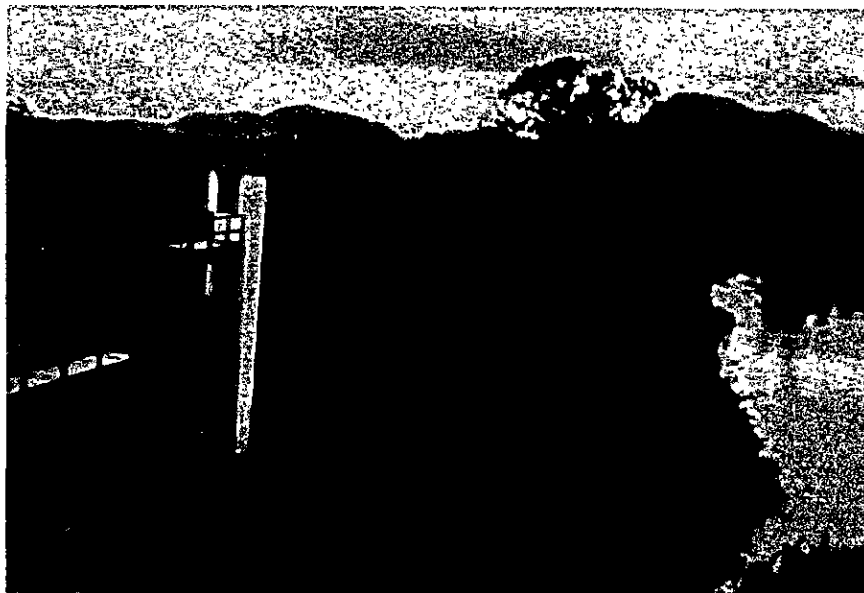
PRESENT CONDITION OF THE PROJECT ROAD
(NONG DAENG - PAK BOT)



EXISTING TIMBER BRIDGE ON THE PROJECT ROAD



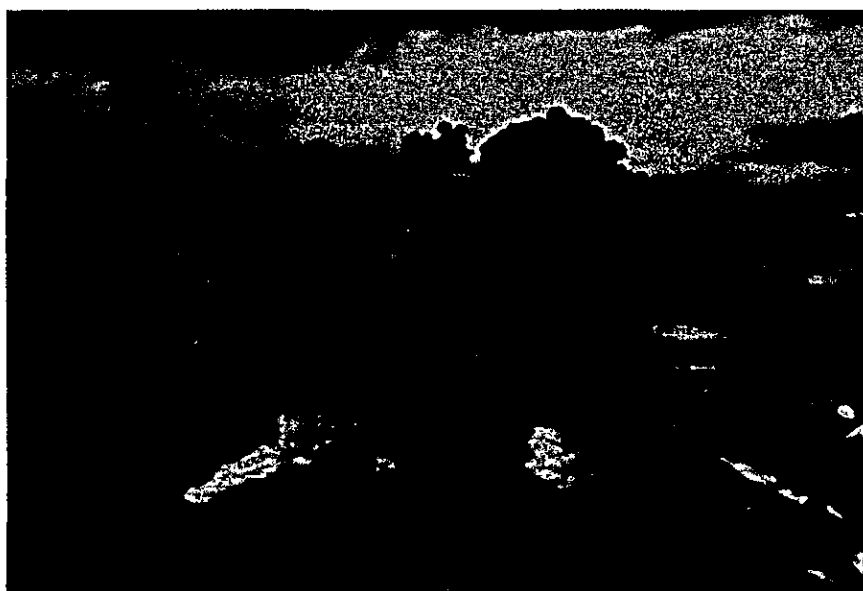
LIGHT BUS (MODIFIED TRUCK), MOST POPULAR
VEHICLE IN THE PROJECT AREA



PASAK RIVER (NEAR WICHIAN BURI, JULY)



PASAK RIVER (SAME SITE AS THE ABOVE, OCTOBER)

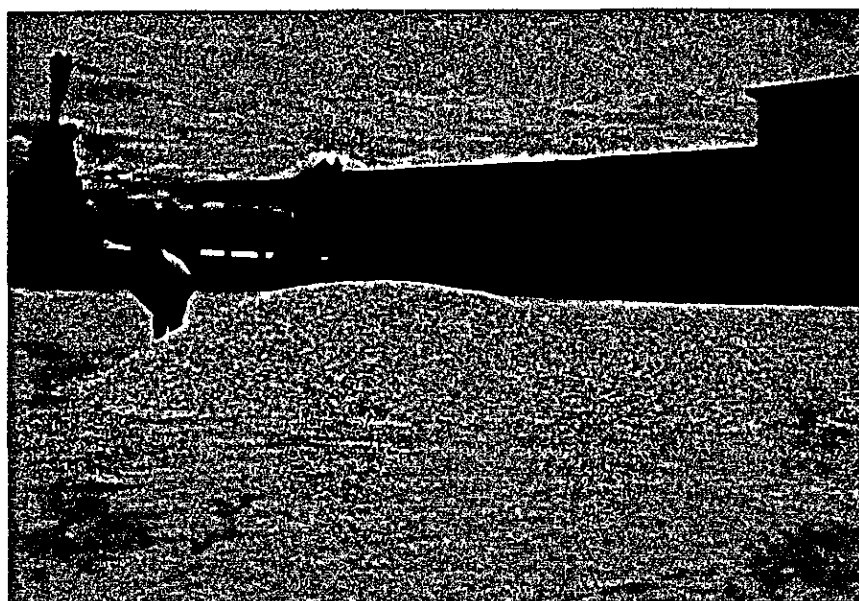


OVERFLOW SECTION OF THE EXISTING ROAD





THRESHING OF MAIZE ON FARMSIDE



STORE HOUSE AT ASSEMBLY MARKET OF MAIZE
(CHAI BADAN)



BARGES FOR MAIZE TRANSPORTATION AT THA RUA
TERMINAL MARKET

PHETCHABUN - CHAI BADAN HIGHWAY PROJECT FINAL REPORT

VOLUME 1 TEXT

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- CHAPTER II BACKGROUND OF THE PROJECT
- CHAPTER III THE STUDY AREA

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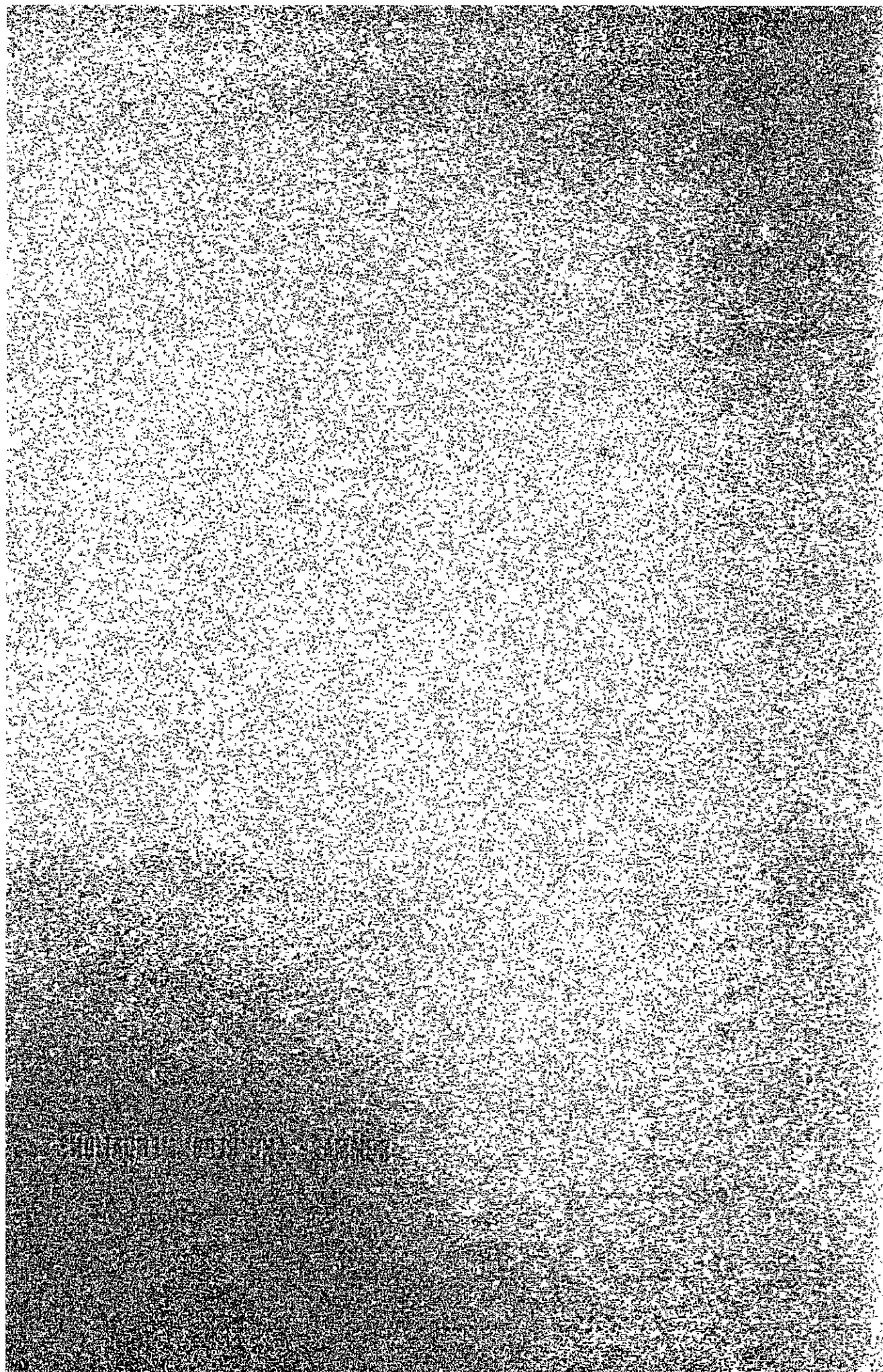
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SUMMARY AND RECOMMENDATIONS



SUMMARY AND RECOMMENDATIONS

1. The Kingdom of Thailand, with about 44 million of population in 1977 and an area of 514,000 square kilometers, is characterized in its socio-economic development by the dominantly urbanized Metropolitan Area co-existing with the rural areas sustained substantially by the traditional agriculture. Although the share of the agricultural sector in the national production reduced to 20.1 percent of GDP in 1977; 370 billion Bahts, it is still the predominant sector holding 63 percent of total labor force and 50 to 60 percent of the export value of the country.
2. For the recovery of the agricultural production in the rural area and the reduction of regional imbalance between Bangkok area and the remaining areas, the improvement of regional road networks will play a critical role. Road networks of the country comprise 12,700 km of national highways, 8,900 km of provincial roads and 13,000 km of incomplete provincial roads. Only about 4,300 km of provincial roads are paved. The rural areas which suffer from annual flooding require the expansion of all-weather road networks to accommodate the improved local communication and the timely transportation of the agricultural products.
3. In the Fourth National Economic and Social Development Plan (1977-1981), the Royal Government allocates 73 percent of the budget for the transportation sector to the road investment, putting emphasis on the

improvement of rural road networks to accelerate the agricultural development in rural areas. Complying with the national strategy, the Department of Highways (DOH) of the Ministry of Communications is contemplating to expand about 8,000 km of additional provincial road networks by the target year of its Plan for Provincial Road Construction and Improvement (1977-1981).

4. The proposed Phetchabun - Chai Badan Highway Project is a part of the above-mentioned government program and is listed up as Route No. 2260 in the above Five Year Plan. The area, where the proposed road is demanded, suffers from flooding of the Pasak River and its tributaries and always in rainy season faces to the difficulty in land transportation of agricultural products to the outside markets. It is indispensable for the further development of the area to establish a network of all-weather roads with constructing the proposed road.
5. The Project Area, located in the central part of Thailand, relates with four Amphoes (districts) of Changwat (Province) Phetchabun and one Amphoe of Changwat Lop Buri. It extends over 150 kilometers from north to south and is 40 kilometers wide in east-west direction. The Pasak River and the National Highway Route 21 run north to south in the western end of the Area. The existing roads, 280 kilometers in total, are mainly earth or laterite surfaced and usually flooded with the water in rainy season.
6. Agriculture is the most predominant sector in the Project Area. Major crops are maize, rice and beans. Among them, maize is the most important crop, sharing a considerable portion in the national production of which about 85 percent is exported. For example, Changwat Phetchabun produced about 23 percent of total maize production of whole Kingdom in 1976. Physical environment of the area such as soils, climate and topography is suitable mostly for cultivation of rice and upland crops especially maize. A considerable acreage of land still remains uncultivated mainly because of inaccessibility.

7. Most of cash crops such as maize and beans are collected from local markets to assembly markets located along Route 21 and then sent to Tha Rua or Bangkok through Lam Narai. Lacking all-weather road, the products in the inner area suffer from high transportation cost in rainy season and consequently are forced to be sold in lower farmgate prices.
8. For the planning of the proposed road as an artery in the road network in the Project Area, three route alternatives were formulated taking into account various aims and factors, e.g. possibility of new land development, improvement of local communication, reduction of transportation cost, effective utilization of the existing road networks and traffic pattern. Outline of alternatives are summarized as follows:

	Alt.-I	Alt.-II	Alt.-III
Major aim	Improvement of local communication	Maximization of new land development	Improvement of existing transportation system
Direction	north-south	north-south	east-west
Length (km)			
Improvement	147.4	54.1	79.5
New construction	10.0	85.2	30.8
Total	157.4	139.3	110.3

9. Influence of the proposed road to accelerate the agricultural development will extend over adjacent area of the road with a 5 kilometers distance. Within the influence areas of each route alternative, it was estimated that the newly cultivable lands in 1978 would be 130,000 rai in case of Alternative-I, 321,000 rai for Alternative-II and 87,000 rai for Alternative-III. Effects of the proposed road to the agricultural development are presumed to be multiple: acceleration of speed of opening up of new land, increase of crop yield, acceleration of double cropping and increase of farmgate price. Agricultural development benefits attributable to the Project will be the increment of net added value of production derived from those effects.

10. Traffic forecast was worked out for the years of 1983, 1989 and 1977. Freight traffic forecast was based on mainly transportation demand of agricultural products. Basic factors of passenger traffic forecast were trip rates obtained from a home interview survey and projected population increase. The length of road links of which traffic volume in 1989, the 7th year after opening to traffic, will exceed 300 in ADT are 61 percent for Alternative-I, 17 percent for Alternative-II and 78 percent for Alternative-III, respectively of the total length of their whole links. According to the DOH's Standard and the traffic volume in the 7th year, corresponding road classes were assigned to each road link.
11. For comparative analysis of alternatives, preliminary estimates were made for project costs and benefits. The costs include construction cost and road maintenance cost. The benefits include the one derived from the road users' cost savings, and the other from the agricultural development attributable to the proposed road. Economic indicators of three alternatives are compared as follows:

	<u>Alt.-I</u>	<u>Alt.-II</u>	<u>Alt.-III</u>
Internal Rate of Return (%)	20.6	18.5	17.1
Net Present Value (Million Baht)	165.8	125.8	98.5
Benefit Cost Ratio (Discount Rate 12%)	1.73	1.62	1.41

Economic comparison of alternatives suggests that Alternative-I is most advantageous, followed by Alternative-II. In other words, the north-south route is more preferable than the east-west route. Furthermore, from the viewpoint of the improvement of road network, alternatives in north-south direction are desirable. They can form an all-weather road network linking with Route 21 and Route 205.

12. To determine the optimum route in north-south direction, economic comparison was made for the possible combination of sections of Alternative-I and -II in northern, central and southern parts. As a result, Alternative-I was selected for central and southern parts and Alternative-II for northern part, though the difference between two alternatives is small in central and northern parts. However, if a great importance is placed on the better alignment, the selection of

Route Alternative-II is also possible for the central part. Finally, the optimum route was selected in combination of the most part of Alternative-I and a minor part of Alternative-II. The main features of the optimum route are summarized as follows:

Route : Tha Maduk - Rang Yoi - Si Thep - Wichian
Buri - Sap Bon - Nong Daeng - Pak Bot -
Noen Sadao - Khok Charoen - Yang Lat -
Tham Nam Bang - Nam Ron (1) - Phetchabun

Length :

Improvement	130.1 km (85 %)
New construction	21.2 km (15 %)
Total	151.3 km

Pavement :

SBST	94.2 km (62 %)
Soil aggregate surface	57.1 km (38 %)
Total	151.3 km

Road Width :

Formation width	9.0 m
Pavement width (SBST)	5.5 m

Main Construction Works :

Earthwork

Clearing & grubbing	58 ha
Soil & rock excavation	704,300 m ³
Embankment	847,400 m ³

Pavement

Selected fill	211,100 m ³
Subbase & shoulder	295,700 m ³
Base	85,900 m ³
Prime & SBST	541,800 m ²

Drainage structures

Box culverts	160 m
Pipe culverts	5,010 m

Bridges	952 m
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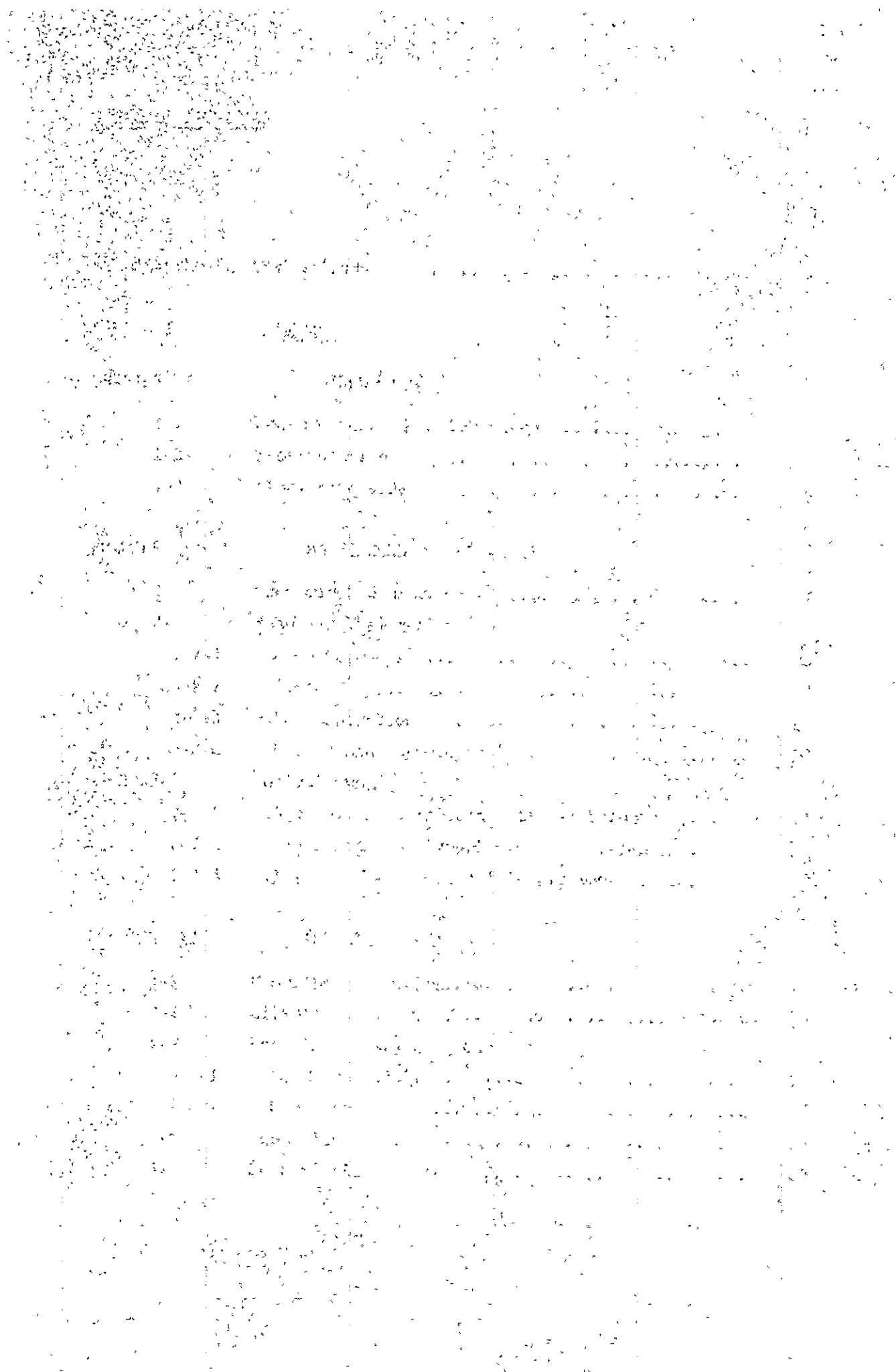
13. Major benefits accrued from the Project include savings of road users' costs and increment of net added value of agricultural production attributable to the road improvement. They are estimated as follows:

	<u>1983</u>	<u>1989</u>	<u>1997</u>
Road Users' Cost Savings (Million Baht)	47.8	55.3	62.4
Increment of Net Added Value (Million Baht)	15.2	51.0	46.3

14. Total investment cost of the proposed road is estimated at Baht 332.2 million of which foreign currency component is US\$ 7.18 million (43 % of total investment cost). The cost is expressed in mid-1978 price and include construction cost, engineering and administration, land acquisition, and physical and price contingencies. Recurrent expenditure for maintenance of the proposed road is estimated at around Baht 3 million per annum. The overlay cost of Baht 40.6 million is also required in the 7th year after opening of the road.
15. The economic internal rate of return of the Project in the optimum route is estimated at 20.4 percent, which exceeds the opportunity cost of capital in the country. Sensitivity tests made under a variety of reverse conditions of costs and benefits indicates that the Project is economically justifiable. Furthermore, the Project, which establish an all-weather road network in the Project Area, will have a considerable impact to the social development of the Area. It will enable the rural people the easy access to the provincial centers where major social institutions exist. Together with the income effects caused by the increased farm incomes attributable to the Project, the improvement of local communication will stimulate the accelerated raising-up of the rural living standard.
16. To complete the highest efficient road network in the Project Area, it is required to construct feeder roads in addition to the proposed artery road. The important feeder roads are those linking Amphoe offices to the Route 21 in view of the strengthening of local administration and social security. Among them, the road link between Si Thep and Mai Sarika on the Route 21 is the most important route.

The economic feasibility of the Project will not be affected greatly even if the investment for this feeder road is included.

17. The Project is justifiable in economic, social and technical aspects. And, it is recommendable that the Royal Thai Government will proceed to the further steps, including detailed design works, for the implementation of the Project so as to open the proposed road to traffic in 1983 as planned.



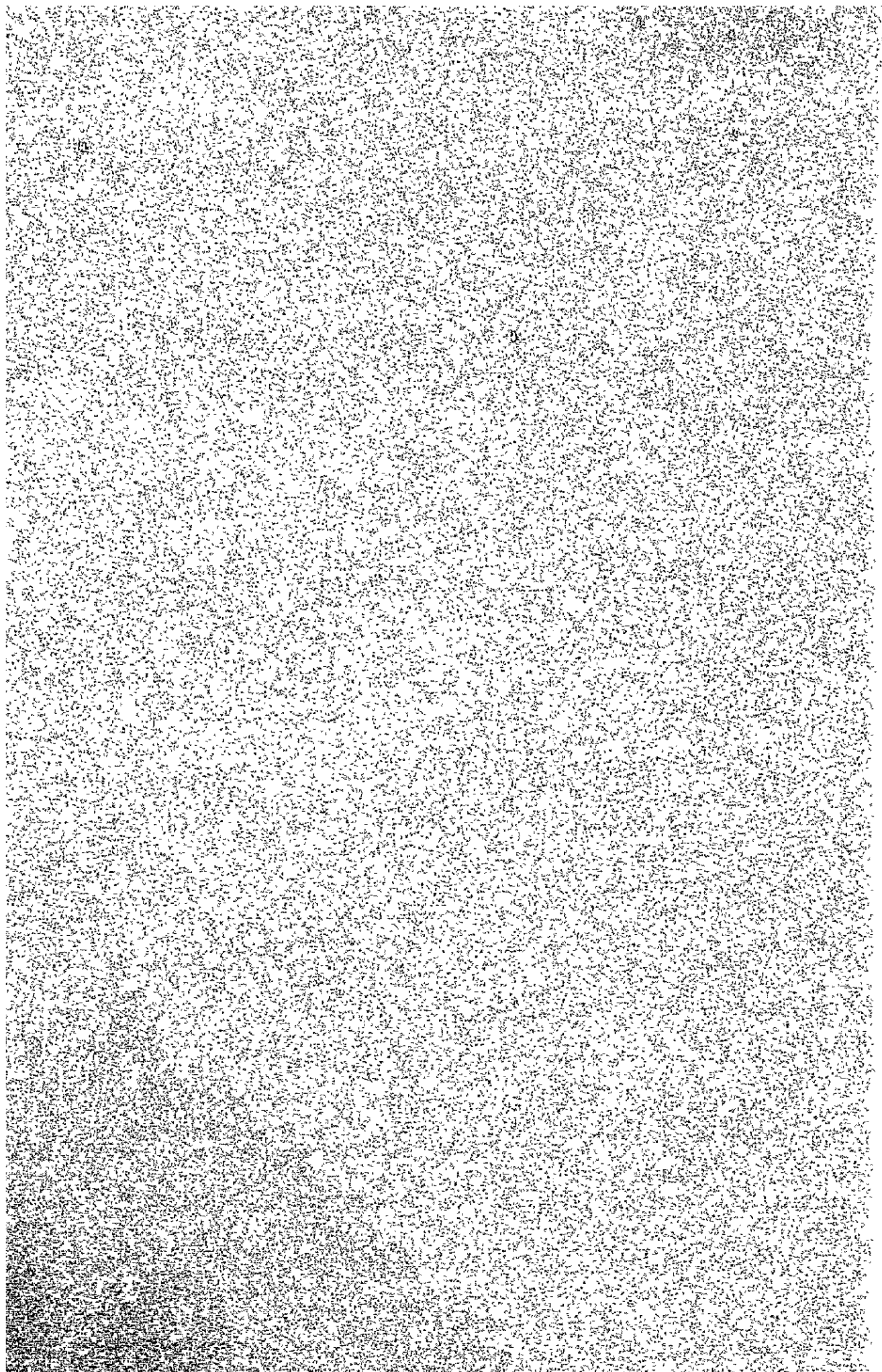


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GLOSSARY

AADT	:	Annual Average Daily Traffic
AASHO	:	American Association of State Highway Officials
ADT	:	Average Daily Traffic
Amphoe	:	District
B	:	Baht (Thai unit of currency)
B/C	:	Benefit Cost Ratio
Changwat	:	Province
DOH	:	Department of Highways
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
GRP	:	Gross Regional Product
IBRD	:	International Bank for Reconstruction and Development
IRR	:	Internal Rate of Return
MDU	:	Mobile Development Unit
NPV	:	Net Present Value
rai	:	Unit of area (0.16 hectare)
RMC	:	Road Maintenance Cost
SBST	:	Single Bituminous Surface Treatment
Tambon	:	Sub-District