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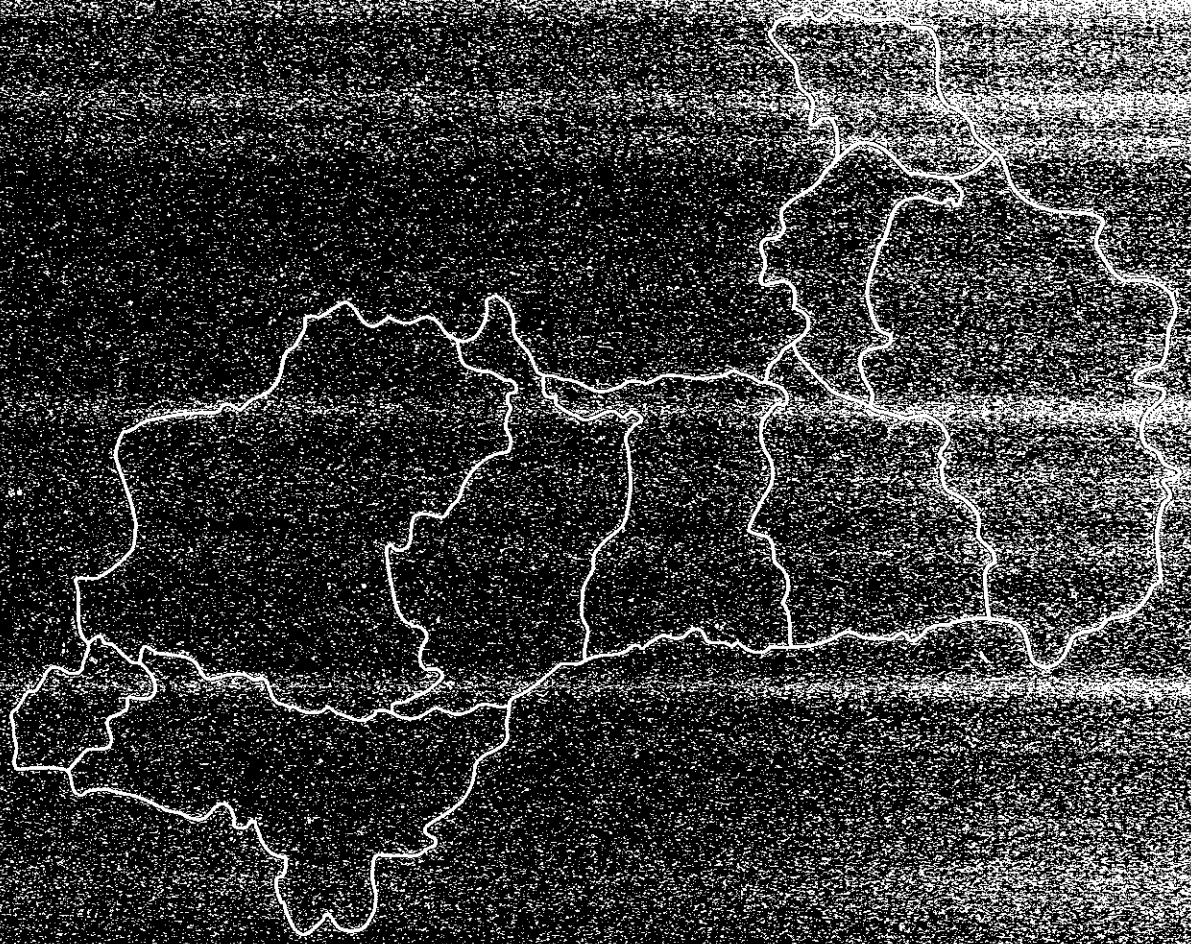
JAPAN INTERNATIONAL COOPERATION AGENCY

THE GOVERNMENT OF THE KINGDOM OF THAILAND
NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT BOARD

THE STUDY ON THE REGIONAL DEVELOPMENT PLAN FOR THE LOWER NORTHEAST AND THE UPPER EAST REGIONS IN THE KINGDOM OF THAILAND

FINAL REPORT



Main Report

September, 1993

NIPPON KOEI CO., LTD.

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Kingdom of Thailand, the Government of Japan decided to conduct the Study on the Regional Development Plan for the Lower Northeast and Upper East Regions in the Kingdom of Thailand and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Thailand a study team headed by Dr. Tsuyoshi Hashimoto of Nippon Koei Co.,Ltd. from March 1992 to March 1993.

The team held discussions with the officials concerned of the Government of Thailand and conducted field surveys in the study area. After the team returned to Japan, further studies were carried out and the present report was prepared.

I hope that this report will contribute to the promotion of the master plan 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 Kingdom of Thailand for their close cooperation extended to the team.

August, 1993

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

LEGEND

- International Boundary
- Provincial Boundary
- 202 National Highway (Number)
- Railway
- Airport
- National Park
- Major Tourism Attraction

Major City (Population)

- 100,000~500,000
- 50,000~100,000
- 25,000~ 50,000
- 10,000~ 25,000

N

SCALE

0 6.5 32.5 65.0

km

Laos

Khon Kaen

Huai Huat

Mukdahan

Savannakhet

Mukdahan

212

202

Yasothon

202

Amnat Charoen

212

23

Bua Yai

202

2

207

Phimai

Satuk

219

214

Buri Ram

Pha Taem

Ubon Ratchatani

217

Si Sa Ket

Warin Chamrap

Phibun Mangsahan

201

205

Nakhon Ratchasima (Khorat)

Prasart Kamphaeng Yai

24

Kaeng Tana

Chon Mek Border Point

Sung Noen

Surin

220

221

Det Udom

Sikhiu

2

24

Dan Kwian

Pak Tong Chai

218

219

214

24

Bangkok Metropolitan Region

Pak Chong

Chok Chai

24

Nang Rong

Prakhon Chai

Prasat

24

24

Kantralak

Khao Yai

304

Phanom Rung

Wang Takrai N.P.

Muang Tam

Tha Plan

Phu Chong Nayoi

Khao Phra Viharn

Nakhon Nayok

33

305

Prachin Buri

Kabin Buri

33

319

304

Sa Kaeo

Aranyaprathet

317

Eastern Seaboard

Phnom Penh

Cambodia

Note : Basic elements of this map composition were derived from the Geographic Information System (GIS) Database developed in the study.

Location Map of Study Area

The Study on the Regional Development Plan for the Lower Northeast and Upper East Regions in the Kingdom of Thailand

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Abbreviations

AAT	Airports Authority of Thailand [MOTC]
ADB	Asian Development Bank
AED	Agricultural Extension Department [MOAC]
BAAC	Bank for Agriculture and Agricultural Cooperatives [MOF]
BMA	Bangkok Metropolitan Area
BMR	Bangkok Metropolitan Region
BOB	Bureau of the Budget [OPM]
BOI	Board of Investment [OPM]
BOT	Bank of Thailand
CAO	Changwat Administration Organization [MOIT]
CAT	Communication Authority of Thailand [MOTC]
CDD	Community Development Department [MOIT]
CPD	Cooperatives Promotion Department [MOAC]
CRDP	Coordinating Committee for the Royal Development Projects
DFPOT	Dairy Farming Promotion Organization of Thailand [MOAC]
DOA	Department of Aviation [MOTC]
DOH	Department of Highways [MOTC]
DOLA	Department of Local Administration [MOIT]
DRDC	District Rural (or Regional) Development Committee
DTEC	Department of Technical and Economic Cooperation [OPM]
EGAT	Electricity Generating Authority of Thailand [OPM]
ESBC	Eastern Seaboard Committee [NESDB]
ERTAT	Expressway and Rapid Transit Authority of Thailand [MOIT]
ETOT	Express Transportation Organization of Thailand [MOTC]
FIO	Forest Industry Organization [MOAC]
GCST	Government Cold Storage Organization [MOAC]
IEAT	Industrial Estate Authority of Thailand [MOID]
IFCT	Industrial Finance Corporation of Thailand
IPD	Industry Promotion Department [MOID]
ITD	Internal Trade Department [MOC]
JICA	Japan International Cooperation Agency
JPPCC	Joint Public / Private Consultative Committee [BOI]
LDD	Livestock Development Department [MOAC]
LNE-UE	Lower Northeast - Upper East
LTD	Land Transport Department [MOTC]
MOAC	Ministry of Agriculture and Cooperatives
MO	Marketing Organization [MOIT]
MOC	Ministry of Commerce
MOD	Ministry of Defence
MOE	Ministry of Education
MOF	Ministry of Finance
MOFF	Marketing Organization for Farmers [MOAC]
MOID	Ministry of Industry
MOIT	Ministry of Interior
MOPH	Ministry of Public Health
MOTC	Ministry of Transport and Communications
MOUA	Ministry of University Affairs
MSTE	Ministry of Science, Technology and Environment
NEB	National Environment Board [MSTE]
NESDB	National Economic and Social Development Board [OPM]

NESDC	National Economic and Social Development Committee
NHA	National Housing Authority [MOIT]
NRDC	National Rural (or Regional) Development Committee
OARD	Office of Accelerated Rural Development [MOIT]
OCSC	Office of the Civil Service Commission [OPM]
OECF	Overseas Economic Cooperation Fund (Japan)
OPM	Office of Prime Minister
OPP	Office of Policy and Planning [MOIT]
PDA	Provincial Development Committee
PEA	Provincial Electricity Authority [MOIT]
PRDC	Provincial Regional Development Committee
PRDCC	Provincial Rural (or Regional) Development Coordination Center
PWA	Provincial Waterworks Authority [MOIT]
PWD	Public Works Department [MOIT]
PWO	Public Warehouse Organization [MOC]
RFD	Royal Forest Department [MOAC]
RID	Royal Irrigation Department [MOAC]
SNRDC	Office of the Secretary to the National Rural (or Regional) Development Committee
SRT	State Railway of Thailand [MOTC]
TAT	Tourism Authority of Thailand [OPM]
TCPD	Town and Country Planning Department [MOIT]
TOT	Telephone Organization of Thailand [MOTC]
TRDC	Tambon Rural Development Committee
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
USAID	United State Agency for International Development

Abbreviation of Measures

Length

mm	=	millimeter
m	=	meter
km	=	kilometer

Area

ha	=	hectare
km^2	=	square kilometer

Volume

l	=	lit = litre
m^3	=	cubic meter
MCM	=	million cubic meter

Weight

mg	=	milligram
g	=	gram
kg	=	kilogram
t	=	ton = MT = metric ton

Time

sec	=	second
hr	=	hour
d	=	day
yr	=	year

Money

US$	=	U.S. dollar
B	=	Baht

(1 U.S.dollar = 25.2 Baht, as of July 1993)

Energy

kcal	=	kilocalorie
J	=	joule
MJ	=	megajoule
HP	=	horsepower
TOE	=	tons of oil equivalent
kW	=	kilowatt
MW	=	megawatt
kWh	=	kilowatt-hour
GWh	=	gigawatt-hour

Others

%	=	percent
°	=	degree
'	=	minute
°C	=	degree Celsius
cap.	=	capita
md	=	man-day
mil.	=	million
no.	=	number
pers.	=	person
PCU	=	passenger car unit
ppb	=	parts per billion

Unit Conversions

1 rai	=	0.16 hectare

CHAPTER 1

INTRODUCTION

1.1 The Study

(1) Study Area

The Thai government requested the Japanese government for technical cooperation to prepare an action-oriented development plan for a geographic area that is considered strategically important in the light of her development policies. The Study Area is defined as seven provinces in the Northeast: Nakhon Ratchasima, Buri Ram, Surin, Si Sa Ket, Ubon Ratchathani, Yasothon and Mukdahan, and two provinces in the East: Prachin Buri and Nakhon Nayok, collectively called the Lower Northeast and the Upper East (LNE-UE) regions.

(2) Study objectives

The objectives of the Study are the following:

(a) To prepare an integrated regional development master plan for the Study Area with following components:

- regional development master plan to the year 2010,
- medium-term development plan for the year 2001, and
- action-oriented development plans with specific reference to the objectives and policies of the Seventh Five Year Plan; and

(b) To formulate a set of institutional and financial measures required for efficient implementation of the proposed plans.

1.2 Work Progress

1.2.1 First field investigation

The Japan International Cooperation Agency (JICA), the official agency for technical cooperation under the official development assistance (ODA) program of the Japanese government, has nominated a consultant team (the Study Team) of Nippon Koei Co., Ltd. to carry out the Study. After preparatory works in Japan, the Study Team arrived in Thailand on March 2, 1992 for the first field investigation period.

Design of the Study

At the beginning, NESDB and the JICA Study Team discussed the overall schedule of the Study, assignment schedule of experts, reporting schedule, approach to the Study, methods of the Study, and other related matters. An agreement was reached on most issues related to the overall framework of the Study as stipulated in the minutes of meetings signed by representatives of NESDB and the JICA Study Team in the presence of the JICA Advisory Team ("Minutes of Meetings signed on March 18, 1992). A report entitled "the Design of Study" was compiled containing the above and submitted at the end of March.

Inception works

The JICA Study Team made the first official visits to the nine constituent provinces according to the following schedule.

March	10	: Nakhon Ratchasima
	11	: Buri Ram
	12	: Prachin Buri, Nakhon Nayok
April	1	: Yasothon
	2	: Ubon Ratchathani, Mukdahan
	3	: Si Sa Ket, Surin

In each province, the Study Team had a briefing from the respective provincial governments on existing conditions of the province, collected some basic data and materials, and exchanged views on development constraints and prospects with officials and private sector representatives.

Members of the Study Team in charge of different sectors have visited many government agencies and provincial government offices, together with NESDB staff, to collect data and materials related to the Study. Some NGOs have been contacted as well. Studies on some specific aspects have been entrusted to selected Thai consultants.

Most works have been done in the office in Nakhon Ratchasima prepared by NESDB for the Study. They represent cooperative efforts by NESDB staff and the JICA Study Team.

Existing conditions of the Study Area have been analyzed by sector. Constraints to development and prospects have been clarified both by sector and by province. Development objectives, strategy and possible scenarios for the Study Area have been examined at a preliminary level. An Inception Report was compiled containing the results of these works.

Formal communications

The first Steering Committee meeting was held on July 7, 1992 with the attendance of representatives from related agencies nominated for the supervision of the Study execution. The Study Team presented the contents of the Inception Report. Formal comments by the Steering Committee were transmitted subsequently to the Study Team in writing.

Two sessions of the workshop were organized to discuss critical issues related to the LNE-UE regional development with the provincial officers and people in the Study Area. The first session was held in Nakhon Ratchasima on July 22 and attended by representatives from the provinces of Prachin Buri, Nakhon Nayok, Nakhon Ratchasima, Buri Ram and Surin. The second session was held in Ubon Ratchathani on July 28 with the attendance of representatives from the provinces of Si Sa Ket, Ubon Ratchathani, Yasothon and Mukdahan.

For the workshop, NESDB and the JICA Study Team prepared a paper in Thai summarizing the contents of the Inception Report and transmitted it to each province in advance. Each session started with the presentation by NESDB and the Study

Team on preliminary results of the Study, followed by a discussion session by participants.

On August 3, 1992, the Study Team reported to the Secretary General and the Executive Committee of NESDB preliminary results of the Study. Some key issues were discussed and guidance for further works obtained.

Frameworks and scenarios preparation

While preparing for the formal communications, works continued after the submission of the Inception Report. A possible range of economic growth rates was examined and alternative socio-economic frameworks were worked out. The spatial development framework presented in the Inception Report was further clarified.

Development prospects and opportunities clarified through sector studies were examined in the light of the regional development objectives for various development scenarios. A most desirable yet realistic course of the regional development in the Study Area was worked out in the form of development phasing.

Sector works

Results of land use analysis and other works subcontracted to Thai consultants and experts were made available and reflected in sector works. Development objectives, strategy and measures were examined by sector. Sector works were coordinated through a few staff meetings as well as daily communication among different experts.

Progress Report

A Progress Report was compiled on the basis of all the works outlined above. Comments by the Steering Committee and the results of the workshop as well as NESDB contributions were partially reflected in the revised development objectives and strategy and development scenarios.

1.2.2 Second field investigation

The second field investigation started on October 5, 1992 with the dispatch of four members of the Study Team. After discussion with NESDB, the Embassy of Japan and the JICA Bangkok Office on the schedule and the procedure of the Study during the second field investigation, they immediately resumed the Study. Other members arrived subsequently.

A workshop was organized on November 5 in Saraburi to exchange views particularly on people's participation and community-based development related to the LNE-UE regional development. Representatives of several NGO's took part in the workshop as well as NESDB staff and the JICA Study Team.

Sector works and a draft master plan

Sector works have been compiled into sector plans in a draft form. Development projects and other measures formulated through sector works have been coordinated and integrated into a draft LNE-UE regional development master plan.

The JICA Advisory Team visited the kingdom during November 19 through 26. They had discussion with the JICA Study Team on work progress and commented on the draft development master plan. They also discussed administrative matters with NESDB.

An Interim Report was compiled, containing the draft development master plan. It consists of two parts : Main Report and Sector Report (separate volume by sector). Comments on the earlier reports by the Steering Committee and results of the workshops in July and November are largely reflected in the plan as well as NESDB contributions.

Study of priority projects

In parallel with the revision of the draft master plan and the sector reports, preliminary feasibility analyses were conducted on selected priority projects. For the other priority projects, more detailed profiles were worked out.

Presentations

During the final phase of the second field investigation, the JICA Study Team presented the Master Plan proposals to different audiences. On February 18, 1993 the Study Team reported for the second time to the Secretary General and the Executive Committee of NESDB. Directors of different divisions of NESDB also participated, and positive responses were obtained from most participants.

Another workshop was organized on February 23 in Nakhon Ratchasima, inviting representatives of local people. Some 25 people participated, and active discussions took place.

On March 9, a seminar was held in Khao Yai with the participation of representatives of all the related government agencies, and selected international organizations as well as NESDB and the JICA Study Team. Under the chairmanship of the Deputy Secretary General of NESDB, presentation by the Study Team, commentaries by relevant experts from government agencies and institutes, and discussions took place in four sessions.

Draft Final Report

A Draft Final Report was compiled based on all the works through the first and the second field investigation periods outlined above. It consists of three parts: Main Report, Sector Report (separate volume by sector), and Preliminary Feasibility Analyses on Sected Priority Projects. Main Report contains a revised Master Plan for the LNE-UE regions. Sector Report contains revised sector works where priority projects are further elaborated and project profiles are attached.

1.2.3 Final works

Second seminar

The second seminar was organized by NESDB, supported by JICA to present the Master Plan proposals to high-ranked officials of the central and provincial governments. The seminar took place in Pattaya on June 26 under the chairmanship of the Secretary General of NESDB.

Four experts of the Study Team dispatched by JICA for this occasion made presentation in four sessions, and commentaries were provided by several Thai experts. A discussion session was presided by the NESDB Secretary General to receive further comments from participants and to clarify key issues.

Final Report

The JICA Study Team compiled the Final Report of the Study in Japan, consisting of Executive Summary Report, Main report (this volume), Sector Report (separate volume by sector), and Preliminary Feasibility Analyses on Selected Priority Projects. All the comments and contributions by various Thai experts and officials have been reflected within the scope of work for the Study on the Final Report, including issues raised during the second seminar.

1.3 Organization of the Report

The remaining part of the Final Report : Main Report is organized in the following way. Chapter 2 contains the objectives and basic strategy for LNE-UE regional development, together with an overview of the Study Area in national economic and spatial development.

Chapter 3 presents development scenarios and frameworks. First, three development alternatives are presented, and possible economic growth rates and sector options to realize different growth rates are examined. Second, the alternatives are evaluated, and the alternative of balanced development is selected. Third, development frameworks are worked out, and a development scenario with phasing is presented for the balanced development.

Chapter 4 and Chapter 5 present sector plans. In Chapter 4, a development plan by economic sector is presented. Chapter 5 contains development plans for natural resources and infrastructure. Each sector plan consists in general of objectives and strategy, development targets or potentials, and development projects with support measures.

In Chapter 6, the LNE-UE regional development master plan is presented, coordinating and integrating the sector plans. Most development projects and associated support measures proposed by sector are packaged into three area development programs and three special sector programs. Measures for human development are separately presented. Recommendation is made on development administration to facilitate the implementation of the Master Plan.

Chapter 7 presents the action plan, where priority projects to be further studied or implemented during the current five year plan period are highlighted. Immediate actions to be taken are clarified for all the core projects. Series of steps to be taken for the Master Plan adoption and promotion are also recommended.

1.4 Study Organization

The Study was carried out by a study team appointed by JICA in close collaboration with NESDB officers assigned to the project. The Study Team consisted of 16 members of Nippon Koei Co., Ltd. as listed in Table 1.1. JICA formulated the Advisory Team for the Study to provide advice to the Study Team. The Advisory

Committee members are listed also in Table 1.1. Apart from the JICA Advisory Team, Nippon Koei Co., Ltd. formulated its own advisory group comprising two regional planning experts as listed in Table 1.1.

A list of NESDB officers assigned to the project is given in Table 1.2. NESDB organized a steering committee comprising representatives from relevant NESDB divisions and other ministries and departments and that would assist NESDB and the JICA Study Team by providing advice. The Steering Committee members are presented in Table 1.2.

The Study Team sub-contracted part of the study work to a number of Thai consultants and integrated survey results into final output. Thai consultants employed by the JICA Study Team are as follows.

- Socio-Economic Survey	:	Chula Unisearch, Chulalongkorn University
- Tourism Survey	:	Chula Unisearch, Chulalongkorn University
- Border Trade Survey	:	Khon Kaen University
- Distribution Survey	:	Khon Kaen University
- Land Use Map Preparation, Remote Sensing and GIS Analysis	:	Minister Thailand, Thailand Remote Sensing Center, Viewsiam Co., Ltd.
- Financial and Institutional Survey	:	Chulalongkorn University

Table 1.1 List of Members of JICA Study Team, JICA Advisory Team, JICA and NK Advisory Group

Position	Name
JICA Study Team	
Team Leader	Tsuyoshi Hashimoto
Regional Planner	Haruo Yamane
Agricultural Specialist	Hisashi Ikewada
Agro-Industrial Specialist	Hasan Gencaga
Industrial Specialist	Eiji Nishita
Tourism Planner	Manuel Knight
Distribution/Trade Specialist	Manabu Fujikawa
Urban Planner	Masafumi Tanifuji
Telecommunications Planner	Tomotaka Taniguchi
Energy Specialist	Hiroshi Tanaka
Transportation Planner	Akio Nakamura
Water Resources Planner	Seiichi Nakao
Environment/Land Use Planner	Ravi Sundaram
Institutional Specialist	Masatoshi Akagawa
Investment Planner	Fumihiko Furuichi
Coordinator	Akifumi Watanabe
JICA Advisory Team	
Chairman (JICA)	Koichiro Katsurai
Member (JICA)	Masaaki Hanai
Member (JICA)	Masayoshi Takahashi
Member (Institute of Development Economics)	Koji Taniguchi
JICA	
Headquarter	Takeshi Kanome
Headquater	Hironobu Ito
Bangkok Office	Senya Mori
Bangkok Office	Junji Yokokura
NK Advisory Group	
Professor, Graduate School of International Development, Nagoya University	Haruo Nagamine
United Nations Center for Regional Development	Kenji Oya

Table 1.2 List of NESDB Personnel Involved in the Study and Steering Committee Members (1/2)

NESDB

Project Director (Assistant Secretary-General of NESDB)	Somchai Krusuansombat
Assistant Project Director (Director, CRDC)	Manu Sattayateva
Project Manager (Director, NERDC)	Sukich Maneethirapattanakul
Assistant Project Manager (CRDC)	Weera Sritaranondha
Assistant Project Manager (NERDC)	Pichit Sariwongchandr
CRDC	Sema Swettanai
CRDC	Theerapat Kaiyarit
CRDC	Sommai Pakdeechat
CRDC	Piyachat Sonkom
CRDC	Sutee Sawang-Arom
CRDC	Somchai Kittichai
CRDC	Teera Worapunth
CRDC	Boonruen Jabtien
CRDC	Phonruth Suwankasem
NERDC	Praditha Dumrong Jareon
NERDC	Montree Boonpanit
NERDC	Montree Deemanop
NERDC	Arjintr Chatkao
NERDC	Dusit Srisabhum
NERDC	Settapongse Sraseeda
NERDC	Vibhawan Sakulpongse
NERDC	Sunisa Tantabhorn
NERDC	Kanokwan Kaoklang
NERDC	Sujin Kantungkul
NERDC	Songsakdi Subhaksa
NERDC	Pairoj Primpru
NERDC	Tiam Reankuntod

Note: CRDC : Central Regional Development Center
NERDC : Northeastern Regional Development Center

Table 1.2 List of NESDB Personnel Involved in the Study and Steering Committee Members (2/2)

Steering Committee Members	
Assistant Secretary-General, NESDB (Advisor of the Committee)	Thamarak Karnpisit
Assistant Secretary-General, NESDB (Chairman of the Committee)	Somchai Krusuansombat
Chulalongkorn University	Dr. Surin Settamanit
National Institute of Development Administration	Dr. Pasit Tongyingsiri
Thailand Development Research Institute	Dr. Chalongpop Suasngkornkarn
Karat Sanitaryware Company Limited	Thiraphon Varanusupakul
Thai Army	• Lieutenant Colonel Surapol Udomchairatana • Colonel Pisanu Puchakarn
The Office of Policy and Planning (Ministry of Interior)	Anuratana Saensuksai
Director of Infrastructure, Project Division (NESDB)	
Director of Economic Preparedness, Planning Division (NESDB)	
Director of Urban Development, Coordination Division (NESDB)	
Director of Central Regional Development Center (NESDB)	Manu Sattayateva
Director of Northeastern Regional Development Center (NESDB, Secretary of the Committee)	Sukich Maneethirapattanakul
Assistant Secretary of the Committee	
Central Regional Development Center	Weera Sritaranondha
Northeastern Regional Development Center	Pichit Sariwongchadr

CHAPTER 2

DEVELOPMENT OBJECTIVES AND BASIC STRATEGY

2.1 LNE-UE Regions in National Development

2.1.1 National economic and spatial development

National economic development

The Thai economy is one of the fastest growing economies in the world. Rapid growth started in mid-1960s. The average per capita income growth was at 4% per annum during 1965-1987. The growth has accelerated since 1987 with an estimated rate of 13.2% in 1988, 12.0% in 1989, and 10.0% in 1990. The growth slowed down slightly to 7.5% in 1991.

Continuing growth at such high rates may face difficulties due to a number of factors. Main factors include constraints in infrastructure capacities, lack of skilled labour and escalating land prices. Various problems have begun to surface associated with the Bangkok-centered economic growth. They include the environmental degradation of the Bangkok Metropolitan Area (BMA), increasing income disparity between the BMA and other areas, and limited generation of employment opportunities in the manufacturing sector.

National spatial development

Thailand is divided into seven regions for planning purposes: the Bangkok Metropolitan Region (BMR), the Central, the Eastern, the Western, the Northern, the Northeastern, and the Southern regions (NESDB, Urban Development Coordination Division). In these regions, 18 cities are considered major urban centers. Six cities are within the BMR. The remaining 12 cities are the regional major cities in six other regions as designated during the fifth plan period. These cities are expected to play major roles for the more balanced development of the kingdom.

The population distribution in Thailand is characterized by strong primacy of Bangkok. The two-city primacy index was 27 in 1985 with the Bangkok population of 5,363,378 against that of 200,051 in Nakhon Ratchasima, the second largest city surpassing Chiang Mai.

Population of the Bangkok Metropolitan Region (BMR) kept growing at the highest rates among the regions, deriving from high rates of in-migration. As a result, concentration of population in the BMR rose from 8.9% of the national population in 1970 to 10.5% and 10.8% in 1980 and 1990 respectively. Overall, the rate of population growth in Thailand decelerated in the last two decades: 2.7% per annum in the 1970 - 80 period to 2.0% per annum in the 1980 - 90 period (Table 2.1).

Table 2.1 Population by Region in Thailand

Region	Year		
	1970	1980	1990
	Population (thousands)		
Bangkok Metropolis	3,077	4,697	5,876
Central	7,535	9,726	12,072
Northern	7,489	9,074	10,583
Northeastern	12,025	15,699	19,037
Southern	4,272	5,628	6,964
Whole Kingdom	34,398	44,824	54,532
		Annual Growth (%/yr)	
		(1970-80)	(1980-90)
Bangkok Metropolis		4.3	2.3
Central		2.6	2.2
Northern		1.9	1.6
Northeastern		2.7	1.9
Southern		2.8	2.2
Whole Kingdom		2.7	2.0

Source: population censuses in 1970, 1980 and 1990

2.1.2 LNE-UE regions

(1) Location and natural conditions

Location

The Study Area is defined as the jurisdiction of seven provinces in the Lower Northeast region and two provinces in the Upper East region. The Study Area is collectively called the Lower Northeast and the Upper East regions (LNE-UE). These provinces in the Study Area are Ubon Ratchathani, Mukdahan, Yasothon, Surin, Si Sa Ket, Nakhon Ratchasima and Buri Ram in the Northeast, and Prachin Buri and Nakhon Nayok in the East.

The Study Area is bordered on Laos to the east and on Cambodia to the south. From Laos, it is separated largely by the Mekong river, and from Cambodia by the Phanom Dongrak mountain range.

Natural conditions

The Study Area has the land area of 88,971 km^2, corresponding to 17.3% of the total land area of the kingdom. Land area varies widely among the provinces, ranging from 2,122 km^2 in Nakhon Nayok to 20,494 km^2 in Nakhon Ratchasima.

The seven provinces in the Northeast within the Study Area fall within the Korat plateau, which is an elevated land extending to the northeast of the BMR with relatively small undulation. The provinces of Prachin Buri and Nakhon Nayok are separated from the Korat plain by a low range of mountains.

The seven provinces in the Northeast constitute the catchment area of the Mun river which drains largely the provinces of Nakhon Ratchasima, Buri Ram, Surin, Si Sa Ket and Ubon Ratchathani, and the Chi river which flows through Yasothon before it joins the Mun river in Ubon Ratchathani. The northeastern corner of the Study Area within Mukdahan drains directly into the Mekong river.

The two provinces in the East coincide largely with the catchment area of the Bang Pakong river. The province of Prachin Buri drains the upper and middle catchment area of the Bang Pakong river itself, while Nakhon Nayok drains largely its main tributary, the Nakhon Nayok river.

The Northeastern region is known for its dry climate. The annual precipitation ranges from some 1,000 mm in the western most part to over 2,000 mm in the area along the Mekong river. The two provinces in the East receive slightly larger amount of precipitation around 1,500 mm than the average in the remaining seven provinces.

The Northeastern region has two distinct seasons. The dry season extends from November through March, and the wet season from May through September in general. April and October are transitional months. The precipitation during the five months in the wet season and October accounts for more or less 90% of the annual precipitation.

(2) Socio-economy

Population

The Study Area had a population of 9,909 thousand in 1990 accounting for 18.2% of the national population (54,532 thousand). The Study Area's population grew at 2.1% per year between 1980 and 1990, which was faster than that of the nation at 2.0% per year for the same period. This high population growth rate in the Study Area could be attributed to high fertility in the Study Area and social increase in population due to net in-migration.

The high fertility in the Study Area is observed from the mean number of children ever born and still alive per ever-married woman as shown below.

Mean Number of Ever-born and Living Children per Ever-married Woman

Area	Number of Born Children	Number of Living Children
Bangkok	2.3	2.2
Central	2.8	2.6
North	2.7	2.5
Northeast	3.2	3.0
South	3.1	3.0

Reflecting a high fertility in the region, the population has a higher proportion of young age groups as shown below.

Age group	Northeast (%)	Nation (%)
below 10	20.8	18.1
below 20	43.7	39.2

This fact indicates that in the future there will be more new entrants into the labor market in the Study Area than in other regions.

Migration

The Northeast is the most volatile region in Thailand in terms of migration. Migrants to and from the Northeast accounted for 45% of the total migratory movements.

The BMA was the most popular destination for the migrants from the Northeast, amounting to 292 thousand or 52% of all the Northeast migrants recorded in August 1989. This was followed by those headed for the Central (205 thousand or 37%). Among the migrants into the BMA, Northeasterners were the largest group accounting for 48% of all the migrants to the BMA.

There is also a large flow of migrants from the BMA to the Northeast. The number of migrants in this direction was 434 thousand as recorded in August 1989, larger than the migrants in the opposite direction. Most of these migrants (97%) to the Northeast were those headed for the rural areas of the region. This segment of the migrants is considered to include the following types:

1) those who have migrated to the BMA seeking jobs and returned to their home villages within the last five years either after making sufficient money or failing to adapt to high skill requirements in the BMA, and

2) seasonal migrants returning from the BMA and staying in their home villages only during the rainy season to engage in farm activities.

Gross provincial product

The Study Area's gross regional domestic product (GRDP) amounted to 42,874 million bahts in 1989 in 1972 price level, accounting for 7.5% of gross domestic product of Thailand (631,610 million bahts). The Study Area showed higher economic growth of 7.2% per year between 1983 and 1985 than that of the nation (5.3% per year). In the second half of the 1980's, however, the trend reversed and the national economy grew at a remarkable rate of 9.9% per year, while the Study Area's growth rate declined to 5.6% per year. In 1989 per capita GRDP amounted to 12,239 bahts which was only 38% of per capita GDP (32,028 bahts).

In terms of industrialization, the Study Area is less developed than the nation as a whole with the industrial sector's share at 16% while that for the nation was 34% in 1989 (Table 2.2). Among the provinces, Nakhon Ratchasima and Buri Ram are comparatively more advanced with industrial sector's shares exceeding 20%. Ubon Ratchathani had a similar share to the area's average at 15%. Other four provinces are less industrialized with their shares ranging from 9 to 14%.

Incidence of poverty

Incidence of poverty in the nation and the Northeast is summarized as follows.

Poverty Incidence in Thailand and the Northeast

Year	Nation (%)	Northeast (%)
1975/76	30	45
1980/81	23	36
1985/86	30	48

Nearly half the population in the Northeast live under the poverty line, while the ratio for the nation is much lower at 30%.

The provinces in the Study Area are compared with each other, the Northeast, and Thailand by selected socio-economic indices in Table 2.2.

Table 2.2 Comparison of the Nine Provinces in the Study Area, the Northeast and Thailand by Selected Socio-Economic Indices

No.	Index	Unit	Province									Study Area	Northeast	Thailand	Source
			Prachin Buri	Nakhon Nayok	Nakhon Ratchasima	Buri Ram	Surin	Si Sa Ket	Ubon Ratchathani	Yasothon	Mukdahan				
1.	Area	sq.km	11,958	2,122	20,494	10,322	8,124	8,840	18,609	4,162	4,340	88,971	168,854	513,115	1)
2.	Population (1990)	thousands	785	222	2,375	1,357	1,220	1,286	1,870	529	265	9,909	19,037	54,532	
	Density (1990)	per sq.km	66	105	116	132	150	146	99	127	61	111	113	106	
	Growth rate (1970-80)	% /year	3.0	2.4	2.7	3.2	2.8	2.9	(3.6)	(1.4)	(1.2)		2.7	2.7	
	Growth rate (1980-90)	% /year	3.3	0.8	2.0	2.1	2.0	1.9	1.5	2.8	(4.2)		1.9	2.0	3)
	Urban Population (1980)	%	10.9	8.4	12.2	8.5	3.5	2.5	9.4	5.7	9.0	7.5		(27.1)	
3.	Economic Structure (1989)														2)
	Agriculture	%	30	25	29	27	27	33	23	29	33	28	30	16	
	Industry	%	15	9	23	19	11	7	15	9	12	16	15	34	
	Service	%	55	66	48	54	62	60	62	63	55	56	55	50	
4.	Gross Regional Product (1989)	current mln baht	14,031	4,285	34,193	14,914	12,506	12,008	20,697	5,242	3,122	120,998	229,875	1,775,978	2)
	per capita GRP	current baht p.c.	17,716	20,602	14,745	10,692	10,013	9,418	11,145	10,238	11,189	12,239	11,981	32,028	2)
5.	Land use (1988)														
	Forest area	% of total	24.1	22.7	12.6	5.8	4.2	9.0	20.6	11.6	35.8	15.2			
	Total farm land	% of total	41.3	66.7	70.0	65.2	75.0	62.8	52.8	80.7	29.5	59.9			4)
	(paddy field)	(% of farm land)	(52.2)	(86.2)	(43.5)	(78.7)	(82.7)	(77.7)	(69)	(62.2)	(44.7)	(63.9)			
	(field crops)	(% of farm land)	(37.7)	(2.3)	(41.7)	(12.7)	(6.4)	(13.0)	(8.5)	(10.9)	(17.3)	(20.9)			
	(idle land)	(% of farm land)	(0.9)	(0.0)	(2.1)	(2.5)	(4.8)	(2.0)	(17.8)	(17.1)	(24.7)	(6.7)			
	unclassified land	% of total	34.6	10.6	18.4	29.0	20.8	28.2	26.6	7.7	34.7	24.8			
6.	Physical Infrastructure														
	Road density, DOH roads (1988)	km/sq.km	0.09	0.08	0.07	0.08	0.10	0.08	0.08	0.06	0.13	0.08	0.08	0.10	5)
	Household electrification	%													
	Service ratio for improved water supply	%	1.0	2.1	0.6	0.6	0.6	0.4	1.0	1.1	0.9		0.9	2.7	7)
	Per capita water use	cubic meter/year	674	473	334	384	522	423	422	306	467				8)
	Per capita electricity use (1990)	kwh/year											135	681	
7.	Social Infrastructure														
	No. of hospital beds per 1,000 population		1.2	2.3	1.0	0.5	0.6	0.6	0.8	0.8	1.2	0.8		1.4	2)
	No. of doctors per 1,000 population		0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.3	2)
	No. of school per 1,000 population		0.8	0.9	0.6	0.6	0.6	0.7	0.8	0.8	0.9	0.7	0.7	0.7	2)
	Student/teacher ratio		22	16	22	21	22	22	20	16	20	21	20	19	2)
8.	Major Towns		Prachin		Nakhon	Buri Ram	Surin	Si Sa Ket	U.Ratchathani	Yasothon					
	(Urban population in 1980)	thousands	Buri (17)		Ratchasima (89)	(24)	(30)	(20)	(73)	(17)					
					Pak Chong (46)				Warin						
					Sikhiu (17)				Chamrap (31)						

Sources :

1) National Statistcal Office, Preliminary Report - 1990 Population and Housing Census
2) NESDB computer printouts
3) Census results, 1970, 1980, 1990
4) Statistical Yearbook of Thailand, 1990
5) DOH, Department of Local Administration, Public Works department
6) PEA (Population basis)
7) MWA, PWA (% ratio of customers to population)
8) PWA (amount of water supplied per customer)
9) EGAT, MEA, PEA, NEA, POF, Dept. of Local Administration

2.1.3 Position of LNE-UE regions

Relative position of the Study Area (LNE-UE) in the national economic and spatial development outlined above may be summarized as follows.

(1) One of the least developed areas

The Study Area is considered one of the least developed areas in the kingdom by most economic indices as indicated in subsection 2.1.2. Development of the Study Area could therefore contribute to a more balanced national development as well as to the continued growth of the national economy.

(2) Largest out-migrating area to the BMA

The Study Area is the largest out-migrating area to the Bangkok Metropolitan Area (BMA). Development of the Study Area with creation of sufficient employment opportunites would therefore contribute to reducing the population pressure on the BMA and alleviating the degradation of its urban environment.

(3) Alternative locations for industries

The Study Area is located close to both the BMA and the Eastern Seaboard (ESB). It provides alternative locations for industries, particularly those to be relocated or expanded from the BMA.

(4) Extensive hinterland of the ESB

The ESB has started to develop rapidly. A key issue from the national economic point of view is how to utilize the momentum of the ESB development to induce the development of its hinterlands. This applies particularly to the Study Area constituting an extensive hinterland of the ESB.

(5) Gateway to Indochina countries

Another key for continued development of the Thai economy is how to make effective use of emerging opportunities for economic interactions with the Indochina countries. The Study Area is in a pivotal position to take advantage of these opportunities.

2.2 Problem Structure of LNE-UE

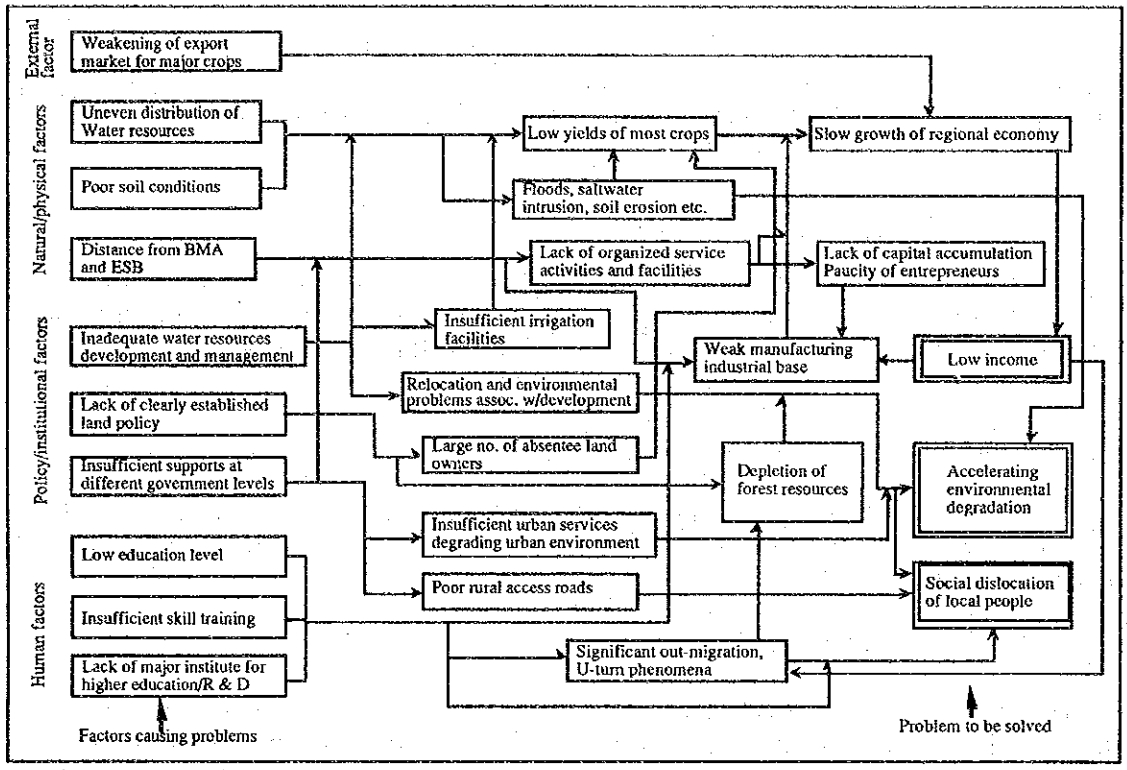
(1) Problem structure analysis

The Study Area faces a variety of problems which combined would work as constraints to further development. Many of these problems are inter-related to cause various undesirable phenomena observed. A problem structure analysis is a method to clarify these inter-linkages in a macroscopic way. The analysis would allow to maintain a broad perspective without getting into details to identify more important and essential factors and major problems to be alleviated through planned development efforts.

A problem structure analysis has been conducted for the Study Area. Results are illustrated in Figure 2.1 in the form of the "problem structure of the LNE-UE regions."

The figure shows more important factors and phenomena and main inter-relationships among them.

Figure 2.1 Problem Structure of LNE-UE Regions



(2) Main factors causing problems

More fundamental factors have been identified, which are at the root of various problems facing the Study Area. These factors may be classified into four categories: natural/physical, policy/institutional, human, and external factors. The main external factor is the weakening export market for major crops such as rice, maize and cassava-tapioca. This is largely beyond control at a regional level. Other factors are discussed below.

Natural/physical factors

The main natural/physical factors identified are (1) uneven distribution of water resources, (2) poor soil conditions and (3) distance from the BMA and the ESB. The Study Area is arid with the average annual precipitation of 1,370 mm under savanna climate. Rainfall distribution is highly skewed especialy in the seven Northeastern provinces within the Study Area with more or less 90% of the total annual precipitation concentrating in the rainy season from May through October. Extended droughts are common during the dry season.

Soil in the Study Area has mostly low fertility and low water retention capacity, derived mainly from sandstone, shale or siltstone. In limited areas, the soil is salty or alkaline.

The distance from the BMA is too short for limited areas and too long for most part of the Study Area. In Nakhon Nayok and Nakhon Ratchasima, certain administrative and commercial activities are less developed as the dependence on Bangkok-based activities are higher. In most parts of the Study Area, the distance from the BMA and the ESB is perceived too long resulting in high transportation costs and limited markets.

Policy/institutional factors

The main policy/institutional factors consist of (1) inadequate water resources development and management, (2) lack of clearly established land policy, and (3) insufficient supports at different government levels. Despite the extensive efforts in the recent past directed at alleviating the water shortage problems in the Northeast, the recent drought has revealed for another time that the problems are far from being solved. A piecemeal approach, against an integrated river basin approach tends to take the largest toll in areas of the most serious water shortages.

The government is still in the process to establish comprehesive and coherent land use policies. Problems to be addressed in such policies include clarification of land rights and land use in forest areas, land allocation criteria and procedures, and land taxes especially related to lands that are under-utilized or under absentee landlords. These problems have all serious implications to the Study Area.

Development administration is the third main factor for discussion. Decentralization and local autonomy are the key words here, but the question is how to substantiate them. Division of responsibilities may not be totally clear in some areas. Planning and management capacity is limited at the local government level.

Human factors

The main human factors identified for the Study Area are (1) low education level, (2) insufficient skill training, and (3) lack of major institute for higher education, and research and development. Other problems include malnutrition and insufficient health facilities and personnel in some parts of the Study Area. Solving these latter problems would not by itself contribute to alleviating the economic difficulties facing the people in the Study Area. Also the mulnutrition is a result, rather than a cause, of poor economic performance. As factors causing problems, the first three seem to be more relevant.

(3) Problem interactions

The main factors described above cause a range of problems, economic, social and environmental. Typical economic problems are poor agricultural performance represented by low yields of most crops, and weak base for manufacturing industry. The poor agricultural performance is not only due to the uneven distribution of water resources and the poor soil conditions but also affected by floods, salt water intrusion and soil erosion, land ownership pattern, insufficient irrigation facilities, and lack of structured supports to farmers.

The weak manufaturing base is due to a number of factors, but the human factors are most important. The low income itself is a constraining factor for consumer goods industries.

A typical environmental problem is the depletion of forest resources. The increase in cultivated area under upland crops in recent years is mainly at the expense of forest area. This, in turn, is related to a return of out-migrants from the BMA who could not find jobs to suit their skill levels.

This U-turn phenomenon as well as significant out-migration pose serious social problems. In short, these phenomena contribute to further reducing the availability of much needed skilled workers as well as farm labour. Relocation of people due to development projects may add to the social problems in the Study Area.

The complexity of problems observed in the Study Area is a result of these typical and other individual problems. It may be summarized in three prime problems: (1) low income, (2) accelerating environmental degradation, and (3) social dislocation of local people as shown in Figure 2.1.

2.3 Regional Development Objectives and Basic Strategy

2.3.1 Existing development policies and objectives

(1) Seventh plan for national development

The Thai government has prepared the Seventh National and Social Development Plan for 1992 through 1996 (hereafter the Seventh Five Year Plan) with emphasis on the following policies:

(a) to maintain economic growth at an appropriate level while sustaining economic and financial stability,

(b) to reduce income disparity by distributing fruits of economic growth to the regions outside BMA, and

(c) to conserve natural resources and environment, promote human resources development and upgrade living standard of the people.

To maintain economic growth the development of less development regions holds a key as well as further development of the Eastern Seaboard (ESB) and its extension into its hinterlands. This would also contribute to reducing income disparity between the BMA and other areas. More employment opportunities would have to be generated in the services sector as well as in the manufacturing sector to upgrade living standard of the majority of people. For this, emerging opportunities for much increased trade with the neighbouring Indochina countries should be effectively utilized.

(2) Opportunities and guidelines for the Northeast

NESDB prepared the "Opportunities and Guidelines for the Northeast" (hereafter the Guideline) in 1989. The Guideline paraphrases the strategy of the Seventh Five Year Plan into the Northeast's regional context in due consideration of the recent change in international political environment.

While various sorts of development efforts have been made to overcome a number of disadvantages of the region analyzed in Section 2.2, the region still remains at a low stage of economic development. The prime concern and objective of the region,

therefore, is to alleviate poverty and upgrade people's living standard, according to the Guideline.

The basic strategy for developing the region includes the following:

1) to effectively utilize the natural resources, both those indigenous and to be imported from the neighboring countries,

2) to accelerate the mobilization of capital to stimulate investment in the region, and

3) to apply new and appropriate technologies in parallel with human resources development.

In recent years, international political climate surrounding Thailand has been swiftly improving. After many years of war and political disturbances, stability and peace are now in sight in the Indochina countries: Cambodia, Laos and Vietnam. These countries will concentrate greater efforts on recovering and strengthening their economies with cooperation from the international community. Under these circumstances the Northeast region of Thailand should play a key role as the new gateway to the Indochina countries. Regional development of the Northeast will be effectively promoted by taking advantage of the emerging new opportunities, especially in the following aspects:

1) to promote international trade with the Indochina countries, import of raw materials and natural resources and export of consumer goods;

2) to establish itself as the center for international cooperation in financing, technological and academic transactions;

3) to promote industrial development through effectively exploiting natural resources indigenous to the region such as natural gas, potash and rock salt and the increased import of raw materials from the Indochina countries for processing in the region and export;

4) to promote agriculture development with emphasis on livestock development, especially cattle raising; and

5) to promote tourism with strengthened linkages with touristic resources in Indochina.

2.3.2 LNE-UE development objectives

The problem structure analysis in Section 2.2 has clarified three major problems to be alleviated through planned development efforts: (1) low income, (2) accelerating environmental degradation, and (3) social dislocation of local people. Development objectives for the Study Area are established to address to these problems, broadly in line with the existing development policies and objectives outlined in subsection 2.3.1.

The objectives for regional development of the Study Area are:

1) To increase income levels of local people to narrow gaps with the national average income by creating employment opportunities in manufacturing and services sectors, increase agricultural production especially during the dry season through crop diversification and livestock improvement, and promoting inter-linkages between these sectors;

2) To enhance the quality of land and water environment for environmentally sound and sustainable development in order to support higher levels of primary production, to add to tourism value for both domestic and foreign tourists, and to promote physical and moral sanitation of local people; and

3) To promote people's participation in regional development for socially viable development through project planning and implementation incorporating socio-cultural value of local people, organization of rural people and utilization of indigenous systems to encourage self-help efforts for production, marketing and basic services.

2.3.3 LNE-UE development strategy

Effective development strategy should focus on the more fundamental factors which are at the root of various problems as analyzed in Section 2.2. Elements of the basic strategy address to rural land use, urban functions, linkages between urban centers and between urban and rural areas, and integrated water management. It may be expressed in sum as follows:

1) Implementation of key infrastructure development projects related to transportation artery and water resources to transform the development structure of the Study Area;

2) Selective improvement of urban infrastructure and services in accordance with expected functional division among major urban centers to support a wide range of activities related to emerging opportunities for increased economic interactions with the Indochina countries and the ESB induced development; and

3) Preferential implementation of the new land policies and strategy to clarify land tenure and land use, allocate lands and impose land taxes for more rational land use.

Development strategy by sector is defined in more specific terms in Chapter 4 for economic sectors and in Chapter 5 for natural resources and infrastructure.

CHAPTER 3

DEVELOPMENT SCENARIOS AND FRAMEWORKS

3.1 Development Alternatives

3.1.1 Definition of development alternatives

Three distinct alternatives are defined for the development of the LNE-UE regions.

Trend development

This alternative represents the continuation of what has been taking place in the Study Area in the recent past. The growth rate is low and out-migration of people continues. Majority of small farmers continue to cultivate mainly traditional crops (rice, maize and cassava). The level of industrialization is low, confined mainly to consumer goods, construction materials and simple agro-processing. New industries in industrial estates and elsewhere are slow to develop. Agriculture-induced services dominate the services sector.

Accelerated development

This alternative is to attain the highest economic growth with emphasis on high industrialization and border trade related services. The high industrialization will be supported by export-oriented, labor-intensive and footloose industries. Large commercial operation for diverse crops and livestock would dominate the agricultural sector. Crop diversification would contribute to the development of new agro-processing industries. Large in-migration would accompany these changes as well as large intra-regional migration.

Balanced development

This alternative represents an intermediate path between the first two alternatives. The growth rate is intermediate, and there would be small magnitude of net in-migration. Industrialization would be based more on domestic resources (low cost semi-skilled labor, agricultural products etc.) and domestic markets. Agriculture by small farmers would take a form of integrated farming combining crop cultivation, backyard livestock/poultry, fishery, sericulture and others. This would contribute to crop diversification, new agro-industries, and agriculture and industry induced services.

3.1.2 Alternative socio-economic frameworks

Socio-economic frameworks are worked out for the three development alternatives defined above with respect to population, the gross regional domestic product (GRDP), and per capita GRDP.

(1) Population

Trend development

Following the trend, fertility and population growth rate will decline. The level of migration, both outbound and inbound, will remain at the present level. The population in the Study Area will increase from 9,909,000 in 1990 to 12,600,000 in 2010 at the average rate of 1.21% per year, the average growth rate of the nine provinces in the Study Area projected by "Population Projections for Thailand 1980-2015", NESDB in 1991. This analysis projects a 1.3% per year growth for Thailand until 2010 under the "medium-fertility" case.

Accelerated development

As a substantial number of employment opportunities are created within the Study Area, potential outmigrants will stay, outmigrants from other parts of the Northeast will settle in the Study Area, and additional migrants will be attracted from other regions. Based on the analysis on recent migration patterns, these potential migrants correspond respectively to about 3% of the Study Area's population. Thus the population in the Study Area will be 9% larger than in the case of trend development or 13,700,000 in 2010, representing an average annual growth of 1.63%.

Balanced development

Employment opportunities to be created under this alternative will attract potential outmigrants in the Study Area and from other parts of the Northeast. Therefore, the population in the Study Area will be 6% larger than in the case of trend development or 13,400,000 in 2010, an increase at 1.52% per annum on an average.

(2) GRDP

Trend development

Following the recent trend (average annual growth rates in 1980-90), the agriculture, the industry and the services sectors in the Study Area would grow at an average annual rate of 2.9%, 8.0% and 6.5%, respectively. As a results, the GRDP in the Study Area would grow from 121,000 million bahts in 1989 to 413,600 million bahts in 2010 (in 1989 price, hereafter) at an average annual rate of 6.0%.

Accelerated development

Highest conceivable growth rates are assumed for agriculture at 5.0% per annum and for industry at 15.0% per annum to project the GRDP in 2010 in these sectors. The services sector GRDP in 2010 is calculated by applying the services sector multiplier at 1.0 for agriculture and 2.0 for industry. The total GRDP in 2010 would be 1,284,100 million bahts, representing an annual average growth of 11.9%.

Balanced development

Growth rates for agriculture and industry are taken to be the median value of the respective growth rates under the first two alternatives : 3.9% per annum for agriculture and 11.5% per annum for industry. The same services sector multiplier

value used for the accelerated development is applied. The total GRDP in 2010 would be 723,800 million bahts, representing an annual average growth of 8.9%.

(3) Per capita GRDP

Results of growth assumtion and calculation above are summarized, and the per capita GRDP is calculated for each alternative (Table 3.1).

Table 3.1 Alternative Socio-Economic Frameworks

	1989	2010					
		Trend Development		Accelerated Development		Balanced Development	
GRDP *							
Agriculture	33,900	61,800	(2.9)	94,400	(5.0)	75,700	(3.9)
Industry	19,400	97,700	(8.0)	365,100	(15.0)	190,800	(11.5)
Services	67,700	254,100	(6.5)	824,600	(12.6)	457,300	(9.5)
Total	121,000	413,600	(6.0)	1,284,100	(11.9)	723,800	(8.9)
Population **	9,909	12,600	(1.21)	13,700	(1.63)	13,400	(1.52)
Per capita GRDP ***	12,211	32,800		93,700		54,000	

* million bahts in 1989 price; annual growth rate % in parenthesis
** 1,000 ; annual growth rate % in parenthesis
*** bahts in 1989 price

As shown in Table 3.1, per capita GRDP in 2010 would be 32,800 bahts under the trend development, 93,700 bahts under the accelerated development, and 54,000 bahts under the balanced development. The per capita GDP of Thailand is projected to be 105,400 bahts in 2010. Thus the ratio of per capita GRDP in the Study Area to per capita GDP of Thailand is 31% for trend development, 89% for accelerated development, and 51% for balanced development.

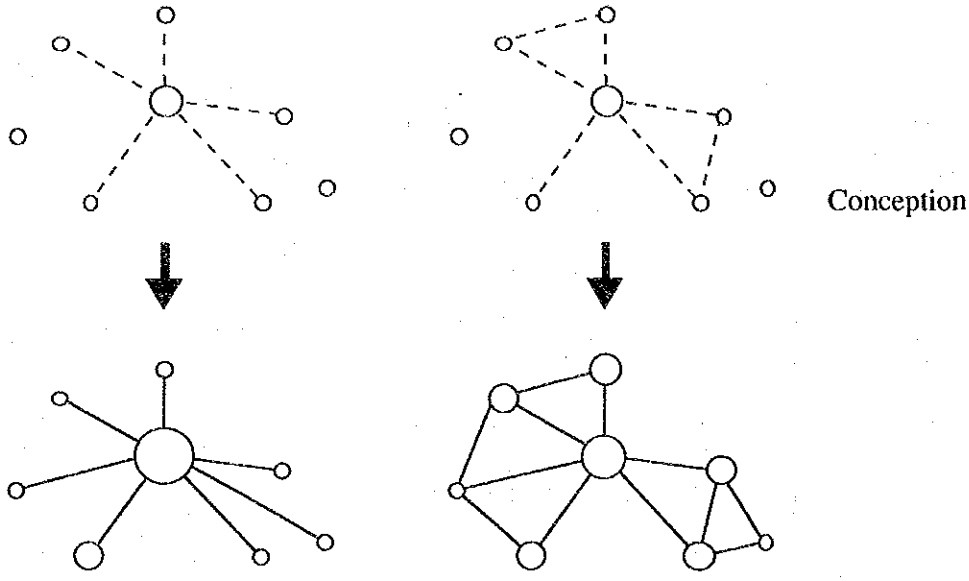
3.1.3 Alternative spatial development patterns

(1) Alternative models for spatial development

The Seventh Five Year Plan represents a major departure from the past in urban development strategy of the Thai government. A new strategy, called regional network approach, views cities and towns within a region or subregion as members of a cluster of urban centers. These centers interact with one another as well as with their hinterlands to realize in totality more than the sum of parts. This may be contrasted with the conventional growth pole strategy (Figure 3.1).

A basic perception behind the regional network approach strategy is that cities of the same size class can have very different functions and potentials. Rather than trying to make a single large city a generic center for a predetermined region, the network concept is based on a clustering of many settlements each with its own specialization and localized hinterland relationships.

Figure 3.1 Schematic Presentation of Growth Pole Approach and Regional Network Approach to Urban Development



(1) Growth pole approach (2) Regional network approach

(2) Spatial development under three alternatives

Trend development

Present spatial development patterns would not change much under this alternative. Population distribution would be more dispersed throughout the Study Area. Nakhon Ratchasima and Ubon Ratchathani would continue to be strong urban centers, and other urban centers would be relatively isolated from one another, except those closer to these strong urban centers.

Accelerated development

Under this alternative, a large number of people would be moving from other areas into a few largest cities in the Study Area. Export-oriented, labour-intensive and footloose type industry to support this alternative may not induce much development of other secondary towns and hinterlands. The resultant pattern of urban development may resemble the one realized by the growth pole approach.

Balanced development

Integrated farming and various domestic market oriented industries to be promoted under this alternative tend to spread out the fruits of development more widely throughout the Study Area. This would strengthen secondary cities with various functions. The regional network approach is more applicable to this alternative to realize a network of medium size cities.

3.2 Evaluation of Alternatives

(1) Evaluation criteria

The development alternatives may be evaluated from several points of view. The LNE-UE regional development objectives naturally provide a set of evaluation criteria: i.e. economic growth, environmental quality and social viability. Another important criterion is public sector resource requirements, including not only investment funds but also institutional support. Evaluation by these criteria is summarized in Table 3.2.

(2) Evaluation results

Trend development

This alternative represents the continuation of the trend. Degree of industrialization would be low based mainly on limited agro-processing as well as trend growth of existing industries. Most farmers would continue to cultivate traditional crops. The economic growth would be the lowest at 6% per annum.

This alternative would involve the smallest public sector resources as little intervention would be necessary by the government. Effects on environment would be minimal, although soil erosion, water shortages and forest depletion may continue.

Under this alternative, a substantial number of people would continue to migrate out of the Study Area. In fact, the only way to attain the objective of narrowing income gaps between the Study Area and the country under this alternative seems to be the encouragement of out-migration. Still the attainment levels of per capita income would be the lowest. Population distribution under this alternative would be more dispersed.

Accelerated development

The economic growth would be the highest under this alternative with the highest attainable growth of 12% per annum through 2010. Such a high growth would be supported by high industrialization based mainly on export-oriented, labour-intensive, footloose industry. Practically the only viable way to enhance the competitive advantage of the Study Area for this type of industry is to improve the provision of infrastructure and utilities. This would require increasingly large public investments. Also under this alternative, agriculture may be dominated by large commercial operation.

This alternative may face serious water shortage. In particular, the most popular location for the export-oriented, labour-intensive, footloose industry would be Nakhon Ratchasima, where the water availability is most critical (Section 5.2). This alternative may result in more serious water pollution due to industrial discharges and more serious soil degradation due to commercial operation of agriculture.

Social implication of this alternative is also important. Under this alternative, a large number of people would be moving from other regions into a few largest urban centers in the Study Area, and more people would move out of the rural areas into the urban areas. Magnitude of inter- and intra-regional migration may be such that it would cause social dislocation of people.

Table 3.2 Evaluation of Development Alternatives

Accelerated Development	Trend Development	Balanced Development
(1) Economy -- more important activities		
- High industrialization labour-intensive, foot-loose industries - Border trade related services - Large commercial operation for diverse crops and livestock	- Low industrialization -- mainly agro-processing - Agriculture-induced services - Small farming for rice, maize, cassava etc.	- Domestic based - Industry and agriculture induced services - Integrated farming for diverse crops in combination with livestock, poultry etc.
(2) Public sector resource requirements		
- Large public investment fund required	- Little intervention	- High degree of development management
(3) Environmental impact		
- Critical water shortage and soil degradation	- Little effect on environment	- Manageable effects on environment
(4) Social impact		
- Large inter- and intra-regional migration	- Out-migration to large cities	- Small/manageable in-migration
(5) Spatial development		
- High concentration of urban population in a few cities	- More dispersed population distribution	- Network of medium size cities
(6) Growth rate		
- High (12%)	- Low (6%)	- Medium (9%)

Balanced development

This alternative seeks a balance between the first two alternatives. It would represent a most desirable yet realistic alternative. The development master plan for the LNE-UE regions is further elaborated for this alternative.

Under this alternative, the industrialization would be based more on indigenous resources and domestic markets, at least initially. Integrated farming seems to fit well with this alternative, as it is a way to utilize both human and natural resources more effectively. Integrated farming of various forms would expand the base for a range of rural industries. In both ways, small farmers can earn extra income, while staying in rural areas, provided that the marketing is properly dealt with.

Some forms of integrated farming are known as environmentally sound agricultural practice : e.g. swine raising to produce also biogas and organic fertilizer, and aquaculture in paddy fields. Thus the environmental impact could be more manageable under this alternative.

This alternative would involve small net in-migration related mainly to new industrial and service activities. Spatial development may be characterized more by a network of medium size cities rather than the dominance of a few largest cities under Alternative 2 or more dispersed population distribution under Alternative 1.

This alternative would call for the public sector resources in the form not only of investment funds but also of institutional supports. This, in fact, requires higher degree of development management than the other two alternatives.

The socio-economic framework for the balanced development alternative is compared with the future growth rates of the Thai economy in the Seventh Five-Year Plan and other existing projections in the following Table 3.3.

Under the balanced development alternative, the service sector will increase its share from present 56% to 63% in 2010. This increase in share will be derived from growth in tourism and border trade with Indochina countries as well as from the structural shift of the service sector in favor of specialized business, banking, insurance, real estate services and higher order services in health and education.

Table 3.3 Proposed Socio-Economic Framework Compared with National Projections

Sector	Thailand		Study Area
	Seventh 5 Year Plan	Long-term Projection	(Balanced Development)
GDP/GRDP	8.2	6.5 ~ 8.3 1)	8.9
Agriculture	3.4	2.2 ~ 3.0 2)	3.9
Industry	8.9 ~ 9.5	8.0 ~ 9.3 3)	11.5
Service	8.1	7.5 ~ 8.5 4)	9.5
Per capita GRDP/GDP (Baht per person)	71,000 in 1996 (1991 price)	105,400 ~ 114,100 5) (1989 price)	54,000 (1989 price)

1) 6.5%/year by UCR Study for 1996-2010, 7.8%/year by TDRI (1)* for 1989-2006, 9.3%/year by TDRI (2)* for 1989-2010
2) 2.2%/year by TDRI (1) and 2.5%/year by TDRI (2)
3) 8.0%/year by TDRI (1) and 9.3%/year by TDRI (2)
4) 8.5%/year by TDRI (1) and 7.5%/year by TDRI (2)
5) 105,400 baht by the Study and 114,100 baht by TDRI (2) for 2010

* TDRI Study (1) : "Load Forecast for the Thailand Electric System, Volume 3, Regional Economic Forecast 1992-2006", by Monenco Consultants Ltd. and the Thai Development Research Institute, 1992

TDRI Study (2) : "State Railway of Thailand Master Plan Study", Thai Development Research Institute, 1992

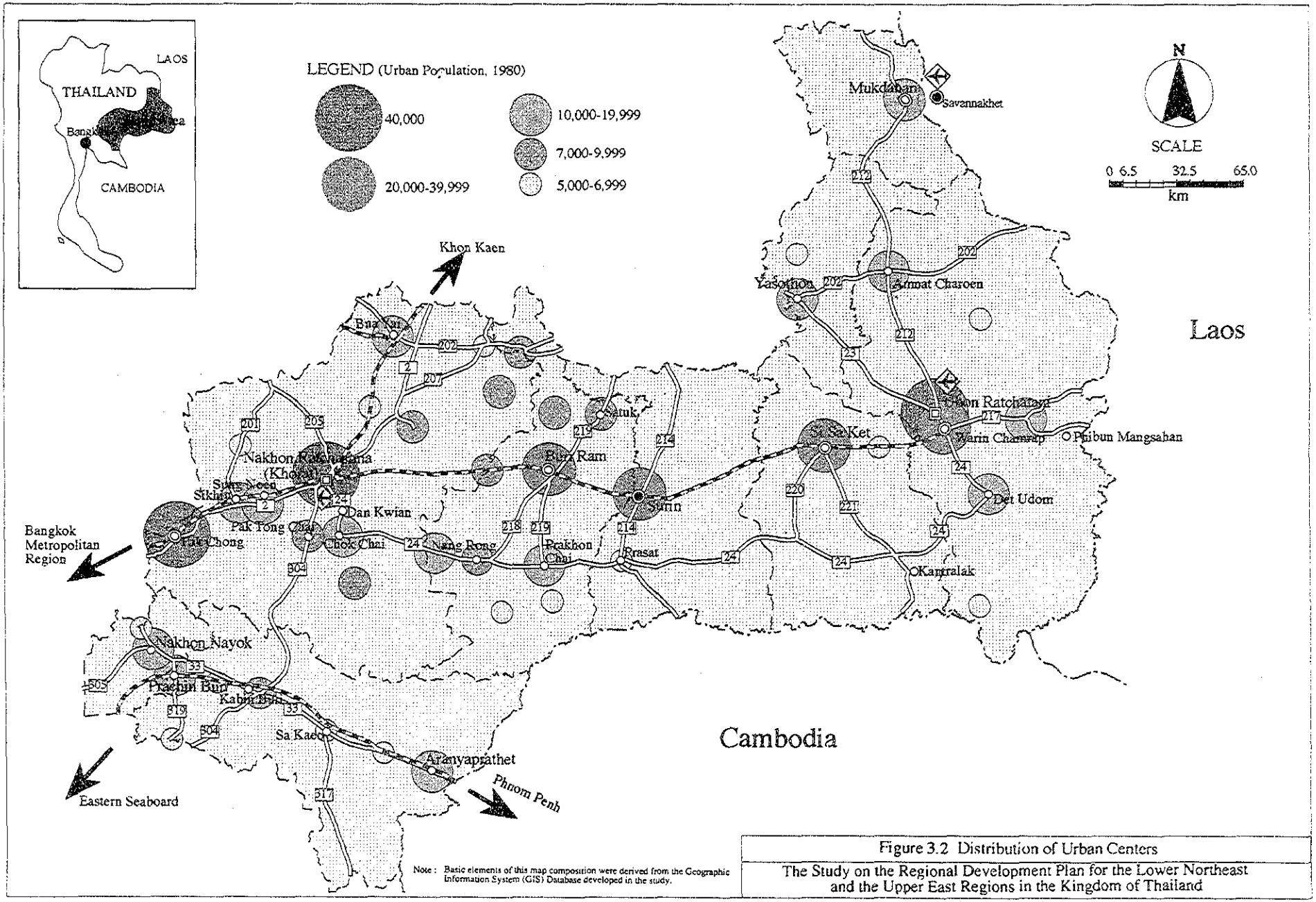
3.3 Spatial Development Framework for Balanced Development

3.3.1 Development axes and arteries

(1) East-west development axis

There exist two main areas of urban population concentration in the Study Area (Figure 3.2). One is along the route no.2 from the western border of the Study Area to the capital city of Nakhon Ratchasima, and the other around the capital of Ubon Ratchathani. These areas contained in 1980 respectively 30% and 21% of the total urban population in the Study Area. The corridor connecting these two areas would naturally constitute the most important east-west development axis.

Along this east-west development axis, the development would proceed from the more urbanized area around Nakhon Ratchasima and Ubon Ratchathani toward the less developed central part. Roads and railways serving this axis will be improved. A motorway may be introduced later to connect the provincial capitals, while the route no.24 would serve mainly for long haul freight with continual improvement of road conditions. The alignment of the latter away from the provincial capitals makes it convenient for this purpose.



Note : Basic elements of this map composition were derived from the Geographic Information System (GIS) Database developed in the study.

Figure 3.2 Distribution of Urban Centers

The Study on the Regional Development Plan for the Lower Northeast and the Upper East Regions in the Kingdom of Thailand

(2) North-south development axis and artery

The main north-south development axis at present passes through the western part of the Study Area. It leads from the ESB, passes through Kabin Buri in Prachin Buri and Nakhon Ratchasima and connects to Khon Kaen and the further north to reach Nong Khai. With Prachin Buri as an alternative location of industries relocated from the BMA, new industrial estates in Kabin Buri, and Nakhon Ratchasima as a regional industrial and trade center, this development axis is developing into an inter-regional artery or the Northeast Industrial Development Corridor.

(3) New regional artery

Three broad areas are identified from Figure 3.2 where urban population is largely lacking. These are (1) eastern part of the area along the border between the East and the Northeast, (2) central part of the Lower Northeast : Surin - Si Sa Ket, and (3) area along the Mekong river. The less developed status of these areas in terms of urbanization is due primarily to transport network deficiencies or water shortages.

To induce the development of these interior and frontier areas, a new regional artery should be established. This, in fact, is an inter-regional artery. It would lead from the ESB, effectively link the Upper East and the central part of the Lower Northeast, and extend to Yasothon and Mukdahan (Figure3.3). It may be extended further beyond the Mekong river, crossing Laos to reach the Vietnamese coast. Then it will be an international artery.

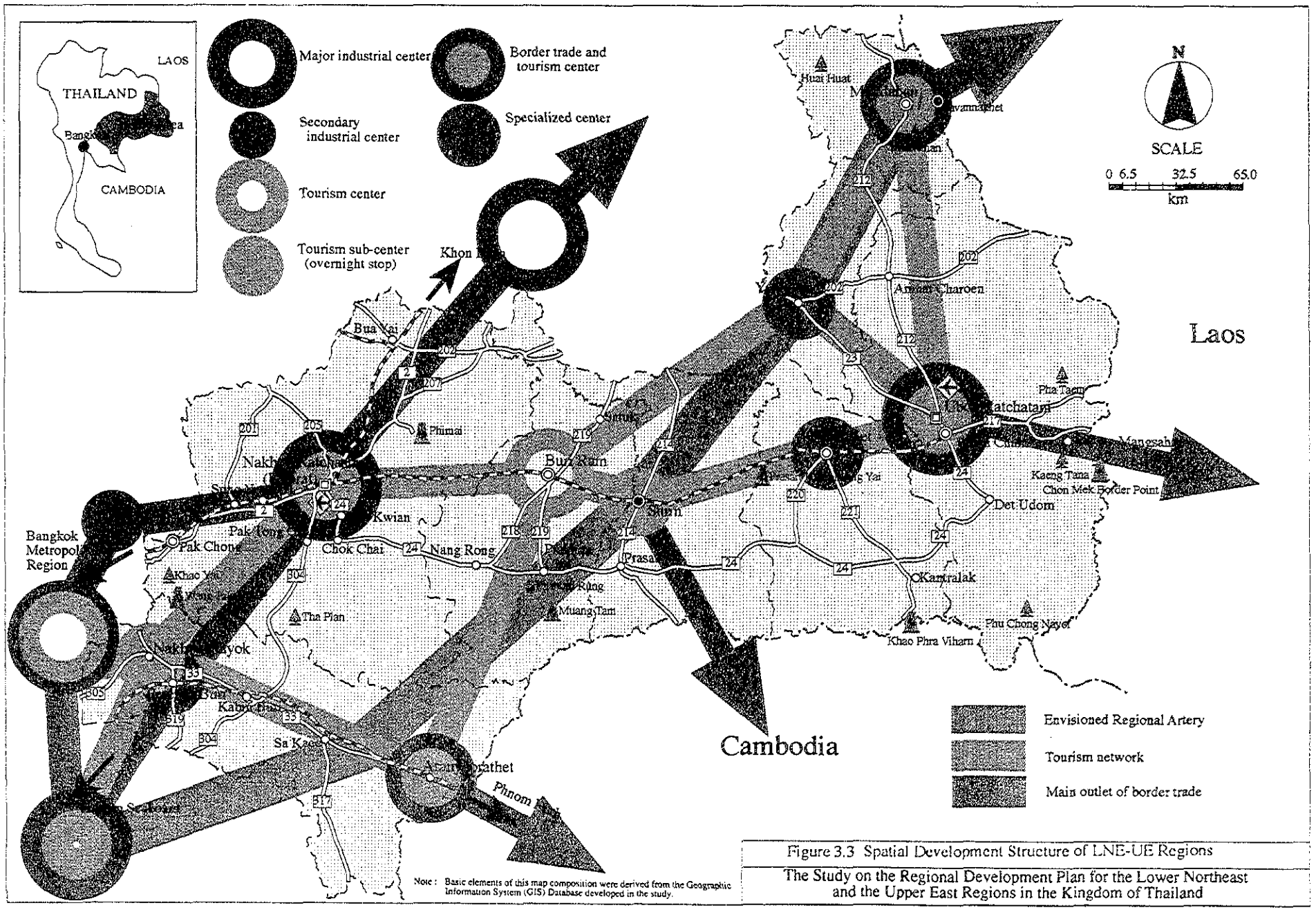
3.3.2 Urban centers

(1) Urban clusters

In accordance with the regional network approach to urban development, several urban clusters may be defined to guide the urban development in the Study Area. Each cluster consists of a major urban center(s) and other lower-tier centers, which would complement one another to realize distinct characteristics to perform expected functions. The characterization and priority of each cluster are summarized in Table 3.4. Hierachical structure of urban centers is illustrated in Figure 3.4.

(2) Nakhon Ratchasima urban cluster

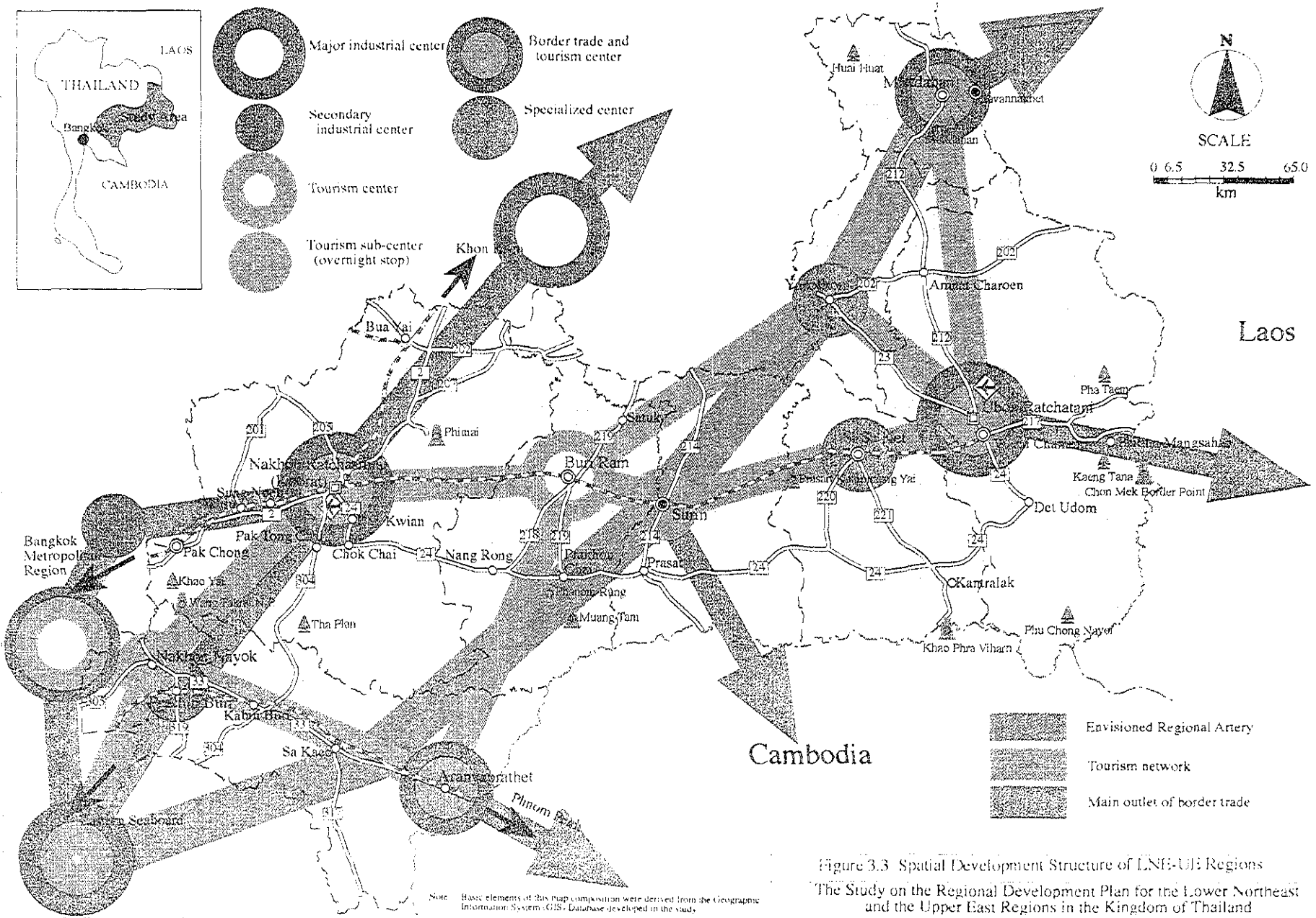
Nakhon Ratchasima is the regional center with multiple functions related to industry and trade. In particular, it is the location of labor-intensive, footloose industry and will be a center for metal works and machinery. Important lower-tier centers include Pak Chong, Sikhiu, Sung Noen, Chok Chai and Pak Thong Chai with various activities such dairy livestock, poultry, horticulture, textile, construction materials industry and tourism. Bua Yai may also be included.



Note : Basic elements of this map composition were derived from the Geographic Information System (GIS) Database developed in the study.

Figure 3.3 Spatial Development Structure of LNE-UE Regions

The Study on the Regional Development Plan for the Lower Northeast and the Upper East Regions in the Kingdom of Thailand



Note: Basic elements of this map composition were derived from the Geographic Information System (GIS) Database developed in the study.

Figure 3.3 Spatial Development Structure of LNE-UE Regions

Table 3.4 Characterization of Major Urban Centers and Clustering (1/2)

Major Urban Centers	Characterization and Priority	Other Urban Centers
Nakhon Ratchasima	Regional center with multiple functions; location of labour-intensive, footloose industry; secondary tourism center; priority includes urban infra-structure to serve industries, urban land use plan and water resources development/management	Pak Chong, Sikhiu, Sung Noen, Chok Chai, Pak Thong Chai (Bua Yai) Phimai
Ubon Ratchathani	Sub-regional center with multiple functions; future location of teleport; development of its hinterlands is the key	Warin Chamrap, Det Udom, Phibun Mangsahan Amnat Charoen
Si Sa Ket	Secondary agro-industrial center complementing Ubon Ratchathani specialized in livestock	Kantralak
Surin	Community urban growth center; center of handicrafts and rural industries; priority includes the link with the ESB and water resources development for diversified agriculture	Prasat
Buri Ram	Community urban growth center; future tourism center; priority includes better water management and beautification of the city, tourism areas and their access roads	Prakhon Chai, Nang Rong, Satuk

Table 3.4 Characterization of Major Urban Centers and Clustering (2/2)

Major Urban Centers	Characterization and Priority	Other Urban Centers
Prachin Buri	Community urban growth center; alternative site for industries to be relocated from the BMA; center for fruits and vegetable processing; priority includes flood control and increased water supply	Kabin Buri
Nakhon Nayok	Controlled urban growth center; future science and technology center; priority includes flood control, enhancement of urban functions and effective land use control	
Aranyaprathet	Controlled urban growth center; center for border trade and base for Indochina tourism; priority includes urban infrastructure and water supply	
Sa Kaeo	Secondary trade center located on the crossroads complementary to Aranyaprathet	
Mukdahan	Border trade center; future connection to Laos and Vietnam through a new bridge over the Mekong; priority includes improvement of transport infrastructure	
Yasothon	Secondary trade center located on the crossroads; aquaculture center; priority includes the improvement of road links with its hinterland	

Figure 3.4 Hierarchical Structure of Urban Centers

Regional Center	Sub-regional Center	Strategic Centers	Lower-tier Centers
Nakhon Ratchasima		Pak Chong	Si Khiu Sung Noen Chok Chai Pak Thong Chai (Bua Yai) Phimai
	Ubon Ratchathani (including Warin Chamrap)	Si Sa Ket	Det Udom Phibun Mangsahan Amnat Charoen Kantralak
	Buri Ram Surin		Prakhon Chai Prasat Nang Rong Satuk
	Prachin Buri	Nakhon Nayok Kabin Buri	
		Aranyaprathet Sa Kaeo	
		Mukdahan Yasothon	

(3) Prachin Buri - Nakhon Nayok urban cluster

Prachin Buri is a community urban center and will be a fast growing industrial area offering an alternative location for industries to be relocated from the BMA, and a center for fruits and vegetable processing. Nakhon Nayok is a controlled urban growth center and would be more oriented to services. The Khao Yai area to the north is conceived for research and development related to high-tech industry, complementary to the technopolis in Nakhon Ratchasima. It would also be a center of weekend tourism for visitors from the BMA and conference tourism complementing Pattaya. Kabin Buri is naturally included in this cluster with industrial estates along the Northeast Industrial Development Corridor.

(4) Aranyaprathet urban cluster

Aranyaprathet is a controlled urban growth center and will develop as a center for border trade and a base for Indochina tourism. Sa Kaeo on the proposed regional artery will complement Aranyaprathet for industry and trade related functions.