(5) Buri Ram - Surin urban cluster

Buri Ram and Surin are secondary urban centers. Surin will be a center for handicrafts, and various rural industries will also establish in the province, once the link with the ESB is improved with the proposed new regional artery. Buri Ram may become a tourism center due to its central location closer to most tourism attractions, the planned international airport, and the cosiness of the capital city. Nang Rong, Prakhon Chai, Lahan Sai and Prasat will grow more rapidly once the new regional artery is established to complement these major centers. Satuk in the north may also develop fast related to the new airport. Tourism and trade access to Cambodia from Surin/Buri Ram would be increasingly more important.

(6) Ubon Ratchathani urban cluster

Ubon Ratchathani with Warin Chamrap across the Mun river, is a sub-regional center also with multiple functions, including those related to border trade. Si Sa Ket is a secondary agro-industrial center complementing Ubon Ratchathani. Livestock development and crop diversification in the hinterland will support processing activities in these major centers. Det Udom and Phibun Mangsahan are also included in this cluster.

The hinterland of Ubon Ratchathani will include also Amnat Charoen for specialized services in health, education and trade. It will also be a major center for specialized agro-industry products and products of wood-including furniture.

(7) Mukdahan - Yasothon urban cluster

Mukdahan is a border trade center and a gateway for Indochina tourism. Yasothon is a secondary trade center located on the cross roads. It may become an aquaculture center to serve not only the Study Area but possibly the entire Lower Mekong basin. Livestock activities are also important in the hinterland.

3.3.3 Population distribution

(1) Population distribution by settlement size groups

The emphasis of programs on settlement size distribution is a) to promote the growth of small centers serving the rural hinterland and b) to support large regional cities to attain agglomoration economies to counter the polarizing effects of the BMA.

A large number of small urban centers need to be identified and designated as municipalities. Including sanitary districts, there were 122 urban settlements in the Study Area in 1992. This is too small a number to serve 11,855 villages (muban) in the Study Area : an average of 97 muban per urban center. Not only the existing sanitary districts should be promoted as rural service centers, but their number should be at least doubled by the year 2010, with an average population of 5,000 in 2010. The distribution given below is targeted to achieve this.

The second type of settlemets to be promoted are the four main growth centers : Nakhon Ratchasima, Prachin Buri/Nakhon Nayok, Buri Ram/Surin and Ubon Ratchathani - including Warin Chamrap. The target level of population for each of these four growth areas would be around one million inhabitants. Given the overall level of urbanization targeted for 2010, however, their average population will be

500,000. The present and projected distribution by settlement size group will be as follows.

	Settlement Size Group	Present Population	Population in 2010
1.	Four large centers	497,863	2,000,000
2.	Intermediate sized cities	123,643	1,350,000
3.	Rural Development centers	476,494	1,200,000
	Total urban	1,098,000	4,550,000
	Total population	9,109,000	13,360,000
	% urban	11.1	34.0

(2) Urban and rural population by province

The total population in the Study Area in 2010 is allocated to the nine provinces. Provincial shares of population will change reflecting the following.

1) Urban population will grow to a size required for supporting hinterland development and the growth targets envisaged under the balanced development alternative.

2) The size of rural population will remain at the 1990 level.

Projected urban population by province is summarized in Table 3.5.

Table 3.5 Urban and Rural Population in 2010

Province	Population 2010			Annual Growth (%/year)		
	Urban	Rural	Total	Urban	Rural	Total
Nakhon Nayok	200.0	191.6	391.6	9.9	0.0	2.9
Prachin Buri	650.0	719.1	1,369.1	12.1	0.0	2.8
Nakhon Ratchasima	1,700.0	1,905.5	3,605.5	6.6	0.0	2.1
Buri Ram	300.0	1,260.7	1,560.7	5.8	0.0	0.7
Surin	250.0	1,154.1	1,404.1	6.9	0.0	0.7
Si Sa Ket	150.0	1,228.6	1,378.6	4.9	0.0	0.3
Ubon Ratchathani	1,000.0	1,638.6	2,638.6	7.6	0.0	1.7
Mukdahan	180.0	221.1	401.1	7.3	0.0	2.1
Yasothon	120.0	491.8	611.8	6.0	0.0	0.7
Total	4,550.0 (34.0%)	8,811.2 (66.0%)	13,361.2	7.4	0.0	1.5

3.3.4 Land use framework

(1) Land use evaluation

The land use policy guidelines proposed by TDRI in 1987 and adopted by the Cabinet (in 1987) emphasize the economic, conservation, social and security dimensions of land utilization. An evaluation procedure of land development along this is summarized in Table 3.6. Present land use is compared with planned land use in each district and province using a GIS, and a re-classification in the five broad land use development categories recommended is enumerated below.

Protected area

All the existing natural forest areas and water bodies determined from existing land use irrespective of the planned land use, are classified under this area. No development is to be encouraged in these areas and strict measures need to be implemented to ensure preservation of these areas.

Reforestation area

All existing reforestation areas, encroached forest areas, or pasture and barren land, for which planned land use is conservation forest are categorized together as the reforestation area. Reforestation efforts must be intensified in these areas. The type and kind of forests to be promoted will depend on local conditions, and purposes of the reforestation program. Also classified in this category are planned land use categories for paddy, field and tree crops, and areas unsuitable for crop cultivation, in which present land use is reforestation or encroached forests.

Table 3.6 Land Use Evaluation

Present Land / Planned Land Use	Irrigated Land	Paddy	Field Crops	Fruit	Pasture	Forest	Refore-station	Encroa-ched Forests	Water Bodies	Barren Land	Mixed Paddy and Forest	Mixed Field Crop and Forest
Protected Forests	2	2	2	2	2	1	2	2	1	2	2	2
Paddy	3	3	3	3	3	1	2	2	1	3	5	5
Field Crops & Tree Crops	4	4	4	4	4	1	2	2	1	4	5	5
Unsuitable for Cultivation but can be Pasture/ Livestock Grazing Area or Woodland	5	5	5	5	5	1	2	2	1	5	5	5

Legend :
(1) Protected Area
(2) Reforestation Area
(3) Intensive Paddy Cultivation Area
(4) Intensive Field Crop and Tree Crop Cultivation Area
(5) Land Area for Development

Intensive paddy cultivation area

All areas for which the planned land use is paddy, and for which the present land use is irrigated (paddy) lands, paddy, pasture and grass land, and barren land are classified together. This category corresponds largely to paddy cultivation areas where planned land use and existing land use match. Efforts to increase productivity and make intensive use of land must be made by introducing irrigation and farmland improvement, introducing high yielding varieties, improving soil fertility by promoting use of fertilizers etc.

Intensive field crop and tree crop cultivation area

All areas of field crops and tree crops, where existing land use matches the planned land use are categorized together. Pasture and grass land, and barren land for which planned land use is field crops and tree crops are classified in this category. Appropriate choice of crops and efforts to increase crop productivity must be made.

Land area for development

Within all the land use categories, any land where there is a mis-match between existing land use and planned land use are classified as the land for development. These lands include planned land use areas of protected forests and conservation forests as well as areas not suited for crop cultivation but presently being used for crop cultivation. These also include mixed forest and paddy, and mixed forest and field crop areas in existing land use. Careful planning of the land use in this area is necessary considering all dimensions of the land policy. The area under this category is also the potential area for conversion to non-agricultural uses like industry or community development.

(2) Proposed land use for development and conservation

The land use evaluation has resulted in identification of potential area for each of the five land use categories (Table 3.7; Figure 3.5). Comparing this result with the present land use, changes in land use are proposed as the land use development zones as shown in Table 3.8 and Figure 3.6.

Table 3.8 Landuse Development Zones

(Unit : 1,000 rai)

Land Zone / Province	Protected Areas	Reforestation Areas	Paddy Cultivation Areas	Field and Tree Crops Area	Development Areas	Total
Nakhon Nayok	413	6	850	52	3	1,324
Prachin Buri	1,589	541	1,763	1,854	1,528	7,275
Nakhon Ratchasima	1,678	829	4,437	4,685	1,306	12,935
Buri Ram	487	243	3,620	1,584	370	6,304
Surin	351	117	3,977	798	263	5,506
Si Sa Ket	723	117	3,069	988	628	5,525
Ubon Ratchathani	3,266	506	2,890	2,409	2,965	12,036
Yasothon	290	30	1,268	682	287	2,557
Mukdahan	1,105	349	259	633	254	2,600
Total	9,902	2,738	22,133	13,685	7,604	56,062

Source : GIS Analysis of present study

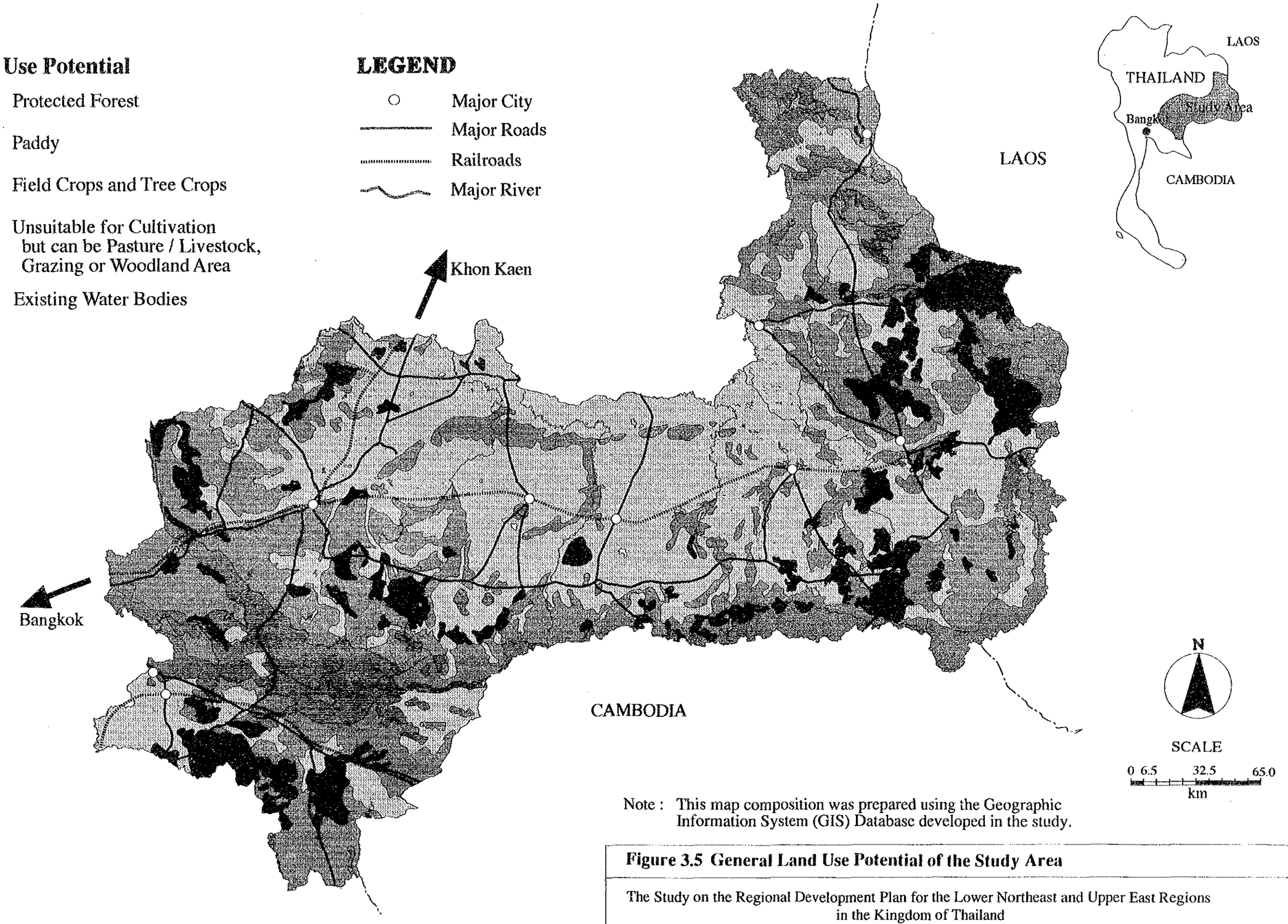
Land for paddy cultivation

Potential paddy cultivation area excluding part of protected areas suited to paddy or field/tree crops has been identified as 22,132,000 rai. This area is comparable to the paddy cultivation area in 1988 (21,352,000 rai), but represents a significant decrease

Table 3.7 Land Use Potential of the Study Area (Area in Rai)

Province \ Land Potential	Protected Forests	Paddy	Field crops/ Tree crops	Unsuitable for cultivation	Water bodies	Total
Nakhon Nayok	11,450	870,000	31,600	420,682	1,250	1,334,982
Prachin Buri	1,354,861	2,092,142	2,640,625	1,187,500	0	7,275,128
Nakhon Ratchasima	1,560,782	4,661,235	5,576,923	1,108,253	61,964	12,969,157
Buri Ram	253,950	3,580,403	1,954,670	508,326	11,596	6,308,945
Surin	81,149	4,115,960	1,018,640	245,787	31,184	5,492,720
Si Sa Ket	502,681	3,186,232	1,131,160	677,306	24,110	5,521,489
Ubon Ratchathani	1,421,635	3.738,239	4,203,972	2,141,481	190,441	11,695,768
Yasothon	76,858	1,443,841	1,022,822	16,106	0	2,559,627
Mukdahan	938,645	397,186	1,221,653	18,373	1,894	2,577,751
Total	6,202,011	24,085,238	18,802,065	6,323,814	322,439	55,735,567
	percentage distribution					
Nakhon Nayok	0.86%	65.17%	2.37%	31.51%	0.09%	100.00%
Prachin Buri	18.62%	28.76%	36.30%	16.32%	0.00%	100.00%
Nakhon Ratchasima	12.03%	35.94%	43.00%	8.55%	0.48%	100.00%
Buri Ram	4.03%	56.75%	30.98%	8.06%	0.18%	100.00%
Surin	1.48%	74.93%	18.55%	4.47%	0.57%	100.00%
Si Sa Ket	9.10%	57.71%	20.49%	12.27%	0.44%	100.00%
Ubon Ratchathani	12.16%	31.96%	35.94%	18.31%	1.63%	100.00%
Yasothon	3.00%	56.41%	39.96%	0.63%	0.00%	100.00%
Mukdahan	36.41%	15.41%	47.39%	0.71%	0.07%	100.00%
Total	11.13%	43.21%	33.73%	11.35%	0.58%	100.00%

Source: GIS analysis of potential landuse maps of Department of Land Development



Note : This map composition was prepared using the Geographic Information System (GIS) Database developed in the study.

Figure 3.5 General Land Use Potential of the Study Area

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

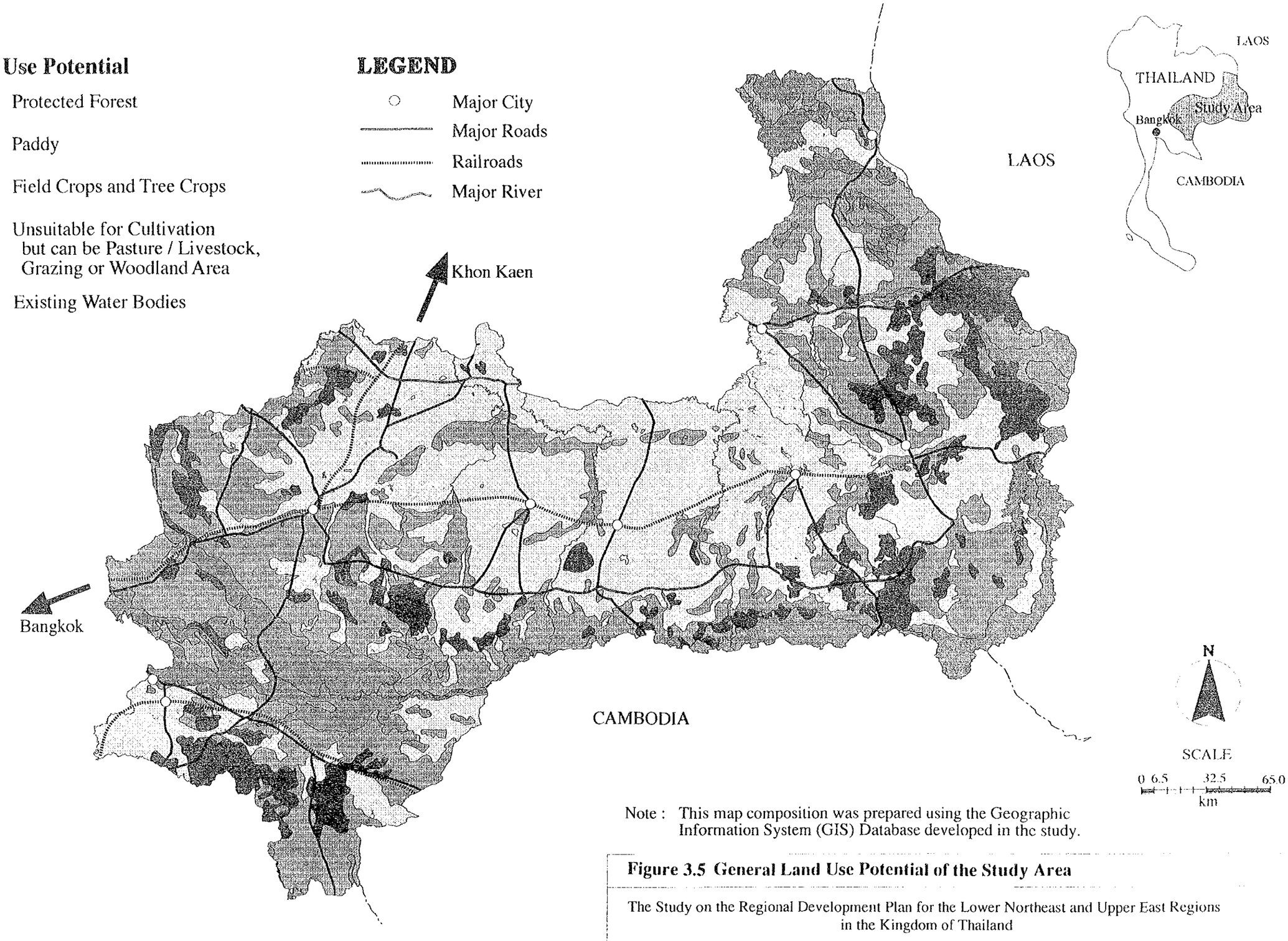


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Figure 3.5 General Land Use Potential of the Study Area

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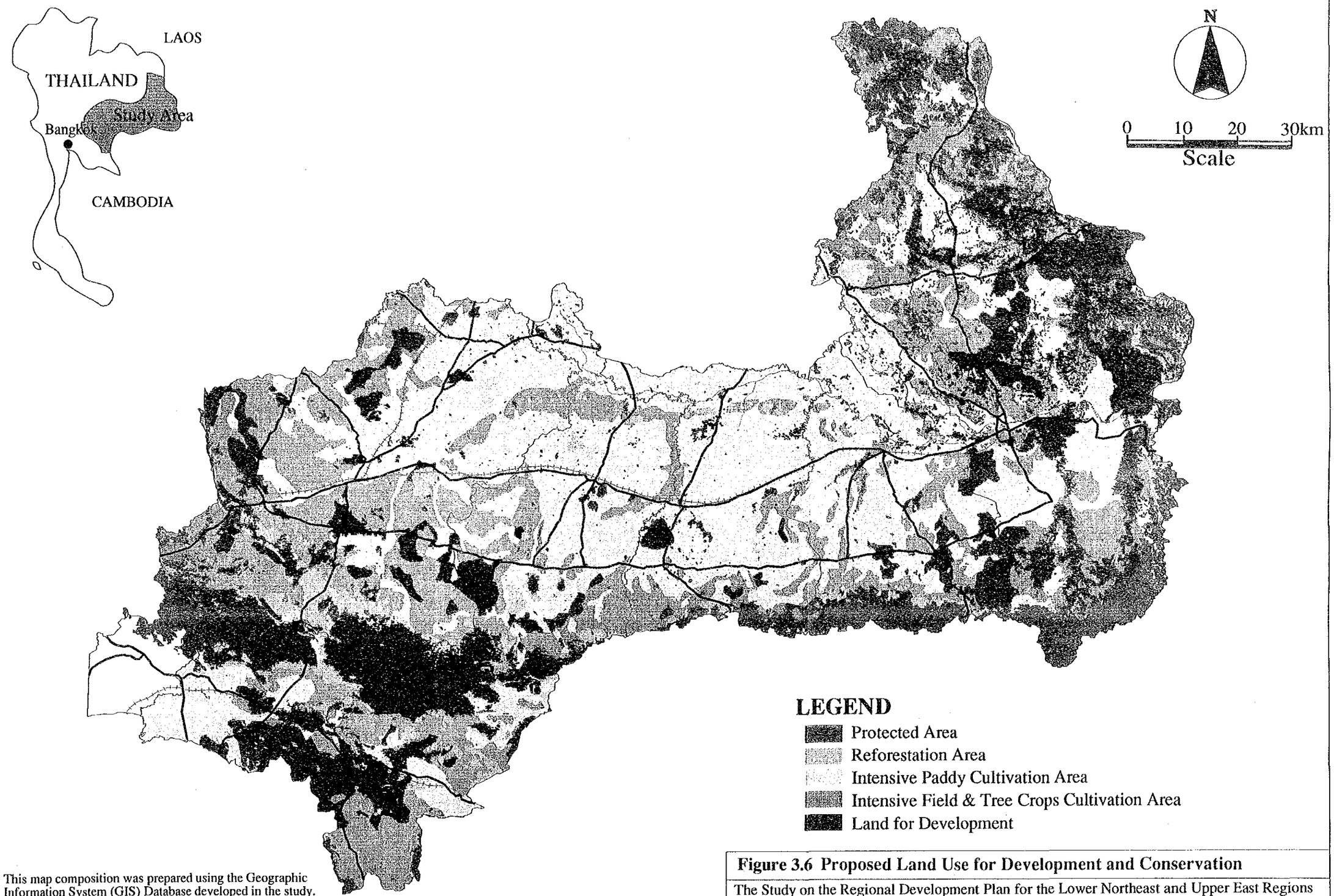
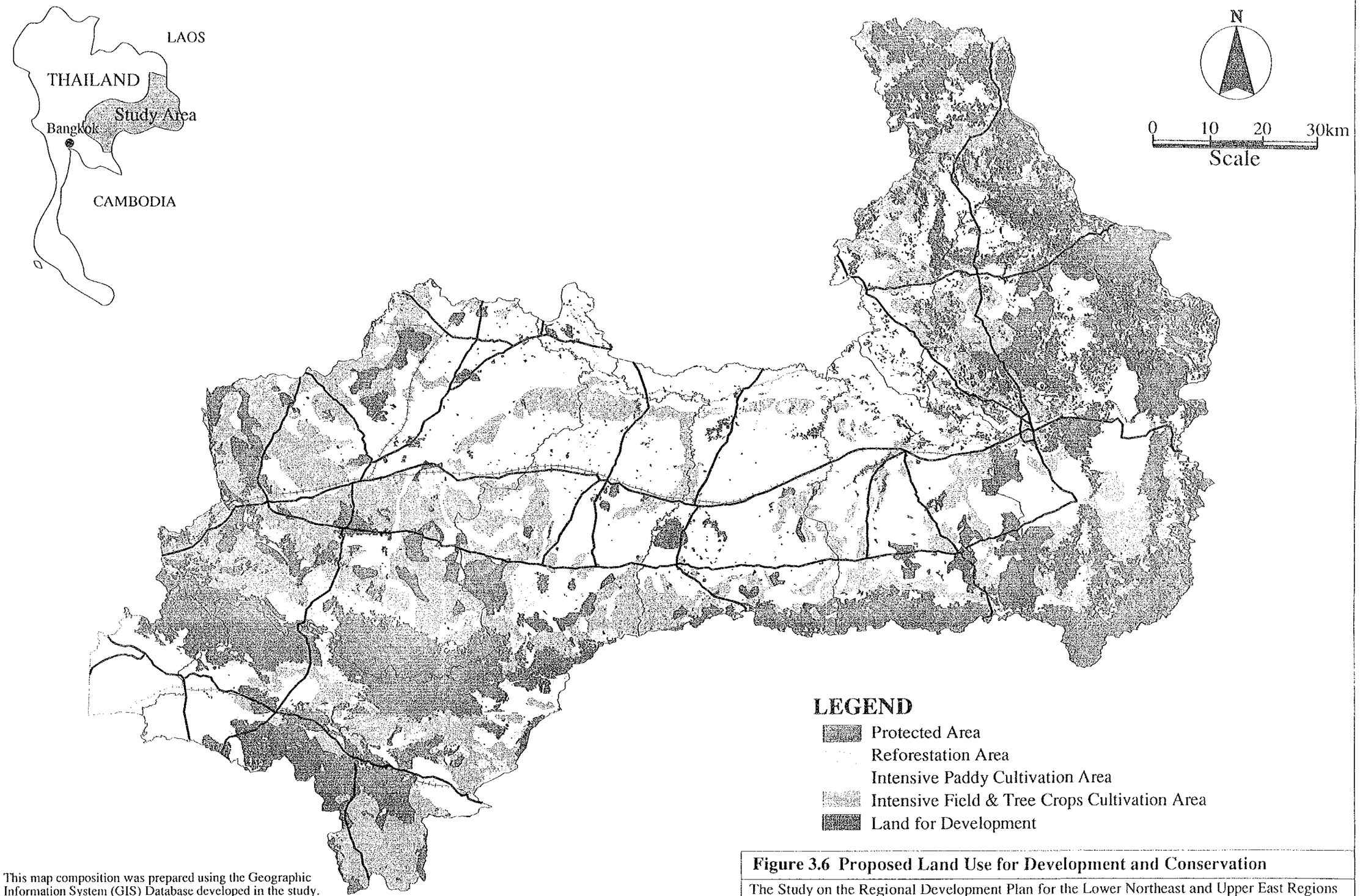


Note : This map composition was prepared using the Geographic Information System (GIS) Database developed in the study.

Figure 3.6 Proposed Land Use for Development and Conservation

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



Note : This map composition was prepared using the Geographic Information System (GIS) Database developed in the study.

Figure 3.6 Proposed Land Use for Development and Conservation

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

from 28,064,000 rai estimated for 1992. The decrease is substantial in all the provinces except Nakhon Nayok, Prachin Buri and Nakhon Ratchasima. This reduced area is still large enough to meet the subsistence needs of the projected population in 2010.

Land for field crops/tree crops cultivation

Potential field and tree crops area excluding part of protected areas suited to paddy or field/tree crops is 13,684,000 rai, much larger than the area presently under these crops (11,450,000 rai in 1992). The potential area is significantly larger in all the provinces except Nakhon Nayok, Prachin Buri and Nakhon Ratchasima. This increased area is considered the upper bound in planning for the area to be devoted to crop diversification. Part of the area identified as "paddy", however, could be used for field crops as a substitute for rainfed rice.

Land for forests

The 1985 National Forest Policy specifies that 40% of the total area of the kingdom must be set aside for forests, consisting of 15% for conservation forests and 25% for economic forests. Subsequently, forest area targets have been set by province.

The protected area, consisting of existing forest area and water bodies, constitutes 17.7% of the Study Area. This satisfies the conservation forest area targets for all provinces in the Study Area as well as the national conservation forest target of 15%.

For reforestation, 4.9% of the Study Area has been identified by the land use evaluation. If an additional area corresponding to some 5% of the total land in the Study Area is taken respectively from the potential area for field and tree crops and the potential area for development and used for economic forests, 15% of the Study Area may be considered as economic forests. This would make the forest area 30% of the Study Area, a realistic target for the year 2010.

Land for other uses

After deducting the area to be used for economic forests, 4,803,000 rai or 8.6% of the Study Area would remain for other uses. The land required for the projected urban population of 4.5 million in 2010 would be 570,000 rai, assuming population density of 50 per ha in the urban area. Additional land requirements for industries would be 53,000 rai by 2010 (Section 4.2). Other land uses include pasture/grazing land, rural household compounds, tourism and recreational areas.

3.4 Development Phasing for Balanced Development

LNE-UE regional development will be realized in steps, as the resource base and the financial capacity expand to support the development and related institutional development takes place over time. To plan for the regional development accordingly, the planning period is broadly divided into three phases: Phase I up to 1996 (the end of the Seventh Five Year Plan), Phase II for 1997 - 2001 (the Eighth Five Year Plan), and Phase III for 2002 - 2010. Expected performance of the Study Area in each phase is described below for the balanced development. Characterization of each phase is summarized in Table 3.9.

Table 3.9 Development Phasing - Characterization of Each Phase

	Phase I ~ 1996	Phase II 1997 ~ 2001	Phase III 2002 ~ 2010
Aim for Economic Development	Preparation for take-off	Take-off by the end of the century	Realization of economic structure for self-sustained growth
Physical/Economic Links	Restructuring within the Study Area and initial links with the ESB	Strengthened links with the ESB and initial international links	Establishment of international links
Government/Private Sector Partnership	Preferential treatment by the Government for implementation of new land policies, industrial location, and investment into key infrastructure	Strong private sector initiative for all the economic activities supported by coordinated government efforts	Private sector participation in the provision of some infrastructure and social services
Driving Forces (key economic activities)	Mixed farming of various forms	Crop diversification (fruits and vegetables, oil crops, flowers, etc.)	Integrated farming Drip irrigation for high value-added crops
	Footloose industries	Car and rolling stock assembly New agro-processing	Machinery and engineering Automobile manufacuring
	Domestic tourism Agriculture induced services	Industry induced services Border trade related services	International tourism Borderless service
Growth Rates	5 ~ 8% p.a.	8 ~ 12% p.a.	~ 9% p.a.

3.4.1 Phase I (up to 1996)

(1) Characterization

This phase is a preparation period for economic take-off. In addition to the continuation of on-going development efforts, new initiatives will be necessary in more promising areas identified by the Master Plan. Physical links within the Study Area will be strengthened to fully exploit readily available development opportunities. Most essential during this phase is the preferential treatment by the central Government for full supports of the Study Area. The supports will include implementation of the new land policies, industrial location incentives, and investments into key infrastructure as well as the improved provision for the basic human needs. The economic growth rates will be 5-8% per annum.

(2) Socio-economy

Agriculture

Land registration will be completed in this Phase. Various forms of ownership should be upgraded to provide full title security and develop an efficient land and rural credit market.

Renewed efforts will be intensified for mixed farming by small farmers and for crop diversification, applying established technology through extension. Essential for this will be the utilization of existing water resource facilities and the improvement of marketing. The suitable concepts of privatization through water users' association and contract farming will be tested in a pilot scheme.

Applied research will be intensified with emphasis on rain-fed crops and crops to be cultivated under supplemental irrigation. Water saving irrigation technology, e.g. drip irrigation, will be introduced on a pilot scheme.

Overall provision of agricultural support services will be re-structured including the following:

1) promulgation of suitable varieties and breeds, and proper use of fertilizer and agro-chemicals suitable for the local conditions as well as their distribution with private sector intiatives,

2) review of the BAAC lending policy particularly to small farmers including widening of its lending to non-farm activities,

3) extension services geared to mixed farming of various forms by small farmers, and

4) efficient dissemination of market information and technologies.

Industry

Consumer goods and construction materials industries will continue to grow steadily as well as existing simple agro-processing as the basis for industrial growth during this phase. Additional growth will be provided by more footloose industries, a few new agro-processing industries, and various linkage type industries.

More footloose industries will be established along existing arteries mainly in Nakhon Ratchasima and Prachin Buri. Skill training will become increasingly common among these industries, and sub-contracting/input delivery arrangements will develop with local firms. More important linkage type industries are metal works, machinery, agricultural and transport equipment, metal and plastic containers, and packaging.

Expansion/relocation of industries into the Study Area will slowly increase not only from the BMA but also from NIES and Japan. Also links with industries in Saraburi and the ESB will be strengthened.

A few agro-processing industries will be newly established under contract farming systems for raw materials procurement. They may be meat/dairy products and vegetables/fruits processing.

Services

Tourism activities will continue to be dominated by domestic tourism, but tourism facilities and services in a few cities will be upgraded to international standards to cater mainly for business related tourists. Restoration efforts will be renewed for selected Khmer ruins.

New bases for improved and expanded services will start to be developed within the Study Area related particularly to marketing, financial services, tourism, higher education, training and social services. Accordingly, functional division among major urban center's will start to be clarified.

Industry induced services and border trade related services will steadily develop. Particularly to encourage broad based border trade related activities, a package of support measures will be formulated, and negotiation with the neighbouring countries initiated.

(3) Infrastructure

The most important during this phase related to infrastructure is to take the initial step to transform the development structure of the Study Area. Two critical areas of infrastructure for this purpose are water resources and transportation artery.

An alternative link between the East and the Northeast will be established and links with the ESB improved. They will constitute the initial stage of the regional artery establishment (subsection 3.3.1).

A comprehensive review will be conducted of exiting water resource facilities and plans. In particular, the following will be undertaken:

1) effective utilization of existing facilities possibly with integration/linking and rehabilitation,

2) reformulation of development plans/projects from a river basin point of view, and

3) feasibility studies of major priority multi-purpose water resource development projects.

Land use plans for selected municipalities will be newly prepared or updated in line with the functional division among major urban centers established by the Master Plan. For selected border trade centers, permanent structures will be established by the Government including trading facilities, and roads and utilities to serve them.

In addition to full utilization of existing infrastructure and utilities with proper maintenance and rehabilitation as well as better management, limited infrastructure projects will be implemented such as the following:

- extension of basic telephone services to all the tambons with the introduction of the ISDN,
- initiation of rural energy program,
- expansion of applied research on new and renewable energy,
- acceleration of the on-going Phanom Dong Rek water resource development,
- implementation of priority water projects,
- revised water jar program,
- expansion of piped water supply for selected urban centers,
- household electrification,
- study of co-generation system,
- establishment of rural road maintenance system, and
- sewerage systems for a few large cities.

(4) Spatial development

Expansion of urban areas during this phase will take place mostly centering around the two areas of urban population concentration: (1) along the route no.2 from the western border of the Study Area to the city of Nakhon Ratchasima, and (2) along the route no.226/217 within Ubon Ratchathani. Ribbon-type development in the primary and the secondary urban centers will start to be controlled by planned development of urban lands.

The north-south axis leading from the ESB, passing through Prachin Buri to reach Nakhon Ratchasima will be steadily strengthened with location of more industries along the route. It will become a new artery extending further to the north.

(5) Social services for human development

This phase will be a preparation period for building a firm foundation for human development. Basic education will be extended to nine years up to the lower-secondary education from the present primary education. Enrollment in secondary schools will be increased through expanding and reinforcing lower-secondary schools, especially in rural areas, and financial support measures. Suranaree University of Technology in Nakhon Ratchasima and Ubon Ratchathani University will start functioning as the major centers for higher-education for science and technology fields. Another major higher-education center will be planned during this period. The existing non-formal education centers and job training centers will be reinforced to upgrade skill levels of the existing labor force.

Incidence of morbidity and mortality will keep improving by concerted efforts by the government and communities, leading to narrower gaps with the nation in various health indicators. Emphasis in this phase will be laid on reinforcing tambon health care centers. Efforts will be made to make accessible the health insurance system and health card system to a larger proportion of the population.

3.4.2 Phase II (1997 - 2001)

(1) Characterization

This phase will continue the preparation for take-off, which will be realized by the end of the century. Physical and economic links with the ESB will be much strengthened and initial international links will be established with the Indochina countries for broad based border trade related activities. Strong private sector initiatives for all the economic activities will be supported by coordinated efforts of governments at different levels. The economic growth will accelerate from 8% per annum and may overshoot to 12% per annum or even higher.

(2) Socio-economy

Agriculture

All the support activities initiated/renewed during Phase I will be continued and expanded in this phase. Mixed farming and crop diversification will be further expanded.

Marketing outlets of new crops will be established through contract arrangements with processors and traders and establishment of new agricultural commodity markets. Some of high value-added crops will be cultivated under drip irrigation in commercial scale.

Extra cash income from integrated farming and establishment of land tenure will enhance the credit-worthiness of small farmers. This will allow them to invest into improved agricultural technology, and build up rural assets.

Industry

Footloose industry will locate widely in the Study Area where trainable manpower is available. Handicraft manufacturing will grow along with continued growth of tourism industry. Car and rolling stock assembly plants to be newly located will lead the growth of the linkage type industry. A large scale automobile test course will contribute to the improvement of quality of local made automobiles.

This is a critical phase for technology upgrading. Research and communication/ conference functions will be established to support advanced industrial activities. A branch of the Northeast Industrial Promotion Center will be established in the central part of the Study Area which will provide technical training and consultancy services to Laos and Cambodia as well.

More agro-processing industries will be established based on expanded production of diversified crops and livestock. Consumer goods industry will grow further as income levels in the Study Area increase, and some of them will expand their markets into neighbouring regions. Relocation of Bangkok-based industries will accelerate.

Services

Formal arrangements will be established with the neighbouring countries for broad based border trade related activities. The support package formulated during Phase I will encourage various export processing, trade and other service activities. Other industry induced services will also expand rapidly, as industries in the Study Area diversify and links with the ESB strengthened.

International links will start to be formed for various services with information network. These services include agricultural marketing, commodity trade, tourism (links first with Siem Reap, then with the central Vietnam), finance, science and technology development, and skill training.

(3) Infrastructure

This phase will see the rapid transformation of the development structure of the Study Area related to water resources and transport infrastructure. The major priority multipurpose water resources development projects studied during Phase I will be implemented. The new road link with the ESB will be completed, and the extended sections of the regional artery improved.

Permanent structure for border trade will be expanded in more locations. For a few selected locations, infrastructure and associated facilities will be established across the borders to realize broad based border trade related activities.

Land use plans of other municipalities not covered during Phase I will be prepared/updated in line with the functional division among major urban centers established by the Master Plan and the subsequent developments. Solid waste disposal and wastewater treatment facilities will be introduced in the primary and the secondary urban centers for early prevention of environmental problems.

Increased public investments will be provided at different government levels to support rapidly developing economy for upgrading various infrastructure and utilities. They will include the following:

- extension of natural gas pipeline and establishment of co-generation,
- consolidation of power transmission links with Laos,
- commercial application of new and renewable energy,
- expansion of the ISDN-based telecommunication services,
- establishment of local air services network, and
- improved urban infrastructure in secondary towns.

(4) Spatial development

Urban areas will expand gradually throughout this phase from the two areas of urban population concentration toward the central part of the Study Area. Secondary urban centers will start to develop more rapidly toward the end of the phase as the link with the ESB is established, including those in the central part of the Study Area.

The Bangkok - Nakhon Ratchasima link will be further strengthened with railway improvements. The ESB - Nakhon Ratchasima link will also be strengthened.

Deficiencies in transport network within the Study Area will be completely resolved, including remote rural areas and border areas. Centering around the Study Area, a comprehensive multi-modal transport network will start to emerge, including motorways, local air service network, railways, and the navigation on the Mekong river.

(5) Social services for human development

Continued efforts by the public sector will be maintained during this phase. Enrollment in the lower-secondary schools will reach 100% by the end of this phase. An increasing portion of the lower-secondary school graduates will continue to the upper-secondary schools or equivalent.

The third major higher-education center to be established in the Study Area will start providing locally educated graduates to emerging businesses in the Study Area, both in science and technology fields and in business and social science fields. Non-formal education and skill/job training centers will be reinforced and expanded covering a wider and more diverse fields to meet various demands arising from accelerating economic development.

Various health indicators in morbidity and mortality of the Study Area will catch up with those of the nation by the end of this phase by continued efforts by the government, private sector and communities. By the end of this phase, all tambon health care centers will be provided with at least five health workers (currently two in general). Further effort will be maintained in increasing health card holders and converting health card holders to the health insurance members.

3.4.3 Phase III (2002 - 2010)

(1) Characterization

The economy of the Study Area having taken off, its structure will become more balanced during this phase to allow self-sustained growth. International links will be established with the Indochina countries for various activities, and extended further to other countries. Economic interactions with the Indochina countries will take place increasingly in a borderless fashion. The strong private sector will participate actively not only in new economic activities but also in the provision of some infrastructure and social services. The economic growth will stabilize at around 9% per annum.

(2) Socio-economy

Agriculture

By an early part of this phase, intensive agricultural land use will be well established with new crops, diversified crops and various forms of integrated farming. Zero-grazing or semi zero-grazing of cattle will be popular as another form of intensive agricultural land use.

Direct export of fresh fruits, vegetables and flowers will be practiced not only in the vicinity of the BMA but also in other areas. The latter will utilize international airports newly established within the Study Area.

Hydroponics and other forms of industrial agriculture will be introduced. Drip irrigation and other water-saving irrigation technology will be applied widely to high value-added crops.

Industry

More and varied industries will be established capitalizing on the linkage opportunities offered by industries in the ESB, such as basic chemicals and basic metals. Machinery and engineering industries will become the leading subsectors. Manufacturing of light aircrafts and helicopters for agriculture and business uses will be established and become an export industry.

Agro-processing and a wide range of other industries will continue to develop as raw materials base expands by supplies from the Study Area and the neighbouring countries. More industries will transfer their manufacturing bases to the Indochina countries. Manufacturers of intermediate goods based on local and imported raw materials will locate in the Ubon Ratchathani - Mukdahan - Yasothon industrial triangle because of plenty of industrial water available. Nakhon Ratchasima will have agglomeration of engineering and machinery industries to become "Detroit of Thailand". Automobile manufacturing will be established and export increasingly to neighboring countries. A train workshop will be serving the SRT northeastern system as a whole. The central part of the Study Area will embrace a variety of handicraft manufacturers and rural industries.

Services

An international tourism network will be established encompassing the BMA, the ESB, the Study Area, and the Indochina countries. It consists of several tourism circuits linking tourism objects in the Study Area with those in the Indochina countries.

International links for various services will further develop. Industry induced services and border trade related services will be undertaken increasingly in a border-less fashion between the Study Area and the Indochina countries.

A few urban centers will be equipped with higher order service functions such as international conference, higher education/technology development, and international financial center, all serving the neighbouring countries as well. Some infrastructure and social services in major urban centers will be provided by the private sector within the regulatory guidelines provided by the public sector.

(3) Infrastructure

The regional artery will be completed within the Study Area, including the Mekong crossing, at the beginning of this phase. Its extension to the Vietnamese coast will be improved throughout the phase.

Advanced urban facilities will be provided in major urban centers including those related to higher order services and various amenity facilities. In particular, a comprehensive information center or a "teleport" will be established to support agricultural marketing, international tourism, financial services, medical care, resource management and other activities.

Solid waste disposal and wastewater treatment facilities will be introduced to secondary towns. Together with proper production processes, more recycle-based land and water use patterns will be gradually established.

(4) Spatial development

The regional artery will be strengthened both within the Study Area and the ESB as urban development takes place along it. Branch arteries will develop to Cambodia through Aranyaprathet and to Laos through Ubon Ratchathani.

The transportation network in the Study Area will be extended and linked with the Indochina countries by road, railway and air. A new mode of transportation will be introduced within the Study Area such as high speed trains.

Urban areas will be well established along the east-west axis connecting the cities of Nakhon Ratchasima and Ubon Ratchathani. Networks of primary and secondary urban centers will be formed with functional divisions among them not only to complement different urban centers but also to serve their rural hinterlands collectively.

(5) Social services for human development

The vicious circle of "poverty --- low educational attainment --- poverty ..." will begin to be improved to a "better education --- better income" mechanism during this phase. Overall, the private sector will play an increasingly important role, while the public sector will shift its emphasis to rural areas. An emphasis in the basic education level will be laid more on the upper-secondary level. Each of the nine provincial capitals in the Study Area will have at least one higher-education institute. Non-formal education centers and job/skill training centers will start offering courses in advanced and sophisticated techniques for the regional population as well as providing technical training courses for trainees from the Indochina countries.

Efforts in improving incidence of morbidity and mortality will be continued. Measures will also be taken to cope with increasing incidence of diseases associated with economic development and changing age structure. By the end of this phase, all sub-districts (tambons) in the Study Area will have the second health care center. It is also aimed that all the population in the Study Area are covered either by the health insurance program or health card program.

CHAPTER 4

DEVELOPMENT PLAN BY ECONOMIC SECTOR

4.1 Agriculture

4.1.1 Objectives and strategy

(1) Constraints

Major constraints to agricultural development in LNE-UE are summarized as follows (details in Sector Report).

Marketing and prices

Three main crops in the Study Area, rice, cassava and maize are also main export crops in Thailand. In 1990, a third of the national production of 3.7 million tons of maize was exported. The Study Area is the dominant producer of cassava. International prices of these commodities have been declining due to oversupply, protectionism, and quality regulations. International prices of rice and maize have been typically as shown below.

International Prices of Rice and Maize

(Unit : US$/ton in 1985 value)

	1970	1980	1985	1990
Rice	394	414	216	197
Maize	160	119	81	75

Source : IBRD, Commodity Prices and Price Projections, 1991

Prices of other crops are often low and unstable, especially when they are traded through middlemen. Some farmers face debt problems due to borrowing from middlemen. Lack of farmers' organization in marketing is a constraint here, although contract farming has been recently introduced.

The distance to Bangkok and poor marketing infrastructure is a constraint to development of horticulture. The Study Area has a strong base for livestock production, but this industry is not well organized and suffers from restrictive policies.

Water availability

The Study Area is under savanna climate with an average annual rainfall of about 1,400 mm. The rainfall is highly variable both seasonally and annually. During the rainy season from May through October, more or less 90% of annual rainfall occurs on an average. Droughts are frequent and often extended.

In the downstream of the Chi river, habitual floods and poor drainage hinder the development of cassava, maize, pastures, fruit trees and vegetables. Floods and salt

water intrusion both up the river and into the groundwater are constraints to agriculture in the downstream of the Bang Pakong river.

Due to generally flat land and sandy soil, water storage is ineffective. Irrigation covers only 405,000 ha (1988) or 7.6% of the total farmland.

Groundwater resources are generally poor in the Northeast. Water from shallow wells in the northern half of the Study Area is mostly salty.

Soil conditions

Soil in the Study Area is mostly low in fertility and water retention capacity. As it is derived mainly from sandstone, shale or siltstone, it is inherently low in calcium, potassium, magnesium and phosphorus as well as organic contents and has low cation exchange capacity. In limited areas, the soil is salty or alkaline. Farm land has extended already into marginal lands, and there is little room for further expansion of farm land without encroaching upon forest areas.

Land tenure

Over 80% of all the farm holdings in the Study Area are owner-operated. In Nakhon Nayok and Prachin Buri, the ratios of farm holdings owned by farmers cultivating the lands are lower, and 42.2% and 18.6% of the total farm holdings respectively are rented.

However, there are different forms of ownership and not all provide complete security. Only 23.5% of villages have villagers having title deeds. Within the national forest reserve area, 6.3% of villages have villagers with title deeds, while 28.1% of villages outside the national forest reserves have villagers possessing title deeds. In the national forest reserves, 75.1% of villages do not have any evidence of tenancy nor land documents. Thus, although the land tenureship does not appear to be a serious problem from the high ratio of land owners-farm operators, problems do exist in terms of land ownership security. Insecure land tenancy discourages investments to improve land productivity.

Agricultural extension

Agricultural extension services are insufficient in the Study Area in terms of quantity and quality. A government extension worker covers only those farmers in a group organized by the government. The farmers' groups cover only about 9% of the total farmers in the Study Area. The mobility of extension workers is severely restricted by the lack of official vehicles. They have to use their privately owned motorcycles. Common extension workers are believed to be too young and to have limited practical experiences. Though they have a basic agricultural training, farmers are reluctant to accept knowledge given by them. Training of the extension workers is centered on rice cultivation but there are increasing demands on technology on others such as vegetables, fruit trees, fisheries and animal husbandry.

Agricultural cooperatives

Agricultural cooperative development in the Study Area has been poor covering only 19% of the farmers in 1990/91. Main activities of the cooperatives are credit services. Joint sales or purchasing of agriculture commodities by the cooperatives are

rather rare. Only large and superior cooperatives can afford to manage the joint sales and purchases. Unit service area of a cooperative, i.e. two amphoes, is too large to manage by an organization. There is much intervention by the government in cooperative operation. Virtually most of cooperatives are controlled and operated by the government even though the cooperative law stipulates that a cooperative should be operated by representatives of member farmers. There are virtually no technical services to cooperatives by the controlling agency, i.e. the Department of Cooperative Promotion.

Lack of structured supports

While there are technical solutions for most of the individual problems facing the farmers in the Study Area, a real problem seems to be the lack of structured efforts to support them to help themselves. Little application of fertilizer and new technology may be due to low education or lack of information. Experiences of crop damage through recurrent droughts tend to make farmers indifferent to making efforts to increase production without support measures that are institutionalized and thus dependable. Market information and assurance of marketing outlets would be prerequisites to convincing farmers to introduce new crops. There is a need for new mechanisms, such as credit and insurance, to protect the farmers so that they can take risks to obtain higher incomes.

(2) Objectives

The objectives for agricultural development in LNE-UE, including crop cultivation, livestock and fishery, are established in line with the LNE-UE regional development objectives.

1) To raise income level and create sufficient employment opportunities in rural areas by promoting crop diversification, improving productivity, and expanding marketing outlets in order to minimize the drift of people out of the rural areas;

2) To promote environmentally sound agricultural practices through mixed farming combining crop cultivation and livestock, poultry, fishery and other activities, proper crop cycles and on-farm water and land management; and

3) To promote farmers' organization for effective marketing, input procurement and water and land management.

(3) Strategy

Crop diversification, crop cycles, and yields

Higher agricultural productivity may be attained through crop diversification in favour of high value-added crops for export and processing in the Study Area. More promising crops are oil crops such as groundnut, soybean, sunflower and safflower (under supplemental irrigation), various seed including grains and vegetables, horticultural products, sugarcane, and flowers for export of conventional crops, fragrant rice has better export prospect and thus should be encouraged.

Proper crop cycles should be established to increase agricultural production especially during the dry season and to minimize soil degradation, soil erosion and crop diseases. Some

crop diseases. Some crops would be combined with livestock, poultry or fishery for integrated farming.

Crop yields are reported to be considerably below the economically optimum levels. Yields can be substantially improved by developing/introducing suitable varieties, improving the input levels and mix, and most importantly by improving farm practices. The last involve measures for soil improvement, such as application of natural or green manure, moisture conservation practices, and selection of crops and better timing to adjust to seasonal pattern of rainfall.

Marketing improvement

Marketing of agricultural produce should be improved by establishment of assembly markets and encouragement of joint marketing through cooperatives and farmers' organizations. Some government programs, such as credit for storing crops during the harvest season for sale at higher prices off-season, need to be strengthened.

Contract farming should be encouraged for direct sale of new agricultural products to retailers or agro-industries. Contract farming would provide an opportunity to organize individual farmers to negotiate with large retailers or processors.

Mixed farming

To support various mixed farming systems, provision of agricultural inputs should be improved. This includes seedlings/saplings, animal feed, fish stock, seed and fertilizer. Sericulture, aquaculture in ponds and paddy field and simple agro-processing should be incorporated in the mixed farming, where possible.

Water management

Effective water management is essential for maximum utilization of limited water resources. Priority is the full utilization of existing facilities, but some facilities in the Study Area are not well planned for location and scale. An inventory of existing facilities should be reviewed and updated, and additional water storage should be planned in combination with rehabilitation/improvement of existing facilities by a river basin approach.

Water facilities planned by the river basin approach would call for an integrated operation and management. In particular, farmers need to be organized for on-farm water management. As a prerequisite, farmers should be involved in the planning and implementation of irrigation facilities.

Livestock improvement

Livestock in the Study Area has much room for expansion due to the rapidly growing demands for meat and dairy products as income increases and the availability of agricultural by-products for feed such as cassava leaves and chips, rice bran, sugarcane tops, and groundnut and leucaena leaves. Hot and dry climate is advantageous for prevention of livestock diseases. Livestock in the Study Area can be improved through breed improvement, disease control, improved feed base, and marketing outlets.

4.1.2 Development targets

(1) Agricultural land development

Potential agricultural land

Land suitability for agriculture has been analyzed by using the GIS and combined with the present land use to clarify potential land development. Results given in subsection 3.3.4 indicate the following potential related to agricultural development.

Potential paddy area, 22,132,000 rai, is smaller than the area presently under paddy, 28,064,000 rai estimated for 1992. This area is comparable to the paddy area in 1988 (21,352,000 rai). The potential area is significantly smaller than the present paddy area in all the provinces except Nakhon Nayok, Prachin Buri and Nakhon Ratchasima. Potential field and tree crops area is 13,685,000 rai, much larger than the area presently under field crops, fruits, vegetables and flowers (8,091,000 rai in 1989). Development area defined as potential area for non-agricultural activities, constitutes 7,602,000 rai. This area is mostly unsuitable for cultivation but can be used for cultivated pasture, grazing, or woodland.

Agricultural land development

Given the potentials outlined above, the agricultural land development aims at the following. The total paddy area would be maintained at the 1989 level in the Study Area. Production increase in paddy would therefore be realized by expanding irrigation area and double cropping. Field and tree crops area will be expanded by 2 million rai corresponding to 36% of the potential expansion area. Of the development area, some 800,000 rai or 40% of the total would be devoted to pasture/grazing area to support the expansion of livestock production. Also about 5% of the development area or 375,000 rai (60,000 ha) would be developed as commercial forests.

(2) Agricultural value-added

To realize the regional development indicated by the socio-economic framework for balanced development, the agricultural sector value-added would have to increase from 33,900 million bahts in 1989 to 76,400 bahts in 2010 (in 1989 price). Crop cultivation, livestock, fishery and commercial forestry would support this increase as summarized in Table 4.1.

Table 4.1 Projection of LNE-UE Agricultural Value-Added

(Unit : 10^6 Bahts in 1989 price)

Subsector	Value-added in 1989	Assumption	Value-added in 2010	Average growth gate (% p.a.)
Crop cultivation				
Paddy	11,313	No net area change, 50% yield increase due to irrigation, double cropping and technological advancement	17,000	1.96
Existing field and tree crops	12,392	No net area change, 30% increase due to yields and changes in crop composition	16,100	
Conversion/activation	-			3.90
Oil crops		400,000 rai, unit VA = 2,000 Baht/rai	800	
Fruits and vegetables		1,600,000 rai, unit VA = 6,750 Baht/rai	10,800	
Subtotal	23,705		44,700	3.07
Livestock	9,172	Threefold increase	28,200	5.49
Fishery	1,023	Threefold increase	3,100	5.42
Commercial forestry	-	60,000 ha for fast growing tree species, unit VA = 6,400 Baht/ha	400	-
Total	33,900		76,400	3.90

4.1.3 Development projects and support measures

(1) Mixed farming promotion program

This program will provide a package of support measures for farmers to undertake integrated or mixed farming, introducing new crops, varieties and breeds. Extension services and agricultural input will be provided through cooperatives to individual farmers. Marketing of output will also be conducted through cooperatives.

A typical case of integrated farming is a traditional combination of rice and fish in paddy fields. Other components include upland cash crops, vegetables, trees and hedges for fuel, backyard poultry and livestock, and sericulture.

(2) Livestock improvement program

A comprehensive package of measures will be provided under this program to support livestock raising, including breed improvement, disease control, feed improvement, and arrangements with meat and dairy processors. A few livestock improvement centers will be established to provide these services in addition to re-activation of existing ones. Establishment of feed mills will also be supported. Preferred locations are Si Sa Ket, Yasothon, and Ubon Ratchathani.

(3) Crop cycles research

This is a research project to establish proper crop cycles suited to the LNE-UE regions which will improve/maintain soil property, minimize crop diseases, and maintain land surface coverage. Existing research results will be reviewed, and new research and field experiments conducted in a selected locality in each province.

(4) Agricultural marketing network development

The project will establish central commodity markets in provincial and district centers with agricultural marketing service centers, and local assembly markets. A central commodity market will accommodate commodity transactions in wholesale under established rules and regulations, and facilities for trading, storage, grading and information distribution, and related personnel will be provided. Local assembly markets will serve individual farmers for collection, sorting, simple processing, loading/unloading and transportation of crops; they would preferably be operated on a cooperative basis. The local authorities (municipalities) should also play an active role, particularly in rural service centers.

(5) Agricultural cooperatives promotion

Marketing is a constraint to crop diversification towards horticulture, and to dairy production. Producer associations/cooperatives can play a key marketing role and reduce dependence on middlemen. Similarly, they can play an important role in input procurement and distribution for their members.

The project will establish an agricultural cooperative institute as the information center on cooperative activities in the country. The institute will monitor individual cooperatives' activities, establish and maintain data base on experiences of successful cooperatives, disseminate information on cooperatives, train cooperative managers/farmers for efficient farm management, and offer seminars/workshops on cooperative activities.

(6) Floating cage net aquaculture development

Existing large and medium size reservoirs will be effectively utilized to develop aquaculture by floating cage net, a relatively new technology in Thailand. Provision of fingerlings, applied research and extension will be essential (see (7) below).

(7) Yasothon aquaculture center

This project will extend and expand the efforts made by the United Nations through the Mekong Secretariat. An aquaculture center will be established for breeding, fingerlings production, research and extension. The center may serve not only the Study Area but the entire Lower Mekong basin.

(8) Drip irrigation development

The project is for pilot implementation of drip irrigation through application of established technology and research results on crops. Drip irrigation is the most efficient irrigation method with small losses of water in evaporation and percolation. Operation costs are low due to low pressure in pipes and low labour requirements.

This method is particularly suited to upland crops in the Study Area. It is good also for preventing soil salinization.

A few locations will be selected initially representing different land conditions including salt affected land. High value-added crops should be selected for application such as safflower, vegetables for fresh consumption, processing and seed, and alfalfa. A preliminary feasibility analysis on this project is found in a separate volume.

(9) Participatory irrigation system improvement

This is a pilot project to identify most suitable participatory approach to irrigated agriculture in the Study Area. A few different types of irrigation schemes will be selected such as a major irrigation scheme without on-farm facilities, irrigation with small reservoirs, and new groundwater irrigation. Water users' associations may be an important component.

(10) On-farm drainage improvement

The project will provide relatively large scale drainage improvement in selected locations such as salt affected land, lower paddy field susceptible to flooding or salt water intrusion, and upland crop area with water logging. Different drainage works will be applied to specific locations such as drainage canals, polder dikes and others.

4.2 Industry

4.2.1 Objectives and strategy

(1) Constraints and prospects

Overview

Industrial activities of the Study Area in a modern sense are still in an early stage of building their foundations. The manufacturing value-added in the Study Area was only 2.3% of the national value-added in this sector in 1989. It is dominated by agro-industry, and in particular products of slaughtering, rice milling, alcoholic beverage and cotton and jute. These constitute 75% of the manufacturing value-added in the Study Area. For the kingdom as a whole, the share of agro-industry in manufacturing value-added was 7.2% in 1989. This structure itself is the major constraint to LNE-UE industrial development.

Limited purchasing power due to low incomes constrains regional consumer goods industry. For intermediate goods industries (e.g. textiles, chemicals, pulp and paper, and metal industries), the limitations are the lack of final producers in the Study Area, and the difficulties of developing supplying arrangements with companies outside the Study Area. Another major constraint is limited local resources, particularly agricultural products, water and mineral resources.

Agro-industry

The main constraint to agro-industry is the limited output of primary agricultural commodities and its extreme concentration in a few products with limited processing (de-husking paddy, processing of cassava into tapioca, and grinding maize for

mixture in animal feed). For rice milling, secondary processing would be a prospect such as grading rice for export standards (now done only in Bangkok), grading and packaging for retail trade, and pre-cooked rice in can or vacuum packs.

Tapioca may face problems in the near future in export markets, particularly in EC upon implementation of unified agricultural policies after 1994. A structural change from tapioca to starch may be a direction to pursue. Crop diversification and integrated farming will expand the base for agro-processing. In addition to new crops to be processed, meat and milk production has a large potential. This would support a major expansion in feed milling. Import of cheaper agriculture produce from Indochina countries for processing may be a possibility to be pursued.

Non-agro industries

The Study Area has strong manufacturing activities in the engineering sub-sector. One is the fabrication of bus bodies and specialty trucks, and a very large number of vehicle repair industry. The latter includes a substantial amount of replacement parts manufacturing. They may be regarded as a forerunner of the leading industry in the Study Area, expanding into manufacturing of precision metal components, precision dies and moulds for plastic and metal industries.

Construction materials industry particularly of concrete products is one of most common industrial activities in almost every district of the Study Area. Cements are obtained mostly from Sara Buri, but sand and gravels are locally produced. The industry is expected to grow continuously, as income levels increase.

Chemical industry manufacturers in the Study Area cover a broad range of products such as industrial oxygen, alcohol, incense sticks and salt. Alcohol is produced from molasses and converted into alcoholic beverages. Table salt and industrial salt are produced in Phimai in large scale from locally available rock salt. Industrial salt is the feed stock of a chemical company in Samut Prakarn for manufacturing of chlorine and caustic soda. Large water requirements pose a constraint to expansion.

Other export oriented light industries already existing in the Study Area include jewelry, artificial flowers, Christmas decoration lamps, toys, electronic consumer products, silk materials and silk textiles, and wigs. These are also labor intensive and footloose. This type of industries are promising in the Study Area, as their establishment depends mainly on abundant supply of a trainable workforce. Making final products rather than intermediate products for finishing in Bangkok as currently done for gem stone cutting, would be a key to expand and diversify activities of this type for higher value-added and larger markets.

(2) Objectives

The overall objective of industrial development in the Study Area is to support the LNE-UE regional development objectives in all the three aspects : economic growth, environmental quality and social aspects. They are as follows.

1) To lead the growth of regional economy and increase income levels directly by creating employment opportunities, and indirectly by supporting agricultural development and inducing service activities;

2) To support an environmentally sound development pattern by minimizing pollution through appropriate industrial location, production processes, and wastewater treatment and solid waste disposal; and

3) To contribute to the social cohesion of local people by providing extra incomes and opportunities for self-help efforts through supporting development of rural industries.

(3) Strategy

Agro-industries will continue to be a backbone industry in the Study Area. They should be further promoted and diversified through crop diversification, integrated farming and contract farming with processors.

Metal working and machinery industries including electrical and transport equipment should be developed as another backbone industry. These industries would support industries in the BMA and the ESB as well as local industries. They require higher technologies than simple labor intensive, export oriented type of industries and tend to develop a wider spatial linkage and can also meet the future requirements of the Indochina countries. They will support agricultural modernization by providing agricultural machinery and equipment, storage and transportation facilities and processing equipment including canning, bottling and packaging.

Labor intensive, footloose industries and local culture based handicraft industries need to be promoted especially in rural areas to absorb both the new workforce and those shifted from agriculture. Many of these industries will shift to other less developed countries in the medium to the long term. In the meantime, entrepreneurs and investors need to be attracted from outside, who have sufficient management resources such as capital, technology and marketing skills, to pioneer in manufacturing new products. For this purpose, a wide range of support measures should be taken including improved urban facilities, and infrastructure and skill development as well as various incentive measures.

4.2.2 Development targets

(1) Industrial value-added

To support the development indicated by the socio-economic framework for the balanced development, the industry sector value-added would have to grow from 19,400 million bahts in 1989 to 190,800 million bahts in 2010 (in 1989 price) at an average annual rate of 11.5%. Contribution of the manufacturing, mining and quarrying, construction and utilities sectors is summarized in Table 4.2.

The growth in agro-industry component of the manufacturing sector is based on detailed studies of the major product lines. These detailed studies show that agro-industry output and value-added would grow by 6.5% per annum if appropriate development policies are pursued by the government such as clarification of land tenure, promotion of contract farming, and price deregulation.

Non agro-industry component of the manufacturing sector is expected to grow rapidly. The projected level of growth can be achieved if the investment levels of 1989-1991 can be maintained over the plan period.

Mining in the Study Area is largely confined to construction materials. These two sub-sectors are projected to grow at similar rates. High levels of projected urban growth and increases in public investments will sustain the projected levels of growth.

The implied composition of industry sector in the Study Area in 2010 is similar to that of the country as a whole at present. The major exception is the continuing high share of agro-industry (28%) in total manufacturing value-added.

Table 4.2 Projection of LNE-UE Industrial Value-Added

(Unite : 10^6 bahts in 1989 price)

Sector-sub-sector	Value-added in 1989	Growth assumptions * (% per annum)	Value-added in 2010
Manufacturing			
Agro-related	6,800	6.5	25,500
Non agro-related	2,300	17.2	64,000
Subtotal	9,100	11.5	89,500
Mining and quarrying	2,400	11.5	23,600
Construction	5,300	11.5	52,100
Utilities	2,600	11.5	25,600
Total	19,400	(11.5% p.a.)	190,800

* Based on detailed sector analysis (Sector Report)

(2) Phased development of manufacturing industry

The manufacturing industry will be the main source of growth in industrial value-added and employment creation. The job creation, industrial land requirements and changes in industrial structure are summarized in Table 4.3.

Table 4.3 Phased Development of Manufacturing Industry

Phase	Period	No. of new jobs to be created	Industrial land requirements (rai)	Industrial structure (%)		
				Agro	Non-agro	Linkage
I	~ 1996	71,000	5,500	62	24	14
II	1997 ~ 2001	125,000	9,600	47	35	18
III	2002 ~ 2010	500,000	38,000	28	40	32

Of the industrial land requirements of 5.500 rai during Phase I, the Suranaree Industrial Zone, Kok Kruad Industrial Estate and Prachin Buri Industrial park will provide about 60%. During Phase II, three planned industrial estates in Nakhon Ratchasima, Prachin Buri and Ubon Ratchathani will provide some 50% of 9,600 rai required. Assuming that 60% of new industries will locate in industrial estates, a total of 2,000 to 3,000 rai of industrial estates will have to be developed every year during Phase III.

4.2.3 Development projects and support measures

Development activities for industry are undertaken mostly by the private sector, while the roles of the government are confined mainly to taking facilitative measures to encourage private investments. In addition to various infrastructure projects, some projects may be undertaken by the public sector initiative or by the public-private partnership. Additional policy measures would also be taken. These projects and measures are outlined below (details in Sector Report).

(1) Complete cycle projects (CCP)

To encourage the production of high value-added crops and their processing, a concept of a complete cycle project has been introduced. Under this project, an institutional mechanism is established to integrate these production and processing activities by related government agencies, agri-business enterprises and local farmers.

During the first phase of plan implementation, the NESDB regional offices responsible for Master Plan implementation should coordinate the implementation of a few CCP's in the Study Area. These will involve oil seeds, vegetable processing and livestock products.

In four areas targeted for crop diversification, the Ministry of Agriculture, RID, BAAC and private entrepreneurs will cooperate to produce and process raw materials and varieties/breeds suitable for processing.

Depending on the results of these pilot schemes, the commodity and area coverage of such projects will be expanded in Phases II and III of project implementation. A first step in this project would be a review by NESDB of the guidelines for CCP's and formulation of new guidelines to insure both the interests of the farmers and processors. The timely delivery of the required inputs from all other related agencies will be another important function of the coordinating agency.

(2) Khao Yai resort and research development

Technology development as well as skill training holds a key to bringing up the engineering and machinery industries as backbone industries for the Study Area and also to supporting high-tech industries in the Chachoengsao area and elsewhere. Also tourism activities in the Study Area may be expanded and diversified by establishing conference tourism complementary to Pattaya. The Khao Yai resort and research development would serve these purposes.

Facilities for conferences, technology development and applied research would be provided together with improved recreational and post-conference tour facilities. The area should be inter-linked with the on-going "technopolis" in Nakhon Ratchasima for research activities and joint training programs.

(3) Commerce and industry plaza complex

This project should be implemented as a public-private joint venture. The plaza complex will accommodate offices of traders, suppliers and distributors with stock of essential parts and office supplies and maintenance personnel, public information and one-stop service center for investors, exhibition hall for manufactured products and new technology, and meeting rooms for business transactions and management

seminars. A plaza complex may be established first in Nakhon Ratchasima, followed by another in Ubon Ratchathani.

(4) Notheast industrial promotion sub-center

A branch of the Northeast Industrial Promotion center in Khon Kaen will be established with the same functions. It will be expanded in steps to provide assistance of technical training and consultancy services to Laos and Cambodia. Then it may be re-named as the Indochina industrial promotion center. It will serve also as a center for two-step technical assistance by international aid agencies to the Indochina countries. A preferable location is Surin, which will be a center for various rural industries.

(5) Automobile test course

The project will establish a large scale automobile test course serving not only domestic but also regional automobile industries to help develop tomorrow's cars that would meet rapidly changing requirements of the regional socio-economic environment. Research issues include safety, fuel efficiency, application of alternative energy, pollutions and new materials. The facility requires a comparatively large area to accommodate multi-purpose straight track, high speed oval circuit, slippery track and others of substantial length along various profiles of topography. Considering availability of spatious land at reasonable costs, natural conditions, and availability of urban services, it should be located in Nakhon Ratchasima in line with the concept of making it a "Detroit of Thailand".

The project may be implemented by the contribution of the automobile industry supported also by the public sector. The facility will be used by respective companies on a time sharing basis. Also a part of the facility can be designed to be used for automobile speed racing to add to tourism attractions.

(6) Nakhon Ratchasima industrial modernization

The project has the dual objectives of improving urban environment of Nakhon Ratchasima as the regional center and of modernizing existing small and medium industries to promote industrial linkages with those incoming industries as dependable subcontractors. Target industries include automobile repair and engineering, food processing, plating and textile dyeing that tend to produce noise, vibration, foul smells and polluted wastewater.

The idea is to organize a kind of cooperatives by type of industry and relocate them into better working environment such as industrial district or estate, where they can jointly work for marketing, raw materials procurement, and research works. The public sector should plan for the project and extend low cost finance for the facilities to be jointly owned by the occupants, including a wastewater treatment plant. Evacuated land could be purchased by the public sector for public facilities such as neighborhood park or used for residential buildings in conformity with the designated land use to improve urban environment.

(7) Other projects

In addition to various infrastructure projects to support industrial activities, the following projects described under other sectors would contribute more directly to the industrial sector.

- Integrated urban development with an industrial estate as a component as well as urban infrastructure and utilities,
- Isarn Indochina In-Bond program for export processing, and
- Agropolis with agro-processing facilities.

(8) Promotional Measures

For promotion of industrial development as proposed, regular and frequent exchanges of information and coordination among the concerned agencies at the central and local level will become increasingly important. NESDB central and regional offices are better equipped to play a key role in this regard.

At the central level, NESDB should guide manufacturing and processing industries under various State enterprises to relocate their factories out of the BMA and maintain close coordination with BOI, DIP, DIW, IEAT, FTI, DLA etc. Relocation of these factories will induce relocation and/or new location of the supporting industries of the private sector.

At the regional level, NESDB can coordinate NIDPC in Khon Kaen, BOI in Korat, relevant changwat offices, universities, colleges and vocational schools, local industrial clubs and chamber of commerce to help improve investment climate including social amenity of each locality, an important factor to attract both domestic and foreign investors.

4.3 Tourism

4.3.1 Objectives and strategy

(1) Constraints

Major factors constraining the development of foreign tourism in the Study Area have been identified as follows.

Lack of outstanding attraction

The Study Area has numerous Khmer, Thai and Lao points of interest as well as religious objects and interesting scenery, but lacks strong unique resources. Most of natural resources are for local recreation, except the Khao Yai national park attracting a wider range of tourists. More famous cultural sites are the Phimai historical park, Phanom Rung historical park, Khao Phra Vihan sanctuary and Muang Tam sanctuary, all featuring Khmer ruins. Natural-cultural resources include the Phu Pa Taem national park in Mukdahan

Scattered locations

Distances between interesting attractions in the Study Area commonly require road trips of one or two hours. This can be tiresome especially during the hot months of January through June.

Enclave land

Laos has only recently opened itself to overland tourism, but only via Nong Kai. Cambodia remains virtually closed except to the most adventerous and wealthy tourists. Travel to these countries from the Study Area has been minimal. This makes it difficult to create many interesting tour itineraries by combining attractions both inside the Study Area and beyond the boundaries.

Monotonous scenery

The countryside of the Study Area features generally flat terrain with limited hills and valleys. Much of the area is monotonous, particularly during the lengthy dry season when it becomes parched and is visually of little interest.

(2) Objectives

Tourism development objectives for LNE-UE have been established as follows to support the LNE-UE regional development objectives.

1) To provide main or supplemental sources of income for local people related directly and indirectly to various tourism activities;

2) To contribute to the enhancement of environmental quality by providing economic incentives for tree planting, city beautification and other activities; and

3) To give local people sense of participation in regional development and communication with international society.

(3) Strategy

Potentially the most attractive tourism resource in the Study Area is probably the area's proximity to major attractions in Cambodia, Laos and Vietnam. Realization of this major potential in full can be expected in the midium to the long term future, as these countries open up not only politically but also socially and basic infrastructure is developed including effective links with the Study Area. In the meantime, domestic tourism will continue to be dominant. For tourism development in the Study Area, therefore, an important strategy would be to upgrade the tourism resources and improve tourism infrastructure capitalizing on domestic tourists so that they would become important elements for foreign tourism by the time the neighboring Indochina countries would fully open themselves up.

Along this basic strategy, the lack of outstanding attraction within the Study Area would not turn out to be a major constraint. What is most important is that the upgrading of tourism resources and the improvement of tourism infrastructure would be conducted with a view to integrating them into envisioned future tourism circuits for foreign tourism.

4.3.2 LNE-UE tourism network

(1) Gateways and tourism circuits

The future tourism network for the LNE-UE regions will consist of gateways, tourism center/sub-centers, main tourism circuits and other individual tourism objects (Figure 4.1). In addition to Bangkok, the main gateway for foreign tourists, Buri Ram would become the gateway and tourism center of LNE-UE once the international airport becomes fully operational. Mukdahan and Aranyaprathet will be gateways and over-night stop points for tourists to Laos/Vietnam and Cambodia, respectively. Other tourism sub-centers are Nakhon Ratchasima strongly linked to Bangkok, Nakhon Nayok as a base for conference tourism, Surin complementary to Buri Ram, and Ubon Ratchathani for its own merit and as an alternative gateway to Laos.

Three main tourism circuits will be established in the mid- to long term future : integrated Khmer tourism circuit, hinterland tourism circuit along Lao border, and another tourism circuit linked to the Vietnamese coast. These circuits and other individual tourism objects are described below.

(2) Integrated Khmer tourism circuit

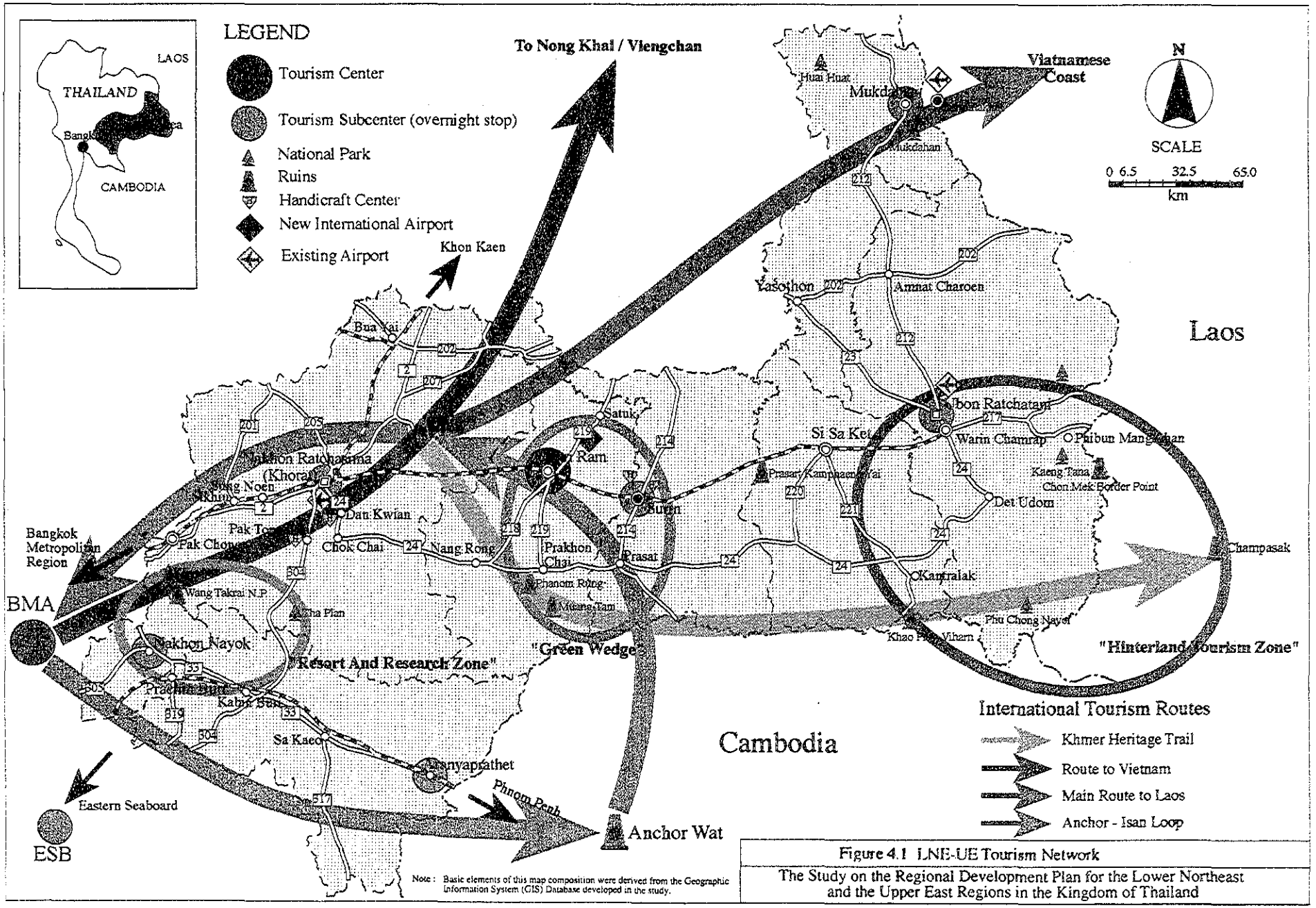
An effective link with Cambodia may be realized in the near future, once hostile conditions inside Cambodia are resolved. Aranyaprathet would become the most important crossing point for tourists travelling from Thailand into Cambodia. It may function efficiently as a tourist base for the ruins of Angkor Wat, some 150 km to the east, if Cambodia is too slow to develop its own infrastructure at Siem Reap.
Another link to Cambodia is the access from Surin. The city of Surin has already a road connection to Siem Reap by the route 214. An integrated tourism circuit is easily conceived, centering around the Khmer heritage, combining the Angkor in Cambodia with additional attractions in the Study Area.

Once local air services network is established, the Angkor/Siemreap will be linked to the central part of the Study Area by 40 minutes air travel. Many tourists would prefer to station in the Study Area with better facilities, services and amenities and make an excursion to the Angkor/Siem Reap.

(3) Hinterland tourism along Lao border

A link with Laos can be strengthened most easily through Ubon Ratchathani. At present, Ubon Ratchathani, being remote from any port of entry, is well off the kingdom's main tourism routes. This disadvantage may turn into a benefit, if tourism resources in Ubon Ratchathani are effectively combined with those in Laos. Wilderness experiences or unusual experiences of religious or cultural nature in a remote area would become tourist attractions.

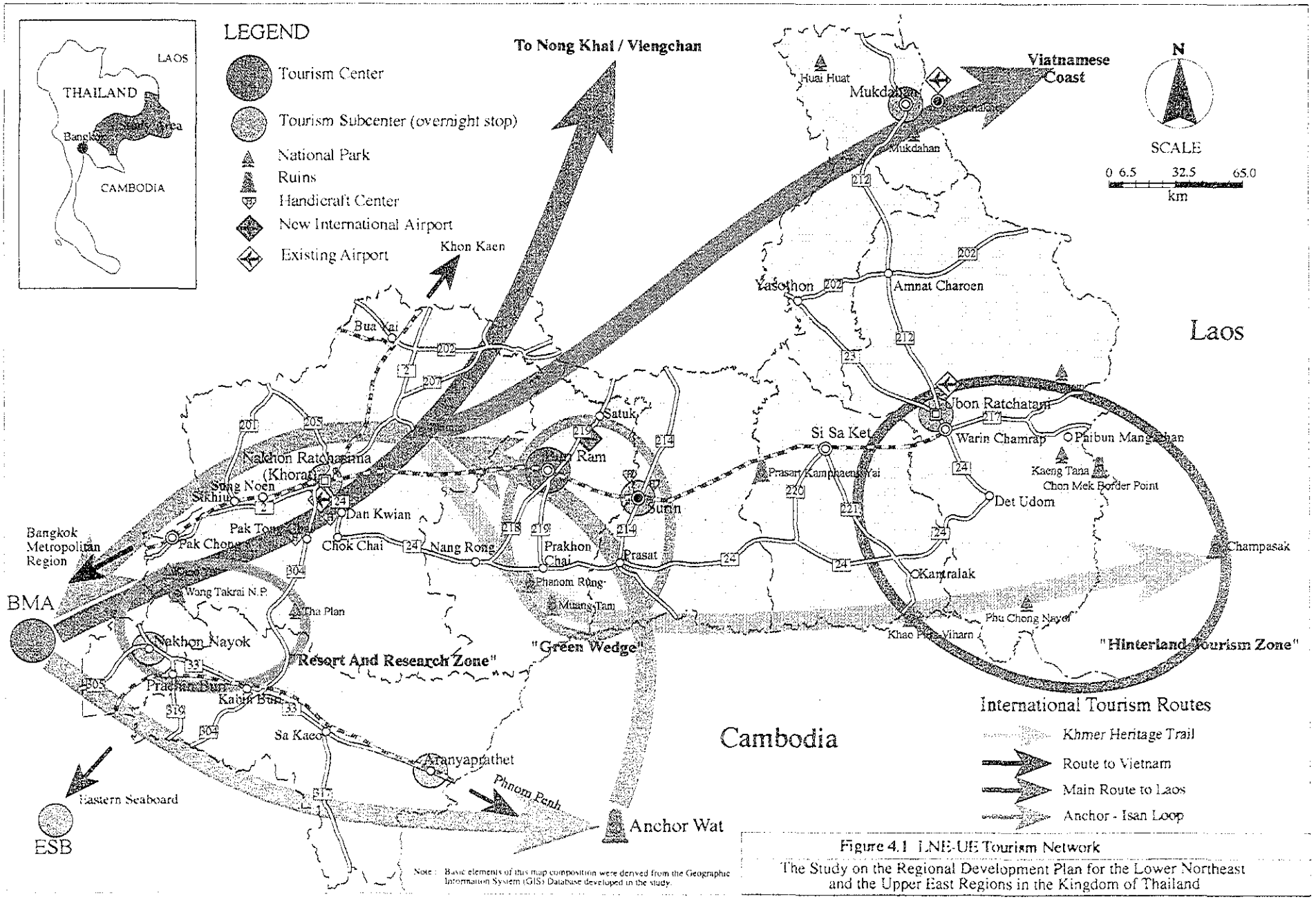
Tourism resources in Ubon Ratchathani include the Kaeng Tana national park, dam reservoirs and the Mum river with nearby cliffs and hills as well as various religious and cultural objects. These may be effectively combined with resources on the Lao side such as ruins at Champasak and the Mekong river itself.



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

Figure 4.1 LNE-UE Tourism Network

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 4.1 LNE-UE Tourism Network

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

(4) Integration with Vietnamese coasts

Another link with Laos may be established by constructing a bridge over Mekong between Mukdahan and Savannakhet. This link would be a natural extension of the regional artery for the Study Area. This link would allow the integration of tourism resources in the Study Area with those along the coast of Vietnam, and become an integral part of a major Indochina tourism network in the long term future.

(5) Other tourism objects

The Khao Yai national park is a major attraction already well established. Because of its proximity to Bangkok, the park is visited easily on weekends by Bangkok residents, both Thai and foreign. The park can be developed as a nature-oriented destination for "ecotourism" preserving its flora and fauna while offering opportunities for trekking, camping, horse back riding and excursion for wild animal viewing and bird watching. It could be used also to diversify the attractions of the Study Area for foreign tourists and reduce the monotony of their trips.

There exist a few other national parks in the Study Area that can be developed to enhance the tourism value of the Area. A wide variety of handicrafts constitute another valuable asset of the Study Area. They should be marketed as an integral part of the major attractions described above in the form of handicraft center, silk museum, basketry village and the like.

4.3.3 Development projects and support measures

(1) Khmer ruins restoration program

Restoration of Khmer ruins in the Study Area should be continued. This will cover the Khao Phra Vihan sanctuary on the Cambodian border. The program may be expanded further to provide technical and material supports for the restoration of the Angkor in Cambodia.

(2) Elephant park establishment

This project will capitalize on well established elephant roundup in Surin. In order to attract more tourists all the year round, an elephant park shall be established as a semi-natural habitat and reserve for elephants. An elephant training center will also be provided.

(3) "Green wedge" development

This project will create a sort of "green wedge" in the middle of generally dry central part of the Study Area. This will enhance the tourism value not only of the integrated Khmer circuit but also of the Study Area as a whole.

This would be made up of extensive forest along the border with Cambodia, greeneries surrounding the ruins of Phanom Rung and Muang Tam, a new elephant park and irrigated agricultural areas. Additional tourist attractions would be introduced in stages. City beautification of Buri Ram may be another project to be implemented along this line. Advantages of this area for this purpose include the following. The city of Surin is located closest to the Cambodian border of all the provincial capitals in the Study Area and has already a road connection to

Cambodia. The area contains more attractive tourism resources. The area is endowed more favorably with water resources.

(4) Other projects to support tourism

Other infrastructure projects will support the tourism development in the Study Area. They include the following. Project descriptions are contained in Chapter 5.

Project	Effects on tourism
Regional artery establishment	Improve access to/from the ESB and Indochina countries
Lam Nam Chi/Lam Plai Mat multipurpose water resources development	Expand irrigated area (part of "green wedge") and provide domestic water
International airport establishment	Provide a gateway
New Mekong bridge	Provide link to Vietnamese coast
Local air services network development	Expand a tourism network
Railway improvement	Strengthen/diversify tourism network within LNE-UE and extend it into Indochina
Khao Yai resort and research development	Diversify tourism combined with conferences and research development

In parallel with the restoration/upgrading of tourism resources and the improvement of the tourism accommodation and infrastructure, marketing activities need to be geared up systematically. Tourism marketing is particularly important for the tourism network in LNE-UE, as the cultural tourism appeals only to specific segments of tourists.

4.4 Trade, Distribution and Other Services

4.4.1 Objectives and strategy

(1) Constraints

Distribution and marketing

The marketing and distribution system in the Study Area has developed largely as a function of regional consumption and production patterns. Commodity flow from the Study Area to Bangkok is only 3.5% of the total flow into Bangkok from the whole kingdom, and commodity flow from Bangkok to the Study Area is 12.8% of the total outflow from Bangkok.

In agriculture, the distribution system for agricultural input and consumer goods for the rural population, and marketing of agricultural produce are reasonably well developed. Primarily because of low incomes, the volume of commodities traded is small. This increases the distribution margins and constrains the commercial development of physical facilities which will facilitate improvements in efficiency.

For agricultural input, the demand is spread throughout the year in small volumes. For the small farmers, in particular, timely procurement of input and their prices increase their production costs and may hinder input use.

The output marketing system is reasonably well developed for the major commercial crops such as cassava, kenaf, and sugarcane. For other commodities, market information, transport services and marketing facilities are largely not available. This discourages farmers to diversify the output composition in favor of perishable, high value-added goods.

For consumer goods distribution and services for the rural population, the key constraint is the low density and long distances to market/service centers. Development of the physical infrastructure, particularly roads and communication networks, is needed to improve the distribution of goods and delivery of services to the rural population.

Border trade

Prerequisites to much increased border trade and related activities are, of course, stable political and social conditions and consistent foreign trade policies of the Indochina countries. These are beyond control at the regional level.

The major constraint to expansion of border trade in the Study Area is inadequate facilities and services. Trade areas are small and unsanitary, bus services are insufficient, and infrastructure is inadequate such as the lack of common utilities. Major problems from traders' point of view include high competition, high initial costs and high transportation costs.

(2) Objectives

Objectives for this sector in the Study Area have been established as follows to support the LNE-UE regional development objectives.

1) To expand the trade and distribution sector to support the growth of production sectors and create employment opportunities with relatively small initial resource commitment;

2) To improve the access of rural population to market outlets and rural services, including health and education;

3) To improve the efficiency of this sector to increase incomes of people working in this sector and reduce costs to final beneficiaries; and

4) To support the development of specialized subsectors such as business services, and higher order services for education, culture and recreation.

(3) Strategy

For marketing of agricultural products, the emphasis will be placed on improving market access. This calls for improvements in transport and information, marketing outlets in rural market centers, and institutional measures to promote competition among traders. Another element of strategy is to reduce farmers' dependence on middlemen and seasonal price fluctuations by developing the storage infrastructure

(drying facilities, silos and cold storage) and improving farmers' access to institutional credit.

For input deliver, both the private channels, including the distribution system of input manufacturers, and cooperatives should be supported. The government could play a key role in the latter by providing finance to rural input distribution associations/cooperatives through BAAC.

Regional truck terminals, facilities for modal split between rail and road transport, and other storage and handling facilities will be improved to facilitate inter-regional trade.

To encourage broad based border trade related activities, a new institution should be introduced. These activities include not only commodity trade but also processing, financial transactions and skill training. The new institution would allow to combine effectively advantages available in Thailand and advantages available in Cambodia and Laos. The former include the proximity to large markets and the access to reliable suppliers of intermediate goods and parts. The latter are primarily low cost labor and raw materials.

4.4.2 Development projects and support measures

(1) Projects for distribution

Development projects for distribution of agricultural and manufactured products are included in the agriculture and the industry sectors (Sections 4.1 and 4.2). Distribution components of agricultural development projects are central commodity markets, local assembly markets and silo development. A distribution component for industrial development is the industrial parts trade and distribution center. Also regional truck terminals are described under the transportation sector (Section 5.5).

(2) Agropolis

The project will provide complex facilities for trading, storage, simple processing and development of agricultural produce within a large compound. A quality control center and an agricultural exhibition hall will be included to encourage the improvement of the quality of agricultural products and development of new produce. The project may be implemented by a private enterprise, but public-private partnership may be preferable for quality control. The project may be located in Ubon Ratchathani or Si Sa Ket.

(3) Border trade centers development

Border trade centers will be developed at Aranyaprathet, Mukdahan and Ubon Ratchathani with permanent structure and developed in stages for various functions and facilities. Functions and facilities may include a trade information center, grievance committee on trade disputes, small exhibition center, temporary storage facilities, simple processing facilities, branch of customs office, and financial facilities. The public sector initiative is necessary for planning and initial establishment.

(4) Isarn Indochina In -Bond program (III-B program)

The program will introduce a new institution to promote broad based border trade related activities (Figure 4.2). It should be formulated and developed jointly with the governments of neighbouring countries.

Main features of the program are as follows.

1) The program applies to Thai-owned facilities in Cambodia and Laos across the borders from Aranyaprathet and Mukdahan.

2) Thai corporations are allowed upto 100% ownership and control of their facilities (production and processing) including land.

3) These companies will be allowed to import duty-free raw materials, equipment and production input, provided that finished products are eventually re-exported from Cambodia or Laos to Thailand and other countries (including Vietnam) through the distribution centers in the Study Area.

4) The products may also be sold in Laos and Cambodia if certain local content provisions are met.

5) The program provides for streamlined customs procedure for issuing work permits to Thai personnel and facilitating flow of materials and finished products across the Thai-Laos/Cambodia borders.

6) The Thai customs will charge import duty only on value-added.

The Thai government should take the initiative to draft the program for opening dialogues with Laos and Cambodia.

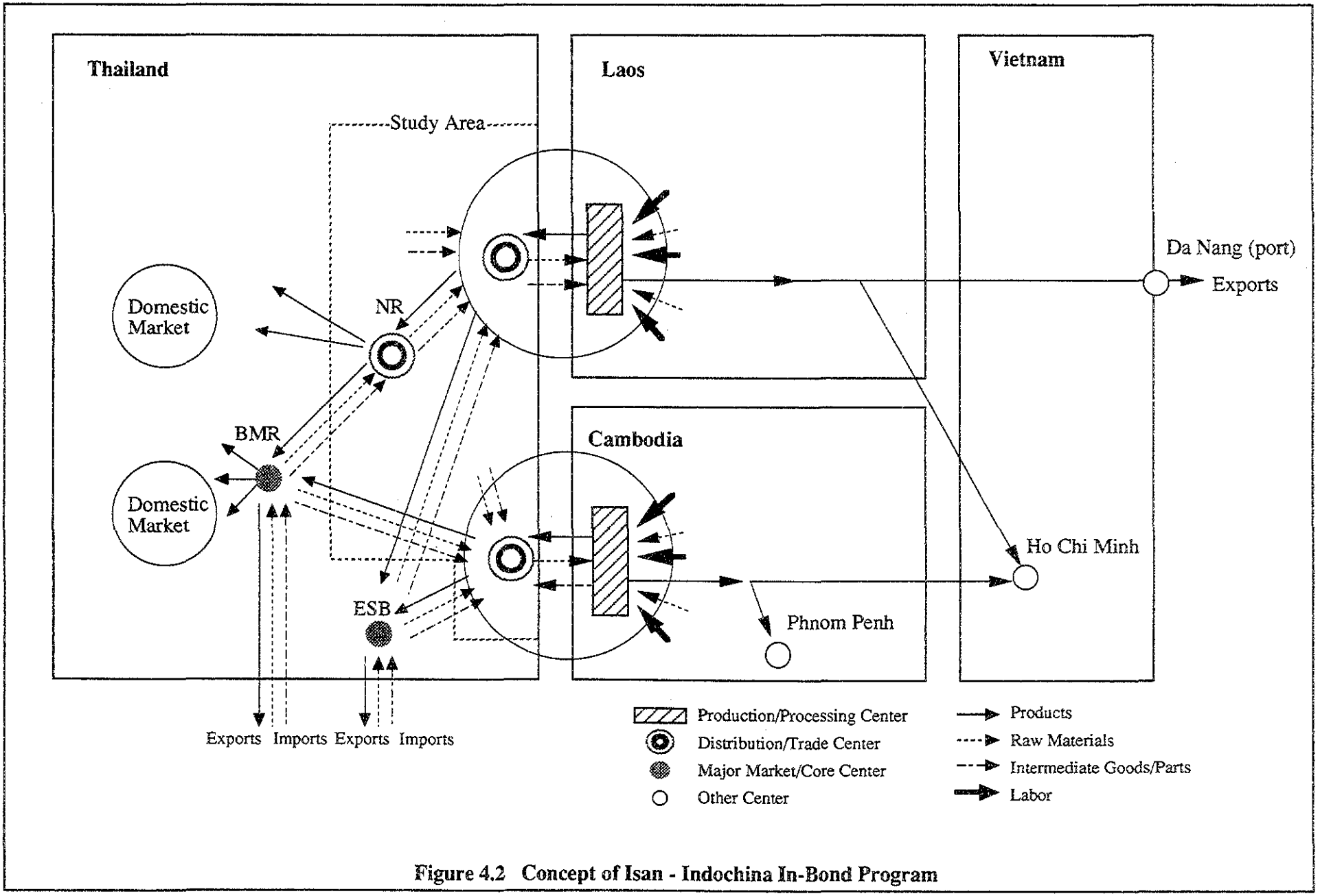


Figure 4.2 Concept of Isan - Indochina In-Bond Program