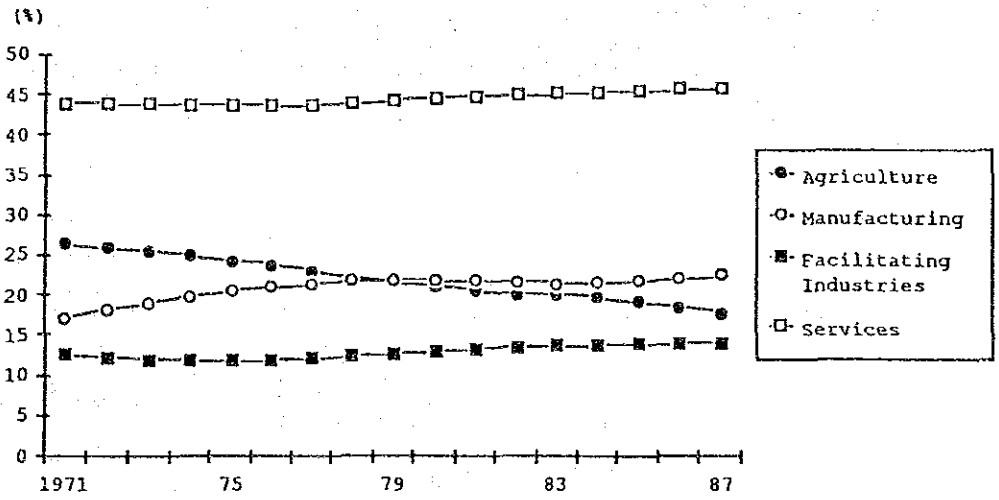
PART I

DEVELOPMENT PERSPECTIVE

1. REGIONAL DEVELOPMENT ISSUES AND ROLE OF THE UPPER CENTRAL REGION

1.1 Why Upper Central Region

Toward the year 2010, Thailand will experience a transformation from an agricultural to an industrial economy and from a rural to an urban society. Manufacturing GDP exceeded agricultural GDP at the beginning of the 1980's and the manufacturing sector steadily increased its magnitude in the national economy (See Fig. 1.1). According to a recent World Bank's projection, the share of manufacturing GDP will increase from 24% at present to at least 30% in the year 2001. This implies that the share of urban population will increase from 27% at present to at least 35% in the year 2001.



Sources : NESDB, National Income of Thailand, Various Issues
Note : 1) Facilitating industries comprise construction, electricity, water supply, transportation and communication
2) Detailed analysis is given in Technical Report Vol. 8 : Economic Environment
3) Figures are based on 5-year moving average

Fig. 1.1 GDP Composition by Sector, Whole Kingdom

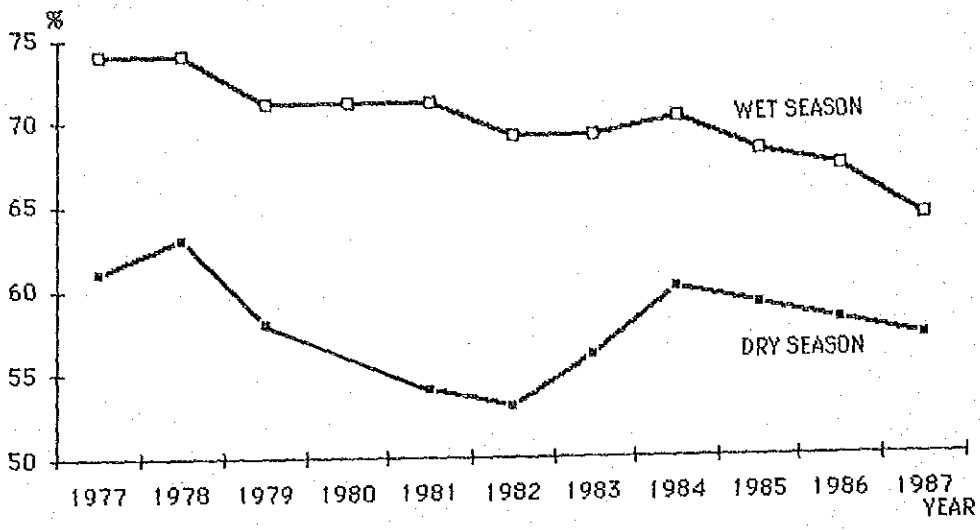


Fig. 1.2 Changes in the Share of Agricultural Employment, Whole Kingdom

Table 1.1 Export Composition by Commodity Group (%)

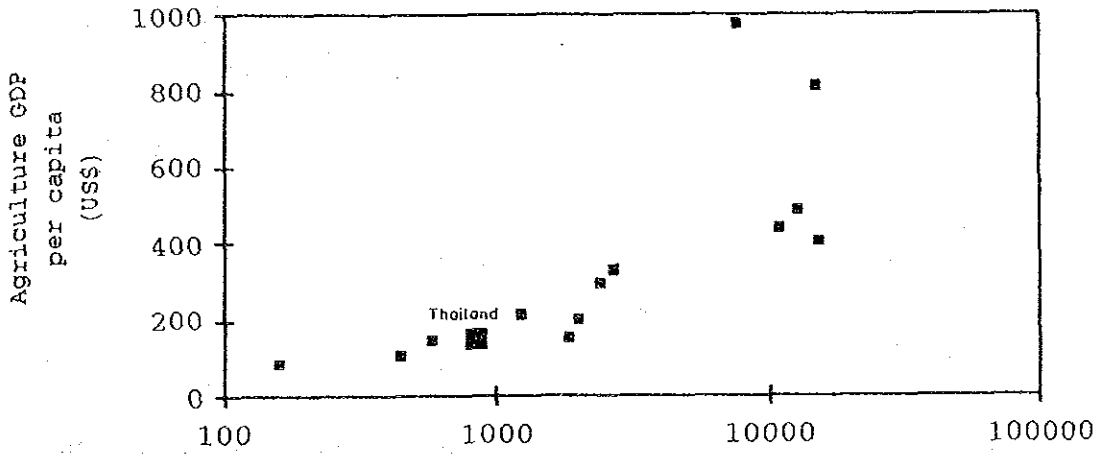
	Agricultural Products	Agro-processed Products	Manufactured Products
1965	82.6	8.8	2.7
1970	62.1	15.5	5.4
1975	44.4	31.7	15.1
1980	37.5	22.6	25.0
1981	37.0	27.6	25.3
1982	32.6	32.8	26.9
1983	34.3	28.6	30.6
1984	34.4	26.9	33.4
1985	29.0	27.0	38.1

Remarks : "Agro-Processed Products: includes SITC 011, 012, 013, 022, 023, 024, 031, 032, 046, 047, 048, 052, 053, 054, 055, 061, 071, 072, 073, 074, 075, 091, 099, 11, 122, 41, 42, 43

Source : U.N., International Trade Statistics

In the meantime, the agricultural sector is still predominant in employment absorption and export. Though relative magnitude of agriculture has gradually been declining in the labor market, the sector absorbs about 60% (in dry season) to 70% (in wet season) of the national total employment at present (See Fig. 1.2). According to a World Bank's projection, the share of agricultural employment will still be within a range of 50% to 60% in the year 2001. In export, relative magnitude of the agricultural products has rapidly declining with increasing share of the manufactured products (See Table 1.1). However, contribution of the agricultural sector reaches nearly 60% of the total export, when the export of agro-processed products is included. At present, the export amount of the agricultural products and agro-processed products are almost the same.

In view of its substantial role in employment absorption and agro-processing, the agricultural sector will still be important. In fact, an international comparison suggests that the higher income country enjoys the higher per capita agricultural GDP the country attains (Fig. 1.3).



Remarks : Bangladesh, Nepal, Indonesia, Phillipines, Thailand, Colombia, Mexico, Brazil, Argentina, Korea, New Zealand, Australis, France, Denmark, Canada

Source : World Bank, World Development Report, 1989.

Fig. 1.3 Per Capita Agricultural GDP and Per Capita GDP : A Cross National Comparison

This perspective suggests two important issues in overall regional development:

1) Where should industrialization and urbanization be accommodated in short and long terms?

2) How should the agriculture and natural environmental base be maintained and utilized in the process of industrialization and urbanization?

The Upper Central Region (UCR) is the national center of rice production and, at the same time, the frontier of the expanding Bangkok Metropolitan Region (BMR). Therefore, development of this subregion particularly calls for a balance between (1) maintaining agriculture and natural environmental base and (2) accommodating industrialization and urbanization. The UCR will be a pioneer for the national challenge of agricultural-industrial coexistence.

1.2 Overall Regional Development Issues

We understand that Thailand has now four major issues of regional development:

- Seaboard industrialization,
- Development of the Bangkok Metropolitan Region (BMR),
- Regional cities development, and
- Rural development.

The UCR is not a self-contained region but rather a region open to various other regions. As such, development of the UCR cannot be discussed without reference to these four major issues of regional development, from the viewpoint particularly of regional specialization in national land use, interregional linkages and national policies for the development at local level.

1) Seaboard industrialization

Eastern Seaboard (ESB) is and will be a major engine of the national industrialization. While ESB development program is still ongoing,

major concentration of industrial investments is rapidly moving from Bangkok to its surrounding Changwats within the BMR and further to the Eastern Region, Changwat Chachoengsao and Chon Buri in particular (See Fig. 1.4). A belt extending from Bangkok toward Laem Chabang Port will increasingly attract industrial investments. It is expected that intensive public investments being made in the ESB are to be fully made use of for the development of basic, export and supporting industries. Furthermore, the seaboard development is going to expand toward the resource-rich southern region, with a new government thrust of Southern Seaboard Development.

In this regard, the issue for the UCR is whether and in what way it can benefit from the seaboard industrialization, particularly from ESB development.

2) Development of the BMR

The BMR is continuously attracting economic activities and population of the country. Share of the BMR in the national GDP has increased from 35.8% to 48.6% during the period 1975 to 1987 (See Fig. 1.5).

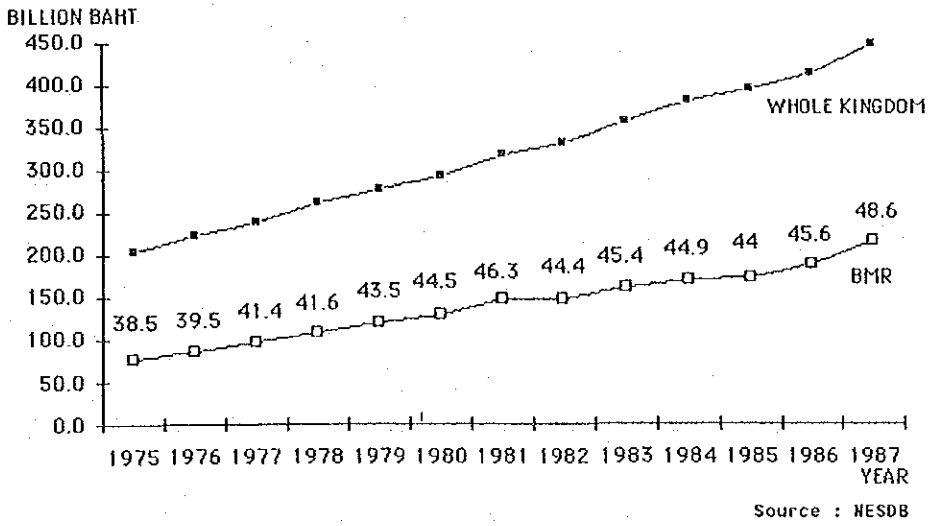


Fig. 1.5 Share of BMR in GDP

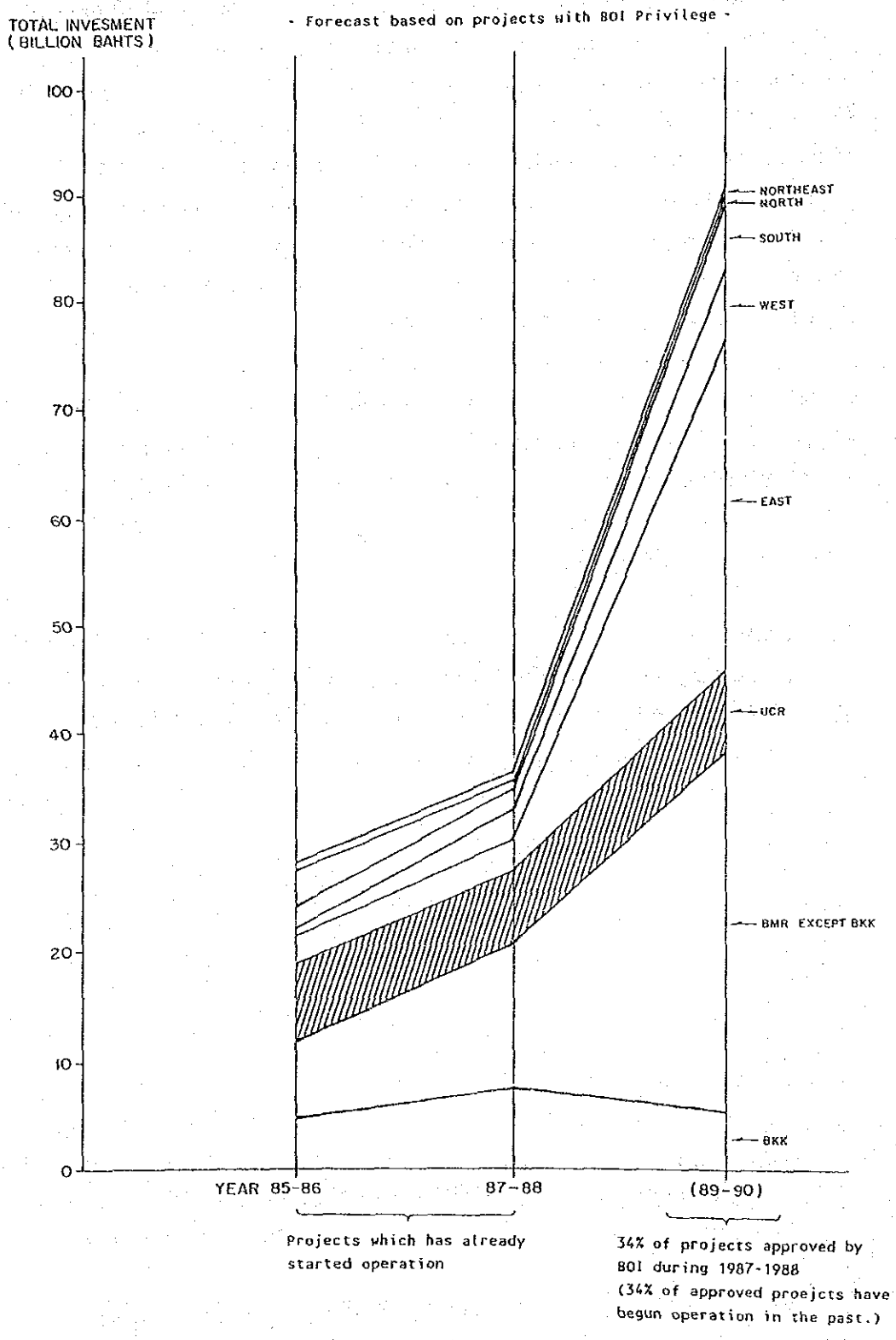


Fig. 1.4 Trend of Industrial Location in the Whole Kingdom

The concentration of economic activities and population in the BMR will continue to be a predominant trend in national development. The other cities are too small to support or absorb industrialization, while it will increasingly rely on the agglomeration of supporting industries in the BMR. There will be no drastic change in the currently centralized pattern of government decision making functions to encourage or regulate private business activities. Relatively higher levels of living amenities and urban services are other factors to further attract the people including investors, engineers and skilled workers.

We understand that the government started to move its regional policy emphasis, since the Sixth Five-Year Plan period, from the decentralization and regulation of growing Bangkok to the accommodation of growing Bangkok. This direction is consistent with the rapid industrialization now taking place.

The limited infrastructure capacity of the BMR to absorb further economic activities and population, however, will urge changes in the spatial pattern of BMR from an extensive ribbon development along a few inter- regional highways to a multi-directional development on the basis of more intensive road network within the BMR. At the same time, the increased diseconomy of the BMR will become a key factor to the decentralization of some industrial and service activities toward major regional cities.

A careful planning is necessary not only within the BMR but in the surrounding areas. The issue for the UCR is that what type of activities it can accommodate and to what extent under both short and long-term perspectives.

3) Regional cities development

Regional cities development has been a priority policy of regional development since the Fourth National Five-Year Plan period. The population of these regional cities, including not only municipal areas but whole Amphoe Muang, is all increasing at a rapid rate ranging from 2.1% to 4.6% per annum between 1982 and 1987 (See Table 1.2).

Table. 1.2 Population Changes in Regional Cities

	Annual Growth Rate (%) 1982-87
Whole Kingdom	2.0
Regional Urban Growth Centers (Amphoe Muang)	
Chieng Mai	2.6
Khon Kaen	3.5
Nakhon Ratchasrima	4.6
Chon Buri	3.3
Songkhla	3.4
Second Generation Regional Urban Growth Centers (Amphoe Muang)	
Phitsanulok	2.8
Udon Thani	1.8
Nakhon Sawan	2.0
Ratchaburi	1.0
Surat Thani	1.7
Phuket	2.0
Bangkok Metropolitan Region	2.3
The Rest of the Kingdom	1.9

Source : Department of Local Administration, Ministry of Interior

Apparently, growth pole policies have begun to work effectively in these regional cities. Encouragement of currently growing regional cities is of increasing importance.

However, this new phenomenon, namely, the simultaneous urbanization of the BMR and of regional growth poles, may bring about a result that intermediate areas like the UCR remain as mere transit areas without either a definite function or development policies.

4) Rural development

Rural development will gain continued importance particularly from the viewpoint of relatively widenining income disparity between

agricultural and industrial sectors, and between rural and urban areas (See Table 1.3). While poverty eradication will still be an issue not to be overlooked in the rural development, an increasing importance will have to be placed on the support of rural areas as the bases of national environmental management and national food supply. The national environmental management becomes feasible only when the rural people whose economy is dependent on land and water can improve their life without exhausting these natural resources. The national food supply will become more and more important as the subsistence farming will diminish under the coming labor shortage situation. In this regard, too, it depends on the possibility of rural people to sustain their life that whether the national food supply is ensured in long-term.

These emerging issues of rural development have profound implications for development of the UCR. Particularly, the issue is how development of the UCR can contribute to the natural environmental management and food supply in the national context and how it can sustain and improve the life of the people engaged in the use of natural resources and food production.

Table 1.3 Changes in Per Capita Annual Income

(Baht)

	1975/76	1980/81	1985/86
Whole Kingdom	4,186	8,916	10,022
Rural (R)	3,577	6,874	7,037
Urban (U)	7,908	15,192	19,128
Agriculture (A)	2,960	6,034	5,768
Non-agriculture (NA)	6,155	13,854	15,748
U/R	2.21	2.21	2.72
NA/A	2.08	2.29	2.73

Source : Socio-Economic Surveys

Table 1.4 Changes in GDP Per Employment

(Baht)

	1975	1980	1986
Whole Kingdom	16,435	30,199	41,180
Agriculture (A)	7,088	10,801	10,282
Non-agriculture (NA)	41,688	77,576	103,199
NA/A	5.88	7.18	10.04

Source : TDRI, Human Resource Problem and Policy Priorities of Thailand

2. SALIENT FEATURES OF THE UPPER CENTRAL REGION

2.1 Interregional Settings

From the interregional point of view, the UCR is a part of the Upper Chao Phraya Delta, a frontier of BMR economy, and a gateway to the BMR from the northeastern and northern regions.

1) The UCR as a Part of the Upper Chao Phraya Delta (see Fig. 2.1)

The UCR is situated at a place where all the river waters of the Chao Phraya Basin concentrate and flow down to Bangkok.

It has thus been at a strategic position in the rice production for the country and in the water supply and flood mitigation for Bangkok.

The UCR is dependent on the northern region for its water resources. Forest areas in the northern region are "a natural water reservoir" but they have been depleting as a result of cultivation. Many decades ago, there was no water shortage in dry season since farming activities were not possible except during the wet season without irrigation facilities and reservoirs. After the government developed Greater Chao Phraya Irrigation Project and large reservoir storages of Bumipol and Sirikit Dams, the farmers in the central region adapted themselves to a new situation and started dry season farming. The increase of dry season paddy crops created a new dry season demand for water.

The UCR currently receives water of 3,790 million cubic meters (mcm) in wet season and 1,450 mcm in dry season to irrigate 3.2 million rai and 0.7 million, respectively.

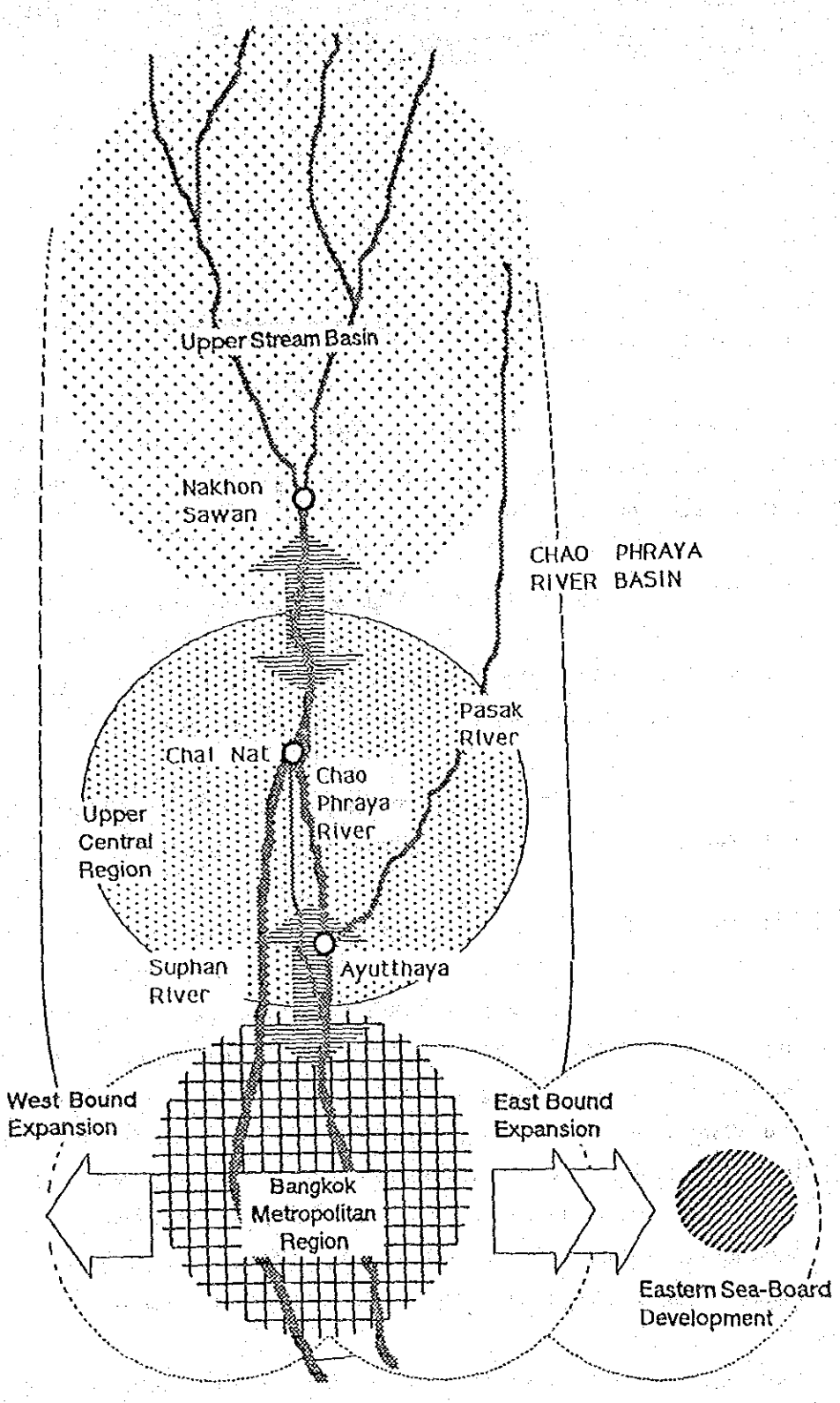


Fig.2.1 Upper Central Region as a Part of Upper Chao Phraya Delta

Aside from the water for irrigation, the water released to Chao Phraya river has to meet various needs such as river transport, pumping irrigation, the urban waterworks and domestic consumption including those in the Bangkok Metropolitan Area, and the flow to push sea water intrusion, which altogether amount to 20,000 mcm in dry season.

Due to its very flat terrain and river bed slope, the flood plane of Chao Phraya River, especially in Ayutthaya and western part of Lop Buri easily suffers from deep flood during wet season. This area is so called "Conservation Area" which is used mainly for floating rice cultivation. In accordance with the basic design concept of the Chao Phraya Project, "Conservation Area" in Chao Phraya River Delta is designated as a deterring basin for mitigation of the flood in the BMR.

2) The UCR as a Frontier of BMR

The economic space centering on Bangkok within 200 km radius is regarded as under the direct influence of Bangkok economy. The UCR is located within this space, as shown in Fig. 2.2.

Looking at the zone between 100 km radius and 50 km radius around the center of the BMR, two major urban centers of Chon Buri and Chachoengsao are located in the eastern region with another center of Ratcha Buri in the western region. In the UCR, three urban centers of Ayutthaya, Sara Buri, and Ang Thong are located. An annual population increase of 1.7% in this zone between 1981 and 1986 is substantially lower than 2.0% of the nation. This may indicate that people in this zone are migrating to the BMR. However, this tendency varies within the zone, as the eastern region shows an active economy even at the national standard.

In the zone between the 100 km and 200 km from Bangkok, major facilities in the ESB such as Laem Chabang Port, Map Ta Phut Port and a number of industrial zones are to be developed. In the western region, there are two tertiary regional growth centers of Kanchanaburi and Phetchaburi. In the UCR, Sing Buri, Chai Nat and Lop Buri are located in this zone. An interesting phenomenon is that a comparatively high

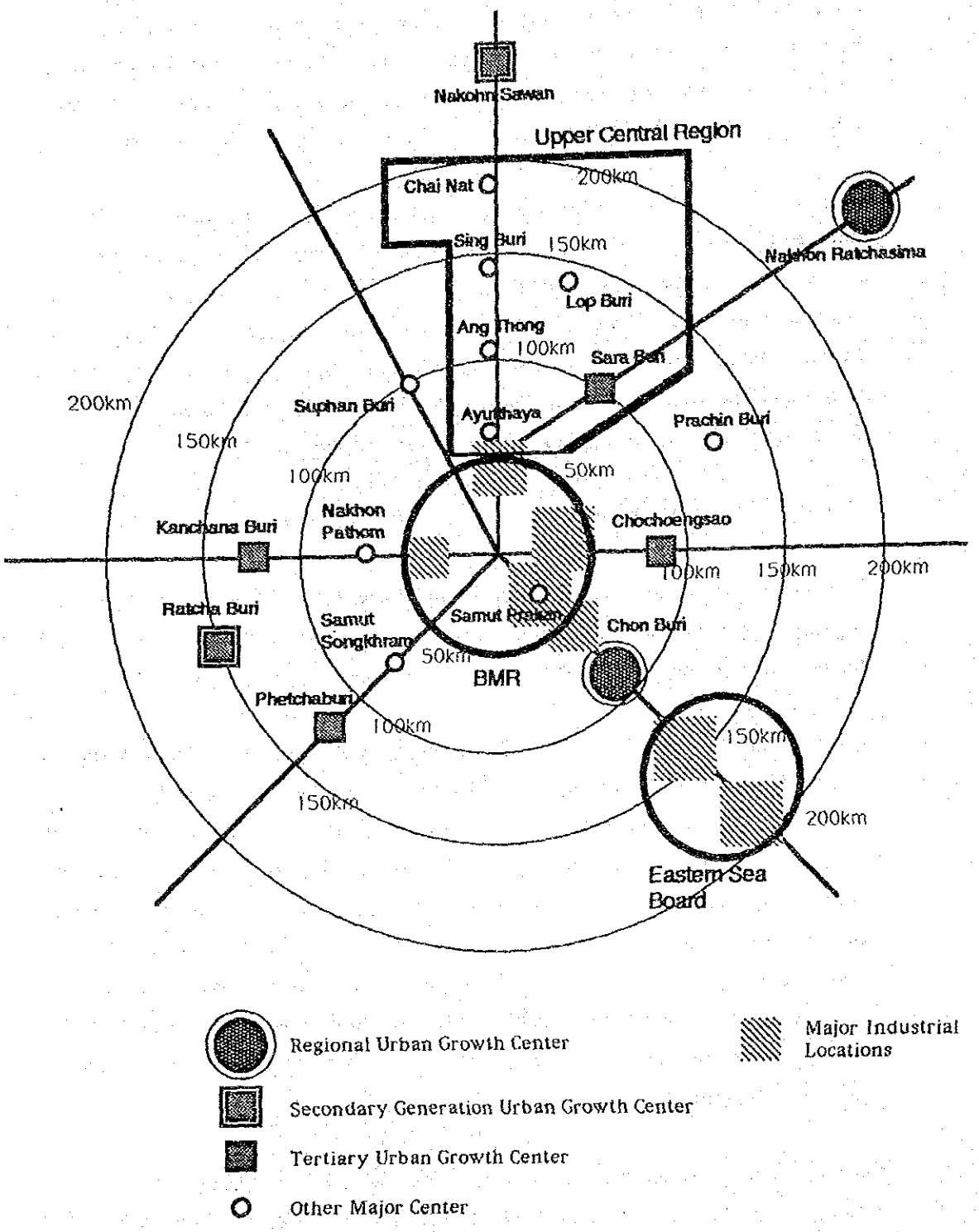


Fig. 2.2 Major Urban Centers and Industrial Location within a 200 km Radius Economic Zone Centered on Bangkok

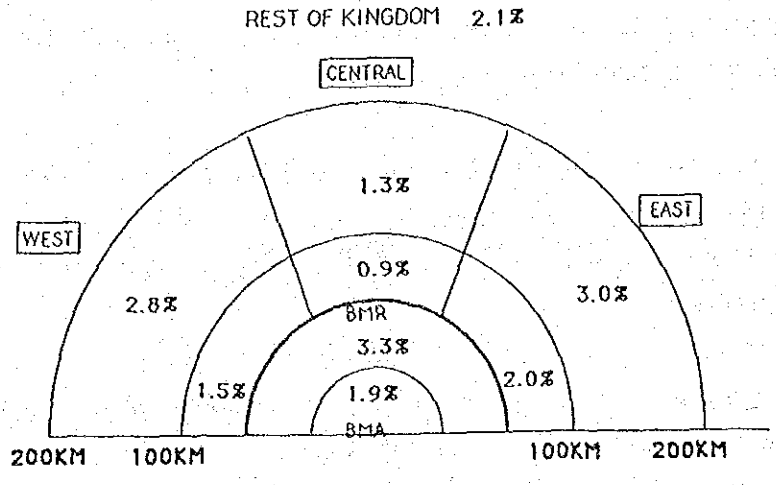
economic growth are observed in this zone, though the UCR is still an out-migrating labor supply area (see Fig. 2.3).

The zone between 100 to 200 km from Bangkok is significant in terms of potential employment opportunities and the need to stop out- migration. Remarkable economic potential of this zone is agro- processing industries.

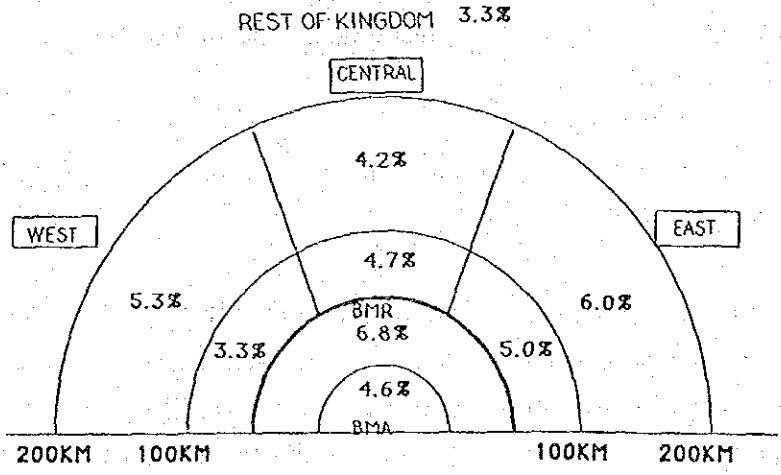
It has a good access to both a large consumption market and widely ranging supporting Industries of Bangkok and the surrounding agricultural materials supply regions. Whereas the present pattern of transportation network in the 200 km zone of Bangkok is basically radiate, circular network in the future would further encourage agro-processing activities to be concentrated and diversified on the existing accumulation.

3) The UCR as a Gateway to Bangkok from the Northeastern and Northern Regions (See Fig. 2.4)

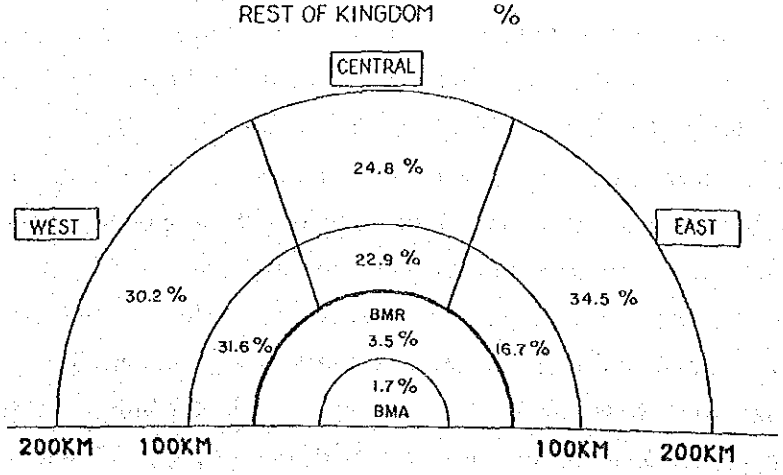
More or less 90% of the three major export crops of rice, tapioca and maize bound for Bangkok either pass through or are produced in the UCR. This region will possibly be a major transit of energy flows; the natural gas from not only Eastern Seaboard but potential onshore gas field in the northeastern region; the petroleum products depot being considered in the UCR for distribution to the BMR, the northeastern and northern regions; and the ultra high voltage transmissions from the hydro and thermal power plants in the northern and northeastern regions to the BMR. Significance of the UCR being gateway will be larger upon the realization of its direct link with the Eastern Seaboard. On the other hand, the demand of basic commodities such as foodstuff, construction materials and less technology intensive industrial products will increase in the neighbouring countries such as Laos, Cambodia and Vietnam, so that a series of regional cities on the major highways and railways to these countries will potentially play the role of supplying these commodities to meet such demand. In this regard, the gateway function of the UCR will possibly be of international importance in long term.



POPULATION CHANGES : 1976 - 1986



GDP CHANGES : 1981 - 1986



AGRICULTURAL GDP/GDP: 1986

Fig.2.3 Changes in Population and GDP and Share of Agricultuel in GDP in Greater MBR

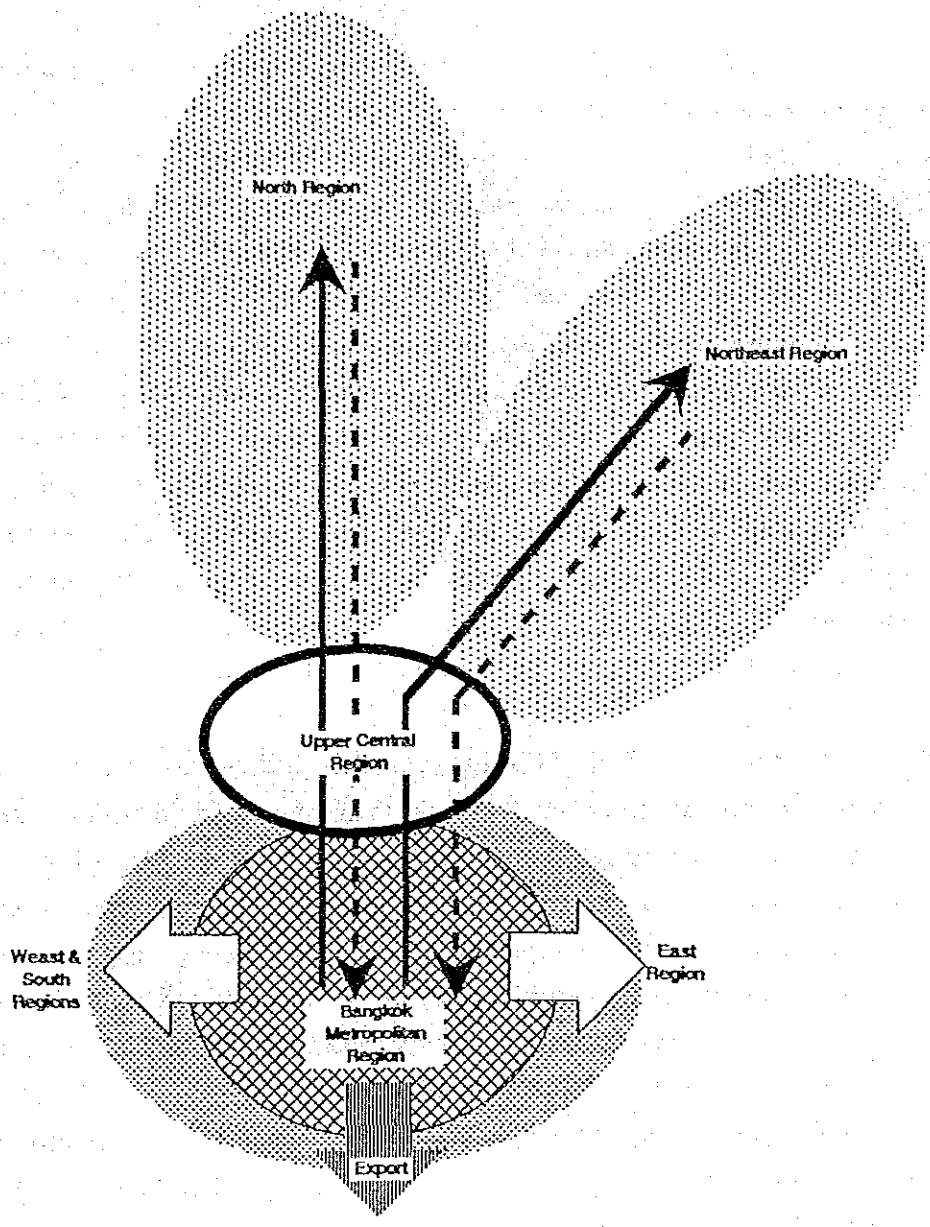


Fig. 2.4 Upper Central Region as a Gateway of the Bangkok Metropolitan Region

2.2 Resource Endowments

The UCR is endowed with four major resources: water, soil, nonmetallic minerals and manpower.

Regarding the water resource, it is needless to say that Chao Phraya Delta Irrigation is an outstandingly important asset. The irrigated area in the UCR accounts for 20% of the national irrigated area in dry season whereas the region occupies only 1% of the total national space. The region is the national center of rice production and export. Regarding the soil, the UCR is endowed with the land with good soil not only in the delta but in the upland area. According to our interregional land potential analysis, the UCR accounts for 16% of a national total area of the lands best suited to paddy, and 7% of that best suited to the upland crops. Though most of the upland areas in the UCR suffer from water shortage, these are one of the upland areas still remained with high potential for crop diversification in the country.

The UCR, Changwat Sara Buri in particular, has a large concentration of limestone which is closer to Bangkok than any other limestone deposits in the country. Thus, the region has long been a major supplier of cement and other building materials. This is a seed of long-term industrialization because of the infrastructures so far developed for limestone mining and cement industries, the agglomeration of cement related industries and the market potential in not only the growing BMR but possible demand expansion in the northeastern region as well as further neighbouring countries. Lastly regarding the manpower aspect, it should not be overlooked that the UCR is one of the most densely populated regions in the country. Except the BMR, its population density is the highest in the country but Changwat Phuket, Pattani and Chon Buri. As long as the availability of manpower is a critical factor to the international competitiveness of Thai industries, the UCR will keep attract labor-intensive industries. In addition, the UCR is endowed with relatively educated manpower. In the central region except the BMR, the ratio of the manpower with secondary education and above to the total labor force reaches 14% while the national average ratio excluding the BMR is 10%, although there is no comparable statistical figure for the UCR itself. It is supposed that the region is endowed with human resources not only in terms of quantity but quality.

2.3 Constraints

In spite of the interregional settings and resource endowments of the UCR as discussed earlier, the UCR is so dependent on external factors that it has not been able to form a self-sustainable regional economy (see Fig. 2.6). Per capita GRP of the UCR has thus been below the national average and gap has been widening (See Fig. 2.5). There are three major external factors to this.

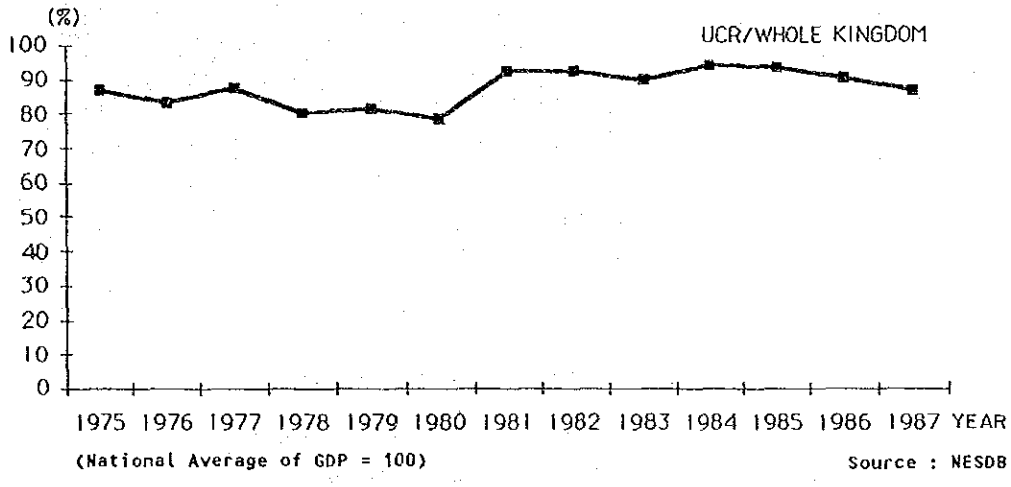


Fig. 2.5 Per Capita GDP Level of UCR

First is the natural condition. The UCR, of which economic base is agriculture, is dependent on the water from Chao Phraya River irrigation and rainfall. The water from Chao Phraya River is diverted at Chai Nat Dam by five canals and rivers: Makhamthao--Uthong Canal, Suphan River, Noi River, Chai Nat-Ayutthaya Canal, and Chai Nat- Pasak Canal. However, due to the influence of the tropical monsoon, volume of river water fluctuates a lot between wet and dry seasons (see Fig. 2.7). In addition, dry season water fluctuates a lot from one year to another (see Fig. 2.8). Rainfall is not high with only 1100 mm/year. It has high annual and seasonal fluctuations as well as high intensity. The distinct wet and dry seasons affect to the river water flow of the region.

Due to volume fluctuations, both seasonal and annual, of the water from irrigation and rainfall, agriculture and income of farmers have been unstable in the UCR.

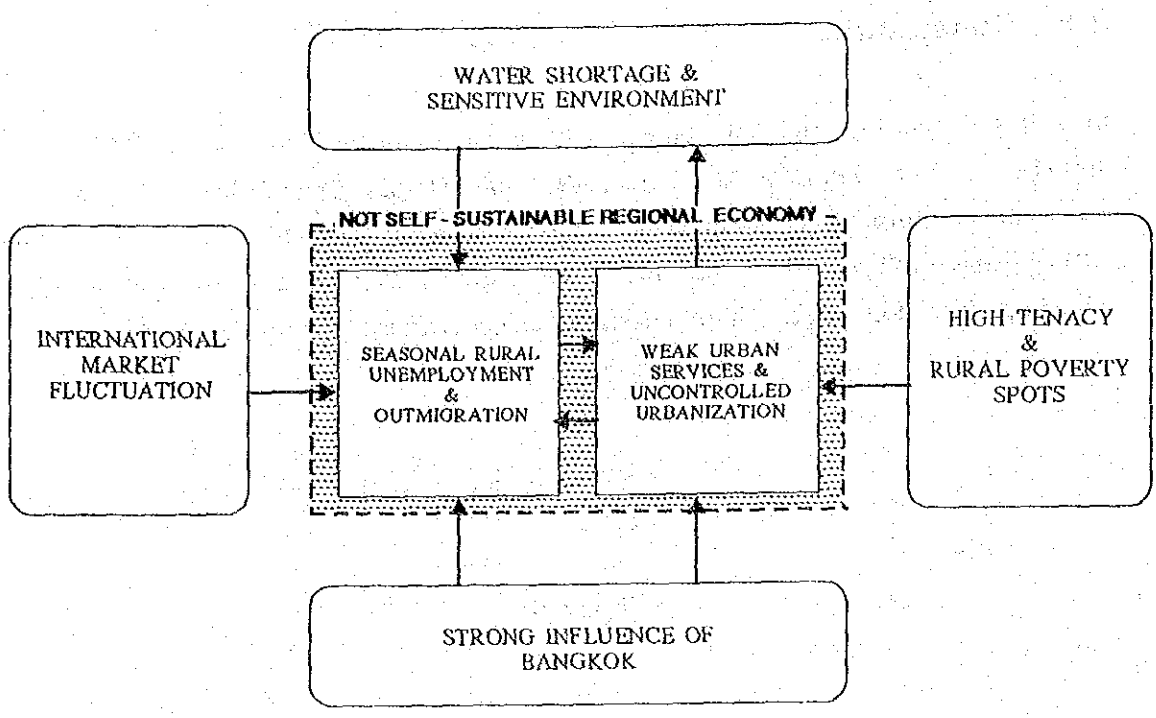
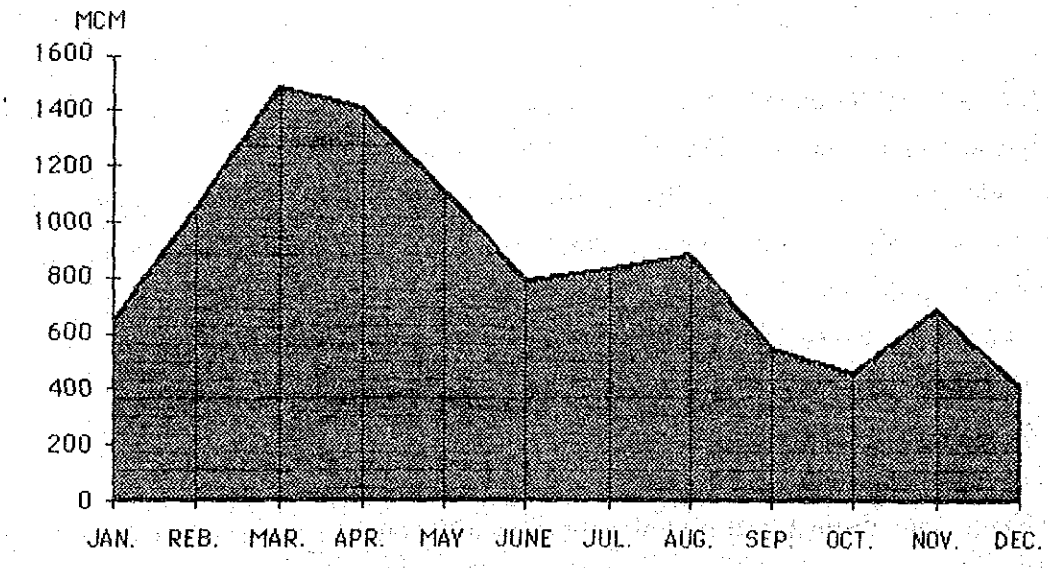
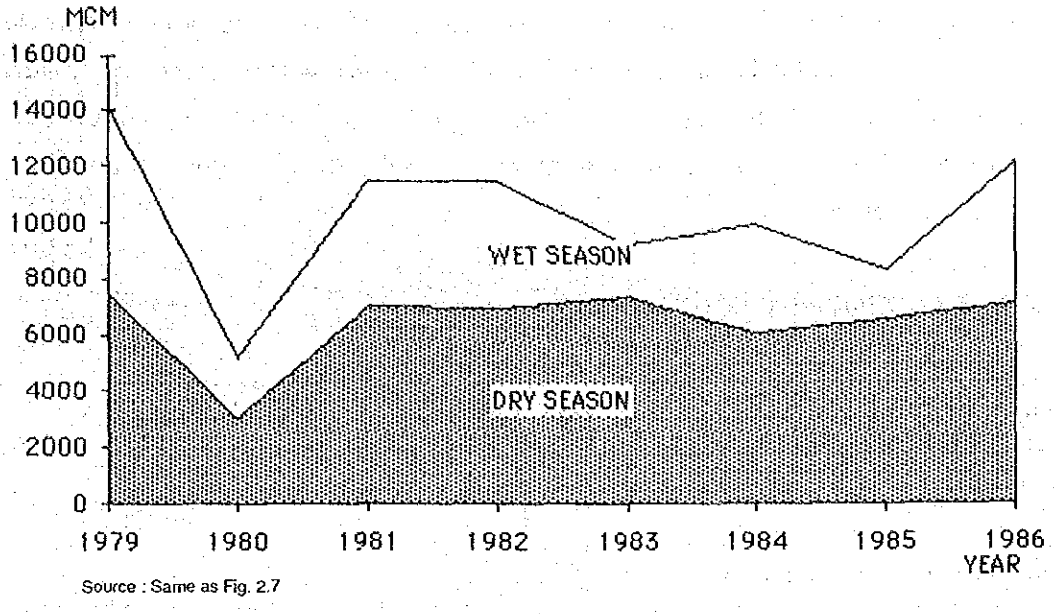


Fig. 2.6 Problem Structure of UCR



Source : Master Plan Study on the Water Management System & Monitoring Program in the Chao Phraya River Basin (Interim Report, JICA, 1985)

Fig. 2.7 Seasonal Fluctuation of Chao Phraya River Water



Source : Same as Fig. 2.7

Fig. 2.8 Annual Fluctuation of Chao Phraya River Water

The water volume fluctuation has caused a deterioration of water quality as typically observed in the Lop Buri River which collects the water drained out of irrigation canals of the east bank of Chao Phraya River. Tests show that the water from the Lop Buri River has only 2.0 - 3.0 mg/l of dissolved oxygen as compared with 6.0 - 7.0 mg/l in Chao Phraya River.

Due to the surface water pollution in the upstream area, in some communities, groundwater has to be used for water supply in dry season. Since the BMR is situated at the downstream of the Chao Phraya River Basin, water pollution from the UCR affects quality of the water in the BMR.

Decreasing forest area due to agricultural development has inhibited the natural processes by which water purifies itself. At the same time, it needs to be emphasized that urban settlement has been a source of pollution. A solution to this agricultural and urban pollution combined must be found. A balance needs to be kept between the self-purification capability of river basin and the population pressure on the basin.

Instability of UCR's agriculture is caused by another natural environmental problem, that is erosion. In the UCR, the land is covered by a thin soil layer which is susceptible to erosion due to intensive rainfall. Soil fertility is easily

deteriorated by the effects of high temperature and solar radiation. Erosion is observed in the uplands of Lop Buri and Sara Buri where potential erosion area amounts to 370 thousand rai. Such uplands are mostly agricultural, and it is estimated that 10% of the total crop area is subject to erosion in Lop Buri and 21% in Sara Buri.

Table 2.1 Potential Erosion Area

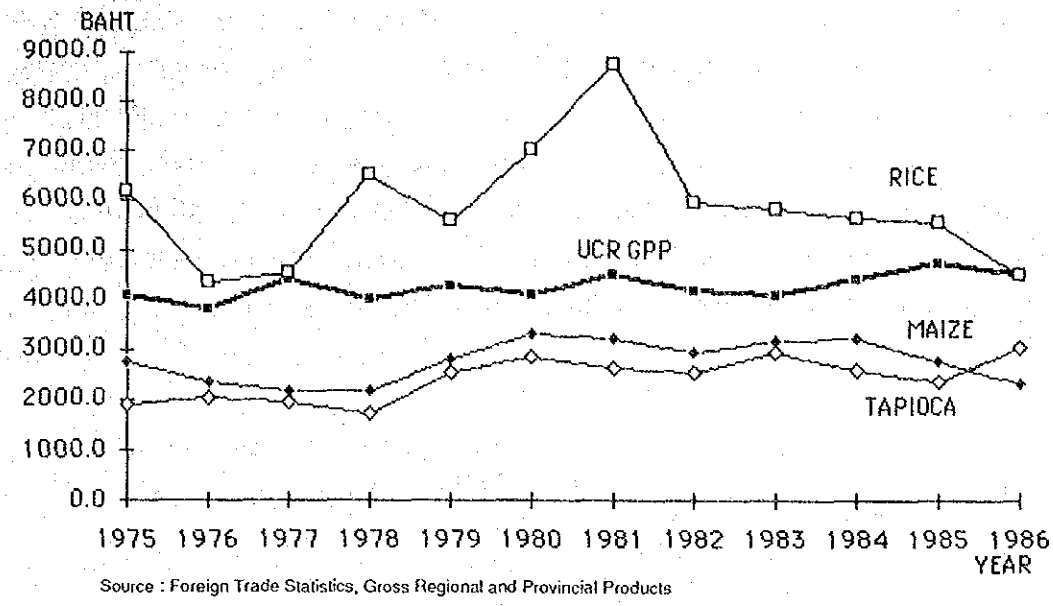
Name of Province	area (1000 rai)	(% of Province)
LOP BURI	223.3	(5.8%)
SARA BURI	147.0	(6.6%)
Potential Erosion Area Total	370.3	

Source: 1) "STATISTICAL REPORTS OF CHANGWAT" National Statistical Office of the Prime Minister, 1981
2) "Detailed soil reconnalssance soil map of Lop Buri and Sara Buri" Soil survey division, LDD

Second is the international market condition. Farm production has been increasing in most of the important crops but its value has fluctuated from year to year. This is mainly due to unavoidable changes of agricultural commodity prices in the international market. Per capita income of the agricultural sector is very much affected by fluctuating international market prices of agricultural products. Such international market price fluctuation are uncontrollable and unpredictable. This causes the Thai farmer's income to be unstable.

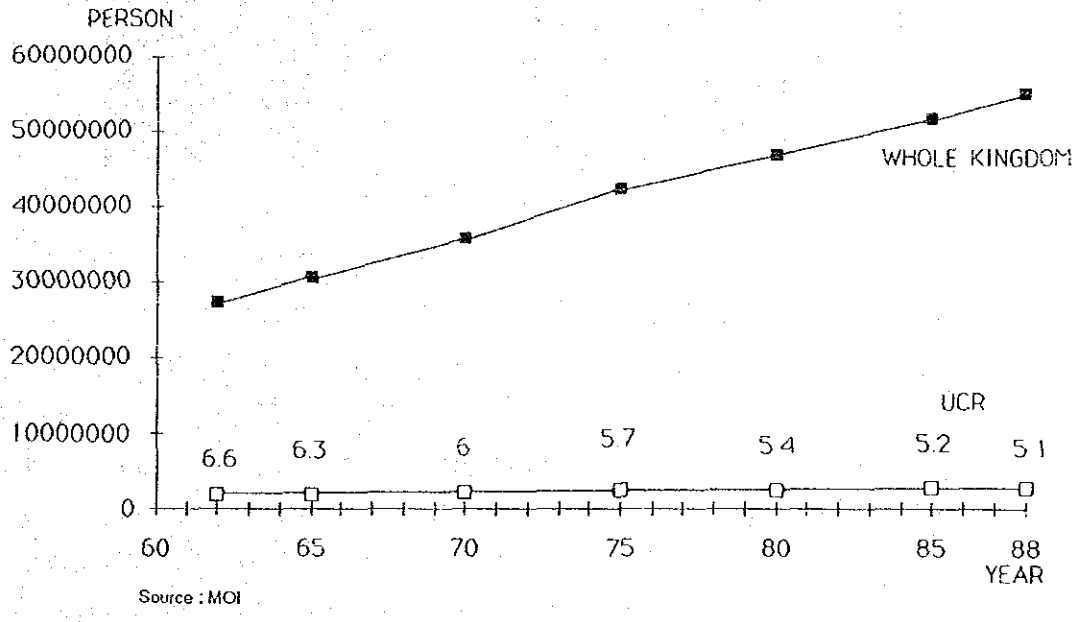
International market prices of rice and maize went down since 1981 until recently and agricultural GDP of the UCR lagged just behind this trend (see Fig. 2.9). Recent recovery is encouraging but similar cycle will be repeated unless nothing is done.

With these natural and market constraints, the rural sector of the UCR has been unstable. Although the UCR attracts inmigrants from lower income areas particularly in the northeastern region, it is still a net out-migrating region. In the past 10 years or so, the UCR has been a net population loosing area (see Fig. 2.10).



Source : Foreign Trade Statistics, Gross Regional and Provincial Products

Fig. 2.9 Fluctuation of International Market Prices and Agricultural GRP of UCR



Source : MOI

Fig. 2.10 Population Changes of UCR

As the third factor, we need to point out that the proximity of this region to Bangkok intensifies the instability and weakness of UCR's economy. Many people tend to find permanent or seasonal job opportunities in Bangkok rather than to stick on agriculture or find non- farm job opportunities within the region. Available statistics do not show the UCR-specific situation of seasonally fluctuating labor market, but Fig. 2.11 shows a considerable seasonal fluctuation of labor market in the central region.

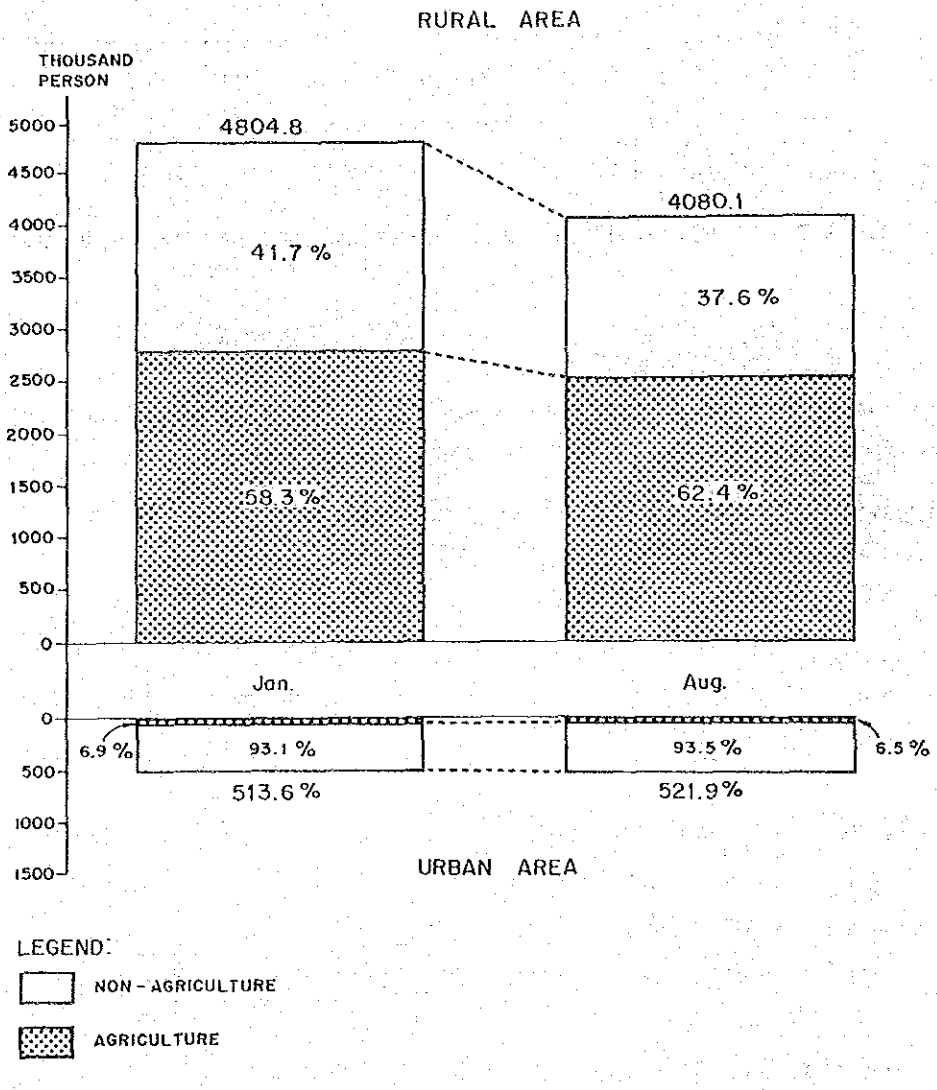


Fig.2.11 Seasonal Fluctuation of Labor Market: Central Region

According to the national statistics, almost 5 million farmers suffered from seasonal unemployment in 1987, representing almost one-third of the all farm workers. This problem is endemic to the agricultural community without dry season irrigation system; rain-fed paddy area and upland crop growing area. Although 45% of the agricultural land in the UCR is covered by the Chao Phraya Project, irrigation water is not sufficient during the dry season. Therefore, seasonal unemployment is an important issue in the UCR, as well as in the rest of Thailand.

The rural sector thus depends heavily on non-farming supplements to farming income, as it accounts for about 60% of the total net family income for the average farmer (see Table 2.2).

Table 2.2 Net Cash Income of Farm Family, 1986

Unit : Baht/farm family

Category	UCR	Central Region	Whole Kingdom
1. Net farm income	11,590	13,392	9,010
Crops	14,748	13,876	8,389
Animal	-1,263	1,650	1,869
Other	-1,895	-2,134	-1,247
2. Non-farm income	17,578	17,605	13,296
3. Net family income	29,168	30,997	22,306
4. Family expenses	29,616	30,627	19,043
5. Savings	-448	370	3,263

Source: Office of Agricultural Economics

If there are non-farm income opportunities sufficient enough to absorb surplus rural labour within the UCR, whether it is seasonal or permanent, the labour would be attracted in cities in the UCR in stead of directly migrating into Bangkok. However, it is not only the rural but the urban area that has experienced net out-migration. Unstable rural sector is mainly responsible for the stagnant urban sector, but in the UCR, its proximity to Bangkok intensifies this. Bangkok strongly pulls out not only manpower but urban service activities from the provincial areas, with a result that the UCR has not sufficiently developed its own urban service activities. Thus, urban-rural interactions are not diversified within the region.

This is partly due to a natural condition as well. The UCR is carved into pieces by rivers, canals, and flood plains, as it is the ancient delta of Chao Phraya River. Urban service areas have thus been limited and only scattered small scale urban centers exist. The lack of regional core city has been a distinct disadvantage for the industrialization and urbanization in the UCR.

In the meantime, the proximity to Bangkok causes uncontrolled urbanization and land speculation. Industrial expansion from Bangkok particularly affects Changwat Ayutthaya and causes the emergence of unorganized settlements without sufficient basic human services and appropriate land title along the many riversides. In Sing Buri, where urban activities are developing, it was recently observed that the people in such settlements work as street vendors. These settlements are increasingly found outside the municipalities and sanitary districts so that no local government can either control the resultant environmental pollution or provide public services. In Sara Buri, the land speculation by industrial dispersal from Bangkok causes the declining willingness of farmers to maintain farmlands and the difficulty for local authorities to acquire the land for public projects. Added to these situations is a high tenancy in the UCR. The ratio of tenant farmer is 20% nation-wide, but it is almost 40% and still increasing in the UCR. At the same time, a large number of absenty land owners are supposed to exist. This high tenancy with the absenty land owners has been an obstacle to encouraging the farmers to intensify or diversify agriculture and keeping agricultural profits to be used for investment within the region. This is a social issue, too.

Three these external factors of water cum environment, international market and proximity to Bangkok as well as a major internal factor of high tenancy are responsible for the stangnance of rural and urban areas.

If this situation is left alone, the UCR would become a mere transit region encroached by quick-return-oriented industrial investments in a piecemeal manner. Population would keep migrate out and presently rich agricultural asset would be devastated without viable farmers to succeed agriculture. Deteriorating environmental conditions would cause the water pollution and flood to seriously hit Bangkok.

3. OBJECTIVES AND TARGETS

3.1 The UCR in Fully Industrialized Thailand : A Vision

Development of a region is a continuous long term process. A key to this process is a vision which provides common view for the people with different interests concerning specific programs and policy directions. In view of long term implications of the interregional setting and resource endowments of the UCR, a possible goal of the UCR in fully industrialized Thailand would be the following:

National Food Supply Center

The UCR will be the most productive paddy area with intensive water use facilities in the Chao Phraya Delta. It will also be a diversified upland crop area, where food processing industries co-exist.

Sub-national Distribution Center

Being at a strategic location for goods distribution with the access not only to the northern and northeastern regions but also to the BMR and the ESB. Energy, food and industrial products can easily be distributed without going through traffic conjestion in the BMR.

New Inland Industrial Base

With concentration of water, energy, agricultural products, mineral resources and distribution facilities, both resource based and technology intensive high value added industries can be located in the UCR.

To realize this future opportunity, the following project ideas to be considered at the national level could have profound implications:

- With water diversion from the Salween and Mae Khong Rivers to the central plain; a drastic increase of agricultural production in dry season could be expected; increases of urban and industrial water for the Chao Phraya River Lower Basin could also be attained.

- A high capacity inter-city passenger train between Bangkok and Sara Buri could decrease the travel time between the BMR and regional centers. This would enable people to move and commute to and from Bangkok without any road traffic conjestion. To establish a human resource development center, such easy access to the present national center is essential.

- An energy distribution center would be located in the UCR: In view of scattered energy resources in Thailand and the increasing energy demand, a stable, secure, and efficient system of energy transport will be an increasingly important national issue. The UCR could play a strategic role as a distribution center for petroleum products, having a pipeline from the ESB refineries and distributing those products to the northern BMR and the northern and northeastern regions. It will also strategically be located in natural gas pipeline network, connecting to both onshore and off-shore natural gas fields. Stable and easily controllable fuel will readily be available in the UCR. The UCR is a power supply gateway to Bangkok with ultra high voltage transmission lines from the hydro and thermal power plants in the northern and northeastern regions.

- The UCR would also be an import and export center for neighbouring countries. Demand of basic commodities such as foodstuff, construction materials and industrial products will increase in neighbouring developing countries such as Laos, Cambodia, and Vietnam. The UCR can be one of the export bases with a well developed infrastructure.

3.2 Objectives

Having this vision in mind, the UCR needs to overcome a set of the present constraints as discussed earlier. The ultimate goal of UCR development should be to enhance the quality of life of the people living in the UCR as well as for it to best mobilize its comparative advantages for the national development. To this end, we propose the UCR to be developed under the following objectives:

1) Maintaining and Restoring Ecological Environment

In order to ensure a balanced development of agriculture and industry in the UCR, maintaining and restoring ecological environment is the most basic. In addition, this is a matter of vital importance to the socio-economic activities of Bangkok and national food supply. During the first 10 year planning period (short term), environmental maintenance and restoration is important particularly to stabilize agriculture in the UCR and to minimize industrial and urban pollution for the UCR as well as the BMR. During the second 10 year planning period (long term), the environmental maintenance of the UCR will have national importance in reserving the strategic place for national food supply and offering a space with natural environmental amenity combined with good access to Bangkok to accommodate certain environmental-oriented activities in the Greater BMR.

2) Deepening and Widening of Regional Economy

In order for the UCR to be more self-sustainable, deepening and widening of economy within the region is essential. Diversified regional economy could effectively contribute to long term and more internal-based industrialization of the country. In short term, the deepening and widening of regional economy is important in increasing the opportunities to earn income within the region through both farm and non-farm jobs and fully utilizing the agricultural and industrial resources existing in the region. Labor intensive export industries will play an important role in absorbing rural labor as long as wage level allows them to operate in the form of present production. In long term, the regional economy so deepened and widened can form industrial linkages with the ESB and diversified industrial base of the

BMR with reinforced transport link. Then, surrounding regions, including the northeastern region, and larger market of surrounding countries will further encourage the deepening and widening of regional economy so that the gateway functions of the UCR will be more diversified.

3) Human Resources Development

Thai industrialization will continuously proceed with the widening and deepening of industrial activities, associated with urbanization. Agriculture sector will also be forced to shift from extensive to intensive and integrated agriculture. Human resource development is crucial to support these industrial shifts. In short term, the human resource development in the UCR is important in enhancing the bottom of regional human resource base and ensuring basic social services, particularly the environmental maintenance and the economic diversification. With the good environmental amenity maintained and the diversified regional economy, the human resource development in the UCR will attract from Bangkok and develop additional specialized activities such as higher education, specialized training and research and development.

3.3 Targets

In accordance with the objectives above, macro targets for the UCR are set for the years 1996, 2001 and 2010 as shown in Table 3.1 and Fig. 3.1 and 3.2. Major consideration taken into account in target setting is as follows:

1) Thai economy is fast growing now at more or less 10% per year. In view of the expected decline of aggregate investment efficiency in long term (as has been observed in many fast growing countries) however, average GDP growth rate will be decelerated in long term. A recent medium term macro-economic projections such as those by the Energy Policy Office/TDRI and the World Bank indicate growth rates of 4.6% to 7.4% during the period 1988 to 2001.

Having these in mind, the national economic growth is assumed at 6.5% for the period 1987 to 2010.

Table 3.1 Macro-Economic Targets

		1987	1996	2001	2010
Population	Population (thousand)	2,741	2,932	3,134	3,459
	Annual Population growth rate	1.1%	0.7%	1.3%	1.1%
	% urban population	27.1%	29.3%	29.7%	31.0%
Production	GRP (million baht at 1987 price)	49,516 (100%)	82,827 (100%)	110,869 (100%)	189,061 (100%)
	Sector-mix agriculture	20%	16%	14%	11%
	Mining & munufacturing	26%	28%	30%	32%
	Services	54%	56%	56%	57%
	Annual GRP growth rate	3.5%	5.9%	6.0%	6.1%
	Per capita GRP (baht	18,065	28,253	35,377	54,653
Employment	Employment (thousand)	1,482	1,605	1,694	1,903
	Sector-mix agriculture	48%	40%	36%	30%
	Mining & manufacturing	13%	16%	18%	22%
	Services	39%	44%	46%	48%

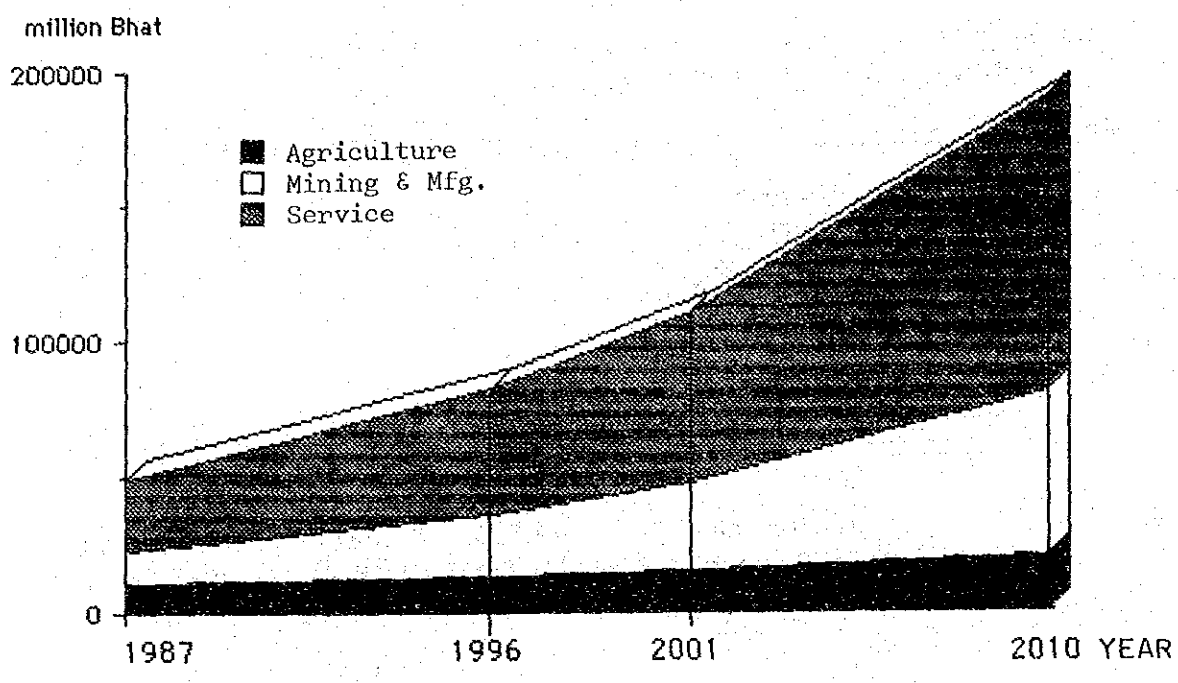


Fig. 3.1 GDP by Sector

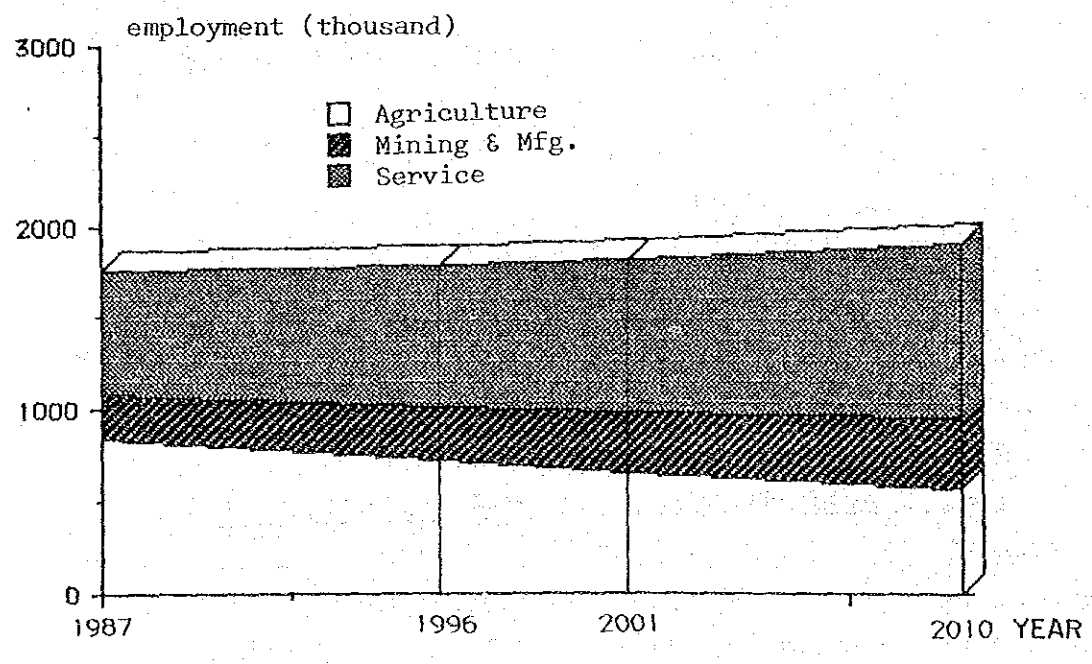


Fig. 3.2 Employment Structure of the UCR

2) Per capita GRP of the UCR is lower than the national average by 86.5% in 1987, and the gap has been widening. Toward the year 2010, it is targetted that per capita GRP growth of the UCR will be accelerated up to that of national average growth rate, which will more or less be 5%

3) Agricultural GRP of the UCR is targetted to grow at a rate between a maximum level of 4%, which is made possible without farmland expansion by a substantial input of new water to the UCR through national water resource development projects such as diversion of Mekon River Water to the Chao Phraya Basin, together with drastic changes in agricultural pricing policies, and a minimum level of 1% which is necessary to maintain per capita agricultural GDP at least at the present level.

4) Industrial GRP of the UCR is targetted to grow at a rate between a maximum level of 8%, which has recently been recorded in Changwat Pathum Thani, a northern part of the BMR next to Changwat Ayutthaya and Sara Buri, and a minimum level of 5% which is a growth rate of the industrial sector of the UCR supposed to have been realized during the 1980's without exceptionally large input of electronics industry during that period.

5) Service GRP will grow in response to the growth of productive sectors and maintain a rate necessary to absorb, together with industrial sector, the surplus agricultural labor within the UCR.

6) Sectoral productivities are targetted to increase so as to attain the targetted aggregate growth rate of per capita GRP. Productivities are estimated at moderate side because the farmers with nonfarm side jobs and the fluctuation in employment-mix between wet and dry seasons will continue to exist.

7) Population is targetted to grow at a rate of 1.0%. This will enable the target per capita GRP to be attained. In this case, labor participation ratio will decline slightly from 58% at present to 55% in the year 2010 because of the combined effects of changing population age structure, larger entry into eductation and declining unemployment.

4. SPATIAL DEVELOPMENT PLAN

4.1 Macro-Spatial Structure of Central Region

The regional development of the UCR is subject to several external factors and activities in the BMR and its related areas.

1) Urbanization in the BMR

Urban growth is rapid in the immediate surroundings of Bangkok. Economic activities of Bangkok are expanding year by year, and its urban space has extended over 30 km. radius zone, though vast green areas remain outside the 30 km radius zone. Urbanization takes a form of the ribbon development along three major corridors to east, west and north.

Industrial activities are spread beyond the reach of even 50 km. along these three corridors. Being led by this industrial dispersal, urbanization is likely to spread beyond 50 km. radius zone. However, our preliminary analysis shows that even given a four-fold increase in the economy of the BMR by 2010, the size of a necessary space to accommodate this economy could be only half of the present area of the BMR. Given sufficient infrastructure to ensure the shift in spatial pattern of urbanization from a ribbon type to a more all round type, the BMR does have sufficient space to accommodate future growth. However, the UCR will suffer from uncontrolled urbanization in its southern part, Ayutthaya and Sara Buri in particular.

2) Industrial Development of the ESB

Because of the impact of the ESB project, the trend in industrial location is and will be strong in the ESB as well as the BMR. These regions will certainly lead industrialization of Thailand.

The area between Bangkok and the ESB has great potential with the vast land still available for new industrial investments. Chon Buri, a primary regional growth center, and Chachoengsao a tertiary regional growth center, will function as service centers.

Another notable expansion of industrial investments is observed along the northern corridor at the fringe of the BMR, or about 50 km. away from the center of Bangkok. Existence of the international airport here has encouraged industrial development. The southern part of the UCR has faced considerable pressure of industrialization. An issue is how to accommodate this expansion to benefit the region.

3) Major Projects to Bring about Changes in Physical Structure

Two projects which affect the regional structure in the UCR as well as the BMR have been committed, i.e., the outer Ring Road and the new rail link between the UCR and the ESB.

(1) The Outer Ring Road in the BMR

The outer ring road, the eastern part of which has been committed for construction, is expected to remove a number of constraints to future urban expansion. Furthermore, it will change major traffic flows by providing direct links between the northern and northeastern regions and the ESB and southern region. The UCR will also be benefited from this link with the BMR and a closer connection with the ESB with ports and basic industries.

(2) New Rail Link between Kaeng Khoi and Klong Sip Kao

This project, which has been committed, will assure a short-cut link between the ESB and northeastern region. This rail link will be significant to the national railway network, and provide benefits to the UCR as well.

Because the economy of Bangkok is so large, most of the regional economic activities are Bangkok-oriented. However, they maintain

limited inter-regional economic relations. This has resulted in a radial pattern of highway network at present. From the macro-spatial point of view, an inter-regional road network should be reinforced so as to more closely connect one regional urban center with another in order to stimulate the regional economy in this 200 km. zone as a whole.

It is in this context that the UCR is hoped to form a self-sustained economy by making use of characteristics in the central region. The UCR is proposed to be specialized in the following nature :

- Food production center being within the Chao Phraya Delta and best accessible from the BMR.
- Sub-national center of goods distribution and related industrial activities for the BMR, the northeastern and northern regions as well as for the ESB.
- A new industrial base to support and be linked with industries of the BMR and the ESB, with the agro-processing and distribution activities as its seeds.

A proposal of the spatial structure is shown in Fig. 4.1. The main considerations underlying this structure are three folds:

- To assure effective links between major industrial potential areas and the ESB.

  For this end, a new link between the UCR and the ESB is proposed : Lop Buri - Tha Rua - Chachoengsao - Chon Buri - the ESB.

- To expand the land usable for further development by providing an arterial road network.

  Future urban expansion pattern has to shift from the present ribbon type to a more intensive type.

- To propose a concept of "Suburban Agro-Industrial Belt"

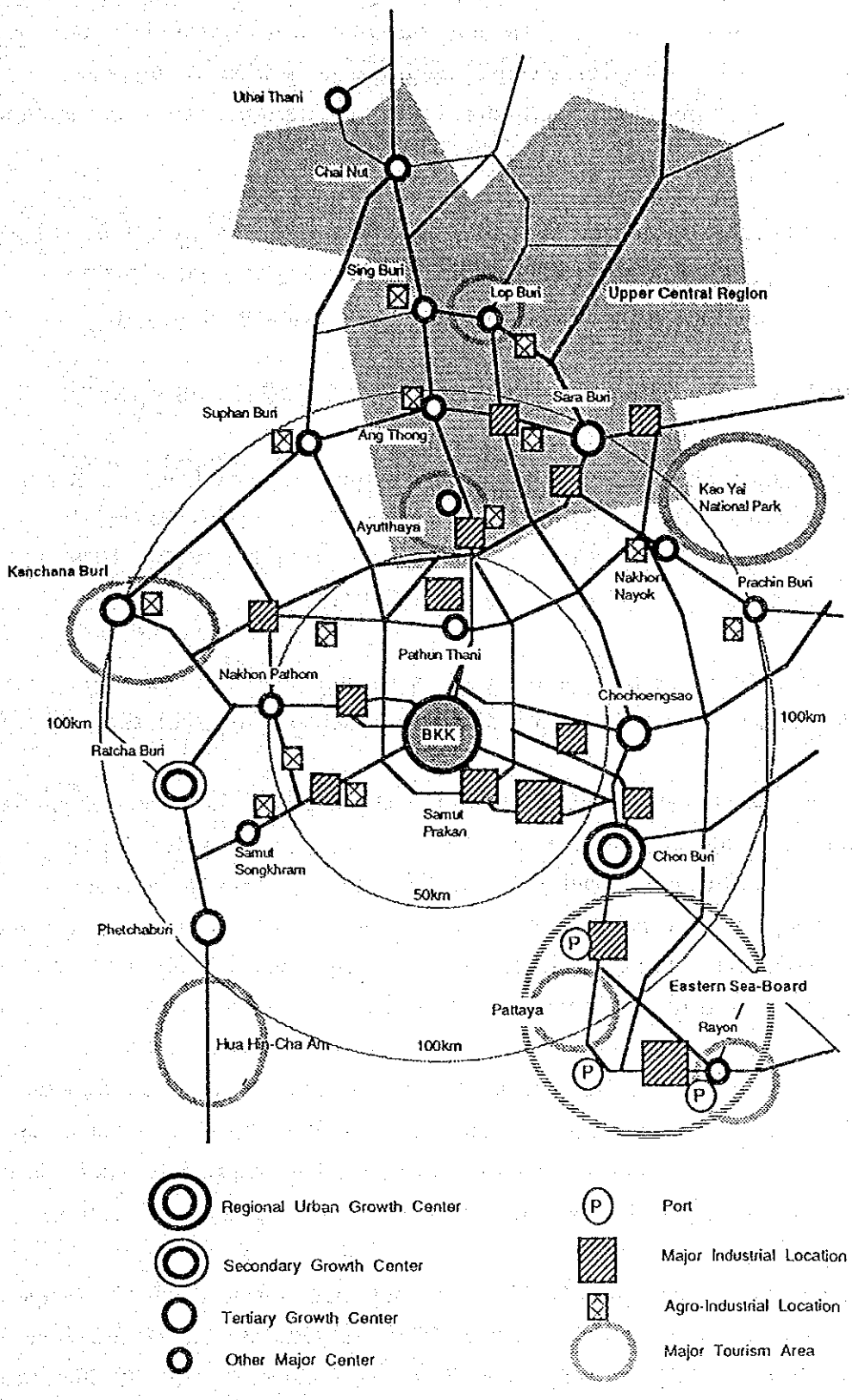


Fig. 4.1 Macro-Spacial Framework (Highway) Integrating Bangkok and Its Related Economies

By strengthening the links between major urban centers in the 100 km radius zone, an agro-industrial development axis may be created. This belt involves centers with a wide variety of agriculture-related activities, such as agro-products distribution and agro-processing :

Phetcha Buri - Ratcha Buri - Kanchana Buri - Suphan Buri - Ang Thong - Tha Rua - Sara Buri - Nakhon Nayok - Prachin Buri - Chon Buri - Laem Chabang Port (as a gateway of export).

4.2 Land Use Framework for Development and Conservation

The land use framework is proposed for the purpose of maintaining and efficiently utilizing natural environment and resources, based on the following assessment. Compared with other regions, land use of the UCR has the following distinct characteristics (see Table 4.1) :

1) Almost 90% of the area of the UCR is suitable for cultivation while about 50% of the area of the whole Kingdom is suitable for cultivation.

2) About 75% of the area of the UCR has already been cultivated. Compared with other regions, there is very little space remained for further expanding agricultural land in the UCR. Taking also into account a high population density which is almost double of the national average (excluding the BMR), intensified and diversified use of land is inevitable in the UCR.

3) The most conspicuous land use of the UCR is paddy. The area with the soil best suited to rice accounts for almost 50% of the whole area of the UCR, while it accounts for only 10% in the Whole Kingdom. The ratio of irrigation coverage is also by far higher than the national average.

4) On the other hand, the UCR lacks the sufficient forest area. It occupies only 2% of the area while about 30% of the national land is still covered with forest. Land conservation, including erosion control, is important for the purpose of stabilizing agriculture of the UCR.

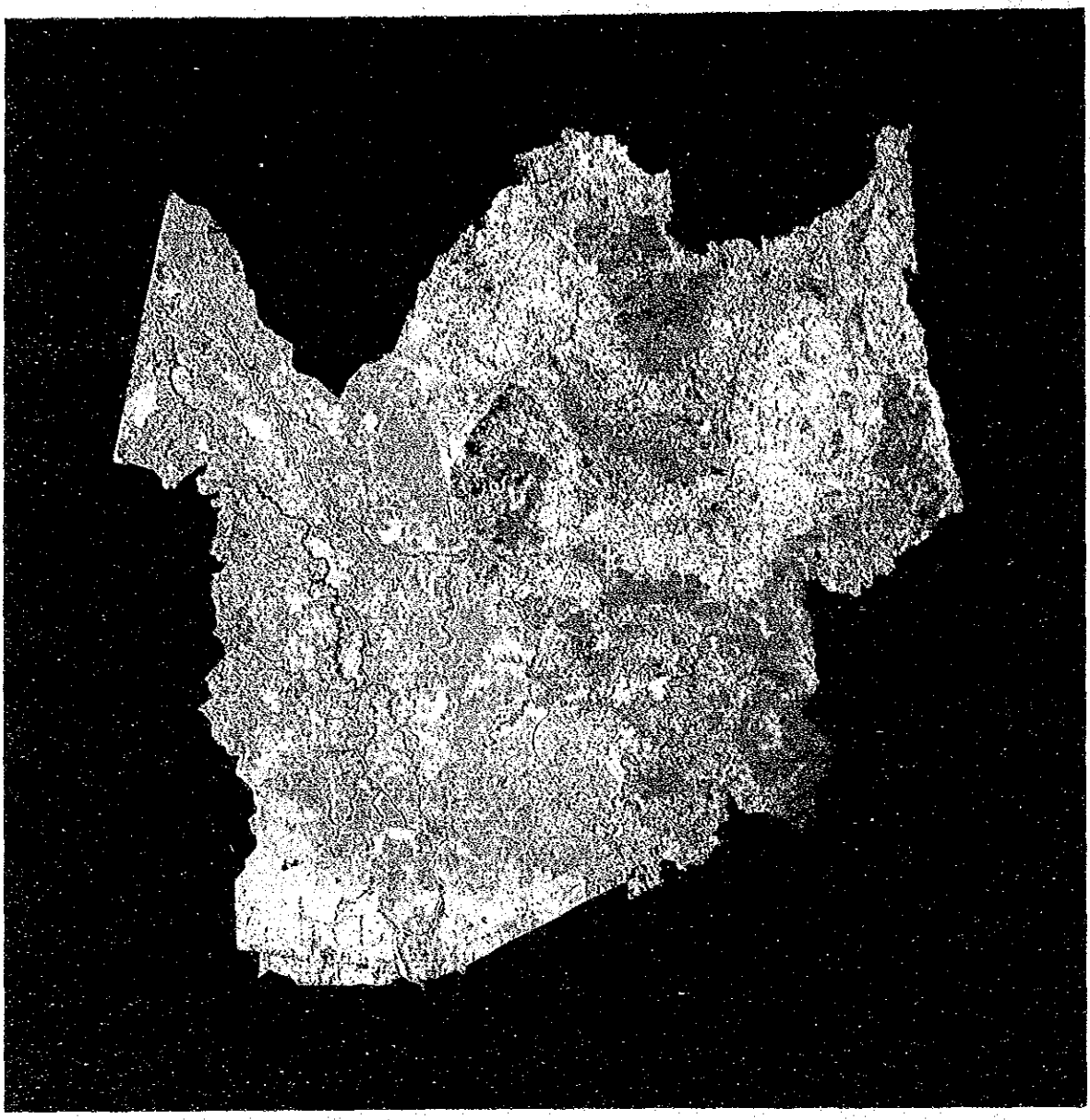
Table 4.1 Comparative Nature of Land Use of UCR

	Whole Kingdom	UCR	The Rest of Central
Total area	100.0 (320,697)	100.0 (10,371)	100.0 (54,567)
Area suited for cultivation, of which best suited to:	53.2	87.5	55.4
Paddy	9.6	47.1	8.8
Upland crops	3.2	5.9	7.4
Tree crops	1.2	0.0	1.5
Area used for (1986):			
Farming	41.4	74.4	39.1
Paddy	23.1	46.9	18.0
Other farming	18.3	27.5	21.1
Forest	28.6	2.3	28.0
Unclassified	30.0	23.3	32.3
Irrigated area (1986)	6.2	35.3	14.2
Area used for farming / Area suitable for cultivation	77.9	85.1	71.5
Irrigated area / Area used for farming	14.9	47.4	35.8
Population density (1987), person per sq.kms	90	165	84

Note : excluding the Bangkok Metropolitan Region

Within the UCR, land use may be classified into two major categories: the Chap Phraya Delta and the Upland Area, as shown in Fig. 4.2 which is identified through a land-sat image analysis.

The most suitable and potential agricultural land use in the Chao Phraya Delta is growing paddy due to its soil and hydrological conditions. In other words, only paddy is suitable for this area, unless water control measures for both irrigation and flood protection are provided. Since the UCR is endowed with the most productive paddy field in the country, the land used for paddy should be maintained as the major land use in the delta. This implies the need to establish a policy for agricultural land use. The land suitable only for paddy is about 47% of the total area of the UCR as shown in Fig. 4.3



Notes: Two major categories of land use in the UCR can be seen by this image: the Chao Phraya Delta where rice fields (colored with yellow) are predominant, and the Upland Area which tree crops (dark blue) and forest (light blue) cover.

This image was processed with the "Most Likelihood Method", using the LANDSAT-5 TM data on December 9, 1987. Each pixcel (30 m x 30 m) was geometrically corrected so as to be identical to the 1/500,000 topographical map.

Fig. 4.2 Land Use Classification in the UCR : Chao Phraya Delta and Upland Area

A number of upland crops are suited to the upland areas, but soil conservation measures are necessary to maintain stable production in long term. At the same time, given water resources development with appropriate technology in the upland area, the production and diversification of upland crops may be greatly improved. The area suitable for the upland crops covers about 41% of the whole UCR as shown in Fig. 4.3.

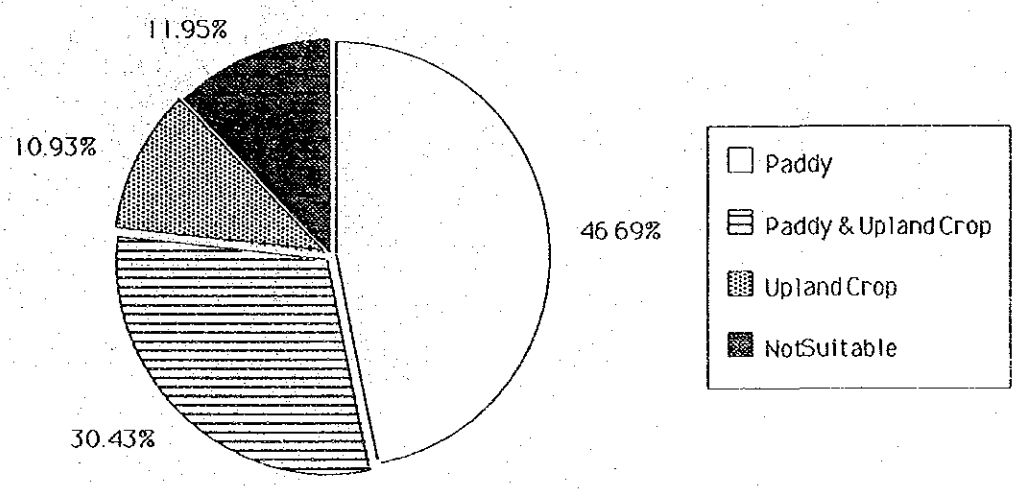


Fig. 4.3 Composition of Land Use Potential in the UCR

The land where no agricultural activitie is suitable accounts for about 12% of the total area of the UCR. This land should be preserved or reforested to maintain the water retaining capacity in the UCR.

Based on the assessment of the land capability as mentioned above, four land use categories for land management can be depicted as shown in Fig. 4.4. Land use for in each categorized area is recommended as follows:

(1) Development Area in Delta: Zone 1

Agricultural intensification and diversification should be encouraged in this area. Expansion of the second crop

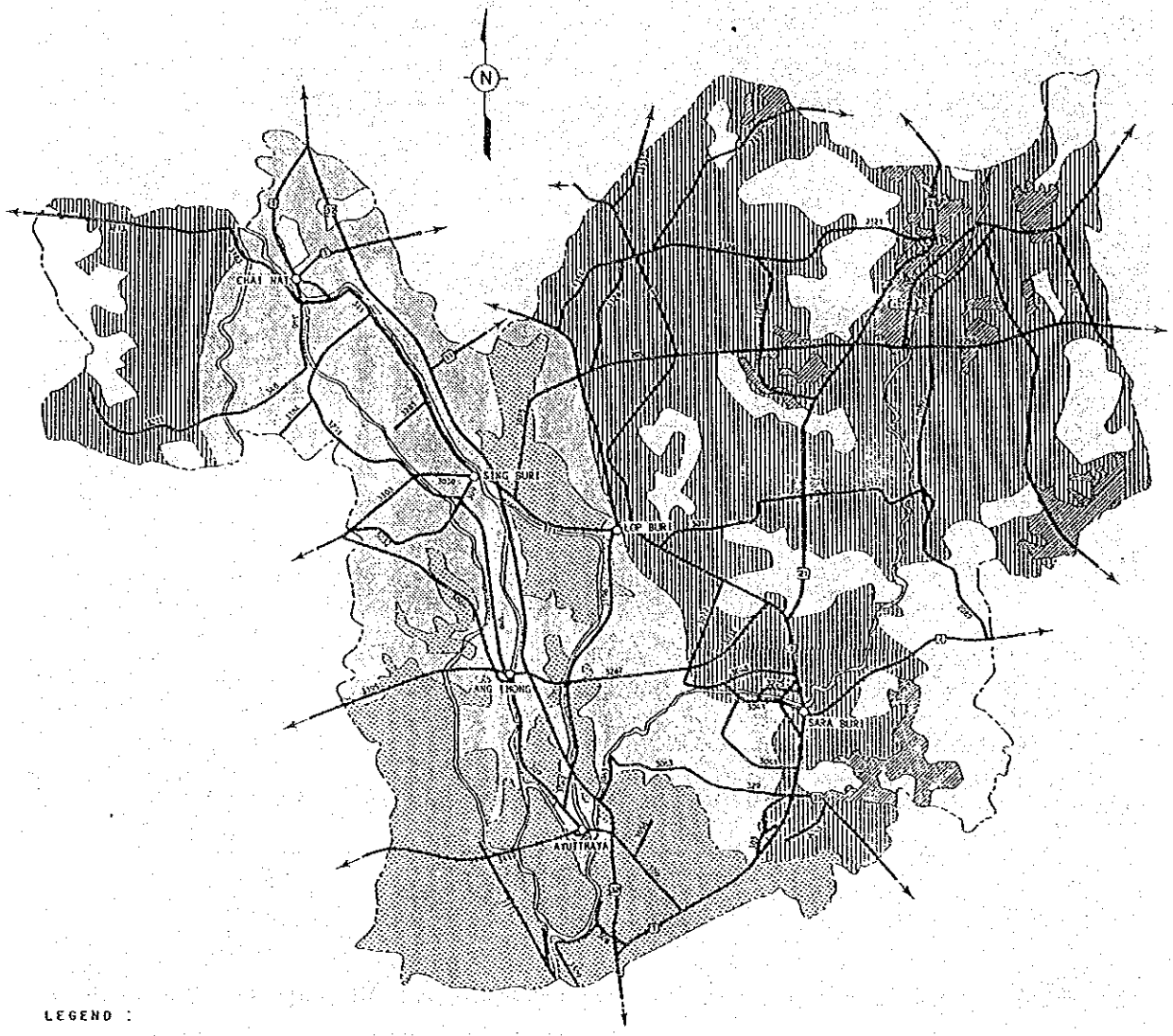


Fig. 4.4 Land Use Framework

production may be emphasized through an efficient use and allocation system of irrigation water. Small and medium scale horticulture development on the river bank, where soil is suitable for upland crops, can be introduced.

(2) Conservation Area in Delta: Zone 2

Conservation of paddy fields is the basis of flood control. In addition to this, the development of fish pond and small animal feeding can be introduced to diversify the income sources of farmers. Land use changes from paddy field to those to other than paddy field should be made careful, taking into account possible negative environmental impacts.

(3) Development Area in Upland: Zone 3

Diversification of upland crops, mixed cropping and horticulture development should be encouraged, associated with improvement of soil conservation and water resources development. Together with forage production, livestock should also be promoted.

(4) Conservation Area in Upland: Zone 4

Land rehabilitation and soil conservation for appropriate agricultural activities are necessary especially at the foot of hills and the steep slope areas. Forestation with pasture and livestock raising can be introduced. Maintenance of soil fertility and controlling of the Soil moisture are important for stabilizing the agricultural activities in this area.

(5) Preservation Area: Zone 5

This area should be designated to preserve the environment as it is or to rehabilitate the environment as it should be. Major roles of this area are to retain water resources, preservation of valuable flora and fauna, prevention of natural disaster and soil erosion.

Regarding the industrial land use, a dual task of promotion and control of industrial location must be undertaken to minimize various conflicts between environment and industrialization. For this end, a scattered pattern of industrial location is never recommended because it merely leads to the dispersal of environmental problems. Instead, industrial parks with sufficient buffer green or industrial development zones should definitely be designated in the area of the following types.

For industrial investment control:

- Area with limited potential for agricultural production
- Area without flood mitigation function
- Area being sufficiently far from water intakes
- Area meeting with the requirement of environmental policies

For industrial investment promotion:

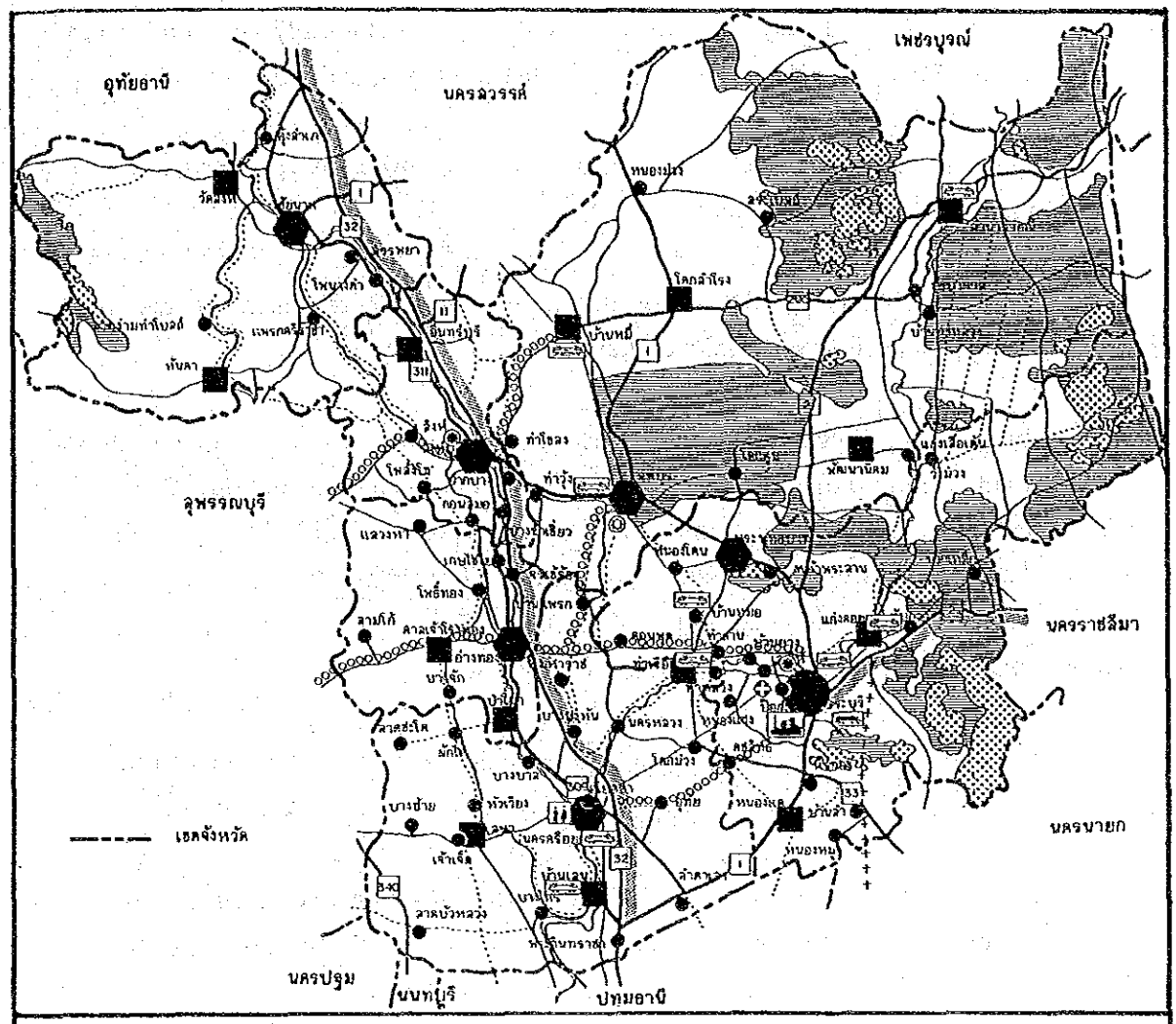
- Area being sufficiently close to urban service centers
- Area with infrastructures such as water, transportation, electricity and telecommunication

4.3 Human Settlement Framework

The Department of Town and Country Planning (DTCP) has proposed a regional development plan for the UCR. In this plan, the hierarchical system of urban centers has been studied, taking into account the urban functions to be strengthened in accordance with the hierarchical system, as shown in Fig. 4.5. In this system, Sara Buri has been identified as the primary regional center followed by the 6 secondary urban centers of Chai Nat, Ang Thong, Sing Buri, Lop Buri, Phraphutthabat and Ayutthaya, and the 14 tertiary local centers, including Tha Luang and Kaeng Khoi.

The DTCP's study is appreciable enough in the sense that it is in line with the human settlement system which have so far been formed in the UCR.

In the context of the development strategies for the UCR toward the year 2010, we propose the following interregional factors to be incorporated in this system:



LEGEND :

Land Use
- preservation boundary
- conservation boundary
- development boundary

Commodity System
- The central community 1
- The central community 2
- The central community 3
- The central community 4

Development Activities
- Regional industrial center
- Tourism center
- Public health service center
- Administration center
- Transportation and marketing center
- Agricultural production market

Transportation Network
- National highway
- Provincial highway
- Other agencies road
- 4 lanes highway widening project
- Improvement project
- Improvement project
- Construction project
- Railway
- Railway construction project
- Railway station
- Inland waterway

Sources : Office of Town and Country Interior Ministry

Fig. 4.5 Urban Function of the UCR Identified by DTCP

- Interregional gateway functions of the UCR particularly for the access to the ESB as well as for regional distribution function.

- Potential agro-industrial belt surrounding the BMR at a distance of about 100 km from Bangkok.

- Need to effectively discourage the ribbon type development of the BMR from penetrating into the UCR.

We propose the following human settlement framework as it integrates these interregional factors with the basic human settlement system of the UCR which has historically been formed on the basis of two distinct agricultural areas; Chao Phraya Delta Area and Upland Area (See Fig. 4.6).

Major points underlying this proposal are two folds:

- To strengthen regional growth cities which are capable of playing leading roles in boosting the industrialization in the UCR; and

- To form a sub-regional human settlement structure centered on the higher ordered centers so that all peripheral rural centers may be linked with the central urban service functions.

1) Strengthening of Regional Growth Centers

Sara Buri which has been recognized as a "Regional Urban Growth Center" in the National Plan, may be developed as one of the primary regional centers, or a "New Industrial Core". This center, in 2010, will be a city with about 142,000 population, which is almost equivalent to that of Nakhon Sawan at present. Emphasis should be placed on the strengthening of its marketing, distributing, and industrial capabilities for agro-products and local resources, taking into account its another function as a gateway to/from the northeastern region, the BMR and the ESB.

Ayutthaya is another potential growth center with tourism and industrial supporting functions, and will increase the importance of these functions much more in future than it is recognized at present.

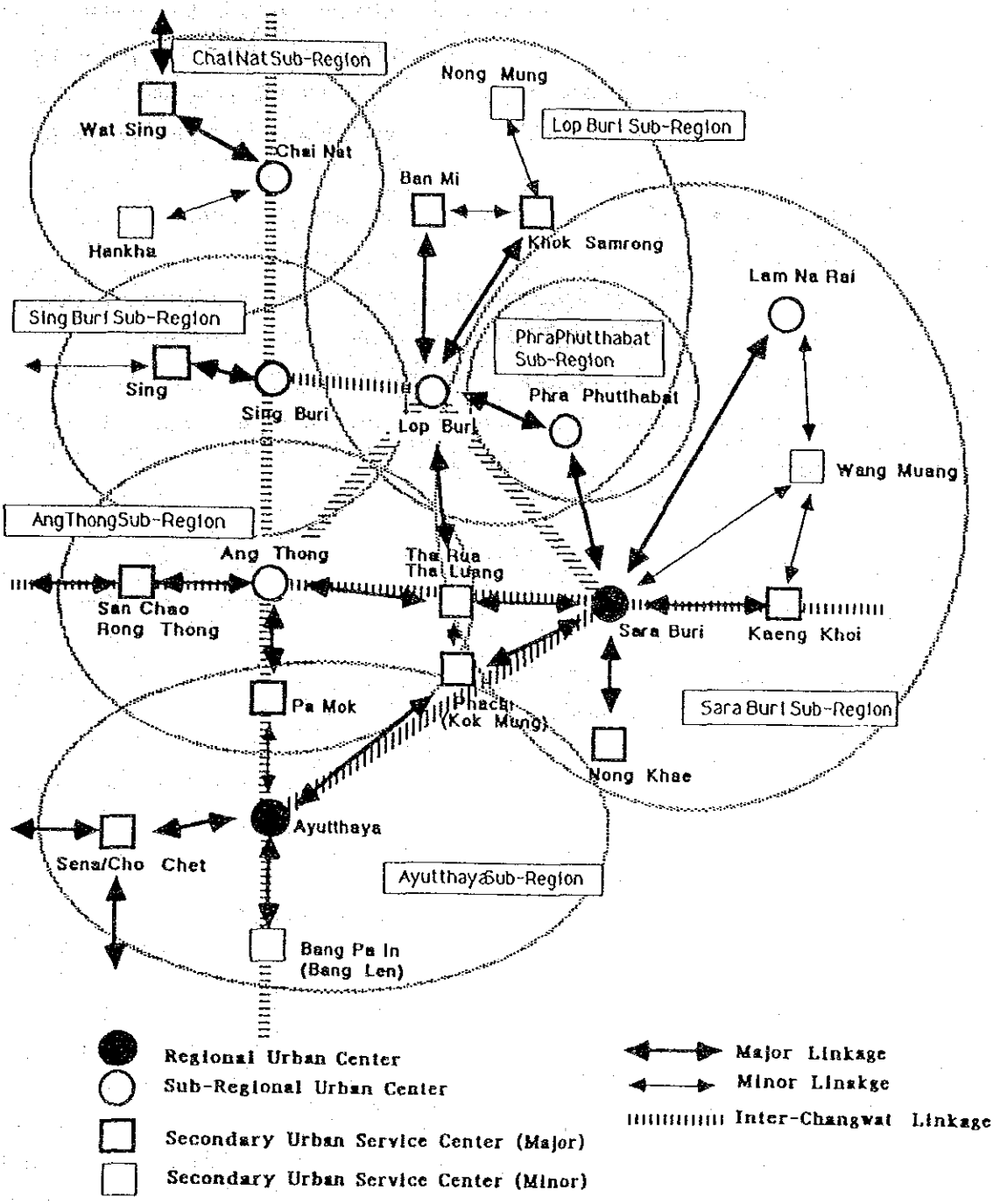


Fig. 4.6 Concept of Human Settlement Center Hierarchy

Our projection shows that the municipal population will double in 2010, or about 130,000, but it would be impossible to accommodate this population in a limited area within the present municipal boundary. In order to put forth proper urbanization while promoting its particular urban amenities for the above purpose, a thoughtful land use management of the area involving the vicinities are highly required.

2) Formation of a Sub-regional Human Settlement Structure

The UCR consists of seven sub-regions with human settlement systems centered on the major urban centers, namely, Sara Buri, Phra Phutthabat, Lop Buri, Ayutthaya, Ang Thong, Sing Buri, and Chai Nat. The characteristics and the development directions of each sub-region's economy are summarized as shown in Table 4.2.

Table 4.2 Development of Sub-Regional Structure

Sub-Region	Primary Center	Secondary Center	Major Hinterland Activities
Sara Buri	Sara Buri	Kaeng Khoi Tha Rua Tha Luang Phachi (Kok Mung) Lam Na Rai Wang Muang	A wide variety of industries (agro-processing, local resources based, and urban supported) Upland agriculture intensification, and diversification
Lop Bur	Lop Buri	Nong Muang Khok Samurong Ban Mi	Upland agriculture intensification, and diversification, and agro-processing industry
Phra Phutthabat	Phra Phutthabat		Upland agriculture diversification
Chai Nat	Chai Nat	Wat Sing Hankha	Intensive rice cultivation and crop diversification
Sing Buri	Sing Buri	Sing	Intensive rice cultivation and agricultural diversification, and agro-processing industry
Ang Thong	Ang Thong	San Chao Rong-Thong Pa Mok	Intensive rice cultivation and diversification, and agro-processing industry
Ayutthaya	Ayutthaya	Sena Cho Chet Bang Pa In Kok Mung	Intensive rice cultivation and conservation. Agro-processing and pollution-free industries

PART II

STRATEGIES AND PRIORITY PACKAGES

5. STRATEGIES AND PHASING OF DEVELOPMENT

Particularly for the UCR, development strategies need to be established in response to the national development perspectives. The following points are of special importance:

1) It is necessary for the country to make best use of the UCR for national industrialization beyond the year 2000, with particular attention to (1) the growing importance of domestic market in the national economy, (2) the need to fully manage and upgrade the industrial production facilities and technologies brought in by foreign investments and (3) the need to make use of primary resources for high value commodities.

2) The UCR must be prepared for the spatial restructuring of the BMR, which should be inevitable in view of accelerating urban congestion problems. The restructuring will involve all surrounding rejoins, including the ESB, the western region and the UCR. It is in this spatial restructuring context that the UCR can make use of industrial development of the ESB.

3) UCR development is very much dependent on the water from Chao Phraya River as well as from Pasak River and, at the same time, it gives substantial environmental impact over the BMR. Hence, development of the UCR has to be managed within the framework of the whole Chao Phraya Basin management. If a region has limited capabilities to respond to the national development, the region has to build up such capabilities. In case of the UCR, stress should be given to the following two aspects:

   (1) The capabilities to make use of the natural and human resource potential within the UCR for taking the development

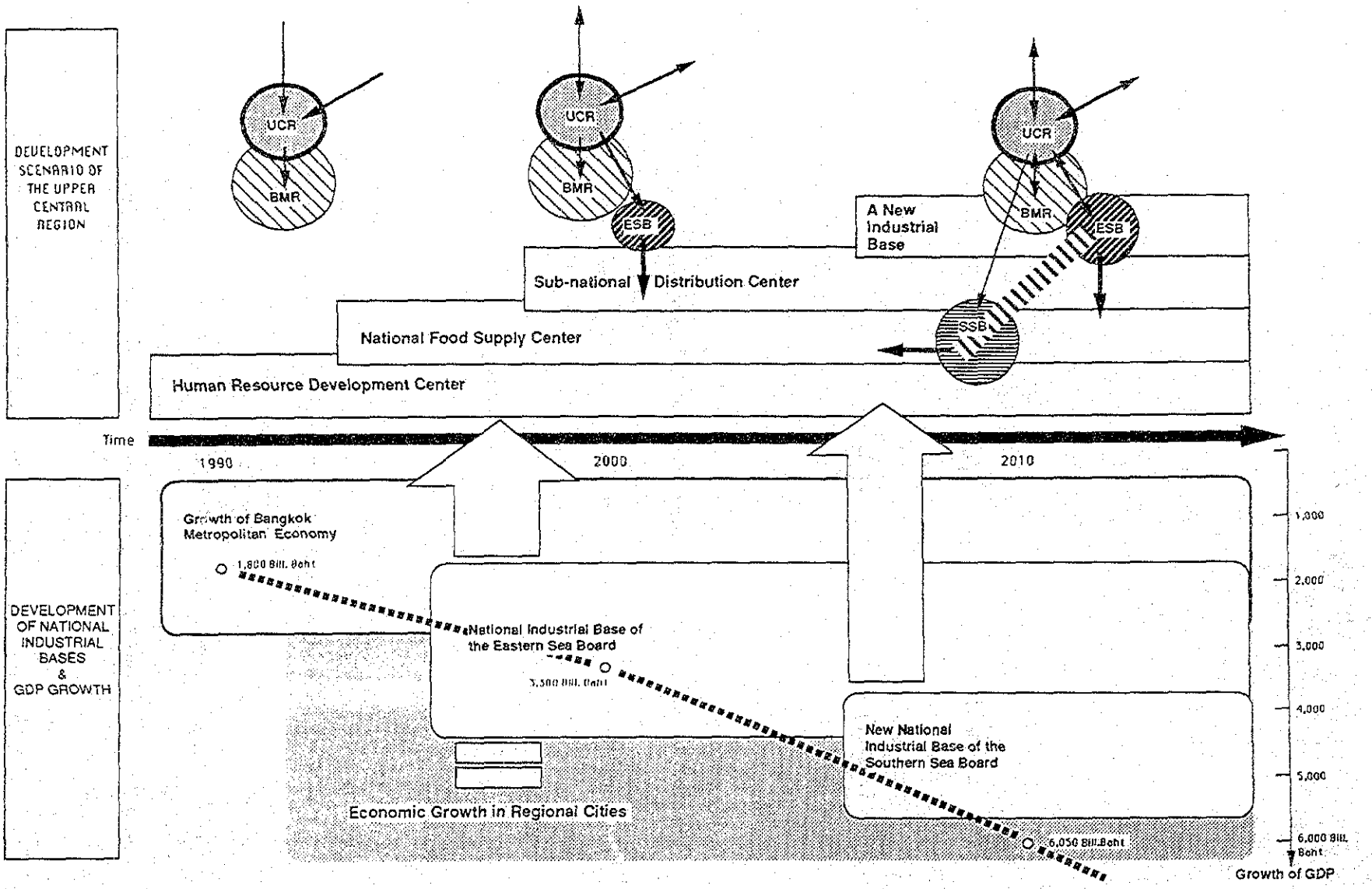


Fig. 5.2 Development Scenario of the UCR in the Changing National Spatial Structure

opportunities brought into the region by the expanding BMR and national projects in and around the UCR.

(2) The capability to prevent the negative impact of the expanding BMR from undermining the economic and environmental bases of the people living in the UCR at present.

Such capability building will, after all, lead to the need for improvement of development management policies at the national level.

Under the emerging nation-wide trend in which industrialization and urbanization overlie on the traditional rural economy, the improvement of national policies will warrant the incorporation of innovative methods for development management initiated at the local level. We wish to present development strategies for the UCR as such a case.

5.1 National Development Perspective in the 1990's and in the Period from 2000 to 2010 (see Fig. 5.1)

Toward the year 2010, an overall trend of the national development will be transitions from the agricultural and rural based economy to the industrial and urban based economy, and from selling natural and human resources by the piece to linking and recycling such resources domestically.

During the 1990's, national economic expansion will continue to be led by export industries, many of which are those of direct foreign investments, as long as the rural surplus labor is available. However, such a growth pattern will gradually be replaced by the domestic-market based diversification of industries and agriculture from the late 1990's toward the year 2010.

In terms of spatial development (see Fig. 5.2), more infrastructures will have to be developed to catch up with growing demands under the present structure during the 1990's. In the meantime, there will be many cases in which remedy measures have to be taken against environmental conflict due to rapid industrialization and urbanization. In the late 1990's, however, there should be a thrust of new infrastructures with expanded national investment capacity for integrating the national space more closely and making the national space

more open to the international economy. Southern Seaboard Development is understood to be an early attempt for this end. In response to this, a new structure of the capital region will have to be established to sustain the central business and administrative functions possibly by the development of mass transit network and new city.

In accordance with these expected changes in the national economy and space, pattern of development administration will have to gradually be changed from the present pattern where the central initiative for industrialization and urbanization coexists with the central management of local administration to a more decentralized pattern in which the local authorities for extensive urban areas will take initiative in regional development.

In carrying out national development toward these directions, there should be a number of the issues for transition. The followings are foreseeable issues:

1) Maintaining a balance between environment and development.

2) Expanding development opportunities all over the country by providing transport, communication, water and energy in every corners.

3) Broadening and upgrading human resource base.

5.2 Phased Development Strategies for the UCR (see Fig. 5.1)

In view of the national development perspectives as understood above, and the proposed objectives of (1) maintaining and restoring econogical environment, (2) deepening and widening of regional economy and (3) human resource development toward a vision of the UCR in fully industrialized Thailand being national food supply center, subnational distribution center, a new inland industrial base and human resource development center, the following development strategies for each sector are recommended.

5.2.1 Agriculture

Two strategies need to be carried out during the 1990's. First, early efforts should be made to strengthen productive capacity and willingness of the farmers through:

1) Increasing efficiency in the use of available irrigation water in the Chao Phraya Delta and tapping potential water resource in the upland area;

2) Improving post harvest through strengthened agricultural corporative;

3) Promoting crop diversification at the farm level to rehabilitate and improve agricultural environment and stabilize income of the farmers so as for them to sustain major field crop production in the upland and, in the Chao Phraya Delta, to utilize the land and farm labor being idle in the dry season for diversified crops and fishculture: and

4) Strengthening the control to discourage the speculative and excessive transfer of land from agricultural to nonagricultural use in high productive areas.

Second, succeeding efforts should be made to intensify the linkages of agriculture with market, especially with the diversifying domestic market, by developing the multi-level structured distribution and processing centers and encouraging the recycle use of agricultural and agro-industrial wastes for the input to livestock and crop farming.

5.2.2 Industry

During the 1990's, an urgent strategy is to strengthen the land use control over industrial location from the environmental viewpoint particularly in Ayutthaya, which is now subject to disorganized spill over of industrial facilities and somewhat speculative industrial estate investments despite that Ayutthaya is not environmentally suitable for industrial locations. In the meantime, resource-based industries, especially those which process the major field crops produced in the UCR as well as the northeastern and northern regions should be promoted in the potential areas, especially the Greater Sara

Buri Industrial Core (GSIC) as elaborated in the Chapter 6 PRIORITY PROJECT PACKAGES. It is essential to encourage intermediate agro-processing technologies and local entrepreneurship in the GSIC.

Beyond the 1990's, industrial development should be concentrated on the GSIC which will, then, make use of a variety of projects of national importance such as Kaeng Khoy- Chachoengsao Railway, upgraded highway route No.1, and the UCR-ESB highway link, gas and petroleum products pipelines, and Pasak dam. With closer linkages with the ESB and the BMR and stronger urban functions, the GSIC will become a base for supporting the ESB industrial activities and accommodating the industries subject to relocation away from Bangkok. Unlike a number of other ongoing growth poles, GSIC will be able to enjoy the benefit of being close to a broad and diversified supporting industrial base of the BMR.

5.2.3 Human Resource Development

Strategies during the 1990's address themselves to the two aspects of fostering the manpower required for industrialization and motivating people to effectively respond to development programs envisaged by the government. In the former aspect, priority should be given to the earliest possible introduction of compulsory secondary education and encouragement of on-the-job vocational training in the private sector. In the latter aspect, non-formal education should be strengthened and directed toward the social education with a focus on the peoples participation in environmental conservation, water management at the farm level, and promotion of agricultural diversification.

Beyond the 1990's, a strategy is recommended to induce higher educational, R & D and urban amenity functions possibly in the GSIC.

5.2.4 Urban Development

During the 1990's, the strategies for urban development are three fold. First, the basic urban need facilities such as waste treatment, water supply and drainage should be improved and expanded in the present subregional centers and secondary order centers. Second, in these cities, investments should be made to intensify agro-industrial linkages through strengthening goods

distribution functions and technologies diffusing functions. Third, in Sara Buri, efforts should be made to strengthen and integrate basic infrastructures such as waste treatment, sewerage and transportation under a framework of cooperation among Sara Buri City and its surrounding municipalities ; and in Ayutthaya, intensive investments should be made to maintain and upgrade the city as a major center of tourism based on cultural and historical assets.

Beyond the 1990's, the GSIC should be formed as a seat of industrial and service functions to be partly relocated from Bangkok.

5.3 Priority Actions (see Fig. 5.1)

In carrying out these strategies, we propose the following two types of actions to be taken with high priority:

1) Project Packages as Breakthrough for Regional Development (see detail in Chapter 6 PRIORITY PROJECT PACKAGES of this report)

   (1) Integrated Pasak River Basin Development
   (2) Greater Sara Buri Industrial Core Development
   (3) Agro-Industrial Linkage Development
   (4) Human Resource Development: Focus on Non-formal Education.

2) Strengthening of Management for Environment and Development

   (1) Water Resources Management
   (2) Environmental Management
   (3) Urban Management

   The project packages should be undertaken in parallel with the strengthening of management for environment and development. Underlying needs for this process are institutional rearrangements to be considered at the national level. The followings can be pointed out as key issues for the consideration:

   (1) Environment and water resource management of the whole Chao Phraya River Basin: scope, long-term organizational arrangements and short-term/priority actions.

(2) Nation-wide land use zoning system: designation of the areas for development and conservation, respectively comprising agricultural and urban zones, the areas for preservation, and the historical and cultural areas.

(3) Reinforcement of local administration with a focus on the multi-level long and medium terms planning framework for regional and urban development, the inter-city cooperation for specific public services within certain area, and the cost-sharing between central and local authorities to be supported by public lending scheme for multi-year local projects.

(4) Establishment of policy guidelines for restructuring the capital region: industrial relocation, suburban transport network, new town development, etc.

In the light of the strategies' project packages and management issues above discussed, the following actions are recommended to be taken with high priority during the period under the 7th Five-Year Plan:

1) Urgent Actions to Cope with Emerging Problems

(1) Preparation of guidelines for land use and environmental control in the areas where industrial activities easily cause water pollution of Chao Phraya River or farm lands are important in retarding floods for Bangkok.

(2) Comprehensive environmental study of the Chao Phraya River Basin.

(3) Preparation of nation-wide land use zoning system for development and conservation.

(4) Rehabilitation of soil erosion areas in the Pasak River Basin by agroforestry program.

2) Actions from which Immediate Returns can be Realized

(1) Intensive investments to maintain and upgrade tourism assets and facilities at Ayutthaya as a major stop-over tourism area. Sewerage and solid waste disposal should be urgent tasks.

(2) Chao Phraya Irrigation Operation Improvement

(3) Village Industry Promotion Centers

3) Early Completion or Accelerated Implementation of Major Planned/Ongoing Projects with Direct Impact over the UCR

(1) Klong 19 - Kaeng Khoi Railway Construction
(2) Bangkok Outer Ring Road
(3) Sara Buri By-pass
(4) Medium-scale Water Resource Projects in the Pasak River Basin, including Lam Sonthi Irrigation and Ban Mok-Kaeng Koy Irrigation
(5) Petroleum pipeline project from Sriracha to Sara Buri
(6) Natural gas pipeline from Nam Phong in Khon Kaen

4) Actions to Embark in Long-Term Development

(1) Preparation of Pasak Dam construction
(2) Construction of East-West Highway Links (Suphan Buri - Tha Rua - Sara Buri)
(3) Initial organizational arrangements for environmental and water management of the whole Chao Phraya River Basin
(4) Organization of inter-city cooperation for extensive urban utility services in the GSIC (Local Authority Association).
(5) Establishment of business incubator system for local enterprise ship development.
(6) Promotion of agricultural cooperative activities in joint procurement of agricultural input and joint marketing.
(7) Trial implementation of compulsory secondary education in a Changwat being relatively advanced in the secondary level education.

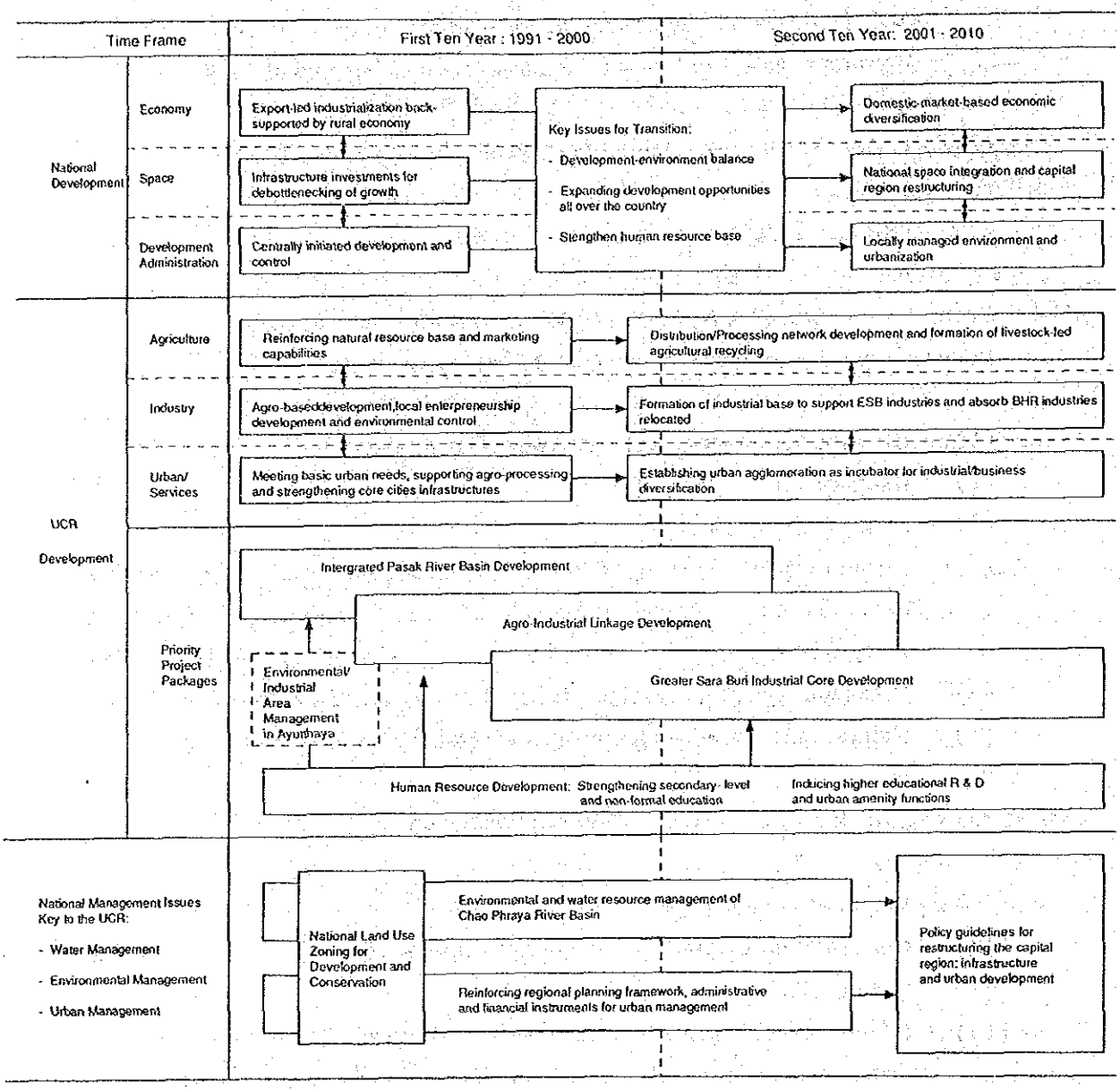


Fig. 5.1 Phased Development Strategies for the UCR