

Chapter 3 Infrastructure in the Target Provinces



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3.1 Infrastructure Development

3.1.1 Spatial Perspective

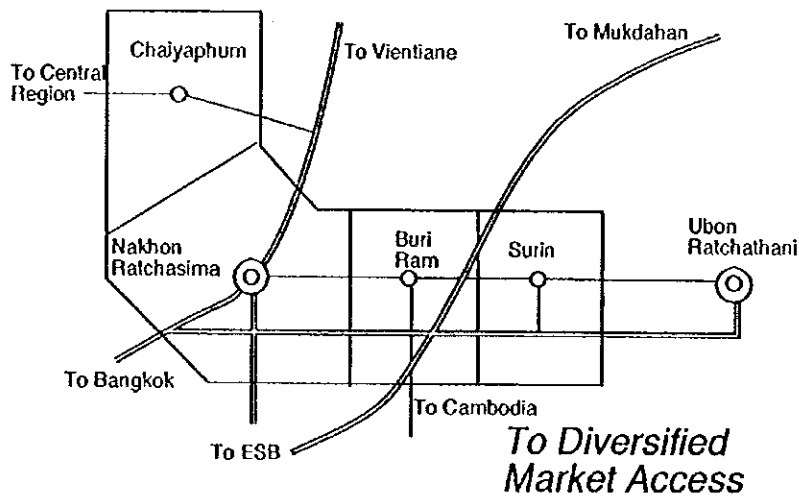
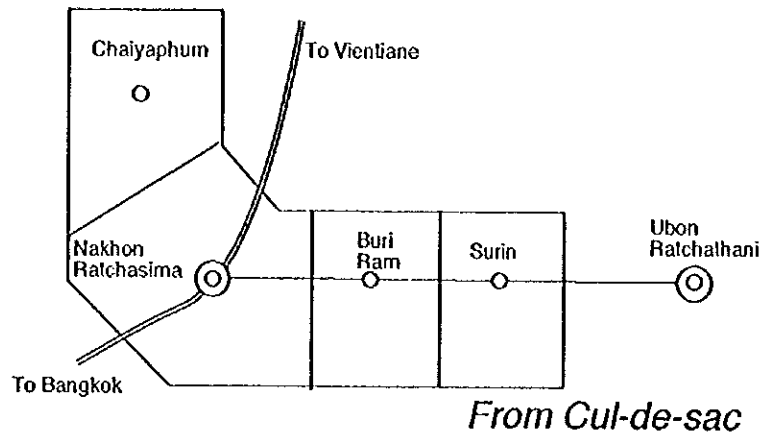
Divided by mountains, the North-Eastern region lies in a different river basin from the Central Region. The North-East, which extends across the most area of the Khorat Plateau, belongs to the Mekong River basin by its tributaries. The relatively flat terrain within the Khorat Plateau enables to construct infrastructure network easily.

The four provinces, which consist of Nakhon Ratchasima, Buri Ram, Surin and Chaiyaphum, are located in the south-western corner of the North-East. The city of Nakhon Ratchasima is positioned at the juncture of two major arterials in the North-East. One is Route 2 (Nong Khai - Nakhon Ratchasima - Bangkok. Also called Nong Khai corridor) and the other is Route 24 or 226 (Ubon Ratchathani - Nakhon Ratchasima. Also called as Ubon Ratchathani corridor). From a viewpoint of land transportation, the location of Nakhon Ratchasima represents the function of the city as the gateway of the North-East from Bangkok.

Contrary to it, Nakhon Ratchasima is almost an exit from a viewpoint of water surface transportation because the city is located at upstream of Lam Takhong River, a tribute of the Mekong. The current water surface transportation is, however, less significant than ever.

The above function as a gateway implied the Nakhon Ratchasima's conventional role to connect to the Bangkok metropolitan region. In addition, the role of gateway is changing gradually as other neighboring countries open their markets to international environment. Specifically, the four provinces can be a regional hub among Bangkok, Eastern Seaboard, Cambodia and Laos if provided sufficient infrastructure network. The Figure 3.1-1 illustrates the concept from "cul-de-sac" to diversified market access.

Figure 3.1-1. ACCESS IMPROVEMENT AND NEIGHBORS



3.1.2 Highway Development

The Highway Act of 1992 classifies the roads in Thailand into the following six categories;

- Special highway
- National highway
- Concession highway
- Municipal road
- Sukhaphiban road
- Rural road

The Department of Highways (DOH) under the Ministry of Transport and Communication (MOTC) controls and implements the construction, rehabilitation and maintenance of the first three types of road. Municipal

Roads are under municipalities and Sukhaphiban roads are under sub-municipalities. Rural roads are under Public Works Department, Office of Accelerated Rural Development, National Security Command and Royal Irrigation Department.

This section deals with the first three classifications because other roads are very minor.

The highways have several rules of numbering as follows:

- Route beginning with number 2 is in the North-East.
- Single digit highways, which represents Primary Highways, link the region. Highway Route 2 (Friendship Road) connects between Saraburi and Nong Khai.
- Two digit highways represent Primary Highways in the region.
- Three digit highways represent Secondary Highways in the region.
- Four digit highways link provinces and amphoes or important places in those provinces.

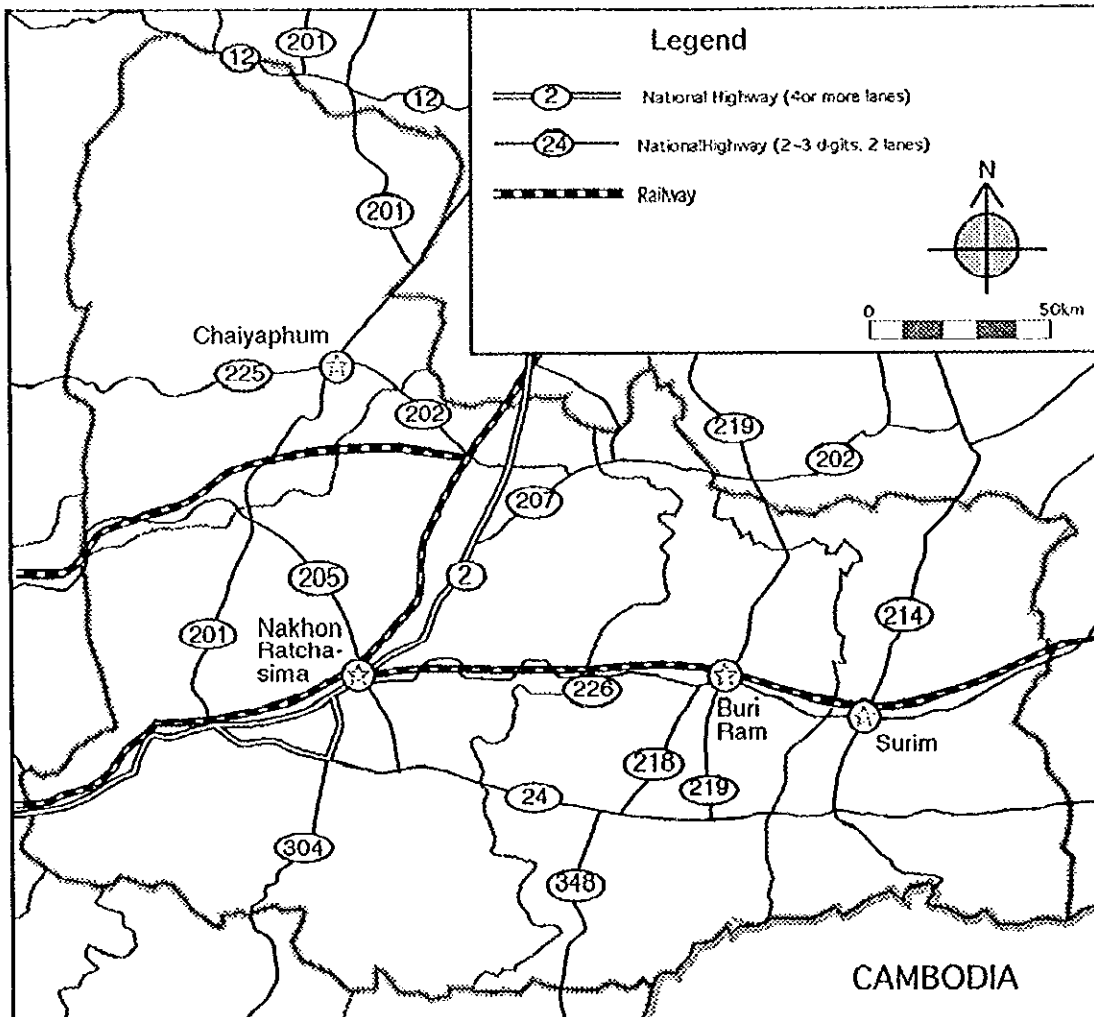
In addition to the numbered highways, some highways also have names with A as "A2." This means that the highways are also listed in the ASEAN highway project.

3.1.2.1 Current Status

Figure 3.1-2. shows the current network structure of highways which are numbered less than four digits. The following characteristics have been observed:

- Route 24 does not pass any provincial capitals.
- Route 226 has several grade crossings with railroad. It influences the horizontal curve shape.
- Because Chaiyaphum Province is not located along the two major corridors, it has only three and four digit highways.

Figure 3.1-2. CURRENT HIGHWAY NETWORK IN FOUR PROVINCES



As the development of the Route 24 progresses, it will create another east-west corridor to the south of current Ubon Rathchathani corridor.

Table 3.1-1. HIGHWAY DISTANCES BY REGIONAL BUREAUS

Highway Bureau	Under Maintenance (km)						Subtotal		Under Standard Road	Under Construction Road	Total (km)	
	Concrete		Asphalt		Unpaved Roads		Actual Distance	Per 2 Lanes			Actual Distance	Per 2 Lanes
	Actual Distance	Per 2 Lanes	Actual Distance	Per 2 Lanes	Actual Distance	Per 2 Lanes						
5. Khon Kaen	147	243	3,523	3,644	-	-	3,670	3,887	52	137	3,835	4,075
8. Nakhon Ratchasima	190	380	3,586	3,722	114	114	3,890	4,216	-	23	3,913	4,239
Whole Country	2,084	4,281	45,426	48,688	1,421	1,421	48,932	54,390	499	2,706	51,775	57,595

Note: Khon Kaen Bureau includes Chaiyaphum, Ban Phai, Chum Phae, Udon Thani, Mahasarakham, and Khon Kaen. Nakhon Ratchasima Bureau includes Nakhon Ratchasima, Buri Ram, Surin, Prachinburi and Sakaeo. Source: DOH. 1999.

The above table outlines the highway distances by Highway Regional Bureaus under DOH. Two bureaus hold almost 7 to 8% of whole country in highway distances. This is reasonable proportion and the highway density in the North-East meets the national average level. In contrast, the portion of highways with more than two lanes in the region is very limited. The portion of highways with more than two lanes under maintenance by DOH in Khon Kaen and Nakhon Ratchasima Bureau are 5.9% and 8.4% respectively. These numbers falls behind the national level of 11.2%¹.

Table 3.1-2. HIGHWAY CONSTRUCTION PROJECTS IN 1998

Highway Project Commencing in Fiscal Year 1998 (Local Budget Financing)

Highway Construction				
Route No.	Description	Highway Standard	Distance (km)	Amount (1,000Baht)
2	Saraburi - Nong Khai Section A. Si Khiu Rt.205	Special	44.88	1,404,842
205	Nakhon Ratchasima Bypass	Special	7.21	230,000
Highway Rehabilitation and Improvement				
Route No.	Description	Highway Standard	Distance (km)	Amount (1,000Baht)
201	B. Nong Bua Khok - Chaiyaphum Sect. 1	Special	23.70	466,559
2226	A. Chaiyaphum - B. Thangphat Phuttaison	2	29.80	172,313

Highway Project Completed in Fiscal Year 1998 (Local Budget Financing)

Highway Construction				
Route No.	Description	Highway Standard	Distance (km)	Amount (1,000Baht)
2	Nakhon Ratchasima Bypass	Special	16.29	420,436
2389	A.Kaeng Kho - B.Nong Sung - B.Srapang (Chaiyaphum)	4	46.90	236,477

Source: DOH, 1999.

The above table indicates the latest road construction projects in the four Provinces. Despite the economic crisis in 1997, the budget allocation for the highway development experienced only a drop of 10% from the fiscal year of 1997. The new construction is limited to bypass and rural highways of four digits. In addition, no foreign loan was allocated to the highway construction in the North-East.

¹ Under the assumption that the all highways are 4 or 2 lanes, the percentage is obtained by (Per 2 lanes - Actual distance)/(Actual Distance).

3.1.2.2 Ongoing Projects

(1) Four-Lane Highway Construction Project

Currently this project has two phases after its government approval in 1993. For the convenience and safety for the all users, this project intends to expand current highways from two to four lanes. This section describes only for the four provinces.

1) Project I Phase (1996-1999)

The eight sections, total 252 kilometers, of Route 2 were listed on the Project I Phase. In addition to the project, some urbanized area has six lanes along Route 2. Around Nakhon Ratchasima, the section between Si Kheu and Nakhon Ratchasima has been expanded to six lanes with some segments still under construction.

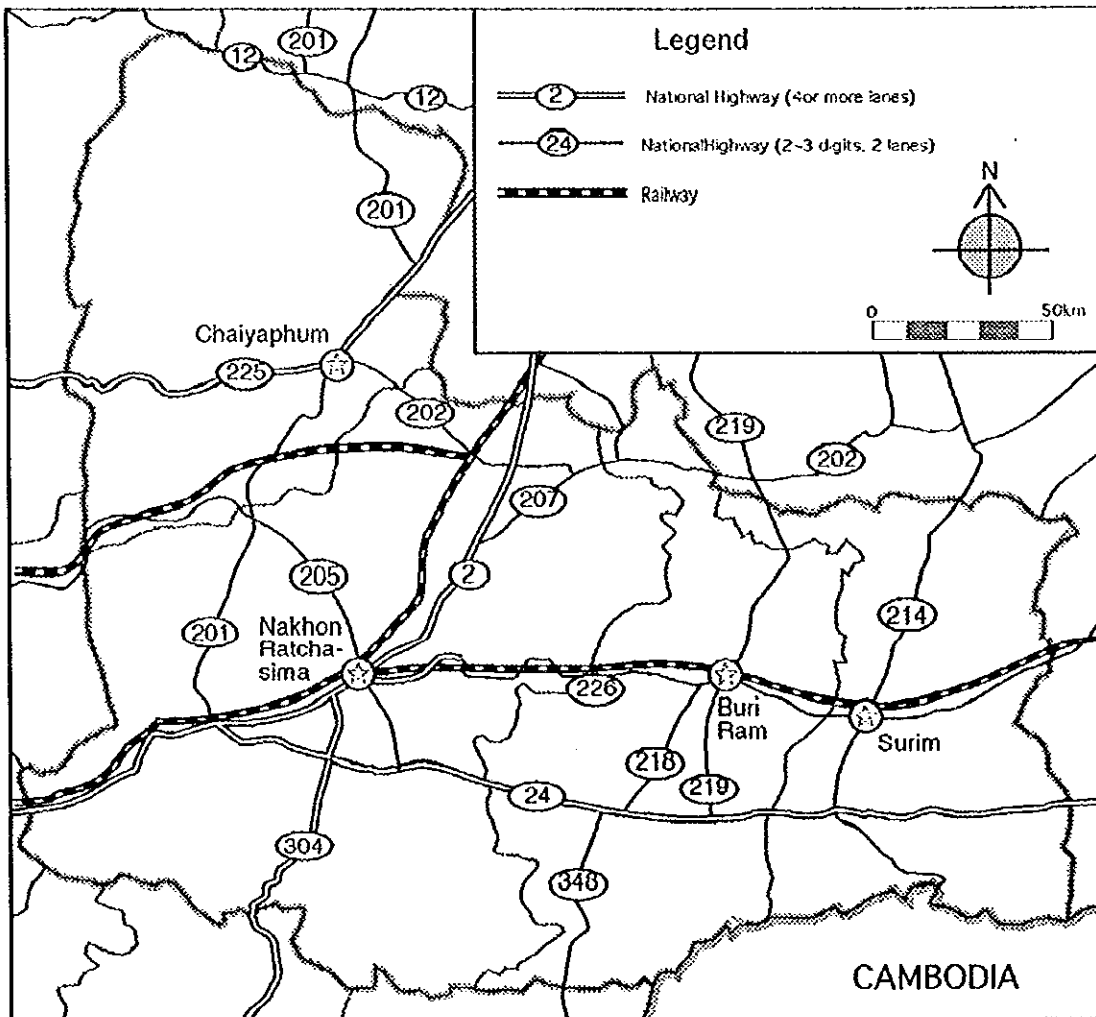
2) Project II Phase (1996-2006)

The following highways in the four provinces were prioritized in the Project II Phase.

- Route 225 (Nakhon Sawan – Chaiyaphum)
- Route 201 (Chaiyaphum – Kaeng Khro)
- Route 304 (Kabinburi – Paktongchai)
- Route 24 (Si Kheu – Ubon Ratchathani)

Figure 3.1-4. illustrates the road network after the Project II Phase. The Project II Phase is supposed to be completed in 2006.

Figure 3.1-4. ROAD NETWORK AFTER PROJECT II PHASE



(2) Inter-city Motorways

The inter-city motorways, also called as toll motorways, are access controlled high standard highways. Based on JICA study in 1991, the Thai Cabinet resolved the master plan in 1997. The duration of the project is from 1997 to 2006.

Figure 3.1-5. INTER-CITY MOTORWAYS MASTERPLAN IN NORTHEAST

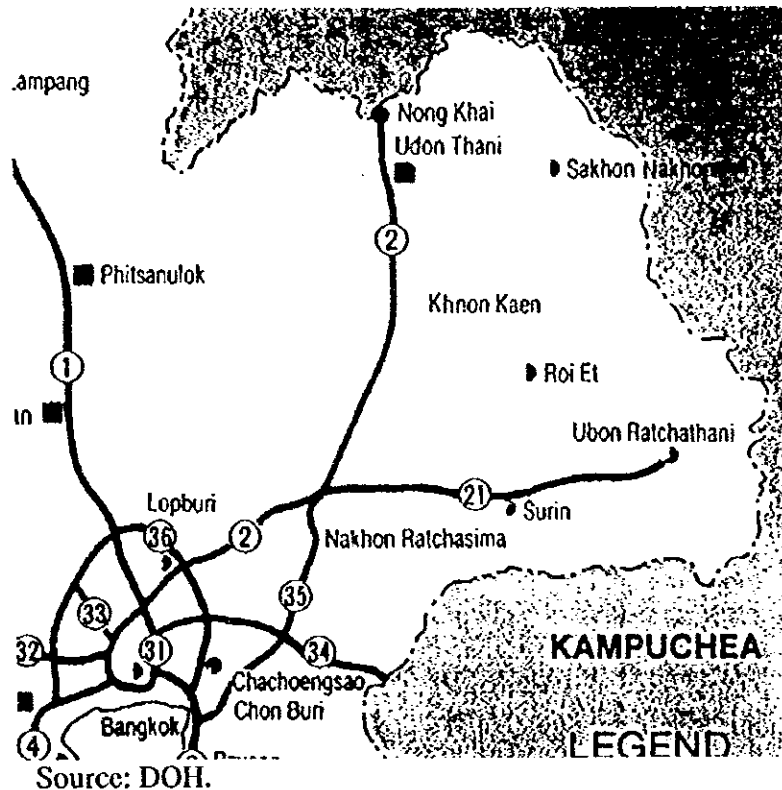


Figure 3.1-5 shows the structure of the motorway masterplan in the North-East. The following three routes are planned in the four provinces.

- TM 2: Same route with current highway Route 2
- TM 21: Close route with current highway 226
- TM 35: Current 204 and 304. Connects North-East and ESB.

To realize this masterplan, DOH prepared Action Plan for the most prioritized three projects. As the projects started from Bangkok area, the above routes in the North-East have very low priority. In 1996, the construction work for TM 2 was scheduled to be started from 8th Five Year Plan period (1997-2001). However, the economic crisis in 1997 required total revision of construction schedule and introduction of privatization scheme. At present, no clear implementation schedule is not prepared for the Inter-City Highway construction in the North-East.

3.1.2.3 Problem and Issues

One of the most important roles of the highways to promote industrial development is to connect the region with the outer market. Specifically, the highways to connect the four provinces with Laem Chabang Port in the Eastern Seaboard (ESB) should have the first priority. Currently, Route 304 runs between Nakhon Ratchasima and Chachoengsao but the two lanes in the mountainous area are not adequate for container transportation. The expansion of this whole route to four lanes is an urgent issue.

In addition to Route 304, construction of another highway route between ESB and North-East is significant. The route between Sa Kaco and Mukdahan via Buri Ram was proposed by the JICA study of 1993 and DOH improved some segments on the existing highways. The government has not authorized the project idea due to the mountainous topography and budget constraint. It is also an issue for DOH to reconsider the route master plan as the second Mekong Bridge at Mukdahan will be completed in 2003.

Although the highway density is at the national average level, most highways in the region have only two lanes. To secure safety and to promote containerization in the region, the four lane highways are required on the major arterial. Accordingly, the implementation of Project II Phase of the four lane project on time is a significant issue.

Although the toll motorway project has already started from the Bangkok metropolitan area, there is no practical implementation schedule in the North-East. It is an issue to clarify the future schedule for the North-Eastern region including the privatization scheme.

3.1.3 Railways

The State Railway of Thailand (SRT) monopolizes the whole operation and planning of the railways in Thailand. The railway sector has less significance in the transportation mode share in the North-East.

3.1.3.1 Current Status

Table 3.1-3. RAILWAYS IN NORTH-EAST

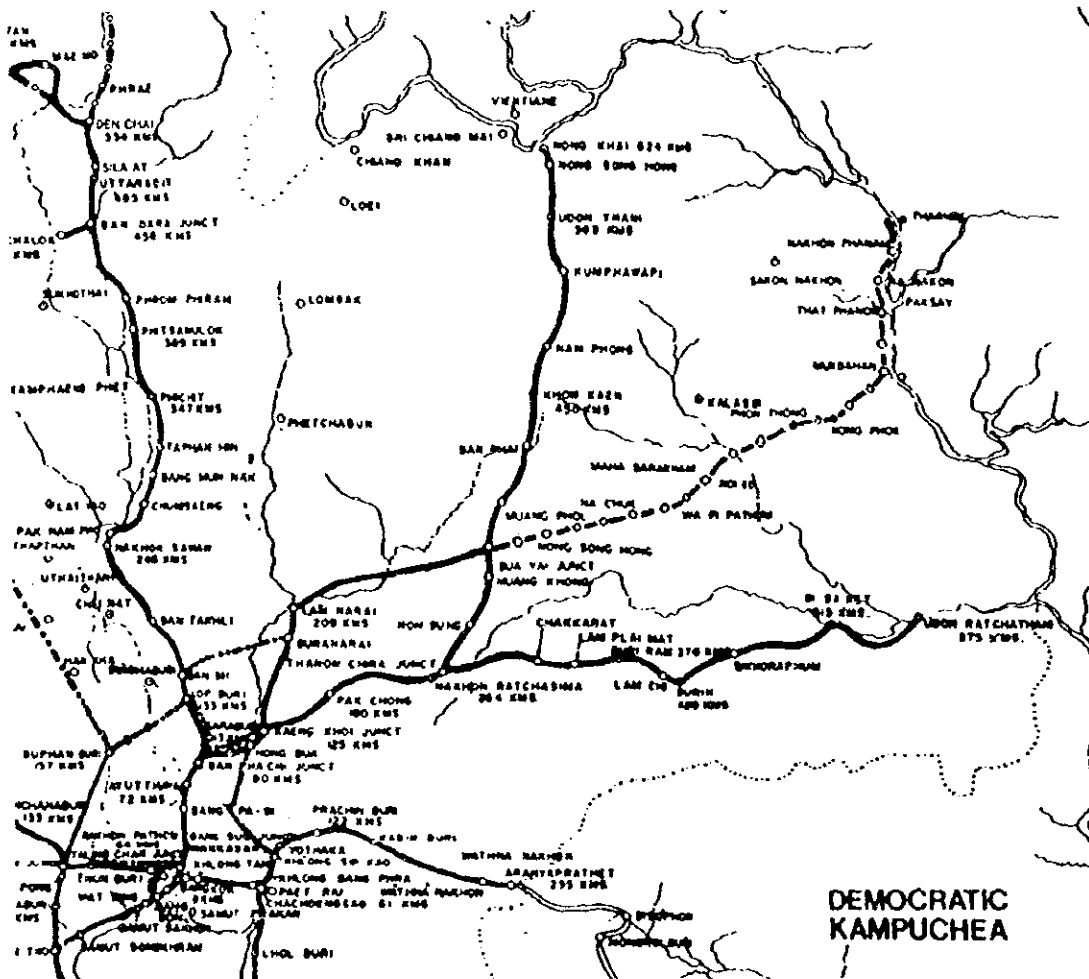
Province	Number of Stations	Number of Stopping Places	Route Kilometers	Route Percentage
Nakhon Ratchasima	39	11	300	7.5%
Buri Ram	9	1	113	2.8%
Surin	8	-	65	1.6%
Chaiyapun	6	5	88	2.2%
Subtotal	62	17	566	14.2%
North-East	86	25	817	20.5%
Whole Country	445	141	3,976	100.0%

Source: SRT. 1996. p.22-23

The four provinces totally hold the total 566 kilometers of routes (Table 3.1.3). This is almost 70% of the North-East because not all of the provinces have the railways (Figure 3.1-6). All tracks are laid by single.

SRT has two major corridors in the North-East. One is Nong Khai Corridor and the other is Ubon Ratchathani Corridor. The Table 3.1-4 and 3.1-5 show the major commodities on each corridor on rail and truck.

Figure 3.1-6. RAIL NETWORK IN NORTH-EAST AND BANGKOK AREA



Source: SRT. 1996.

Table 3.1-4. MAJOR COMMODITY FLOW ON NONG KHAI CORRIDOR

		unit: ton/year			
Category	Commodity	Truck	Rail	Rail Share	Total
Outgoing	Rice	483,000	95,000	16%	578,000
Outgoing	Sugar	430,000	28,000	6%	458,000
Outgoing	Molasses	188,000		0%	188,000
Outgoing	Tapioca	4,644,000		0%	4,644,000
Incoming	Petroleum	590,000	455,000	44%	1,045,000
Incoming	Cement	1,760,000	129,000	7%	1,889,000
Incoming	LNG		129,000	100%	129,000
Incoming	Fert. & Feed	400,000		0%	400,000
	All Others	3,854,000	56,000	1%	3,910,000
	Total	12,349,000	892,000		13,241,000

Source: CPCS and NEC. 1995. p.16

Table 3.1-5. MAJOR COMMODITY FLOW ON UBON RATCHATHANI CORRIDOR

Category	Commodity	Truck	Rail	Rail Share	Total
Outgoing	Rice	389,000	102,000	21%	491,000
Outgoing	Sugar	61,000		0%	61,000
Outgoing	Molasses	28,000		0%	28,000
Outgoing	Tapioca	773,000		0%	773,000
Incoming	Petroleum	262,000	173,000	40%	435,000
Incoming	Cement	1,708,000	126,000	7%	1,834,000
Incoming	Fert. & Feed	207,000		0%	207,000
	All Others	938,000	16,000	2%	954,000
	Total	4,366,000	417,000		4,783,000

Source: CPCS and NEC. 1995. p.16

In terms of the financial aspect, SRT operates at a loss both in freight and passengers recently.

In 1996, SRT completed the new line construction between Nong Bua and Khlong 19 with the help of an OECF loan. This line directly connects the North-East to the Eastern Seaboard without passing through Bangkok.

Additionally, an Inland Container Depot (ICD) was built at the Lat Krabang, close to Khlong 19, in the middle of 1990s. The ICD is the first depot with full service rail facilities. It means that the North-East has strong advantage in the container transportation on rail from Eastern Seaboard.

3.1.3.2 Ongoing Projects

A new line has been planned to connect from Bua Yai (Nakhon Ratchasima Province) to Nakhon Phanom. This project was also proposed in the JICA study in 1993. The total length of the new lines will be 368 km. Although

a feasibility study (CPCS and NEC. 1995) was conducted, the project has been postponed due to the government budget constraint. If completed, the line can lead to China via Laos and Vietnam.

3.1.3.3 Problem and Issues

Because of its single track lines, SRT cannot provide sufficient services. For passenger transport, the role of railways is more limited than bus services. Still, the railway is suitable transportation mode for bulky commodities such as tapioca and sugar. In addition, the North-East currently has direct rail connection with Laem Chabang and Map Ta Phut. To emphasize the role of railway for exporting commodities, it will be an issue to run on schedule and keep maintenance standard.

Under the current situation, doubling tracks in two corridors are unlikely to realize. The new line construction between Bua Yai and Nakhon Phanom requires strong government support and subsidies to prioritize the development in Nakhon Phanom and Mukdahan.

3.1.4 Civil Aviation

The Department of Aviation (DOA) under the MOTC has primary responsibility in civil aviation matters. Each airport authority manages the airport.

3.1.4.1 Current Situation

Only two airports are located in the four provinces. Namely, Nakhon Ratchasima Airport and Buri Ram Airport.

Table 3.1.6. SPECIFICATION OF TWO AIRPORTS

Airport	Nakhon Ratchasima	Buri Ram
ICAO code	VTUQ	VTUO
Runway	Asphaltic concrete, 2100x45m	Asphaltic concrete, 2100x45m
Navigation aid	NDB, DVOR/DME	NDB, DVOR/DME
Passenger facility	Waiting room	Waiting room
Handling facility	Fueling	-
Rescue Category	5	4
Customs	Available	-
Distance from city (km)	26	30
Opened in	Dec.97	Nov.96

Source: DOA. 1997-99.

The above table shows the outline of airport specification. Both airports are for civil use. The airports can accept an aircraft as large as a Boeing 737 class.

Nakhon Ratchasima Airport is identified as a custom airport. This means that any aircraft including foreign carrier can use the airport for the first landing point in Thailand. The custom and immigration staff will be dispatched to the airport on request. However, the service is not used now.

Table 3.1-7. SCHEDULED FLIGHTS FROM BANGKOK

Flight from Bangkok to	Nakhon Ratchasima	Buri Ram
Operator	TG	TG
Flight/week	14	5
Distance (km)	207	319
Flying time (min.)	45	70
Fare (Baht)	555	950
Seat/Flight	65	65

Note: As of February 2000.

Source: Thai Airways International. 1999.

Two airports have scheduled flights only from/ to Bangkok. The above table shows the scheduled flights from/ to Bangkok. The flight to Nakhon Ratchasima is the shortest flight from Bangkok and the flight to Buri Ram is the second shortest.

The scheduled flight can carry cargo if space is available.

Besides scheduled flights, chartered flights, private flights, government flights can use the airports. The government flights fly to rain artificially in especially dry season.

3.1.4.2 Ongoing Projects

Currently, there is no ongoing project for airport development.

3.1.4.3 Problem and Issues

These airports are so close to Bangkok that the airport management cannot be a profitable business. Especially, the traveling time by cars from Bangkok to Nakhon Ratchasima is shorter than that by airplanes. This makes the travel

by air less attractive. In addition, the distance between the airports and cities are also far. Consequently, the airports run in red.

From carrier side, it looks difficult to use the advantage of Nakhon Ratchasima Airport as a custom airport. It is necessary to utilize the advantage by charter flights connecting Nakhon Ratchasima Airport with other regional hub airports such as Hong Kong and Singapore.

3.1.5 Water Supply

Because the available water sources are scarce, the water right is also restricted in the four provinces. The Royal Irrigation Department (RID) has the strong power to distribute the agricultural water usage. The Provincial Waterworks Authority (PWA) under the Ministry of Interior supports each Municipality to develop waterworks. In addition, Underground Water Division, Department of Mineral Resources, Ministry of Industry surveys the potential of underground water. Each provincial government, Accelerated Rural Development and other organizations explore and dig underground water wells as necessary.

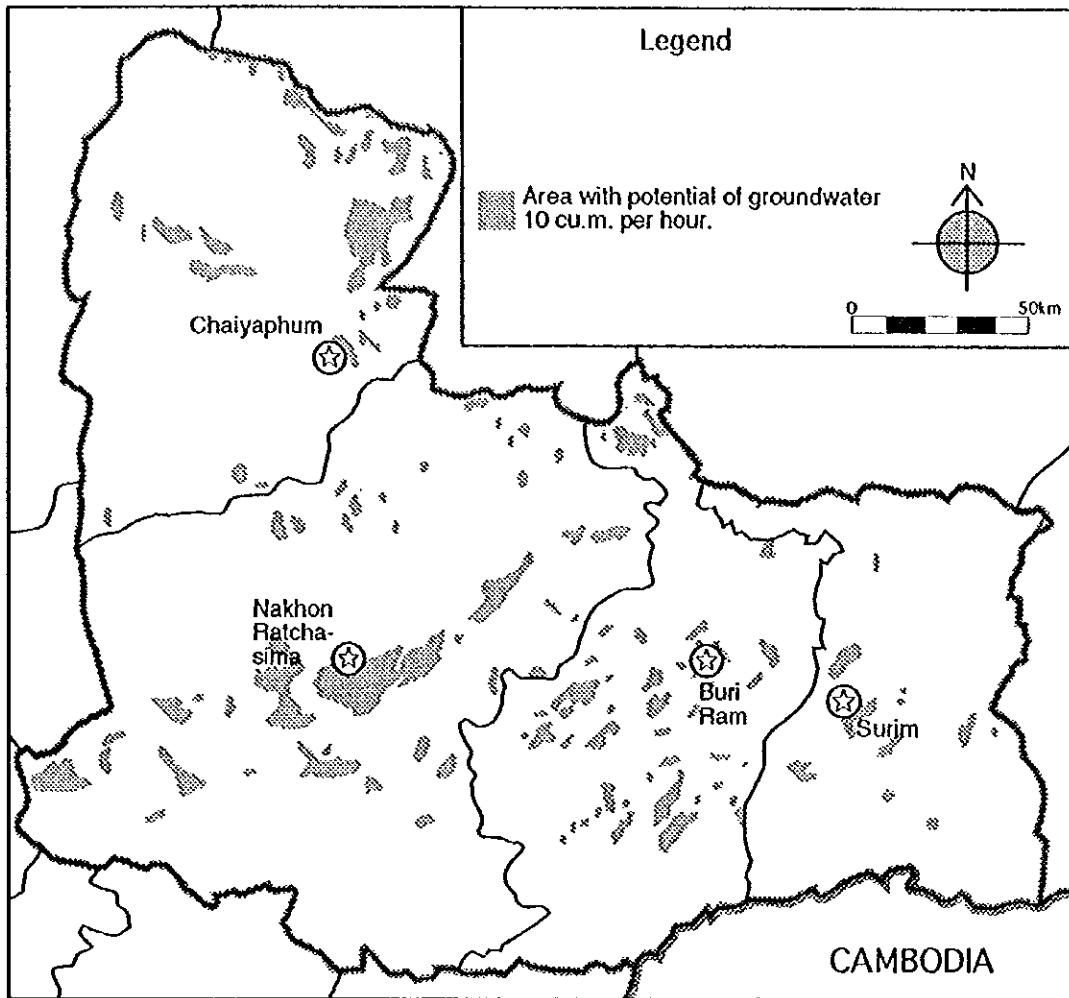
3.1.5.1 Current Situation

The surface water resources are limited to only Mun River and its attributes in the four provinces. The four provinces have a large reservoir of Lam Ta Khlong. In addition, the mountain area holds Lam Phra Phloeng Dam in Nakhon Ratchasima Province and Chu La Phon Dam in Chaiyaphum Province. All dams are operated by RID. The agricultural usage of water has a priority in water allocation from surface water sources and the water usage for waterworks use follows it. Consequently, the water allocation from surface resources to industrial usage has the lowest priority. Instead of piped water supply, some factories also carry water from Lam Ta Khlong Reservoir by water trucks.

The ground water development depends on the very local condition and it is difficult to generalize the availability of ground water. However, the location close to river can provide suitable ground water in quality and volume. The area where has ground water potential more than 10 cu. m. per hour is limited to less than 10% of total area (See Figure 3.1-7). Some

ground water, especially in the northern border region of the four provinces, contains so much salt that the water is not suitable for industrial use.

Figure 3.1-7. AREA WITH GROUND WATER POTENTIAL MORE THAN 10CU. M. PER HOUR



Source: Department of Mineral Resources, MOI.

3.1.5.2 Ongoing Project

Currently, two dam projects are ongoing in the southern part of the four provinces. Additional medium size reservoirs are under construction. All dams intends to mitigate water shortage in agricultural sector during the dry season.

3.1.5.3 Problem and Issue

The water shortage is one of the biggest problems in the North-Eastern region, especially in the agricultural sector. However, the water usage by small and medium-size industry has no problem if supplied by a waterworks authority nearby.

It is not suitable for water consuming typed large scale industry to locate in the region without any measure of own water procurement. Medium scale reservoir or own ground well can be prepared at the industrial estate level.

3.1.6 Electricity Supply

Electricity Generation Authority of Thailand (EGAT) is responsible to generate and transmit electricity to substations. Provincial Electricity Authority (PEA) under the Ministry of Interior transmits and distributes electricity in the provincial area. The Metropolitan Electricity Authority (MEA) serves electricity for the Bangkok Metropolitan area. The substations between EGAT and PEA are operated by either of them.

3.1.6.1 Current Situation

The North-East Region 3 Office in Nakhon Ratchasima serves the four provinces. It has four Class 1 Offices in each provincial capital and seven Class 2 Offices in the secondary cities.

EGAT has completed the National Transmission Grid. All generated power once flows into the Grid with synchronization. The first stage substations receive 230 kv or 115 kv transmission from EGAT and step them down to 22 kv. The following substations transform the voltage as low as necessary. Four out of the thirteen substations in the four provinces belong to the PEA. Other nine stations are owned by EGAT. Each substation is designed to serve a radius of 25 km.

Current service coverage is 97% of the households in four provinces. This means more than 35 thousand households are outside of the PEA service area.

Table 3.1-8. POWER CONSUMPTION IN FOUR PROVINCES (1997)

Province	Consumption (GWh)	Population	Per Capita (kWh)
Nakhon Ratchasima	1,759	2,510,839	701
Buri Rum	325	1,494,836	217
Surin	277	1,367,685	203
Chaiyaphum	280	1,115,519	251
Northeast	6,518	21,095,841	309
Bangkok	32,307	5,604,772	5,764
Whole Kingdom	82,429	60,816,227	1,355

Source: Alpha Research Co. Ltd. 1999.

The above table shows the electricity consumption by provinces. Because Nakhon Ratchasima holds many industries, the per capita consumption is significantly higher than other three provinces. The consumption level per capita in the three provinces is the lowest level in the kingdom.

Table 3.1-9. USER CATEGORY AND REVENUE

Category	Four Provinces (1999)				All PEA area (1998)			
	Sold Unit (GWh)		Revenue (mil.B.)		Sold Unit (GWh)		Revenue (mil.B.)	
Residential (<150kwh)	624	23.4%	1,040	19.1%	5,721	11.9%	9,982	10.0%
Residential (>150kwh)	355	13.3%	798	14.7%	6,158	12.8%	14,361	14.3%
Business	1,502	56.3%	3,189	58.6%	33,463	69.7%	69,785	69.6%
Government and NPO	149	5.6%	313	5.8%	1,770	3.7%	3,755	3.7%
Agriculture pumping	12	0.4%	19	0.3%	198	0.4%	323	0.3%
Temporary use	26	1.0%	74	1.4%	632	1.3%	1,797	1.8%
Standby Rate	2	0.1%	6	0.1%	62	0.1%	225	0.2%
Total	2,670	100.0%	5,439	100.0%	48,004	100.0%	100,228	100.0%

Source: PEA Region 3. 1999., PEA. 1999.

The above table shows user category and revenue in four provinces and all PEA area. Business users occupy the most important portion in unit and revenue. Because the tariff structure differs by category, the revenue is not completely proportional between unit and revenue. In addition, the four provinces and all PEA area show similarity in usage by categories as all PEA does not include Bangkok Metropolitan area.

3.1.6.2 Ongoing Projects

Due to the economic crisis in 1997, PEA postponed some of the projects under the Eighth Five Year Plan. Actually, the four provinces experienced a drop in electricity consumption in 1999.

Table 3.1-10. POWER PROJECTS IN NORTHEAST

Unit: mil. Baht & mil.

Project	Target	Duration	Summary of investment cost				Fund Source
			Foreign Loan	Local Loan	PEA	Total	
Transmission System and Substation Development Project, 7th stage (North & Northeast)	37 substations	2001-04	7,100 (\$85.58)	4,455	2,727	10,605 (\$85.58)	OECF, Buyer's Credit
Power Distribution Systems Reinforcement Project, 7th stage (North & Northeast)	5,300 cct.km	2001-05	5,800 (\$145.00)	900	2,300	9,000 (\$145.00)	OECF, ADB

Source: System Planning Department, PEA. 1999.

The above table indicates the two projects in the North-East. Both of them were rescheduled from the Eighth Year Plan Period (1997-2001) to the following period. These projects will increase the security and reliability of power supply in the North-East. The purpose of these projects is to:

- achieve the sufficient and stable supply
- minimize interruption, voltage drop and system loss, and
- reduce system operational and maintaining problems.

3.1.6.3 Problem and Issues

Though the PEA provides the sufficient service to the four provinces, the electricity has minor problems in quality such as instantaneous voltage drop. Voltage-sensitive machinery is required to install equipment to prevent the potential damage. This is not a local problem but a problem at the National Grid level. To avoid such voltage drops, overall improvement in reliability is necessary in generation, transmission and distribution process. The completion of above ongoing projects will significantly improve the quality of power supply.

For other aspects, the power supply by PEA is sufficient enough to promote industry in the four provinces. PEA can supply its service on request by industries at any level.

3.1.7 Telecommunication

Although Telephone Organization of Thailand (TOT) under the MOTC had monopolized telecommunication service in the whole Kingdom, Thai

Telephone and Telecommunications Public Co., Ltd. (TT&T) has commenced service in the provincial area² by concession since 1993. Additionally, to conform the WTO Agreement to liberate Thai market by the year 2006, the Government obliged TOT to be privatized. TOT is currently preparing a step-by-step plan for the transformation. The Thai telecommunication sector is on the way of privatization and competition age.

3.1.7.1 Current Status

Currently, TOT and TT&T provide the telecommunication service in the provincial area. Each service provider has almost 1.5 million line capacity and one million lines connected in the whole provincial area. The market share of the two is very close.

Table 3.1-11. BASIC TELEPHONE SERVICES IN FOUR PROVINCES (1997)

	Main Telephone Stations			Line Capacity	Exchange (1996)	Population	Pop. / Sta.
	TOT	TT&T/TA	Total				
Nakhon Ratchasima	41,679	37,648	79,327	92,494	77	2,510,839	31.7
Buri Ram	10,014	8,323	18,337	23,565	31	1,494,836	81.5
Surin	10,622	4,852	15,474	23,008	22	1,367,685	88.4
Chaiyaphun	6,755	9,768	16,523	21,710	29	1,115,519	67.5
Northeast	214,986	171,886	386,872	512,969	491	21,095,841	54.5
Bangkok	1,256,092	955,522	2,211,614	3,351,930	223	5,604,772	2.5
Whole Kingdom	2,499,504	2,315,539	4,815,043	6,908,957	2,725	60,816,227	12.6

Source: Alpha Research Co. Ltd. 1999.

Table 3.1-11 indicates the outline of the basic telephone service in 1997. Huge gap can be found in the telephone density between the four provinces and Bangkok. The population per station in the four provinces is more than 15 to 30 times of Bangkok area. The gap is mainly caused by the difference between the urban and rural area within each province as the area coverage in each province is still insufficient in the rural area. In the urban areas in the four provinces, the service level is close to Bangkok.

The number of waiting list peaked in 1993 at 1.8 million and decreasing rapidly by the boom of mobile phones and the introduction of concession. Currently, the telephone subscription is available within one week from application if the applicant lives in the service area.

² "Provincial area" includes all area but Bangkok metropolitan area. Bangkok metropolitan area is served by TOT and another concessionaire, Telecom Asia (TA).

In the four provinces, from 7% to 14% of the lines are contracted for business users. This is significantly lower than that rate of Bangkok, 23%.

Optical fibers have been rapidly introduced since 1995. Provincial area holds 42,879 core-km (1997) of optical fibers and it is 57% of the whole kingdom. Optical fibers serve most MSU and RSU in the four provinces.

Integrated Services Digital Network (ISDN) has been also available in the area since 1994. However, the subscribers are very limited. The only 306 ISDN subscribers are served in whole provincial area, while 1,396 subscribers are served in the Bangkok Metropolitan area (1998). In Buri Ram, no one uses the ISDN although the service is available.

The average fault rate in the provincial area in 1998 was 2.73 cases month per 100 lines which is higher than that in Bangkok, 2.38, but lower than the intended target of 3.75 (TOT). This indicates the reliability of the service.

3.1.7.2 Problems and Issues

Although the statistical numbers appears inferior telecommunication service in the four provinces, the actual condition is good in the urbanized areas especially in each provincial capital. Various telecommunication services including ISDN, Internet, line lease and Integrated Satellite Business Network (ISBN) are available in the urban area on request. In addition, mobile service is available almost everywhere in the four provinces. These services can fulfil the business and industrial user's complicated demand on telecommunication.

One problem is the low quality of subscriber's telephone lines. Because the length of secondary cable between last cabinets and the telephone units extends more than 200m in the provincial area, it picks noise on the way. In addition, the telephone cable runs on the electric poles without sufficient clearance with power lines. This is caused by the insufficient standard for telephone service. It is required to revise the service standard and the number of cabinets.

The other problem is the low service level of the rural areas. The industrial users who need high telecommunication quality will naturally avoid such areas that the problem will be very minor.

Another issue is about the provision of services. Although the service is physically available on request, the whole menu of service is not clearly presented by the telecommunication service providers. Because people tend

to consider fewer services are available than actual, it is necessary for telecommunication service provider to announce and present the function, availability and price of new services clearly to the users.

3.1.8 Pipeline

Transportation by pipeline is very limited in Thailand. PTT (Petroleum Authority of Thailand) Gas plans and implements the construction of pipeline based on the government policy. The investment decision is based on the profitability and government financial support

3.1.8.1 Current Situation

Currently, there is no gas pipeline in the four provinces due to the lack of sufficient gas users, such as thermal plant and industrial users. All natural gas and petrochemical products are transported from the Central Region by trucks or trains.

3.1.8.2 Ongoing Project

The pipeline construction project between Wang Noi (Pathum Thani Province) and ASEAN Potash Mining (APM) Project (Chaiyaphum Province) is now under preparation. The outline of the new pipeline is as follows:

- Wang Noi – Nakhon Ratchasima 24-inch diameter 182km
- Nakhon Ratchasima – APM 24-inch diameter 78km

In addition, several block valve stations will be required.

Because the APM Project is the only one potential big user of natural gas, whether to lay this new route completely depends on APM Project and the new chemical complex. The PTT Gas will not construct the new pipeline until the chemical complex ensures the consumption of natural gas.

3.1.9 Summary of Current Availability

Figure 3.1-8. Comparison among Regions

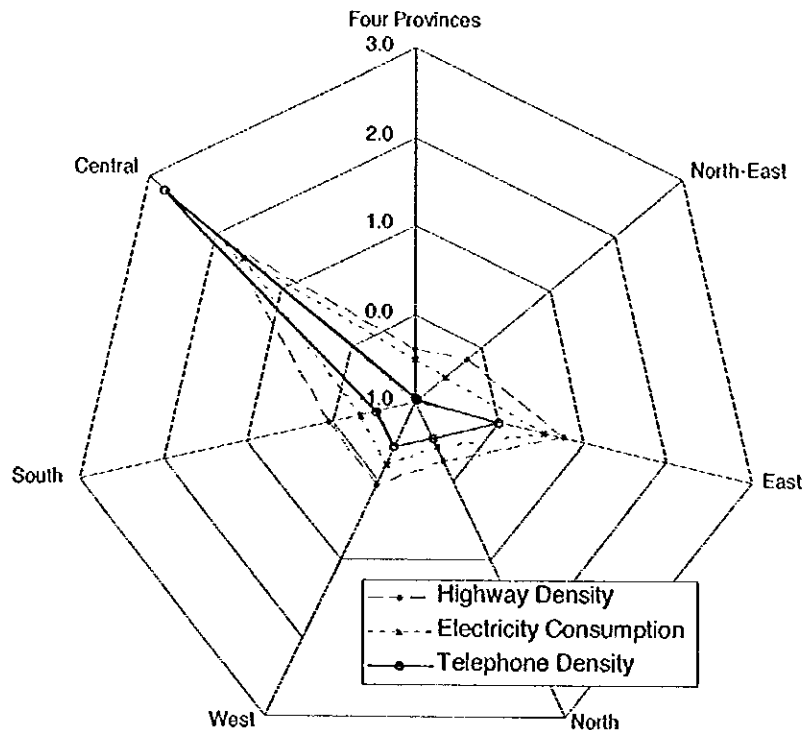


Figure 3.1-8 compares the development level of service among regions in the kingdom. The following indicators were selected with standardized indexes:

- Highway density: per two lane km/sq. km (1997)
- Electricity consumption: MKWh/person (1997)
- Telephone Density: Stations/ per 100 persons (1997)

All indicators were standardized with average and standard deviation. The level of 0 is at the national level. The Central Region includes Bangkok and its vicinity. Because these numbers includes rural and urban area within each region, it does not necessarily express the potential for the industrial development.

The Central Region stands out among the regions and the Eastern Region follows it. The utility level in the North-East is the lowest level in the country. Especially, the highway density is the lowest. Telephone density and electricity consumption in the North-East have similar pattern with the North Region. The difference between the four provinces and the North-East is not

so prominent that four provinces has the same level with the average of the North-East.

Table 3.1-12. AVAILABILITY OF INFRASTRUCTURE SERVICES

	Nakhon Ratchasima	Buri Ram	Surin	Chaiyaphum
Highway	***	**	**	**
Railway	***	**	**	**
Civil Aviation	***	**		
Water Supply	***	**	**	**
Electricity	****	****	****	****
Telecommunication	****	****	****	****

- **** Easily available
- *** Available
- ** Available but inconvenient
- * Hardly available
- Not available

The above Table summarizes the relative availability of infrastructure service by provinces. The electricity and telecommunication services are sufficiently available in the four provinces. Other service level is differentiated by province by province.



3.2 Land Use and Industrial Estates

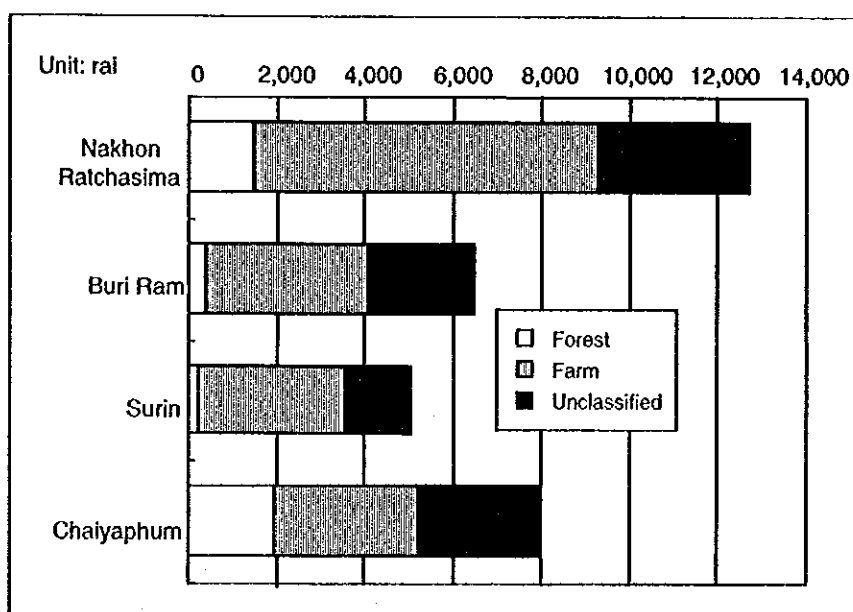
3.2.1 Land Use

The Department of Town and Country Planning (DTCP) under the Ministry of Interior demarcates the municipal boundary to be planned by the department. Outside of the boundary, the land use is not so clearly controlled. Especially, Royal Forestry Department (RFD) has strong power for forest conservation. The highest level of land use classification has three categories:

- Forest land
- Farm land
- Unclassified land

The last category, unclassified land, includes swamp land, sanitary district area, municipal area, railroads, highways and public area.

Figure 3.2-1. Land Use in Four Provinces (1993)



Source: Alpha Research Co. Ltd. 1999.

The above figure expresses an outline of land use in the four provinces. The forest area occupies the largest percentage (24.1%) in the Chaiyaphum Province. In other three provinces, the portion of forest area is between 3.4% and 11.2%, significantly lower than that in Chaiyaphum.

While the farm land in Buri Ram in 1993 dropped from 1990, other three provinces slightly increased the farm land. This implies that the agricultural activity is still expanding in the three provinces.

For industrial location, current category of "unclassified" land is suitable because it has no conflict with agricultural sector. In the four provinces, the unclassified land is sufficiently available to meet the industrial users' demand.

3.2.2 Industrial Estates

There is the Suranaree Industrial Zone (SIZ) in Nakhon Ratchasima. The SIZ was developed in 1996 and operated by Suranaree Industrial Zone Co., Ltd. The SIZ covers an area of 3,000 rai and some 1,000 rai are now in use. Approximately, 75 % them are allocated for factories, 15 % for administration, and 10 % for utilities. As of December 1999, the SIZ has 83 factories including 19 Japanese affiliated ones like JVC and Orion Electric. The SIZ seems to have the following advantages for outside investors.

- Abundant supply of cheap labor
- Tax and duty privileges applied to projects promoted in the BOI Zone 3
- Well-developed infrastructure (roads, airport, telecommunications, etc.)

Some 90% of the resident factories relocated their factories in Bangkok and its neighboring areas in the SIZ. Most of them have expanded their production scale by relocation. Coca Cola Co. relocated its factory in Khon Kaen because the quality of water is better in Nakhon Ratchasima.

The most important problem the resident factories have been confronted with is lack of human resources with management capability. They moved most of the engineers and managers/supervisors which had worked at their older factories in the metropolitan areas to their new factories in the SIZ. Many of those managerial persons live in Nakhon Ratchasima apart from their families. Although there are Suranaree University of Technology and several technical colleges in Nakhon Ratchasima, they can not meet the growing demand from manufacturers.

Outside the SIZ in Nakhon Ratchasima, foreign manufacturers such as Seagate Corp. and Kawasumi Co. relocated their plants from the metropolitan area. Seagate moved from the Nawanakhon Industrial Estate to expand its production base in Southeast Asia.

At present, the IEAT plans to develop an industrial estate with 1,072 rais in Buri Ram. The construction of this industrial estate aims to promote economic development, to increase income, and to create employment in Buri Ram. It is in line with the development policy for regional industries which is adopted by the government. Moreover, the Ministry of Science, Technology, and Environment has requested all industrial estates to carry out EIA and the Buri Ram Industrial Estate already assigned a private enterprise for EIA.

Figure 3.2-2 shows the location of the Buri Ram Industrial Estate. It is planned to construct along the national road no. 226 on the opposite side of the IPC 7. The following shows the allocation of the land with a total area of 1,072 rais.

Factory Site (general use):	484 rais
Factory Site (export processing use):	143 rais
Utility Area:	283 rais
Residential Area:	29 rais
<u>Green Area:</u>	<u>133 rais</u>
Total:	1,072 rais

The Buri Ram Industrial Estate plans to allocate 133 rais (12 % of the gross area) to green areas with trees planted. It will build reservoirs in lowlands to supply water to resident factories. It will also construct a treatment center for organic water waste inside the industrial estate. All resident factories are requested to make the primary treatment of their waste water within their factories. Each of the factories engaged in electronics, foundry, metal engineering, and plastic processing is obliged to introduce its own treatment facilities for chemical waste water so that the chemical content in its waste water can be reduced to less than the regulating standards. Thus, waste water going through the primary treatment by the resident factories is gathered up by the treatment center for organic waste water. The treatment center makes the secondary or final treatment to discharge it to rivers. The center is designed to be capable of treating 6,500 cubic meters per day.

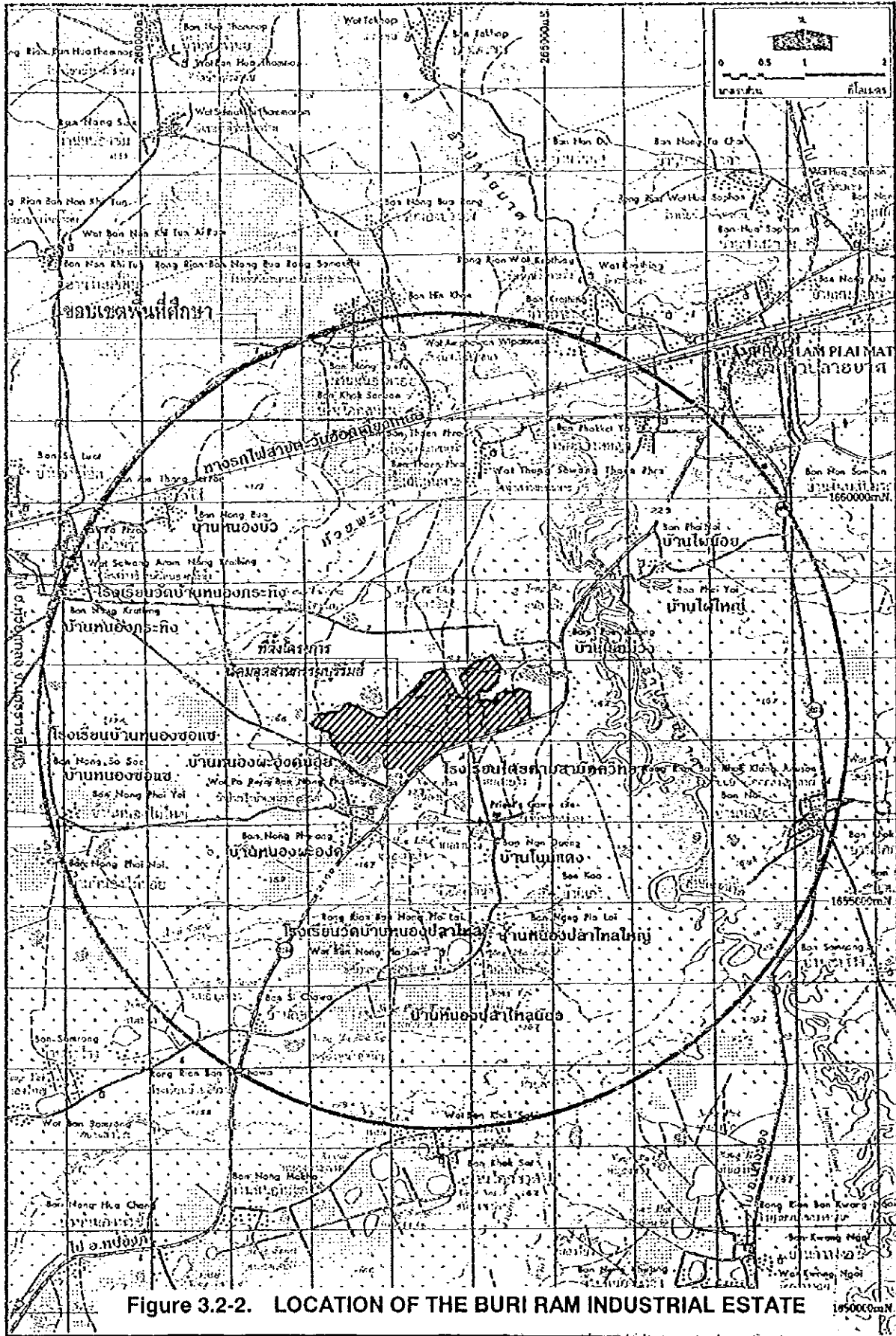


Figure 3.2-2. LOCATION OF THE BURI RAM INDUSTRIAL ESTATE

The following shows types of industries/products allowed to set up their factories and not allowed to. The Buri Ram Industrial Estate is chiefly intended to invite manufacturers which are engaged in agricultural products processing and light industries which will not be threatened with environmental disruption.

<Types of Industries/Products allowed>

Textile weaving, Fishery nets, Garments, Rubber products, Corn starch, Tapioca starch, Feedstuff, Vegetable oils, Dairy products, Electronics products, Shoemaking, Corrugated paper boxes, Artificial flowers, Jewelry, Foundry & metal processing, Electric equipment, Plastic products, Farm implements, etc.

<Types of Industries/Products not allowed>

Petrochemicals, Tannery, Dyeing, Pulp, Insecticides, Smelting of used lead, Explosive materials, Fluorescent lamps, etc.

Furthermore, a private enterprise planned to develop another industrial estate in the northern part of Nakhon Ratchasima, but that plan has now suspended.

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3.3 Review of Previous JICA Study

Japan International Cooperation Agency (JICA) conducted the study of “Regional Development Plan for the Lower Northeast and the Upper East Region in the Kingdom of Thailand” (hereunder “Previous Study”) from February 1992 to July 1993. The previous study covered 9 provinces in all, 7 from the Lower Northeast and 2 from the Upper East Region in Thailand. Three provinces (Nakhon Ratchasima, Buri Ram and Surin) out of 9, are also included in this study. Chaiyaphum Province was not included in the previous study. This Chapter reviews the current status of the proposed project within the duplicated three provinces.

3.3.1 Regional and Inter-regional Projects

The project numbers with R refer to the final report of the above study.

R1. Regional Artery Establishment

This program proposed initial link from Eastern Seaboard and Mukdahan via Buri Ram. Because the mountainous topography increased boosted the estimated cost, DOH has not listed the route in its program.

R2. Railway Improvement

This extends a new line from Bui Ya to Mukdahan. Although a feasibility study was conducted, the SRT does not take any further action due to budget constraint (See also 3.1.3.2).

R3 Route 24 Improvement

The route number 24 is listed in the Phase II of Four Lane Project. The DOH will expand the route by 2006 (See also 3.1.2.2). The DOH estimates total 5,076 million Bahts for 226 km out of the 390 km of the total length.

R5 Local Air Service Network Development

Nakhon Ratchasima Airport and Buri Ram Airport were opened after the study. The Nakhon Ratchasima Airport was derived from the former airport which was for both civil and military use. The former airport

became military use only. Currently, these new airports have scheduled passenger flights to Bangkok.

R7 Phanom Dong Rek Water Resources Development

Feasibility study for phase I was conducted in 1995, followed by implementation.

R8 Lam Thakong Pumped Storage Power Generation

This project originally started by another JICA study from 1989-1991. OECF agreed the loan of 18,242 million yen in September 1994 for the procurement of four turbines. In addition, the World Bank financed the part of civil work, which has completed by 95% as of February 2000. Currently, the first two turbines are being installed and scheduled to be completed by the middle of 2001. The procurement of the remaining two turbines has no fixed schedule due to the drop of power demand and economic crisis.

R9. Buri Ram International Airport

Buri Ram now has their own airport: however, Buri Ram International airport project is not under consideration at present due to not enough passengers and Airline is not break-even.

R10. Buri Ram/Surin Twin City Development

Finish Draft Project in 1994, but no movement for further action.

R11. Nakhon Ratchasima Integrated Urban Development

This program is operating by Ministry of Interior to co-operate all the ministries that respond for integrated urban development program. This program was started in year 1998 and implement in 1999.

R12. Korat Skill Training Center

Korat Skill Training Center of Provincial Agriculture Office provides monthly skill training program to farmers and was establishing in 1987.

R13. Nakhon Ratchasima Industrial Modernization Program

Nakhon Ratchasima Industrial Modernization Program has been implementing in 1994 and already pursue its objective and now it is under implementing process.

R14. Khao Yai Resort and Research Development

The project had been granted by the government in 1994, and then in 1995 the project was put on hold. At present this project is again under hiring project's advisor process in order to design the building and details. The building will be built by this year. The objective of this project is to train and support the human resource for environment tourism purposes. Fund is supported by OECF (from Japan).

R15. Groundwater Exploration

In Northeast Region, groundwater exploration has never been explored; however, at present there is Miyazawa fund to start the project.

R16. Natural Gas Pipeline Extension

There will be Natural Gas Pipeline Extension in NorthEast Region. The project is under feasibility study due to high investment cost.

R17. Regional Truck Terminals

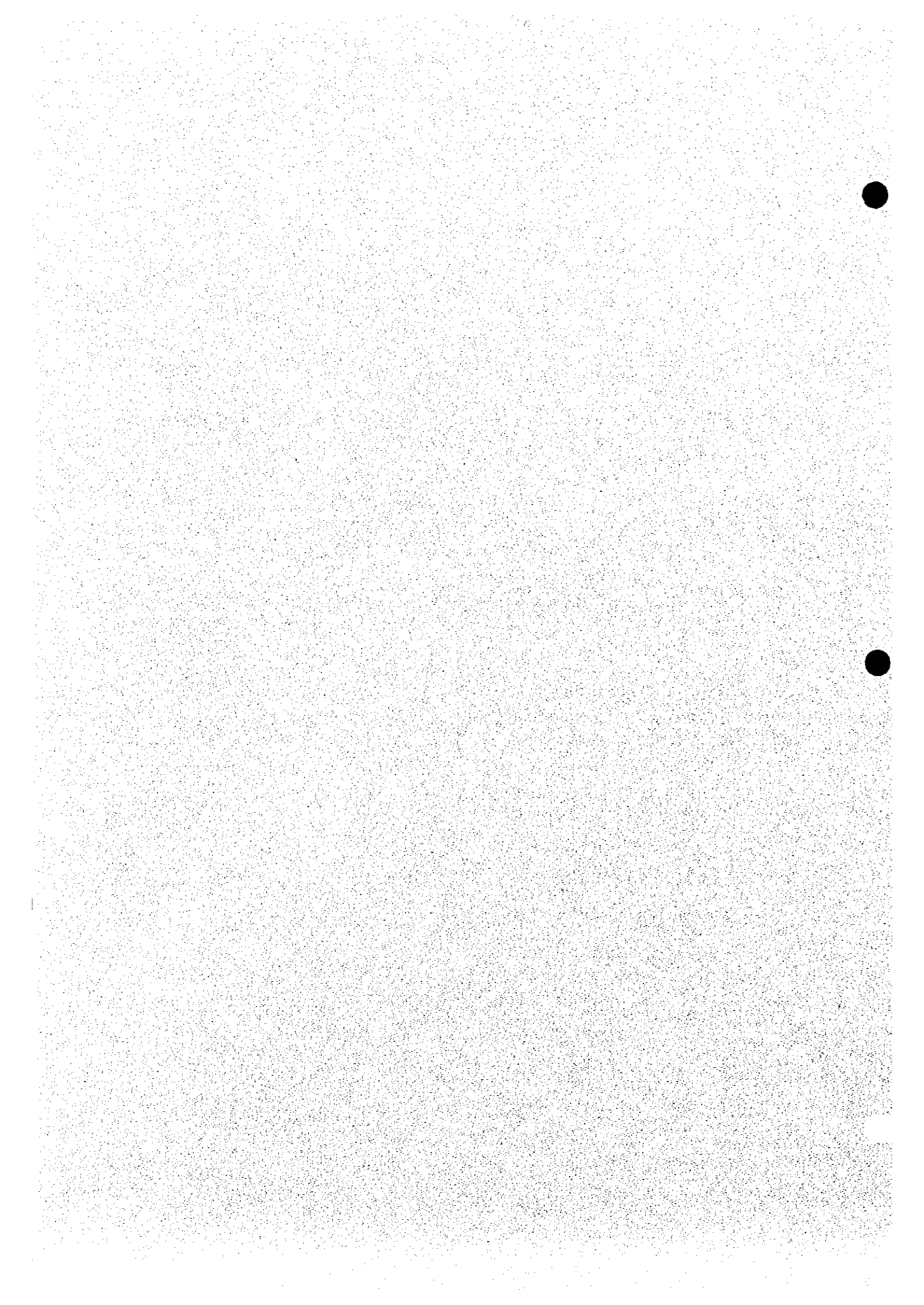
This project has not yet been planned.

R18. Rural Telecommunication

This project already started since plan 5 in Tambon level and ended in plan 7 total of 1813 Tambon in North East Region. At present (plan 8), this project is implementing in Village level; this plan will apply to 28,000 out of 45,000 villages. The plan will be finished in 2001.



Chapter 4 Current State of Industries in the Target Provinces



Chapter 4 Current State of Industries in the Target Provinces

4.1 Current Situation and Prospects of Local Companies

4.1.1 Manufacturing Industries In Nakhon Ratchasima

4.1.1.1 Overview of Industries In Nakhon Ratchasima

According to the factory register of the Ministry of industry, there were 5,812 manufacturing establishments in Nakhon Ratchasima as of the end of 1996. This means that the province ranked fifth in the country. Of total, 4,220 establishments had 10 or less employees (72.6%) and most of them were rice mills. On the other hand, there were 56 large enterprises employing 300 or more persons. The number was largest among the target provinces and ranks tenth in the country¹.

The Federation of Thai Industries (FTI), considered to be a social club of large manufacturing companies, has 152 members in its Nakhon Ratchasima Chapter, of which processors of agro-products represent a relatively high percentage, e.g., 10 rice mills, 8 tapioca mills and 5 sugar refineries. They are operated throughout the province, and food processing companies including dairy producers operate in and around Pakchong area in the south. According to a pamphlet made by the FTI Chapter to introduce the province's profiles, there were 7,150 manufacturing establishments in 1997, of which processors of agro- and farm products and food processing accounted for 71.7%.

While local industries are dominated by the processing of agro-products because agriculture is a traditional economic base of the province, there are a large number of small- and medium-sized machine shops, ceramics factories and construction material factories. Machine shops originated in repairing of agricultural machines and implements, and motor vehicles, which was evolved to machining and metalworking. In the 1990s, new industries such as electric and electronics have started to build and operate production

¹ It should be noted that the Bangkok Metropolis overwhelms other provinces in the ranking, ten times the number of establishments in the province in second place.

facilities in the province. A major concentration of new industries occurs in and around the Suranaree Industrial Zone. The industrial estate housed 57 establishments as of June 1996, of which electric and electronics manufacturers totaled 13. Thus, industrial diversification takes place in the province while the traditional processing of farm products still occupies the position of a major economic base.

The following section briefly describes the current state of manufacturing establishment as identified during the second field survey, and major issues facing them.

Table 4.1-1. PROFILE OF SURVEYED COMPANIES IN NAKHON RATACHASIMA

Code No.	Type of business	Company name	Employee	Capital	Major Products	Market
KR - 1	Agro processing	Mae Sunneing Co.	10	Thai 100%	Chili paste	Mainly domestic
KR - 2	Agro processing	General Food Products	120	Thai 100%	Rice mill	Mainly export
KR - 3	Food processing	Sethi Lao Co.	100	Thai 100%	Rice craker	Mainly domestic
KR - 4	Food processing	Vanguard Foods Co., Ltd.	130	JV	Frozen vegetable, yakitori	Export 100%
KR - 5	Agro processing	Chia Meng Co., Ltd.	400	Thai 100%	Rice mill	Export 100%
KR - 6	Food processing	Learn Thong Protein Foods Co., Ltd.	300	Thai 100%	Chiken sousage	Domestic 100%
KR - 7	Food processing	Minor Dairy Limited, Minor Cheese Limited.	120	JV	Ice cream Cheese	Domestic 100%
KR - 8	Food processing	EFFEM FOODS	200	JV	Pet foods	Export 30%, Domestic 70%
KR - 9	Food processing	Thai Chim Ltd.	60	JV	Yuba, Japanese foods	Mainly export
KR - 10	Food processing	Thai Silk Products Co., Ltd.	60	Thai 100%	Mulberry tea	Export 50%, Domestic 50%
KR - 11	Electrical & electronics	Asian Production & Technical Service Co.	300	USA 100%	HDD, PCB	Export 100%
KR - 12	Electrical & electronics	JVC Component Thailand Co., Ltd.	3,000	Japan 100%	Electronics parts	Export 5% Domestic 95%
KR - 13	Electrical & electronics	Korat Denki Co., Ltd.	1,750	Japan 100%	TV, VTR	Export 100%
KR - 14	Electrical & electronics	Nippon Mechatronics Parts Co., Ltd.	550	Japan 100%	HDD, Printer, VTR head	Export 99%
KR - 15	Electrical & electronics	Seagate Technology	8,300	USA 100%	HDD	Export 100%
KR - 16	Electrical & electronics	Takahashi Korat Co., Ltd.	65	Thai 100%	Electronics parts	Export 100%
KR - 17	Electrical & electronics	Thanakorncity Co., Ltd	16	Thai 100%	TV cabinets	Domestic 100%
KR - 18	Electrical & electronics	Toyonaga (Thailand) Co., Ltd.	800	JV	Commutator	Export 95%
KR - 19	Electrical & electronics	Press Craft (Thailand) Co., Ltd.	580	JV	Housings	Domestic 80%
KR - 20	Vehicle & Machinery	Cherdchai Macchina Co., Ltd.	1,000	Thai 100%	Buses	Domestic 100%
KR - 21	Vehicle & Machinery	Daisin Group	2,000	JV	Auto-parts	Domestic 88% Export 12%
KR - 22	Vehicle & Machinery	Korat Automotive Co., Ltd.	16	JV	Special vehicles	Export 30% Domestic 70%
KR - 23	Vehicle & Machinery	Korat Saian Co., Ltd.	145	Japan 80%	Mold	Export 70% Domestic 30%
KR - 24	Vehicle & Machinery	Korat PS Work Co.,m Ltd.	75	Thai 100%	Milling machines	Domestic 99%
KR - 25	Vehicle & Machinery	Rongkrung Nai Kieng Co.,	23	Thai 100%	Auto repairing	Domestic 100%
KR - 26	Car seat (sewing)	Lear Seating Co.,Ltd.	440	JV	Sheet	Export 100%
KR - 27	Toy	Thaitoy Co., Ltd.	1,300	Thai 100%	Toy and Parts	Export 95%
KR - 28	Plastic film	MMP Packaging Group Co., Ltd.	150	Thai 100%	PE films	Domestic 100%
KR - 29	Silk textile	Jaturong Thaisilk Co., Ltd.	10	Thai 100%	Silk textiles	Domestic 100%
KR - 30	Silk textile	Chaluay Thai Silk	54	Thai 100%	Silk textiles	Domestic 100%
KR - 31	Silk textile	Nualchan Thaisilk	30	Thai 100%	Silk textiles	Domestic 100%
KR - 32	Ceramics	Umdang Ceramics	20	Thai 100%	Ceramics	Domestic 50%
KR - 33	Ceramics	Dinpao Industry	40	Thai 100%	Ceramics	Domestic 100%
KR - 34	Ceramics	Chaow Din Pottery	60	Thai 100%	Ceramics	Domestic 50%
KR - 35	Salt	Pimai Salt Co., Ltd.	93	Thai 100%	Salt	Domestic 100%
KR - 36	Rubber processing	Rubberon Technology	320	Thai 100%	Golf grip	Export 98%
KR - 37	Vehicle & Machinery	Daichi Alloy	120	Thai 100%	Tin foils	Domestic 90%
KR - 38	Vehicle & Manufacturing	A.S. Korat Industry	30	Thai 100%	Hydraulic brake	Domestic 100%
KR - 39	Vehicle & Manufacturing	A.L. Cast Co., Ltd.	130	Thai 100%	Al. die-casting	Domestic 100%

4.1.1.2 Results of the Interview Survey of Selected Manufacturing Establishments

During the survey, the study team visited 39 establishments in the province. Of total, 10 were processors of farm products and foodstuffs, 9 electric and electronics, 6 automotive and machinery parts, 4 textiles, 3 ceramics, and 3 others. The size of establishment varies greatly between 5 and over 500. General profiles of the establishments surveyed are summarized in Table 4.1-1. The current state of the establishments is analyzed in the following five areas: 1) business trends; 2) management; 3) production technology; 4) market development; and 5) request for government.

(1) Business trends

15 establishments (38%) decreased sales compared to the previous year due to the effect of the 1997 economic crisis. The majority reported flat or increased sales to reflect the fact that the survey chiefly covered export enterprises. They enjoyed sales growth due to the devaluation of the baht, regardless of industry types, including food processing and electric and electronics. On the other hand, manufacturers serving the domestic market experienced sales downturns at a rate of 30 – 40% in 1998. They reported the continued sluggishness in 1999 without any signs of recovery. In particular, the silk industry faced difficulty as imported raw silk prices rose together with domestic prices. It should be noted, however, that the establishments visited were all recommended by the provincial office (PIO) of the Ministry of Industry and appear to be relatively in good condition; none of them expressed or suggest difficulty in continuing business.

(2) Management

Many enterprises, including large ones, are basically managed by families or relatives, with the exception of Pimai Salt Co. On the other hand, joint ventures with foreign capital hire professional managers. It is often pointed out that owners of family concerns have strong interest in business expansion but they do not have information required for new business development. In particular, the lack of market information was cited by the enterprises surveyed, regardless of type and size (especially by domestic market-oriented enterprises). Some enterprises operate web sites, which are not used for company-wide, business purposes and remain to be personal

projects of owners. Many enterprises are enthusiastic about promoting the 5S campaign or obtaining ISO certification. Even though some rice mill companies which emphasizes exports has obtained ISO certification.

Financially, they are generally in good condition. In particular, foreign joint ventures receive full support and control of their parents and none of them have difficulty in meeting financial needs. Most of local companies have little complaint about financing and financial access, while the many express the need for better loan terms including interest rate and security requirements.

Owners and managers are relatively enthusiastic about participating management seminars held elsewhere, but they do not have time to study a particular subject continuously and thus not have comprehensive knowledge on business management. In fact, this is pointed out by the enterprise side. The Ministry of Industry and universities has developed and offer various educational programs, but they have still to show favorable results.

A major problem cited by individual enterprises, foreign enterprises in particular, is that many workers return to home during the rice harvest season, which ranges from three months (November and January) to four months. This disturbs production planning and management and enterprises take various measures to keep workers at factory. Foreign enterprises believe that factory workers should work throughout the year and efforts should be made to raise awareness of local workers. In contrast, local enterprises are relatively lenient to the problem and some accept the seasonal return as a lifestyle in locality. The exception is Pimai Salt Co., owned 100% Thai capital, which dismisses workers who return to home for rice harvesting.

(3) Production technology

As it is very difficult to discuss this subject from general perspectives because different industries require different elements of production technology, comments are made on the following key industries.

Food processing industry: Most enterprises have modern facilities and equipment, including imports. While some factories are labor intensive, such as biscuit, the enterprises visited have high levels of production technology. According to the IPC staff, many factories operating in the area still depend on manual workers and have problems in the areas of quality control and hygiene.

Electric and electronics industry: Labor-intensive operation is dominant among both assemblers and suppliers, while a large number of imported equipment, particularly those made in Japan, is used, including second-hand equipment used at Japanese factories. Quality control appears to have reached internationally accepted levels and most enterprises are prepared for ISO certification.

Silk and Ceramics industry: This is a traditional industry in the province, where production techniques and know-how have been inherited in the same family. Individual enterprises realize that traditional production techniques alone cannot exploit an opportunity for market development. Also, many designs lack originality and there is the need for new ideas, designs and production techniques to modernize the traditional industry to meet the market needs.

(4) Market development

Some enterprises maintain production facilities in Nakhon Ratchasima and have sales and marketing divisions in Bangkok. This pattern is usually seen among manufacturers who export their final products. On the other hand, Japanese-affiliated electronics manufacturers do not have sales and marketing functions, which are controlled by their parents. In particular, many enterprises surveyed operate on the basis of long-term contracts with customers (including OEMs) and thus do not have any division or staff responsible for market development. Manufacturers of traditional products, e.g., silk and ceramics, rely on agents in Bangkok when exporting their product, because many feel the need for considerable time and market to explore the overseas market – a major obstacle that is more important than the export cost itself. As a result they have to continue indirect exports by accepting unfavorable conditions. In addition, small enterprises feel

difficulty in obtaining information on the domestic market and point out limited opportunities for advertisement of products such as exhibitions.

Finally, many enterprises are concerned about losing competitiveness due to cost increase, regardless of industry type. For them, additional costs to comply with environmental regulations and international standards are major concerns, not to mention the increases in labor and material costs.

(5) Request for government

At the end of the interview survey, each enterprise was asked if it had any request for the government. The majority of local enterprises responded that they had none. It should be noted that the response somewhat indicates that they do not expect any support from government because they have been disappointed by previous government support. On the other hand, foreign enterprises demanded the streamlining of import procedures and the improvement of the communication system. Among local enterprises, the adjustment of material costs (correction of excess protection of farmers), support in R&D fields, assistance in market development were voiced. Also, some criticized the lack of consistency in government policy and programs. One example cited was a silk product display center constructed by the Tourism Authority of Thailand in Paktongchai (major silk producing center), which has not been used since its completion.

Many enterprises raise these issues and requests at meetings of FTI and trade organizations, as well as the meeting between the government and the private sector to represent opinion of the entire producing area. However, they are not recognized in many cases, apparently causing the disappointment and the negative response in the survey. Finally some enterprises pointed out that the lack of clout over government policy originated in the fact that private enterprises were not well organized to form an effective pressure group.

As for infrastructure, few enterprises complained about roads and transport access. They do not feel that distance to Bangkok (3 hours) is not a problem. On the other hand, many demand the improvement of the communication system and power supply.

4.1.1.3 Major Issues on Industrial Development in Nakhon Ratchasima

From general profiles of industrial structure and distribution in the province, it is clear that the existing industrial base has some diversity. The survey of enterprises still continues and the results of the questionnaire survey that is conducted concurrently should be incorporated into the results of the interview survey to reach the final conclusion. Preliminary findings on major issues related to industrial development in the province are summarized as follows:

- (1) To build up the supplier base for the electric and electronics industry;
- (2) To create value added for traditional industries (upgrading or modernization of production techniques and design);
- (3) To encourage the upgrading of production techniques and product development in the machining and metalworking industries;
- (4) To raise the levels of processing of farm products to food production;
- (5) To train manpower for factory operation, focusing on morale, diligence and skills; and
- (6) To secure public support for industrial development, including the upgrading of communication and power supply systems, market development, and human resource development and training.

4.1.2 Manufacturing Industries in Buri Ram

4.1.2.1 Overview of Industries in Buri Ram

According to the Ministry of Industry, the number of manufacturing factories in Buri Ram was 2,079 as of the end of 1996. Among them, factories with 9 or less employees numbered 1,710 (82.2%). Most of those small-size factories were engaged in rice milling. On the other hand, factories with 300 or more employees were only 6. Another statistics by the same source showed there were 98 factories with 20 or more employees engaged in agricultural production or food processing. They included 41 rice mill factories and 30 tapioca factories.

The Buri Ram Chapter of the Federation of Thai Industries (FTI) has 39 members as of October 1999. The Buri Ram Chamber of Commerce has a

membership of about 300 as of January 2000. Almost all members of the Buri Ram FTI also hold membership in the Buri Ram Chamber of Commerce. Thirty nine members of the Buri Ram FTI include 10 crush stone factories, 11 concrete factories, and 6 rice mill factories.

Besides agricultural products like rice and tapioca and construction materials like stone and concrete, there are some medium to large-size factories engaged in the production of garments, footwear, and wigs. Those factories have taken advantage of abundant cheap labor in Buri Ram. Furthermore the plan of developing an industrial estate in Buri Ram is now in motion. This industrial estate is intended to invite factories for food processing and light industries.

The following summarizes the present situation and problems in the manufacturing industries in Buri Ram, on the basis of data and information from 16 factories we visited during the second field survey.

4.1.2.2 Results of the Interview Survey of Selected Manufacturing Establishments

We studied 16 factories in total, made up as follows; rice milling, rice bran oil, rice noodles, sugar, canned fruits/vegetables, pig breeding, pork sticks, ice, ice cream, sportswear, sports shoes/sandals, wooden furniture, farm tractors, and wigs. The profiles of those factories are shown in Table 4.1-2. The following summarizes their business trends, management, production technology, marketing, and requests to the Thai government.

(1) Business trends

Nine factories for agricultural products or processed foods have not been seriously damaged by the economic crisis in 1997. A factory exporting half of their canned fruits/vegetables increased their sales steeply due to the devaluation of the baht. Other factories of rice bran oils, pork sticks, and ice cream also expanded their domestic sales by sharp price hikes of their products. But most of the nine factories including those benefited from the crisis have now suffered from fluctuations in the prices of raw materials and stagnant domestic consumption.

Table 4.1-2. PROFILE OF SURVEYED COMPANIES IN BURI RAM

Code No.	Type of business	Company name	Employee	Capital	Major Products	Market
BR-01	Machinery	Jakpetch Machinery Esarn Co., Ltd.	40	Thai 100%	Tractors	Domestic 90%
BR-02	Chemical	Aderans Thai Co., Ltd.	800	Japan 100	Wigs	Export 100%
BR-03	Wood processing	Miracle World Co., Ltd.	80	Thai 100%	Wooden Toys	Export 90%
BR-04	Food processing	Doi Kham Food Products Co., Ltd.	20	Thai 100%	Fruits processing	Export 50%
BR-05	Textile & garments	Nargrong Pacific Garment Co., Ltd.	130	Thai 100%	Garments, Shoes	Export 100%
BR-06	Textile & garments	Union Shoes Co., Ltd.	65	Thai 100%	Sport Shoes	Domestic 90%
BR-07	Construction materials	Somboonsook Group of Companies	400	Thai 100%	Stone milling, road construction	Domestic 100%
BR-08	Food processing	RMC Farm Co., Ltd.	20	Thai 100%	Ham, sausages	Domestic 100%
BR-09	Construction materials	Kitmongkhon Buri Ram Ltd., Part.	30	Thai 100%	Concrete blocks	Domestic 100%
BR-10	Wood processing	KMI Forest Co., Ltd.	30	Thai 100%	Eucalyptus chips	Domestic 100%
BR-11	Food processing	Buri Ram Meat ball factory	40	Thai 100%	Meat ball	Domestic 100%
BR-12	Agro-processing	Buri Ram bran oil Co., Ltd.	80	Thai 100%	Bran oil	Domestic 100%
BR-13	Food processing	Rong tio Rongman	15	Thai 100%	Rice noodle	Domestic 100%
BR-14	Agro-processing	Saha-palana Group	200	Thai 100%	Rice milling	Domestic 100%
BR-15	Food processing	Winner Ice Cream Co., Ltd.	10	Thai 100%	Ice Cream	Domestic 100%
BR-16	Agro-processing	Burium Sugar Co., Ltd.	90	Thai 100%	Sugar	Export 90%

Four factories for sportswear, sports shoes/sandals, wooden furniture, or wigs have high export ratios of 90 % to 100 % in their sales. Due to the crisis, those factories increased their sales sharply. In the past two years, however, their products have been confronted with keen competition with products from Vietnam and China with cheaper labor force.

(2) Management

The factories for agricultural products or processed foods are run by Thai family concerns, except for a canning factory with its headquarters in Bangkok. Two factories of wooden furniture and farm tractors are also operated by Thai family companies. On the other hand, two factories engaged in production of sportswear and footwear have their headquarters in Nakhon Pathom and Chachoengsao, respectively. These two factories were established after the crisis. They are positioned as processing centers by their headquarters. A wig factory, wholly invested by a Japanese firm, is managed by the parent company.

(3) Production technology

Small-size factories for farm products or processed foods are equipped with some old machines and equipment. Their production technology is obsolete. They need investment funds to renew their production facilities and to introduce new machines like packaging ones for export use. Medium to large size factories have several staffs for quality control of their products. They are active in acquiring the international standards like HACCP.

Manual technology in the factories for sportswear, footwear, and wigs is on a high level because their products are all exported. The sportswear factory has recruited workers with higher skills. The footwear factory has been training its workers under the Rural Industrial Development Program. In the wig-making factory, workers have been given OJT for two to three years. Those factories have carried on 5S movements. The footwear factory has introduced the methods of "Minimum Cost Manufacturing (MCM)".

The factories for wooden furniture and small tractors have already made much investment in their production facilities. The wooden furniture factory exports 90 % of its products to Europe and the US. Its production technology has attained the international standards.

(4) Marketing

Agriculture products or food processing factories are lacking in marketing capability. Small to medium-size factories have few staffs for marketing their products or developing new products. The provincial office of the Ministry of Commerce has informed them of the market prices of raw materials like rice, tapioca, and sugar. But it has not offered them enough information on the market conditions of raw materials and development trends concerning products, technology, and application areas. In the case of the canning factory, its headquarters in Bangkok is responsible for product planning, marketing, and research and development.

The factories for wooden furniture and farm tractors are lacking in expertise for export marketing. The wooden furniture factory with a high export ratio has found difficulty in diversifying its product line and developing new products made of eucalypt. The tractor factory, which exports its products to

Laos in the past two years, has found it hard to expand exports due to bad quality of imported parts from China. Marketing activities in the factories for sportswear, footwear, and wigs are carried out by their headquarters in the Bangkok area or Japan..

(5) Requests to the Thai government

Most of the factories studied expect marketing support from the Thai government. The factories engaged in agricultural production or food processing need not only the domestic market prices of raw materials but a wide variety of information concerning the domestic and foreign markets. Such information include their competitors' sales trends in the international marketplace, practical methods to develop new products and application fields, and future prospects of market conditions at home and abroad.

Those factories for wooden furniture and farm tractors expect the government to give marketing guidance as well as marketing information. The furniture factory hopes that the government will carry out a periodical marketing guidance program by foreign experts. Those factories, which intend to expand their export sales, have found it difficult to compete with their foreign competitors with cheaper labor force in the future unless they try to strengthen their marketing and merchandizing capability.

Besides marketing support, smaller factories in both the agricultural sector and the non-agricultural sector expect the government to establish a small loan system where they can borrow investment capital or working capital with more favorable conditions. The furniture factory points out that import duties of subsidiary materials are too high compared with those on finished products

4.1.2.3 Major Issues on Industrial Development in Buri Ram

The agriculture and food processing industry and the light industries can be regarded as two major sectors for industrial promotion in Buri Ram. In the agricultural and food processing sector, it will be imperative to develop new demand areas and highly value added products, on the basis of agricultural resources. A promising direction for industrial promotion in the light industries seems to facilitate the production of international brand products like Nike and Adidas. In the areas of wooden furniture and leather,

industrial promotion policies should give priority to development of new markets including export.

The following problems are to be tackled to take the above directions for industrial promotion.

- Marketing support by the government (e.g. information services, market development, product development)
- Invitation of foreign enterprises and promotion of technical transfer
- Creation of a small loan system for SMEs
- Development of physical and social infrastructure
- Extension of education among farmers and factory workers

4.1.3 Manufacturing Industries In Surin

4.1.3.1 Overview

According to the factory register of the Ministry of Industry, there were 2,005 manufacturing establishments in Surin as the end of 1996. That is the smallest number in the target provinces. Investment of the existing factories were 2,578.024 million baht, and total employee in Surin establishments were 19,082. Most of the establishments were located in Muang District, Sangkla, Prasart, Tatume District respectively. Most of the establishments was small enterprises and there is no establishment with more than 500 employees.

4.1.3.2 Summary of Factory Surveys.

The study result is base on 20 Factories visit, the following are type of industries that The Team (Local consultants) had been visited. 2 Agro Industries, 1 Concrete product, 11 Food and Beverage Factories, 1 Wood Processing Factory, 2 Textile and Garment Factories, 1 Plastic and Chemical factory, 1 Steel factory and 1 other.

<u>Type of industry</u>	<u>No. of factory</u>	<u>Percentage</u>
Agro industry	2	10.00
Concrete products	1	5.00
Plastic and chemical	1	5.00
Wood processing	1	5.00
Steel	1	5.00
Textile and garment	2	10.00
Food and beverage	11	55.00
Other	1	5.00
Total	20	100.00

Table 4.1-3. Profile of company surveyed in Surin

Code No.	Type of business	Company name	Employee	Capital	Major Products	Market
SR - 1	Leather Shoes	Ta Si La Shoes	24	Thai 100%	Shoes	Domestic 100%
SR - 2	Food processing	Nim Nual	3	Thai 100%	Preserve fruit	Domestic 100%
SR - 3	Food processing	Lim Nguan Lee Noodle Factory	18	Thai 100%	Noodle, Bean Sprout	Domestic 100%
SR - 4	Food processing	Rice Noodle Factory	15	Thai 100%	Rice Noodle	Domestic 100%
SR - 5	Food processing	Jueng Hieng	10	Thai 100%	Preserve Radish	Domestic 100%
SR - 6	Food processing	Nam U-don	5	Thai 100%	Salted Pork Shredded Pork	Domestic 100%
SR - 7	Garment	Kaw Kiattisak	80	Thai 100%	Clothes	Domestic 100%
SR - 8	Machinery	Lo Ha Kit Machinery Factory	25	Thai 100%	Mill equipment	Domestic 100%
SR - 9	Refreshment	Sai Roong Drinking Water	8	Thai 100%	Drinking Water	Domestic 100%
SR - 10	Animal Breeding	Pig Farm	35	Thai 100%	Pig Breeding	Domestic 100%
SR - 11	Construction material	Kiat Pai Sarn Concrete Co., Ltd.	60	Thai 100%	Concrete, Brick	Domestic 100%
SR - 12	Food processing	Chang Krob Krua Co., Ltd.	25	Thai 100%	Fish Sauce	Domestic 100%
SR - 13	Garment	Siam Silk	24	Thai 100%	Silk Product	Domestic 100%
SR - 14	Plastic & Chemical	Num Huad Heng Co., Ltd.	15	Thai 100%	Bottle (Plastic)	Domestic 100%
SR - 15	Food processing	Lord	2	Thai 100%	Preserve Shrimps and fish	Domestic 100%
SR - 16	Food & Beverage	Nan Bakery	5	Thai 100%	Cake, Bakery	Domestic 100%
SR - 17	Wood processing	Furniture Factory	20	Thai 100%	Furniture	Domestic 100%
SR - 18	Food & Beverage	Green World Fruit Product Co., Ltd.	30	Thai 100%	Fruit Juice	Domestic 95% Export 5%
SR - 19	Animal Breeding	Mhoa Kaset 22 Ltd., Part.	10	Thai 100%	Chicken farm	Domestic 100%
SR - 20	Food processing	Elephant Brand Sweet Shop	6	Thai 100%	Thai sweets	Domestic 100%

The following summarizes the present situation and problems in manufacturing sector in Surin, as the result of the interview survey of 20 factories. In some questions, the total number of replies were more than 20 because of plural replies.

(1) Business Trends

In 1996, 14 of 16 factories (85%) resulted in making profit and 9 of 16 factories make a big profit (Table 4.1-4). In 1997 and 1998, most of the factories start to loss their sales. Most of the commodity product factories have a stable trend but construction, textile and garment, plastic and chemical, their trend upon economic status; however, they either make a big profit or break even. Moreover, 18 of 20 factories, their target market is in the country, over 90 percent of product sold in the country, 80 percent sold in Surin. Therefore, many factories would like to diversify market, outside the province or the country but they don't have any organization to advice in both information and help.

Table 4.1-4. PERFORMANCE TREND COMPARE TO PREVIOUS YEAR

Year	Big profit		Small profit		Almost even		Small loss		Big loss		Total
In 1996	9	56.25	5	31.25	1	6.25	1	6.25	0	0.00	16
In 1997	4	22.22	9	50.00	1	5.56	4	22.22	0	0.00	18
In 1998	0	0.00	13	65.00	4	20.00	2	10.00	1	5.00	20
In 1999	1	5.00	16	80.00	2	10.00	1	5.00	0	0.00	20

(2) Management

According to face to face interview, all of the factories operate by family. Therefore, family management style are common in Surin, because most of the factories run by family, also work procedure are routine work and employee skill is low, which reflect to the education level over 90% employee education below upper secondary school. Only 6.82% finish vocational school and higher, ten of them work in concrete factory, 7 of them work in pig breeding, only in concrete and pig breeding is operate in semi professional management.

Table 4.1-5. EDUCATION LEVEL OF EMPLOYEE

Subjects	Primary school	Lower secondary school	Upper secondary school	Vocation school and higher	Total
No. of employee	309	39	62	30	440
Percentage	70.23	8.86	14.09	6.82	100

(3) Production Technology

As we mention above, most all of the factories in Surin are run by family, also machinery and equipment are old and obsolete. Therefore it is very difficult to reduce cost or improve product qualities, due to unavailable loan from financial institute. Also 40% or 8 factories mention the only way to improve their production technology is to purchase new machinery and equipment. In addition 65% or 13 factories require more working capital for develop their factories, meaning that 40% or 8 factories require loan or working capital to improve or purchase new machinery and equipment (Table 4.1-6).

Table 4.1-6. PURPOSE OF LOAN

	No. of investment
Purchase of machinery and/or equipment.	8
Purchase of technology.	0
Working capital.	13
Others.	3
Total	24

Note: Plural answers

(4) Marketing

According to companies visiting, over 90% of product sale domestically approximately 70% of domestic sales sold within Surin province. Only shoes factory exports their product 100%, however, shoes factory still facing pricing, quality and new product development problems.

Table 4.1-7. MARKET BREAKDOWN

Market breakdown	Surin	
	No.	%
Domestic		
1-35%	0	0.00
35-70%	0	0.00
70-100%	19	100.00
Total	19	100
- In the province area		
1-35%	3	16.67
35-70%	4	22.22
70-100%	11	61.11
Total	18	100
Indirect export		
1-35%	1	100.00
35-70%	0	0.00
70-100%	0	0.00
Total	1	100
Direct export		
1-35%	0	0.00
35-70%	0	0.00
70-100%	1	100.00
Total	1	100

Refer to factories owner comment that local factory produce product for local use only, because they can not create new product (Product development) in order to sale to other areas or even outside the country (Table 4.1-7). Over 70% did not try to improve their product in order to sale their product to other areas and gain more market share. Before gain market share, they need enormous help from both government to supply experts, information and financial Institution for loan to improve their productivity, quality, training skill labour.

(5) Requests to the Thai Government

Most of the factories do not expect anything much from the government. Moreover, entrepreneurs know that government sector services that existing is inefficient.

Table 4.1-8. REQUEST TO THAI GOVERNMENT INSTITUTE

Kinds of support expect from government institution	No. of expect	Percentage
Corporate management advice.	7	11.48%
Financial management/accounting system consulting	9	14.75%
Technological guidance	5	8.20%
Guidance on quality control	10	16.39%
Training of employees	8	13.11%
Information services (Technology and marketing)	8	13.11%
Inquiry services (Potential partners and buyers)	8	13.11%
Inquiry Services (Material supplies)	6	9.84%
Total	61	100.00%

According to companies visit as shown in Table 4.1-8, 16.39% require guidance on quality control, 14.75% require financial management/accounting system consulting, 13.11% require training of employees, Information services (Technology and marketing) and Inquiry services (Potential partners and buyers) and 9.84%, 8.20% require inquiry services (Material suppliers); and technology guidance respectively. In addition, they still need help from the government as follows.

1. Force financial institute release more loan
2. Provide information center for new market, quality improvement, new raw material suppliers.
3. Export information
4. Training Center

4.1.3.3 Problems for Industry Promotion In the Province

Major factories in Surin is rice mill; however, the companies that we visit is small size and all of them run in family style (management), therefore problems that occur in Surin are become usual problems. The following are problems that effect in today operation; low quality product, unskilled labor, lack of training in accounting and management, abundant cheap labors.

4.1.4 Manufacturing Industries In Chaiyaphum

4.1.4.1 Overview

There were 2,156 manufacturing establishments in Chaiyaphum, as the end of 1996. Percentage share of rice mill is high at 66.53%. The remaining 33.47% engage in various activities mostly for local consumption. Agro-industry, car repair and concrete product covers 67.80% of remaining activities. Out of non rice mill, 98% share as small and medium enterprises. The total capital investment of Chaiyaphum manufacturing establishments were 5,953 million Baht, total labor force in these factories were 17,741.

Table 4.1-9. PROFILE OF COMPANY SURVEYED IN CHAIYAPHUM

Code No.	Type of business	Company name	Employee	Capital	Major Products	Market
CP - 1	Garment	Chaiyaphum Garment Co., Ltd.	95	Thai 100%	Clothes, Jacket	Export 100%
CP - 2	House Hold Material	Thai Niyom Trading Ltd. Part	7	Thai 100%	Funnel, drainer	Domestic 100%
CP - 3	Car –seat	Chaiyaphum	4	Thai 100%	Car seat	Domestic 100%
CP - 4	Plastic & Chemical	Chaiyaphum Plastic	n.a.	Thai 100%	Plastic	Domestic 100%
CP - 5	Agriculture	Oa. Peech Phol	2	Thai 100%	Dry Tapioca Corn	Domestic 40% Export 60%
CP - 6	Incense	Incense Oil Co., Ltd.	12	Thai 100%	Oil	Domestic 100%
CP - 7	Service	Tavorn Electric	5	Thai 100%	Repair and change car electric system	Domestic 100%
CP - 8	Construction	Sorn Chaiwattana Kor Srang Ltd., Part.	130	Thai 100%	Civil Works	Domestic 100%
CP - 9	Agriculture equipment	C R Tractor Co., Ltd.	22	Thai 100%	Tractor	Domestic 100%
CP - 10	Religion material	Koonlarp Koonngoen Koon Thong	33	Thai 100%	Monk's coin	Domestic 100%
CP - 11	Food processing	Phu Keaw Hotel Bamboo shoot		Thai 100%	Bamboo shoot	Domestic 100%
CP - 12	Agriculture equipment	Siam Chai Tractor	2	Thai 100%	Agriculture Tractor	Domestic 100%
CP - 13	Wood processing	M.P. Particle Board Co., Ltd.	138	Thai 100%	Particle Board	Domestic 50% Export 50%
CP - 14	Agriculture equipment	Som Mai Karn Chang	3	Thai 100%	Agriculture Tractor	Domestic 100%
CP - 15	Food processing	Sirichavalit	22	Thai 100%	Noodle	Domestic 100%
CP - 16	Agriculture	Tong Jit Puech Phol	17	Thai 100%	Maize, Tapioca	Domestic 100%
CP - 17	Food processing	Suchart Preserved mango Factory	2	Thai 100%	Preserved mango	Domestic 100%
CP - 18	Agriculture	C C Trading & Supply Co., Ltd.	32	Thai 100%	Tapioca pellet	Domestic 4% Export 96%
CP - 19	Food processing	Num Charoen Panich	28	Thai 100%	Korat noodle	Domestic 100%
CP - 20	Animal Feed	Chaiyaphum Farm Agriculture Product Co., Ltd.	27	Thai 100%	Pig feed	Domestic 100%
CP - 21	Mattress	Chai Kaew Ltd., Part	64	Thai 100%	Mattress, Pillow	Domestic 100%
CP - 22	Plastic & Chemical	Pisaetrit	42	Thai 100%	Shower Cap	Export 100%
CP - 23	Agriculture equipment	Sor Charoen Yont	10	Thai 100%	Produce and Repair Agriculture equipment	Domestic 100%
CP - 24	Fruit processing	Nissara Panich	20	Thai 100%	Fruit juice	Domestic 100%
CP - 25	Plastic and Chemical	Bumnegnarong Plastic	11	Thai 100%	Plastic bottle	Domestic 100%

4.1.4.2 Summary of Companies Survey by Interviews.

During the survey, the study team visited 25 factories in Chaiyaphum province, which was supported by the concerned provincial industrial officers. Breakdown of factories interviewed by province and type of industry is as follows.

Type of industry	No. of factory	Percentage
Agro industry	4	16.00
Concrete products	1	4.00
Plastic and chemical	3	12.00
Services	2	8.00
Wood processing	1	4.00
Steel	1	4.00
Textile and garment	2	8.00
Food and beverage	5	20.00
Other	6	24.00
Total	25	100.00

In general, Chaiyaphum company result is similar to Buri Ram and Surin, due to similarity of business, management, major agriculture and education level of company work force. However, there are still some nature different which will be describe in summary details.

(1) Business Trends

As shown in Table 4.1-10 in 1996, approximately 85% of the firms in the interviews survey had earned profit, 40% for big profit and 45% for small profit. In 1997, the number of profit had decline to 47.82%, 37.18% decrease in profit to 26.09% almost break even and 21.74% small loss due to economic collapse in 1997. In 1998, it seem to be the most difficult year of their operations, only 29% or 7 factories gained small profit and the remaining 71% almost break even and loss, some of the factories had adjusted their plan by cut down their production, lay off labor and administrative cost saving in order to recovery their loss or expenses. As a result, the factories back on profit track by having 52% on profit side in 1999. Small and medium size enterprise can adjust their plan and operation strategy a lot faster than large scale enterprise, more over, within 1-2 years, they can restructure themselves in order to meet the market demand.

Table 4.1-10. PERFORMANCE TREND COMPARE TO PREVIOUS YEAR

Year	Big profit		Small profit		Almost even		Small loss		Big loss		Total
	No.	%	No.	%	No.	%	No/	%	No.	%	
In 1996	8	40.00	9	45.00	0	0.00	3	15.00	0	0.00	20
In 1997	3	13.04	8	34.78	6	26.09	5	21.74	1	4.35	23
In 1998	0	0.00	7	29.17	11	45.83	5	20.83	1	4.17	24
In 1999	1	4.00	12	48.00	9	36.00	3	12.00	0	0.00	25

(2) Management

Many factories are own by family and manage as family style management, family management usually use their own judgement from past experience, therefore, when they make decision, they usually refer to their past experience or their own instinct. Because management training is not versatile to them, and they can not access to useful information, in order to make a good management decision. Moreover, most of the factories visits use labor as a key success production in their factory and use of low level education employee which is share about 76%. However, there are more employee graduate form vocational school and higher than Surin.

Table 4.1-11. EDUCATION LEVEL OF EMPLOYEE

Primary school	Lower secondary school	Upper secondary school	Vocation school and higher	Total
372	133	13	160	678
54.87%	19.62%	1.92%	23.60%	100%

The number of vocational school and higher graduate level in Chaiyaphum are total of 160 people, because of one particle wood product company, already employed of 138 people, meaning that particle wood product company is only company that using upper management level to manage their organization.

(3) Marketing

Approximately 80% of the firms sold their product for domestic consumption and over 50% sold in the province. Chaiyaphum export their product in both direct and indirect about 20% of their total production. Details are shown in Table 4.1-12. Again, a most of the enterprise complain about market competition, pricing and high cost of production because they can not diversify and expand their market to other provinces or export to other country. Similarly, for export market, they need to improve product quality, packaging, low production cost. Also, they want to join business with the same product producer in order to maximize their product strength and minimize cost.

Table 4.1-12. MARKET BREAKDOWN

Market breakdown	Chaiyaphum	
	No.	%
Domestic		
1-35%	1	4.55
35-70%	3	13.63
70-100%	18	81.82
Total	22	100.00
- In the province area		
1-35%	5	35.71
35-70%	2	14.29
70-100%	7	50.00
Total	14	100.00
Indirect export		
1-35%	1	12.50
35-70%	1	12.50
70-100%	6	75.00
Total	8	100.00
Direct export		
1-35%	0	0.00
35-70%	1	100.00
70-100%	0	0.00
Total	1	100.00

(4) Product Technology

Many enterprises still produce their product with the old machinery. Almost all of small and medium enterprise still use the machine that can not produce product to meet market demand, lack of financing in order to purchase of new machinery and equipment to improve product quality, production efficiency and standardize labor skill. More over, government sector did not supply information for the benefit of replacing new machinery and equipment.

About half of factories visited need a working capital for their business and 28% are still needed for purchasing of machinery and equipment as shown in Table 4.1-13.

Table 4.1-13. PURPOSE OF LOAN

Capital Investment	No. of investment	Percentage
Purchase of machinery and/or equipment	10	28.57
Purchase of technology.	0	0.00
Working capital.	18	51.43
Others.	7	20.00
Total	35	100.00

(5) Request to Thai Government

Small and medium enterprises in Chaiyaphum did not depend on government services, except to renew their license. Most of them usually depend on Industry Association and Provincial Chamber of Commerce, which they both operate by the private sector. However, if they can depend on government, they would like the government to supply the following.

- Require training center in both skill and role of employee (More responsibility, dependable).
- More financial program for SMEs.
- Research and development center for new product, and quality improvement.
- Effective industrial information center (new market) and government service.
- Reduce tax for imported machinery.

Table 4.1-14. Request to Thai government institute

Kinds of support expect from government institution	No. of expect	Percentage
Corporate management advice.	4	10.53
Financial management/accounting system consulting	5	13.16
Technological guidance	5	13.16
Guidance on quality control	4	10.53
Training of employees	5	13.16
Information services (Technology and marketing)	7	18.42
Inquiry services (Potential partners and buyers)	4	10.53
Inquiry Services (Material supplies)	4	10.53
Total	38	100.00

Moreover as shown in Table 4.1-14, the most important requirement from the government is information services (Technology and marketing), Secondly, 13.16% require financial management/accounting system consulting, technological guidance and training employees program.

4.1.4.3 Problems for Industry Promotion in the Province

Problems of Chaiyaphum are similar to Buri Ram and Surin, on one hand, some of the company tries to stay small because they like to be able to control

their business, on the other hand; they want to expand their production capacity, market share, quality in order to meet market demand. However, there are many problems to hold their decision for expanding their business. The following problems are to be tackled in order to solve and promote industrial in the province.

- Provide useful information for marketing, management, production purpose.
- Find foreign investor to invest and transfer technology into the area.
- To train labor force in focusing on skills, diligence and role.
- Establish financial loan program for SMEs.

4.1.5 Bangkok Metropolitan Area

The survey of selected enterprises in Bangkok Metropolitan Area (BMA) was conducted to address the issues related to major assemblers and their relationship with suppliers, i.e., what they think about their current suppliers of raw materials and parts; what they expect from them; whether they are interested in procurement from local manufacturers, and what conditions motivate them to locate their factories in rural regions. 20 enterprises were visited, mainly machinery, electric and electronics, and food processing industries in consideration of the industrial structure in the study area. As the survey still continues, this section presents an intermediate report on the survey results with a particular emphasis on the current state of machinery and electric/electronics industries.

4.1.5.1 Major Trends and Issues Facing Manufacturers In Bangkok Metropolis

The current state of manufacturing companies in the region strongly reflects the effect of the economic crisis, regardless of industry type as well as characteristics of individual enterprises, including the ownership and size of establishment.

(1) Export enterprises

Export-oriented manufacturers, who export more than 80% of total output, have been boosting their production at an annual 10% after 1996, with increased price competitiveness in the international market due to the

devaluation of the baht. Thus, they turn the effect of the economic crisis to their own advantage and successfully leverage the weak local currency for business expansion. Meanwhile, export expansion requires exporters to obtain certification under internationally acceptable safety standards, and Japanese companies operating in the country strive to obtain certification under support of parent companies in Japan. For local companies to explore a new market and respond to market dynamics with agility, however, the country needs to have its own certification organization to allow certification procedures within the country and train local experts to ensure the certification process to be operated in an efficient and effective manner.

The second issue is a general lack of linkage to local industries because export-oriented companies import most of parts and materials they require. For instance, Japanese companies, both assemblers and suppliers, depend upon parents in Japan, while local procurement is highly limited. In particular, even large companies obtain full support from Japanese parents in the areas of market development and product design and development, and they are responsible for production only. As a result, important decisions are mostly made in Japan, including certification of outsource parts, quality improvement, and design change, while local companies have little autonomy.

The third issue is that export-oriented manufacturers fail to differentiate their products according to regional cultural and economic conditions as they have globalized their product strategies. Also, their products are facing increasingly fierce competition in the domestic market that is deluged with low-cost imports from the PRC, South Korea and Europe.

(2) Domestic market-oriented enterprises

Assemblers who primarily serve the domestic market continue to suffer sluggish demand, which has plummeted due to the economic crisis and is not likely to recover in the next three to five years. In fact, negative impacts of the economic crisis extend to every aspect of their operation and management, including a drastic drop in sales, the pressure to reduce work force, the lack of working fund, difficulty in securing mortgage-backed loans,

and public support and assistance to rescue them is lagged behind to prevent a quick recovery.

As these manufacturers have actively procured parts from local suppliers to maintain the average local content at an 80% level, their downturns hit small suppliers very hard and their orders have declined to one half the peak level.

They try to weather the crisis by making a strategic shift to exports to take advantage of the depreciation of the baht. Nevertheless, as many Japanese companies operate production facilities throughout the world, their local subsidiaries cannot freely expand exports in response to economic conditions in Thailand. Instead, they have to consult with parents in Japan when making critical decisions on development of export markets and production increase. Thus, their recovery depends on how well they can coordinate with parent companies in making their structural adjustment in the context of global strategy of multinationals.

The second issue is the decline in commercial transaction between Japanese companies and local suppliers to reflect sluggish domestic demand and increased export production. For the manufacture of export products, Japanese manufacturers primarily purchase parts from Japanese suppliers operating in the country because they are not satisfied with local suppliers in terms of quality, delivery schedule, price and/or responsiveness to design change. Meanwhile, local suppliers have been developing the relationship with U.S. and European assemblers since 1997. As they increase supply to U.S. and European customers, they move away from Japanese companies who are highly demanding in quality and other requirements. Managers of local suppliers feel that U.S. and European companies are faster in decision on acceptance or rejection of local products and provide more appropriate advice than Japanese customers do. The situation suggests the need for efforts to improve the relationship between Japanese manufacturers and local suppliers through the fostering of the local parts industry that is dominated by small enterprises, thereby raising local content.

(3) Local enterprises

They do every thing on their own, from marketing to product development and certification under international standards and are active in exporting their products to the U.S. in response to the currency devaluation. Some of them steadily expand export markets by differentiating their products by design or feature that is not found in product made in industrialized countries. Nevertheless, they often face the shortage of resources to support an export drive and need long-term support in the areas of finance, technical know-how, marketing, industrial design, circuit design, design of printed circuit boards, and certification under international safety standards. They procure parts from diverse sources including the PRC, South Korea, Taiwan and Japan, as well as local suppliers to whom they maintain a stronger linkage than Japanese companies with a higher local content.

They held limited market share and were unable to obtain sufficient technical and financial support up until 1996. In particular, they could not win much orders from Japanese companies operating in the country, which found that local products were inferior in terms of quality, price and/or delivery. As the economic crisis broke out, however, they quickly responded by aggressively selling to U.S. and European companies operating in the country, rather than expecting recovery of the domestic economy. They used the weaker currency as a strong sales point to foreign companies and boosted sales significantly. At present, 50% of their output go to U.S. companies and 30% to European customers. Japanese companies account for only 20%. In fact, local companies point out that Japanese companies are reluctant to procurement from local suppliers despite of their dominant presence, i.e., they boast the largest number compared on the basis of country of origin.

(4) Common issues

Large manufacturers in Bangkok serve as a major source of high grade, volume products supplied to Europe, the U.S. and Japan, and their production capabilities are considered to be a world class. Today, however, they operate at around 70% of capacity. If they operate in two shifts, supply capacity can meet demand twice the current level. As the

worldwide supply and demand situation is generally on the oversupply side, Thai manufacturers have to operate in the highly competitive environment where they strive to develop new markets by offering products differentiated from others, boost production through market expansion, and reduce prices by improving the operating rate. To achieve these goals, they have to strengthen business capabilities including marketing, the ability to develop products and local procurement of materials. As pointed out earlier, Japanese export-oriented manufacturers operating in Bangkok are responsible for production activities only and leave product development and marketing capabilities to their parents in Japan. Thus, they cannot make critical decision to cope with the difficult situation caused by the economic crisis quickly and effectively, and the lack of autonomy therefore constitutes a major issue to tackle if they are to drive the troubled Thai economy.

Indochina is a relatively small market and Japanese companies do not show strong interest. Realizing the situation, Chinese and South Korean companies are active in exploring the market and provide it with low-cost products. The peninsula has 200 million populations, however, and is expected to become a major market. In fact, it is a potential market for Thai industry. To exploit the market opportunity, they must have the ability to develop it on their own. As Japanese companies have shifted human resources to high-tech industries, they do not have the ability develop products designed for each market, as done in the 1980s. Chinese and Korean companies have been entering niche markets worldwide, where Japanese companies do not make committed efforts. As a result, world share of Japanese companies has declined after the peak in the 1980s. Clearly, it is time for Japanese companies to establish a new regional strategy for Indochina, i.e., leaving the market to local companies in Thailand and allowing them to develop their own products. This way, they will be able to contribute to industrial development from long-term perspectives.

4.1.5.2 Prospect for Investment In Rural Region

(1) Export enterprises

Many export-oriented manufacturers built factories in rural regions between 1987 and 1993, as attracted by BOI's incentives and low wages and expanded operation. As initial incentives terminated, they moved to industrial estates around Bangkok, such as Ayutthaya and Nava Nakhon. However, these areas were reclassified to Zone 2 and incentives are no longer applied.

Among machinery and electric/electronics industries, facilities and equipment related to manufacture household appliance would not become obsolete in the next few years. These manufacturers, as well as automakers, are not likely to build their factories in rural regions. On the other hand, production of office equipment and high-tech products (e.g., printers, hard disk drives, floppy disk drives) and precision molding products (e.g., magnetic heads, high density SMT and DVD heads) is and will be on the rise, and all manufacturers feel the need for new facilities and are expected to invest in a Zone 3 area, including Panasonic, Sony, Sharp and Victor.

In fact, these manufacturers have not established a major export production base for office equipment and IT equipment in the country, unlike household appliances. In the recent few years, they have started to build such bases for high-tech products, and there is an opportunity for the country to attract their investment if adequate infrastructure and incentives are provided.

(2) Desirable infrastructure and incentives

Manufacturers that moved to the vicinities of Bangkok are no longer eligible for incentives and at present require new factory sites. They are therefore seriously considering investment in rural regions, partly motivated by availability of incentives. Generally, they consider the following conditions to be minimum required factors for decision to invest in a rural region:

- 1) Availability of Zone 3 incentives;
- 2) Minimum wage at around 130 baht;

- 3) Good access to Bangkok and infrastructure; and
- 4) Availability of operators and other workers who are trained to work continuously according to working rules at a modern factory.

In addition, if high-tech factories are to be attracted, the following infrastructures and services will become critical:

- 1) Upgrading of an existing industrial estate (e.g., uninterruptible power supply, digital communication backbone, and road access to port facilities);
- 2) Availability of ground water supply and drainage facilities;
- 3) Availability of manpower power suitable for factory operation (high moral, diligence, basic skills, etc.);
- 4) 24 x 360 customs service; and
- 5) Availability of a vocational training center offering programs that meet the needs of local industries.

