

Chapter 2.4: Development of Public Health System in Thailand — A Roi-Et Study —

TANI Hiroaki

1. Introduction

Being in good health is a desire of everyone and an undeniable human right. Poor health status of people means not only the poor welfare of a nation, but also the low quality of human resource for economic and social development. From an economic viewpoint, "poor health leads to absenteeism from work or school, low physical and mental productivity, short working lives and huge cost of caring for sick (Weisbrod et al, 1978)." Therefore, enhancement of health status of people is an important task of the government. Adequate public health services should be provided to all the population under an effective public health system.

In Thailand, the rapid economic growth has been marked during the last three decades. Meanwhile the government has developed a system for public health under the guidelines of the National Economic and Social Development Plans. Especially, in the provincial areas in which the majority of the population live, Thailand has developed a system for primary health care, such as Village Health Volunteers, Village Health Communicators, which achieved almost full coverage at the village level. Furthermore, the concept of village-based self-managed primary health care is being extensively promoted.

Despite these efforts, unsolved health problems still remain in rural areas. For example, the disparity in accessibility to adequate health services is observed between rural and urban areas. In addition, changes in life style are bringing about new health problems and may require new measures on top of the current public health system.

The purpose of this chapter is to analyse public health system in Thailand focusing on related organizations, institutions and those operations at the local level. It consists of four topics viz. public health administration, health care system, self-managed primary health care system, and medical insurances. Major source of information referred in this chapter is derived from the data collected in Roi-Et between October 10th, 1992 and November 9th, 1992.

2. Public Health Administration

2.1. Organizational Structure of Public Health Administration

Chart 1 illustrates the organizational structure of Thai public health administration. This chart indicates that administrative officials of public health should cooperate with each other at national and local levels to provide better health care services to people. In this regard, the coordination between provincial administration of public health and municipal administration is crucial for providing effective health services to the residents of the area.

2.2. Central Administration for Public Health

In Thailand, the government owns and operates 70% of the hospitals and the rest, namely, 30% in the private sector are mainly located in urban areas. Therefore, in Thailand the Ministry of Public Health takes major responsibility for the delivery of health services to the people. Among the public health services, the Ministry of Public Health operates Health Centre in every tambon (group of villages), Community (District) Hospital of 10–90 beds in every district, Provincial Hospital of 200–500 beds with specialized care in every province including Bangkok, specialized institutions and hospitals.

Besides, many other ministries have activities and responsibilities contributing to people's good health. The Ministry of Education, Ministry of Interior, Ministry of Agriculture and Cooperatives, and

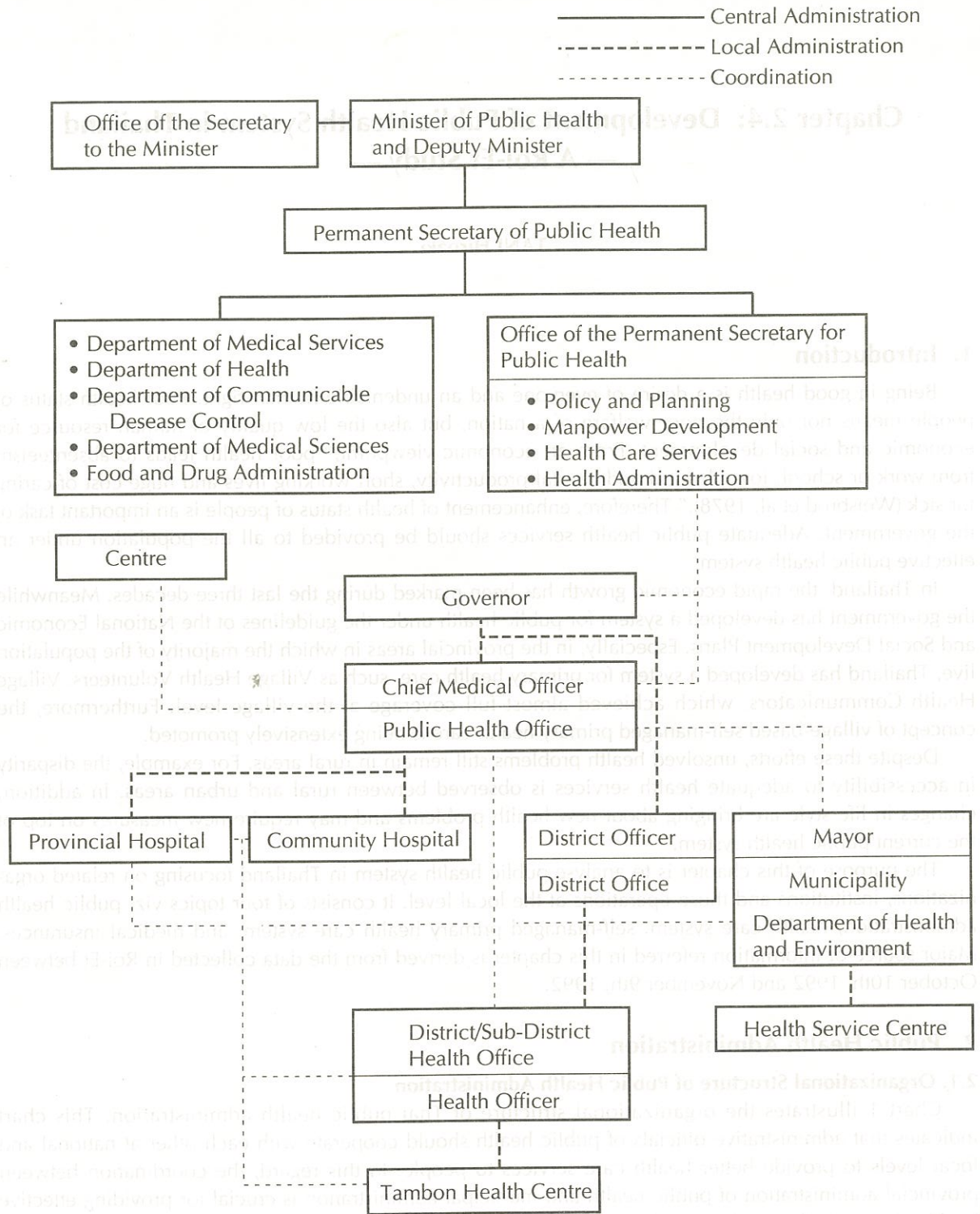


Chart 1. Organization Structure of Public Health Administration

Ministry of Public Health are four key ministries of importance for the achievement of Health for All. The Office of the Prime Minister is another key governing body acting as support unit for overall development.

At the same time, some other ministries or organizations carry out health related activities. Those are Ministry of University, Ministry of Industry, Ministry of Defence and Government Pharmaceutical Organization. Since so many ministries and organizations are involved in public health activities, the coordination among ministries and organizations have been crucial for public health management in Thailand.

2.3. Local Administration of Public Health in Roi-Et

Provincial Health Office

Roi-Et Province has Provincial Health Office headed by Provincial Chief Medical Officer who is nominally responsible for both administration and support of all medical and health facilities in the province, including the Provincial Health Office. In practice, the day-to-day running of hospitals is left to the hospital directors, and the Provincial Chief Office tends to focus on its supervisory aspects. As a policy maker, the Provincial Chief Medical Officer is accountable to the Permanent Secretary of the Ministry of Public Health at the central level, but is informally accountable to the Governor at the provincial level as well.

To execute the tasks of the Provincial Chief Officer, the Provincial Health Office has 11 divisions as follows:

Administration, Planning and Evaluation, Medical Supplies, Dental Health, Infection Prevention, Health and Treatment, Sanitation and Environment, Personnel Development and Primary Health Care, Public Relations, General Hospital, and Community Hospital.

For policy making at the provincial level and its evaluation, the Provincial Health Office has Planning Committee and Evaluation Committee as well as Planning and Evaluation Division. Furthermore, Provincial Health Office holds a conference of District Health Officers to discuss policy matters and related issues.

District/Sub-District Health Office

District/Sub-District Health Office is the organization composed of technical and administrative staff members who supervise public health activities in the district/sub-district level. This office is directly accountable to the District Officer who reports to Ministry of Interior. In practice, however, most of technical and managerial support and supervision come from the Provincial Health Office.

In case of Roi-Et province, there are 14 District Health Offices and 3 Sub-District Health Offices, and two officers are allocated for each District/Sub-District Health Office. Every month, the office holds a conference of health officers working at Tambon Health Centres to discuss planning for public health and other issues at the district/sub-district level.

Roi-Et Municipality

Since Roi-Et Municipality is a local autonomous government, its public health administration is independent from the Provincial Health Office. For delivery of health services to the residents, Roi-Et Municipality manages Health Service Centre under the Health and Environment Department. However, major activities of the Health Service Centre are limited to those of promotive and preventive nature, rather than curative, on account of the lack of medical facilities and doctors. In actual operation, public health activities in the municipality are undertaken in cooperation with the Provincial Hospital. Thus, the municipality has an important role as coordinator with the provincial administration of public health.

In Roi-Et Municipality, most patients are obliged to use Roi-Et Provincial Hospital directly, since the Health Service Centre can not provide curative services owing to the financial and manpower constraints. This situation is causing congestion at the Provincial Hospital, and the problem might get even severer in the near future. As a matter of fact, many municipalities are facing the same problems in Thailand. Accordingly, Ministry of Public Health has allocated a special budget for Health Service Centres but only to 9 municipalities among 100 municipalities in all. Since Health Service Centres have an important role as the secondary level referral centre, the Health Service Centres in Roi-Et Municipality should be supported so as to provide curative services as soon as possible.

3. Health Care System in Roi-Et

3.1. Distribution of Health Facilities in Roi-Et

Table 1: Distribution of Health Personnel

	Roi-Et Province (1992)*	Whole Country (1990)**
Doctor: Population	1: 17,375	1: 4,525
Dentist: Population	1: 112,146	1: 23,123
Pharmacist: Population	1: 82,240	1: 14,164
Nurse: Population	1: 4,603	1: 998

Table 2: Ratio of Population per Bed in Public Health Facilities

Roi-Et Province	Bangkok Metropolis	Provincial Areas
(1990)**	(1982)*	(1982)*
1,615	366	935

Table 3: Distribution of Health Facilities and Personnel in Roi-Et Province, 1990

District/ Sub-District	Bed	Hospital*			Health Centre*		Population ***
		Doctor	Staff	Number	Personnel		
Muang Roi-Et	507	45	493	14	41	139,338	
Thawat Buri	10	2	32	15	49	93,038	
Selapoon	30	3	43	19	49	81,465	
Pon Thong	30	3	42	17	41	117,915	
Nongpork#	10	2	27	11	28	92,116	
Pochai	10	1	24	9	21	99,299	
Moeiwadee	10	1	16	5	12	120,745	
Sub-District							
Artsamart	10	2	30	10	25	105,934	
Panomprai	30	3	44	16	49	67,111	
Chaturapakpimarn	10	2	31	11	30	45,279	
Kasetwisal	30	3	47	13	28	54,931	
Suwanapoon	30	3	57	13	33	23,259	
Pathumrat#	10	2	27	11	30	52,031	
Muang Suang	10	1	14	5	11	26,636	
Pon Sai	10	1	19	3	10	22,456	
Sri Somdet	10	1	14	5	19	34,566	
Sub-District							
Changharn#	—	—	—	6	21	46,480	
Sub-District							
TOTAL	757	75	960	183	497	1,222,599	

#In Nongpork and Pathumrat District, the expansion of the Community Hospitals was being undertaken to increase the number of beds from 10 to 30. And a community hospital was being constructed in Changharn Sub-District (November, 1992)

Sources: * Provincial Health Office in Roi-Et

** Health Statistic Division, Office of the Permanent Secretary for Public Health

*** Department of Local Administration in Roi-Et

During the past decades, the government expanded health infrastructure at the community level. Thus, now almost every Tambon (group of villages) is covered by Tambon Health Centre, and also nearly every district has a community hospital. However, functions of Tambon Health Centres and Community Hospitals are not enough to satisfy people's needs regarding curative and rehabilitative services. In addition, the disparity in distribution of health facilities and personnel is still evident between rural and urban areas.

In case of Roi-Et Province, the ratio of population per doctor is almost four times higher than the national level (Table 1), and the number of population per bed has not reached the national level either, as shown in Table 2. Furthermore, major health facilities are concentrated in the Roi-Et Municipality area, including some private clinics. Meanwhile, some other districts have only one bed for ten thousand population (Table 3). Obviously, the lack of health facilities and personnel is still a serious problem, especially in rural areas in Roi-Et Province.

3.2. Referral System

Since the number of health facilities for advanced curative services is limited for meeting people's demand especially in rural areas, the Ministry of Public Health has taken initiative to strengthen the referral system.

In case of Roi-Et, Roi-Et Provincial Hospital plays an important role as centre of referral system at the provincial level for the patients sent from lower level health facilities. Cases requiring more specialized treatment are sent by Roi-Et Provincial Hospital to Khonken Hospital which is the centre of referral system in the North-East Region, or to a specialized hospital in Bangkok. For minor illnesses, people are encouraged to go to health facilities in the community. However, since health services offered by district or Tambon health facilities are limited regarding curative aspects, people in urban and sub-urban areas tend to prefer to go to the provincial hospital directly without following the referral system.

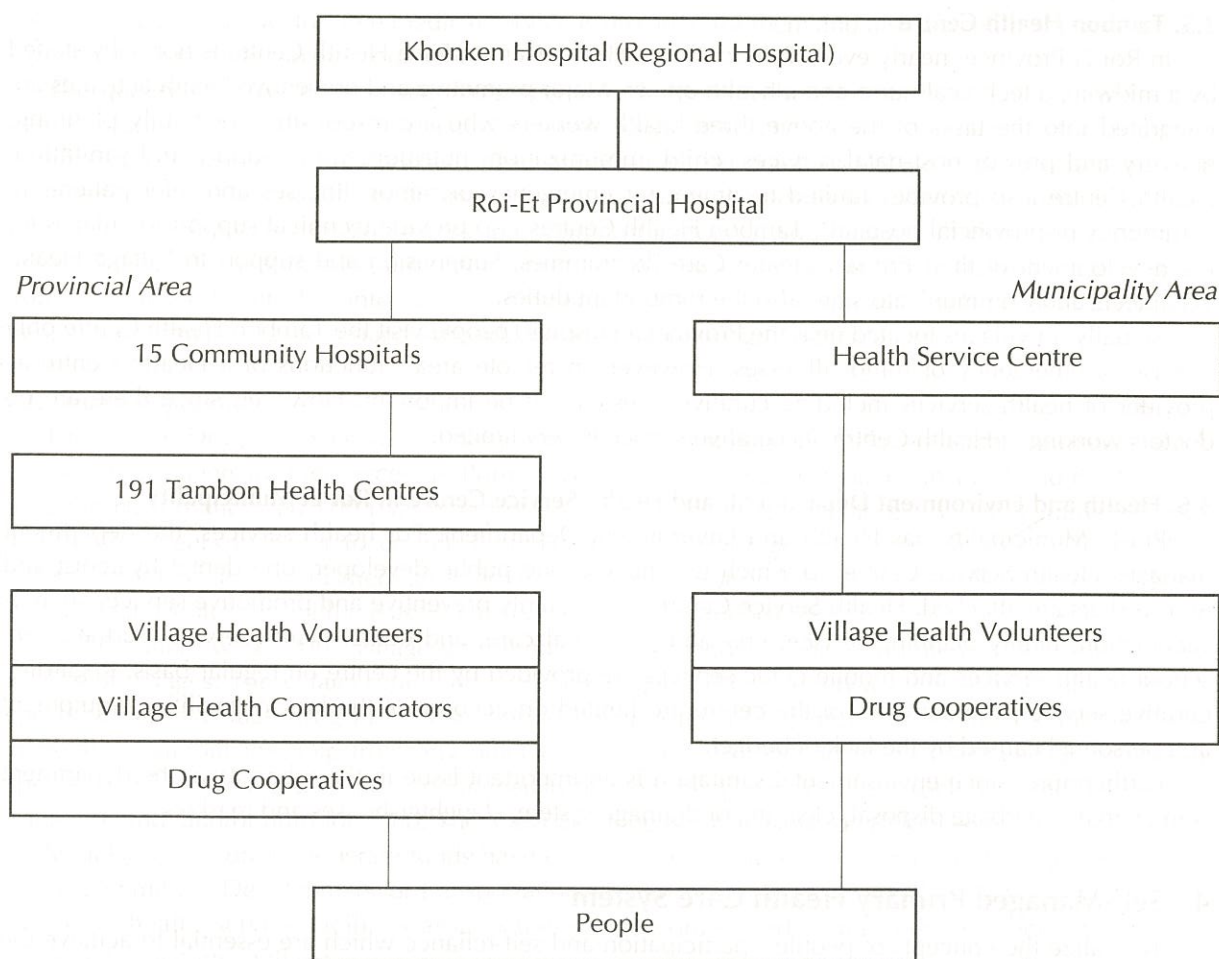


Chart 2. Referral System in Roi-Et Province (based on the data in November, 1992)

3.3. Roi-Et Provincial Hospital

In the province, Roi-Et Provincial Hospital is the most sophisticated general hospital with 507 beds, 31 doctors and 304 technical personnel in 1991. One of its most important functions is to work as the centre of the referral system. It provides advanced medical treatments to the patients sent from other hospitals and health centres.

Other important function is to provide urban health services. The Hospital provides people from urban and sub-urban areas with not only curative but also promotive and preventive services such as family planning services and vaccination. The Hospital also supports Village Health Volunteers by way of offering training opportunities to promote primary health care in the municipality area.

In Roi-Et Provincial Hospital, the average number of in-patients in 1991 is 466 per day for the 507 beds. Considering seasonal fluctuations in the number of patients, the number of beds is not enough to provide health services for in-patients. And also, since the number of diseases such as cancer, cardiac diseases which demand advanced medical treatment is increasing, the number of in-patients will also increase and cause high demand for expansion of facilities.

3.4. Community (District) Hospital

Roi-Et Province has 15 Community Hospitals which have 10 or 30 beds, and one or a few doctors each. In addition, one Community Hospital was being constructed and two were expanding the facilities to increase the number of beds from 10 to 30 (based on the date in November, 1992). Each Community Hospital provides curative, preventive, and promotive health services as the referral centre at the secondary level.

Although the expansion of Community Hospitals is being undertaken in some districts, some others have only one bed per more than 10,000 population (Table 3) and the quality of health services there does not seem to satisfy the people's demand on account of the lack of doctors.

3.5. Tambon Health Centre

In Roi-Et Province, nearly every Tambon has a Health Centre. Each Health Centre is normally staffed by a midwife, a technical nurse and a health officer. Major promotive and preventive health activities are integrated into the tasks of the above three health workers who are responsible for family planning, delivery and pre- or post-natal services, child immunization, nutrition, water supply and sanitation. Health Centre also provides limited treatment for emergency or minor illnesses and refer patients to community or provincial hospitals. Tambon Health Centres also provide technical support to villages for the development of their Primary Health Care Programmes. Supervision and support to Village Health Volunteers and Communicators are also their important duties.

Actually, in villages located near the Provincial Hospital, people visit the Tambon Health Centre only in case of emergency or minor illnesses. However, in remote areas, functions of a Health Centre as provider of health services including curative ones should be important. However, since there are no doctors working at Health Centre, its curative service is very limited.

3.6. Health and Environment Department, and Health Service Centre in Roi-Et Municipality

Roi-Et Municipality has Health and Environment Department. For health services, the department manages Health Service Centre, to which two nurses, one public developer, one dental hygienist and two workers are attached. Health Service Centre offers mainly preventive and promotive services such as vaccination, family planning service, pre- and post-natal care, and dental health service. Furthermore, school health services and mobile clinic services are provided by the centre on regular basis. Regarding curative services, the activities of the centre are limited on account of the lack of facilities, equipment and personnel caused by the lack of budget.

Furthermore, since environmental sanitation is an important issue in the urban area, the department is in charge of garbage disposal, cleaning of drainage system, slaughter-houses and markets.

4. Self-Managed Primary Health Care System

To realize the concepts of people's participation and self-reliance which are essential to achieve the goal "Health for All", the government has introduced self-managed primary health care approach in the Fifth National Health Development Plan, in which training of Village Health Volunteers and innovative

health development projects such as Health Card Project, Drug Cooperative Project were organized. Since that time, self-managed primary health care system in the community has been strengthened and now it is indispensable to enhance public health in rural areas where majority of population still live.

4.1. Village Health Volunteers and Village Health Communicators

During the Fifth National Health Development Plan, the main policy was addressed to the enhancement of people's participation for raising awareness and solving of health problems through primary health care. According to this policy, training of Village Health Volunteers and Communicators has been organized. Now, Village Health Volunteers and Communicators are found in almost every village in the country. Activities of Village Health Volunteers and Communicators are mainly promotive, such as delivery of health information. In addition, they also conduct pre-natal and post-natal care including nutrition survey for infants.

In the provincial areas of Roi-Et, normally each village has approximately one Village Health Communicator per ten households and one Village Health Volunteer selected as leader of Village Health Communicators in the village. Besides the activities conducted on individual basis, every Sunday the Village Health Volunteers and Communicators visit every household for promotion and survey. Training on basic health services is provided for Village Health Volunteers and Communicators in the Community Hospital or Tambon Health Centre.

Besides, in the municipality, there exist 90 Village Health Volunteers working in 13 kums (administrative divisions in the municipality). Each kum has one Village Health Volunteer per 60–80 households. Every month the Provincial Hospital holds a conference in which Village Health Volunteers are trained more and discuss their problems.

In Thai communities, Village Health Volunteers and Communicators have a number of tasks without pay. However, many people are willing to be a volunteer since being a volunteer means to be reliable and respectable person in the community. Furthermore, as another incentive to be Village Health Volunteer or Communicator, free medical service is provided for them and also a small amount of money is provided for participation in conferences.

The quality of activities of Health Volunteer groups seems to be different between rural and urban areas. Volunteer groups in the municipality consist only of Village Health Volunteers who are better qualified. Especially in the kums which have cooperative and office of Village Health Volunteers, the volunteers can provide better health service including curative ones to the community people. On the other hand, Village Health Volunteers and Communicators in some rural villages seem not to be provided with adequate training and information as those working for the kums. Therefore, activities of groups of Village Health Volunteers and Communicators should be evaluated with certain criteria and then, groups which are below standard could be advised to strengthen their activities.

4.2. Drug Cooperative

The Village Drug Cooperative is a programme aimed at supporting Village Health Volunteers' work and helping villagers for their access to Primary Health Care. It was introduced in 1983 and the Ministry of Public Health allocated 700 baht worth of drug and medical supplies to every newly trained Village Health Volunteers in order to enable them to set up the village drug funds in their villages. The replenishment of drugs and medical supplies after consumption by villagers is taken care of by the Village Health Volunteer with the assistance of the local health personnel.

In 1992 there were 1,005 village drug funds existing in Roi-Et. This accounted for 47% of the total number of villages. The village drug funds can be categorized into two types. First is the single purpose type in which a village drug fund is supported by the sales of the drug and medical supplies at the cooperative without the help from any other financial sources. Second is the integrated or combined type, is found where a drug fund is combined with other development funds such as health card fund, sanitation fund, and/or nutrition fund. The integrated type is more likely to last longer.

Actually, many drug cooperative funds have ended in failure owing to ineffective management by the village committee. Development of transportation and communication, as well as availability of easily accessible health service facilities around the village contributed to the reduced necessity of Drug Cooperatives within a village.

Case Study of the Cooperative Fund in No.11 Kum

The Roi-Et Municipality has 13 kums in total. In No.3 and No.11 Kums, the Cooperative Funds have been developed as a means to improve health status of residents in a self-reliant manner. Meanwhile, in many villages, cooperatives have ended in failure. As a model case, the activities of the No.3 and No.11 Kums give many suggestions for successful management of a cooperative. In this section, activities of the cooperative in No.11 Kum are taken as a model case based on the information collected through the interviews with the persons concerned.

No.11 Kum is located in the sub-urban area in the municipality, wherein there were 123 households. For public health activities, there were two Village Health Volunteers and the cooperative which provided villagers with Health Card, medical supplies and loan for improvement of sanitation by using the fund. For management of the fund, the cooperative has a committee consisting of chairman, manager, treasurer and secretary. At the initial stage to establish the cooperative fund, a survey is conducted to confirm whether more than 70% of the villagers are willing to invest money to establish the cooperative. Upon confirmation of this requirement, Health Service Centre in the municipality permits the kum to have Health Card and supplies the cards to the kum. The cooperative sells the cards for 300 baht a card to the villagers and establish the fund. The kum can use the fund to invest by loan and selling goods to villagers and after one year the kum pays the amount of money for Health Cards sold in the kum back to Health Service Centre. Every May and November, the investors receive dividends depending on the amount of investment.

In case of No.11 Kum, water container was provided to the villagers for 580 baht with 3% interest per year. For the poor, Health Card was provided for lower price. The profit made by loan and selling goods is used as follows: 25% for paying back to the Health Service Centre, 35% for health activities support, 10% for the committee, 30% for reserve. Average earning during half a year is 300,000 baht, and the amount of reserve in 1991 was 57,561 baht which has been successfully increasing year by year.

The success of the cooperative in the kum seems to be due to continuous support from the Health Service Centre and Provincial Hospital as well as qualified management staff of the cooperative committee. This model case may not be readily applicable to other communities, since in many villages it is not easy to find qualified management staff for the fund. Training of the management staff should be offered continuously.

5. Medical Insurance System

In Thailand, the government bears 70% of medical expenses and the patients, 30%. To cover own medical expenses of the patients, there are two types of medical insurance. Besides, free medical services are available for the weak.

5.1. Health Card

The community based Health Card Project was introduced by Ministry of Public Health in 1983. The aims of the project include the following.

- strengthening community organization and people's involvement in the management of fund for maternal and child health, other preventive, promotive and curative activities.
- increasing the use of Tambon Health Centres by rural families which used to go to the Provincial Hospital without following the referral system.
- reducing congestion and waiting time for those referred to hospitals.
- ensuring accessibility to services through voluntary purchase of a Health Card.
- raising fund by selling the card. The fund is further increased by loans and other income generating activities to finance health services and other community development activities.

In 1992, there were approximately 1,400,000 Health Card holders in about 7,600 villages, 1,900 tambons, 400 districts, of 58 provinces except Bangkok. The area coverage seems to be already nationwide, but the number of Health Card holder is still low.

Since participation of the project is based on voluntary decision of an individual, purchasing of Health Card depends mainly on the affordability and expectation about the risk of sickness of each individual. Thus, Health Card holders are more in the middle income groups than those in lower income

groups. From past experience, active local leaders and well-organized communities have been instrumental to the promotion of the project. However, any rise or reduction in the Health Card price and adjustment in the benefits have always been crucial to the fluctuation in the demand for Health Card and, consequently, the number of the holders.

In case of Roi-Et, there is only one kind of Health Card which costs 300 baht per family per year and is good for 6 episodes of diseases for medical treatment. This includes annual medical check-up at the local health centre, immunization to children and pregnant women, family planning services, delivery, pre-natal and post-natal care.

In 1992, 444 villages participated in the Health Card Programme which accounted for only 21% of total number of villages in the province. The programme was found unsuccessful in those villages where many people were covered by other forms of free health services, or employee health insurance schemes.

5.2. Health Insurance under the Social Security Act

The Social Security Act was passed by the Parliament and enacted in September 1990. Under this act, both public and private hospitals are obliged to provide medical services to the insured workers as medical benefit.

According to the law, in all establishments with more than 20 employees, both the employers and the government should equally contribute 1.5% of the amount of payroll to the Social Security Fund which provides medical benefit, maternal benefit, death benefit and invalidity benefit to the employees.

5.3. Free Medical Service

The family whose income is less than 2,000 baht per month or a person whose income is less than 1,500 baht are provided with Welfare Card which offers free medical care. In Roi-Et province, about 20% of the population are covered by the Welfare Card. For elderly, Senior Cards are provided for male of more than 65 years old and for female of 60 and above. Actually, in Roi-Et 69,675 aged people are covered with the Senior Card. Free medical service is also provided to infants in 0-1 year, primary school children, veterans, some underprivileged groups, civil servants, and Village Health Volunteers and Communicators.

In Roi-Et, the coverage of medical insurance is low on account of the free medical services and low medical bill. Since expenditure for medical health services is expected to increase with higher rate than that of the income per capita, the burden to the government and the people will increase in the near future. Therefore, appropriate collection of medical expense from the beneficiaries and the enhancement of the coverage of medical insurance will be crucial for securing sufficient financial resource for health care services in the coming years.

6. Concluding Remarks

The health status of Thai people has improved remarkably through development of public health system during these decades. Their success has been attributable especially to the strengthening of primary health care in the rural areas by expanding health facilities and organizing people's participation.

However, there exist some problems which Thai people are facing now. These are classified into two types. The first is the disparity in the health status of people and the quality of health services between urban and rural areas. The disparity exists not only between Bangkok Metropolitan Area and other provinces, but also between municipal and rural areas in a province. In case of Roi-Et, those who live in the urban and sub-urban areas have an easy access to advanced health services in the Provincial Hospital, while the health facilities in tambons and districts can not offer equally good health services for rural people owing to the lack of doctors and facilities. Such inequalities should be minimized as soon as possible to guarantee the fundamental human right to rural majority. For that purpose, the resource allocation to rural areas should be prioritized.

The second type consists of newly emerging health problems. Through the change of life style, new type of diseases are becoming most serious among Thai people such as cancer, adult's diseases, AIDS. Car accidents are also one of major causes of death. Therefore, the public health system should be adjusted to deal better with those problems. Since treatment of those diseases require advanced medical

technology, health facilities need to be strengthened to meet people's demands. Consequently, medical expenditure for health service will increase rapidly in the near future, so that the adequate bill collection from the beneficiaries will be a critical issue. Meanwhile, to prevent such diseases, promotive and preventive activities at the community level are essential, which the existing system for primary health care would be able to undertake successfully. Furthermore, the medical check-up on community basis should be strengthened for detection and treatment of cancer and adults' diseases at early stages. Community based health care is still an essential strategy to deal with newly emerging problems.

The experience of Thailand in public health system building would be quite useful to other developing countries, since community based primary health care system has been successfully developed by way of encouraging self-reliance among people. Furthermore, hopefully, Thailand may provide useful lessons for combating newly emerging health problems, from which people in industrialized countries also suffer, through their experience of applying the concept of self-reliance in promotive and preventive activities.

REFERENCE

1. Health Education Division and Health Planning Division (1991) Health in Thailand 1991. Ministry of Public Health, Bangkok, Thailand.
2. Howard Jones (1990) Social Welfare in Third World Development. Macmillan Education L.
3. J. Dennis Mull (1990) The Primary Health Care Dialectic: History, Rhetoric, and Reality. Anthropology and Primary Health Care, p.28-48. Westview Press.
4. Office of the Prime Minister (1979) Thailand into the 80s. Kingdom of Thailand.
5. Roi-Et Provincial Hospital (1992) '91 Annual Report of Roi-Et Provincial Hospital. Roi-Et, Thailand.
6. Thailand Development Research Foundation (1986) Population and Health.
7. UNICEF (1989) Country Programme Recommendation, Thailand.
8. Weisbrod B. et al. (1973) Disease and Economic Development: The Impact of Parasitic Disease in St. Lucia. University of Minnesota. cited in Howard Jones (1990) Social Welfare in Third World Development. Macmillan Education L.
9. WHO/UNICEF (1979) Primary Health Care. Report of the International Conference on Primary Health Care, Alma Ata, U.S.S.R., 6-12 Sep. Geneva.

Chapter 2.5: Human Resources Development — An Integration of the Preceding Four Chapters —

KAMIYA Masahiko, KOBAYASHI Takemichi,
TANI Hiroaki and YOTSUMOTO Kenji

All the four chapters are written from the viewpoint of “Human Resources Development” (HRD), which is the fundament of this Part. Then, why HRD? Before answering this question, we must first answer another question: “What is the objective of development?” We submit that it is to improve the quality of life of the majority of the population. We would also submit that it should be ultimately achieved through self-reliant endeavours of the people themselves. Although material and economic bases are important, there have been a number of actual cases in the world that the richness in economic resources has not necessarily warranted high quality of life for the majority. On the other hand, there seem to be no exception in that the countries that have made sustained effort in human resources development have always achieved impressive progress in development. Consequently, it would be fair to assume that HRD is the most fundamental element of development.

Since we consider health and education as the essential prerequisites for HRD, the foregoing four chapters have focussed on these key elements in our analysis toward HRD in Roi-Et. Low quality of life that should be overcome through development has been brought about by low level of education, low health status and low income. As a matter of fact, these three factors reinforce each other. For example, the quality of labour force, which is primarily determined by the standard of education and health, directly affects the economic potential of an individual and hence, that of the nation as a whole in the long run.

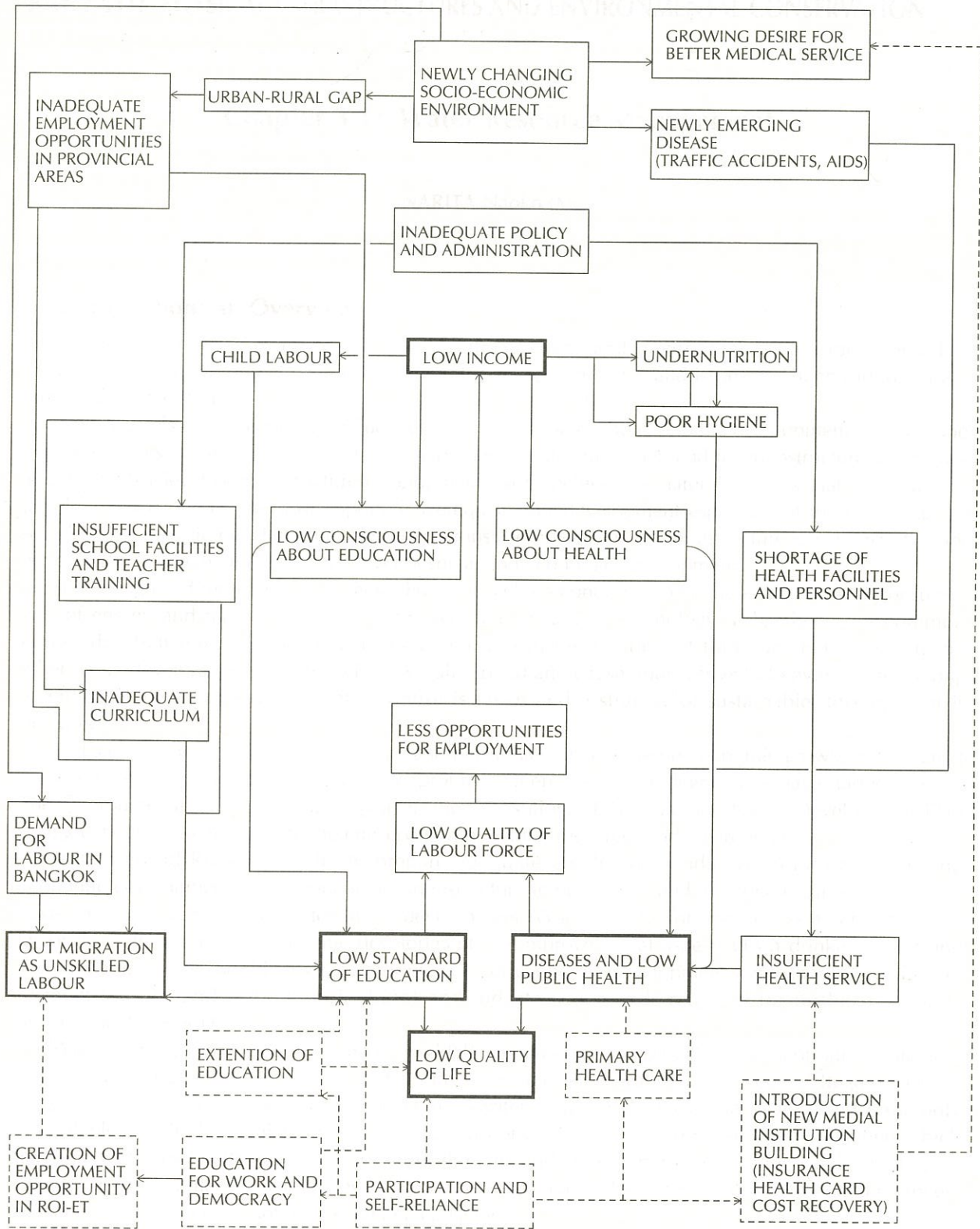
At the household level, low income of households results in child labour, malnutrition and poor hygiene. In addition, the low awareness of health and education further negatively affects the status of health and education, thus causing a vicious circle. At the national level, low income constrains the national revenue, meaning that the shortage of facilities and qualified personnel for social services is caused. It should also be noted at this juncture that such inadequacies are being aggravated by inappropriate policies and administrative management.

Besides the problems mentioned above, the socio-economic changes in Thailand have brought to the fore several new and serious problems. Of all these, the most critical would be the urban-rural gap. The gap in job opportunities is the major cause of out-migration of unskilled labour from rural to urban areas, which leads to the excessive concentration of population in Bangkok and drain of young, risk-taking and competent labour force from rural areas. In addition, newly emerging health problems like adults' diseases (heart attack, diabetes, etc.), AIDS and traffic accidents have started threatening people's health. Furthermore, as the economic level of people's life moves upward, their level of expectation for health services also moves up. This raises financial burden on the government in the field of medical services.

In order to cope with these problems, the following concept has been found important through our fieldwork. As noted at the outset of this chapter, the improvement of the quality of life is the ultimate objective of development. It follows therefore that the eradication of existing enclaves of poverty and low quality of life is imperative. Viewing the matter from this position, various facets of inadequacies are identified by us with regard to both education and health fields as follows:

It is apparent that the low standard of education is a serious bottleneck, so that the extension of education is essential as a measure for improving the quality of human resource at the grass root level. Education for work enhances people's aptitude for new and more rewarding job opportunities, and the education for democracy helps foster people's capability to participate more effectively in the development management process in the provincial areas.

Another bottleneck is the poor public health. In order to meet the demand for modern medical services, it is urgently required to introduce new medical arrangements such as health insurance systems, health cards and the like. However, it is not possible to solve all the health problems only with "modern" approaches which largely cater to the preference of newly emerging middle or higher income groups. We should not forget to carry out province-wide solutions, namely, the strengthening of primary health care addressed to the large majority of low income groups, for which the participation and the spirit of self-reliance of people is indispensable. In any country, development cannot be achieved without people's participation, based upon mutual trust between the provider of services (i.e., the government agencies concerned) and the recipients of the services. The attached figure presents the discussion advanced above in a diagrammatic form.



* [Dashed Box] Means New Policy Dimensions for Human Resources Development

Problem Structure Diagram on Human Resources Development in Roi-Et

PART III: PHYSICAL INFRASTRUCTURES AND ENVIRONMENTAL CONSERVATION

Chapter 3.1: Water Resource Management

NARITA Naoko (Ms.)

1. Introduction: An Overview

Part III attempts to examine the role of infrastructure and environmental considerations. For obtaining harmonious and viable development, the related problems and issues of Changwad Roi-Et are analyzed as case study.

Needless to say, infrastructure influences the pace of social and economic development. At the same time, the reverse is also true in that the development creates more demand for infrastructure and brings about a higher level of infrastructure development. Nonetheless, it is natural to think that infrastructure development is one of the most important prerequisite for development especially at the early stage of social and economic development, although it must be noted that the infrastructure development is not the only factor which determines the level of social and economic development.

It is recognized more and more these days that higher economic growth depends on more consumption of energy and natural resources along with the advanced technology. It has been our common knowledge that environment and development are in the relation of trade-off. However, on the other hand, development can be environmentally sound and cause improvement of environment so long as effective means of environmental control is taken and a strategy of sustainable development is practised.

In Thailand, on account of the strategy and plans that concentrate on economic growth and its great achievement particularly in the last decade, problems of environmental degradation have started to arise. The environmental considerations appear in the 7th National Economic and Social Development Plan with great degree of attention to the conservation of natural resources and environment.

In Changwad Roi-Et, in order to prepare adequate conditions conducive to further social and economic development, above mentioned infrastructure improvement and environmental considerations have become a very crucial factor for its development. Water-supply, for instance, is a very important factor for both social and economic development. To improve social aspect, clean drinking water and domestic-use water should be secured for people. For economic development water should be sufficient to meet the demand of both agricultural and industrial demands required for further economic development of Roi-Et.

Water shortage in Northeast Thailand is widely recognized as a consequence of not only insufficient but also its irregular rainfall pattern along with inadequacies of water supply system. Regarding non-agricultural water supply in Changwad Roi-Et, pipe-water supply by the Provincial Water Supply Authority is available only in the municipality, so that the most of villagers outside of it use water containers which keep rainwater and wells to get their water for drinking and other domestic uses. Pipe-water supplied by PWSA still has not met the demand even within the municipality. Its major reasons lie in that the process of water purification does not have sufficient capacity.

Agricultural water supply is the most essential need of people in Roi-Et, because agriculture is their main occupation. Therefore, economic development of the province can not be achieved without catering to the water requirement. They suffer from the water shortage especially during the dry season, during which the water from reservoirs and ponds of various sizes and wells is used for their agricultural activities. Since reservoirs and ponds are few in number and furthermore, there are problems of dry-ups caused by evaporation and percolation during the dry season so that they tend to use well water. However, salinity of water being quite high in the area, productivity is low and soil degradation is caused. There is a need of sufficient irrigation system to secure water for agricultural use such as large-

scale reservoirs. However, on account of peculiar topographic features, there is no suitable place for such reservoir development. Therefore, new types of water storing system is required for overcoming the salinity problem.

As for the infrastructure regarding the transportation, as a result of continuous effort in the last 20 years, inter-provincial high way has been rather satisfactory. However, the rural inter-village type road development, despite the lapse of 20 years, has not been able to meet the demand. These problems cause inconvenience to villagers and also reduce communication opportunity. The inaccessibility to the market is a serious disadvantage for development.

In Roi-Et, along with the development and improvement plans of roads to rural areas, the airport project has been drawing attention of many. Some people in Roi-Et expect that the airport will be an incentive for good investors to come in and contribute to the industrialization of the province. The project has been approved in the National Plan. However, there is a difficulty regarding the location because of many protesters. With regard to all roads and airport construction projects, the land use regulation should be introduced. To obtain harmonious development, both protecting farm land and promoting industrialization should be equally considered. It is for this reason that the land use regulation is needed to avoid thoughtless and unfair development.

Electricity suffers from shortage of demand rather than the supply capacity as such, causing its cost recovery and innovation difficult. Not much consumption from individual residents can be expected because their life style has not changed drastically from its traditional one and does not demand electricity that much. The provincial office is keen to promote industrialization of the province. However, there still remain some technical problems. The occasional blackouts can disturb the operation in a factory and the stability of industrial growth.

In Roi-Et, there is a plan to develop industrial estates. Two locations have been the target for the industrial estates project within Roi-Et municipality. The related personnel are expecting investments to be made there, especially of foreign investment such as Japanese and others. For the project, water supply, roads and electricity must be ready for the set-up. However, it seems that the project has yet a long way to go before realization although the Chamber of Commerce and Industry, as leader of the project, is making strenuous efforts toward it.

As another type of infrastructure in Roi-Et municipality, garbage disposal management has become one of its important projects. It is mainly for the betterment of peoples' life in terms of public hygiene management and convenience. It is one of the most urgent need of the people in the municipal area. In the Roi-Et Progress Project, garbage treatment is one of major concerns as a means of improving peoples' sanitation and environmental health status. The garbage disposal problem will obtain larger dimension in accordance with the expansion of industries and population increase in the near future.

In Northeast Thailand, severe deforestation can be observed generally. Roi-Et, not as an exception, suffers from this problem. The national goal for afforestation has been set to cover 40% of the land with trees. In Roi-Et, only 10% of the land remains as forest. It is estimated that about two million rai has to be afforested to meet the national goal. The main reason of deforestation lies in expansion of field for agriculture, livestock and overcutting of trees for fuels, which are all due to population growth. In Northeast area, since its topographic nature is plateau, major problems caused by deforestation is a hindrance of peoples' daily life rather than of watershed destruction and soil erosion. Forests have been the energy source of villagers and income raising source, such as wood production and agro-forestry development. Because most are engaged in farming in Roi-Et, development should be carried out without affecting the sustainable welfare of their life. Afforestation must be promoted at the same time, the quality of forest must be improved through deliberate strategy. The purpose of afforestation must be clarified in order to conserve forests for the farmers.

For each of the offices concerned with above mentioned issues, one problem which all of them have in common is that of extremely limited budget. Thailand's economic development has been remarkable indeed. However it appears that redressal of highly centralized bureaucracy has been behind the economic achievements. One of the three major objectives of the 7th National Development Plan is to sustain the country's economic growth at an appropriate level with stability. This objective can not be fulfilled by expecting the economic growth merely in Bangkok region. Industrialization and improvement in agricultural productivity in the provincial regions of Thailand are needed for sustaining "economic growth with stability".

As mentioned earlier, certain level of infrastructure development is a precondition for accelerating development. However in this regard there are gaps in various aspects of Roi-Et. This means that Roi-Et requires huge amount of budget for initial investment. As a matter of fact, serious considerations have been given to solve the shortage in budget. The special budget of 6,000 million baht provided to provinces of Thailand for rural development shows an effort for overcoming the budget shortage problem. However, the 6,000 million baht allocation itself is no more than 2% of all development expenditures of the government. The idea of decentralization, despite the long-standing goals aimed by the government ever since the establishment of the office of Accelerated Rural Development in 1966, largely remains unimplemented in many rural areas. As a result, the quality of life in these areas will remain considerably low, due primarily to scarce budget allocation.

Roi-Et had its share from the 6,000 million baht special budget and received about 2.6% of it, 155 million baht. The amount is quite reasonable considering that Roi-Et has population of 1,231,171, which is about 2.2% of the national population. The details of 155 million baht is shown below (Table 1). From the list, it can be assumed that projects for domestic water supply are emphasized in Roi-Et, taking nearly 60% of the total. The special budget enables the development projects of each office and district by supporting their budget a great deal, for example, looking at the ARD share for domestic water, it is 8,459,594 baht. ARD budget of 1992 for water supply is 75,452,300 baht so that the special budget is about 11% of ARD budget for water supply. However, 155 million is too small to provide budget for other districts and offices which are not in the list and, which need more budget as well. Only limited number of districts and offices will benefit from the special budget. The budget shortage was repeatedly pointed out by respective officials concerned as the most serious problem which disturb their operations. Inadequate resource allocation was observed everywhere at varying degrees.

Table 1: Details of Special Budget Received in Roi-Et

	Domestic water baht/No. of projects	Occupation baht/No. of projects	Natural resources baht/No. of projects	Total baht/No. of projects
Public health office	65,937,063/118	280,077/ 1		66,217,140/119
Amphur Phon Thong	1,230,320/ 1			1,230,320/ 1
Provincial office	667,750/ 1			667,750/ 1
Amphur Nong Pok	96,000/ 1			96,000/ 1
Amphur Pon Sai	750,000/ 1			750,000/ 1
Sub-district				
Mai Wade	2,700,000/ 1			2,700,000/ 1
Construction office	10,025,294/ 26			10,025,294/ 26
ARD	8,459,594/ 14	334,430/ 3		8,794,024/ 17
Sanitary district				
Kasset Wissai	546,530/ 2			546,530/ 2
Sanitary district				
Ban Newet	517,359/ 1			517,359/ 1
Forestry office			637,500/1	637,500/ 1
Roi-Et municipality			15,167,350/2	15,167,350/ 2
Agriculture office		24,855,868/51		24,855,868/ 51
Agriculture office of Nong Pok		1,183,210 /1		1,183,210/ 1
CD		3,191,910/15		3,191,910/ 15
Animal husbandry office		4,311,708/ 8		4,311,708/ 8
Fishery office		574,290/ 3		574,290/ 3
Education office		1,690,975/ 8		1,690,975/ 8
Commercial office		10,082,647/ 1		10,082,647/ 1
Labour office		214,200/ 1		214,200/ 1
Sanitary district				
Ponom Prai	1,508,192/ 1			1,508,192/ 1
TOTAL	92,438,102/167	46,719,315/92	15,804,850/3	154,962,267/262

2. Water Supply for Agricultural Use

2.1. Present Condition

2.1.1. Agricultural Pattern and its Water Balance

In Roi-Et, about 80% of population are involved in agriculture and the main crop is rice. The region is suitable for rice growing all year round considering its geographical feature as plateau and average temperature, about 27°C. 200% crop intensity can easily be obtained if they can ensure water supply. However, under the present condition, during the dry season, rice growing goes down to 40 thousand rai from that of rainy season, 3 million rai owing to severe water shortage. There are about 2,900 thousand rai paddy field in Roi-Et. However, irrigation system covers 347,782 rai of it, meaning that only about 12% is assured of water supply. Therefore normally farmers grow rice once a year only from June to November during the rainy season. They may grow rice during the dry season as well if rice harvest during the rainy season is very low, caused by natural disasters such as droughts, epidemics and harmful insects. Therefore, even though the 200% crop intensity may be achieved, the year will be a year of bad harvest owing to the low productivity.

Farmers avoid the rice cultivation during the dry season, and usually grow other crops that require less water. These are tobacco, melon, tomatoes, and fish or frog culture. Silk production also seems to be a very common activity of women in villages to raise side income. These activities are promoted under the guidance of agricultural office, Accelerated Rural Development, Community Development etc. through providing advice, technical support, and financial support. For many years, a large number of farmers have been migrating to Bangkok and other towns in search of jobs during the dry season. Recently with progress of income raising activities during the dry season, farmers have begun to remain in the region all year around little by little. Dry season activities are often conducted at the village level. Tambon Council submits a request concerning the jobs and the support they need to a coordinator officer of the related offices. Accordingly the coordinator officer sends professionals and trainers to the village. Those offices concerned cooperate with each other to find the most suitable person to be sent to the village. For example, if Community Development organizes a group of housewives to grow some vegetables, CD can ask for a trainer from another office who would have more professional knowledge, such as Agriculture Office.

All of these dry season activities mentioned above do not require large amount of water supply as rice growing does, but certainly need some water. Villagers must clarify what activities can benefit most from the available water. Water balance calculation and estimation are one of the responsibilities of Royal Irrigation Department. The estimations are made commensurate with the record of last 5 years in order to find out the balance between the amount of water left in a reservoir and the agricultural activities to be undertaken during the dry season.

In the procedure of estimation RID first set the "deadline" of a reservoir so that it will not dry up. Around October usually the water level of a reservoir is the highest so that from that level RID assumes 30% of water is for rice production and 5% for other consumption like for cattles, household uses and so on. Then 60 cm above the deadline must be kept for preparing rice plantation of the next year. The rest of water in a reservoir can be used for the dry season activities. RID provides advice as to what activities can be done with the estimated amount of water available for dry season. For instance, 19% of the reservoir water is needed for melon growing, 5% for tomato. RID also evaluates the accuracy of the estimation after the season in order to improve it the next year.

RID estimation seems to be highly reliable. However, on the other hand, it appears that the agricultural activities are very limited because of water shortage and inefficient irrigation system. During the dry season when there is no rainfall, farmers can depend only on the water coming from irrigation system and wells, which contains rather high salinity. In Roi-Et, as mentioned earlier, only 12% of cultivated land being covered by irrigation, it is no wonder that the farmers suffer from serious water shortage during the dry season.

Many water resource conservation projects have been undertaken and there are many that are still ongoing to overcome the problem. There are 12 medium scale reservoirs in Roi-Et. Many operations for many years have been underway such as repair, improvement and further construction with large budget of RID. However, the water storage capacity of these medium scale reservoirs during the dry season is very low. One of the reasons for that appears to be the inadequate management of the water use. Under the topographic conditions and nature of soil in Roi-Et, the inadequate water management is caused by

design (usually the reservoirs are shallow and vulnerable to evaporation) and the lack of discipline of the villagers concerned especially with those of medium scale.

2.1.2. Administrative Arrangements

Water shortage being one of the most acute problems of whole Northeast region, there are 16 departments in different ministries engaged in irrigation development. Of all the departments, RID under Ministry of Agriculture and Cooperatives is the most representative office for providing agricultural water supply. It is capable of constructing large- and medium-scale reservoirs while others are responsible for small-scale ones. The scale classification is made mainly by the amount of budget as follows.

Table 2: Construction Cost

Small-scale	less than 5 million baht
Medium-scale	less than 200 million baht (In principle, 80,000 rai* irrigated land is covered)
Large-scale	more than 200 million baht

*1 Rai = 1600 m²

As a policy, upon constructing small-scale reservoirs, villages should donate the land for large- and medium-scale reservoirs, RID buys the land in order to be responsible for control and management by itself.

RID has two main functions, viz. 1) construction of irrigation system to supply water and 2) maintenance and improvement works of existing reservoirs. Besides these main functions, it also make plans for water supply development and provides suggestions of water resource management to government and private sectors that are involved in the matter.

RID considers that there are 4 levels for irrigation development.

- 1st: construction of reservoir and main canals
- 2nd: construction of additional canals and drainage system for controlling excess wake supply
- 3rd: construction of sub-distribution canals on farmers' land to be managed by the farmers themselves (with RID's technical support if necessary)
- 4th: construction of road and the land leveling along the distribution canals, organizing the groups of farmers to take care of their distribution canals (activities instructed by RID)

In Roi-Et, there are 12 medium-scale reservoirs in 8 districts and 1 sub-district. The first one was started in 1939. According to the RID's 4 levels of irrigation development process, Roi-Et is up to the 3rd level at present.

The financial report of 1992 obtained from RID shows that the repair and improvement of medium-scale reservoirs occupies very large portion of expenditure. The figures are as follows.

Table 3: RID Financial Report of 1992 (In baht)

Administration	726,668
Repair & improvement/medium-scale	16,562,300
Repair & improvement/small-scale	8,712,900
Construction of canals	6,261,200
"Green Eastern" projects (i.e. Eesarn Keeou; Vide Part IV)	11,278,200
Service centre	5,173,000
TOTAL	48,715,268

Considering the period of construction and cost, the medium-scale reservoirs have disadvantages. It takes a long time until people can enjoy its full benefit, and repair and improvement works take

significant amount of time and budget. It therefore disturbs smooth operation at the 4 levels. Water supply influences the productivity and even the farming pattern. It means that the policy of RID, being the main department for agricultural water supply, can influence the agricultural activities themselves. The diversification of agricultural production, which is one of the most essential policy agenda, cannot proceed faster than the progress of RID in providing water to the village. As a result, the operation pattern and the efficiency of operation of RID are indeed crucial for improving the overall performance of the agriculture sector.

2.1.3. Salinity

In Northeast Thailand, water supply during dry seasons has been so insufficient that the farmers cannot increase their agricultural production. Therefore they have been obliged to out-migrate seasonally to make their living and recently some people tend to remain in the city all year round. The rural development is very difficult as long as people go on migrating to outside. The main reason for seasonal out-migration is that farmers do not have jobs for their livelihood. Therefore, the most effective solution is to make a condition in rural area for farmers to be able to earn enough livelihood all year round. The solution was to diversify the agricultural production and to realize continuous agricultural activities during the dry season by improving the efficiency in the use of the small amount of water.

For activities such as tobacco growing and edible frog culture, it is common to use water from shallow wells. They are found everywhere of a village and used for domestic uses as well. Although wells seem to be a convenient source of water, the water contains high salinity. It is due to the natural condition of the region, but the salinity is getting even higher these days as deforestation are getting severer. Wells are dug shallow, about 3 m at the deepest in order not to touch the saline layer. However, salinity layer level differ from one place to another even within one village, so that some people may get rather fresh water but others very saline water, which affects the productivity. In Roi-Et, salinity problem is one of the most serious water resource management problems along with others.

2.2. Policies and Projects

At the central government level, the decentralization is a topic of heated discussion today. Among the policies regarding decentralization in the 7th National Development Plan, it commits itself to the enforcement of budgetary policy to raise production and income of farmers by increasing productive efficiency and diversifying agricultural production (ref. Page 107, 7th National Development Plan). Regarding the water use, it suggests more efficient use of water supply along with the plan of extending the delivery system to distribute water from main canals down to the farm level. Furthermore, it also encourages farmers' participation in the planning for water distribution and its maintenance. Particularly in the Northeast, it is necessary to develop irrigation system that fits to its natural conditions such as plateau topography that cannot use gravity to distribute water, and the salinity problem that lowers productivity.

It was not long time ago when the *Tameike*, a Japanese style small-scale reservoir system, was introduced to Northeast Thailand. The project was carried out with cooperation of JICA in order to realize integrated farming. Among all other irrigation projects, it is unique because the structure of reservoir was totally different from that of Northeast tradition.

The most different feature of *Tameike* is that it is dug deep. As mentioned earlier, wells and reservoirs in Northeast Thailand are dug rather shallow to avoid the salinity layer in the ground. However, *Tameike* is dug into salinity layer. By virtue of the weight of stored water, it intends to push the saline water downward into the ground through seepage because saline water is heavier than fresh water. Consequently, *Tameike* is able to provide good amount of sweet water for agricultural activities during the dry season. Its management and maintenance can be handled by farmers once its technical design, such as the location selection and structure are drawn out by professionals. Also its construction does not require too long time nor a large chunk of budget because the scale is small.

Integrated small-scale farming by *Tameike* method is realized in Ban Umao of Roi-Et province. While many have been successful, some have failed on account of technical reasons. *Tameike* needs high embankment and in order to avoid the soil erosion on the sides, it needs to be constructed within the repose angle. Therefore not everywhere is suitable to construct one because it requires on appropriate location for its structure. Also if the salinity is too high, the seepage effect is no longer expected. In order

to get successful result from *Tameike* project, there is a need of careful survey and cooperation of villagers to provide best locations for it.

2.3. Tasks Ahead

For both short- and long-term rural development of Northeast Thailand, there is a need of big change in its agricultural pattern. The diversification of agricultural production seems to be one of feasible changes. It is well-known that rice growing is the long tradition of Thai agriculture and it may be very difficult to change the farmers' attitude toward it. However, as stressed in the 7th National Development Plan, agri-businesses should be more encouraged in order not to widen the gap between agricultural development and industrial development, which is already glaring at present. For diversifying and increasing the types of products of agro-industries, the farming itself should be diversified. It does not mean that rice growing had better be ceased but that other agricultural products will be very important, particularly those activities which can be undertaken during the dry season.

Water availability during the dry season is very important in this regard. Since natural rainfall can not be expected to improve in the foreseeable future, what really matters are the extent to which the water can be reserved and the ways by which the available water is efficiently used. As considered in the 7th National Development Plan it would be very effective to collect water fees in irrigated agricultural areas based on the amount of use. And for water storing method, *Tameike* project should deserve more attention not only for storing water but also for over-coming the salinity problem.

In any event, the agricultural development in Roi-Et, no matter what kind of form may it take in the future, organizing agricultural cooperatives should be essential. Cooperatives that can promote agro-industries, collect water fees and select the most effective location and structure for *Tameikes* is called for.

3. Water Supply for Non-Agricultural Water Uses

3.1. Present Condition

In Thailand, piped water supply is under the responsibility of two authorities, viz. Metropolitan Water Works Authority and Provincial Water Works Authority. MWA is in charge of Bangkok Metropolitan area, Samut Prakan and Nonthaburi provinces. Other areas are under the service of PWA. MWA is capable of providing water to about 65% of population of its territorial jurisdiction at present. In the Rural Water Supply Decade Plan for the period from 1985 to 1995, PWA has set its target for providing water for 75% of population of its territorial jurisdiction. However, according to the survey of 1986, only 5.1% of population was supplied with piped water. It seems that the target of the Decade Plan is too ambitious to be realistic.

In Roi-Et, PWA provides water only in the municipality area. Within the municipality, there are areas where the supply does not reach because pipe line is not yet expanded enough and water purifying process does not catch up with the demand. Production rate is too low. At Roi-Et Water Supply office, there are 6,570 users in its distribution area, and demand no less than 7,550 m³/day and the production rate is about 8,640 m³/day. Considering the high leakage of 30 to 40%, available water is absolutely insufficient. Its water source is Chi river and Nong Yama reservoir. About 70% of production depends on Chi river and the rest on the reservoirs. Shortage in non-agricultural water supply seems to consist not in the water resource per se but in the facilities.

In 1992, target for increasing the number of water users is 1 million according to the nation-wide policy. For Roi-Et alone, 1,400 has been targeted. Up till August 1992, there was an increase of 495. However, it seems to be impossible to achieve the national target in view of various reasons. First, the rate of water production is limited due to poor facility, second there are no main pipes in the small street to service the low income people and finally, the water distribution system does not reach outside of the municipality area.

The areas where the piped water is not available, shallow wells and ceramic water containers are used as source of water. The projects that supply non-agricultural water in those areas are conducted by ARD and others. However, these projects are usually to produce ceramic jars and to dig shallow wells only, rather than to establish piped water supply system in the villages. It may take considerable time to expand the piped water supply to the village level.

3.2. Policies and Projects

Central government has announced the Master Plan for providing domestic water supply for villages in each province in order to expand water availability in rural areas. The accelerated plan to solve the domestic water shortage in rural areas was approved by National Rural Development Committee in December 1991, with the budget of 2,000 million baht distributed to related agencies during 1993 to 1996. As a policy of this project, provinces should play an important role in decision making. Provincial Administrative Organizations should propose the problems of water supply. The project objective is concentrated on water for domestic use.

Upon project decision making, Village Committee will collect data on water supply conditions of the village and find the problems to be solved regarding the water supply. Keeping in view the villagers attitudes and capability, the Committee will propose a project considered most appropriate for the village. Tambon council will examine relevance of the proposal submitted by each Village Committee, as well as the feasibility of the project and determine the priority among the proposed projects.

By the same token, the District Development Committee is responsible for the inspection of the conditions of water supply in villages, sub-district and district. Keeping in view the feasibility of the proposed projects, it will determine the priority according to the needs. It also sets the approximate budget for the project.

At the provincial level, Water Supply Development sub-Committee (appointed by agents working for the water supply development related to the Provincial Development Committee) has a role of checking the relevance of the project and its beneficiary area, consistency with the project policy, the budget and priority of implementation. Provincial Development Committee is the agent responsible for supervision throughout the process of the Master Plan making and to approve the plan efficiently.

Roi-Et Water Supply Authority has the project that consists of two phases with the budget of 254 million baht in 1993 fiscal year. The 1st phase of the project is 1) to construct water pump factory at Baan Dindang 2) to install water pipe from Baan Dindang water pumping factory to Roi-Et water supply Authority 3) to improve water purification facilities in order to expand the capacity and 4) to install mobile water purifying equipment. The budget for this part is 129 million baht. The 2nd phase is to expand the water purifying facilities at sub-district Janghan with the budget of 125 million baht. In the fiscal year 1993. If the project is successfully completed, the capacity of water production will increase to 16,500 m³/day and expected to accommodate the population increase expected in the coming 10 years.

3.3. Tasks Ahead

At present, the provision of sufficient water for the people's need seems to be the top priority target, for the access to clean water is one of the basic preconditions of social welfare. At the same time, the water supply is crucial for achieving economic development. For further economic development of Roi-Et, industrialization of the region will be very important, which requires water supply as key infrastructure along with others such as electricity and transportation system. Therefore, different approaches should be made to develop water supply, as an infrastructure for both social and economic development.

The expansion of absolute amount of water supply is important in order to meet the demand and also to realize cost recovery. The 7th National Development Plan encourages the private sector to participate in the provision of basic services. Administrative procedures of public sector tends to be complicated owing to various official arrangements which cause delay in development. There is possibility that the private sector might do the works more efficiently and smoothly. In addition, water production process and its management should increase the efficiency to reduce the water losses and operation and management of water supply system need to be upgraded.

4. Conclusion

Through studying infrastructure and environmental aspects in Roi-Et, the close relation between economic development and infrastructure and environmental questions was confirmed. Environmental degradation such as deforestation was caused by poverty and it lowers quality of people's life in many ways. Poverty is the result of bad achievement of economic development. In order to achieve high economic development, the agriculture and industries need to be accelerated. However, the infrastructure as

an essential precondition to those is not ready yet. That is the reason why the economic development has continuously been slow and kept people poor. The activities necessary for development at provincial level have been under the heavy control of the central government policy, because provincial regions like Roi-Et has been suffering from the tendency of putting high priority of resource allocation in favour of the Bangkok metropolitan region. However it is encouraging to learn that the government has started to change their policy toward decentralization.

In the 7th National Development Plan, the policy of decentralization and upgrading of capacity building of local authorities for fiscal administration are stressed. It considers allowing regional authorities to submit their budget proposals directly to central agencies concerned, so that the allocations be made in accordance with the criteria given by central agencies. If so, development projects in provincial areas can be freely implemented within the provincial development plan framework. Also it encourages greater flexibility in budget distribution to provincial areas (ref. P.106, The 7th NESD Plan). Regarding the resource allocation, it is encouraging to learn that the Army has agreed to cut its budget for the first time in favour of development promotion. Perhaps decentralization is going to the right direction.

REFERENCE

1. Dhira Phantumvanit, Winai Liengcharernsit. "Coming to terms with Bangkok's Environmental problems" reprinted from *Environment & Urbanization* Vol.1 No.1./April 1989.
2. Dhira Phantumvanit, Khunying Suthawan Sathirathai. "Thailand: Degradation and development in a resource-rich land." reprinted from *Environment* Vol.1 No.1.
3. "Natural Resource Management" TDRI Foundation.
4. "The Seventh National Economic and Social Development Plan (1992-1996)" National Economic and Social Development Board, Office of Prime Minister, Bangkok, Thailand.
5. "Group Training Course in Rural Development" Arranged by Accelerated Rural Development, Ministry of Interior and Department of Technical and Economic Cooperation, Office of the Prime Minister, Government of Thailand.
6. "Master Plan for Providing Water Resource for Villages in Each Province" Secretary, Office of National Rural Development Committee, June 1992.
7. Kirasak Chancharaswat. "Thailand Rural Development" Rural Development Coordination Division, National Economic and Social Development Board. Bangkok, Thailand. No date, but distributed by NESDB in October 1992.

And many other forms of information obtained through visiting offices, and various financial reports are used for working out this chapter.

Chapter 3.2: Transport System in ROI-ET

Myint San

1. Introduction

Roi-Et is one of the provinces of Northeast region, which is the most backward of all the regions in Thailand. Most of the people are engaged in farming. But their productivity is very low because of water shortage problem. Moreover, Thai economy has an extreme unbalanced growth pattern between central Bangkok and other provincial regions. Most administrative and economic activities are concentrated in Bangkok. For example in 1988, manufacturing gross output of Bangkok and its adjacent region (Hereinafter Bangkok Metropolitan Region, or "BMR") contributed as much as 78% but Northeast Region contributed only 4.3%. According to the number of employees data, BMR contributed 63%, whereas the Northeast (Hereinafter "NE") region contributed 6% of total employment of the manufacturing sector in the country. Moreover, if we see GRP (Gross Regional Product) of manufacturing sector in 1982, BMR contributed 75%, whereas NE Region, 4.7% of total GRP in the manufacturing sector. This means that most of the industries are located in BMR. As a result, other regions are facing with unbalanced budget allocation. It creates budget shortage problem and poor infrastructure in Roi-Et.

Roi-Et depends on road transportation only. In Map 1, we can see they have no airport, railway nor seaboard. Khon Kaen, near Roi-Et, has an airport and a railway station. But road transport is most popular mode of transport for both passengers and freight in developed and developing countries. Good transport system provides good opportunities for economic development and social services.

Rural road is very important for rural people. Rural road connecting isolated areas to markets and sources of supply are essential for upgrading agriculture from subsistence level to a commercial cash-crop oriented level. Most of the rural population live in relatively isolated villages. These villages are served by dirt roads and cart-tracks only, which are unusable during rainy seasons. It means the difficulty for rural people to sell their agricultural produce and to communicate with other regions.

Thai government started rural development programmes in 1966 under its Fifth National Economic and Social Development Plan (1966–1971) in order to improve the standard of living in rural areas. Government formed the Department of ARD (Accelerated Rural Development) in the Ministry of Interior. The focus of its activities is on infrastructure development, particularly road construction and water supply. According to an ARD officer in Roi-Et. 99% of ARD budget is used in infrastructure development and 1% for employment generation.

The focus of the study of our Working Group (WG)-III is infrastructure development and environmental conservation in Roi-Et. This chapter deals with transportation system in Roi-Et. I interviewed with officers of the following departments.

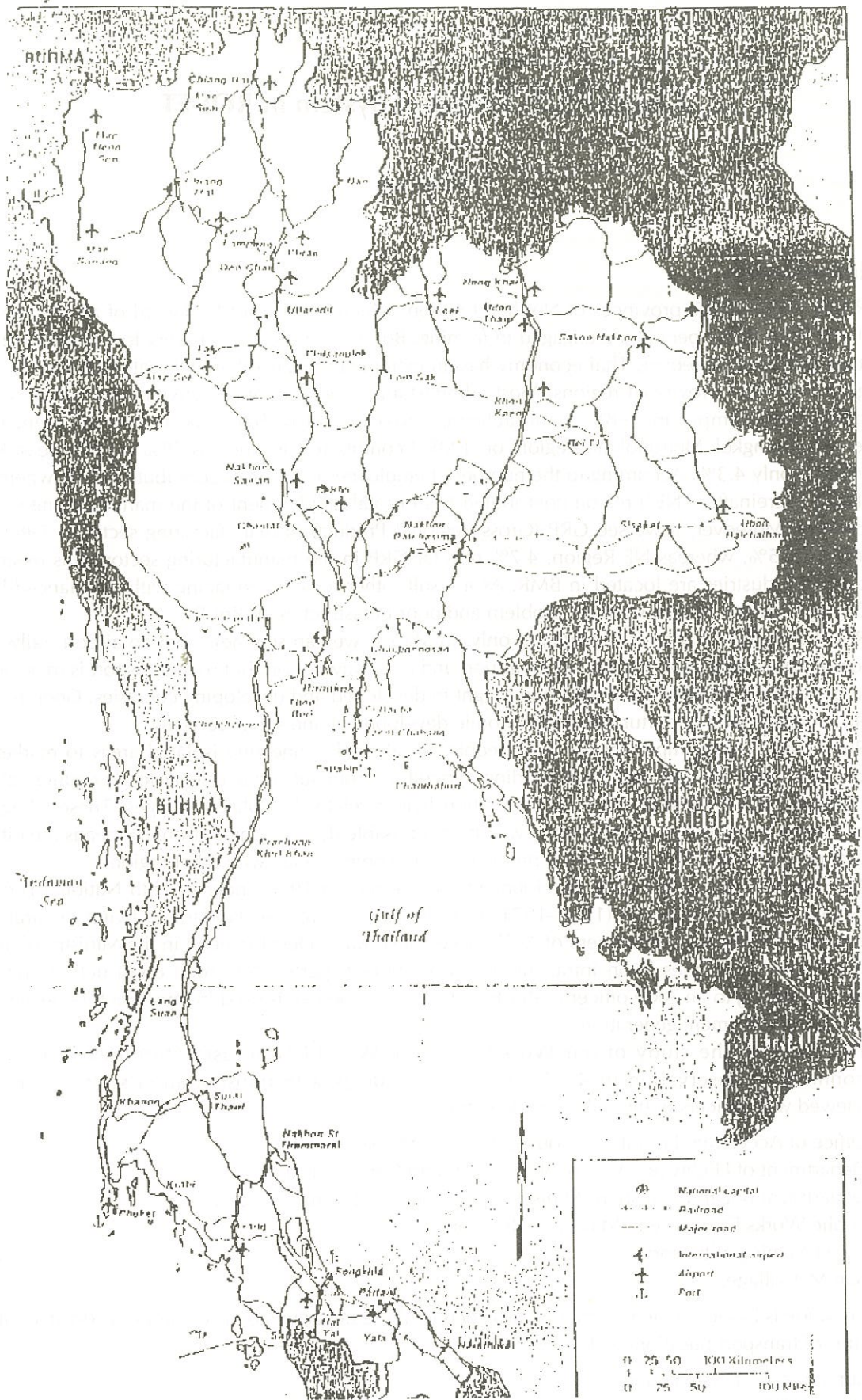
- (1) Office of Accelerated Rural Development (ARD), Ministry of Interior.
- (2) Department of Highway, Ministry of Transport and Communication.
- (3) Department of Land Transport, Ministry of Transport and Communication.
- (4) Public Works Department, Ministry of Interior.
- (5) Roi-Et Municipality, and
- (6) Ban Mat village.

My study is based on the information provided by these departments. The analysis is divided into two domains of transport questions as follows:

- (A) Rural transport system, and
- (B) Urban transport system

Each section consists of the following components.

- Present condition of transport system and problems.



Map 1.

- Policy implementation.
- Future tasks, and
- Conclusion.

1. Rural Transportation

1.1. Present Condition and Problems

In Roi-Et, there are 2048 villages, whose infrastructure especially rural transport system is poor. Most people live in rural areas, and are largely engaged in agriculture. Rural roads connecting isolated areas to markets and sources of supply are essential for converting agriculture from a subsistence level to a modern agriculture involving commercial activities. But most of rural roads are temporary and it is difficult to pass during rainy seasons. It means that rural people are difficult to sell their agricultural produce and to communicate with other regions. To raise the standard of living of rural people, we need a good transport system to connect villages with market centres. To improve the rural transport system, ARD office constructs the temporary roads in rural areas. During the 1966–1992, 99% of ARD budget was used in infrastructure development, and 60–70% out of 99% was for new construction. Table 1 shows ARD construction projects in Roi-Et (1966–1992).

Table 1:

Types of road	No. of projects	Constructed road length (km)
- permanent	276	328.71
- concrete	102	79.176
- temporary	n.a.	1724.161
TOTAL	398	2132.047

Source: ARD Office (Roi-Et), 1992.

According to this table, ARD mainly constructed temporary roads (81%) of total road length constructed (1724.161 km). It is because the temporary roads are urgently needed by rural people and their cost is much lower than other roads. In Table 2, we can easily see that the temporary road construction cost is very low.

Table 2: Average Road Construction Cost

Types of road	Average cost (million baht per km)
- permanent	2.8
- concrete	1.5
- temporary	0.49

Source: Public Works Department, 1992.

This table shows that the temporary road construction cost is lower by 2.31 million baht per km compared with permanent road, and by 1.01 million baht per km compared with concrete road. But temporary road has difficulties during rainy seasons because the road surface soil is soft.

To develop the rural and urban transport system, PWD (Public Works Department) constructs three types of road (permanent, concrete, and temporary). Sometimes PWD and ARD jointly construct rural roads. Table 3 shows the road construction of PWD in 1992.

Table 3: PWD Road Construction

Types of road	Constructed road length (km)	Budget (million baht)
- permanent	12.594	22.526
- concrete	2.305	3.469
- temporary	7.910	3.915
TOTAL	22.809	29.910

Source: PWD Office, 1992.

In this table, 75.3% of PWD road construction budget is for permanent road and it is mainly for urban areas. For rural transport, they spent 13.1% of road construction budget. In 1992, PWD constructed only 22.8 km road because of budget shortage problem.

Problem:

- (1) To improve the poor rural transport system, ARD and PWD are facing with budget shortage problem. So they can not implement their projects successfully.
- (2) Sometimes they lack in construction materials, e.g.: rocks.
- (3) Compensation for the land rights of the villagers who live in the construction areas.

1.2. Case Study of Ban Mat Village

Profile of village

No. of villages	:	Three natural villages
Village area	:	10 km ²
Population	:	2070
Household	:	378
Main occupation	:	Farming
Average cash income	:	1800 baht (annual)
Primary school	:	1
Public health clinic	:	1

Ban Mat village is 2 km away from main road and it takes 15 minutes to go to Roi-Et. They go to the neighbouring villages and Roi-Et by motorcycles and buses. Bus fare is 4 baht to Roi-Et. The number of buses and motorcycles in Ban Mat is as follows:

No. of buses	:	3
No. of four wheel cars	:	4
No. of three wheel cars	:	5
No. of motorcycles	:	200
No. of total vehicles	:	212

All buses are owned by villagers. These buses mainly transport farm produce to the market in Roi-Et Municipality although they have problems during rainy season, their temporary road is near the main road, 2 km. They get the budget from government, on average from 400,000 to 500,000 baht to maintain the temporary roads each year. This budget is enough only for maintenance. But they need a permanent road. So Ban Mat Tambon Council leader requested to the Amphoe office to develop their road. But it depends on government budget. Next year, (1993), ARD has a plan to start asphaltic road. Ban Mat Tambon Council leader, council members and people are very active and cooperate with each other to improve their standard of living and their village. In fact, they have always been trying to improve their transport system in such a manner.

1.3. Policy Implementation

Rural roads are very important for rural people. If rural road is good, they can easily sell their agricultural produce and they can get market information by communicating with other regions. The growth of demand for production, i.e: good transport connection with market centres, is related to the specific agricultural and industrial development of these centres and their hinterlands as well as to the agricultural and (small scale, agro-based) industrial development of the country as a whole (Seah Chee Mow, 1977). The integration of rural areas into national economy can be achieved only through urban-rural linkages. These are the connections which provide the network needed to facilitate important flow, such as the movement of agricultural produce into agro-processing centres, the distribution of agricultural inputs or the spread of innovations and new ideas from centres to their hinterlands. ARD formulated the policy to construct rural road. One of ARD's tasks is to improve or construct access from the village to the existing system of paved highway and laterite feeder roads. The ARD standard road is a permanent all weather road connecting villages to existing highway system. ARD roads are making it possible for the villagers to take their produce to markets with less cost of transport. These also

mean provision of economic opportunities and that of social services to the rural people (ARD report, 1985).

To develop the rural transport system, Thai government has a plan to construct two stages road construction system as follows:

Stage 1: To construct major city highway network system.

Stage 2: To construct inter-village network system.

Concerning inter-village network system, ARD started temporary road system and then permanent road system. ARD and PWD have a plan to construct a transport network system.

1.4. Future Plan and Tasks

Some villages have transport problem in rainy season because most of the rural roads are temporary roads. ARD has a future plan to construct permanent road and inter-village road network system. Table 4 shows the future plan of ARD in 1993.

Table 4: ARD Road Construction Plan for 1993

Types of activities	No. of projects	Budget (proposal) [million baht]
(a) Construction of rural highways (class 3-5 level)	2	9,680,500
(b) Construction of bridges	3 (places)	11,248,000
(c) Repairing permanent road	8	48,715,200
(d) Metaling surface of temporary roads	5	1,247,400
(e) Repairing temporary roads	2	4,789,750
TOTAL	20	75,680,850

Source: ARD Office.

Table 4 shows that ARD intends to spend about 64% of total budget in repairing permanent road and 15% for bridge construction. For rural highway, 13% of total budget. ARD will spend only about 8% for temporary roads, less than 2% for metaling surface of temporary roads and 6% for repairing temporary roads. According to this table, ARD will spend about 70% of total budget for new road construction and about 30% for maintenance. According to interviews with ARD and PWD officers, their budget is not enough for their projects and they need more budget for future tasks.

2. Urban Transport System

In general, urban transport is not poor in Roi-Et. We can go to Bangkok and other provinces by using regular air-conditioned buses. However, Roi-Et is 547 km away from Bangkok, so that it takes long time (about 8 hours) by bus from Bangkok. This distance can discourage the location of manufacturing industries and business activities in Roi-Et. Moreover, Khon Kaen, about 50 km away from Roi-Et, has an airport but which is often quite crowded. It takes at least 4 hours (round trip) by bus between Khon Kaen and Roi-Et.

Land Transport office mainly takes care of the intra-city transportation. Main functions of this Office are to:

- [1] operate the transport system;
- [2] oversee the traffic safety;
- [3] impose vehicles tax;
- [4] inspect cars and motorcycles conditions for environmental control;
- [5] register all vehicles; and
- [6] issue licences for cars and motorcycles.

Main objective of this office is to protect the benefit of consumers. To fulfill this objective, they undertake the following activities:

- [a] to monitor operation of bus schedules at the bus terminal.
- [b] to check around the bus routes.
- [c] to attend to the complaints of passengers.

In Table 5, we can see the bus schedules supervised by this office.

Table 5: Bus schedules in Roi-Et

[a] Regular bus routes (Roi-Et-BangKok)	10
[b] Regular bus routes (BKK-Roi-Et-Other provinces)	10
[c] Regular bus route (province-province)	21
[d] Local bus routes	7
Total bus routes	48

Source: Land Transport Office, 1992.

According to this table, Roi-Et has 48 bus schedules. There is no serious problem in urban transportation. In fact, Roi-Et-BangKok buses are mostly not crowded. However, small buses connecting villages with Roi-Et municipality are always crowded. Thus they need more buses for rural people.

Table 6 shows the number of vehicles and motorcycles registered commensurate with the vehicle law.

Table 6:

Year	All vehicles & motorcycles	Rate of increase (%)	Tax revenue (million baht)
1988	47,278	—	n.a.
1989	50,362	6.5	16.4
1990	57,975	15.1	17.4
1991	70,231	21.1	21.4
1992	76,637	9.1	24.04

Source: Land Transport Office, 1992.

In this table, during the period 1988–1992, total vehicles and motorcycles increased by 29,359 and tax revenue also increased by 7.64 million baht during (1989–1992). Moreover, we see an upward trend in the rate of increase in total vehicles & motorcycles from 6.5% during 1988–1989 to 21.1% during 1990–1991, but the rate declined to 9.1% during 1991–1992. In Roi-Et, the number of cars per 1000 population is 6.

The Highway Office is mainly in charge of road maintenance. We can classify two kinds of highways.

- [1] concrete-paved highway.
- [2] asphalt-paved highway.

Generally, the width of highway is between 10 m and 12 m. Cost of the standard highway is 426 million baht per km for new highway and 20 million baht for road widening. In Thailand there are four types of road classification (see Map 2: Northeastern Route).

<i>Road classification</i>	<i>Remarks</i>
Class 1: Main highway	one-digit highway
Class 2: National highway	two-digit highway
Class 3: Province to province	three-digit highway
Class 4: Intra-province	four-digit highway

Map of the Northeastern Route



Map 2. The Northeastern Route

Most of the highways are largely in good condition for travelling and cargo transport. But the problem is very long travelling time (e.g.: 8 hours to Bangkok and 2 hours to Khon-Kaen). It means unattractiveness of Roi-Et for industrialization and other new economic activities. They depend on Khon-Kaen airport. As mentioned earlier, this airport no longer can accommodate the increasing demand for neighbouring provinces, it being congested already.

3. Policy Implementation

Roi-Et is one of development centres in the Northeast region. Now Thailand is engaged in border trade with Laos. As a result, this region will be one of important places in the years to come. So they need an efficient transport system. They have a plan to construct an airport in Roi-Et. The main objectives of the airport project are to:

- [1] induce the location of industries and to create attractive job opportunities for Roi-Et people. Industries considered suitable to Roi-Et will include:
 - (a) labour-intensive industries.
 - (b) less water consumptive industries.
 - (c) agro-based industries.
 - (d) small and medium scale industries.

In Roi-Et, however, water resource shortage and low levels of skills of the local labour force are serious problems that impede promotion of industrial development. We need a huge investment for infrastructure development and human resource development (HRD).

- [2] promote transportation and communication.
- [3] develop the tourism sector.

Many entrepreneurs are expected to be interested in locating their business activities in Roi-Et if its transport system is improved. Besides, they should provide enough electricity, water supply and skilled labour for accelerating industrialization. However, highly centralized administrative system and concentration of economic activities in Bangkok region cause insufficient budget allocation for development in Roi-Et. It means that they can not create good transport system and other essential infrastructures. As a result, businessmen and investors are not interested in Roi-Et to establish their industries and other new business activities, making economic growth rate of Roi-Et very low. Most people in the province are suffering from poverty and low quality of life on account of low economic growth. As a result, Thai Government is now trying to promote decentralization policy, including efforts to reduce the overconcentration of industries in BMR. However, in practice, decentralization of industries is not easy. In the first place, there should be budget allocation in favour of provinces, that may ultimately bring about sufficient infrastructure and skilled labour.

4. Recommendation (Conclusion)

Good transport system is one of the most essential prerequisites for Roi-Et progress. However, there are two serious problems that constrain transport development. These are:

- [1] Budget shortage problem.
- [2] Land right problem.

As a matter of fact, new Thai government is trying to introduce decentralization policy, under which a larger scope of decision-making power is to be accorded to the local level. However, the extent to which such decentralization of authority is to be made is still under debate. For example, the Tambon Council at present does not have authority of issuing project contracts nor own budget for their village development. They should always request the Amphoe Officer to sign the bill on their behalf. Not only Tambon Council, but other offices are also facing budget shortage problem. Our central question is therefore the budget shortage problem. Consequently, several strategies need to be pursued in order to increase the budget. For example,

- to collect more taxes;
- try to get more foreign assistance;
- policy shift in resource allocation in favour of provinces; and
- change in development style.

Most of Roi-Et people are engaged in farming. But their productivity is very low primarily because of water shortage. To solve this problem, they need a lot of budget. Alternative strategies, perhaps more cost effective, could be the changing of cropping system or introduction of non-agricultural activities in Roi-Et. Now that Thai government and military leaders have agreed to reduce the military expenditure, there is emerging a favourable change in policy climate. Needless to say, the main objective should be to shift budget allocation in favour of rural areas.

Concerning foreign assistance, it should be noted that at the beginning, ARD financed its projects through the assistance of many foreign countries. As a result, ARD programmes were rapidly extended. However, at present, the amount of such assistance has lessened in accordance with the rise in the status of Thai national economy as a whole. However, in Thailand, there is still much to be done for alleviating serious urban-rural gaps. Presumably, it would be necessary for ARD to try to get more assistance, for example, private financial institutions and NGOs if Thailand is no longer qualified for larger amount of ODA. Not only ARD but also other offices of Roi-Et should cooperate with international agencies to tap foreign financial and technical assistance.

At the same time, Thailand should transform its traditional socio-economic and institutional structure causing glaring urban-rural gaps to a more balanced growth system. Provincial regions should be given

fairer opportunities. Now Thai government is trying to be a "NAIC" (Newly Agricultural and Industrializing Country). For this to happen, poor provinces such as Roi-Et should receive much larger chunk of resource allocation.

The other problem is the land right problem. Generally speaking, areas required for certain public projects are owned by farmers. As a result, they lose their land because of public projects, such as road construction and so on. For example, the airport project area (500 ha) is owned by farmers. They don't want to sell their land because they have no replacement for cultivation. Moreover, people who live near the airport will suffer from noise and other environmental hazards. Consequently, the province requires a consistent land use policy for designating the location of transportation facilities, industrial, residential, agricultural areas and so on.

Road classification should be based on distinct and interrelated factors of service function, traffic operation and engineering standard. Apart from the urban roads (lying within the limits of a city or a town) a basic system of three distinct services levels, reflecting both policy objectives and physical standards, should be defined as follows:

- [1] A national network servicing international, intercity and inter-regional demands, requires superior mobility and structural strength for long distance trips and heavy vehicles. Therefore high engineering standards such as bitumen or similar surfacing are required.
- [2] An intra-regional network providing continuous access to designated centres as well as circulation within internal areas (province and district) requires all-weather roads.
- [3] A local network connecting minor centres and farms to market and service centres is possibly suitable for labour-intensive construction and maintenance methods.

Chapter 3.3: Garbage Collection

NOH Chang-II

1. Introduction

In the rapid change of Thai economy, urbanization of Bangkok and the regional cities have faced insufficient infrastructure and environmental problems. Better management of urban development especially within regional cities could lessen socioeconomic disparity between Bangkok and other provincial cities, as well as upgrade the quality of life in rural areas.¹ But Thailand has never had a history of zoning to control and develop land use. In addition, urban infrastructure is implemented by a variety of agencies of central government, often causing conflicts among them.² Generally few city governments in the developing world have the power, resources, and trained staff to provide their growing population with the land, services, and facilities needed for an adequate human life.³ Roi-Et Municipality is not an exception. It has been suffering from insufficient urban infrastructures and environmental problems related to clean water, solid wastes collection, sanitation, schools, and transport.

Fortunately, Roi-Et Municipality has initiated what is called Roi-Et Progress Project (RPP) with focus on urban development to improve the environmental conditions and to promote economic development. Accordingly, the urban infrastructure such as garbage collection has been given high priority by municipal authorities (see Appendix 1). The purpose of this chapter is to analyze the current garbage collection in Roi-Et Municipality, investigate environmental problems of waste disposal such as water and soil pollution, and propose privatization of garbage collection as an alternative for development and conservation of environment in Roi-Et.

First of all, through evaluating the process and the methods of garbage collection in Roi-Et Municipality, an attempt is made to define an environmentally sound and inexpensive methods of garbage collection. Secondly, the viewpoint of "polluters pay principle", such as pricing the appropriate fee and increase of fee-payers is stressed as new available resource for the extension of services for all residents. In order to prove the merits of privatization of services of local government, privatization of public toilet will be introduced as an actual example. Lastly, all obstacles to privatization of garbage collection are examined for finding our better alternatives. In any event, it is submitted that it is only through search for an environment-friendly life style that the problems of garbage disposal could ultimately be solved.

2. Garbage Collection System in Roi-Et Municipality

Garbage collection and disposal in Roi-Et is undertaken by Sanitation and Environment Department of Roi-Et Municipality with the assistance of Public Health Administration. The total area to which the Roi-Et Municipality provides garbage collection service is only 11.63 km² of Municipal area where are 33,752 of population and 8,071 households in 1992. There is no garbage collection outside the Municipality not only because the garbage in rural areas is small and not serious, but also because the cost of garbage collection is relatively higher than in urban areas.

Therefore, in this chapter the garbage collection system only in Roi-Et Municipality is reviewed. First, there are two processes of waste collection service that should be noted. One is the collection process

1. National Economic and Social Development Board, *THE SEVENTH NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN (1992-1996)*, p.125.

2. Daniera, Amrita & Sussangkan, Chalongsob, "National Urban Development Policy Framework", *TDRI QUARTERLY REVIEW 1992*, p.26.

3. WCED, *OUR COMMON FUTURE*, Oxford; Oxford University Press, 1987, p.238.

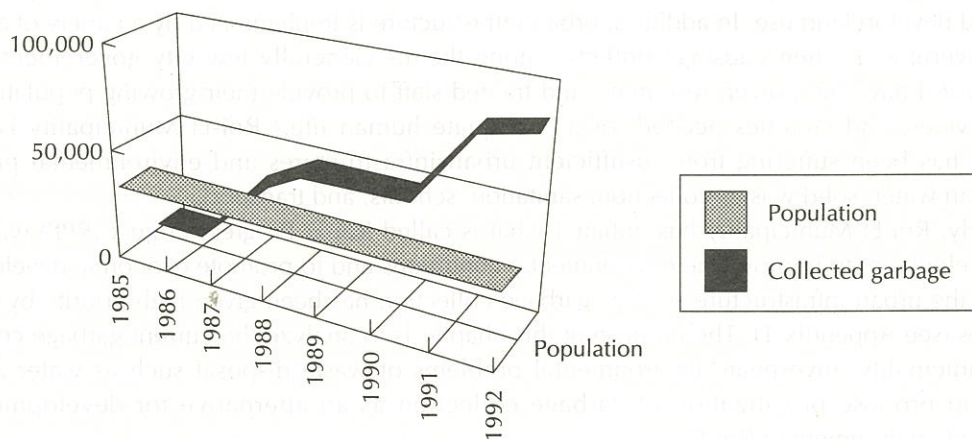
itself, and the other is the method by which the collected garbage is disposed. Second, the finance of garbage collection, especially garbage fee as the main source of revenue is analyzed. In the last section, the toilet privatization is discussed as an example of private sector participation.

2.1. The Procedure of Garbage Collection and Disposal in Roi-Et Municipality

As noted earlier, two aspects of the service can be separately performed, and both of the two require improvement. Before analysing these, the facilities for garbage collection are reviewed.

2.1.1. Manpower and Equipment for the Garbage Disposal

Roi-Et Municipality is supposed to supply garbage collection service to its residents. The present waste collection capacity of Roi-Et is 196 m³ per day (5,900 m³ per month, 87,000 m³ per year). Through recent investment in the facilities, the garbage collection capacity has rapidly increased without increase of population in Roi-Et (see Figure 1). In fact, the garbage problem in Roi-Et Municipality is caused by shortage of budget and facilities rather than by increase in population. There is no available data about the amount of garbage generated daily by Roi-Et population.



Source: Table 3
Note: unit of garbage: m³/year

Fig. 1 Population and Collected Garbage in Roi-Et Municipality

The Roi-Et Municipality has 33 collection crews who clean the road and public areas. They are responsible for 500 m of road per day and work twice a day from 5 AM to 8 AM and from 1 PM to 5 PM. In addition, they are assigned to look after the three public markets, which are the priority areas. The municipality has eight trucks, and the capacity of each truck is 40 cubic yards. One is used to cut branch of trees and the others are used to transfer solid wastes and allocated into 7 areas. Each truck collects wastes twice a day and cover 60,000 m of road in total.

2.1.2. Garbage Collection in Roi-Et Municipality

At present, the municipality collects garbage from household through combination of two methods. Garbage collection from household generally consists of two parts, viz. "station" system and "door to door" system. The former is for residents to bring wastes to a communal container, and the latter is for each household to leave garbage at the curbside for collection.

Unfortunately, there are no available data about the extent to which the people are being served and the amount of waste not collected. But it is clear that municipal service does not reach households in slum areas, not only because it is difficult for the refuse lorries to get into slum areas but also because they squat on public land and do not pay garbage collection fee. Eventually, the garbage from the slum area (which is generally located along the canals), is dumped mostly in vacant areas or directly into the canal. There are no exact data as to the extent to which the garbage dumped into canal contaminates the quality of the water resource, but it obviously causes septicity in large part of the canals in Roi-Et.

The problem of industrial wastes and its impact on water resource do not seem serious because of low levels of industrial development. In municipality there are only two medium size factories. One is fishing net factory and the other, a noodle factory. The garbage of the noodle factory is collected by

municipality but fishing net factory and other small factories dispose by themselves the industrial waste together with household garbage on dumping ground. But in the near future, unless the municipality establishes the system of industrial solid wastes disposal, it would have to spend a lot of money and time to recover polluted water and soil. Provision of infrastructure and appropriate management to dispose of the hazardous waste should be initiated immediately, rather than waiting until the problem of those wastes becomes too serious.

Recently, the wastes from the two hospitals are arousing apprehension of residents about epidemics and AIDS. The probability of AIDS infection through wastes from hospitals is not confirmed yet, but it should be recognized that the hospitals don't have their own special waste disposal facilities and dispose biologically hazardous wastes without special treatment, so that those wastes threaten the health of residents, especially those who make their living on scavenging on the refuse site. Ironically, somehow accelerated by ungrounded overreaction of citizens against AIDS, the public opinion is now strongly urging the municipal authority to attend to garbage problems. Public opinion often plays a critical role in the drive to improve urban conditions. In case of Roi-Et, the public pressure is triggering the consideration of hospital management and the local government about hazardous wastes.

2.1.3. *The Garbage Disposal on Dumping Ground*

All wastes collected are carried to the dumping site which is 5 km away from the Roi-Et Municipality. The site which is 10.3 rai (i.e., about 1.6 Ha) has been used for more than 10 years, and it will run out of space in a short period of time.

The waste disposal method employed by the municipality is not incineration but open dumping and open burning owing to the smallness of the site and insufficient facilities. Such an open dumping causes environmental problems including public health problems as well as a visual problem for the nearby households. Because wastes are not collected separately and disposed through safe-hole dumping and incinerator system, hazardous wastes such as one of hospitals could be easily found together with general solid waste of household at dump site and would pollute the water resource.

As an alternative both to solve temporarily the problems of the over-dumped site and to supply new public market, Roi-Et Municipality has been running "Sathong" fill land project (see Appendix 1). This project is to bring environmentally-sound wastes from the dump site, fill the old pond (Sathong) with those, and supply a new 30 rai public market for the people presently engaged in vending business on the footpath. Roi-Et Municipality is suffering from both the footpath vendors around public markets and the over-flowing dump site. Public markets are crowded with street vendors and can not be kept clean. By way of providing a new public market, municipality intends to improve the cleanliness and convenience of social service.

Roi-Et Municipality has a tentative plan for a new dump site to solve the garbage disposal problem. For determining the new dump site, Municipal authorities should consider space and distance of the site. It should be far enough from communities and its space should be no less than 100 rai in order to ensure separate disposal by types of garbages collected. Actually it is not easy to find out an area satisfying such conditions. It also has a plan to construct composting factory for fertilizer and to bury garbage into the hole. But literally 110 million baht are expected for the construction of new dump site with such facilities, let alone maintenance of present garbage collection system. Though municipal authorities has an ambitious plan, financing problem needs to be cleared first for ensuring the feasibility of the project.

While Roi-Et Municipality does not have its own recycling systems as an integral part of garbage disposal system, there are recycling activities in private sector composed of three parts. First, residents in Roi-Et Municipality themselves collect and sell valuable items such as a glass bottles and so on. Second, a plastic recycling factory buy used plastics from residents or collectors and produce renewed plastic goods. Third, the scavengers who live in the dumping site collect used paper, bottles and so on. The amount of garbage recycled by private sector is small, and valuable wastes are still left undisposed on the dump site. Nonetheless, the activities of private sector in the recycling system certainly are a kind of easement for alleviating the financial burden of the Municipality.

2.2. **The Finance of Garbage Collection in Roi-Et Municipality**

Generally speaking, available financial revenues for a local government include local tax, subsidies from central government, fees for services and loans. In the case of Roi-Et Municipality, the revenue

consists of general income such as local tax, and the grants from the central government. Most of the resources are used for operation and maintenance, but not for investing in new development projects (see Table 1).

The expenditure of garbage collection, even though garbage collection service is not the main activity of Roi-Et Municipality, accounts for 11.4% of its total expenditure (see Figure 2). This means that municipality is shouldering a relatively severe financial burden for garbage service.

To make the problem worse, there are so many households in Roi-Et not paying the garbage fee (see Figure 3). Of course, Municipality has a right to impose fee to users as well as to determine the level of garbage fee keeping in view the level of the charge in other cities. Now the level of fee imposed upon household are 5 baht to 30 baht according to the quantity of wastes and the nature of the offence (see Appendix 3). While the municipality does have authority to impose these fines, it is not necessarily determined to collect fee from all households. The reason is that there are so many households which cannot afford to pay and do not want to pay the garbage fee.

Like many other cities, the cost of operating garbage collection system is much higher than the amount of garbage fees collected. Actually, the garbage fee covers no more than 6% of the total expenditure of waste disposal (see Figure 4). Needless to say, this in turn, constrains the future expansion and operation of garbage collection system on account of inadequate financial resource.

2.3. Participation and Privatization

Involvement of people's participation in cleaning the public area is a kind of available resource for municipality. Increase in participation means decrease in municipality's financial burden.

2.3.1. *The Participation in Cleaning the Public Land*

For cleaning of the pond and public areas such as road and public market, municipality initiated the movement of "I love Roi-Et" in the process of Roi-Et Progress Project. Roi-Et Municipality asked students and people who sell in the market to clean public areas. As a result, roads and pond have become cleaner. However, the public markets still remain unclean.

New Environmental Law (see Appendix 3) was passed and widely publicized by spreading pamphlets for the improvement of urban environment, but people don't seem willing to observe the law. Residents are indifferent and unwilling to abide by the New Environmental Law on account of its unrealistic content. It is no more than a dormant law.

2.3.2. *Privatization and Public Toilet*

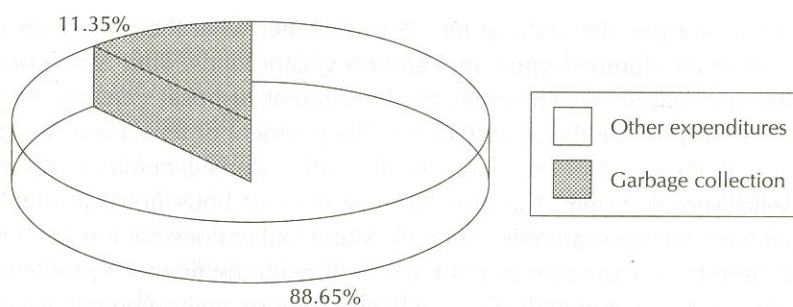
Generally speaking, the purpose of privatization is to increase quality of service and to reduce financial burden of the local government. Taking into account the characteristics of the service, a local government can choose the method and the extent of privatization. The main types of privatization are "Deregulation" (This will enable entry of private sector into certain functions monopolized by public sector), "Joint ventures", "Sub-contracting", and Partial or full "Divestiture" (Withdrawal of a public authority from a certain field of operation)". (Quoted from P.35, NESDB, *National Urban Development Framework*, 1992).

Roi-Et Municipality has a successful experience of privatization. So far 90 percent of public toilets in Roi-Et Municipality are managed by the private sector. Municipality constructs the public toilet and contracts out to private sector who operates and maintains the facilities. Fee of using privatized toilet is 1 baht for one use. Private sector is also encouraged to keep the privatized toilet clean all the time while enjoying free water use. After privatization of public toilet, users are enjoying clean toilet, and Municipality is freed from taking care of their maintenance.

3. The Problems of Garbage Collection in Roi-Et

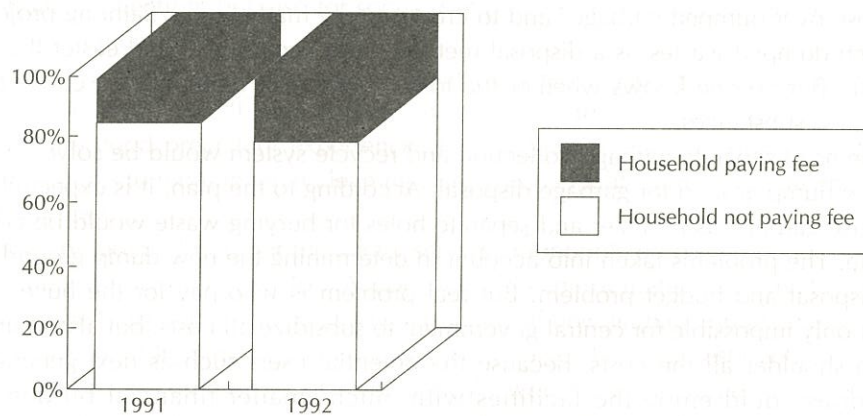
The general problems of garbage collection Roi-Et Municipality faces are not different from those of other towns. The problems consist of two parts. One is the processes of garbage collection and disposal. The other is the securing and allocation of financial resources. These problems are related to each other and inseparable.

To begin with the process of garbage collection and disposal, it should be pointed out in the first place that some areas such as slums and suburbs do not receive garbage collection service. Slum is an



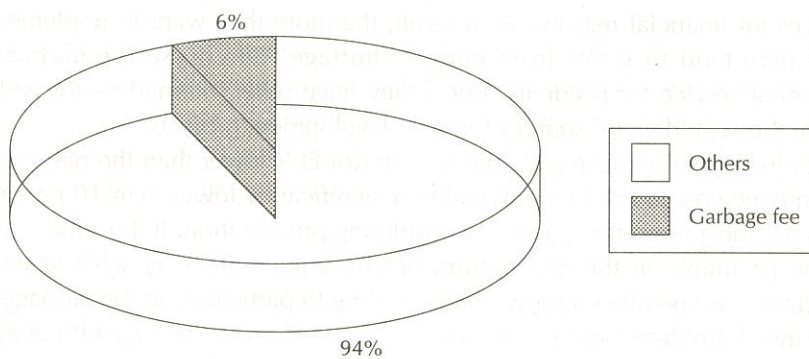
Source: Table 1 and Table 2

Fig. 2 Garbage Expenditure in the Total Expenditure of Roi-Et Municipality in 1991/1992



Source: Table 3

Fig. 3 Household Paying and Not Paying Garbage Fee



Source: Table 2

Fig. 4 Garbage Fee in the Finance of Garbage in 1991/1992

illegal settlement and do not pay the garbage fee. But no matter what the reasons may be, the result is that the wastes from slum are dumped into canal and on vacant lands. That is one of the factors which cause water pollution and public health problems. Insufficient disposal capacity of Municipality also make some cooperatives in the suburbs protest against the payment of fees. Even though they can afford to pay, they refuse to pay the fee. Not only because their life style is generating only a small amount of waste and having self-disposal system, but also because most of households are far from the garbage containers connected with narrow road only. After all, Municipality does not forcibly impose the garbage fee upon them, and these factors to some extent have to do with the financial problem. At any rate, it is clear that most of solid wastes are not collected and likely to cause environmental problems.

Secondly, although Municipality makes efforts to collect wastes of city, because of poor facilities of disposal such as small dump site, open-dumping and open-burning disposal method might have bad effects on public health. Municipality does not separately collect and dispose solid wastes from households, factories and hospitals. So it is easily found that solid wastes of hospital and factory are openly dumped together without any specific treatments. There is a land filling project using such garbages in order to dispose over-dumped garbages and to create a new market area. Sathong project, filling an old pond with such dumped wastes, is a disposal method more economical and easier than searching for a new dump site. But no one knows whether the toxic wastes will ultimately be converted into environmentally harmless substances.

The problems of separate garbage collection and recycle system would be solved after the construction of the new dump ground for garbage disposal. According to the plan, it is expected that composting factory for reuse garbage as fertilizer and separate holes for burying waste would be constructed on the new dump site. The problems taken into account in determining the new dump ground are the methods of garbage disposal and budget problem. But real problem is *who* pay for the huge cost (110 million baht). It is not only impossible for central government to subsidize all costs, but also is unfair for residents themselves to shoulder all the costs, because the potential users such as next generations and newly coming factories could enjoy the facilities with much smaller financial burden. Unfortunately, Municipality has no concrete plan to finance the new dump site.

The financial problems are the most important factor and a key to privatization. One basic problem is that financial burden of garbage collection is rather severe to Roi-Et Municipality. The garbage expenditure accounts for about 11% of total expenditure of municipality. Though the activities of municipality have to concentrate on development projects, they can go very little beyond day-to-day maintenance activities for financial reasons. As a result, the more they want to implement development projects, the more they tend to suffer from budget shortage. Of course the garbage collection is considered an important service for residents. But if they have other alternatives for garbage collection such as privatization, they can divert resources for new development projects.

Secondly, the revenue from garbage fee collection in Roi-Et is lower than the national average. Only 5.8% coverage of garbage cost in Roi-Et municipality is significantly lower than 10 percent, the national average rate. This is the most important factor in considering privatization. If the solid waste collection is expected to become profitable in the near future, private companies may wish to enter the market. Without such expectation, no private sector would be willing to participate in the garbage collection.

What makes financial problem more severe is the "free rider" problem. Four-fifth of all households in Roi-Et Municipality do not pay the garbage fee. Some of them are those who can not afford to pay. Besides, there are those in the suburbs who do not want to pay, because they are not provided with sufficient garbage collection services. Main free riders are users and sellers in the public markets, who do pay some money but not enough, despite enjoying the utility of garbage collection service. Especially, some outsiders of Municipality who come and sell agricultural produce at the public markets do not pay at all. Municipality does not have the authority to impose payment of garbage fee over them. These are the obstacles in the way to the privatization as well as revenue-raising of the Municipality.

4. The Road to Privatization for Garbage Collection

Is the privatization in garbage collection system unsuitable to Roi-Et Municipality? Would that be just a far-fetched idea? The possibility of privatization may be little now, but the cause of privatization is advocated here not for its own sake but for solving financial problems and for improving the quality of

urban services. Some suggestions for improving the quality of life and garbage collection service, thereby leading to the privatization of garbage collection system are described below.

First, Municipal authority has to strengthen its capacity to provide garbage collection service to as many residents as possible. The cost of collecting garbages from slum is cheaper and easier than that of purifying the contaminated water in the canals.

In order to improve and expand garbage collection system, first of all, garbage fee should be linked to the cost of service, and should be imposed whenever beneficiaries can be identified and the benefit clearly accrues to each recipient of the service. Initial efforts should focus on the review of fees currently practised. Roi-Et Municipality has already guidelines for fee imposition, and the current fee system can determine the exact amount of fee to be levied over each type of garbage collection services. Efforts should be made to realize the application of garbage fee; not 5 to 10 Baht but 30 Baht or more; Increase of garbage fee might make poor households more reluctant to pay fees, let alone households not willing to pay fee so far. However, through public education and expansion of good services, it is possible that the properly priced fee would ultimately be accepted by residents. That is not only for the recovery of actual cost of garbage collection, but also for social discipline for the people not to dump away garbage for the sake of preserving environment.

Third, policies and public education to stimulate participation of private sector are needed. For example, social campaigns like "I love Roi-Et" movement, citizen's participation in cleaning and collecting garbage are good precedent experiences for the Municipality. Municipality should continuously encourage residents to participate in cleaning Roi-Et Municipality and in the full enforcement of the New Environmental Law.

Lastly, it should be pointed out that the social services monopolized by the public sector constrains investment and the role of private sector. Accordingly, the participation of private sector in Roi-Et Municipality should be considered both in the construction of new garbage dump site as well as for the garbage collection system. Opening of a new dump site involves heavy investment, so that through the borrowing money from the commercial or foreign bank, would be inevitable. In a way it is a sound approach, because both present generations and future generations will bear the expense through long term commercial borrowing. However, in reality, local governments cannot borrow commercially without prior approval from the Ministry of Interior. In the near future, if local governments were allowed to borrow freely on their own merits and trustworthiness, this will be a useful alternative. In addition, international co-operation can also contribute to the developing and transferring of low cost technologies suitable to provincial cities.

In view of the successful experience in privatizing public toilet, Roi-Et municipality should already know well about that. After following such policies, Municipality will address its attention to privatization of garbage collection, decrease of financial burden, and implementation of new projects for urban infrastructure improvement. Lastly, even after the privatization, municipality should take the responsibility for supervising the private sector that supplies garbage collection services.

REFERENCE

- Advanced Research Group of Companies, *Thailand Company Information 1990-92*, A.R. Business Consultant Co. Ltd., 1992.
- Chalongphop, S., "Dynamic Balance for Social Change and Environmentally Sound and Sustainable Development", *TDRI Quarterly Review*, 1990.
- Chartchai, P., "Greener Growth; Thailand's Road to Sustainable Development Policy Framework" *TDRI Quarterly Review*, 1992.
- Chartchai, P., "Greener Growth; Thailand's Road to Sustainable Development Policy Framework", *TDRI Quarterly Review*, 1992.
- Handely, Paul, "Rich Thai, Poor Thai", *FAR EAST ECONOMIC REVIEW*, 20 AUGUST, 1992.
- Office of the National Economic and Social Development Board, *NATIONAL URBAN DEVELOPMENT POLICY FRAMEWORK*, 1992.
- Piboon, L. & Pongpan, S., "Fiscal System and Practices in Thailand", *Fiscal Systems and Practices in ASEAN*, edited by Mukul, S., Asher, Institute of Southeast Asian Studies, 1992.
- Thailand Development Research Institute Foundation, *The Greening of Thai Industry; Producing More and Polluting Less*, 1991.
- World Resources Institute, *World Resources 1990-91*, 1991.
- WCED, *Our Common Future*, Oxford; Oxford Press, 1987.

Table 1: Finance of Roi-Et Municipality
(1991/1992 fiscal year)

Estimated income	48,570,836
General income	30,533,686
Support grants from the government	18,037,150
Estimated expenditure	48,570,836
General expenditure	46,276,488
Capital expenditure	1,701,300
Reserve	593,048

Source: Roi-Et Municipality, unit: Baht

Table 2: Finance of Garbage Collection in Roi-Et Municipality
(1991/1992 fiscal year)

Estimated Income	5,512,000
Garbage fee	324,000
Others*	5,188,000
Estimated expenditure	5,512,000
Salary	137,040
Permanent wage	922,000
Temporary wage	4,052,400
Fuel	300,000
Transportation	900,000

Source: Roi-Et Municipality, unit: Baht

Note: *Breakdowns of other items except for garbage fee are not available.

Table 3: General Information about Roi-Et Municipality

Year	Population	The total household	Household paying garbage fee	Amount of collected garbage*
1985	33563	6746	×	3210
1986	33941	7012	×	3650
1987	34122	7264	×	32680
1988	33946	7613	×	46080
1989	33846	7865	×	46080
1990	33752	8021	×	46080
1991	33782	8322	1100	80640
1992	33701	8587	1700	86640

Source: Roi-Et Municipality

Note: *: m³/year, ×: not available

Table 4: Rate of Garbage Fee in Roi-Et Municipality

Monthly garbage collection fee for building or household	The rate of garbage fee		
	1986	1987	1988~
$X \leq 20^*$	15	20	30
$20 < X \leq 40$	30	35	40
$40 < X \leq 60$	50	70	80
$60 < X \leq 80$	70	80	100
$80 < X \leq 100$	100	120	150
$100 < X \leq 200$	150	180	200
$200 < X \leq 300$	200	250	300
$300 < X \leq 400$	300	400	500
$400 < X \leq 500$	500	600	700

Monthly garbage collection fee for factory, industry, or the place having lots garbage	The rate of garbage fee		
	1986	1987	1988~
$X < 1 \text{ m}^3/\text{day}$	400	600	800
$X \geq 1 \text{ m}^3/\text{day}$	500	800	1000

Source: Roi-Et Municipality

Note: *: litre/day, ~: from 1988 to now.

Appendix 1 Garbage Disposal Project

Rationale

The garbage disposal is the duty of the keeping clean work, run by the Public Health Administration, Sanitary & Environment Department, Roi-Et Municipality. The process of the garbage disposal is including the garbage collection from public place and from containers placed at the community area. In order to keep the garbage disposal system on sound basis, there are many factors to be taken into account. For example, the economic potential of the local area, the cooperation of local people, the local budget, and so on. These factors can make the garbage disposal system more efficient.

Objective

1. to dispose the garbage in a sanitary manner;
2. to ensure that the source shall not spread the diseases to the people
3. to provide sanitary environment all over the community
4. to educate people to understand the correct garbage disposal method
5. to create and establish people's habits to realize their own duty to keep their dwellings clean
6. to create a good culture of keeping clean the private as well as public areas.

Target

1. to collect the garbage from the road, street, public place in the municipal area and dispose 80% of garbage in the area
2. to collect 80% of the garbage from the dwellings of the people in the municipal area.

Place

1. Roi-Et Municipality area (in total)
2. garbage disposal area determined by the Municipality

Period

1992 fiscal year

the responsible agents – keeping clean work, public health administration, sanitary and environment department

Budget

salary and permanent wage

temporary salary

other expenses — transportation
— fuel etc.

Evaluation

- from a daily operation checking
- from a daily operation report
- from the sick and death rates caused by intestinal diseases
- observation on the public places and dwellings
- observation on the environment
- garbage disposal checking by the responsible officers

Source: Roi-Et Municipality

Appendix 2 The Summary of Improving public land "Sathong" (fill land) Roi-Et municipality

1 Project

2. Rationale

- 1) the garbage disposal area in Roi-Et has been used for more than 10 years and it is saturated with the garbage.
- 2) the municipality is planning to use the garbage for the land-fill purpose to make the new public market for farm produce.
- 3) the old garbage disposal area can be used longer, and municipality can improve and use it.
- 4) the municipality can also achieve its duties in providing the area for the people to work and generating more income.
- 5) the process of the land-fill is to use the garbage and fresh soil alternately in order to make the area smooth and strong.
- 6) the municipality can remove the people who sell their goods on the footpath and from the old and crowded market to the new market.

3. Objectives

- 1) to provide the area for the people to work
- 2) to increase and generate income of the people
- 3) to expand the farm produce market for the people
- 4) to solve the problems of the old crowded market and expand the area for new market
- 5) to reduce problems of the sellers on the footpath
- 6) to keep the order of the public footpath
- 7) to reduce the traffic on the road and footpath problems
- 8) to keep the public market clean. The efficiency of offices that look after the cleanliness of the city will be improved.
- 9) to improve the sanitary and environment work and keep clean and order of the city in order to be compatible with economic and social development.

4. Target

- 1) to improve the public land "Sathong" (30 rai) to be the market centre for farm produce
- 2) to use part of the area to be a public park and a parking lodge for the people

5. Place

the public land "Sathong" (30 rai) in the municipal area

6. Period or the operation

from May to September 1992

7. Budget

Using the municipality budget

8. The owner of the project

the Roi-Et municipality

9. The operation unit

- 1) engineering department
- 2) sanitary and environment department

10. Expectation

- 1) people will have the area to work, and it will generate their income
- 2) the problem of the shortage of public market area will be solved
- 3) the public market can be kept in order and clean. It can increase the understanding between the people and the municipality
- 4) the sanitary and environment work will be more efficient

Source: Roi-Et Municipality

Appendix 3 New Environmental Law

— Announcement of the Roi-Et Municipality on the keeping of order and cleanliness of the city —

1. The building owners who don't clean and look for their walk way: fined 1,000 B
2. The market owners who don't keep the walk way clean: fined 1,000 B
3. Those who occupy some part of the market should maintain their part clean: if not, they will be fined 1,000 B
4. Building owners or market owners who should clean and look after walk way or market area; if not, fined not over 1,000 B
5. Building owners leaving bucket on the footpath and make footpath dirty are fined less than 2,000 B
6. The owners who leave waste things and garbage in the bucket or in his area will be fined less than 2,000 B
7. People who bath or wash anything on the road or public area will be fined not over 500 B
8. Bathing or washing anything in the forbidden river: fined 500 B
9. Advertising, dropping announcement paper in the public area where these are forbidden: fined not over 5,000 B
10. Writing, spraying, painting on the wall or the tree along the road: fined not over 5,000 B
11. Cars which have animals, rocks, soil or sand, garbage or anything dropping them on the road: fined not over 10,000 B
12. Cars dropping oil on the road: fined not over 10,000 B
13. Bringing and feeding animals along the road without cleaning fee; fined not over 500 B
14. Bringing and feeding animals in forbidden area: fined not over 500 B
15. Washing cars or motorbikes on the road or in public area and make dirty: fined not over 2,000 B
16. Using any parts of road for repairing, changing the cars: fined not over 5,000 B
17. Do anything causing damage on footpath: fined not over 5,000 B
18. Parking or driving car, motorbike on footpath: fined not over 5,000 B
19. Leaving, putting damaged cars on the road or public area: fined not over 5,000 B

20. Leaving anything on the road: fined not over 1,000 B
21. Cooking or selling any foods on the road or public area where these are not allowed: fined not over 2,000 B
22. Cooking on cars or any vehicles for selling on the road or public area where these are not allowed: fined not over 2,000 B
23. Selling any goods or any vehicles on the road or any public area where these are not allowed: fined not over 2,000 B
24. Driving or passengers of cars, motorbikes who buy goods selling on the road or public area: fined not over 1,000 B
25. Pull or push animals into water resources where it is forbidden will be fined not over 2,000 B
26. Leave or drop anything or material for construction into water resources or waste water tube: fined not over 10,000 B
27. Owners of restaurants which can serve people over 20 persons without healthy toilet: fined not over 2,000 B
28. Owners of gas stations or oil stations which don't provide healthy toilet: fined not over 2,000 B
29. Leaving of garbage of anything on field or garden owned by government office or government service: fined not over 2,000 B
30. Cut down or damage any trees in parks or public area: fined not over 2,000 B
31. Leave or feed animals in government area which plant grasses or trees with forbidding notice will be fined not over 1,000 B
32. Passing fecal matter or water in public area: fined not over 2,000 B
33. Pouring the feces or urine from buildings or vehicle into water: fined not over 10,000 B
34. Spitting, blowing nazal mucus or leaving anything on the road or floor of public transport vehicles: fined not over 2,000 B
35. Leaving garbage or waste outside the container in public area: fined not over 2,000 B
36. Leaving garbage or waste onto public area: fined not over 3,000 B
37. Abandon anyone's land and cause garbage: fined not over 2,000 B
38. Leaving garbage or waste water or waste thing on the road or water resource: fined not over 10,000 B
39. Leaving waste things from building or vehicle onto public area: fined not over 10,000 B
40. Causing damage to public goods will be fined not over 2,000 B
41. Climbing, seating on the tree fences or public trees: fined not over 500 B
42. Standing, sitting, sleeping on the public bridge: fined not over 500 B
43. Sleeping on the public place: fined less than 500 B
44. Playing kite, football, sports on the road or part of the public place under prohibition: fined less than 500 B
45. Installing, hanging, leaving anything in the public without permission or it's not temporary must be fined not over 2,000 B
46. Installing, hanging, leaving anything in the public by not asking for permission or hot violating the rules; fined less than 2,000 B
47. Untidy and unprepared installation, hanging and leaving anything in the vaulting which can be seen in public: fined less than 2,000 B
48. If the owner of the building leaves the building dirty and that vaulting is within 20 M form the footpath to the over 8 M road: fined less than 2,000 B
49. Trespassing and not obeying the announcement of the officers in the prohibited area or in public area: fined less than 500 B
50. A car driver who may create dirty mess of the road by leaving gasoline, garbage, sand, rocks on the road must be fined less than 3,000 B

Source: Roi-Et Municipality

Chapter 3.4: Development and Conservation of Forest

KITA Motoko (Ms.)

1. Introduction

Nowadays, the environmental disruption, especially the forestry depletion is widespread and drawing serious attention of all countries. Not only the countries that have valuable forests but also those which are importing timber should consider the future of wood production and conservation of forest resources.

Under these circumstances, in 1989, Thai government canceled all the concessions for logging activities and prohibited the people to cut trees. Presumably its two-pronged policies to conserve forests and to increase production of forest resources will contribute to further articulation of proper measures for environmental conservation. Needless to say, it is not easy to determine the relevance of a certain policy, for there are always conflicts amongst various interest groups. Besides, what are effective in the short run may cause negative effects in the long run.

However, it is felt that the overall perspective mentioned above would be relevant to the present situations of Thailand. Therefore, if other countries could help the successful enforcement of these policies, especially Japan, being one of major importers of timber resources, then this could lead to international cooperation, and it would be for the benefit of all nations.

Therefore, in this chapter, I intend to examine Thai forestry policies in order to find out ways to improve environmental conservation strategies. Further, in terms of the objective of the working group III, I attempt to analyze the ways by which Thailand can conserve its environment (especially forests) to enhance socio-economic development (particularly raising villagers' income) in a manner compatible to the process of rapid industrialization Thailand is presently faced with.

In section 2, I intend to deal with three subjects as follows: the first part discusses the overall profile of the forest conditions in Thailand, Northeast and Roi-Et, and the reasons of deforestation are identified. The second is the administrative structure related to forest conservation and development of forest resources. Then, at the end of this section, the problems to be addressed by the forestry policy are examined.

In section 3, policies and projects that are being implemented at present will be looked into and the tasks ahead will be examined at the end of the second section. Based upon the previous two sections, concluding remarks will be put forward from the viewpoint of global environmental conservation towards the end of this chapter as section 4.

2. Present Condition

2.1. Overall Profile

2.1.1. Background

In 1950s, the area of forest land was around 60% of the whole territory of Thailand. In the Northeast as well, the forest covered about 60% of the entire area. The main crop of Thai agriculture is rice. Needless to say, the paddy field can not be developed up to the mountain, thus leaving steep slope areas unused. However, the demand for the land for cash crop led to the use of steep slope areas during 1960s. Therefore, during 1970s, the area of the forest became less than the area of steep slope areas. As a result of industrialization, population growth, economic growth and commercialization of agriculture, the area of the remaining forest is reduced to less than 20% of the area of Thailand at present.¹

There are six main reasons for deforestation in Thailand; population growth, land use policy, agricultural policy, expansion of cash crop cultivation, encouragement of eucalyptus plantation and logging activities. Deforestation in Thailand is always explained that it is caused by population growth.

Table 1: Forest Area in Thailand

Regions	Whole area (km ²)	Forest area					(A) - (B)
		1961	1973	1978(A)	1985	1988(B)	
North	169,644 (100.0)	116,275 (68.5)	113,595 (67.0)	94,973 (56.0)	84,126 (49.6)	80,402 (47.4)	14,535
Northeast	168,854 (100.0)	70,904 (42.0)	50,671 (30.0)	31,221 (18.5)	25,580 (15.2)	23,693 (14.0)	7,528
South	70,715 (100.0)	29,626 (41.9)	18,435 (26.1)	17,603 (24.9)	15,485 (21.9)	14,630 (20.7)	2,973
Central	67,399 (100.0)	35,661 (52.9)	23,970 (35.6)	20,426 (30.3)	17,685 (26.2)	17,244 (25.6)	3,182
East	36,503 (100.0)	21,163 (58.0)	15,036 (41.2)	11,037 (30.2)	7,990 (21.9)	7,834 (21.5)	3,203
TOTAL	513,115 (100.0)	273,629 (53.3)	221,707 (43.2)	175,224 (34.2)	150,866 (29.4)	143,803 (28.0)	31,421

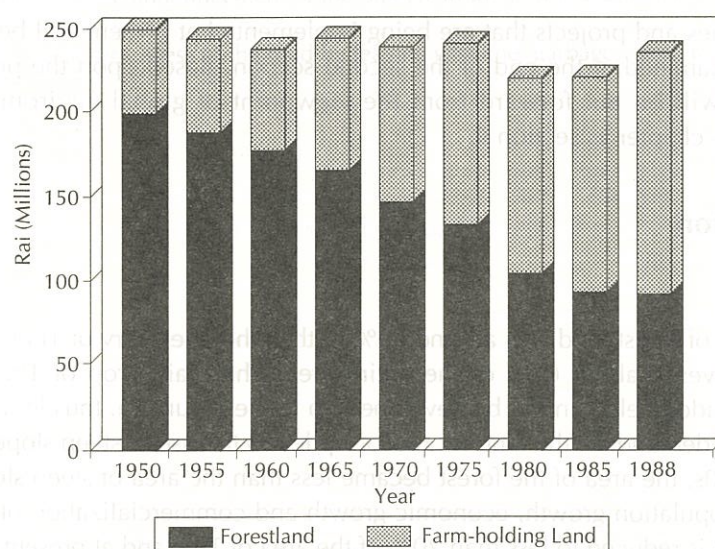
Source: *Thai Koku Keizai Gaikyo 1990-91* (General Condition of Thai Economy), Japanese Chamber of Commerce, Bangkok, p.222.

Table 2: Depletion Rate of Tropical Forest in the ESCAP Region

	Present area of forest (rai)	Area of annual forest depletion (rai)	Annual depletion rate (%)	Years to extinction
Indonesia	85,000,000	1,500,000	2	57
Philippines	10,000,000	700,000	7	14
Malaysia	6,307,200	525,600	8	12
Thailand	29,000,000	1,400,000	5	21
Sri Lanka	3,610,000	190,000	5	19
India	65,698,400	—	—	—
Myanmar	10,995,100	141,700	1	78
Nepal	1,728,700	43,200	3	40
Afghanistan	1,983,800	39,700	2	50
TOTAL	214,323,200		33	

Note: The depletion rate in Thailand in 1980's is about 2.5% annually.²

Source: Awaji, T. Ed., *Kaihatsu To Kankyo* (Development and Environment), 1986, p.335.



Source: Theodore Panayotou, Chartchai Parasuk, *Land and Forest: Projecting Demand and Managing Encroachment*, 1990. p.16.

Fig. 1 Land Utilization in Thailand

Actually, population growth in Thailand was very rapid. The rate was rather high, 4% in 1960's and around 3% in 1970's.³ The government is planning to reduce it to "1.2 percent by 1996, as the country's population will total about 61 million" in the 7th plan.⁴

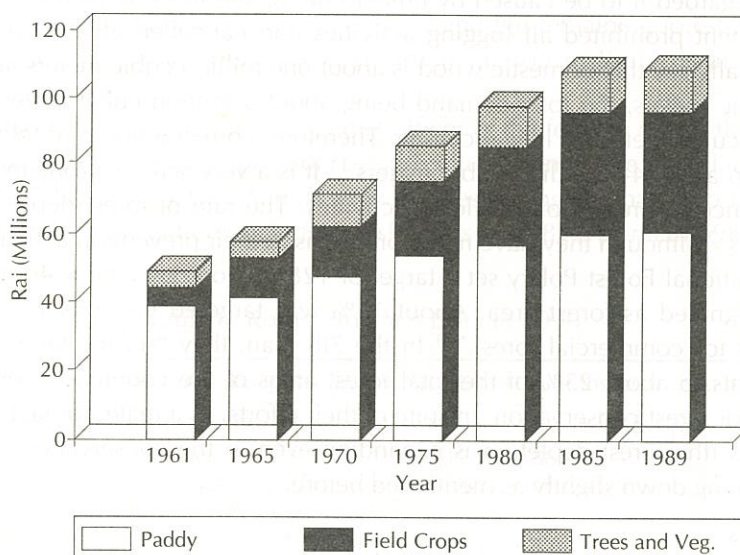
Why did the population growth directly influence forest depletion? One reason is that Thai economy could not absorb the redundancy of population.⁵ Some people went to Bangkok, but most of them stayed in rural areas and some of them entered forest. Another reason is the customary practice of land. Before the Land Code enacted in 1954, people were free to enter forest and get their own land. The Land Code gave people land titles but in return they prohibited people to live in forest without permission. However, confirmation of landowners was not perfect in the process of enforcement. Consequently, some people were regarded as living in public land illegally and some people entered forest illegally because of the old custom and vagueness of the system of land ownership.⁶

From the First National Economic and Social Development Plan to the Fourth Plan, diversification of agriculture was encouraged and it resulted in the expansion of cash crop cultivation.⁷ Although the government has changed its policy towards laying stress on productivity since the Fifth Plan, wide range of forest has already been cut down. Especially cultivation of cassava has spread largely because of big market in EC.⁸

Table 3: Area of Farmland (million rai)

	Rice	Cassava	Sugarcane	Maize
1960/61 ①	37,012	447	345	1,785
1965/66	40,961	632	523	3,605
1970/71 ②	46,840	1,400	862	5,180
1975/76	55,602	3,709	2,444	8,200
1980/81 ③	60,110	7,250	2,927	8,960
Growth rate				
60/61~70/71 ②/①	1.27	3.13	2.50	2.90
70/71~80/81 ③/②	1.28	5.18	3.39	1.72
60/61~80/81 ③/①	1.62	16.22	8.48	5.02

Source: Awaji, T. Ed., 1986, op. cit., p.344.



Source: T. Panayotou, C. Parasak, 1990, op. cit., p.12.

Fig. 2 Crop Diversification Pattern

Table 4: Tapioka Imports by the EC and Exports by Thailand to the EC (1,000 tons)

	1971	1975	1977	1978	1980	1982
France	38	146	192	646	336	650
Belgium	274	353	618	884	939	1,017
Holland	514	1,232	2,025	2,688	2,400	4,688
West Germany	522	484	911	1,439	1,379	1,265
Italy	—	—	—	219	105	214
England	—	7	7	15	11	306
Others	—	—	57	92	20	17
TOTAL	1,348	2,222	3,810	5,983	5,190	8,156
Total exports in Thailand	1,212	2,246	3,872	6,275	4,958	7,607
Exports to the EC	836	1,673	3,639	5,668	4,116	7,348
Share in the EC market (%)	62	84	95	95	78	90
Export rate to the EC (%)	75	74	94	90	83	97

*Volumes of Imports by the EC, Exports by Thailand, Exports to the EC (by Thailand) and its share in the EC market are derived from different sources. Therefore, this table does not have consistency.

Source: T. Tasaka, *Nettairin Hakai to Hinkonka No Keizaigaku: Tai Shihonshugika no Chiiki Mondai* (Political economy of tropical forest destruction and impoverishment of rural communities), 1986, p.343.

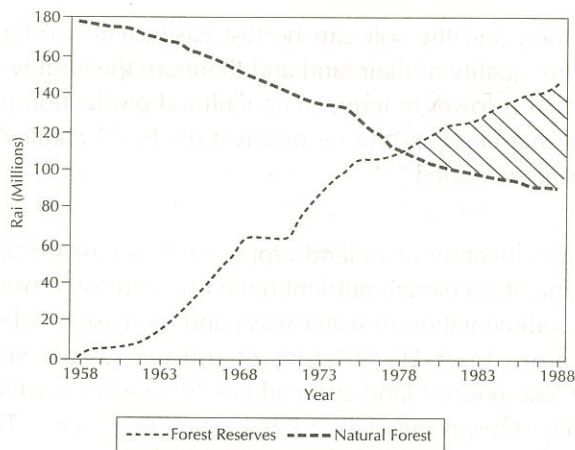
The eucalyptus growing also increased since 1980's because of its great profit. The Thai government enacted various policies to encourage eucalyptus business. They had to mobilize the power of private sector because of too rapid depletion of forest. However, it brought about many conflicts between villagers and the forestry office or private companies. In case of Roi-Et, in 1989, there were some conflicts in Pathunrat, Pone Sai and Suwannakit Divisions (a province consists of several divisions).⁹ Besides, the planting of eucalyptus by villagers is also significant and the government encouraged it before because it could be one of measures to solve poverty. However, the Thai government has toned down its support to the eucalyptus growing because the criticism against eucalyptus growing is drawing the attention of the people. However, eucalyptus growing is increasing even now, though its growth rate is rather low.

In 1988, the big typhoon struck Southern part of Thailand and more than 350 people died because of landslides. People regarded it to be caused by timber cutting and forest depletion. Therefore, in January 1989, Thai government prohibited all logging activities and cancelled all the concessions for timber cutting.¹⁰ They officially say that domestic wood is about one million cubic meters and imported wood is about 2 million cubic meters, the total demand being about 3 million cubic meters. However, there is actually 2.5 million cubic meters of illegal cutting. Therefore, correct amount of total demand for timber is likely to amount to about 4–5 million cubic meters.¹¹ It is a very serious problem and the government is attaching importance to prevention of illegal activities. The rate of forest depletion is coming down slightly from 1982/83¹² although they have many problems in their prevention activities.

"In 1985, the National Forest Policy set a target of 128 million rai (1 rai = 40 m × 40 m) or 40% of total land area designated as forest area. About 15% was targeted for conservation forest while the remaining 25% was for commercial forest."¹³ In the 7th Plan, they "set the target areas for conserved forest, which amounts to about 25% of the total forest areas of the country."¹⁴ Moreover, they have a number of policies for forest conservation. In spite of their efforts, as a matter of fact, forest is depleting in spite of those targets (the forest depletion is expanding even in the conservation forest). However, the depletion rate is coming down slightly as mentioned before.

2.1.2. Characteristics

By analysing Table 5, the reasons for forest depletion in each region can be estimated. Although over half of the forest depletion occurred in the North, the logging activities brought about less than 9% of it. In the South, forest depletion in provinces that produce charcoal and firewood for sale are also small. With regard to the reasons for depletion, logging activities and cutting trees for firewood are generally regarded as the main reason. However, in Thailand, the main reason is the expansion of agricultural land for cash crops.



Source: Land and forest, op. cit., pp.24–25.

Fig. 3 Forest Reserves and Natural Forest

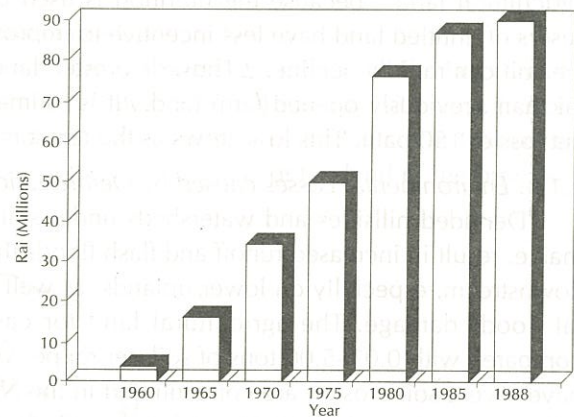


Fig. 4 Cumulative Forest Loss

Table 5: Annual Average of Forest Area Depletion (1985–88)

Region	Area (rai)	%
Thailand	1,471,389	100.0
Northeast	392,036	26.6
North	778,264	52.9
Provinces that produce teak (Tak, Lampang, Mae Hong Son, Lamphun)	133,582	9.1
Central	117,106	8.0
East	4,780	0.3
South	178,204	12.1
Provinces that produce charcoal and firewood for sale (Krabi, Phangnga, Ranong, Satun, Sougkhla)	50,811	3.5

Source: Worked out by the author from Tasaka T., 1991, *ibid.*, pp.22–23, p.116.

In the Northeast, the forestry area depleted more rapidly than that in other regions except in the North. In Roi-Et, the forest depletion has also been severe and the remaining forest area at present is no more than one tenth of the original forest area. The main reason in Roi-Et is also the expansion of agricultural land for cash crops.

In Roi-Et, according to the interview with the chief officer of the forestry office, the main reason is the population growth. It brought about expansion of agricultural land. The population increased from 785,329 in 1970 to 1,209,225 in 1989. Annual growth rates during the past two decades were rather low.¹⁵ The cultivated land for agriculture including cash crops is 3,682,312 rai in 1988.¹⁶

Table 6: Roi-Et Province Data in 1990

Number of agricultural population	1,101,780 (91% of the prov. pop'n)
Agricultural area total (A)	3,401,997 rai (65.6% of the prov.)
rice	2,991,175 rai (88% of A)
cash crop	303,745 rai (9% of A)

Source: Phaisal Lekuthai, ROI-ET PROVINCE DATA, p.13.

2.1.3. Social Losses Caused by Deforestation

No doubt, deforestation has positive effects on agricultural production. Deforestation generates more land for agriculture, leading to the increase in the agricultural output. However, "newly cleared land" is easy to lose the soil "on steeper slopes", and "generally has lower sustainable productivity than existing

agricultural land¹⁷ because the nutrition is used up soon and the soil can be lost easily. Furthermore, "users of untitled land have less incentive to improve the quality of their land and therefore the fertility of the soil can rapidly decline.¹⁸ Thus, deforested land yield is lower in terms of agricultural production per rai than previously opened farm land. "It is estimated that clearing one rai of forest (in 1987) created a net loss of 150 baht. This loss grows as the forest is further denuded."¹⁹

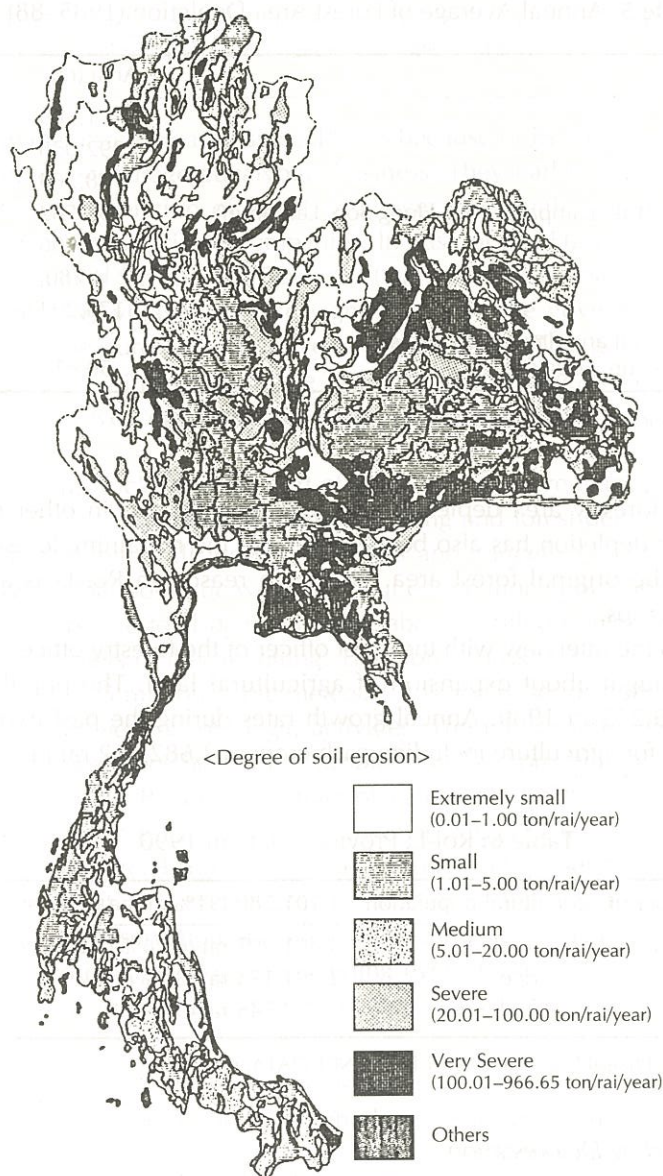
2.1.4. Environmental Losses caused by Deforestation

"Denuded hillsides and watersheds under shifting cultivation or upland crops, such as cassava and maize, result in increased runoff and flash floods that might accelerate nutrient reduction and soil erosion downstream, especially on lower uplands, as well as sedimentation in water ways and increase incidental floods damage. The agricultural land for cash crops loses 20–967 tons of soil per rai per year compared with 0.01–5.00 tons of soil per rai per year lost in forest land and paddies."²⁰ The lands which have severe soil erosion are concentrated in the Northeast, especially Ubon Ratchathani province.²¹ The following are typical environmental problems of each region.

North: severe depletion of water shed area

South: floods, droughts, landslides, unseasonable rains

Northeast: droughts, soil erosion, unseasonable rains



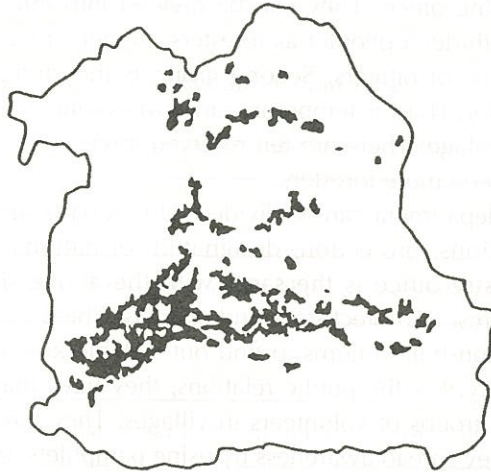
Source: Op. cit., Tasaka, T., 1991, p.80.

Fig. 5 Soil Erosion in Thailand (1981)

2.1.5. Environmental Problems in Roi-Et

There are two main severe environmental problems in Roi-Et.

(1) Saline soil; In the Northeast, salinity is the most severe in Khon Kaen province. The land area that has salt content over 16 mmho/cm or the area covered by salt over 50% is 15,649 rai (25 km²). In Roi-Et, the area is 0 percent. However, the area of the land that has salt content 8–16 mmho/cm or that covered by salt 10–50% is 256,377 rai (4.94% of the province). In total, about 76% of the land of the province is saline to certain extent in Roi-Et.²²



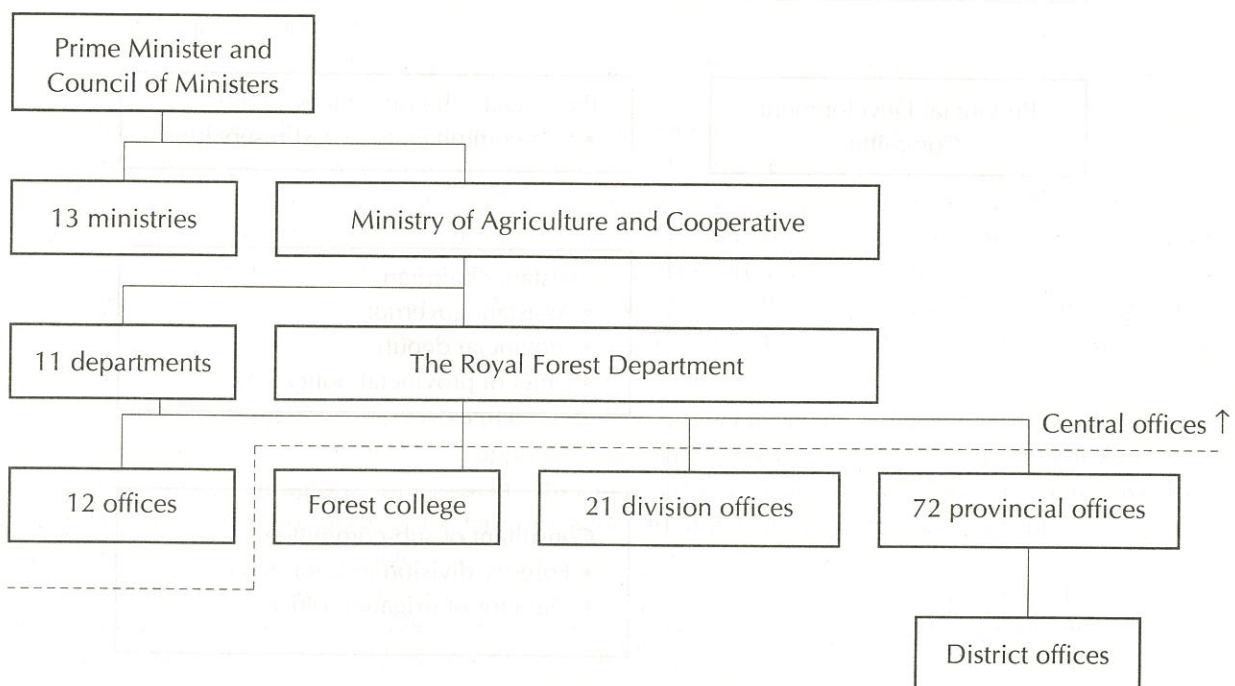
Source: Ibid., p.70.

Fig. 6 Saline Area in the Northeast in Thailand

(2) Soil erosion; In Roi-Et, the land area where 5.01–20.00 ton of the soil is lost per rai per year is 211,630 rai; the area losing 20.01–100.00 ton/rai/year is 1,429,061 rai; and the area of losing 100.01–966.65 ton/rai/year is 953,399 rai. As a result, a total of 50% of land area in the Roi-Et province is subjected to the problem of soil erosion in varying degrees.²³

2.2. Structure of Forestry Policy²⁴

2.2.1. Administrative Structure



In Roi-Et province, there are only three district offices for fourteen districts and three sub-districts. Further, they don't have full-time staff to work in these district offices. The Roi-Et Province Forestry Office has thirteen officers and some of them go to district offices in turn. Because of lack of budget, the Royal Forest Department cannot employ sufficient number of officers for provincial forestry office. Therefore, twenty-one division offices (Local branches of Forestry Department, distributed nationwide) help provincial offices in their division by sending foresters who patrol and check up forests and sometimes arrest people cutting trees illegally, distribute public relations pamphlets and so on. Roi-Et Province Forestry Office receives some kind of aid (only in kind) from Khon Kaen Division Office.

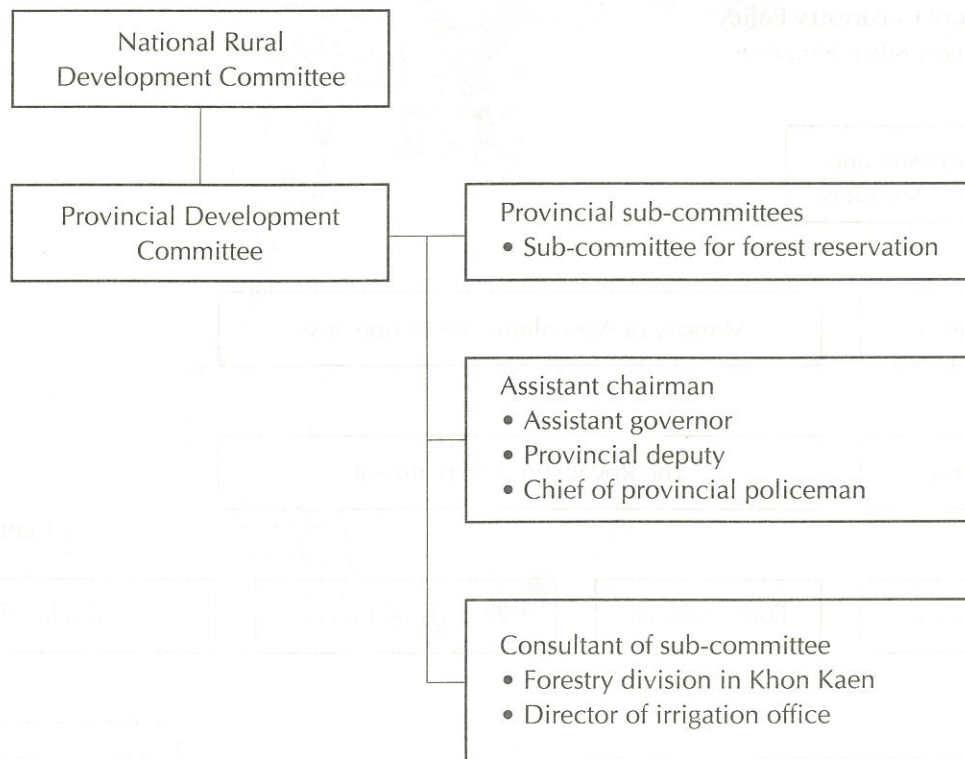
There are 33 employees in the office. They can be divided into three kinds of people. First group consists of government officers (thirteen people) as foresters, trainers, financiers and so on. Each person plays plural roles because of lack of officers. Second group is the clerical staff such as typist, guard, messenger and driver (five people). Third is temporary employees (fifteen people). They look after young plant in the forestry office and village. There are ten reserved foresters in Roi-Et province so Khon Kaen division helps them when they need more foresters.

The function of the forestry department can be divided into six parts such as preservation (of trees and animals), research, public relations, protection, designation of national parks and afforestation. The function of the provincial forestry office is the same with the above six. For the preservation, they designate the national reserve forest to protect trees and animals. There are ten reserved forests in Roi-Et. For the research, they have demonstration farms to find out suitable kind of seeds for local areas and to grow proper trees in each locality. For the public relations, they have many programmes. For example, they give forestry knowledge to groups of volunteers in villages. They have programme to train officers, villagers and foresters. Further they spread awareness by using pamphlets, board and mass medias such as TV and radio. For the protection they also have many projects. Some of these are reviewed in section 3.

In addition to the above functions, provincial offices have some other works to do. They should collect and protect some kind of trees that are in danger of extermination in the natural reserved forest. Further they have to keep wild life and to support it. They expect a regulation which will be enacted shortly.

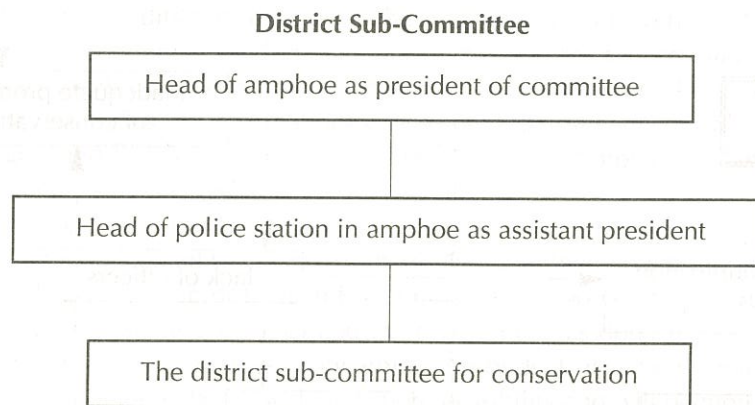
2.2.2. Committees

Further, there are two types of committees to support the forest resource conservation activity. One is one of the provincial sub-committees and another is one of the district sub-committees.



The above is the structure of the provincial sub-committee for forest preservation. This sub-committee consists of 13 members. The function is various activities to conserve forest area. When a certain problem arises, they call all the officers who have responsibility for conservation. They form groups to look around national conservation forest to prevent illegal activities. They report their activities to Forestry Department.

The district sub-committee (vide chart below) is for the damaged forest. This sub-committee consists of 8 members. They plan some programmes to conserve forest in the area which they have responsibility for. Further, they look after the people not to cut trees illegally. For the purpose, they should inform provincial committee and should solve the problem immediately.



2.2.3. Relationships between the Forest Office and Other Organizations

– with GOs

The two most important government offices are the court and the police. Forestry office goes to forest twice a month to arrest illegal people. Sometimes the group of illegal people is rather large, so that the forestry office needs help from police and army. The arrested people are sent to court. As part of afforestation programme, the forestry office gives some government offices seedlings to whoever apply for it, and they send seedlings to schools in order that children can plant trees in public lands and villages. Further they have coordination with agricultural office but it does not work well.

– with Tambon Council

Forestry office sends some messages to enhance villagers' awareness.

– with NGOs

They have many supporting projects and joint projects with NGOs. They help NGOs by giving them information and pamphlets. Sometimes they give seedlings to students' camps.

– with private companies

In 1981, the department started project with private companies in Chachoengsao province. In the project, they gave young plant to private companies that had lands to grow trees. Further they get two types of taxes from industries in their provinces and send it to the central government. These taxes are not their own income. One is the tax imposed on companies when they start operation of timber cutting activities. Another is the tax that they get every year from companies operating in their provinces, 1,000 baht per year for timber activities and 2,000 baht per year for operation of wood factories. Furthermore, factories have to pay a tax, of which amount depends on horsepower of the engine.

In Roi-Et, there is no big company so that there is no project for them. However there are some small scale companies. They are planning to support them to grow trees. In a few villages, the knowledge of integrated farming and agroforestry is being disseminated. However, in Roi-Et, some areas have low quality of soil originally or because of improper agricultural activities, so that some people migrate into forest areas, further aggravating deforestation.

Nowadays, criticism against eucalyptus is that eucalyptus affects negatively the surrounding environment. This argument is popular among those who are interested in environmental problems. Although both the people and the government are aware of the matter, eucalyptus brings about much economic

benefit to the people in the short term. Accordingly, some people prefer planting eucalyptus. It leads directly and indirectly to deforestation of natural forests. The people and private companies fell the natural forest to grow eucalyptus. Besides, in case people plant them around their cultivated land, the productivity of the crop in the land goes down and some people migrate into natural forest. Under the circumstances, the forestry office is implementing afforestation projects in a hurry, but because of lack of seedlings, difficulties lie ahead in the way to achieve the goal. This goal will be elaborated in the next section.

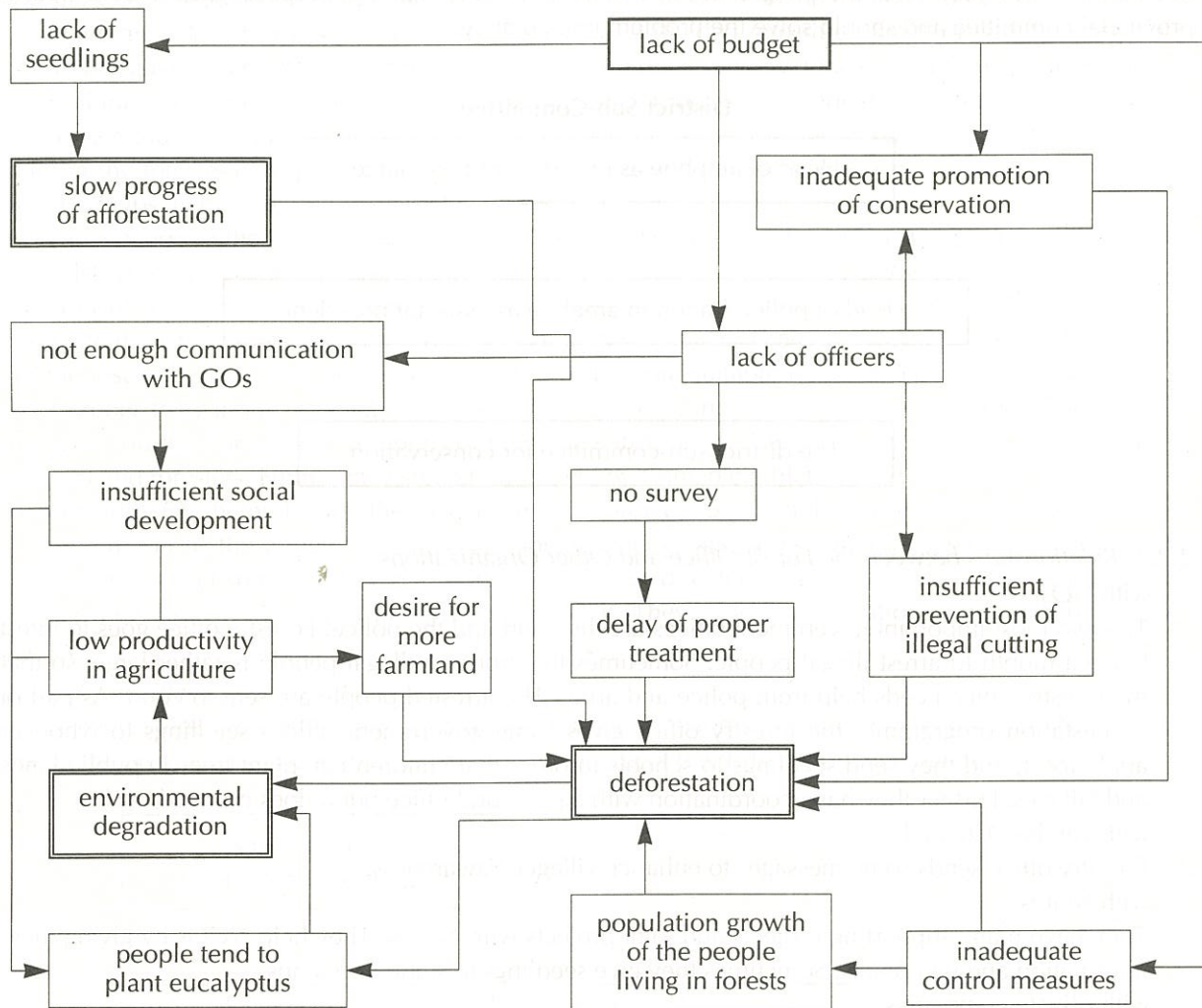


Chart of Problem Structure

3. Forestry Policy and the Projects in Roi-Et

3.1. The Goal and the Aim²⁵

The Royal Forestry Department set the goal that they recover forest area upto 40% of the total area of Thailand. Following the policy of the Royal Forestry Department, the provincial forestry offices also set the same goal. To set the goal, they conducted a research. They have to supply enough wood for domestic consumption because there is a possibility that in the future, countries that are exporting timber resources to Thailand may stop the trade for some reason or other. According to the research, they should keep at least 40% of the national land under forest for that purpose and the other purpose to recover natural environment. Further, the Roi-Et provincial forestry office set the goal for each amphoe (district), each tambon and each village. However, the goal is too far-fetched because of the problems already discussed in the foregoing section.

The Roi-Et Provincial Forestry Office has set six aims and the following summarizes the material provided by the Office.

1. promotion; they make the people know that it is guilty to cut trees in the national reserve forest, and enhance the people's awareness that the forests are public property so they have to protect them by themselves.
2. preservation; the forestry office set 10 forests (the total area is 479,307 rai) as the national reserve forest. However, in these areas, the land area that actually has trees is only 121,875 rai (25.4%). Therefore they are trying to protect these forests completely.
3. to make haste in afforestation; they have to grow trees in 1,482,201 rai of land in the province to achieve the goal. However, as the population grows, the demand for wood production is increasing, so they have to supply from other resource in order to protect natural forest. They have "pra-char-ar-sah project" for it. This project will be reviewed later. Furthermore they emphasize the role of companies because it is difficult to achieve the goal only with government budget. There is the problem that private companies tend to plant eucalyptus and the forestry office said that they had a regulation concerning this problem. It is very important and I asked for it but in vain.
4. Tung-Kula-Rong-Hai; this is the land that has very serious environmental problems such as saline soil, recurrent droughts and floods. The area is 900,000 rai in Roi-Et province. They are expecting some kind of trees that may stop the spread of the saline soil.
5. to protect high valued trees and to manage land in forest areas and in the other area for the purpose that the people get more benefit from land for themselves and their communities.
6. There are 14 districts and 3 sub-districts in Roi-Et province. However the number of officers who are working for the forestry office is only 13 and the division offices don't have officers. Therefore they have to get more foresters somehow. Concerning the budget, it is very difficult to get additional officers, so education of the villagers will have more possibility and will be more effective.

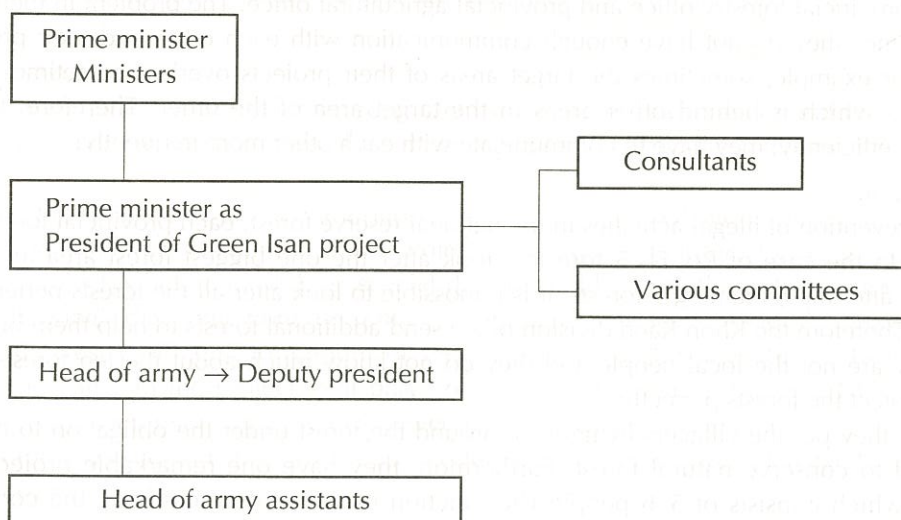
The goal is very far but the head of the forestry office has the vision to reach the goal. He expects the role of private sector such as private companies and villagers. In his opinion, as the industrialization progresses, some people who are presently engaged in agriculture will change their occupation and their cultivated land can be changed to the land for afforestation. He believes it is possible to reach the goal by setting norms to plant trees to each district (including sub district), each tambon and each village. If each district and tambon fulfill their norms, they would reach the goal. However, the point here is the way to fulfill norms. If they take wrong way, it would lead to social and environmental losses.

3.2. Projects of the Central Government²⁶

The Royal Forestry Department has some projects of large scale. Following the 7th national economic and social development plan, they are considering environment and conservation of the remaining natural forest. The following two projects finished already but both of them are very important to think over the role of the Department.

2.2.1. The Green Isan Project

The chart below shows the administration of the Green Isan project.



The Northeast region (Isan) is severe drought area. Because of the lack of water, many people in this region are poor. Then King requested to help them immediately. First, they distributed water by truck. Then they digged wells and used underground water. However, these costed much money so they formed a plan to help people more systematically. Then the project was implemented in Nakhorn Ratchasima, Khon Kaen, Roi-Et, Chaiyaphum, Maha Sarakhan and Buri Ram provinces. The Northeast region or Isan had the problems as follows. The first is political instability. In Isan, there were many groups of communist guerrillas because Isan has border between Thailand and Laos and Cambodia. The second is environmental problem such as forest depletion and lack of water for house use and cultivation as elaborated earlier in Chapter 3.1. The third is people's poor health. Because of poverty, they can not get enough nutrition. Furthermore there are not enough doctors there so they are liable to bad health. The fourth problem is concerning labour. Many people migrate to work in other regions because of lack of job and low wages. Fifth is lack of public utility. Because of lack of budget, transportation, electricity and water supply are not enough. Sixth is low education. It results in unskilled labour.

In order to solve the above problems, they made the Green Isan project in the following process: In 1987, at the beginning of this project, they set the two aims that are to solve lack of water supply and to prevent illegal deforestation. The target areas were divided into three groups which consisted of 5–6 provinces. Then, an organization, the Board of Royal Project which implement the project was made. In Green Isan project, they were emphasizing on development of water reservoir to supply enough water. So over 70% of budget was used for it. This project is discontinued now.

3.3. Projects of the Provincial Forestry Office²⁷

There are many projects in the forestry office and there are three main types of projects. The first project is to give people the knowledge for integrated farming, agroforestry and to increase a kind of spies for conservation of forest area. The second project is to prevent illegal activities in the national reserve forests by patrol and education. The third is afforestation.

3.3.1. Training Project

For the projects of the first type, there is one project for people living in the forest and out of the forest. This project is only training people for 3–5 days by a study tour and lectures. They can not do demonstration because they do not receive enough budget for it. The division office help them by giving materials (trainers, mass media, pamphlet etc.). In the first in the process, assistant chief of district, a head of a village, a head of a Tambon, Tambon Council and a officer of district office chose 50–60 people. Then, the 50–60 people are trained by trainers coming from forestry office, agricultural office and livestock office at a hotel or a school. The people receive lectures and a study tour to the forest during the training. After the training, they get certifications and codes which are used when the people inform the forestry office about illegal timber cutting because it is very dangerous for informers to be known their names by the illegal people. 20 groups have already finished the programme in Roi-Et this year.

There is another project which gives only knowledge about agroforestry and integrated farming. The policy of this project has come from the central government and its implementation is made by the co-operation of provincial forestry office and provincial agricultural office. The problem in their cooperation is that sometimes they do not have enough communication with each other and their projects do not work well. For example, sometimes the target areas of their projects overlap, sometimes one can not assist the area which is behind other areas in the target area of the other. Therefore, to implement projects more efficiently, they have to communicate with each other more frequently.

3.3.2. Prevention

For the prevention of illegal activities in the national reserve forest, each provincial forestry office has 10 foresters. In the case of Roi-Et, 5 foresters look after the one biggest forest area and the other 5 foresters look after the remaining 9 forests. It is impossible to look after all the forests perfectly with only 10 foresters. Therefore the Khon Kaen division office send additional forests to help them but still it is not enough. They are not the local people and they do not know much about the ten forests. It is indeed difficult to protect the forests perfectly.

Therefore they put the villagers living in or around the forest under the obligation to prevent illegal activities and to conserve natural forest. Furthermore they have one remarkable project. They set a special unit which consists of 5–6 people. The function of this unit is to survey the condition of the

forests, to prevent illegal activity and to persuade people living in the forest to leave. They survey the condition of the forests to find out suitable land or damaged area for afforestation. At the same time, they patrol forest and find out illegal activities. However, it is too difficult to find and arrest all the illegal people because the forests are too large for 10 foresters. Illegal activities are committed by both the people who are living in the forest to expand agricultural land and to get firewood and those who are coming from other areas for timber cutting. It takes long time to persuade people living in the forest to leave. As a matter of fact, there are neither law concerning it nor sufficient and suitable land to give them, so it is a very difficult task for them.

Another measure to find out illegal people and arrest them is to use a helicopter. The foresters are divided into two groups and patrol the forests twice a month. One group flies over the forests by the helicopter and the other go round on the ground. These two groups contact each other and cooperate to look for illegal activities guided by the information they collected in advance from foresters or villagers who have their own code. Therefore such information is very valuable to their activities. Therefore, they give some money for the information. Further, sometimes the group of illegal people is rather large, so when it is necessary to arrest illegal people, police and sometimes army help the forestry office.

However, in spite of all efforts, the national forest area is too large for them. Besides, it is difficult to go into the inner part of the forests. As a result, they can not prevent illegal activities perfectly.

Table 7: Illegal Timber Cutting in Roi-Et

	1991	1992
Cases	147	83
Arrested people	148	145
Stumps they found	3,612	2,873
Volume of wood (in cubic m.)	154	240
Equipments illegal people left	115	120

Source: The Roi-Et Forestry Office²⁸

Regarding the people living in the forest, the government had another project named Cor Jaw Gor to make them leave the forest besides the project using the patrolling unit mentioned above. However, it brought about conflict between the government and the people, so that it was stopped.

Now the forestry office does not have any project to move the people and is giving them 15 rai land in the forest per household. They are promoting integrated farming and agroforestry and prohibiting the people to cut any tree in the forest. In return, the forestry office gives them young plants and encourages them to plant trees for their consumption. However, it is obvious that the population growth in future will bring about inevitable depletion of the forest area, so they have to work out projects to make them move as soon as possible. According to the chief of the forestry office, they are planning to implement one project next year that resembles to the Cor Jaw Gor project but will supply larger and better lands to the people.

3.3.3. Afforestation

There are two objectives for planting trees. One is to recover environment and the other is to raise villagers' income. For the first objective, they encourage people to plant fruit trees in their own property land.

Under the Pra-Cha-Ar-Sar project, a group of volunteers in the village go into the forest and plant trees on the land that foresters selected for the project in advance. One project is for one day and given a new name. A project is held on holidays, special days of Buddhism or the birthday of King and Queen (projects on the King's day come from the central government). The seedlings for the project are given by the provincial forestry office. The amount of seedlings depends on; the area and the soil, and the population who can join the project. Not only volunteers in the village but also NGOs can join this project. There have been many joint project between the forestry office and NGOs.

The land for afforestation can be classified into four types; drought area, damaged area, public land and privately owned land.

3.4. Task Ahead

Although the forestry office has implemented many projects, there are many problems in the forest conservation policy. Most of them come from lack of budget as mentioned before. The following tasks can be suggested to improve the present situation.

Avoidance of eucalyptus – They say there are problems regarding eucalyptus that it damages the soil. In spite of it, villagers tend to plant eucalyptus because eucalyptus grows fast and brings about quick and big profit. Private companies are also planting eucalyptus and it results in many conflicts in Thailand between them and villagers living in the forest area (in this case, the people are living illegally) or near the area company bought from the government for plantation. Therefore, the government laid the law of 1989 and prohibit private companies to own large area. In short term, it will actually bring about benefit to the people who planted them, but in the long term, eucalyptus will damage the environment around it and productivity will be decreased. It has not proved scientifically yet but we have to consider the negative possibility involved in the plantation of eucalyptus.

Experiments – If possible, other kinds of trees which grow fast should be used for afforestation. In order to find out suitable species, the forestry office has experiments. The experiments are undertaken both in Bangkok and provincial offices. In Bangkok, they make an experiment on seeds and young plants which come from other regions. However, it is not enough, so in the Roi-Et province, there is one special experiment by the head of provincial forestry office with his donation in Tambon Khon Kaen amphoe Muang. He grows trees around a pond in the village. The trees are brought from other regions. The kind of the trees is fast growing tree, named Sadao in Thai. It is useful to raise villagers' income and it will be able to prevent eucalyptus plantation. Furthermore, they have to have some experiments to find other materials for building construction because high demand for timber resource for construction causes deforestation.

Income raising of villagers – For the purpose, they can give the knowledge of integrated farming and agroforestry to the villagers. The coordination and cooperation between the forestry office and other offices such as agricultural office will be able to gain more efficiency, then it will contribute to raise villagers' income by improving and developing programmes. And it will also contribute to operate their works efficiently and to reduce the cost.

Regulation – For the afforestation, private companies and community units will be useful. But they have to enact regulations to prevent improper activities which damage the environment such as felling the forest for plantation or eucalyptus plantation in areas not prone to drought. To organize community units and put them under the obligation to conserve forests will be useful and low costed.

Public relations – Further they can use mass media to enhance people's awareness on forest conservation. Volunteers will increase by appealing to public opinion. They can implement more promotional and training projects with volunteers' help.

To use International Cooperation – For all the problems on tasks, international cooperation will work well. Foreign governments can help them with knowledge, manpower, materials and money. For example, in 1992, JICA implemented one project in E-Kote village in Chaturapak Piman amphoe in Roi-Et province. They gave knowledge to grow seedlings from seeds and demonstrated. The differences are that the forestry office can give only lectures and they can not do demonstration because of lack of budget and lack of officers. Foreign governments have large budget for aid so it is one choice to request them to help. However institutional adjustment, regarding information for instance, will be required for projects to work efficiently.

4. Concluding Remarks

The problem in the forestry policy is lack of budget. However, more importantly, the gap between the reality and what the government is saying is another problem. The government has to make their policy clear. According to an article in 18 October issue of the Sunday Post (Thai newspaper), forestry policy is "unclear". In spite of their policy in favour of conservating forest and animals, they are planning to construct large dams in natural forest. It will lead not only destruction of the ecosystem in the natural forest but also destruction of watershed that brings about problems of saline water and shortage of water. Moreover, their policy on afforestation is also vague. Although they are encouraging villagers to plant eucalyptus as a quick solution to poverty, they also know its negative effects and criticism and sometimes

hide what they are doing. To change people is a very difficult task but first of all they have to change themselves.

In an Asian perspective, during the colonial period when large-scale logging activities started, people's interest was profit-making only. However, after independence of former colonies, rapid population growth caused forest depletion and poverty, so that people became more aware of the correlation between poverty and forest. India announced a new forestry policy, viz. "Social Forestry Policy" in 1975, as the first forestry policy in the world with focus on the improvement of poverty.²⁹ Recently, with environmental problems getting worse, people have come to deal with forestry depletion from the viewpoint of environmental conservation. Accordingly, many countries started taking measures for forest conservation (raise concession fee and so on), but it was too late. Especially in Indonesia, large area of forest disappeared, yet big companies are busily engaged in logging activities. Among countries which have embarked upon certain forestry policy, Thailand is remarkable in that it cancelled all the concessions.

A study made by American researchers known as "New Forestry" made it clear that the variety in genes, kinds of trees and the ecosystem is very important for sustaining reproductive potential of forests in the long term.³⁰ Forestry management which can keep forest as original as possible, combined with agroforestry area would be the ideal measures. Needless to say, sustainable forestry is also ideal. In most countries, the government needs international cooperation for sustainable forestry because vested interests are too strong to cope with unless a new form of structural adjustment policies, as it were, are introduced. In case of Thailand the government seems to be well aware of environmental problems, so that their policies are on the right track. However, actual activities which we had a chance to observe in Roi-Et don't seem to be always consistent with their policies.

From the viewpoint of enhancing socio-economic benefits in Roi-Et, to conserve forest and to spread agroforestry and integrated farming would presumably be the best alternative. Farmland can get water from rivers if the watershed is well preserved through forest conservation. While eucalyptus is widely grown as the major means to raise villagers' income, they have to find other sources for additional income. Regarding infrastructure, at the moment, Roi-Et does not have sufficient infrastructure. However, the demand for it will rapidly increase along the economic growth, it means that a number of new facilities will be constructed. Government offices have to select building sites carefully, coordinate and cooperate with each other much more intensively.

REFERENCE AND NOTES

1. "Sekai No Shigen To Kankyo 1990-91: Sekai 146 Kakoku No Saishin Deta", Morishima A., Trans., p.121, "World Resources 1990-91" World Resources Institute.
2. Ibid.
3. Awaji, T. Ed., Kaihatsu To Kankyo: Daiichiji Sangyo no Kogai Mondai wo Megutte, 1986, p.343. "Development and Environment"
4. Summary of The Seventh National Economic and Social Development Plan (1992-1996), the National Economic and Social Development Board, Office of the Prime Minister, p.6.
5. Op. cit. 3, p.343.
6. Ibid. p.344.
7. Ibid.
8. Tasaka, T. *Nettairin Hakai To Hinkonka No Keizaigaku: Tai Shihonshugika No Chiiki Mondai*, 1991, p.343. (Political economy of tropical forest destruction and impoverishment of rural communities, Japanese Text)
9. Ibid., p.138.
10. Op. cit. 1, p.121.
11. *Tai Koku Keizai Gaikyo 1990-91*, Bangkok Japanese Chamber of Commerce, (General Condition of Thai Economy, Japanese Text)
12. Op. cit. 3, p.347.
13. Suthad Setboonsarng, Prasong Warakarnjanapongs, *Forestry and Land Use Policy*, 1988, Thailand Development Research Institute Foundation, p.8.
14. Op. cit. 4, p.8.
15. Phaisal Lekuthai, *Roi-Et Province's Data*, 1992, p.33.
16. Ibid.
17. Theodore Panayotou, Chartchai Parasuk, *Land and Forest: Projecting Demand and Managing Encroachment*, 1990, p.56.
18. Ibid., p.20.

19. Ibid., p.60.
20. Ibid., p.53.
21. Op. cit. 8, p.81.
22. Ibid., p.71.
23. Ibid., pp.78-79.
24. Information obtained from the Roi-Et Provincial Forestry Office
25. Ibid.
26. Information obtained from the Roi-Et Province Office
27. Op. cit. 24.
28. The information about months (from when to when) was not given.
29. Ohkita Saburo, *Chikyu Kibo No Kankyo Mondai*, Vol. 2, 1990, p.67. (Global Environmental Problems, Japanese Text)
30. Lester R. Brown, Kato S. Trans., *Chikyu Hakusho 1991-1992*, (State of the world 1991-92, World Watch Institute), p.137.

Chapter 3.5: Integration: Infrastructure and Environment in Roi-Et

NARITA Naoko, NOH Chang-II,
KITA Motoko and MYNT San

I. Introduction

Part III has attempted to analyze the role of physical infrastructures and environmental questions. For obtaining harmonious and viable development, we have analyzed related problems and issues of Changwad Roi-Et as study case. Needless to say, the infrastructures play essential roles in determining the pace of social and economic development. At the same time, the reverse is also true in that the development creates more demand for infrastructures and brings about a higher level of infrastructural development. Nonetheless, it would be appropriate to consider that the infrastructure is one of the most important prerequisites for development, especially at the initial stage of social and economic development, although the infrastructure is not the only factor which determines the level of social and economic development.

It is recognized more and more these days that higher economic growth depends on higher consumption of energy and natural resources along with the introduction of modern technologies. It has been our common knowledge that environment and development are in the relation of trade-off. However, on the other hand, development can be environmentally sound and cause improvement of environment so long as effective means of environmental control is taken and strategy of sustainable development is practised.

In Thailand, owing to the concentrated effort on economic growth and its great achievements particularly in the last decade, problems of environmental degradation have started to arise. These are pointed out in the 7th National Plan with great degree of attention towards the conservation of natural resources and environment.

In changwad Roi-Et, in order to prepare adequate conditions conducive to further social and economic development, the infrastructure and environment have become a very crucial factor for its development. Water shortage in Northeast Thailand is widely recognized as a consequence of not only insufficient but irregular pattern of rainfall and poor water supply system. The irrigation and drinking water supply system are far behind the demand. With regard to transport infrastructure, as a result of continued efforts in the last 20 years, inter-provincial highway network has already reached a rather satisfactory level. However the rural intervillage type road development, despite the lapse of 20 years, has not been able to meet the demand. Electricity rather suffers from less demand than the supply capacity, making its cost recovery and innovation difficult. Provincial office is keen to promote industrialization of the province. However there still remain some technical problems. The occasional black-outs can disturb the operation in a factory and the stability of industrial growth. We consider that these three factors, viz. water supply, transportation, electricity, are the most essential infrastructures for the economic development, which should be improved for the sake of both agriculture and industrial sectors of the province. On account of our limited time and capability, we have examined only water supply and transportation as key infrastructure sectors. From the viewpoint of basic services for living, we have taken up the garbage management as another area of infrastructure. It is mainly for the betterment of people's life in terms of public hygiene management and convenience. Presumably, the garbage and waste disposal problem will obtain larger and larger dimensions in accordance with the expansion of industries and population increase in the near future.

Finally, the problems of deforestation is discussed as the most crucial environmental question. It is quite severe and obvious in the province and also in the whole Northeast region. Forest needs to be

analyzed not only as an aspect of ecology but also as a means of livelihood for farmers in the region. Because most people are engaged in farming in Roi-Et, development should be carried out without sacrificing the sustainable welfare of their life. It is in that context that deforestation must be ceased and conservation of forest and afforestation should be very intensively promoted.

In each of these issues examined in this Part, one of the problems which is observed in all common to these is the problem of extremely limited budget of government agencies concerned. Thailand's economic development has been remarkable indeed. However it appears that redressal of highly centralized bureaucracy has been lagging behind economic achievements. In fact, one of three major objectives of 7th National Plan is to sustain the country's economic growth at an appropriate level with stability. This objective can not be achieved by expecting the economic growth merely in the Bangkok region. Industrialization and improvement in agricultural productivity in the provincial regions of Thailand are needed for sustaining "economic growth with stability".

As mentioned earlier, certain level of infrastructure development is a precondition for accelerating development. However in this regard there are gaps in various aspects of Roi-Et. This means that Roi-Et requires huge amount of budget for initial capital investment. As a matter of fact, serious considerations have been given to solve this problem, resulting in the appropriation of 155 million baht as special budget for rural development in Roi-Et. The idea of decentralization, despite the long-standing goals aimed by the government ever since the establishment of ARD in 1966, largely remains unimplemented in many rural areas. As a result, the quality of life in these areas still remain considerably low, owing primarily to scarce budget allocation.

The 155 million Baht received by Roi-Et is a part of the 6,000 million special allocation to all Changwads in the country. The budget received by Roi-Et divided by the total amount of the special budget is 2.6%. Considering Roi-Et population—Thai population ratio is 2.2%, the budget received is quite reasonable and appropriate. However it should be reminded that the 6,000 million allocation is no more than 2% of all development expenditure of the government of Thailand in 1992. It is no wonder, therefore, that budget shortage was repeatedly pointed out by respective officials concerned as the most serious problem which disturbs their operations. It was difficult to find out detailed quantitative data on account of extremely complicated administrative arrangements and the fact that the inter-provincial compilation of financial accounts is made at the centre. Nevertheless, we would like to note that we have observed the inadequate resource allocation at varying degrees for key infrastructural sectors as well as environmental conservation.

2. Summary of Each Chapter

2.1. Water Supply

Water supply should deal with two purposes, viz. agricultural use and non-agricultural use. In the Northeast region, water resource is scarce for both purposes because its rainfall is much smaller compared with other regions of Thailand, and its topographic conditions makes it difficult to keep rainwater in reservoirs during the long period of dry seasons despite the fact that the most convenient source of water during dry seasons is rainfed reservoirs.

Most people of Roi-Et make living by agriculture. Rice cultivation is their main job. From climatic point of view, 200% crop intensity can easily be obtained. However, owing to insufficient irrigation system, the productivity of the second harvest goes down drastically, so that it is impossible for farmers to make living on rice production alone. Therefore during the dry season, many Isan farmers migrate to Bangkok in search of jobs.

Recently, *Tameike* project (Integrated small-scale water reservoir project) was experimented through Green Isan Project. It is a traditional Japanese style pond-digging technique introduced under the joint project of Chulalongkorn and Kyoto Universities. There is an evidence that the project has enabled to raise farmers' income drastically through side-job activities which are made possible by using water from *Tameike* during dry seasons. The aim of *Tameike* is provide the infrastructural base for integrated farming. Indeed, the integrated farming is expected to serve as a potential leverage to strengthen agricultural development and well-being of farmers in Isan.

As regards the non-agricultural water use, there are also many insufficiencies in its supply system. For drinking water, rainwater kept in large water containers at each household, and shallow well water is

used. For domestic uses, only in Municipality, Provincial Water Works Authority partly provides the pipe-water, but the whole amount of sending pipe-water is behind the demand because of low capacity of pumping facilities. Of all the infrastructures, water supply is one of the prerequisites for inducing investment to come from outside. In this regard, the determination of water charges and O & M (Operation & Management) will be crucial as well for extending the pipe-water supply system besides raising the amount of water capacity.

2.2. Transportation

In the nation-wide perspective, the inter-provincial high ways are well-organized and satisfactory, which is a great asset for Thailand. The remaining problem is their full utilization so as to maximize the benefit from it for economic and social development in each region.

Another transport problem relates to rural areas. Most of rural roads are still of temporary finish without flood-proof arrangements, so that those are not usable in rainy seasons. Also transportation service to rural area is inadequate. These problems cause inconvenience to villagers and reduce opportunities of interaction. As a matter of fact, the inaccessibility to the market poses a serious bottleneck for development.

Along with the development and improvement of road to rural areas, the airport project has been drawing attention of many in Roi-Et. At the moment, the nearest airport to Roi-Et is one in Khon Kaen, about 110 km away. Khon Kaen is one of the most developed towns in the Northeast region. Although there is a well-organized high way connecting Roi-Et and Khon Kaen, it takes almost 2 hours between Roi-Et and Khon Kaen on account of growing congestion on that road. As a result, enterprising investors will feel inconvenient to spend 4 hours round trip between the two places, so that they would prefer to remain within Khon Kaen where there already is an airport.

In view of the actual example of remarkable development brought about by airport construction in Ubon Rachatani, Roi-Et people are expecting the proposed airport project to become a great incentive for investors from elsewhere. The airport project has already been approved in the 7th National Plan. However, its difficulty is its location because of many protesters. Major reason for opposition is the destructive effect of the airport. It may affect the feasibility of the project considerably.

Along with the transport development, the effective enforcement of the land use regulation would be critical. Road is the most effective instrument for development if it can meet the existing transport demand of the society. At the same time, the road development creates new demand by making the development of new industrial estates, or residential areas etc. possible. From the viewpoint of environmental conservation and protection of agricultural land, there should be stricter land use policy in the near future.

2.3. Garbage Disposal

In Roi-Et municipality, the problems of garbage disposal has become severe, so that its proper management is one of the most urgent needs of the people. It is reflected in the Roi-Et Progress Project (RPP), in which great attention for garbage treatment is observed from the viewpoints of sanitation and environmental health.

Only one garbage disposal area has been used for more than ten years by the municipality, which is not very far from the centre of the city. The place is already overloaded and spreading out offensive odour. Since there is no separate disposal system in accordance with types of garbage, the garbage of all kinds is collected together. A serious danger is caused by the wastes from hospitals. Something contagious can be there and mortal for the people who work with garbage and for the environment. In recent years hospital wastes have been managed properly by incineration at a separate place. However, on account of the accumulation of wastes in the past years, the garbage dumping ground can still be dangerous.

Using accumulated garbage for filling the land and also designating a new garbage disposal area are being planned. However there remain many problems along with such plans. The former would be unfeasible from environmental health point of view and the latter, the selection of the location for its would be extremely difficult. In view of the prospect for further development in Roi-Et, the garbage management would be critical for environmental safety of and protection of human life. It is already and will become even more difficult in the near future.

2.4. Conservation of Forest

Even adding the ten reserve forests and all other forest areas in Roi-Et, only 10% of the land is covered by trees in total. The national goal is 40% coverage by trees. It means for Roi-Et 2 million rai (=3,200 km²) needs to be afforested to satisfy the national goal.

The main reason of deforestation lies in population growth, for it raised demand for agricultural production, fuel and livestock. As a result, the forests were destroyed to expand field for agriculture and grazing field for the livestock. Trees are cut down for firewood.

In areas of steep topography, deforestation hinders the replenishment of watershed and also causes soil erosion, resulting in the incidence of frequent floods in the lower reaches. In Northeast region, the problem is slightly different. The entire region is largely a plateau, so that there is not much watershed areas as such. As a matter of fact, forest is therefore more directly related to the productive activities of farmers. It therefore requires careful considerations for the ways to conserve and utilize the forest resources.

What to grow in the forest is also a very important question. Besides being source of energy, forest should be an income raising resource, such as timber production and agro-forestry. Afforestation policy should clarify about which area for what purpose to be afforested. Otherwise it may risk all the attempts of afforestation since in some cases the lessons of experience contradict from one place to another. Pros and cons of eucalyptus growing is a typical case in point.

It seems on the whole that the criteria for area selection and the purpose of afforestation are still under heated discussion. In Roi-Et as well as other changwads must pay keen attention to the operational content of forestry policy, rather than merely in terms of the coverage of total area under trees.

3. Description of Problem Structure/Conclusion

The problem structure of Part III deals with the infrastructure and environmental aspects and their relationship with economic development. The Diagram is structured to clarify that provincial level activities are heavily controlled by the central government. In particular, provincial regions like Roi-Et suffer from the tendency of putting high priority of resource allocation on Bangkok region.

At the provincial level, there are serious problems of environmental degradation. While it is primarily caused by poverty (People cut forest trees for producing food or for additional cash income), the environmental degradation further aggravates the quality of life of the people. As a result, the poverty and the environmental degradation constitute a vicious circle between the two.

The other aspect is the key infrastructures that relate to economic development and quality of life. These infrastructures are an essential precondition for industrial investment required for achieving further economic growth. Therefore, when they fail to reach a minimum threshold level, entrepreneurs are not interested in making investment in that area. Accordingly, the possibility of solving the problem of poverty and low quality of life is lost, further perpetuating the dominance of poverty. Keeping these in view, the following proposals are made.

3.1. Introduction of a Project That Will Facilitate Cost Recovery

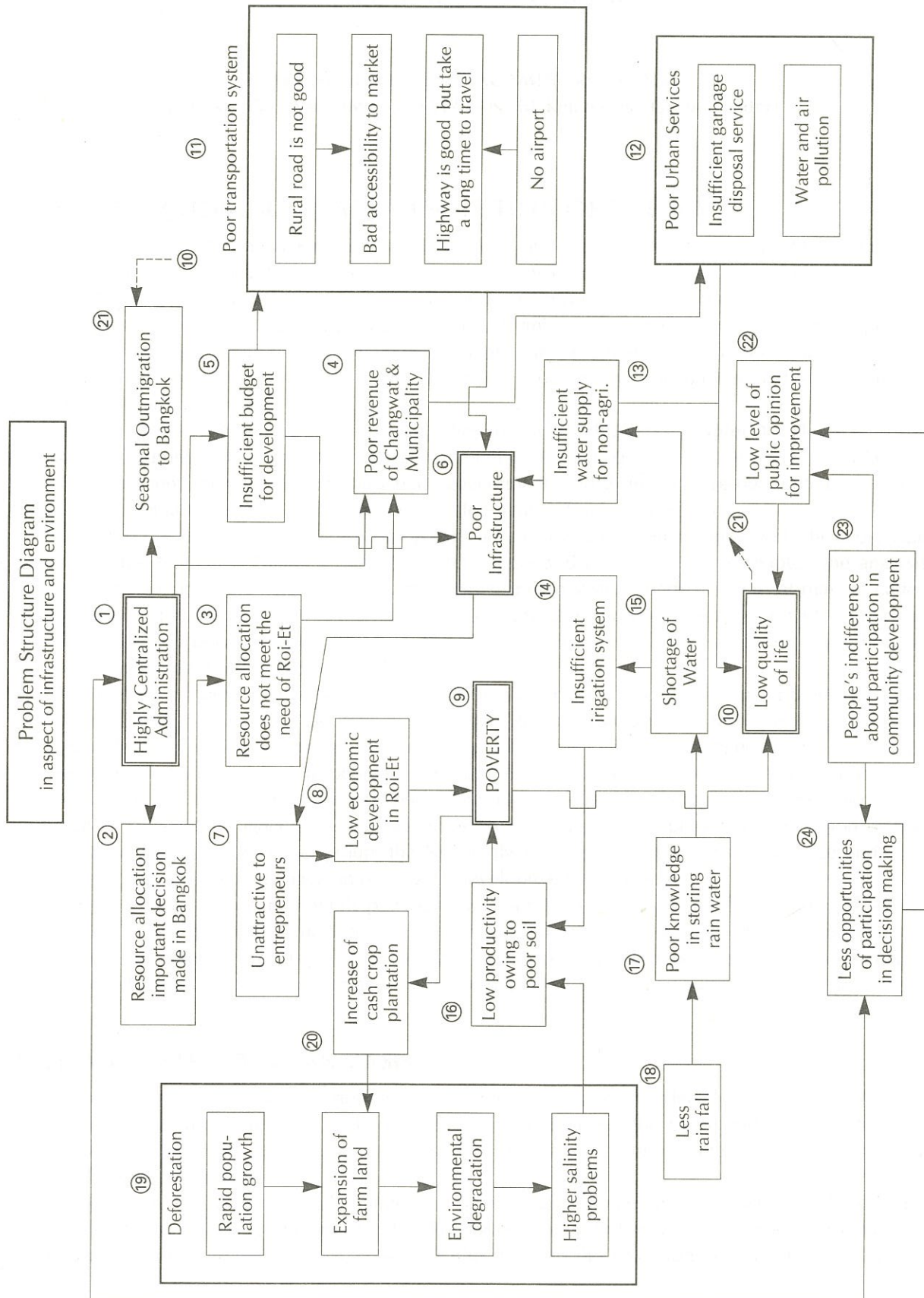
Demand for water supply increases as industrial development proceeds. A water supply enterprise should be established through joint venture between public and private sectors, for increasing the demand for industrial use will facilitate the cost recovery of an effective water supply investment. We note that there already exists an industrial estate project being carried out under the auspices of Tesabarn Roi-Et. Every possibility should be explored for realization of this project.

3.2. Resource Reallocation

There are resource allocation questions of (1) inter regional nature, viz. between BMR and Northeast and (2) inter sectorial nature viz. between army for "defence" and key infrastructures for enhancing new economic opportunities to "defend" poor people in provincial areas. To induce changes favourable for the development of provincial regions, accurate and timely evaluation on the development performance of those regions utilizing modern technology is called for. Such measures like periodical aerial photography would be essential for periodical monitoring. In this regard, technical cooperation with JICA is desired to be explored.

3.3. Other Types of International Cooperation

The long-term benefit of international highway connecting Thailand-Laos-Viet Nam would certainly deserve further investigation, for it would be conducive to further market expansion. The distance between Roi-Et and Danan, Viet Nam is less than 200 km, whereas it is more than 400 km between Roi-Et and the Eastern Seaboard of Thailand.



University of California, Berkeley
Department of Geography
Geography 101
Spring 1968

