Thailand

Telephone Network Expansion Project (1) (2)

Report Date: October, 2002
Field Survey: July, 2001

1. Project Profile and Japan's ODA Loan

Site Map: Nationwide Project

Site Photo: Transmission System in Ayutthaya

1.1 Background

In the latter part of 1970s, telecommunications was identified as one of the most important infrastructures for social and economic development in Thailand, and the Government started implementing many projects to expand telecommunication services, through the Telephone Organization of Thailand (TOT).

As a result, line capacity in Thailand in 1985 reached 830,000 lines, 2.7 times more than in 1977, and the telephone exchange system was completely automatized. Consequently, telephone density (main telephone lines per 100 inhabitants) for the whole country rose from 0.59 in 1977 to 1.54 in 1986. With economic growth, however, telephone demand continued to increase. At the time of project appraisal in 1987, total demand for 1991 was estimated to increase 4.8 times, and a serious shortage of telephone service was foreseen.

In an effort to meet expected demand and to raise telephone density further, TOT developed the 6th Economic and Social Development Plan (ESDP)(1984-1988)[1], in which it set targets for increasing telephone density in the Bangkok Metropolitan area from 7.69 in 1986 to 13.2 and in Thailand as a whole to 3.2 by 1991.

1.2 Objectives

To expand the telephone junction network in the Bangkok Metropolitan area and to expand local cable and transmission networks to cope with increasing telephone demand during the period of TOT 6th ESDP (1984-1991).

1.3 Project Scope

1.3.1 Junction Network Expansion:

Installation of Optical Fiber Cable in Bangkok Metropolitan area (140Mbs capacity: 54 spans, 34Mbs: 10 spans: Total 64 spans of 410km)

[1] The period covered by the 6th ESDP was later extended to 1991.

1.3.2 Transmission Systems Expansion:

Expansion of existing transmission networks and construction of new routes in whole Thailand:

- Construction of 13 spans;
- Capacity increase of 54 spans;
- Relocation of transmission for 76 spans;
- Addition of Standby system for 35 spans

1.3.3 Local Cable Expansion for Subscribers:

Expansion and installation of primary and secondary subscriber cable network in whole Thailand (Primary Cable 308,100 pairs, Secondary Cable 462,150 pairs)

1.4 Borrower/Executing Agency

Telephone Organization of Thailand (TOT)

1.5 Outline of Loan Agreement

	Phase I	Phase II
Loan Amount Loan Disbursed Amount	6,716 million yen 6,716 million yen	24,296 million yen 24,095 million yen
Exchange of Notes Loan Agreement	September 1987 September 1987	September 1987 February 1988
Terms and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 3.0% p.a. 30 (10) years General Untied	 3.0% p.a. 30 (10) years General Untied
Final Disbursement Date	August 1989	February 1994

2. Results and Evaluation

2.1 Relevance

At the time of appraisal, telecommunications network development was a priority policy for Thailand. Telephone demand in Thailand was growing rapidly; the average annual growth rate between 1978 and 1984 was 18.2%. However, the average annual increase in the number of telephones over the same 6 years was 9.9%. With the gap between demand and supply growth rates exceeding 8%, it was obvious that the country would face a serious shortage of telephone service by 1990.

In response to growing demand, the 6th ESDP (1984-91) of TOT laid out a plan for increasing exchange capacity, expanding the transmission network and constructing a subscriber cable network. Hence the Project was relevant to both national needs and government policy. As the facilities installed under the Project continue to play a significant role in sustaining Thai telephone services at present, the Project is still considered relevant at the time of this evaluation.

2.2 Efficiency

2.2.1 Project Scope

The project consisted of three main components: 1) junction network expansion in the Bangkok

Metropolitan Area; 2) transmission systems expansion; and 3) local cable expansion nationwide. The scope of the project was implemented as planned, but the volume of works increased for each component. Construction of the junction network linked by optical fiber cables increased to 537.1 km from the planned 410km. The works for transmission system expansion also increased in order to fit with World Bank-financed projects; the number of stations and spans increased. Local cable expansion was extended to 985,625 lines from the planned 770,250 lines.

In light of the rapid growth of demand for telephone services, the increase of works was justifiable.

2.2.2 Implementation Schedule

Project implementation was delayed by approximately a year and half due to the increases in volume of work described above. TOT's internal approval process for these increases took longer than expected, putting off the start of project implementation. Obtaining approval from the authorities for the installation of cables for the microwave networks was also unexpectedly time-consuming.

2.2.3 Project Cost

Besides the scope of works defined at appraisal, additional works to cope with increasing demand were carried out.

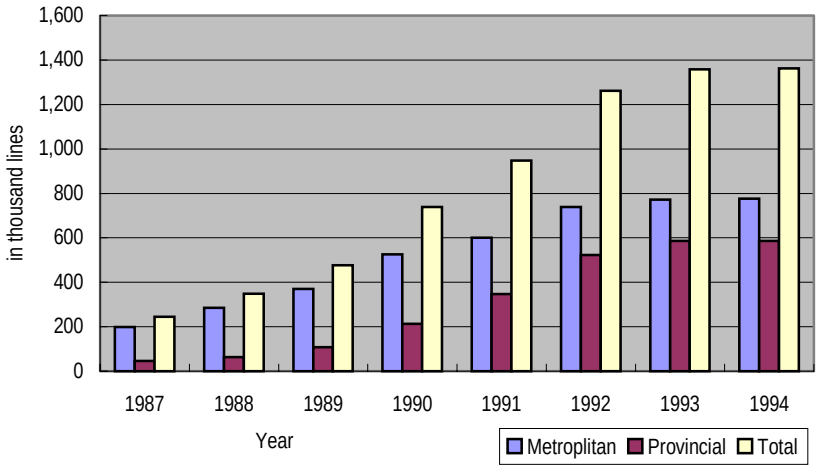
Fluctuations in cost varied by component. The scope of the junction network expansion required more foreign cost but less local cost than estimated, which resulted in a slight cost under-run overall. The scope of the transmission systems expansion with the additional contracts was also completed within the estimated allocation. As for the local cable network, the foreign cost was lower than estimated due to the appreciation of the Japanese Yen during implementation and to competitive bidding. The balance of foreign cost was used to cover the local cost of the component. As a whole, the total project cost resulted in a cost under-run, and 87% of the project cost was financed by ODA loan, as compared to 26% in the original plan.

2.3 Effectiveness

2.3.1 Increase of Telephone Line Capacity

The 6th ESDP (1984-1991) set a goal of 1.021 million additional lines in Metropolitan Bangkok and rural areas between 1987 and 1991. As shown in Figure 1 below, in that period, line capacity increased to about 950,000, and by 1994, when the Project was completed, that figure had increased to 1,362,000. Though this project did not increase line capacity directly, it did contribute directly to the expansion of transmission system capacity, which was indispensable for the increase of telephone line capacity. Hence it is fair to assume that the Project supported the telephone line capacity increase.

Figure 1: Increase of Telephone Line Capacity (6th ESDP)

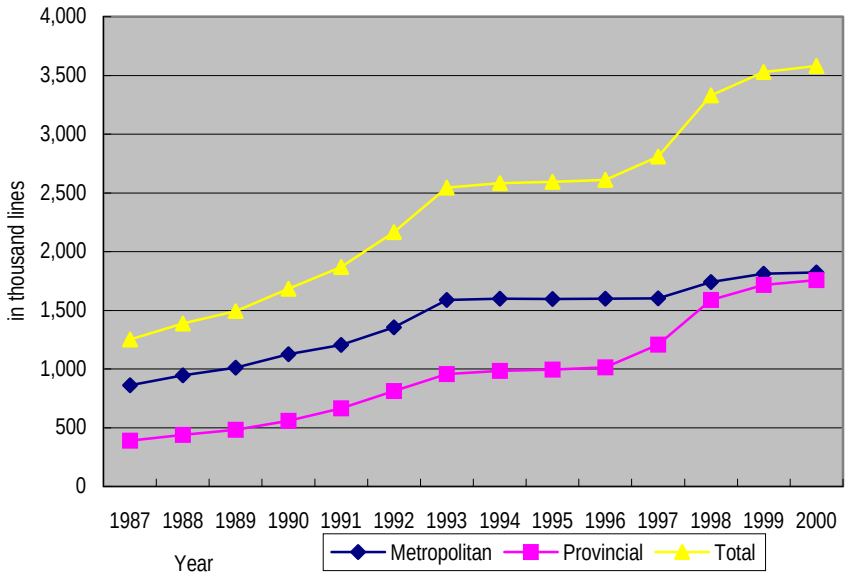


2.3.2 Increase of Telephone Subscribers

The number of subscribers increased from 1,251,000 in 1987 to 1,869,000 in 1991, and again to 2,584,000 in 1994, an annual growth rate of 9.5% on average. (Figure 2) By installing 985,652 primary and secondary subscriber cables, the Project contributed to the increase of telephone subscribers.

The sudden increase in the number of subscribers in 1997 can be explained by the participation of the private sector in the telecommunications sector. In 1992, concessions to operate fixed line telephones were granted to private sector companies, and they became effective in 1993. During the start-up period, TOT suspended receiving new customers so as not to compete with the concessionaires, and then in 1997 TOT restarted to receive customers.

Figure 2: No. of Subscribers (TOT Only)



Source: TOT

2.3.3. Increase of telephone density

During project implementation, between 1987 and 1994, telephone density in the nation increased 2.6 times, from 2.32 per 100 inhabitants to 5.97 per 100 inhabitants. Together with other projects implemented under the 6th ESDP, this project contributed to annual growth rates of telephone supply as high as 30.6%. In 1991, telephone density reached 3.50, exceeding the target figure of 3.20 set in the 6h ESDP.

Table 1: Telephone Density and Telephone Supply Growth Rate

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Telephone density (number/100 people)	2.32	2.53	2.69	3.08	3.50	3.78	4.57	5.97	7.37	11.06	11.41	12.12	12.31	12.44
Growth Rate (%)	n.a.	9.1	6.3	14.5	13.6	8.0	20.9	30.6	23.5	50.1	3.2	6.2	1.6	1.1

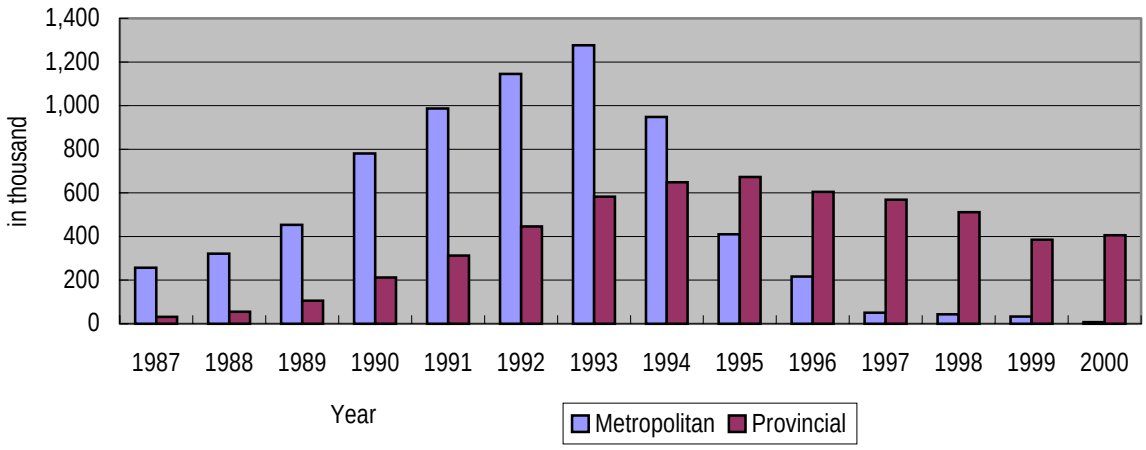
Source: TOT

2.3.4 Waiting List for Main Lines

As Figure 3 shows, the number of applicants on the waiting list for main line in Metropolitan area increased from 257,000 in 1987 to 1,277,000 in 1993. After peaking in 1993, the number started decreasing, falling to a low of 7,802 in 2000. The decrease can be attributed in part to private telephone operators' participation in providing services.

As for waiting applicants for main line in provincial area, the figure started decreasing from 1996 mainly due to implementation of the 7th ESDP (1992-1996). But 407,000 people were still waiting for lines in 2000 in provincial area.

Figure 3: Waiting Applications



2.3.5 Quality of Telecommunication Service

The line interruption rate was 5.7 times per 100 lines per year in 1989. It improved to 3.75 in 1994, then fell in 2000 to 1.63 in the Metropolitan area and 2.26 in rural areas. Recovery ratio within next working day in Metropolitan and the rural area in 1989 was 84.3% and 85.5%, respectively. The ratio was improved by year 2000 to 99.4% and 95.5%. The quality of Thai telephone services has improved in last

10 years.

2.3.6 Financial Internal Rate of Return (FIRR)

Since the Project was an integrated part of the 6th ESDP (1984-1991), which implemented various inter-related projects simultaneously, it is technically difficult and inappropriate to calculate FIRR only for the Project.

At the time of project appraisal, FIRR was calculated at 16.9% for project cycle of 20 years, taking following steps: (1) FIRR for the whole 6th ESDP (1984-1991) was calculated since the Project was an integrated part of the ESDP, which was comprised of various inter-related projects, such as installation of switching systems with 1,021,000 lines, (2) since contribution of this project to the ESDP was estimated at 90%, FIRR for the Project was calculated taking 90% of the operating expenditures and revenues of the ESDP as cost and income for this Project.

At the time of this evaluation, FIRR could not be recalculated due to limited availability of appropriate data.

2.4 Impact

2.4.1 Access to Telephone Lines in Rural Area

The transmission system expansion component of the Project contributed to building a base for rural telephone network expansion. Through this project and other initiatives, Thailand was able to connect all its villages with telephone lines in 2000.

Table 2: Villages without Telephone Lines

	1987	1989	1992	1996	2000	2001
No. of Villages	4,942	4,145	3,774	2,984	0	0

Source: TOT

2.4.2 Environmental and Social Impact

According to TOT, no negative environment impact has been reported for the Project. There was no involuntary relocation or resettlement of local residents.

2.5 Sustainability

2.5.1 Operation and Maintenance (O&M)

As of 2001, TOT has a staff of 23,475; 886 employees are at the management level, 9,704 are engineers and 12,885 are administrative workers. For the purposes of O&M, the country is divided into 9 districts, each of which is covered by a regional Telephone Service Department. Four Service Departments, with a total staff of 7,358, are in charge of the Metropolitan area. Other areas are covered by five Service Departments staffed with 9,267 workers. The Service Departments accounts for 70% of TOT's entire staff.

2.5.2 Current Condition of Project Facilities and Technical Capacity of O&M Staff

Equipment procured by the project is kept in air-conditioned rooms, and no problems with operation and maintenance were observed.

According to TOT, most staff assigned to the station have experience with and knowledge of the stations and surrounding areas. TOT engineers' maintenance skills and techniques have been enhanced through training courses provided by the equipment manufacturers at sites in Thailand and overseas. TOT also manages a technical training center and provides training courses so workers can acquire new skills

and techniques for maintenance and operation. The technical capacity of TOT to properly operate and maintain the system is considered appropriate.

2.5.3 Financial Sustainability

From the time of project appraisal in 1987 to the year 2000, TOT's revenue grew 11% per annum on average, and the agency recorded revenue of 36,768 million Thai Baht in 2000. Its principal revenue source was charges for domestic calls, which had increased until 1997, and since then it has remained almost the same amount up to 2000. In turn, the revenue from the concession fee increased. Besides concessions for the development of fixed telephone lines, granted in 1992 and in 1993, TOT granted a concession for a cellular phone project (900MHz) to a private entity. When private operators became active in mid-1990s, TOT started receiving substantial amounts of money from concession fees. They accounted for 25% of operating income in 2000.

As for expenditures, operation and maintenance costs have increased, but in absolute terms, they are relatively small. On the other hand, general management costs have become a greater part of the whole. In 1998, 1999 and 2000, in particular, special expenses for early retirement schemes ate into TOT's profit margin.

In terms of financial index, TOT's earning ratio on total assets was more than 10% in the early 90s, in recent years it has fallen to 0.8% and 1.5% in 1999 and 2000, respectively.

Deterioration of TOT's profit can be attributed to the following factors. First is the private sector's participation in the telecommunication business. A concession was granted in 1992 for the operation of 2.6 million lines in Metropolitan Bangkok, followed by a concession in 1993 for 1.5 million lines in rural areas. During the start-up period, TOT suspended receiving the new customers so as not to compete with the concessionaires, but as a result, TOT's operational revenues did not increase. Secondly, after completion of this project, TOT shifted its investment target from the Bangkok Metropolitan area to rural areas, where profitability is lower. Finally, special expenses for early retirement schemes and to prepare for the privatization of TOT as part of Thailand's WTO framework agreement have been a financial burden to TOT.

In November 1999, the National Telecommunication Development Master Plan was approved by the Minister for Transportation and Telecommunications. The master plan outlines the privatization plan for TOT, aiming for full corporatization by 2004.

Comparison of Original and Actual Scope

Item	Plan	Actual
1. Project Scope 1.1 Junction Network: Construction of Optical Fiber Network in Metropolitan Area	410km	537.1km
1.2 Transmission System Development in Provincial Area	178 Spans	270 Spans
1.3 Local Cable Expansion	Primary Cable: 308,100 pairs Secondary Cable: 462,150 pairs Cable quantity: 932,277 p-km Duct: 691.5 d-km	Primary Cable: 394,250 pairs Secondary Cable: 591,375 pairs Cable: 1,261,989 p-km Duct: 6,350 d-km
2. Implementation Schedule		
2.1 Junction Network	May 1986 - Aug. 1988	May 1986 - Nov.1992
2.2 Transmission System	Jan. 1986 – Aug. 1991	Jan. 1986 – Oct. 1992
2.3 Local Cable Expansion	Jan. 1987 – Aug. 1991	Jan 1987 – Feb. 1993
3. Project Cost		
Foreign currency	59,606 Million yen	26,665 Million yen
Local currency	58,155 Million yen (10,574 Million bath)	9,783 Million yen (2,174 Million bath)
Total	117,761 Million yen	36,448 Million yen
ODA loan portion	31,012 Million yen	30,811 Million yen
Exchange Rate	1Baht ＝ 5.5 Yen (May 1987)	1 Baht ＝ 4.5 Yen (Weighted average during project implementation)

Independent Evaluator's Opinion on "Telephone Network Expansion Project (1)(2)"

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The project under review is undoubtedly considered most relevant in response to large unmet demand for basic telephone services across the country. At the time the project was negotiated, the Telephone Organization of Thailand (TOT) had the capacity to install about 100,000 additional lines a year while the known expressed demand had outpaced supply with a waiting list of over 318,000, representing a substantial proportion of about one third of existing supply of some 900,000 subscribers in 1989. Moreover, the projected waiting list was expected to exceed 1 million before the end of the 6th ESDP in 1991. The project was therefore urgently needed to relieve the immediate unmet demand and cater for any future demand arising.

As it stood, the project not only met the priority and needs of target group and the development policy of Thailand, it is also most timely as well as critical in building the backbone for a modern national information infrastructure to support economic development and enhance the social well-being of the people as most countries in the world moves into the information era of the 21st century.

As correctly pointed out in the evaluation report that the project was extremely efficient. While the project scope had substantially enlarged with total junction network increased by 31%, transmission system increased by 92 spans from 178 spans, and local cables increase by 35% with ducting increasing by over 800%, the total final project cost was merely 36,448 million yen, as against an estimate of 117,761 million yen with a total saving of up to 69%. As a result the ODA loan portion consequently had been reduced from 31,012 million yen to 30,811 million yen. The report also pinpoints two important reasons behind as, 1) the appreciation of the yen (based on weighted average over the project duration at about 18%), and 2) a competitive bidding process in procurement. However, it is likely that the dramatic drop in project cost was due considerably to economy of scale as well. As mentioned above, past expansion projects in similar transmission systems and local cable works were more or less carried out on a piece meal basis on a much smaller scale. The original estimated cost was likely to be based on such project data. The economy of scale and economy of scope together with competitive bidding, therefore, is thought to be mainly responsible for the very substantial project efficiency resulted overall.

It is noteworthy to note also that, the project, notably the junction network and the transmission system across the country had also considerable benefits by providing the needed transmission capacity to cope with the rapid increase in traffic, arising during the early 1990s from interconnection between TOT's subscribers and private sector's fixed line and mobile subscribers that came into service soon after the completion of this project.