Part V:
Sectoral Cooperation

11
Telecommunications as New Infrastructure for Regional Economic Development in Northeast Asia

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INTRODUCTION

Telecommunications can be seen in two different ways: telecommunications *per se* as an independent industry and telecommunications as infrastructure. Like two sides of a coin, the two features are quite closely interrelated with each other. As an independent industry, it is one of the most profitable and expanding industries in recent years as demands for the services have rapidly increased and diversified. Telecommunications infrastructure is also considered as 'new infrastructure' for regional economic development by some policymakers and commentators.[1] It forms an essential driving force for social and economic change in the same way that the industrial revolution was underpinned by the railway and later the road system.

As prompt and easy flow of goods, materials, and people has been of vital importance for national economy and regional economic development, most of the regional policymakers and planners have paid their attention mainly to the transportation infrastructure. Currently the prompt flow of information is becoming a critical factor for all social and economic activities. Without proper information and its instant transmission, regional cooperation and economic development cannot be easily achieved. At the same time, telecommunications tends to expand the geographical scope of economic activities beyond national borders. Telecommuni-

cations is at the heart of the driving forces for recent regionalization and globalization trends in the world economy. As we move step by step toward the so-called 'information age,' the importance of telecommunications in our entire economic and social life will increase further.

Relatively little attention, however, has been paid to telecommunications in the areas of regional economic development and cooperation in Northeast Asia. Since the telecommunications (i.e. flow of information) will greatly contribute to the enhancement of mutual understanding among nations in the region and will trigger more frequent flow of goods, materials, and people, it should be placed, parallel with other infrastructural components, on the proper position in the regional cooperation scheme in Northeast Asia.

TELECOMMUNICATIONS AND REGIONAL ECONOMIC DEVELOPMENT

The role of telecommunications in economic development has been proven very important.[2] Hardy (1980), for example, using data from 45 countries for the period 1960—73, studied the relationship between GDP and the number of telephones per capita with time-lagged offsets of one year. He found that the casual relationship between the two indeed ran in both directions, and that the role of telecommunications in economic development is more important in the developing countries than in the industrialized countries.

More recently Cronin and others (1991) reaffirmed the bi-directional casual relationship between telecommunications and economic growth through the analysis of 31 years of U.S. data (1958—1988, inclusive). Not only did increases in telecommunications investment strongly stimulate overall economic growth, but increases in output or GNP also led to increases in investment in telecommunications. As the economy grows, more telecommunications facilities are needed to conduct the increased number of economic transactions in the larger economy. Proving also strong causality of telecommunications to economic growth in the United States, the analysis partially refuted Hardy's argument that the smallest effect of telecommunication investment on economic growth is found in the most-developed countries.

We can see more detailed effect of telecommunications on other industries from DRI's study (1990) in the United States. According to this study, virtually every industry has expanded the importance of telecommunications in its production process. From 1963 through 1982 U.S. industry increased its average rate of telecommunications consumption by 167 percent. The finance and insurance industry and the personal services sector were reported to lead the economy in terms of increased usage. Due to the increased production and consumption of telecommunications from 1963 through 1982, the 1982 U.S. economy saved $81.3 billion (in constant 1990 dollar terms) in labor and capital expenses, as Table 11.1 shows. In Table 11.1, a positive number for a given industry means that telecommunications caused the economy to consume less of that industry's labor and capital to produce the actual level and composition of 1982 GNP. Similarly, a negative figure means that it caused the economy to use more of that industry's labor and capital to produce GNP. As in the case of telecommunications consumption, the effect was most prominent in

the telecommunications-intensive service sectors. This study also shows that U.S. industries were able to use telecommunications in place of substitutes, such as labor and courier services, at an average rate of 1.64 to 1 in the same period. That is, $1.00 of telecommunications services was able to replace $1.64 of telecommunications substitutes while maintaining the same level of output.

Pye and Lauder[3] (1987: 108) summarize, in more practical terms, the benefits of investing in telecommunications in the following four categories:

Social Benefits

- Response to national emergencies and disasters and reduction of isolation in remote areas.
- Response to emergency situations.
- Provision of health and education services.

Transport and Location Benefits

- Efficiency of transport system and reduction of the need to travel.
- Increased locational flexibility for offices and factories through replacement of travel; encouragement of organizational decentralization to remote areas.

Marketing Benefits

- Expansion of market and improved international competitiveness.
- Better market information.
- Efficient coordination of international activity, from export of raw materials to booking of tourists.
- Improved access to markets and clients.

Financial Benefits

- Direct cost reduction.
- Better financial control.
- Improved resource usage.

From a user's perspective, a more recent report[4] on the use of telecommunications by firms in OECD member countries shows that firms use telecommunications in four different ways: (a) just as utility in the production process; (b) as productive force to organize and improve production process; (c) as interface with market to grasp demand fluctuations, and thus to capture customers by providing a variety of products and services; and (d) as integrating force to coordinate, unify, and speed up operations from procurement to production and to final sales. Among them, the fourth type of use is the one that fully utilizes the potential benefits through a network.

When economic activities expand their scope beyond national borders to regional and global levels, the role of telecommunications becomes all the more important since it is the best means to overcome the distance between multiple

Table 11.1 Savings in labor and capital due to increased use of telecommunications by industry

Industry	Total savings	Industry	Total savings
Wholesale and retail trade	18,026	Chemicals and products	488
Construction	9,631	Amusements	475
Miscellaneous services	4,381	Agriculture, forestry and fisheries	395
Personal services	3,938	Other transportation equipment	349
Finance and insurance	2,702	Miscellaneous manufacturing	260
Electric and electronic equipment	2,498	Paper and paperboard	251
Business services	2,425	Fabricated metals	230
Real estate	1,814	Rubber & plastics	146
Automotive repair	1,441	Instruments	116
Transportation and warehousing	1,336	Tobacco	24
Utilities	1,283	Leather	21
Food	589	Furniture	21
Printing and publishing	577	Textiles	-51
Non-electrical machinery	488	Motor vehicles and equipment	-157
Non-telecommunications subtotal		53,697	
Telecommunications		27,590	
Economy-wise		81,287	

Source: DRI (1990). Unit: US$ millions.

economic actors far away from each other. Thus, serious concern has to be placed on telecommunications if we really want to achieve regional economic development and cooperation.

CASES OF TELECOMMUNICATIONS DEVELOPMENT PLAN IN CONNECTION WITH THE REGIONAL ECONOMIC DEVELOPMENT PROGRAM

STAR and Telematique in EC.

The STAR (Special Telecommunications Action for Regional Development) is designed to use advanced telecommunications services to assist in the economic development of the Less Favored Regions of the European Community.[5] This was particularly important to the European integration since a real integration cannot be achieved with those regions lagging behind.[6] The STAR is an outcome of a combined effort by the experts in regional development and in telecommunications. In 1984, the Directorate General for Regional Policy (DG XVI) and that for Telecommunications, Information Industries, and Innovation (DG XIII) examined the ways in which they could combine their areas of expertise to assist the LFRs. They decided to carry out a major evaluation on the potential of using advanced telecommunications services to aid regional development, with a view of establishing a programme utilizing the most appropriate telecommunications techniques to facilitate the integration of the LFR's into the Community.[7]

Following the evaluation, such underdeveloped regions as Mezzogiorno of Italy, 15 regions in Spain, 7 regions in Portugal, 13 regions in Greece, Ireland, Corsica, and Overseas Departments of France, and Northern Ireland of the United Kingdom were selected as the programme areas. The funding for the STAR programme is allocated from the European Regional Development Fund (ERDF), which contributes 767.1 million ECUs in total. This funding must be matched in the member states, to an extent that varies only slightly depending on the activities undertaken and according to the level of private expenditure involved. On average, the ERDF contribution comes to approximately 50 percent of the total expenditure. Actual implementation has continued for five years from 1987 to 1991, largely in two categories: construction and enhancement of telecommunications infrastructure, and promotion and demand stimulation of telecommunications use.

Although STAR funding expired in 1991, STAR's spirit was inherited by Telematique which was supposed to continue from 1991 to 1993. The Telematique Programme is also financed jointly by the member states and the EC, with the total contribution of ERDF estimated at around ECU 200 million.[8] Telematique's main objective is to boost regional development by encouraging the following:

- The introduction of advanced telecommunications services into small and medium enterprises (SMEs).
- The introduction of data communications services for users in the public sector.
- The improvement of access to data communications networks within the Community.

The major differences of Telematique, as a second phase, from STAR might be its emphasis on the advanced telecommunications (e.g., data communications), and on the more powerful aid to SME on the basis of data communications.

Teleport

A teleport is quite differently defined by individuals, and many of the existing characteristics of the teleport concept are likely to change over time.[9] The World Teleport Association (WTA), however, defines a teleport as: "An access facility to a full-scale telecommunications medium incorporating a distribution network and telecommunications business services to serve the greater regional community, and associated with, including, or within a comprehensive related real estate or other economic development." According to the WTA definition, basic elements which constitute a teleport in the wide sense are: 1) long-distance communication media (satellite communication, fiber optic networks, etc.); 2) local info-communication networks (private networks, LAN, etc.); and 3) regional development project (urban redevelopment, industrial park, science park, etc.), which is sometimes not essential to the concept of a teleport.

Fundamentally, a teleport must have land and satellite antennas[10] and various related equipments. Especially, satellite antennas should be placed upon concrete foundations with proper elevation and clearance, so that they can view as much geosynchronous arc as possible. At the practical level, however, teleports usually work as network access centers which interface with a variety of carrier media including fiber, space segment, microwave radio, and copper. More recently, teleports have been expected to foster regional economic development by providing an infrastructural edge to them.

The background and course of development of teleports in Europe and Asia are quite different from that of the United States.[11] The most striking difference between United States and non-U.S. teleports is that most U.S. teleports are closely related with the deregulation in the telecommunications industry resulting from the end of the 'Bell Era,' whereas developments of teleports in Europe and Asia have often been linked with efforts to reinforce the existing local or regional economic structure and to foster economic growth. U.S. teleports are more directed toward bypassing existing large-scale networks. In Europe and Asia, the major aims appear to be the improvement of existing telecommunications infrastructure and the promotion of advanced telecommunications applications and services in relation with a regional economic development plan. This objective is also accepted gradually by developing countries. Opportunities for teleports and the form they will eventually take will be highly affected by their relationship with the existing telecommunications authorities and monopolies in these regions.

In the United States, approximately one-fifth of total teleports are associated with large-scale real estate ventures allowing them to offer shared tenant services. For example, the Bay Area Teleport contains properties for office and R&D tenants, whereas the Dallas Fort Worth Teleport is closely related with regional development project in Las Colinas. The Teleport, located in Staten Island, resulted from an idea to keep communications-intensive businesses from leaving the microwave-con-

gested New York City area. Thus, the Staten Island site includes multi-tenant office buildings in the high-tech business park as well as an intelligent building, called Telehouse.

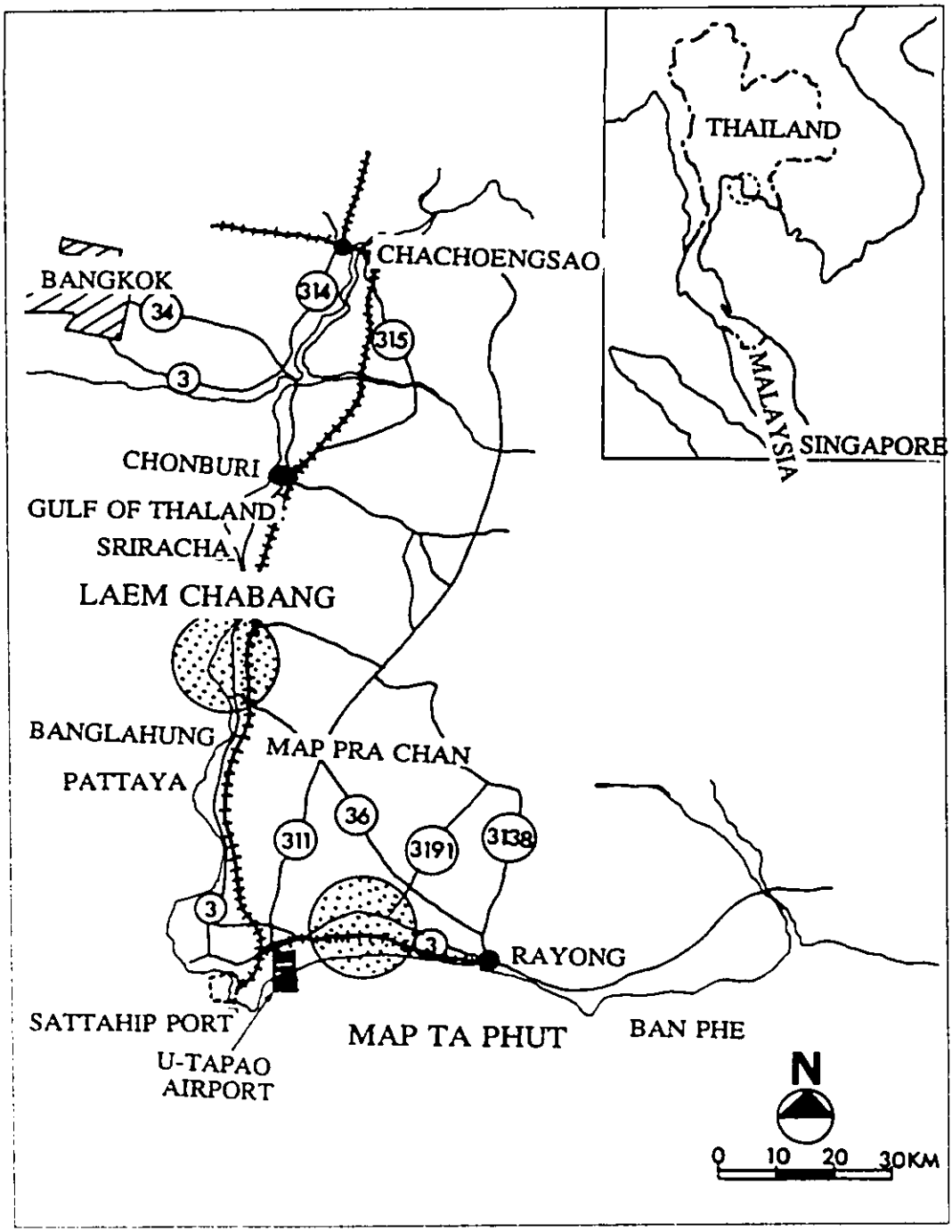
The establishment of a teleport in Europe is often a part of a regional development project, either with an objective to retain and enhance the already strong economic structure and position, or to reinforce the economic structure of an economically depressed area. Examples of the first type can be found in the teleport projects in the Paris region: Île de France Teleport, the Amsterdam Teleport, Teleport Rotterdam, London Docklands, and Mediapark Cologne. The latter two constitute more of a town-development than a regional development scheme. In contrast, the teleports of Roubaix, Metz, and Bremen are clear examples of the second type. Roubaix and Metz have received the status of a "Zône Télécommunication Avancée" (ZTA), serving in this way as a regional modal point for telecommunications. Approximately two-thirds of the European teleport projects are linked with real estate developments within a teleport.

European teleports are established to serve certain kinds of business activities in which a city or a region considers itself strong. Amsterdam Teleport is mostly targeted to the trade and financial sector. London also concentrates on financial sectors and video traffic. Paris contemplates an approach toward a wide range of tertiary businesses. The Hague concentrates on its national and international administrative position. Bremen, Genoa, Rotterdam, and Lisbon concentrate on supporting harbor activities, Metz on trade, Roubaix on its strong regional distribution functions, Avignon on the agro-industry, and Cologne on the media industry.

Most of the teleports under construction in Japan are also closely related to urban or regional development, with each teleport having specific functions. Teleports are also planned in some developing countries in Middle and South America including Jamaica, Mexico, and Brazil, and in the Asia—Pacific region including Korea, Taiwan,[12] Hong Kong, Thailand, Malaysia, and Indonesia. The teleport projects on the Eastern seaboard of Thailand and Batam Island in Indonesia, whose feasibility studies were part of the PECC mission on telecommunications, draw our special attention. The Eastern seaboard includes several industrial estates and resort areas along the Eastern Sea (Cf. Map 11.1). The Eastern Seaboard Development Programme is a unique integrated development programme for Thailand. It is based on new infrastructure and industrial activities that will boost the Thai economy, external trade, and regional balanced growth in the country. For these objectives, the development programme includes:

- The provision of the infrastructure (i.e., ports, roads, railways, water and electricity supply, telephone and telecommunications, etc.).
- Urban planning and the establishment of industrial estates and an Export Processing Zone.

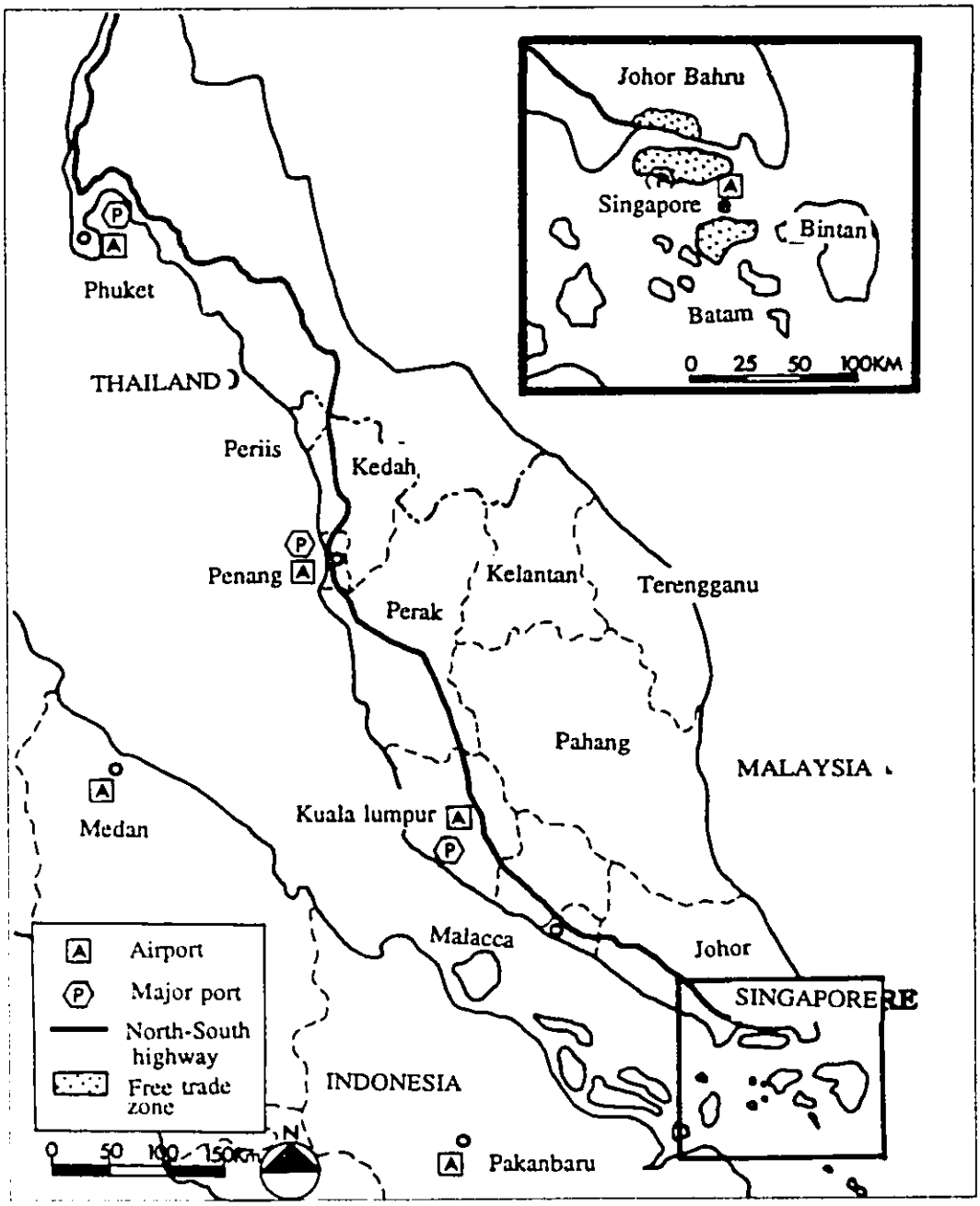
Recently the focus of the project has been placed on the provision of telecommunications facilities and the construction of a teleport around Laem Chabang and Map Ta Phut Industrial Estates, since even if existing industrial estates already have an airport and seaports around them, the lack of sufficient and state-of-art telecommunications facilities and network is an obstacle for a firm in this area to compete



Map 11.1 Eastern seaboard development programme in Thailand

efficiently in the global market and thus aid the area's economic development. The Thai teleport project is an outcome of a full understanding that telecommunications is a key factor in regional economic development.

Batam, an island in Riau Province, forms the southern leg of the 'Growth Triangle' with Singapore and Malaysia's Johore state (Map 11.2), which have



Map 11.2 Site of Batam development programme

developed rapidly. Many firms are moving their manufacturing operations from Singapore to Batam Island to take advantage of much lower land and labor costs.[13] At the end of 1970s, a master development plan was devised for Batam Island that had as its principal objective the orderly yet rapid development of the island as an industrial, commercial, and tourist center in Indonesia. In the Batam development programme, the telecommunications development plan plays an important part in the whole development programme. It includes construction of local networks and international telecommunications facilities like a teleport.

Telecommunications Cooperation within APEC and PECC.

The most prominent economic cooperation among Asian—Pacific countries can be found in APEC (Asian Pacific Economic Cooperation) and PECC (Pacific Economic Cooperation Conference). In these two regional organizations, most member countries have shared the view that modern telecommunications plays an essential role in promoting the free flow of information, people, and goods within the region. Based on this common view, the Second Senior Officials Meeting of APEC in Singapore in May 1990 agreed to add telecommunications as its seventh project. As a result of this agreement, the Working Group on Telecommunications was immediately formed, with its first meeting in Singapore in July 1990.

The Working Group on Telecommunications agreed to undertake a short-term project to compile information regarding policies, regulations, and infrastructure environments on telecommunications for each member country, and three longer-term projects on practical applications of Electronic Data Interchange (EDI), Teleports, and Human Resources Development (HRD).

Although PECC is not an official organization represented by each national government, PECC's work in its specific project formerly was considered on the APEC agenda. Since PECC working group is composed of government officials, academicians, researchers, and even private businessmen from each member country, joint work in PECC is usually more flexible, and it is easier to reach a consensus among member countries than in APEC. In PECC, telecommunications (flow of information) is considered in close relationship with transportation (flow of goods) and tourism (flow of people) since they can have a strong synergetic effect when they are integrated together. Thus the Triple T (Telecommunications, Transportation, and Tourism) Task Force has been formed in PECC in response to urgent need for cooperation in these sectors, which were expected by most member countries to facilitate other sectors' cooperation. This task force has undertaken several important projects such as communication networks, Triple T Port (Teleport), Data Compilation on Telecommunications, and Tourism.

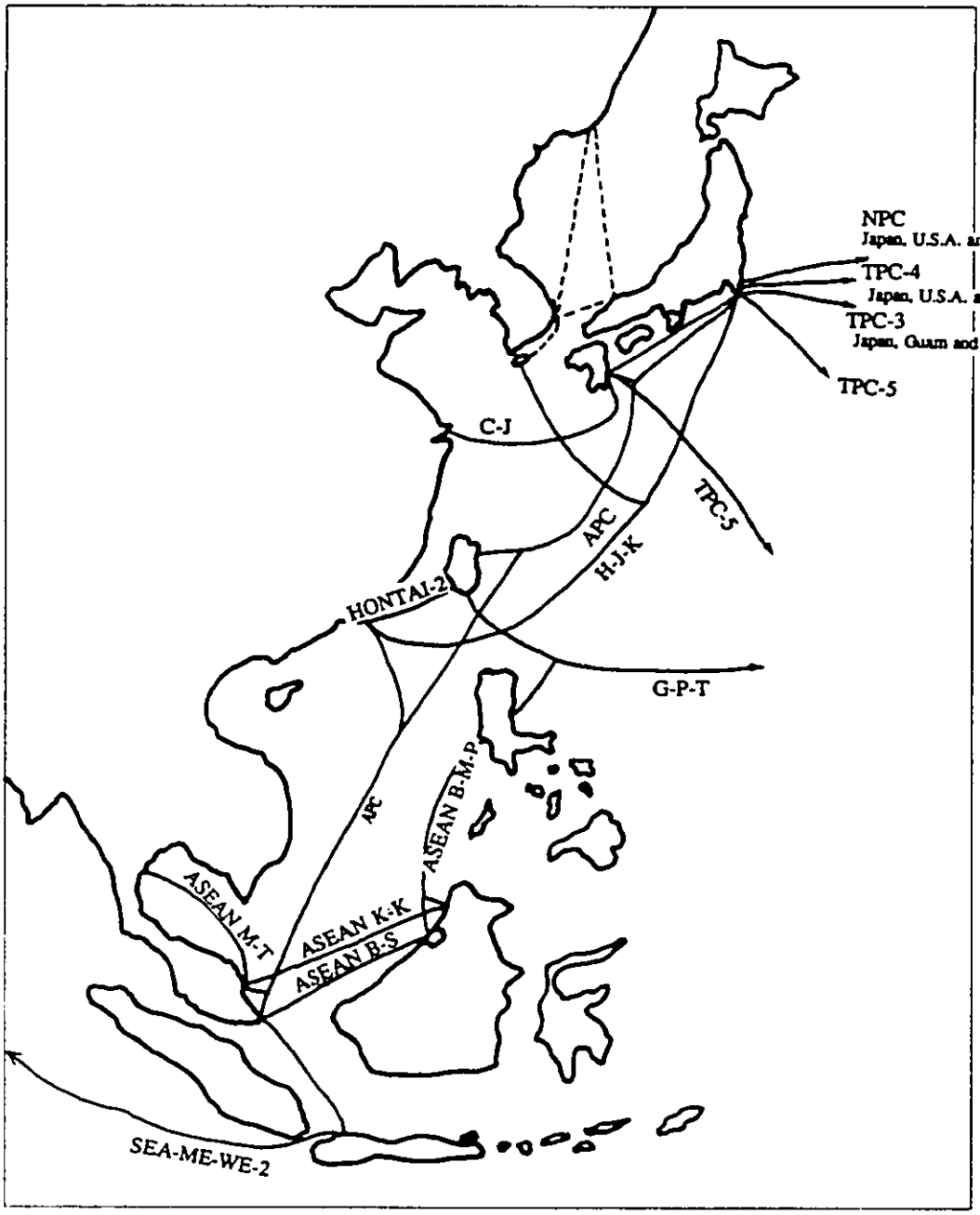
CURRENT STATUS OF TELECOMMUNICATIONS INFRASTRUCTURE IN NORTHEAST ASIA: THE MISSING LINK

International Links and Gateways.

International submarine cable networks.

The 'Missing Link'[14] might be the best term for international telecommunications networks in terms of submarine fiber optic cable networks in Northeast Asia. As Map 11.3 shows, there are diversified submarine cables to interconnect large cities in East Asia. Nothing, however, can be found in the Northeast Asian Region.

The situation can be improved if the long projected TSL (Trans-Siberian Line) can be successfully constructed and put into a full operation by 1995. TSL consists of four segment networks (Map 11.4): Seg. I—submarine cables between Copenhagen in Denmark and Petersburg of Russia and terrestrial networks between Petersburg and Moscow; Seg. II—both submarine cables and terrestrial networks linking Italy and Moscow; Seg. III—terrestrial networks from Moscow to Nakhodka on the Pacific;



Map 11.3 Submarine fiber optic cables in East Asia

and Seg. IV—one submarine cable from Nakhodka to Pusan in South Korea, and another cable from Nakhodka to Japan. The total length of the TSL is around 14,000 km, and it is estimated to cost around $500 million in total. TSL, if it is successfully completed, can be connected to the H—J—K (Hong Kong—Japan—Korea) line, thus enabling calls from Europe even to Southeast Asian Region via TSL and H—J—K. Russia can be connected to the United States and Canada via NPC or TPC—4 from

Japan. Then the Northeast Asian Region can serve as a real bridge connecting Europe and the Asian—Pacific Region.

The TSL Project began to be discussed in the late 80s and early 90s. Basic agreement on TSL was made in 1990, and it was scheduled to be completed by 1995. The COCOM regulation, however, prevented the construction of fiber optic cables in the former Soviet Union. Because the COCOM regulation recently became much lighter than before, the TSL received a great momentum. Last month, the Russian Federation, South Korea, and Japan made a new agreement on the fourth segment of the TSL. If this segment is completed by 1995, it will be the backbone of the Northeast Asian telecommunications.

Satellite Links

This region is covered by both Intelsat's Indian Ocean Satellite and Pacific Ocean Satellite. Accordingly, the Intelsat earth stations are most widely used for international telecommunications via Intelsat's satellites. Presently, available stations are located in the DPRK (Pyongyang), the PRC (Beijing), South Korea, and Japan. A station is under construction in Mongolia to be commissioned next year, and an earth station will be available in Vladivostok next year.

A second satellite network is under operation mainly between the former Comecon countries via Intersputnik. Now, the Intersputnik earth station is available in Mongolia and DPRK.

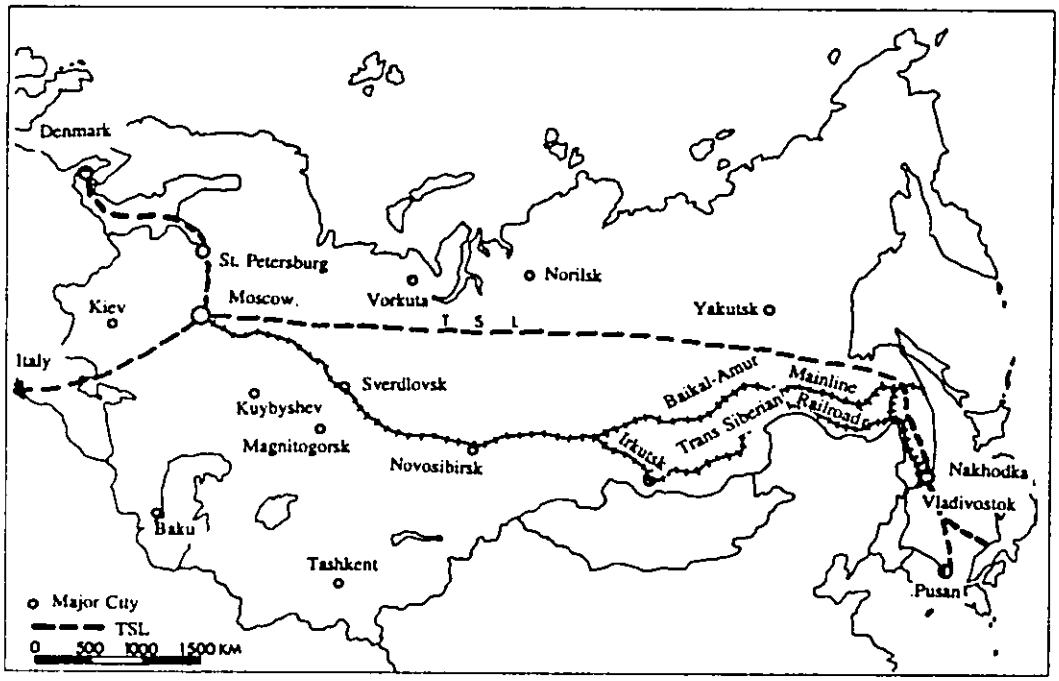
Regional satellites are also available in this region. Asiasat I was launched in 1990, whose footprint was planned to cover most of the Northeast Asian Region. In the present context, the Asiasat system provides some links between Ulan—Bator and Beijing. When Asiasat II becomes available, this system will be used to provide advanced telecommunications services within Mongolia and within the PRC. Existing Japanese satellites cover much of the region, and Koreasat which will be launched in 1995 will also cover a part of that region. Therefore, a more diversified network can be formed in the near future.

Local Telecommunications Networks

Lack of data on telecommunications in each country in this region makes it hard to understand the situation. But roughly speaking, countries in this region can be classified into two groups in terms of the telephone penetration ratio and the telecommunications facilities and equipment. In this respect, Japan and the ROK may be the forerunners, and other countries like the PRC, the DPRK, Mongolia, and the Russian Federation may be relatively lagging behind.

Japan is one of the most advanced countries in the world in the telecommunications sector, and the ROK's total number of telephone lines amount to more than 17 million, thus ranking ninth in the world. However, considering particularly the regional cooperation, the relatively poor telecommunications condition of the other four countries' frontier regions can be an obstacle.

The PRC's national total number of telephones amounts to 12.7 million, and the number of telephones per 100 persons is around 1.1. More than 80 percent of the total telephones are for urban use, while only 19.4 percent of the total telephones are in



Map 11.4 Trans-Siberian line project

rural areas where 50 percent of the population still live.[15] The urban—rural gap is more severe in the three northeastern provinces in PRC which can be seen as part of the Northeast Asian Region. Only Jilin Province's rural telephone penetration rate is slightly above the national average level, but Liaoning and Heilongjiang Provinces' rates are far below the average, 14.6 percent and 11.9 percent respectively as of 1990. This phenomenon can be found anywhere in the region except the ROK and Japan. This means that there are two levels of missing links in this region: one on the international level between developed and underdeveloped countries, and the other on the national level between urban and rural areas.

The Russian Federation is reported to have 21.2 million telephones in total, and the number of telephones per 100 persons is 13. But the situation in the Far East seems to be much worse than this figure implies. For example, it is reported that there are 68,000 telephones in Vladivostok, and 20.3 of every 100 households in Vladivostok have a telephone, which means 4 or 5 telephones per 100 persons. This figure may not tell the whole story of the telecommunications status in this area, but in terms of the quality of telecommunications, present services, it is reported, cannot satisfy the requests from the business and industrial circles. However, international telephone services will soon be improved since an international telecommunications project to build an Intelsat A earth station in this area is being undertaken in cooperation with KDD and other Japanese experts.

Telecommunications facilities and networks in the Rajin—Sonbong area of the DPRK seem not to be in a good condition either. There are reportedly around 5,000 telephone lines in the Rajin—Sonbong Free Economic and Trade Zone where 131,000 persons reside. If so, then the number of telephone lines per 100 persons is

around 3.8. The DPRK government planned to construct a fiber optic network in this area, but the Pyongyang International Telecommunications Center will remain as the only international gateway. It is reported that the DPRK will increase the international telephone lines to 120 and the electronic telephone exchange capacity up to 50,000 in the first phase of the Rajin—Sonbong Area Development Plan.

Generally speaking, telecommunications seems not to have drawn much attention in these areas. Sometimes, even when its importance has been fully appreciated, it might have been left underdeveloped due to lack of financial resources. If little concern is still placed on the telecommunications sector in the national economic development plan and the regional cooperation project in Northeast Asia, expected results will not be produced. As the present society becomes more dependent on information and telecommunications, its importance will increase further in the near future at a higher speed than as is today.

MAJOR ISSUES IN TELECOMMUNICATIONS FOR THE SUCCESSFUL TRADP[16]

Mixed Demand for Basic and Advanced Telecommunications Services

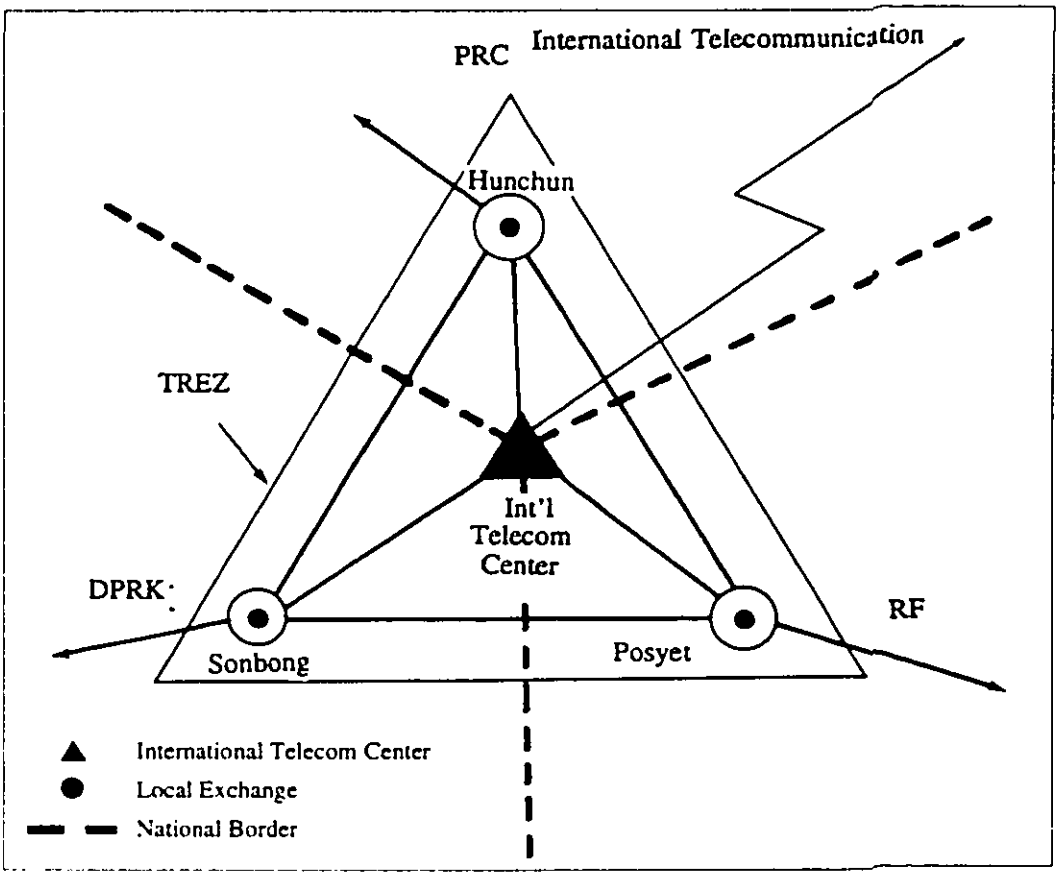
As discussed in the previous section, the status of telecommunications in Northeast Asia except for Japan and the ROK is far below the global level. Even the most basic telecommunications services seem not to be properly provided. What adds to this is that there will also be a rise, though not much, in demand for much advanced telecommunications services such as data communications, high speed transmission services, and mobile services, particularly from the business side. Availability of those services will have much effect on the firms' locational decisions.

If the aim of TRADP includes construction of industrial estates in any forms, invitation of more foreign firms to this area by providing favorable conditions for them, and building of a new international city there, then the demand for advanced telecommunications services mainly from the business circle must be met, even though partially. Therefore, due consideration has to be made from the beginning stage concerning this mixed demand for telecommunications services.

Three Levels of Linkage

If TRADP is to be really successful, three levels of efficient linkage by telecommunications must be assured: international, national, and local. If TREZ induces foreign firms and capital, and if production in TREZ targets foreign markets, then linkage with major foreign centers through an efficient international telecommunications means is required. However, currently no international gateways are available around TREZ, and every international call has to go out through its respective gateway (i.e., a call from TREZ via Pyongyang, or Beijing, or Moscow), which is a very inefficient system. Therefore, it would be better to construct a separate international telecommunications center within TREZ which can be commonly used by everyone within TREZ wherever he may be located. Various cases of teleport which we briefly examined before would give a suitable idea. This would be very critical when banking, insurance, hotels, and other service industries decide about moving into TREZ.

Figure 11.1 Simplified telecommunications network in TREZ



At the national level, the effect of TREZ on each riparian ('near a river') country's economy would be great when activities in TREZ are properly linked with each riparian country. If TREZ exists as an island without any linkage with the national economy, the positive domestic effect will be minimal. Thus, a telecommunications network from TREZ to each hinterland and all major national centers should be assured.

At the local level, TREZ will obtain highest vitality when all parts of the three riparian countries comprising TREZ have to be easily linked. Since specialization, complementarity, and integration are the key ideas in forming TREZ, it will fail without efficient linkage among three national parts. Speaking in terms of telephone services, a call between two national parts within TREZ has to be made as a local call rather than as an international call. If the present system remains as it is today even after the birth of TREZ, a call between Sonbong and Hunchun, for example, will be an international call via Pyongyang and Beijing in spite of their geographical proximity and functional complementarity.

Figure 11.1 is a simplified ideal diagram showing the above relationships. In the diagram, TREZ forms in itself a separate local call area as well as a separate international call area. Everyone in the TREZ, wherever he may be, can commonly use the international telecommunications center as a gateway to make an international

call, and can directly contact everyone within the zone for a local call charge. There are also three local exchanges to link TREZ with the hinterland and major national centers. There must be an independent body or an elaborate agreement among three riparian countries in order to manage this telecommunications system efficiently.

Need-Oriented Strategic Plan

Recently, telecommunications needs have tended to be diversified as telecommunications technology develops rapidly. These needs are very widely diversified and the life cycle of a specific service is too short. This trend will be more powerful in the future. Therefore, the best way to use the limited resources most efficiently is to make a need-oriented strategic plan. For this, we have to know the future as well as present demand for telecommunications services, which is not very easy. To have information on what kind of industries will move into this zone would be very helpful to make this kind of strategic plan. At the same time, this requires a close cooperation among experts in the different sectors.

Financial Resources

If a plan is to be successfully implemented, it has to be financially well-supported. Telecommunications, in particular, has long been regarded as a business operated by the state, or a natural monopoly in the telecommunications business has been allowed. If this system is to be maintained within TREZ, mobilization of financial resources will be of a great importance.

Operation and Regulation

On the other hand, if the telecommunications business fails in the private sector in which foreign direct investment is allowed, there will arise the issue of operation and regulation including tariff. Whether more companies will be allowed to enter into the existing services market, whether intervention into the tariff decision process is to be made, and so on will be important issues. Since the condition of operation and regulation will influence the decision of foreign companies on investment, they also have to be considered at the inception stage.

Human Resources Development

Human resources development is also a very important issue that needs to be touched upon without any delay. Exchange of manpower will be the most useful method, and this can be done within the Northeast Asian Region.

Standardization

The most serious problem in telecommunications may arise in the interface among two or more different kinds of equipment. If the effort for standardization is not made early, this problem will be magnified greatly.

NOTES

1. Janssen and van Hoogstraten (p. 52) saw the telecommunications infrastructure as the 'New Infrastructure' of the information society and one of the crucial factors for regional development. In the same way, the British Department of Trade and Industry (1988) emphasized the importance of telecommunications in the future British economy by calling it 'the infrastructure of tomorrow.'

2. General review of past analyses can be found in Wellenius (1984).
3. This summary is based on the studies mainly done for less developed areas in Europe.
4. Cf. Bar and Borrus, pp. 17—35.
5. Cf. Commission of EC (1991: 4).
6. Cf. Lalor, p. 116.
7. Commission of EC had already requested experts and academicians to do a massive study on the development gap between regions within Community and on the potential effect of information and telecommunications technology on the underdeveloped regions. This requested study commenced in early 1982, and finished in late 1983. Cf. Gillespie and others (1984).
8. Cf. Commission of EC (1992).
9. Cf. NTIA (1987: 7).
10. There is also a possibility that a teleport will be based on the fiber optic submarine cables if they interconnect most of the large cities in the world. Cf. S. Lee, "Development of Teleports in the World."
11. Cf. Engel, p. 48.
12. Taiwan is going to apply the teleport concept in its development of the Hsinchu Science Industry Park. Cf. Tsai and Lin.
13. Cf. Bambang and Bambang.
14. This term was coined by ITU (International Telecommunications Union) in the early 1980s to express the poor telecommunications status in developing countries, and to draw more attention from all around the world to it.
15. This dualism of telecommunications is one of the main obstacles to national development. Cf. P. Lee, "Dualism of Communications in China."
16. The following issues are not limited to TRADP. Rather, they should be considered in the regional cooperation scheme covering all of Northeast Asia.

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