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Economic Intelligence Report

POST AND TELECOMMUNICATIONS SERVICES IN NORTH VIETNAM 1955–61

CIA/RR ER 61–47

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CENTRAL INTELLIGENCE AGENCY

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FOREWORD

The broadening conflict between East and West in Southeast Asia has generated a need for a current assessment of the post and telecommunications resources of North Vietnam. Because telecommunications can play a consequential role in supporting aggressive activities, their status may reflect the current and future intentions of North Vietnam.

The preparation of this report was hampered by a general paucity of information, [redacted] Fortunately a sizable quantity of high-validity data on the operational status of numerous telecommunications networks was available, and these data have heavily influenced the content of the report. For the most part, the format, length, and treatment of the report, including the extensive use of maps, were influenced by the potential operational use to which the report may be put. 50X1

The report deals chiefly with the general post and telecommunications facilities and services of North Vietnam that are managed by the Directorate of Posts, Telephones, and Telegraphs of the Ministry of Communications, Posts, and Telecommunications (Bo Giao-thong va Buu-dien). It also considers a number of important functional telecommunications networks operated by other segments of government, such as the Ministry of National Defense (Bo Quoc-phong) and the Communist Party (Dang Lao Dong). Functional coverage of the telecommunications networks was dictated by the nature of both the purpose and the users of the limited telecommunications resource base of the country. With this coverage a more realistic appraisal of the present and future capabilities of this base can be made.

[redacted] 50X1

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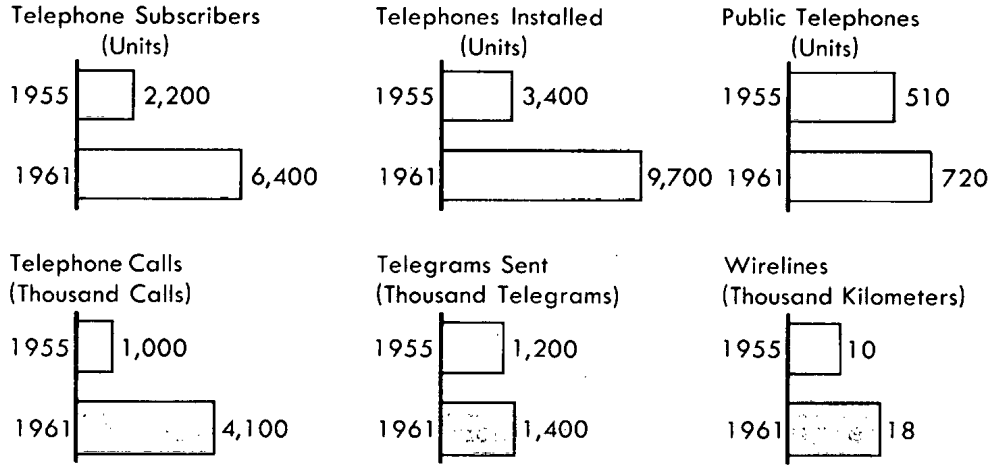
50X1

POST AND TELECOMMUNICATIONS SERVICES IN NORTH VIETNAM*
1955-61

Summary and Conclusions

The status of the general** and functional post and telecommunications resources of North Vietnam*** is in keeping with the underdeveloped status of the country. Nevertheless, notable success has been achieved since 1955 in rehabilitating and enlarging the remnants of these resources, which had been virtually destroyed by the French-Indochinese War. The resources now meet minimal needs of the country. The rehabilitation and enlargement of the resources were guided by two plans: the Economic Recovery Plan (1955-57) and the Three Year Plan (1958-60). The new Five Year Plan (1961-65) indicates intentions to improve the quality, reliability, and availability of post and telecommunications services.

Statistical measures of the development and present status of major telecommunications services and facilities are given below:



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* The estimates and conclusions in this report represent the best judgment of this Office as of 15 October 1961. For a glossary of technical terms, see Appendix A.

** The term general in this report refers to the facilities and services controlled, operated, and maintained [footnotes continued on p. 2]

The average annual rate of growth during 1956-61 for the services and facilities shown above, for the most part, has been impressive, approximating 19 percent for telephones installed, 19 percent for telephone subscribers, 6 percent for public telephones, 27 percent for telephone calls, 3 percent for telegrams sent, and 10 percent for length of telephone and telegraph wirelines. During 1955-61 the total investment in transportation and communications was about 700 million dong,* or about 23 percent of the total of 3.1 billion dong invested in the economy. The share of post and telecommunications in this investment, although unknown, was sufficient to permit a steady rate of growth during the period.

During 1956-61, much technical and material assistance has been received from other countries of the Sino-Soviet Bloc, especially the USSR, Communist China, and East Germany. This aid, indispensable for developmental purposes, facilitated reconstruction of wireline, broadcasting, and telephone facilities in 1955-57 and their subsequent enlargement in 1958-60.

North Vietnam is a member of Sino-Soviet Bloc organizations such as the Organization for Cooperation Among Socialist Countries in the Fields of Post and Communications (OSS) and the International Radiobroadcasting and Television Organization (OIRT), which devise plans for integrating, standardizing, and expanding post and telecommunications facilities and services in and among countries of the Bloc. Although North Vietnam thus far has not played an important role in the workings of these organizations, it likely will try to adhere closely to programs set forth by OSS, at least for postal communications.

In spite of improvements since 1955, the coverage and operating efficiency of the general and functional facilities in North Vietnam are still very low. Their performance suffers from the use of obsolete, manual equipment and from a shortage of skilled technical personnel. The Five Year Plan is intended to overcome these defects. To achieve these aims, however, continued large-scale assistance from the Sino-Soviet Bloc will be required.

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by the Directorate of Posts, Telephones, and Telegraphs of the Ministry of Communications, Posts, and Telecommunications.
*** Viet Nam Dan Chu Cong Hoa (Vietnam Democratic Republic -- commonly known as the DRV).

* Dong values in this report are given in current dong and may be converted to US dollars at the rate of exchange of 4 dong to US $1. This rate does not necessarily reflect the value of the dong in terms of dollars.

I. Introduction

The area of North Vietnam is about 159,000 square kilometers (km), or about the same size as the state of Washington. Narrowing from a width of about 480 km in the north to about 50 km in the south, most of the country is mountainous or hilly, with only about 12 percent of the total land mass suitable for permanent cultivation. This arable land consists of the Red River Delta and the coastal plains extending northeast and south from the Delta. Known as the "rice bowl" of North Vietnam, this area is densely settled and intensively cultivated. Of an estimated midyear population in 1960 of 16 million, 80 percent are concentrated in this general area, which, with a population density of 580 persons per square km, is one of the most thickly populated regions of the world.

The economy of North Vietnam is mainly agricultural. Nevertheless, some industrial growth has taken place in recent years and is expected to continue during the Five Year Plan period (1961-65). During 1956-60 the gross national product (GNP) of North Vietnam increased at an average annual rate of about 11 percent and by 1960 was about three-fourths that of South Vietnam. This impressive rate of growth was achieved mainly through large amounts of technical and material assistance received from the Sino-Soviet Bloc. The total economic aid from the Bloc made available to North Vietnam thus far has totaled about US $520 million, Communist China and the USSR having supplied the major part. 1/*

In recognition of the importance to economic growth of such basic service sectors as transportation and telecommunications, North Vietnam soon after partition pushed their development, and the high rate of economic growth achieved during 1955-60 is a partial reflection of the effectiveness of these efforts. The telecommunications sector grew rapidly and thus provided rapid means for controlling and coordinating the whole economy.

II. Directorate of Posts, Telephones, and Telegraphs

A. Organization

The general post and telecommunications facilities in North Vietnam are owned by the state and managed by the Ministry of Communications, Posts, and Telecommunications (Bo Giao-thong va Buu-dien).**

[redacted] 50X1

** The communications sector of the Ministry is concerned essentially with transportation.

The Ministry exercises this responsibility through its subordinate organ, the Directorate of Posts, Telephones, and Telegraphs (DPTT), which directly administers and operates all general facilities and services.

The organizational structure of the DPTT is shown in the chart, Figure 1.* Basically an operational unit under the Ministry, the DPTT has few administrative and staff responsibilities. These functions are mainly handled at the ministerial level, where coordination of the activities of the various other directorates of the Ministry takes place.

Phan Trong Tue, a major general in the Army and a member of the Central Committee of the Communist Party (Dang Lao Dong), has been Minister of Communications, Posts, and Telecommunications since July 1960. He replaced Nguyen Van Tran, who had been Minister since 1956. As Minister, Trong Tue is believed to exercise little control over operational activities but rather concerns himself with administering the various subordinate branches of the Ministry. Assisting him in this function are three vice-ministers, Duong Bach Lien, Hong Thuc Tan, and Tran Quang Binh. Of these officials, Tran Quang Binh probably deals mainly with post and telecommunications, for he was Director General of the DPTT before assuming his present position in July 1960.

Control of operational post and telecommunications activities rests with the Director General of the DPTT, who is believed to be Ngo Huy Van. In running the DPTT, Ngo Huy Van is aided by a Deputy Director General and by the chiefs of the Postal Bureau and the Telecommunications Bureau. These bureaus exercise nationwide control over their respective activities through provincial and district offices.

Responsibility for broadcasting facilities and services is obscured by overlapping relationships among several entities of the government. The DPTT probably operates and maintains all radiobroadcasting facilities, whereas administrative responsibility for directing the broadcasting effort of the country is believed to rest with the Radio Diffusion Board of the Office of the President. Control of the wire diffusion network, however, is centered in the Ministry of Culture. The Propaganda and Training Section of the Central Committee of the Dang Lao Dong, by virtue of its authority to prepare and approve all programs for broadcasting, sets over-all policy on broadcasting and is by far the most decisive force in the field of broadcasting. 2/

The Ministry of Communications, Posts, and Telecommunications represents the country in its dealings with Bloc-wide organizations,

* Following p. 4.

such as the Organization for Cooperation Among Socialist Countries in the Fields of Post and Communications (OSS) and the International Radiobroadcasting and Television Organization (OIRT). These organizations, of which North Vietnam is a full member, were formed to direct action to integrate, standardize, and expand post and telecommunications services in and among Bloc countries.*

Because of its meager financial, technical, and material resources for post and telecommunications, North Vietnam has not contributed significantly to the work of these bodies. In 1957 it was reported that a multiconductor cable was to be laid from Moscow to Hanoi via Mongolia and Communist China as part of the OSS program, but there has been no evidence to suggest that this project has been accomplished. North Vietnam probably will adhere to programs set forth by OSS, at least for postal communications. These programs, not requiring large amounts of investment funds, fall within the financial capability of the country.

B. Revenue and Investment

Revenue series for the post and telecommunications sector in North Vietnam cannot be computed from the data available. Revenues for 1955-61, however, are believed to have been sufficient to defray operating expenses but insufficient to finance capital investment. For the most part, construction of new facilities has been tied directly to large-scale development projects undertaken by countries of the Sino-Soviet Bloc, particularly the USSR, Communist China, and East Germany.

Data on investment, appearing only as totals for transportation and communications combined, cannot be separated in any way to permit their use. The total investments for transportation and communications, as shown in Table 1,** increased from 88 million dong in 1955 to 150 million dong in 1961, or about 70 percent. For the entire period, investment in transport and communications totaled about 700 million dong, or about 23 percent of the total of 3.1 billion dong invested in the economy.

The French-Indochinese War devastated much of the transportation and communications resources of North Vietnam, and plans for the general development of the economy required priority attention for their restoration. The percentage relationship of transportation and communications investment to total state investment, also shown in Table 1, points up this fact. For the entire period 1955-61, transportation and communications investment was about 23 percent of the

50X1

** Table 1 follows on p. 6.

Table 1

Estimated Investment in Transportation and Communications
in North Vietnam
1955-61

Year	Budgeted State Investment a/ (Million Dong)	Transportation and Communications Investment b/ (Million Dong)	As a Percent of Budgeted State Investment
1955	140	88	63
1956	260	88	34
1957	251	60	24
1958	314	72	23
1959	494	109	22
1960	716	136	19
1961	880 c/	150 c/	17 c/

50X1

c. Extrapolated by using graphic analysis.

total investment. The proportion varied, however, averaging about 36 percent during the period of the Economic Recovery Plan (1955-57) and about 19 percent during 1958-61. In spite of the percentage decrease for 1958-61 compared with 1955-57, investment in these two sectors increased in absolute terms throughout the period.

Investment in the post and telecommunications sector in any event has been sufficient to have facilitated the restoration of facilities and services to their prewar levels by the end of 1957 and, since that time, to permit continuous enlargement. Continued growth in investment is expected during the remaining 4 years of the current Five Year Plan because increased demands of the economy on this sector will require additional investment to finance the construction of new facilities.

C. Manpower and Training

Since 1955 the number and quality of the employees in post and telecommunications in North Vietnam has risen. This trend reflects the vigorous efforts made to restore full functioning of the sector during 1955-57 and then to expand it during the following Three Year Plan (1958-60).

Figure 1

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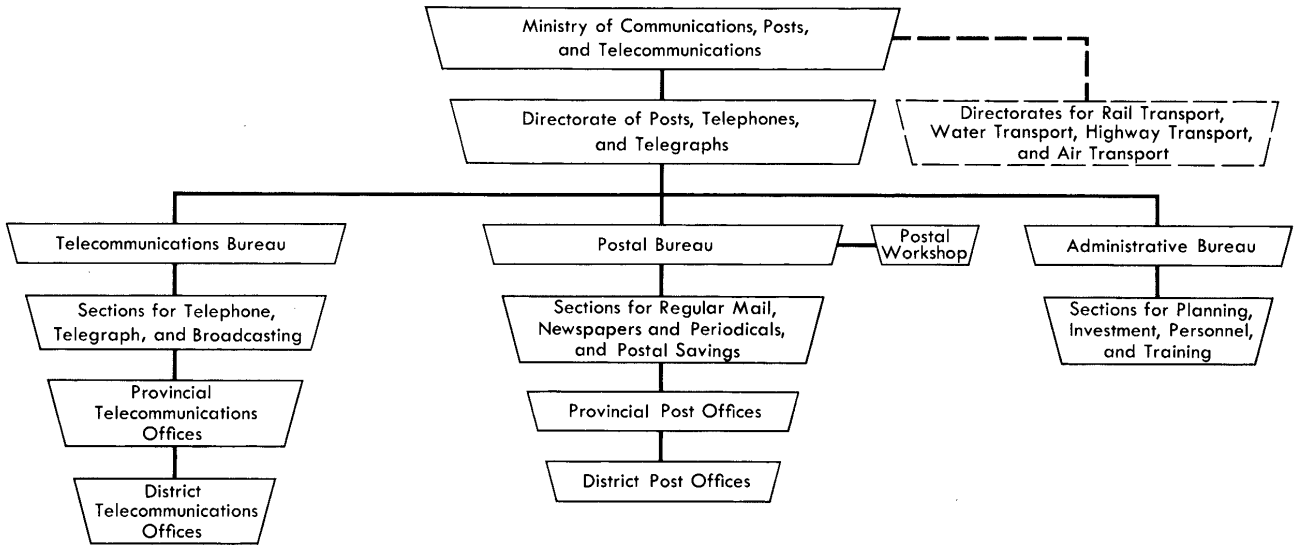
North Vietnam

ORGANIZATION OF THE DIRECTORATE OF POSTS, TELEPHONES, AND TELEGRAPHS, 1961

Ministry of Communications, Posts, and Telecommunications



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Available information lumps workers in post and telecommunications with those in transportation, the combined figure in 1960 reaching about 102,000 workers. The portion for the DPTT probably was sufficient in quantity but insufficient in technical skills. Shortage of skilled workers appears to be common to all sectors of the economy. Shortage of technical personnel and inadequate use of automatic and semiautomatic equipment probably have minimized gains in labor productivity of the post and telecommunications sector and thus in the average yearly wage.

To meet needs for skilled personnel, the DPTT since 1955 has increased its training facilities. In addition to establishing a number of technical schools operated by regional departments, such as those at Hanoi and Ha Dong, specialized programs combining formal and on-the-job training in the fields of broadcasting, telegraphy, land-line design, and carrier frequency techniques also have been initiated. For these programs the limited number of qualified North Vietnamese instructors has been supplemented by technical advisors from the Sino-Soviet Bloc.

In spite of gains during 1955-61 from these added training efforts, a gap between supply and demand continues. To offset this imbalance, especially for technicians for the maintenance of old equipment and the installation of modern facilities, the DPTT is leaning heavily on technicians from the Sino-Soviet Bloc, especially from the USSR, Communist China, and East Germany. Adjunctly a selected number of workers are being sent to other countries of the Bloc for technical training. In 1956, for example, more than 400 communications workers visited installations or attended training courses in countries of the Bloc.

Introduction of modern equipment during 1961-65, even if only to a limited extent, will require higher levels of technological competence. Thus domestic training programs, supplemented by technicians and training facilities of the Sino-Soviet Bloc, should continue to expand throughout the period.

D. Equipment

Other than the telephone apparatus plant at Vinh, North Vietnam has no facilities for producing telecommunications equipment. Needs for equipment are being met through imports from the Sino-Soviet Bloc, but negotiations have been underway for importations from Japan.

Telecommunications equipment imported from the Sino-Soviet Bloc includes telephone exchange and point-to-point radio equipment from East Germany; shortwave radiobroadcasting and carrier frequency

telephone equipment from Hungary; medium-wave radiobroadcasting transmitters, telephone exchanges, and teletype equipment from Communist China; and wire diffusion broadcasting equipment from the USSR. The eventual introduction of microwave radio relay communications may entail the importation of Hungarian PM24/A equipment,* for which contact discussions have been underway since early in 1959.

Planned expansion in this sector will require the importation of equipment from the Sino-Soviet Bloc to remain at a high level. Additional domestic productive facilities probably will be developed during the period of the Five Year Plan, but their output will fall far short of minimal needs.

III. Postal Services

The postal system of North Vietnam, consisting of a nationwide network of main post offices, sub-post offices, and postal stations, provides for the needs of the government and the public. In view of the underdeveloped status and the limited capability of the telephone and telegraph system, the postal system is the main means of communication open to the public. In addition to offering regular mail service, including the delivery of letters, post cards, packages, newspapers, and periodicals, the postal system also provides such services as money orders, postal savings, and telegram delivery. Moreover, most of the main post offices provide telephone and telegraph services for the public.

The central authorities make announcements periodically on postal activities, but for the most part these announcements contain only fragmentary and often enigmatic information. The data, however, do show consistently that newspapers and periodicals form the major portion of the total postal volume. This volume has grown steadily since 1955, and by 1960 more than 53 million units of such matter reportedly were handled by the system. Growth in this circulation of newspapers and periodicals, the content of which is mainly determined by the central government, is indicative of the intent of North Vietnam to extend its domestic propaganda activities through the control and use of written as well as oral media of mass communications. 6/

International postal service is available to all countries of the Sino-Soviet Bloc as well as to those countries of the Free World having postal relations with Communist China. Recently, postal service was initiated with the rebel government of Laos, located at Xieng Khouang. Postal service between North and South Vietnam is limited essentially to five-line postal cards. During 1958-60, about 1.2 million cards

* See the second footnote on p. 14, below.

were exchanged, with 800,000, or about 67 percent, coming from North Vietnam. In recent years the DPTT has pushed vigorously for the "normalization" of postal relations between the two countries, requesting that the service be broadened to include letters and other postal materials. Viewing these efforts as part of an over-all program to facilitate the dissemination of propagandistic and subversive materials within its borders, South Vietnam has steadfastly refused to broaden the service. 7/

The postal system of North Vietnam, as is typical of postal systems in most other underdeveloped countries, provides slow and inefficient service. These defects stem primarily from too few post offices, the limited use of mechanized postal transport, and the almost complete absence of automatic and semiautomatic equipment for the handling and processing of mail.

Since 1955, service has improved somewhat. Postal routes have been extended, and distribution of mail has been hastened, reflecting improvements in the systems of transport themselves. The construction of new postal facilities, including about 350 postal stations in 1959 and about 64 main post offices and 180 postal stations in 1960, has resulted in more timely service to rural areas. In October 1958, domestic airmail service was initiated. This service, however, is mostly confined to handling mail between North and South Vietnam. 8/

The Five Year Plan gives attention to better postal service. Postal routes will be extended, new post offices will be constructed, and mechanized techniques will be introduced on a wider scale. During this period it is expected that OSS programs for the standardization and mechanization of postal service in the Sino-Soviet Bloc will have some impact on the development of the system in North Vietnam.

IV. Telephone and Telegraph Services and Facilities

The general telephone and telegraph system of North Vietnam is managed by the DPTT. Services, nationwide in coverage, are provided by wireline and point-to-point radio facilities. Although backward by modern technical standards, they meet the needs of the country at its present level of economic development.

A. Telephone

As small as it is, the telephone system of North Vietnam provides adequate domestic and international service. Growth in service during 1955-61 is shown in the chart, Figure 2.* During 1956-61,

* Following p. 10.

telephone sets and telephone subscribers increased at the rapid average annual rate of about 19 percent, a rate somewhat typical of backward countries in the early stages of development.

The low proportion of telephones located in DPTT offices suggests the meagerness of service available to the general public. Yet public service probably is adequate for the very low standard of living and the almost prohibitive telephone rate scale. 9/

During 1956-61 the average annual rate of growth in the number of telephone calls was very high, about 27 percent. A steep, unexplainable dip in the number of calls occurred during 1957 and 1958. Growth in the number of telegrams sent of only a little more than 3 percent per year during the same 5-year period indicates the higher priority given to the development of the telephone system.

Telephone subscribers are served by about 40 telephone exchanges operated by the DPTT. 10/ The largest of these, as shown on the map, Figure 3,* are located at Hanoi, Haiphong, and Nam Dinh. Together they account for almost one-half of the total telephone exchange capacity of the country. Installed by East Germany in 1957, the automatic exchange at Hanoi has a capacity of 3,000 lines. The East Germans also installed the manual 700-line exchange at Haiphong, and the manual 300-line exchange at Nam Dinh was installed by Communist China. The map, Figure 4,* shows the distribution of telephone subscribers by administrative area. 11/

Gains in the quality and quantity of telephone service are expected during 1961-65. The installation of additional semiautomatic and automatic exchanges probably will further improve both local and interurban service. Telephone service to rural areas, now very limited, also is expected to improve.

B. Telegraph

The telegraph network of North Vietnam provides regular nationwide telegraph service to state and private users. Specialized telegraphic services, such as facsimile and subscriber telegraph (TELEX), do not exist today, and none is expected to be established in the near future.

Growth in telegraph service during 1955-61, as shown in the chart, Figure 2,* was unimpressive. Service increased at an average annual rate of only about 3 percent during 1956-61. The volume of service increased about 21 percent from 1955 to 1957 but then began to

* Following p. 10.

Figure 2

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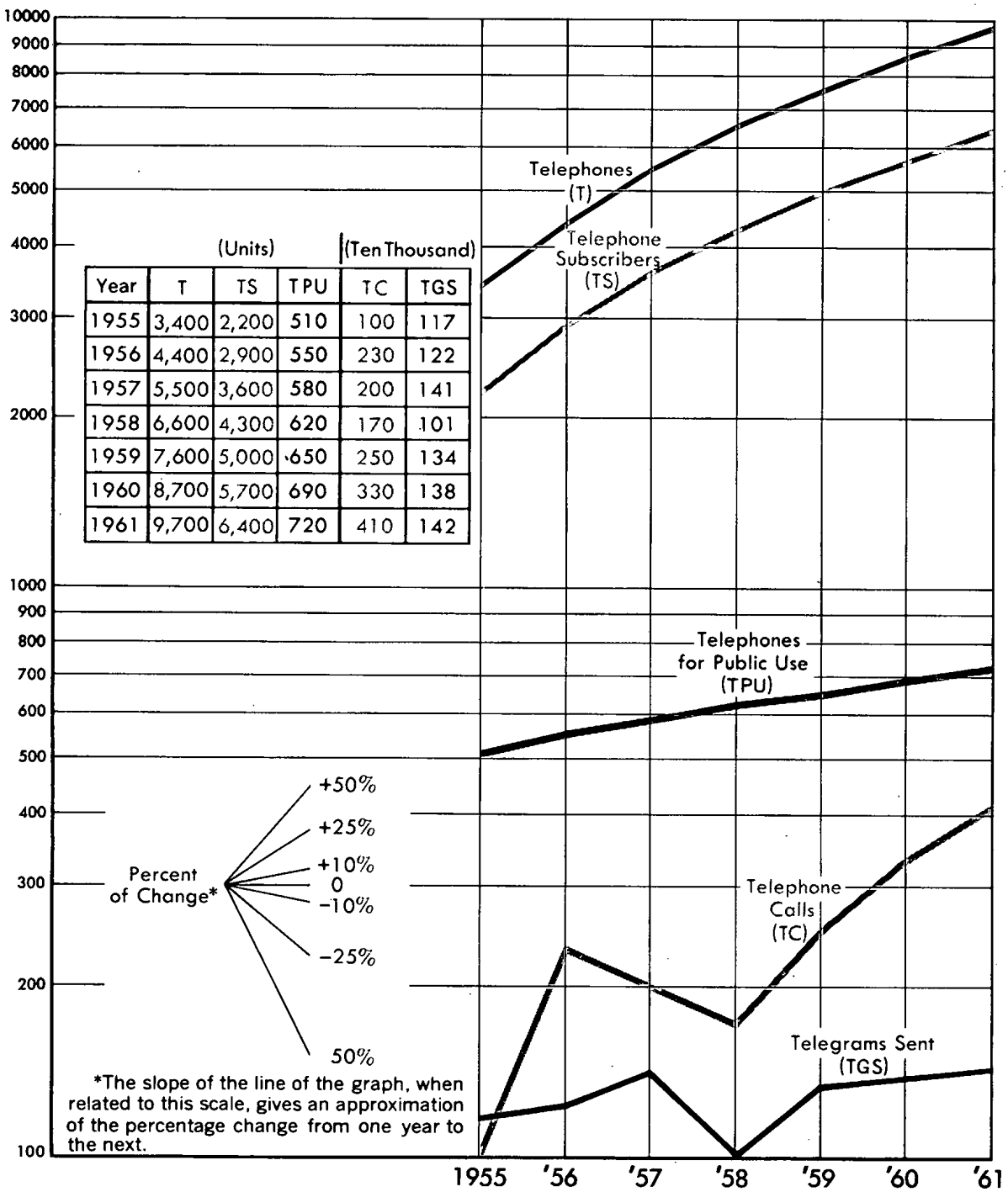
North Vietnam
Estimated Growth of Telephone and Telegraph Services
1955–61



Year	T (Units)	TS (Units)	TPU (Units)	TC (Ten Thousand)	TGS (Ten Thousand)
1955	3,400	2,200	510	100	117
1956	4,400	2,900	550	230	122
1957	5,500	3,600	580	200	141
1958	6,600	4,300	620	170	101
1959	7,600	5,000	650	250	134
1960	8,700	5,700	690	330	138
1961	9,700	6,400	720	410	142

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50X1

50X1

Figure 3

DETAILED INFORMATION FOR FACILITIES IN FIGURE 3

City Name	Coordinates North	Coordinates East	Number of Lines in Operation
Bac Kan	22–09	105–50	20
Bac Ninh	21–11	106–03	30
Bai Chay	20–58	107–03	13
Ben Thuy	18–38	105–43	10
Cao Bang	22–40	106–15	17
Dong Hoi	17–28	106–37	29
Ha Dong	20–58	105–46	45
Ha Giang	22–50	104–58	10
Hai Duong	20–56	106–19	75
Haiphong	20–51	106–41	330
Hanoi	21–02	105–50	1050
Ha Tinh	18–22	105–54	30
Hoa Binh	20–50	105–20	23
Hon Gay	20–57	107–05	46
Hung Yen	20–39	106–04	23
Kien An	20–49	106–30	45
Kim Son	20–07	106–05	10
Lang Son	21–50	106–44	33
Lao Kay	22–30	103–58	37
Nam Dinh	20–25	106–10	83
Ninh Binh	20–15	105–59	29
Phuc Yen	21–14	105–42	25
Phu Lang Thuong	21–16	106–11	35
Phu Ly	20–32	105–56	57
Phu Tho	21–24	105–13	30
Son Tay	21–08	105–30	31
Thai Binh	20–27	106–20	24
Thai Nguyen	21–36	105–50	35
Thanh Hoa	19–54	105–40	52
Thuan Chau	21–27	103–42	30
Tuyen Quang	21–49	105–13	25
Vinh	18–40	105–40	80
Vinh Linh	17–03	107–01	29
Vinh Yen	21–18	105–35	11
Yen Bay	21–42	104–52	43

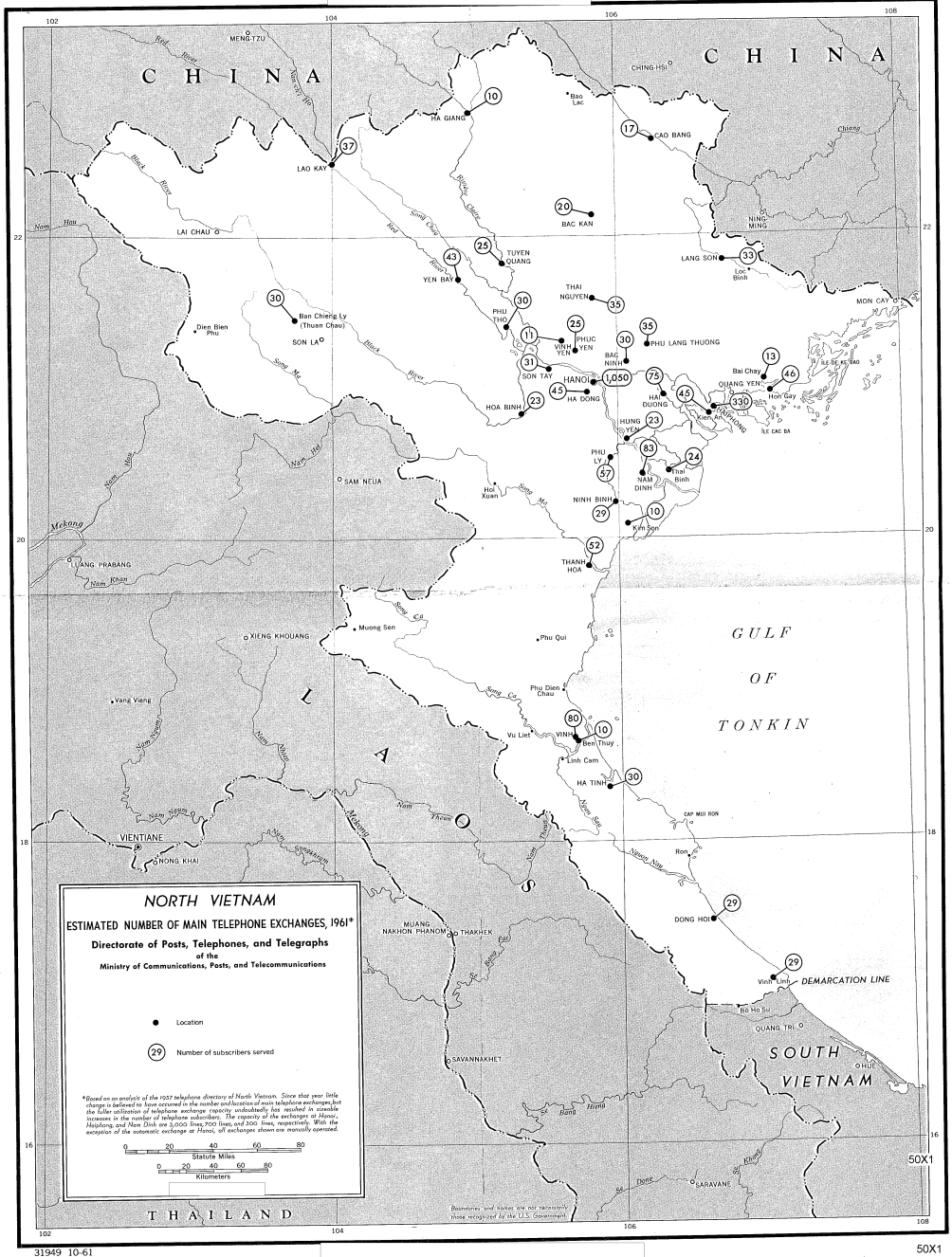

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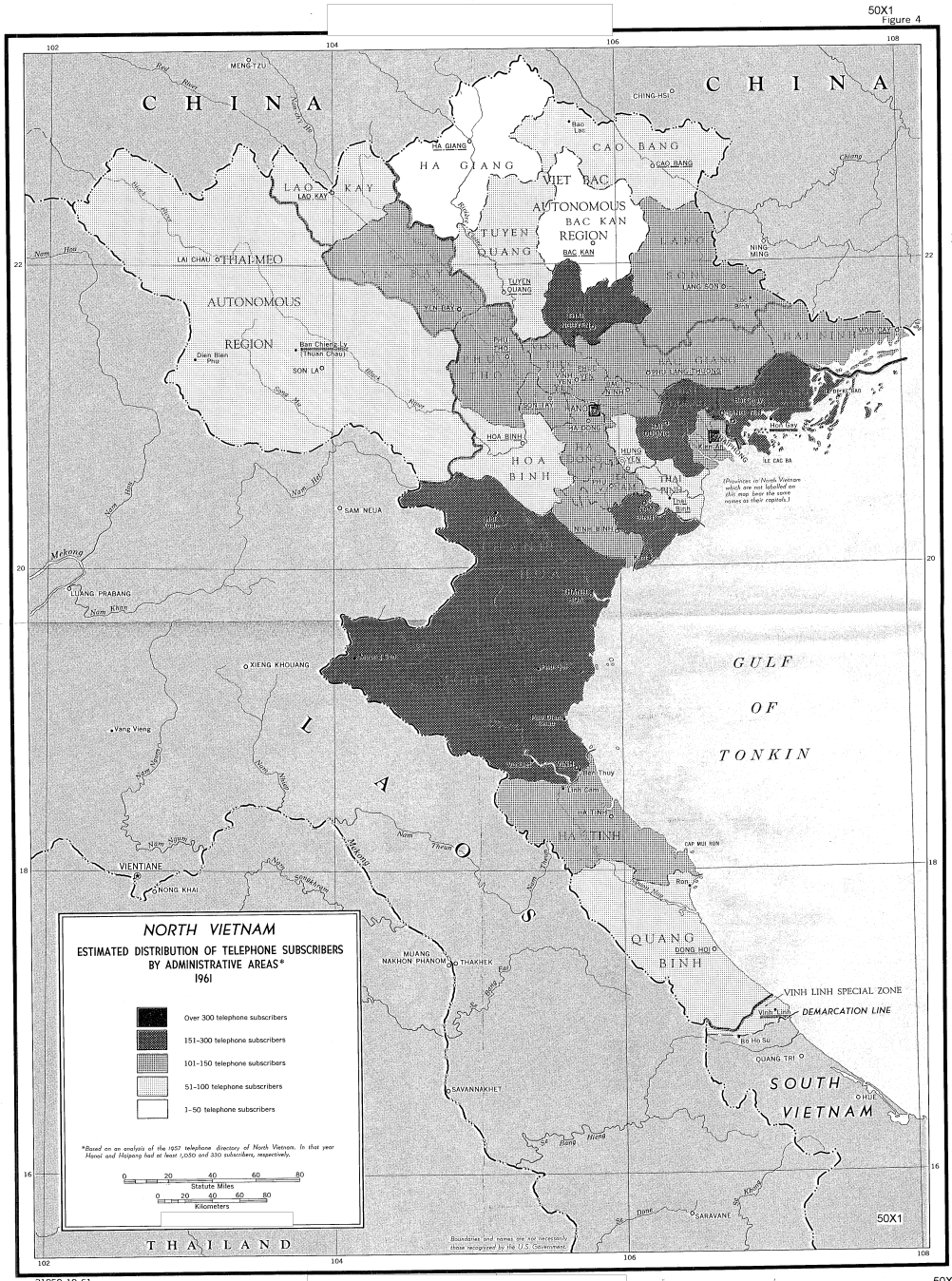
Figure 4



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decline in 1958, so that by the end of 1961 the annual figure probably will be approximately that reached in 1957. In comparison with the development of telephone service, it appears that the development of telegraph service has been relegated to minor importance.

Manual Morse equipment, too slow and inefficient for modern countries, is the dominant mode of telegraphic signaling. Small amounts of automatic Morse and teletype equipment, however, are being introduced, and it is expected that modernization of the telegraph system will continue.

C. Common Telecommunications Facilities

1. General Facilities

The common telecommunications facilities operated by the DPTT comprise only wirelines and point-to-point radio circuits. In recent years the wireline network has become the more important of the two media for carrying domestic telephone and telegraph service and has largely supplanted the point-to-point radio network, which had been dominant in the early years following the war. At present, point-to-point radio is still the principal medium both for international telecommunications service and for domestic service to remote areas not served by wirelines. Radio also is used to back up wireline facilities. Both networks will be improved during 1961-65 and probably will be supplemented with modern microwave radio relay facilities that are ideally suited for meeting growing needs in the more rugged, mountainous terrain of the country.

a. Wirelines

The general wireline network of the DPTT, as shown on the map, Figure 5,* consists mainly of telephone and telegraph open wirelines. This network serves the economic, political, and military organs of government as well as the public. Although subject to frequent interruption resulting from poor construction, use of obsolete equipment, shortages of skilled technicians, and poor climatic conditions, the wireline network probably still meets current needs.

Growth in wireline facilities in North Vietnam during 1955-61 is shown in Table 2.** By the end of 1961 it is expected that the network will comprise about 18,000 km of telephone and telegraph wirelines, an increase of about 80 percent above the 10,000 km in operation in 1955. The current status of the network reflects two

* Following p. 12.
** Table 2 follows on p. 12.

Table 2

Estimated Total Length of Telephone and Telegraph Wirelines in North Vietnam a/ 1955-61

Year	Thousand Kilometers
1955	10
1956	11
1957	11
1958	14
1959	16
1960	17 b/
1961	18 b/

50X1

b. Extrapolated by arithmetic progression from unrounded data.

developmental periods: 1955-57 and 1958-60. During the early period, major attention was given to the repair and reconstruction of the remnants of the wireline network existing at the end of the war. With that task completed, the period 1958-60 was devoted to the construction of additional wirelines in order to extend the spatial coverage of the network. The progress achieved during this 6-year period was effected chiefly by large amounts of technical and material aid rendered by Communist China. Growth in the total length of wirelines expected in 1961 anticipates continuance of this aid, which will likely set the pace of growth for the entire Five Year Plan period. 13/

Equally as significant as the expanded coverage of the network was the introduction in 1957-58 of three-channel telephone and six-channel telegraph carrier frequency equipment. Installed with the aid of Chinese Communist technicians, the application of this equipment to a number of wirelines increased significantly the capacity of the network for handling traffic and diminished the need for construction of additional lines. 14/

The general wireline network also provides international connections with Communist China and Laos. Of the several lines running to Communist China, the one crossing the border at Lao Kay, which

50X1

To accompany Figure 5 (Map 31951)

NORTH VIETNAM

DETAILED INFORMATION FOR OPEN WIRELINE NETWORK, 1961

DIRECTORATE OF POSTS, TELEPHONES, AND TELEGRAPHS

OF THE

MINISTRY OF COMMUNICATIONS, POSTS, AND TELECOMMUNICATIONS

SEE FIGURE 5, MAP 31951, FOR ALL FACILITIES SHOWN

Detailed Information for Facilities in Figure 5

Section Key	Section	Capacity		Type of Service*	
		Number of Wires**	Carrier***	Telephone	Telegraph
1	Hanoi to Ha Dong	24	X	X	X
2	Ha Dong to Luong Son	12–24	X	X	X
3	Luong Son to Hoa Binh	12	X	X	X
4	Hoa Binh to Cho Bo	7–12	X	X	X
5	Cho Bo to Suyut	3–7	X	X	X
6	Suyut to Ban Xom Lom	3–7	X	X	X
7	Ban Xom Lom to Moc Chau	3–7	X	X	X
8	Moc Chan to Co Hai	5	X	X	X
9	Co Hai to Yen Chau	3–5	X	X	X
10	Yen Chau to Ban Mon	4–5	X	X	X
11	Ban Mon to Son La	2–6	X	X	X
12	Son La to Muong Mua	N.A.	N.A.	N.A.	X
13	Son La to Thuan Chau	2–6	X	X	X
14	Thuan Chau to Tuan Giao	2–6	N.A.	N.A.	X
15	Tuan Giao to Dien Bien Phu	N.A.	N.A.	N.A.	X
16	Moc Chau to Van Yen	N.A.	N.A.	N.A.	X
17	Van Yen to Ban Cho	N.A.	N.A.	N.A.	X
18	Ban Cho to Yen Bay	N.A.	N.A.	N.A.	X
19	Hanoi to Son Tay	N.A.	N.A.	X	N.A.
20	Son Tay to Cam Khe	N.A.	N.A.	X	N.A.
21	Cam Khe to Yen Lap	N.A.	N.A.	X	N.A.
22	Hanoi to Gia Lam	22	X	X	X
23	Gia Lam to Yen Vien	N.A.	X	X	X
24	Yen Vien to Phuc Yen	18	X	X	X
25	Phuc Yen to Vinh Yen	1–18	X	X	X
26	Vinh Yen to Viet Tri	18	X	X	X
27	Viet Tri to Phu Tho	18	X	X	X
28	Phu Tho to Lam Thao	N.A.	N.A.	X	N.A.
29	Lam Thao to Thanh Son	N.A.	N.A.	X	N.A.
30	Phu Tho to Phu Ninh	N.A.	N.A.	X	N.A.
31	Phu Tho to Thanh Ba	16	X	X	X
32	Thanh Ba to Chi Chu	16	X	X	X
33	Chi Chu to Ha Hoa	16	X	X	X
34	Ha Hoa to Yen Bay	16	X	X	X
35	Yen Bay to Phu Yen Binh	N.A.	N.A.	N.A.	X
36	Yen Bay to Bao Ha	14	X	X	X
37	Bao Ha to Pho Lu	14	X	X	X
38	Pho Lu to Lao Kay	14	X	X	X
39	Lao Kay to Cam Duong	N.A.	N.A.	N.A.	X
40	Lao Kay to Cha Pa	2	N.A.	N.A.	X
41	Lao Kay to Ba Xat	1	N.A.	N.A.	X
42	Lao Kay to Ho-K'ou, C. China	14	N.A.	X	X
43	Lao Kay to Ban Phiet	1	N.A.	N.A.	X
44	Ban Phiet to Muong Khuong	1	N.A.	N.A.	X
45	Ban Tau Tho to Plaine Des Jarres, Laos	1–6	N.A.	N.A.	X
46	Viet Tri to Thanh Thuy	N.A.	N.A.	X	N.A.
47	Viet Tri to Phu Doan	N.A.	N.A.	X	X
48	Phu Doan to Phu Yen Binh	N.A.	N.A.	N.A.	X
49	Phu Doan to Phu Yen	N.A.	N.A.	X	X
50	Phu Yen to Son Duong	N.A.	N.A.	X	N.A.
51	Phu Yen to Bac Muc	N.A.	N.A.	X	X
52	Bac Muc to Chiem Hoa	N.A.	N.A.	X	N.A.
53	Bac Muc to Vinh Tuy	N.A.	N.A.	X	X
54	Vinh Tuy to Bac Quang	N.A.	N.A.	X	X
55	Bac Quang to Ha Giang	N.A.	N.A.	X	N.A.
56	Yen Vien to Phu Lo	N.A.	X	X	X
57	Phu Lo to Pho Yen	N.A.	X	X	X
58	Pho Yen to Thai Nguyen	N.A.	X	X	X
59	Thai Nguyen to Son Duong	N.A.	N.A.	X	N.A.
60	Thai Nguyen to Dinh Ca	N.A.	N.A.	X	N.A.
61	Dinh Ca to Bac Son	N.A.	N.A.	X	N.A.
62	Bac Son to Pho Binh Gia	N.A.	N.A.	X	N.A.
63	Pho Binh Gia to That Khe	N.A.	N.A.	X	N.A.
64	Thai Nguyen to Phu Luong	N.A.	N.A.	X	X
65	Phu Luong to Cho Chu	N.A.	N.A.	X	X
66	Phu Luong to Bac Kan	N.A.	N.A.	X	X
67	Bac Kan to Phu Tong Hoa	N.A.	N.A.	X	X
68	Phu Tong Hoa to Ngan Son	N.A.	N.A.	X	X
69	Ngan Son to Cao Bang	N.A.	N.A.	X	X
70	Cao Bang to Nguyen Binh	N.A.	N.A.	X	X
71	Nguyen Binh to Tinh Tuc	N.A.	N.A.	N.A.	X
72	Tinh Tuc to Bao Lac	N.A.	N.A.	N.A.	X
73	Coa Bang to Nuoc Hai	1	N.A.	X	X
74	Nuoc Hai to Loung Van	1	N.A.	N.A.	X
75	Loung Van to Soc Giang	1	N.A.	N.A.	X
76	Cao Bang to Tra Linh	N.A.	N.A.	N.A.	X
77	Cao Bang to Dong Khe	1	N.A.	N.A.	X
78	Cao Bang to Quang Uyen	N.A.	N.A.	X	X
79	Quang Uyen to Trung Khanh Phu	N.A.	N.A.	N.A.	X
80	Trung Khanh Phu to Chi Choi	N.A.	N.A.	N.A.	X
81	Chi Choi to Ban Cra	N.A.	N.A.	N.A.	X
82	Quang Uyen to Ha Lang	N.A.	N.A.	N.A.	X
83	Quang Uyen to Phuc Hoa	1	N.A.	X	X
84	Phuc Hoa to Ta Lung	1	N.A.	N.A.	X
85	Ta Lung to Lung-ching, C. China	1	N.A.	N.A.	N.A.
86	Phuc Hoa to Dong Khe	1	N.A.	N.A.	X
87	Dong Khe to That Khe	1	N.A.	X	X
88	That Khe to Na Chem	1	N.A.	X	X
89	Na Cham to Dong Dang	1	N.A.	X	X
90	Yen Vien to Phu Tu Son	N.A.	N.A.	X	X
91	Phu Tu Son to Thuan Thanh	N.A.	N.A.	X	N.A.
92	Phu Tu Son to Bac Ninh	N.A.	N.A.	X	X
93	Bac Ninh to Dap Cau	N.A.	N.A.	X	X
93a	Dap Cau to Que Duong	N.A.	N.A.	X	X
94	Que Duong to Sept Pagodes	N.A.	N.A.	X	X
95	Sept Pagodes to Pha Lai	N.A.	N.A.	X	N.A.
96	Sept Pagodes to Dong Trieu	N.A.	N.A.	X	N.A.
97	Dong Trieu to Hon Gay	N.A.	N.A.	X	N.A.
98	Dap Cau to Viet Yen	N.A.	N.A.	X	X
99	Viet Yen to Hiep Hoa	N.A.	N.A.	X	N.A.
100	Hiep Hoa to Phu Binh	N.A.	N.A.	X	N.A.
101	Viet Yen to Phu Lang Thuong	N.A.	N.A.	X	X
102	Phu Lang Thuong to Bo Ha	N.A.	N.A.	X	N.A.
103	Bo Ha to Yen The	N.A.	N.A.	X	N.A.
104	Phu Lang Thuong to Luc Nam	6	N.A.	X	X
105	Luc Nam to Son Dong	6	N.A.	X	N.A.
106	Son Dong to Luc Ngan	6	N.A.	X	N.A.
107	Luc Ngan to Dinh Lap	6	N.A.	X	N.A.
108	Phu Lang Thuong to Huu Lung	10–12	N.A.	X	X
109	Huu Lung to Lang Son	10–12	N.A.	X	X
110	Lang Son to Dong Dang	12	N.A.	X	X
111	Dong Dang to Diem He	N.A.	N.A.	X	N.A.
112	Dong Dang to Nam Quan	6	N.A.	N.A.	X
113	Nom Quan to Ping-hsiang, C. China	N.A.	N.A.	X	X
114	Lang Son to On Cau	1	N.A.	X	N.A.
115	On Cau to Loc Binh	2	N.A.	X	N.A.
116	Loc Binh to Dinh Lap	1	N.A.	X	N.A.
117	Dinh Lap to Tien Yen	3	N.A.	X	N.A.
118	Tien Yen to Binh Lieu	N.A.	N.A.	X	X
119	Binh Lieu to Hoanh Mo	N.A.	N.A.	N.A.	X
120	Tien Yen to Dam Ha	8	N.A.	X	X
121	Dam Ha to Ha Coi	12	N.A.	X	X
122	Ha Coi to Mon Cay	12	N.A.	X	X
123	Mon Cay to Fang-ch'eng, C. China	N.A.	N.A.	X	X
124	Mon Cay to Nui Ngoc	N.A.	N.A.	N.A.	X
125	Tien Yen to Pointe Pagode	3	N.A.	N.A.	X
126	Pointe Pagode to Cua Ong	4	N.A.	X	X
127	Cua Ong to Cam Pha Port	4	N.A.	X	X
128	Cam Pha Port to Cam Pha	4	N.A.	X	X
129	Cam Pha to Ha Tou	10	N.A.	X	X
130	Ha Tou to Hon Gay	16	N.A.	X	X
131	Hon Gay to Ha Lam	N.A.	N.A.	X	N.A.
132	Hon Gay to Bai Chay	10	N.A.	X	N.A.
133	Bai Chay to Quang Yen	8–10	N.A.	X	X
134	Quang Yen to Haiphong	6	N.A.	X	X
135	Haiphong to Do Son	N.A.	N.A.	X	N.A.
136	Haiphong to Kien An	N.A.	N.A.	X	N.A.
137	Kien An to Ninh Giang	N.A.	N.A.	X	N.A.
138	Ninh Giang to Thai Binh	N.A.	N.A.	X	N.A.
139	Thai Binh to Huyen	N.A.	N.A.	N.A.	X
140	Haiphong to Nui Deo	24	X	X	X
141	Nui Deo to Thuy Nguyen	24	X	X	X
142	Thuy Nguyen to Hai Duong	24	X	X	X
143	Hai Duong to Ninh Giang	N.A.	N.A.	X	N.A.
144	Hai Duong to Ban Yen Nhan	24	X	X	X
145	Ban Yen Nhan to Gia Lam	24	X	X	X
146	Gia Lam to Hung Yen	N.A.	N.A.	X	N.A.
147	Hanoi to Phu Ly	N.A.	X	X	X
148	Phu Ly to Ninh Binh	N.A.	N.A.	X	X
149	Phu Ly to Nam Dinh	N.A.	X	X	N.A.
150	Nam Dinh to Thai Binh	N.A.	N.A.	X	N.A.
151	Nam Dinh to Cole	N.A.	N.A.	X	N.A.
152	Cole to Hai Hau	N.A.	N.A.	X	N.A.
153	Nam Dinh to Ninh Binh	N.A.	X	X	N.A.
154	Ninh Binh to Gia Vien	N.A.	N.A.	X	N.A.
155	Gia Vien to Phu Nhoc Quan	N.A.	N.A.	X	N.A.
156	Phu Nhoc Quan to Lac Thuy	N.A.	N.A.	X	N.A.
157	Ninh Binh to Ha Trung	N.A.	X	X	X
158	Ha Trung to Thanh Hoa	N.A.	X	X	X
159	Ninh Binh to Yen Khanh	N.A.	N.A.	X	N.A.
160	Yen Khanh to Kim Son	N.A.	N.A.	X	N.A.
161	Kim Son to Yen Mo	N.A.	N.A.	X	N.A.
162	Kim Son to Nga Son	N.A.	N.A.	X	N.A.
163	Nga Son to Hau Loc	N.A.	N.A.	X	N.A.
164	Hau Loc to Thanh Hoa	N.A.	N.A.	X	N.A.
165	Thanh Hoa to Quang Xuong	N.A.	N.A.	X	N.A.
166	Thanh Hoa to Thieu Hoa	N.A.	N.A.	X	N.A.
167	Thieu Hoa to Yen Dinh	N.A.	N.A.	X	N.A.
168	Yen Dinh to Thach Thanh	N.A.	N.A.	X	N.A.
169	Yen Dinh to Vinh Loc	N.A.	N.A.	X	N.A.
170	Vinh Loc to Cam Thuy	N.A.	N.A.	X	N.A.
171	Cam Thuy to Hoi Xuan	N.A.	N.A.	X	N.A.
172	Thanh Hoa to Tho Xuan	N.A.	N.A.	X	X
173	Tho Xuan to Bai Thuong	N.A.	N.A.	X	X
174	Bai Thuong to Ngoc Lac	N.A.	N.A.	X	X
175	Ngoc Lac to Lang Chanh	N.A.	N.A.	N.A.	X
176	Lang Chanh to Yen Khuong	N.A.	N.A.	N.A.	X
177	Yen Khuong to Muong Sai	N.A.	N.A.	N.A.	X
178	Muong Sai to Ban Na Mang, Laos	N.A.	N.A.	N.A.	X
179	Thanh Hoa to Nong Cong	N.A.	N.A.	X	N.A.
180	Nong Cong to Nhu Xuan	N.A.	N.A.	X	N.A.
181	Thanh Hoa to Cau Giat	5–6	X	X	X
182	Cau Giat to Phu Dien Chau	5–6	X	X	X
183	Phu Dien Chau to Phu Qui	N.A.	N.A.	X	X
184	Phu Qui to Qui Chau	N.A.	N.A.	X	N.A.
185	Phu Dien Chau to Yen Thanh	21	N.A.	X	X
186	Yen Thanh to Do Luong	21	N.A.	X	X
187	Do Luong to Con Cuong	2–3	N.A.	X	X
188	Con Cuong to Khe Bo	2	N.A.	X	X
189	Khe Bo to Cua Rao	2	N.A.	X	X
190	Cua Rao to Muong Thu	2	N.A.	N.A.	X
191	Muong Thu to Ban Na Luong	2	N.A.	N.A.	X
192	Ban Na Luong to Muong Sen	3	N.A.	N.A.	X
193	Muong Sen to Ban Tau Tho	3	N.A.	N.A.	X
194	Muong Sen to Ben Phay	2	N.A.	N.A.	X
195	Ban Phay to Tham Khup	1	N.A.	N.A.	X
196	Phu Dien Chau to Nghi Loc	7–11	X	X	X
197	Nghi Loc to Cuo Lo	3	N.A.	N.A.	X
198	Nghi Loc to Vinh	7–11	X	X	X
199	Vinh to Nam Dam	20	N.A.	X	X
200	Nam Dam to Nghia Dong	16	N.A.	X	X
201	Nghia Dong to Do Luong	16	N.A.	X	X
202	Vinh to Duc Tho	N.A.	X	X	N.A.
203	Duc Tho to Linh Cam	N.A.	N.A.	X	N.A.
204	Linh Cam to Huang Son	N.A.	N.A.	X	N.A.
205	Duc Tho to Nghi Xuan	N.A.	X	X	N.A.
206	Duc Tho to Huong Khe	N.A.	X	X	N.A.
207	Vinh to Ben Thuy	12	N.A.	X	X
208	Ben Thuy to Ha Tinh	23	N.A.	X	X
209	Ha Tinh to Huong Khe	N.A.	N.A.	X	N.A.
210	Ha Tinh to Cam Xuyen	1	N.A.	X	X
211	Cam Xuyen to Dai Dong	1	N.A.	X	X
212	Dai Dong to Ky Anh	1	N.A.	X	X
213	Ky Anh to Ron	1	N.A.	X	X
214	Ron to Badon	1	N.A.	X	X
215	Badon to Do Trach	10	X	X	X
216	Badon to Tuyen Hoa	N.A.	X	X	X
217	Tuyen Hoa to Don Bai Dinh	N.A.	N.A.	N.A.	X
218	Tuyen Hoa to Huong Khe	N.A.	X	X	N.A.
219	Bo Trach to Dong Hoi	10	X	X	X
220	Dong Hoi to Le Thuy	20	X	X	X
221	Le Thuy to Vinh Linh	20	X	X	X
222	Vinh Linh to Cap Lay	N.A.	N.A.	N.A.	X
223	Cap Lay to Cua Tung	N.A.	N.A.	N.A.	X
224	Vinh Linh to Ben Quang	N.A.	N.A.	N.A.	X
225	Ben Quang to Dong Vang Vang	N.A.	N.A.	N.A.	X

NOTE: X indicates in operation
N.A. information not available

* The type of service indicated below is the service carried on a section and does not relate to the service at the terminals of the respective section.

** In some cases the number of wires observed along a particular section vary.

*** The open wireline network uses 3-channel telephone and 6-channel telegraph carrier frequency equipment. Although carrier equipment is known to be in use on certain sections, the specific type of carrier in use in a section is not known.

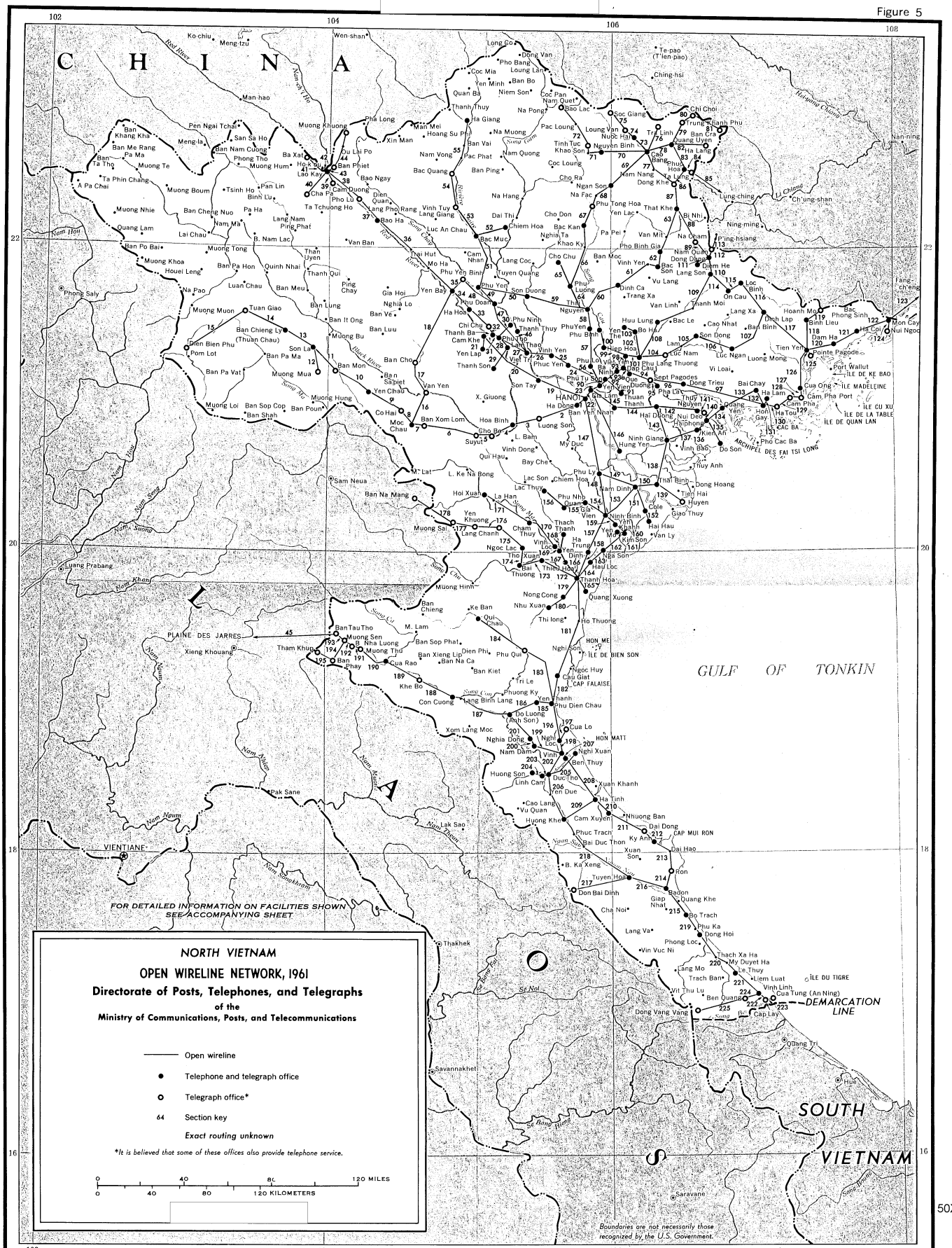
Coordinates of Cities in Figure 5

City Name	Coordinates North	Coordinates East
An Chau (see Luc Ngan)	21 20	106 51
Anh Son (see Do Luong)	18 54	105 18
An Ninh (see Cua Tung)	17 01	107 07
Bac Kan	22 09	105 50
Bac Muc	22 04	105 03
Bac Ninh	21 11	106 03
Bac Quang	22 29	104 52
Bac Son	21 53	106 21
Badon	17 45	106 22
Bai Chay	20 58	107 03
Bai Thuong	19 54	105 23
Ban Cho	21 14	104 38
Ban Cra	22 46	106 44
Ban Mon	21 13	104 03
Ban Na Luong	19 23	104 13
Ban Na Mang, Laos	20 21	104 37
Ban Phay	19 16	104 04
Ban Phiet	22 31	104 02
Ban Tau Tho	19 27	104 05
Ban Xom Lom	20 50	104 43
Ban Yen Nhan	20 56	106 02
Bao Ha	22 11	104 21
Bao Lac	22 57	105 40
Ba Xat	22 36	103 51
Ben Quang	17 03	106 55
Ben Thuy	18 38	105 42
Binh Lieu	21 31	107 19
Bo Ha	21 27	106 12
Bo Trach	17 34	106 32
Cam Duong	22 25	104 01
Cam Khe	21 26	105 07
Cam Pha	21 01	107 19
Cam Pha Port	21 02	107 22
Cam Thuy	20 11	105 28
Cam Xuyen	18 15	105 58
Cao Bang	22 40	106 15
Cap Lay	17 00	107 04
Cau Giat	19 09	105 38
Cha Pa	22 20	103 51
Chi Choi	22 53	106 35
Chi Chu	21 28	105 08
Chiem Hoa	22 12	105 17
Cho Bo	20 46	105 10
Cho Chu (Cho Cau)	21 54	105 37
Co Le	20 19	106 16
Co Nai	20 54	104 33
Con Cuong	19 02	104 54
Cua Lo	18 49	105 43
Cua Ong	20 56	106 48
Cua Rao	19 17	104 25
Cua Tung (An Ninh)	17 01	107 07
Dai Dong	18 06	106 15
Dam Ha	21 21	107 36
Dap Cau	21 12	106 05
Diem He	21 55	106 35
Dien Bien Phu	21 19	103 01
Dinh Ca	21 45	106 03
Dinh Lap	21 32	107 06
Doan Hung (see Phu Doan)	21 38	105 10
Do Luong (Anh Son)	18 54	105 18
Don Bai Dinh	17 44	105 45
Dong Dang	21 56	106 44
Dong Hoi	17 28	106 37
Dong Khe	22 26	106 27
Dong Trieu	21 05	106 31
Dong Vang Vang	16 56	106 35
Do Son	20 43	106 48
Duc Tho	18 32	105 34
Fang-ch'eng, Com. China	21 45	108 20
Gia Lam	21 03	105 52
Gia Vien	20 19	105 49
Ha Coi	21 26	107 46
Ha Dong	20 58	105 46
Ha Giang	22 50	104 58
Ha Hoa	21 34	105 00
Hai Duong	20 56	106 19
Hai Hau	20 11	106 17
Haiphong	20 51	107 41
Ha Lam	20 58	107 07
Ha Lang	22 41	106 40
Ha Nam (see Phu Ly)	20 32	105 56
Hanoi	21 02	105 50
Ha Tinh	18 22	105 54
Ha Tou	20 57	107 11
Ha Trung	20 02	105 54
Hau Loc	19 54	105 53
Hiep Hoa	21 21	105 58
Ho K'ou, Com. China	22 36	103 58
Ho Xa (see Vinh Linh)	17 03	107 01
Hoa An (see Nuoc Hai)	22 44	106 09
Hoa Binh	20 50	105 20
Hoanh Mo	21 36	107 29
Hoi Xuan	20 22	105 07
Hon Gay	20 57	107 05
Hung Yen	20 39	106 04
Huong Khe	18 13	105 40
Huong Son	18 32	105 27
Huu Lung	21 30	106 20
Huyen	20 18	106 30
Khe Bo	19 09	104 40
Kien An	20 49	106 30
Kim Son	20 07	106 05
Ky Anh	18 05	106 18
Lac Thuy	20 24	105 27
Lam Thao	21 20	105 16
Lang Chanh	20 09	105 13
Lang Son	21 50	106 44
Lao Kay	22 30	103 58
Le Thuy	17 12	106 52
Linh Cam	18 31	105 34
Loc Binh	21 46	106 56
Loung Van	22 46	106 08
Luc Nam	21 18	106 24
Luc Ngan (An Chan)	21 20	106 52
Luong Son	20 52	105 31
Lung-ching, Com. China	22 18	106 53
Moc Chau	20 53	104 35
Mon Cay	21 31	107 58
Muong Khuong	22 46	104 07
Muong La (see Son La)	21 22	103 54
Muong Mua	21 10	103 58
Muong Sai	20 11	104 53
Muong Sen	19 21	104 09
Muong Thu	19 22	104 14
Na Cham	22 03	106 37
Nam Dan (Nam Dam)	18 42	105 29
Nam Dinh	20 25	106 10
Nam Quan	21 58	106 42
Nga Son	19 59	105 58
Ngan Son	22 26	105 59
Nghia Dong	18 45	105 27
Nghi Loc	18 44	105 39
Nghi Xuan	18 39	105 46
Ngoc Lac	20 02	105 23
Nguyen Binh	22 39	105 56
Nhu Xuan	19 38	105 33
Ninh Binh	20 15	105 59
Ninh Giang	20 44	106 24
Nong Cong	19 41	105 40
Nui Deo	20 55	106 40
Nui Ngoc	21 26	107 58
Nuoc Hai (Hoa An)	22 44	106 09
On Cau (On Chau)	21 46	106 50
Pha Lai	21 07	106 17
Pho Binh Gia	21 57	106 22
Pho Lu	22 19	104 12
Pho Yen	21 28	105 51
Phu Binh	21 28	105 55
Phu Dien Chau	18 59	105 35
Phu Doan (Doan Hung)	21 38	105 10
Phuc Hoa	22 31	106 31
Phuc Yen	21 14	105 42
Phu Lang Thuong (Bac Giang)	21 16	106 11
Phu Lo	21 12	105 51
Phu Luong	21 46	105 42
Phu Ly	20 32	105 56
Phu Nho Quam	20 16	105 40
Phu Ninh	21 30	105 19
Phu Qui	19 19	105 24
Phu Tho	21 24	105 13
Phu Tong Hoa	22 17	105 53
Phu Tuson (Tu Son)	21 06	105 57
Phu Yen	20 48	105 42
Phu Yen Binh	21 49	104 58
P'ing-hsiang, Com. China	22 06	106 46
Pointe Pagode	21 17	107 27
Quang Uyen	22 42	106 27
Quang Xuong	19 44	105 50
Quang Yen	20 56	106 48
Que Duong	21 10	106 08
Qui Chau	19 33	105 06
Ron	17 53	106 27
Sept Pagodes	21 07	106 18
Soc Giang	22 54	106 01
Son Dong	21 25	106 37
Son Duong	21 42	105 25
Son La	21 20	103 54
Son Tay	21 08	105 30
Suyut	20 46	105 05
Ta Lung	22 29	106 34
Tach Thanh	20 06	105 40
Thai Binh	20 27	106 20
Thai Nguyen	21 36	105 50
Tham Khup	19 19	103 58
Thanh Ba	21 26	105 08
Thanh Hoa	19 48	105 47
Thanh Son	21 13	105 10
Thanh Thuy	21 27	105 19
That Khe	22 16	106 28
Thieu Hoa	19 54	105 40
Tho Xuan	19 56	105 31
Thuan Chau	21 27	103 42
Thuan Thanh	21 03	106 05
Thuy Nguyen	20 56	106 38
Tien Yen	21 20	107 25
Tinh Tuc	22 41	105 51
Tra Linh	22 50	106 19
Trung Khanh Phu	22 50	106 31
Tuan Giao	21 35	103 25
Tu Son (see Phu Tu Son)	21 06	105 57
Tuyen Hoa	17 50	106 06
Tuyen Quang	21 49	105 13
Van Yen	21 03	104 42
Viet Tri	21 18	105 26
Viet Yen	21 17	106 07
Vinh	18 40	105 40
Vinh Linh	17 03	107 01
Vinh Loc	20 02	105 37
Vinh Tuy	22 16	104 52
Vinh Yen	21 18	105 35
Yen Bay	21 42	104 52
Yen Chau	21 03	104 18
Yen Dinh	20 01	105 39
Yen Khanh	20 10	106 03
Yen Khoung	20 09	105 03
Yen Lap	21 20	105 05
Yen Mo	20 07	106 03
Yen Thanh	18 59	105 29
Yen The	21 29	106 07
Yen Vien	21 05	105 55

50X1

50X1

Figure 5



FOR DETAILED INFORMATION ON FACILITIES SHOWN SEE ACCOMPANYING SHEET

NORTH VIETNAM

OPEN WIRELINE NETWORK, 1961

Directorate of Posts, Telephones, and Telegraphs
of the
Ministry of Communications, Posts, and Telecommunications

- Open wireline
- Telephone and telegraph office
- Telegraph office*
- 64 Section key
- *Exact routing unknown*

*It is believed that some of these offices also provide telephone service.

0 40 80 120 MILES
0 40 80 120 KILOMETERS

Boundaries are not necessarily those recognized by the U.S. Government.

31951 10-61

50X1

carries manual Morse, teleprinter, and telephone traffic, is the most important. It is probable that lines connecting with Laos are currently being used for communications with the rebel forces in that country rather than with the central Laotian government. The establishment of connections with Xieng Khouang, the seat of the rebel Communist government of Laos, is likely in the near future.

The wireline network, subject to frequent interruption, does not, in consequence, provide dependable service. [redacted] 50X1
[redacted] 50X1
[redacted] Attempts by the DPTT to improve wireline communications include establishment of training programs in wireline technology; replacement of bamboo poles, which deteriorate rapidly in tropical climate, with those made of concrete and steel; and utilization of military personnel for repair and maintenance purposes. [redacted] 50X1
[redacted] 50X1

Improvement is expected in network performance during 1961-65. Nevertheless, the over-all reliability of the network probably will remain low because of continued heavy dependence on vulnerable open wirelines. Such wirelines suffer from the climatic conditions of the country, especially the extreme heat and humidity associated with the rainy monsoon season between May and September, and from the flimsy nature of construction. As a result, the DPTT contemplates the installation of microwave radio relay facilities on some of the main routes now served by wirelines.

b. Point-to-Point Radio

(1) Domestic

The general point-to-point radio network of North Vietnam, as shown on the map, Figure 6,* gives domestic service to remote areas not served by the wireline network and is used to supplement existing wirelines as well. Most circuits radiate from the main station located near Hanoi.** The only other major station, located at Thaun Chau,*** acts as the control point for that part of the network serving the mountainous area of the Thai-Meo Autonomous Region.

* Following p. 14.

** The Hanoi station is located about 6 km west of Ha Dong. Its antenna field comprises about 50 masts ranging in height from 30 meters to 150 meters.

*** The Thuan Chau station is shortly to be moved to Son La. The new site will consist of three buildings, which will house transmitting and receiving facilities, power supply equipment, and maintenance shops.

At present, manual Morse is the predominant mode of transmission, but the network is in transition to the automatic mode.

The manual mode of operation, as expected, requires substantial numbers of trained personnel. Large stations such as those at Thuan Chau and Vinh, for example, employ between 30 and 50 persons and, of the 255 communications personnel listed in the table of organization of the Thai-Meo Autonomous Region in 1959, more than 180 were employed in radio activities. 17/ The severe shortage of qualified radio maintenance personnel, the use of obsolete equipment, and the manual mode of operations, all have hindered efficient operation of the network. The DPTT has been trying to improve over-all efficiency, but the extent of progress is not known. [redacted] 50X1

[redacted] 50X1

[redacted] During 1961-65, it is 50X1 expected that whereas the efficiency of this network will be improved greatly, little will be done to increase its coverage. 18/

(2) International

In addition to operating a domestic point-to-point radio network, the DPTT also operates international point-to-point radio circuits, as shown on the map, Figure 7.* 19/ These circuits carry telephone, manual Morse, and teleprinter service. 20/ [redacted] 50X1

[redacted] The Hanoi station, opened on 1 February 1959, was built and equipped with aid from Communist China. These international point-to-point radio facilities appear to meet over-all needs, so that no major changes in the number or the foreign terminals of these circuits is expected during 1961-65. The quality of the service may be improved by the use of more modern equipment. 50X1 50X1

c. Microwave

North Vietnam has been considering the employment for the first time of microwave as a modern economic medium for acquiring more capacity and better quality of service. Since June 1959, North Vietnam has been negotiating with Hungary for the importation of PM24/A** microwave equipment. Consisting of two terminal stations and one relay station, the planned line would span a distance of about 60 to 110 km, depending on terrain conditions. One terminal of the

* Following p. 14.

** The PM24/A carries 24 voice channels that operate in the 1,900 to 2,200 megacycle range.

DETAILED INFORMATION FOR FACILITIES IN FIGURE 6

Station Key	Name of City	Coordinates North	Coordinates East
1	Hanoi	21–02	105–50
2	Bac Kan	22–09	105–50
3	Thai Nguyen	21–36	105–50
4	Haiphong	20–51	106–41
5	Vinh	18–40	105–40
6	Nam Dinh	20–25	106–10
7	Thuan Chau	21–27	103–42
8	Moung Lay (Lai Chau)	22–02	103–10
9	Yen Bay	21–42	104–52
10	Lao Kay	23–39	103–58
11	Hung Yen	20–39	106–04
12	Phuc Yen	21–16	105–40*
13	Cho Ra	22–50	105–48
14	Na Ri	22–06	106–12*
15	Cao Bang	22–40	106–15
16	Bao Lac	22–57	105–40
17	Cat Hai	20–42	107–05*
18	Hon Gay	20–57	107–05
19	Tien Yen	21–20	107–25
20	Ha Tinh	18–22	105–54
21	Dong Hoi	17–28	106–37
22	Vinh Linh	17–03	107–01
23	Thanh Hoa	19–48	105–47
24	Hai Duong	20–56	106–19
25	Hoa Binh	20–50	105–20
26	Phu Lang Thuong	21–16	106–11
27	Phu Tho	21–24	105–13
28	Than Uyen	21–59	103–54
29	Quynh Nhai	21–50	103–50
30	Phu Yen	21–16	104–30*
31	Van Chan	21–32	104–21*
32	Song Ma	20–57	103–39*
33	Tuan Ciao	21–35	103–25
34	Phong Tho	22–36	103–21
35	Tua Chua	22–06	103–25*
36	Muong Te	22–31	102–37
37	Dien Bien Phu	21–19	103–01
38	Sinh Ho (Tsinh Ho)	22–25	103–14
39	Tuyen Quang	21–49	105–13
40	Ha Giang	22–50	104–58
41	Lang Son	21–50	106–44
42	Kien An	20–49	106–30
43	Hon Dau	20–36	106–44*
44	Thai Binh	20–27	106–20
45	Phu Ly	20–32	105–56
46	Ben Thuy	18–38	105–42

* Approximate Coordinates.

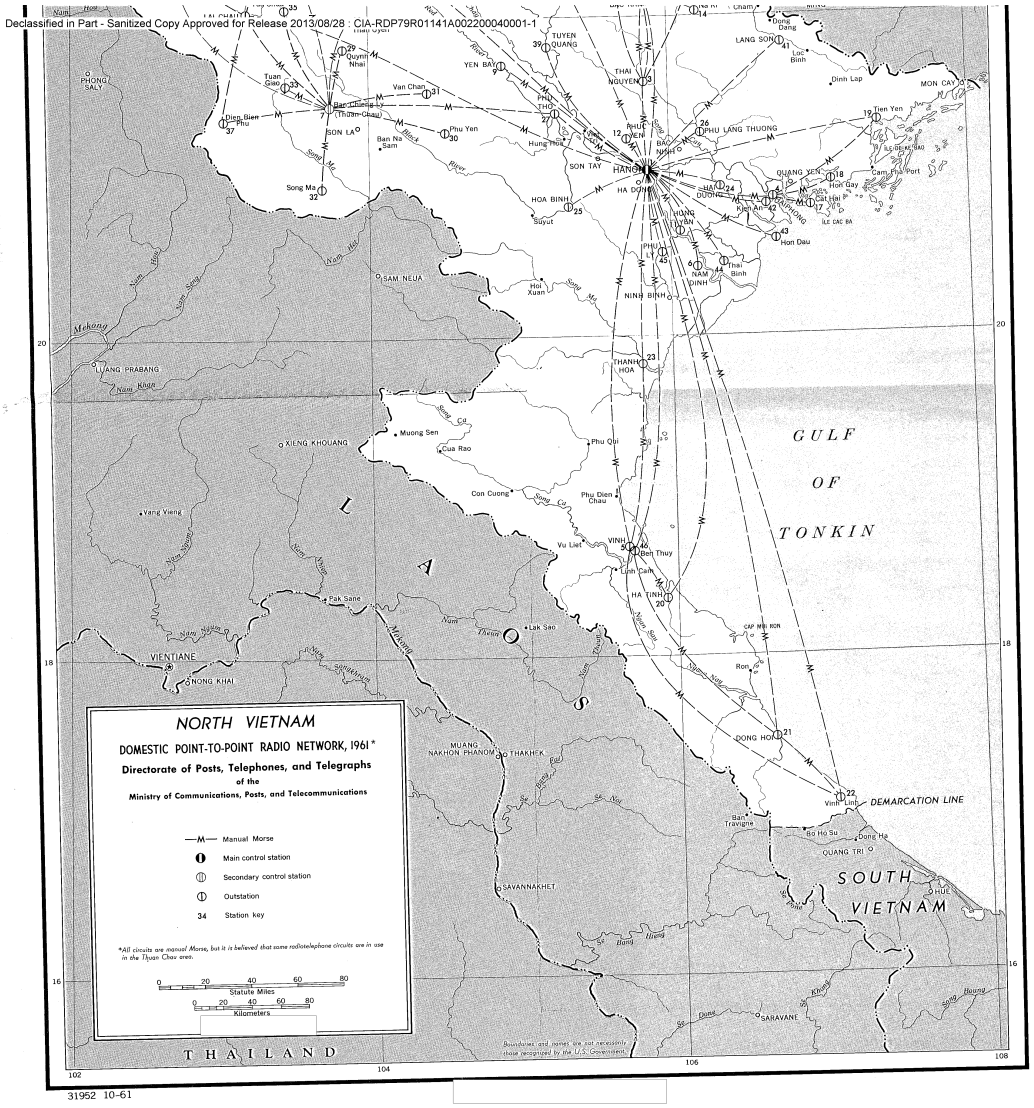


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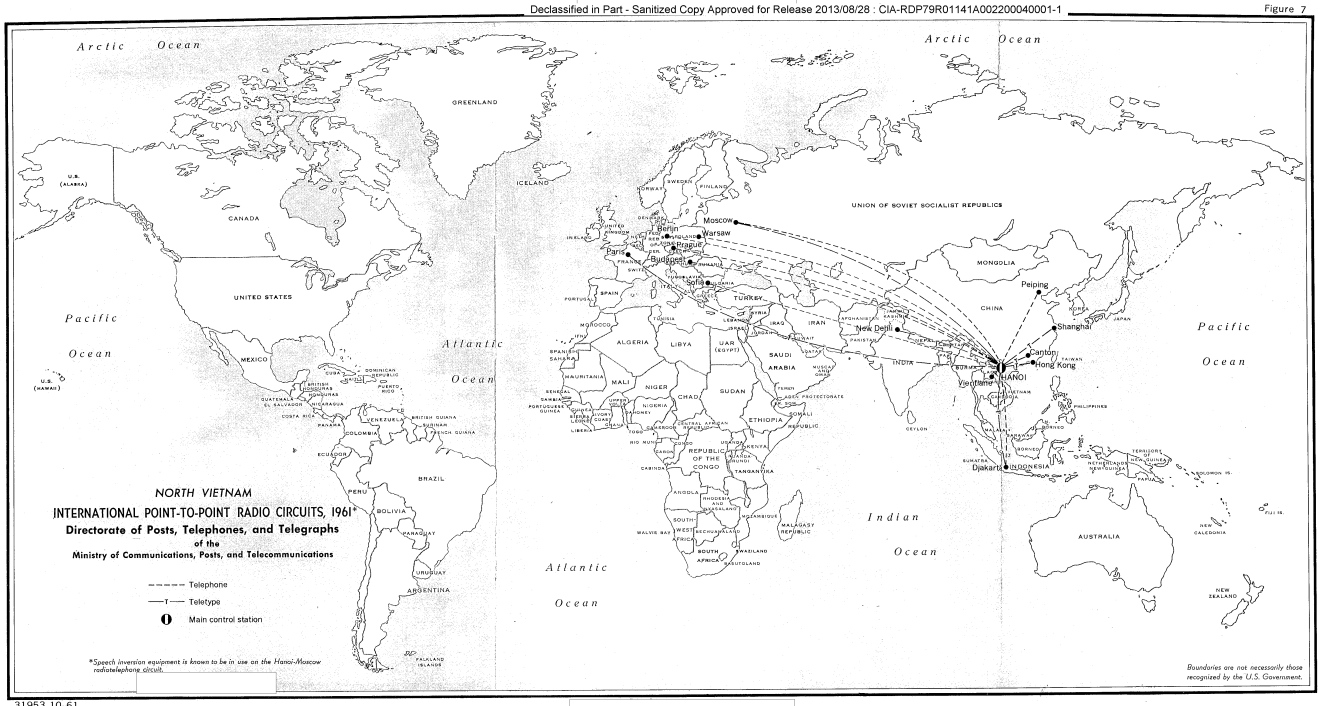
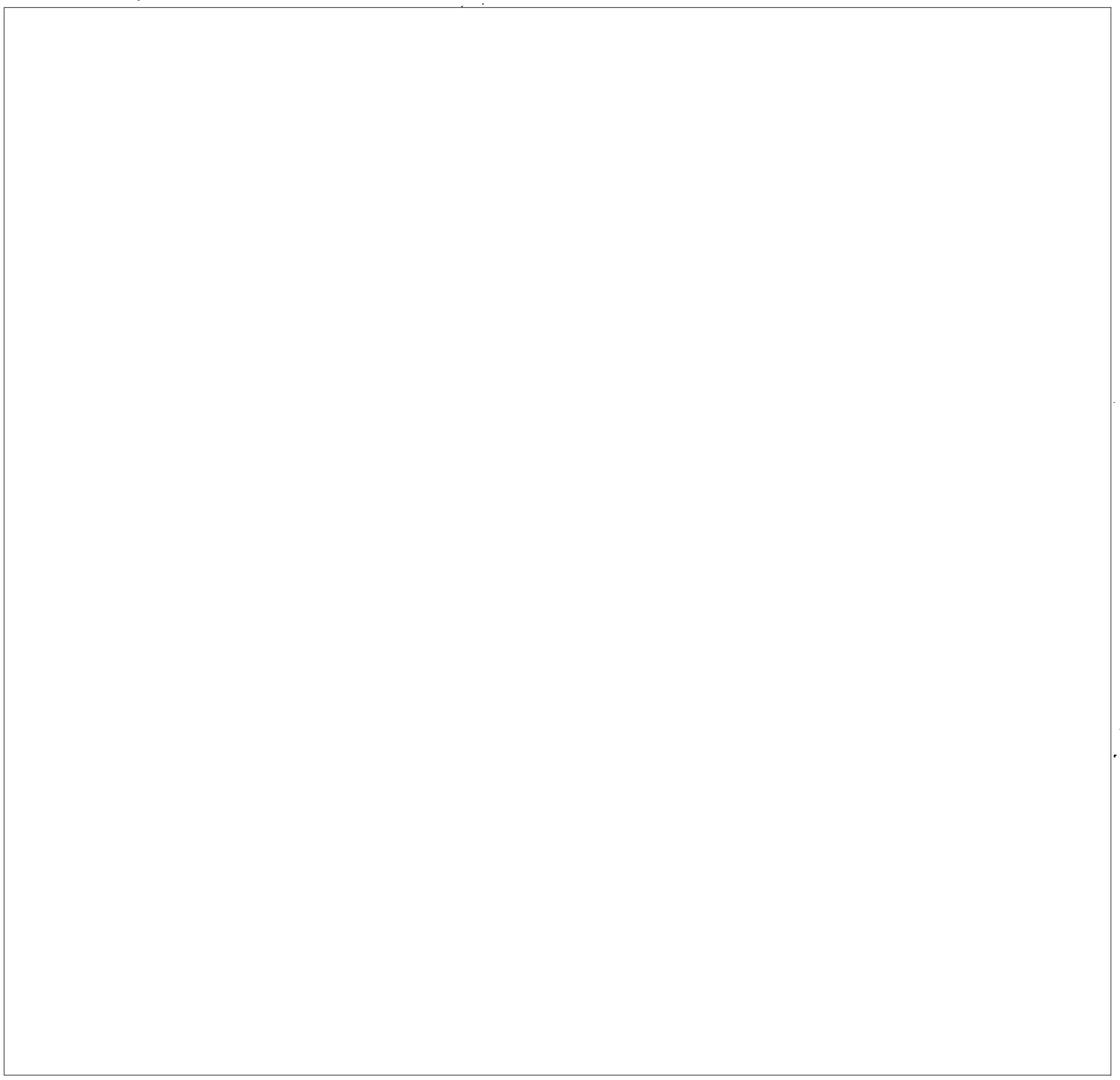
Figure 7



31953 10-61

line undoubtedly would be at Hanoi, with the other possibly at Haiphong, Nam Dinh, or Phu Tho. 22/

Plans are believed to include the provision of a nationwide microwave network, which, in fact, would become the backbone system of the country. Serving as a mainline facility, it would carry telephone and telegraph traffic and would connect all major industrial, agricultural, and shipping centers of the country. In addition, it is likely that this network would connect with a similar network planned for Communist China and would be used for air defense and other military traffic as well as for conventional communications.



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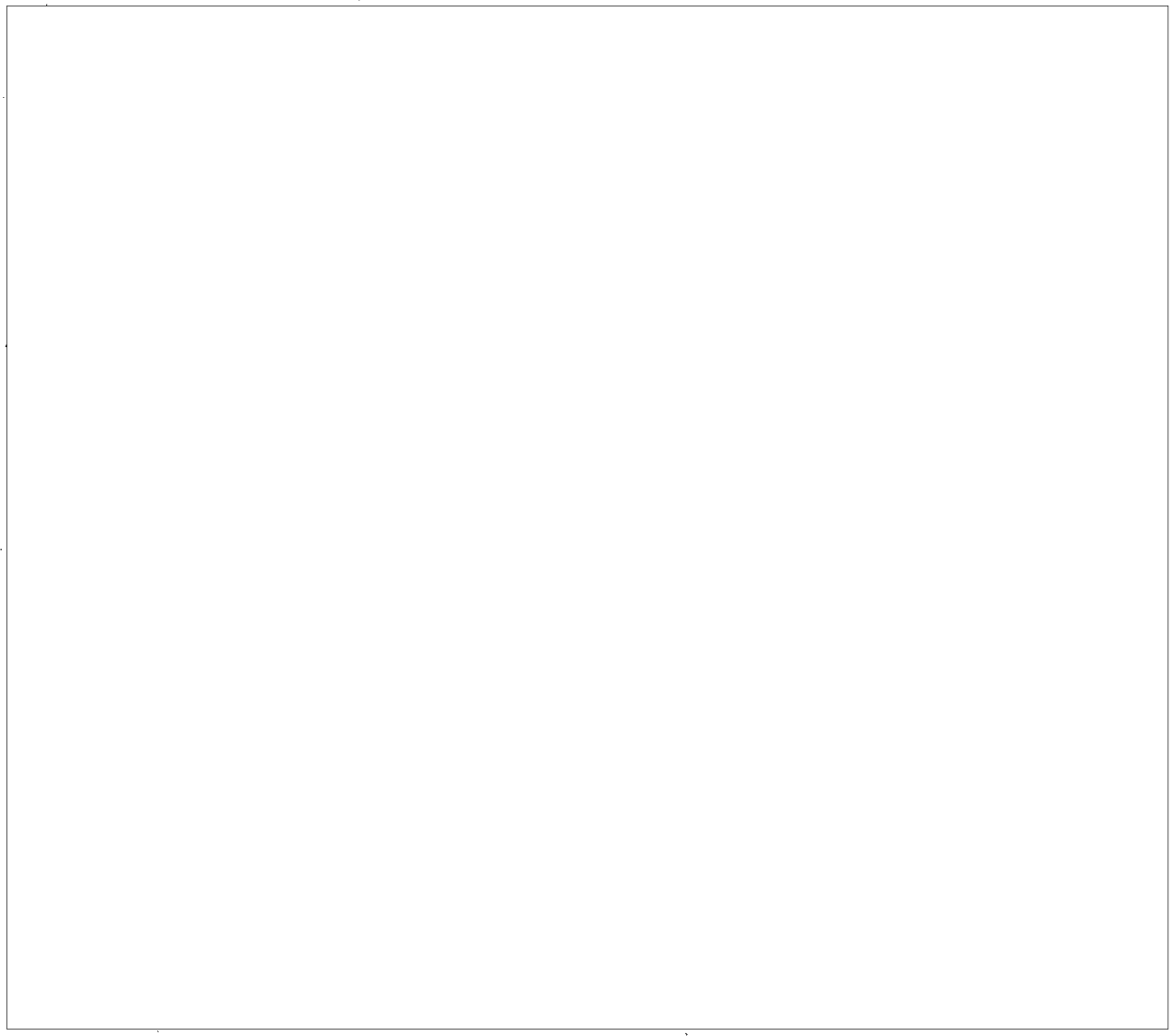

V. Broadcasting

The broadcasting system of North Vietnam provides domestic and international amplitude modulation (AM) radiobroadcasting and domestic wire diffusion services. Television and frequency modulation (FM) broadcasting services are not yet available, but initial planning is underway for their introduction probably within the next 4 to 6 years. Although operating from a relatively small transmission base, especially in comparison with that of South Vietnam, which has twice the number of radiobroadcasting transmitters in operation, the broadcasting system of North Vietnam serves as a useful means for furthering the aims of government. A measure of its effectiveness against South

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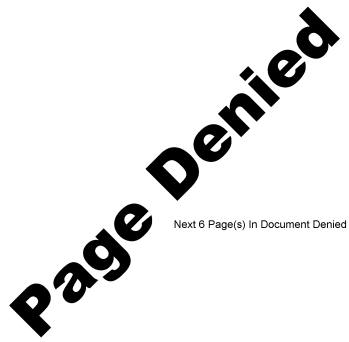

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Vietnam is shown by the consistent jamming of all its broadcasts by South Vietnam. For its part, North Vietnam does not jam broadcasts aimed at it from South Vietnam.

The steady growth of broadcasting service in North Vietnam since 1955 is almost wholly attributable to technical and material assistance received from the USSR. This assistance has permitted the enlargement of the major radiobroadcasting facilities located at Hanoi and the creation of a wire diffusion network. 27/

During 1961-65, efforts undoubtedly will be made to build up both the transmission and the reception bases of the broadcasting service. To attain these goals, continued assistance from the USSR and possibly other countries of the Sino-Soviet Bloc will be necessary.

A. Radiobroadcasting

The radiobroadcasting facilities of North Vietnam, which give both domestic and international service, consist of seven shortwave and two medium-wave transmitters and are controlled by the "Voice of Vietnam" radio station located at Hanoi (often referred to as Radio Hanoi). Two programs are transmitted simultaneously. The First Program, rendered in the Vietnamese language, is intended primarily for domestic listeners, but some broadcasts are aimed at South Vietnam. Furthermore, the First Program carries programs of Radio Moscow. At one time, programs of Radio Peking also were included in the First Program, but this practice was discontinued recently. 28/

The Second Program is intended mainly for Southeast Asia and for the high plateau regions in North and South Vietnam. Programs to Southeast Asia are rendered in the Laotian, Mandarin, Cantonese, Thai, Cambodian, French, and English languages, whereas those to the plateau regions are heard in the mountain dialects of Rhades, Jarai, Bahnar, and Mnong. The Second Program also carries news dispatches to the North Vietnamese embassy in Peking. These dispatches then are distributed to the embassies of other countries of the Sino-Soviet Bloc located in that city. 29/

The "Voice of Vietnam" is subordinate to the Radio Diffusion Board, an independent organ of government attached to the Office of the President. Its broadcast policies are controlled by the Propaganda and Training Section of the Central Committee of the Dang Lao Dong. Using material supplied to it by the Vietnam News Agency, this Party organism prepares and approves all program material. 30/

Facilities of the "Voice of Vietnam" also engage in clandestine broadcasting. With Laos as their principal target, two short-wave

transmitters carry three clandestine programs known as Radio Pathet Lao, the Voice of the Laotian Kingdom, and, beginning in June 1961, the National Army Broadcasting Station. 31/

At least two transmitters, one medium-wave and one shortwave, operate at about 20 kilowatts (kw) and 50 kw, respectively. These and other transmitters were supplied and installed by the USSR as part of an extensive aid program, which has been a decisive factor in the buildup of broadcasting in North Vietnam.

In 1957, there reportedly were 300,000 radiobroadcast receivers in use in North Vietnam, or about 20 receivers per thousand persons (based on a midyear population of 14.9 million persons). The reception base has been enlarged during the past 5 years mainly through importation of receivers, but it still falls far short of adequate per capita coverage. 32/

During the Five Year Plan, radiobroadcasting service will continue to grow. Throughout the period the reception base will be broadened and the coverage of international service widened by the use of more transmitters. To meet these goals, however, North Vietnam will have to rely on continued aid from the USSR and perhaps other countries of the Sino-Soviet Bloc.

B. Wire Diffusion

The wire diffusion service of North Vietnam, controlled by the Ministry of Culture, augments the radiobroadcasting service. Because it assures the government's propagandistic programs of a "captive" audience, it is perhaps, along with newspapers and periodicals, the most important medium of mass communications available.

The wire diffusion network has been given impetus since 1956. In that year, with Soviet material and technical help, installation of 10 additional wire diffusion centers began. The center constructed at Haiphong reportedly is capable of serving 40,000 loudspeakers. Since the completion of this program early in 1957, the network has undergone steady growth, and in 1960 it was announced that 105 wire diffusion centers, mainly in the densely populated areas, were in operation. 33/

The wire diffusion network is patterned after that in the USSR. Wire diffusion centers receive "Voice of Vietnam" broadcasts over telephone wirelines and rebroadcast these programs by wire to individual loudspeakers located in private homes, factories, offices, and public gathering places. In addition, some of the larger centers are believed to originate their own programs of the local-interest variety.

Growth of wire diffusion services and facilities probably will continue during 1961-65, and extension of service to the rural areas probably will be the chief feature of this growth.

VI. Future Trends

Since 1955, North Vietnam has made tangible progress in the rehabilitation and enlargement of its post and telecommunications resources. Services rendered appear to be meeting minimum needs. Now in the first year of its Five Year Plan, the country shows intentions of continuing the development of this sector of the economy. Assuredly the program for progress under the current Five Year Plan, as given in the previous sections of this report, is indeed an impressive one, even though it is unlikely that all goals will be met. The decisive conditions influencing the level of attainment will be the availability of sizable amounts of investment funds and continued large-scale technical and material assistance from other countries of the Sino-Soviet Bloc. If these funds are forthcoming, completion of most of these plans is highly probable.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

Amplitude modulation (AM): The process by which a selected carrier frequency is varied in magnitude (amplitude) by other frequencies that contain the information to be transmitted in telecommunications. (See Frequency modulation.)

Apparatus: Instruments, machines, appliances, and other assemblies used in providing a telecommunications facility.

Automatic (as an adjective): Of or pertaining to any process involved in producing telecommunications service that does not require direct, immediate human assistance.

Band (of frequencies): The entire range of frequencies between two numerically specified frequency limits. The magnitude of this range is a limiting factor on the amount of information that can be transmitted in telecommunications. With respect to frequencies of the radio spectrum as a whole, the International Telecommunication Union has for convenience divided the whole radio spectrum into eight major bands, as follows:

Frequency Bands

Range	Type	Corresponding Wave* Band
Up to 30 kc**	Very low frequencies (VLF)	Myriametric waves
30 to 300 kc	Low frequencies (LF)	Kilometric waves
300 to 3,000 kc	Medium frequencies (MF)	Hectometric waves
3,000 to 30,000 kc	High frequencies (HF)	Decametric waves
30,000 kc to 300 mc***	Very high frequencies (VHF)	Metric waves
300 to 3,000 mc	Ultra high frequencies (UHF)	Decimetric waves†
3,000 to 30,000 mc	Super high frequencies (SHF)	Centimetric waves†
30,000 to 300,000 mc	Extremely high frequencies (EHF)	Millimetric waves†

* Waves are undulating disturbances: a sound wave is a disturbance in the air, which is an elastic medium, and an electric wave is a disturbance in any medium whatever. The number of waves per second is the frequency of a given wave. Because the speed of wave propagation is considered to be constant, the length of a given wave is in inverse relation to its frequency: the longer the wave length, the lower the frequency; and the shorter the wave length, [footnote continued on p. 22]

Cable: A bundle of sheathed, insulated wires and/or coaxial tubes used as a telecommunications medium. It is sometimes referred to as "multiconductor cable."

Carrier (as an adjective): Of or pertaining to a technique for dividing a circuit, lane, supergroup, group, or channel into portions that can be used independently of and simultaneously with all other portions. Different frequencies or different pulses are selected for each portion to "carry" the information to be transmitted, after alteration by the information frequencies. The carrier itself need not be transmitted.

Channel: A portion, electrical or physical, of a telecommunications circuit, lane, supergroup, or group that can be used to transmit information independently of and simultaneously with all other portions. A channel may be used to provide two or more subchannels.

Circuit: A telecommunications connection between two or more distant points by a wire, cable, or radio medium facility used to carry information. The circuit is the fundamental telecommunications connection between distant points. By the application of appropriate techniques, a circuit may be arranged in many different combinations to meet the need for various kinds and quantities of telecommunications service. In its simplest form a circuit may carry only single telecommunications units in sequence. In its most complex form it may by apportionment carry simultaneously thousands of telephone channels and telegraph subchannels; a number of television programs; and other specialized kinds of service, such as high-fidelity broadcast programs, radar signals, and data-processing signals.

For the most complex application, a circuit is often arranged into lanes, each of which can carry, in one direction, 1 television program or up to 1,800 telephone channels. In turn, these 1,800 telephone channels are subdivided into 10 supergroups of 60 telephone channels each. Each supergroup is subdivided into 5 groups of 12 telephone channels each. One or more telephone channels may be further subdivided into 3 to 20 sixty-word-per minute teletype subchannels. Other specialized kinds of service may be accommodated by combining two or more telephone channels.

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the higher the frequency. Wave length usually is measured in linear units of the metric system.

** Kilocycles per second, or 1,000 cycles per second.

*** Megacycles per second, or 1 million cycles per second.

† It is becoming common usage to refer to waves (frequencies) in these three bands as "microwaves."

Coaxial (as an adjective): Of or pertaining to a modern telecommunications cable medium technique using one or more tubes (sometimes called "pipes"). Each metal tube surrounds a conducting wire supported concentrically by insulators. The space in the tube usually contains nitrogen gas under pressure. Generally, coaxial cable is used for the transmission of information in complex form, such as radar, computer data, or television signals, and/or for the transmission of telephone channels and telegraph subchannels. A single tube usually carries information in only one direction at a time. The capacity of a tube depends in part on the distance between repeater stations. In the standard facility, which may have from 2 to 8 tubes in the cable, a single tube carries a lane of up to 1,800 telephone channels or 1 television lane, for which the repeater station spacing is about 7 statute miles. In a new developmental coaxial cable facility, a single tube may carry 3 lanes of a total of 1,800 telephone channels or 3 television lanes, for which the repeater station spacing is expected to be about 3 statute miles.

Electronics: A general term used to identify that branch of electrical science and technology which treats of the behaviour of electrons in vacuums, gases, or solids. Today telecommunications makes extensive use of electronic technology.

Facility: An association of apparatus, material, and electrical energy required to furnish telecommunications service.

Facsimile (as an adjective): Of or pertaining to a telecommunications (telegraph) service in which photographs, drawings, handwriting, and printed matter are transmitted for graphically recorded reception. In one method (Type A), images are built up of lines or dots of constant intensity. In another method (Type B), images are built up of lines or dots of varying intensity, sometimes referred to as "telephoto" and "photoradio."

Feeder (as an adjective): Of or pertaining to telecommunications facilities of relatively low capacity that join facilities of relatively high capacity. (See Main.)

Frequency: The rate in cycles per second at which an electric current, voltage, wave, or field alternates in amplitude and/or direction. (See Band.)

Frequency modulation (FM): The process by which a selected carrier frequency is varied in frequency by other frequencies that contain the information to be transmitted in telecommunications. (See Amplitude modulation.)

Functional (as an adjective): Of, pertaining to, or connected with special, unique, or particular telecommunications facilities managed and operated by a single agency, organization, company, department, committee, ministry, or other entity, in contrast to the facilities of a basic system. (See Basic system.)

Group: A number of channels (usually 12) or subchannels combined (multiplexed) electrically in building up the total capacity of a telecommunications circuit, lane, or supergroup.

Ionosphere: Those layers of the earth's atmosphere occupying the space about 210 statute miles in thickness extending from about 30 statute miles above the earth's surface to the outer reaches (exosphere) of the atmosphere. Reflection from these layers makes possible long-distance transmission of radio signals. The layers, however, are responsible for fading of signals, skip distance, and differences between daytime and nighttime radio reception. The layers also are used as a scattering reflector for ionospheric scatter-transmission techniques to transmit to distances of about 1,000 to 1,500 statute miles.

Joint facility: A telecommunications facility owned, controlled, or operated by two or more agencies, organizations, companies, departments, committees, ministries, or other entities.

Lane: A one-way portion, electrical or physical, of a two-way telecommunications circuit that can be used independently of and simultaneously with all other portions. The largest lane today can handle 600 telephone channels or 1 television program. In some applications the direction of a lane may be reversed.

Leased (as an adjective): Of or pertaining to the direct operation by a user of a telecommunications facility owned by another agency.

Line: A general term used to delineate a telecommunications circuit facility (wire, cable, or radio).

Main (as an adjective): Of or pertaining to telecommunications facilities at and between principal cities and centers that have relatively high capacity compared with feeder facilities. (See Feeder.)

Medium: Any substance or space that can be used practically to transmit a form of electrical energy for the purpose of providing telecommunications service.

Microwave radio relay (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications employing radio frequencies higher than 300 mc. These frequencies normally do not afford

practical direct transmission to great distances, principally because they do not bend well around the earth's surface and because they do not reflect well from the ionosphere. They are, however, capable of reliable transmission from horizon to horizon (line-of-sight) by the use of special antennas that concentrate the radio energy and give it desired direction. In consequence, great distances can be reached by this technique by the interposition of relay stations along the route of the line with a spacing interval of from 25 to 40 statute miles, depending on terrain conditions. This technique can be employed practically to carry from a small number of telephone channels and telegraph subchannels to thousands of such channels and subchannels through two or more lanes and to carry one of more television and other specialized lanes and channels. (See Band.)

Mobile (as an adjective): Of or pertaining to a telecommunications facility that is intended to be operational while in motion or during halts at unspecified points. (See Portable.)

Modulation: The process of altering a carrier frequency or carrier pulses by other frequencies or pulses representing the information being transmitted.

Multiplex (as an adjective): Of or pertaining to the combining of information signals, modulated or unmodulated, of two or more lanes, supergroups, groups, channels, or subchannels for transmission over the same circuit.

Network: An interconnection, electrical or physical, of two or more circuits or portions thereof for the purpose of facilitating telecommunications service.

Point-to-point (as an adjective): Of or pertaining to telecommunications service between fixed points, using the radio medium.

Portable (as an adjective): Of or pertaining to a telecommunications facility that can be readily moved from place to place but normally is not operational while in motion. (See Mobile.)

Private (as an adjective): Belonging to or concerning an individual person, organization, institution, or activity; not public or common.

Pulse: A spurt of electrical energy of extremely short duration (usually measured in millionths of a second) yet capable of being used in telecommunications to transmit information.

Quad: In a multiconductor telecommunications cable, the physical association of a group of four conductors in any one of various arrangements for the purpose of providing two-way multichannel operation.

Reception base: The aggregate telecommunications receiving facilities employed in providing a broadcast service.

Route: The geographical path followed by a wire, cable, or radio line.

Scatter (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications by which energy in radio frequencies above 30 mc is deliberately scattered into one or the other of two reflecting portions of the atmosphere (troposphere and ionosphere) at such a predetermined angle that a usable portion of the energy arrives at the desired receiving location. This technique is especially applicable to regions in high latitudes (Arctic and Antarctic) where facilities of other media suffer from the rigors of weather and terrain and where the conventional long-distance radio media of the lower frequency bands (200 kc to 30 mc) are subject to serious disruptive propagational anomalies. (See Band.)

Subchannel: A portion, electrical or physical, of a telecommunications channel that can be used independently of and simultaneously with all other portions. An appreciable number of telephone channels usually can be subchanneled to carry from 3 to 20 sixty-word-per-minute teletype subchannels on each telephone channel so employed.

Subscriber: Any customer who directly operates telecommunications apparatus in obtaining telecommunications service.

Supergroup: A number of groups (often five) combined (multiplexed) electrically in building up the total capacity of a telecommunications circuit or lane.

System: All of the facilities and networks managed by a single agency, organization, company, department, committee, ministry, or other entity in rendering either functional or basic telecommunications service.

Telecommunications: Transmission, reception, or exchange of information between distant points by electrical energy over a wire, cable, or radio medium facility to produce telephone, telegraph, facsimile, broadcast (aural and visual), and other similar services.

Teletype (as an adjective): Of or pertaining to a technique for effecting telegraph service by the use of an apparatus similar to a typewriter in which information is transmitted by keyboard and received by type printer on a roll of paper or tape or by perforations on a roll of tape or both. The apparatus is sometimes called a "teleprinter" or a "teletypewriter."

Transmission base: The aggregate telecommunications transmitting facilities employed in providing broadcast service.

Transistor: A modern device that is capable of performing in a solid (germanium or silicon) many of the functions performed by the conventional electronic tube in a gas or vacuum.

Troposphere: The layer of the earth's atmosphere occupying the space from the earth's surface to a height of about 6 statute miles. This layer is used as a scattering reflector for tropospheric scatter-transmission techniques to distances of about 200 to 500 statute miles.

Wave guide (as an adjective): Of or pertaining to a telecommunications medium, now under development in several countries, that may be capable of transmitting extremely large amounts of conventional and complex information. It consists of a circular or rectangular hollow metallic tube in which electrical energy travels in the form of waves, much as do sound waves in a speaking tube.

Wire diffusion: Distribution of broadcast programs by a wire or cable medium to wired loudspeakers.

Wired loudspeaker: A telecommunications loudspeaker that receives from a distribution point one or more broadcast programs by a wire or cable medium.

Wireline: A general term used to identify a line consisting of either an aerial cable (and/or separate wires) or an underground cable used as a telecommunications medium.

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