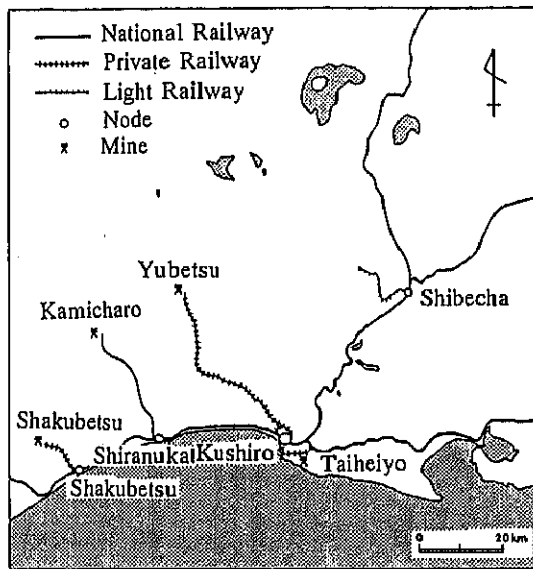


Chapter 4

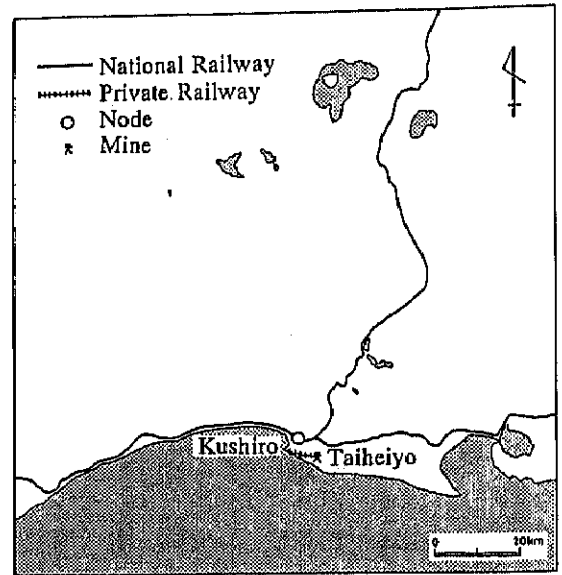
Port Hinterland and Port Space in the Era of Truck Dominance

4.1. Characteristics of Transportation in the Era of Truck Dominance

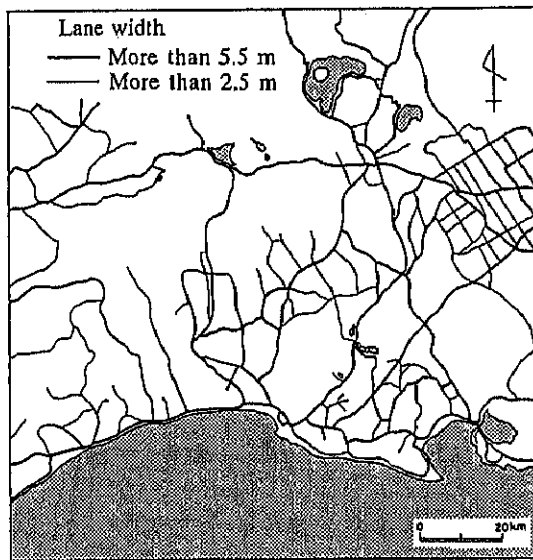
The rail network had gradually declined by motorization which started around the middle of the 1960s. At first this was seen in abolition of the light railways connecting with the agricultural reclaimed lands. Figure 19 (a) shows the rail network in 1968. Most light railways were connected with the coal mines. That is, most light railways connecting the nodes on the trunk lines with the agricultural reclaimed lands were abolished. The following are thought to be the reasons: a truck is excellent to transport a small lot of cargo like agricultural products which are transported separately; the private possession of truck became easy because of the depreciation of its price. On the other hand, the light railways connecting with the coalmines were not abolished quickly. The following are thought to be the reasons: coal is suitable for mass transportation because it is produced in the limited point of a pithead and is weight freight; the railway company was a correlated company of coal mining. However, this means that the railway for coal transport finishes its role with the close of a coal mine. For example Yubetsu, Kamicharo,



(a) Rail Network (1968)



(b) Rail Network (1980)



(c) Road Network (1980)

Figure 19 Rail and Road Networks in the Era of Truck Dominance

Source: Compiled from Landform Map (Scale, 1-200,000).

and Shakubetsu coal mines which were the representative coal mines in the Kushiro Coal Field were closed in 1970. The railways from these coal mines were abolished soon after without being continued as a local transportation means. The railways from the coal mines did not continue as well as Yasuda Railway in the Meiji era.

The close of a coal mine brought a rapid decline or a disappearance of a town based on the coal mining industry. Especially, Yubetsu Coal Mine located in Akan town had the largest quantity of coal production next to Taiheiyo Coal Mine in the Kushiro Coal Field. In the 1950s about 14,000 people lived in Yubetsu and Fubushinai where settlements of the coal miners were situated, but most residents moved to another region such as Kushiro city, the Metropolitan area, the Chukyo area, and the Sapporo area with the close of mine (Table 3) . Especially people who lived in Yubetsu had gone and the settlement of Yubetsu went to ruin (Figure 20) . Population outflows according to the close of the coal mines decreased both exports and imports of the Kushiro port. And hinterland of the Kushiro port declined temporarily. This could be seen not only at the Kushiro port but also the Otaru port, the Tomakomai port, and the Rumoi port which were the major coal export ports. Thus, light railways as feeder lines were abolished and a road network had developed instead of the light railways. The truck transport business from Sapporo to Kushiro started in 1963 and the truck transport gradually came to appear as the trunk line.

Japan Railways Nemuro line and Senmo line, a coal industrial railway between Taiheiyo Coal Mine and South Wharf of East Port, and

Table 3 New Addresses of People Separated from Yubetsu Coal Mining Co. (Sep. 1, 1970)

New Address (Hokkaido)	Staff	Miner	Total	New Address (Outside Hokkaido)	Staff	Miner	Total
Kushiro city	14	150 (4)	164 (4)	Chiba Pref.	8	218	226
Yubari city	1 (1)	81 (81)	82 (82)	Kanagawa Pref.	26	138	164
Akan town	10	66 (3)	76 (3)	Shizuoka Pref.	1	87	88
Ashibetsu city	1 (1)	51 (49)	52 (50)	Aichi Pref.	5	50	55
Sapporo city	7	41	48	Saitama Pref.	3	43	46
Akabira city	0	41 (41)	41 (41)	Tokyo Pref.	8	25	33
Mikasa city	1 (1)	27 (26)	28 (27)	Tochigi Pref.	5	21	26
Ishikari town	0	26	26	Gifu Pref.	0	18	18
Shiranuka town	0	16	16	Ibaraki Pref.	10	7	17
Noboribetsu town	1	13	14	Hiroshima Pref.	2	15	17
Muroran city	0	13	13	Gunma Pref.	0	15	15
Utashinai city	0	11 (9)	11 (9)	Ooka Pref.	7	8	15
Others	5	68 (6)	73 (6)	Others	5	24	29
Total	40 (3)	604(219)	644(222)	Total	80	669	749

(Note) Number in parentheses indicates the number of employees in colliery.

Source: Compiled from the records in *Directory of Yubetsu Colliery Union*.

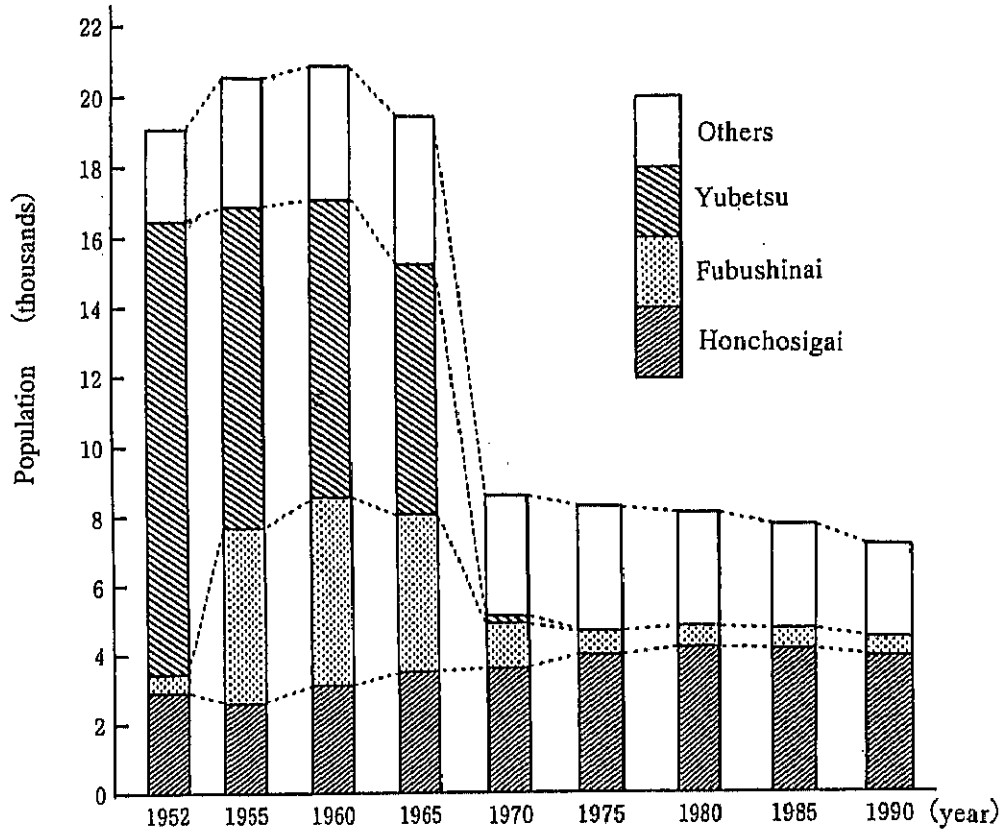


Figure 20 Population Change in Akan Town by Settlement

Source: Compiled from data in Akan Town Office

a freight line between JR Shinfuji Station and the oil terminal in West Port remain in 1998 (Figure 19 (b)). That is, the railways were abolished except the trunk lines and the feeder lines connecting with the Kushiro port. On the other hand, the roads have been constructed according to motorization. Main cities and main settlements are connected with roads which are more than 5.5 m in width. It can be said that the road network is almost completed (Figure 19 (c)).

The development of the road network and the decline of the rail network were reflected on the share of land transportation means of cargo in the Kushiro port. Figure 14 shows the change of the share of transportation means of the exports and the imports in the Kushiro port, based on the data of "Research Data of Port Hinterland". The influence of motorization was more remarkable in the import cargo and the share of the truck transport had already reached 45.5% in 1966. Its share has increased and it accounts for 94.6% in 1993, while the share of the rail transport has decreased from 36.9% in 1966 to 3.0% in 1993. Oil products and heavy oil account for 94.6% of rail cargo from the Kushiro port. As for the exports, the share of the railway is large. The rail transport accounts for 68.2% in 1966 and 53.5% in 1993. The share of the rail transport cargo in the Kushiro port is highest in the important ports in Hokkaido³⁰⁾, because most coal produced in Taiheiyo Coal Mine were transported to the Kushiro port by rail. Cargoes transported by rail have a tendency to specialize in the energy resources like coal, oil products, and heavy oil.

4.2. Port Hinterland in the Era of Truck Dominance

4.2.1. Characteristics of Cargo

The amount of cargo of the Kushiro port in 1993 fiscal year is 15,841,823 tons, next to the Tomakomai port (34,072,155 tons) and the Muroran port (27,248,799 tons). The Kushiro port accounts for 16.9% of the total port cargo in Hokkaido and 80.0% of the total cargo of five important ports in the eastern part of Hokkaido³¹⁾. The imports account for 62.7% of the total cargo of the Kushiro port, so the imports are in excess of the exports.

As for commodity groups of cargo, the share of mining goods and light industrial goods occupying the exports are high. Coal accounts for 78.6% of mining goods and 35.2% of the total exports of the Kushiro port. 58.6% of light industrial goods are paper and pulp, 29.7% are other food industrial goods, and 11.8% are sugar. And a lot of other livestock goods³²⁾ are exported. The share of chemical industrial goods occupying the imports are high and they account for 42.9% of the imports. Next to this, the share of forest goods and agricultural and fishery goods are high. 48.9% of chemical industrial goods are oil products, 18.9% are heavy oil, 18.9% are cement, and 9.7% are chemical fertilizer. 90.0% of forest products are other wood (wood chip), 9.9% are material wood. And 63.1% of agricultural and fishery goods are fodder, 24.1% are fishery goods, and 11.5% are wheat. Also, a lot of natural fertilizers, rubbish³³⁾, and coal are imported.

And the Kushiro port is connected with the Tokyo port by ferry. 24,922 trucks, 16,113 passenger cars, and 34,950 passengers are transported from Tokyo to Kushiro in 1993. And 22,299 trucks, 5,383 passenger cars, and 31,032 passengers are transported from Kushiro to Tokyo. According to “ Research Data of Ferry cargo ” The presumptive amount of the exports is 1,423 thousands tons and the imports is 1,493 thousands tons. As for commodity groups, light industrial goods account for 53.7%, machines account for 11.0%, and paper and pulp account for 8.6% of the total exports (Figure 21 (a)). And special goods account for 39. 2% and machines account for 25.4% of the total imports (Figure 21 (b)).

Now, comparing cargoes in the Kushiro port with cargoes in the whole of Hokkaido (Figure 22 (a)), the Kushiro port has characteristics as follows: percentage of exported light industrial goods, exported mining goods, and imported chemical industrial goods are large. The percentage of exported chemical industrial goods and imported mining goods are small. Especially for the imports, cargoes in the whole of Japan (Figure 22 (b)) and cargoes in the whole of Hokkaido have the same tendency except for forest goods, but cargoes in the Kushiro port have different characteristics as above mentioned. For the export ferry cargoes, the share of light industrial goods are high and the share of agricultural and fishery goods are small. For the import ferry cargoes, the share of special goods are high and the share of agricultural and fishery goods, and chemical industrial goods are small.

Comparing the cargoes of the Kushiro port in 1993 with that in

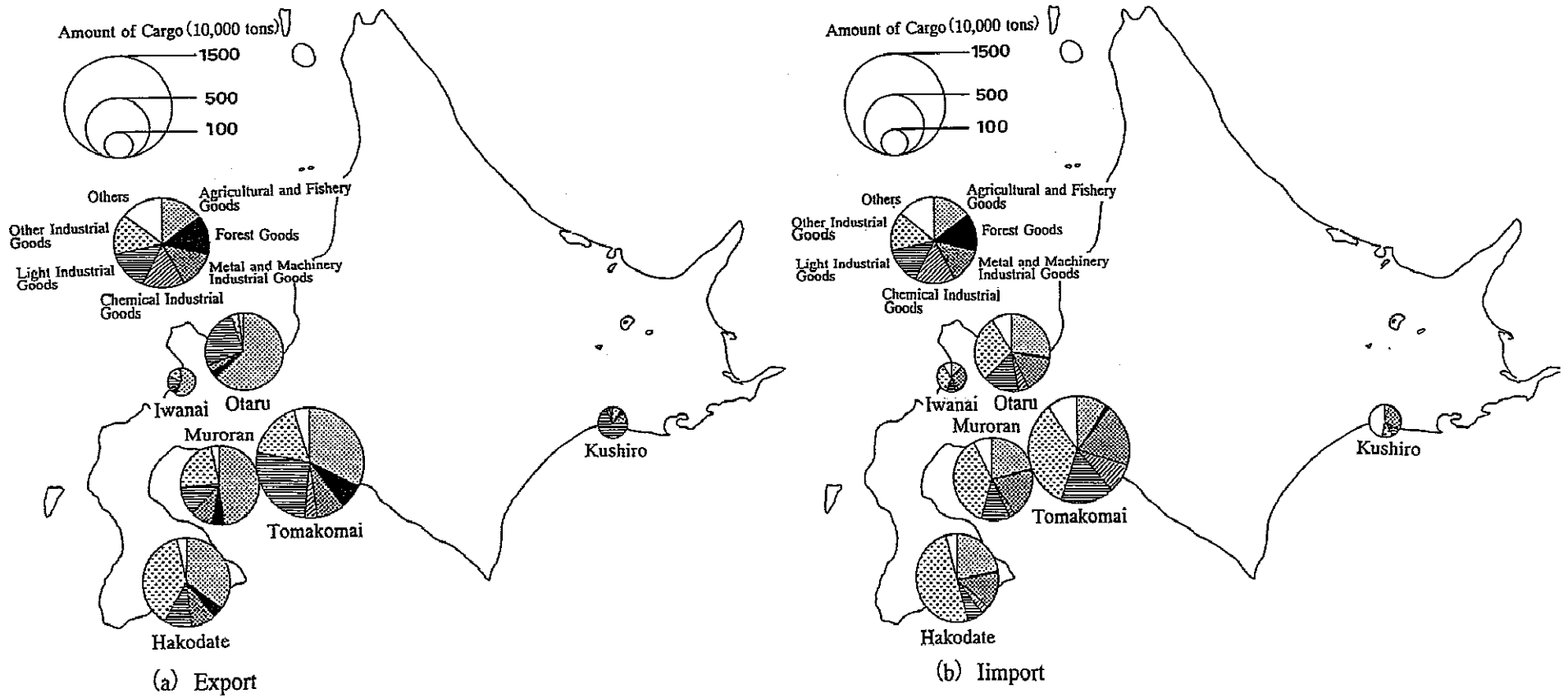
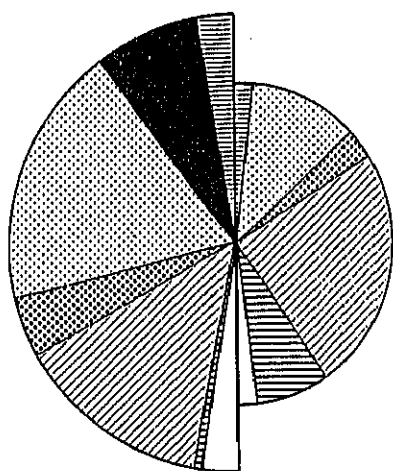
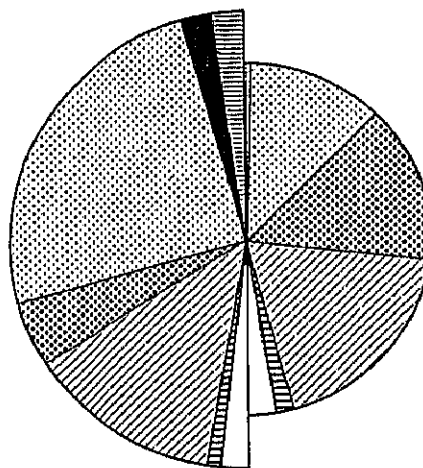


Figure 21 Presumed Amount and Type of Ferry Cargo by Major Port in Hokkaido in 1993
Source: Compiled from *Research data of Ferry Cargo*.



(a) Hokkaido
 Export 33,602,575 tons
 Import 66,774,823 tons



(b) Japan
 Export 814,698,635 tons
 Import 1,399,978,135 tons

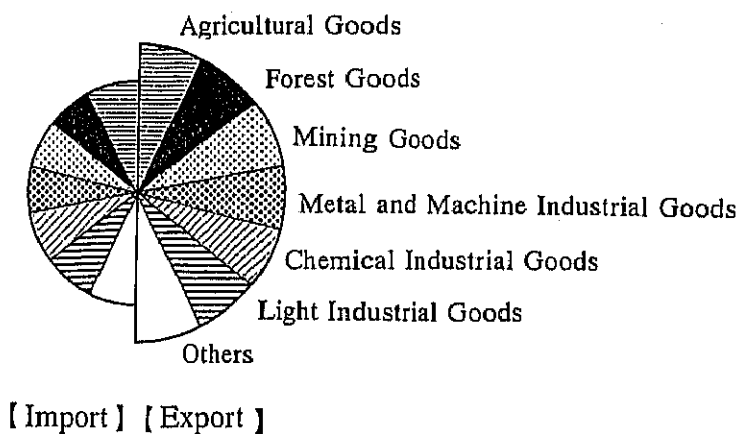


Figure 22 Share of Cargo by Commodity Group in Hokkaido and Japan in 1993

(Note): Size of semicircle indicates the ratio of the import and the export.
 Source: as Figure 13.

1966, in the exports, decrease of mining goods is remarkable and in the imports, increase of mining goods, forest goods, agricultural goods, and chemical industrial goods are remarkable. As a result the trade structure has changed from the export excess type to the import excess type.

4.2.2. Spatial Characteristics of Port Hinterland

a. Exports (Figure 23)

Cargoes are transported from 48 municipalities to the Kushiro port. A large amount of cargoes are transported from four districts in the eastern part of Hokkaido and they account for 99.8% of the total exports³⁴⁾. Especially, cargoes from Kushiro city account for 84.2%, so the port city is the biggest departure place. The share of the Kushiro port for each municipality is over 75% in Kushiro and Nemuro districts. Kushiro and Nemuro districts are within the hinterland of the Kushiro port. Compared with Kushiro and Nemuro districts, the share of the Kushiro port in Abashiri district is low, because the Kushiro port and the Abashiri port are in a rival relation in Abashiri district. The share of the Kushiro port is also low in Tokachi district, too, because Tokachi district is within the hinterland of the Tokachi port. As for transportation means of cargo to the Kushiro port, trucks account for 46.5%, railways account for 53.5%, and others account for 0% (Figure 14 (b)). The share of rail transport is high because coal, which is heavy cargo, is transported by rail. Cargoes other than coal are not transported by rail. Container

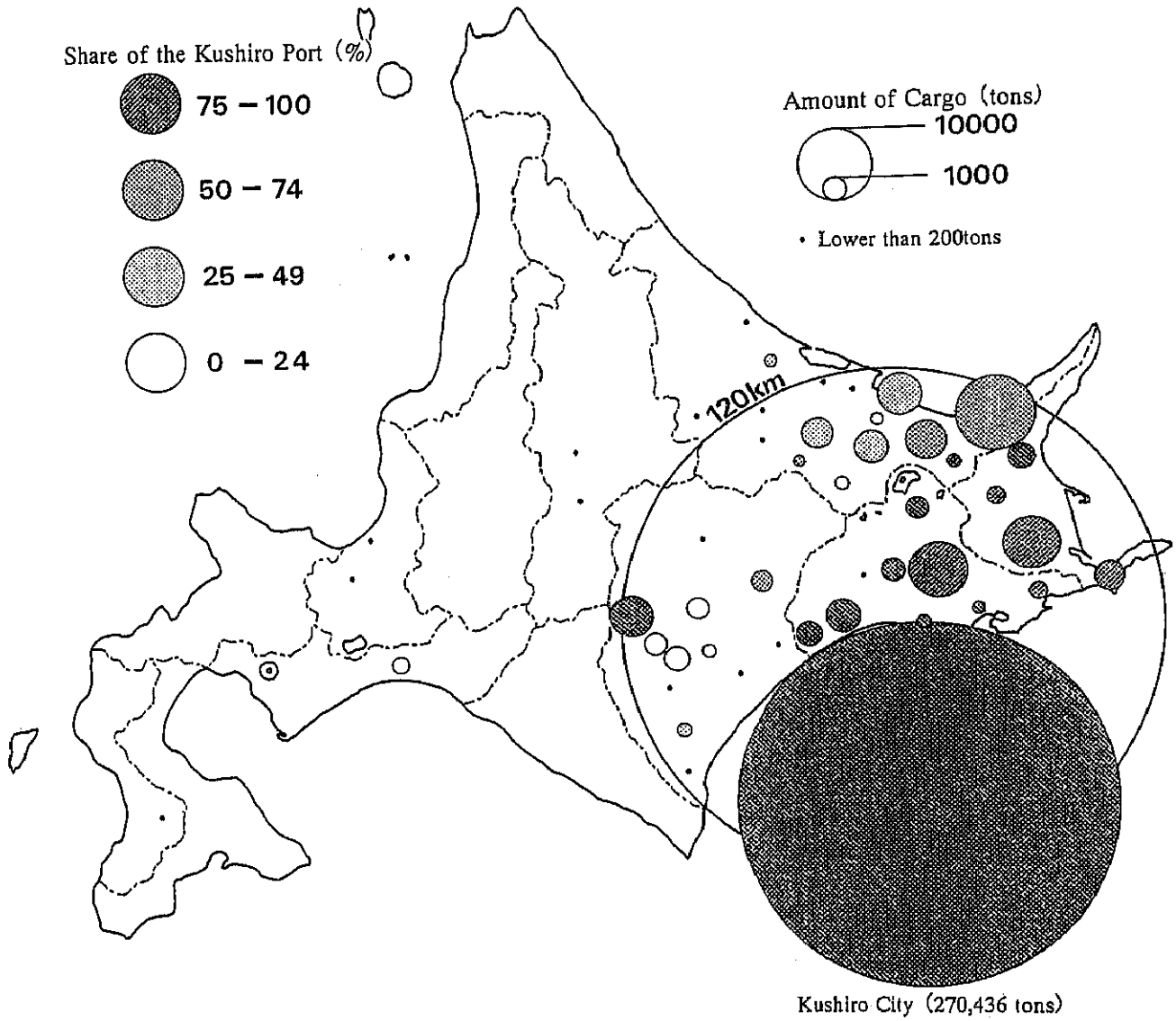


Figure 23 Share and Amount of Total Export Cargo of the Kushiro Port in Oct. 1993
 Source: as Figure 13.

cargo accounts for 1.7% of the total cargo. Containers are chiefly used for the transport of food industrial goods and wheat.

Characteristics of hinterlands are discussed in the following taking into account wheat, food industrial goods, coal, paper and pulp, and fresh milk which are the major export cargoes of the Kushiro port.

- Wheat (Figure 24)

Wheat is chiefly produced in Abashiri and Tokachi districts. 90.1% of wheat in Abashiri district is transported to the Abashiri port and 99.9% of wheat in Tokachi district is transported to the Tokachi port. Wheat is not transported from both districts to the Kushiro port. Wheat tends to be transported to the port which is the nearest to a producing center. Cereals and beans have similar tendencies. As mentioned above, the Kushiro port does not have a function as an export port of agricultural goods in the eastern part of Hokkaido like this. The export hinterland of the Kushiro port is small compared with the import hinterland. Flows of agricultural goods influence these characteristics.

- Food Industrial Goods (Figure 25)

Starch and sugar are the majority of food industrial goods. Therefore, food industrial goods are chiefly transported from Abashiri and Tokachi districts where potatoes and beats are produced. 57.4% of food industrial goods in Abashiri district are transported to the Kushiro port and 37.8% of them are transported to the Abashiri port. The Kushiro port gains a little advantage over the Abashiri port in Abashiri district.

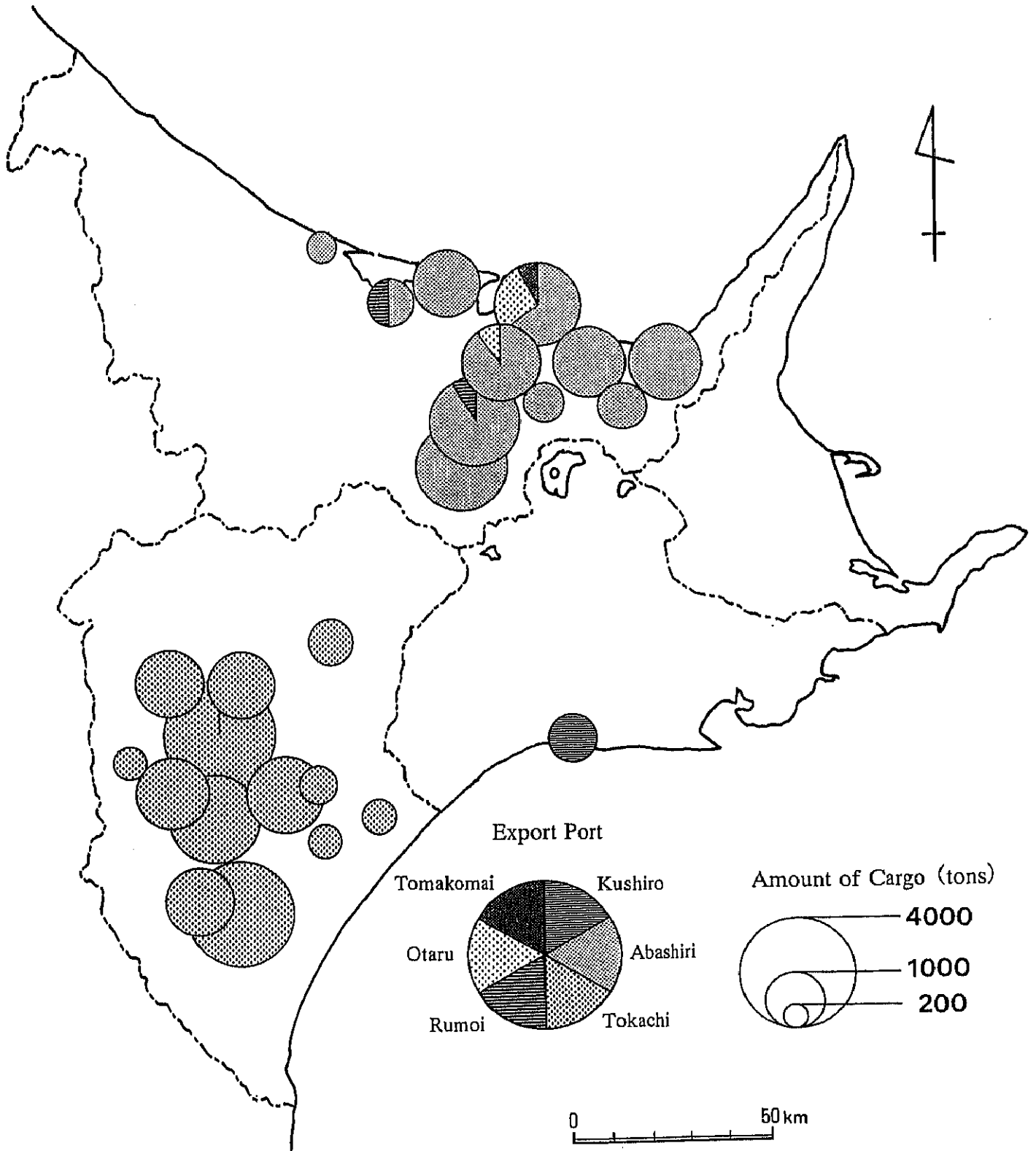


Figure 24 Outbound Movement of Wheat in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

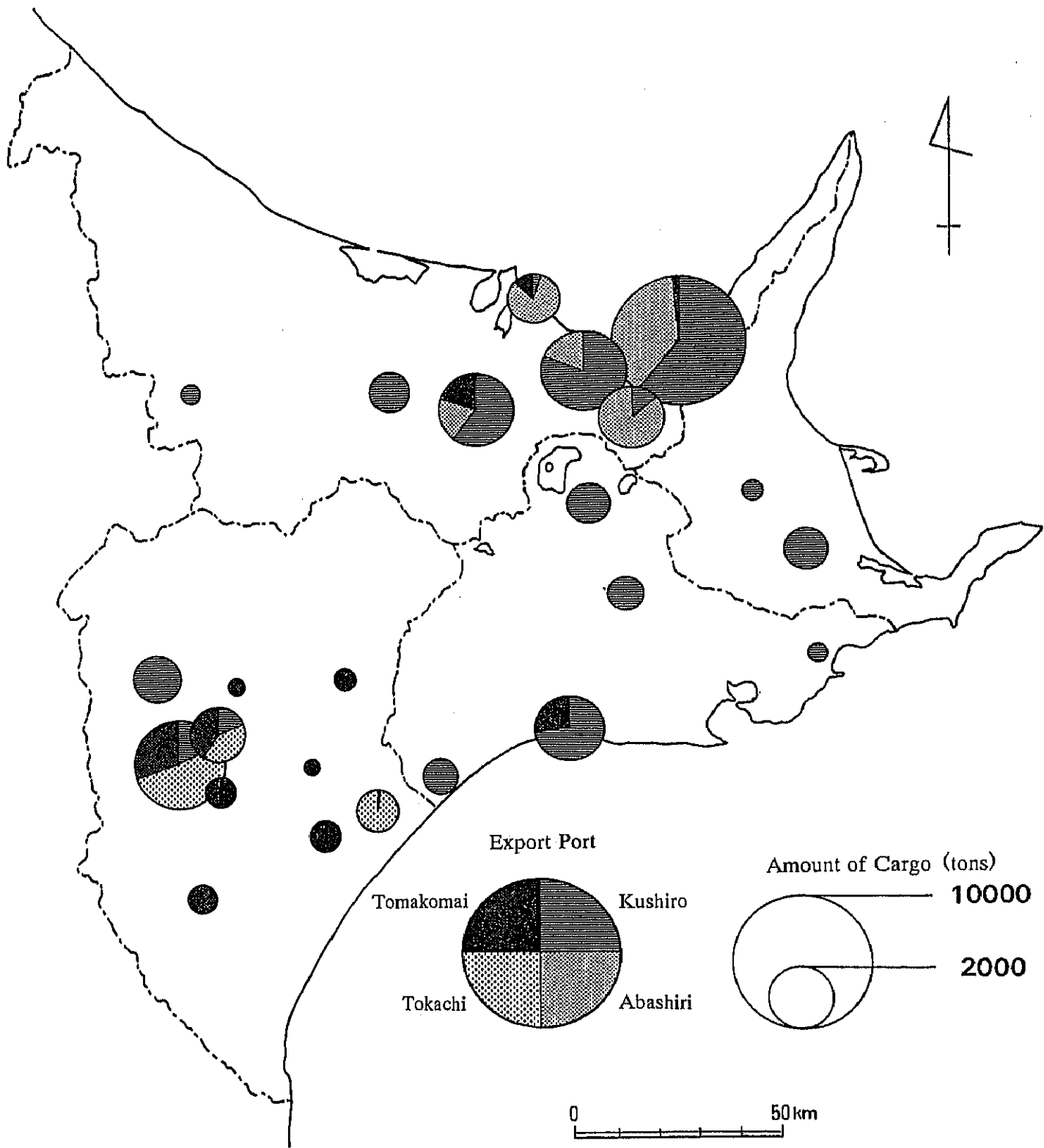


Figure 25 Outbound Movements of Food Industrial Goods in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

Some food industrial goods are transported from Tokachi district to the Kushiro port, but the Tokachi port keeps its dominance in Tokachi district. Many food industrial goods are also transported from Abashiri district to the Tomakomai port and they account for 39.2% of the total exported food industrial goods in Abashiri district.

- Coal

All coal is transported from Taiheiyo Coal Mine which is situated in Kushiro city. And coal of Taiheiyo Coal Mine is not exported from ports other than the Kushiro port.

- Paper and Pulp

Paper and pulp are transported from Nihon Paper Manufacturing Co. and Oji Paper Manufacturing Co. in Kushiro city. Paper and pulp produced in these companies are not exported from a port other than the Kushiro port. And paper and pulp are not transported from a region other than the eastern part of Hokkaido.

- Fresh Milk (Figure 26)

Characteristics of fresh milk hinterland are discussed as follows, taking the case of Hokuren whose amount of shipment of fresh milk is the largest in the east part of Hokkaido.

Fresh milk has been exported on a full-scale from the eastern part of Hokkaido to outside of Hokkaido since the RORO ship called Hokuren-maru³⁵⁾ was placed on the Kushiro-Hitachi line in 1991. Hokuren

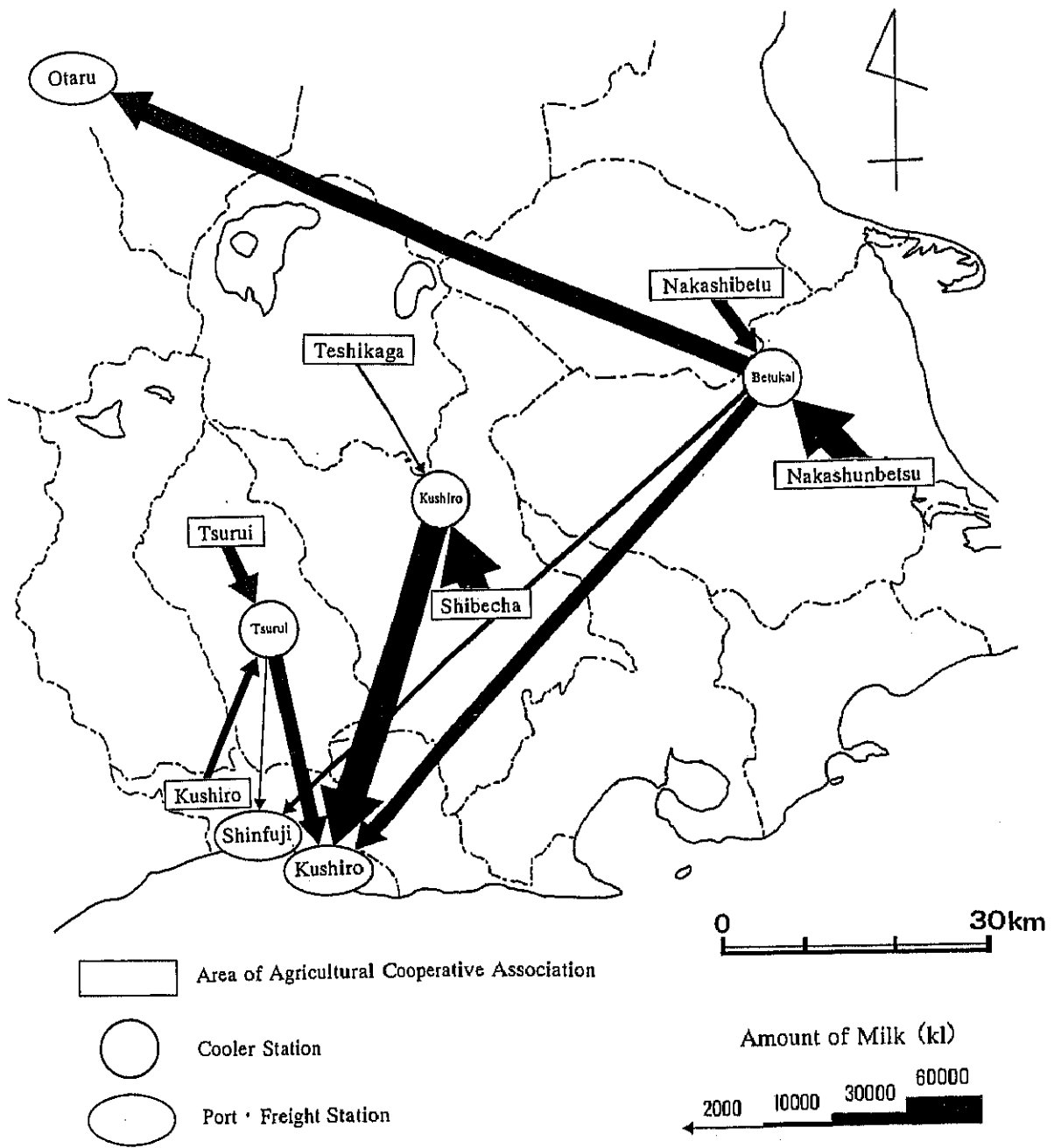


Figure 26 Fresh Milk Movements from the Eastern part of Hokkaido to Honshu in 1998
 Source: Compiled from data provided by Hokuren Agricultural Cooperative Associations.

shipped 175,400 tons of fresh milk from Kushiro and Nemuro districts to outside of Hokkaido in 1998 fiscal year. Fresh milk is transported from farms to the cooler station by a ten-ton tank lorry car. Fresh milk is cooled down to 2 °C here and loaded into a 16,800 liter fresh milk container. The fresh milk container is transported to a port or Japan Railways freight station by a trailer and transported outside of Hokkaido by RORO ship, or ferry, or rail. The cooler station is a base of fresh milk shipment and is constructed in Betsukai town, Shibeche town, and Tsurui village.

Flows of fresh milk for each cooler station in 1998 fiscal year are introduced as follows. 82,300 tons of fresh milk are shipped from the cooler station in Betsukai town. About 70% of fresh milk is from the district of Nakashunbetsu Agricultural Association in Betsukai town and the rest are from the district of Nakashibetsu-cho Agricultural Association. 38% of fresh milk is transported from the Kushiro port to the Hitachi port by RORO ship, 50% are transported from the Otaru port to the Tsuruga port by ferry, and 12% are transported from Shinfuji Station in Kushiro city to Umeda Station in Osaka city by rail. 61,000 tons of fresh milk are shipped from the cooler station in Shibeche town. 93% of fresh milk is transported from district of Shibeche-cho Agricultural Association and the rest is transported from district of Teshikaga-cho Agricultural Association. All milk is exported from the Kushiro port to the Hitachi port by RORO ship. 32,100 tons of fresh milk are shipped from the cooler station in Tsurui village. 67% of fresh milk is transported from district of Tsurui-mura Agriculture Association

and the rest is transported from district of Kushiro-shi Agriculture Association. 94% of fresh milk is exported from the Kushiro port to the Hitachi port by ferry and the rest are transported from Shinfuji Station to Umeda station by rail.

As mentioned above, fresh milk is transported to Kanto district by way of the Kushiro port and to Kansai district by way of the Otaru port. The destination of fresh milk decides an export port. All fresh milk by way of the Otaru port is transported from the cooler station in Betsukai town, because transportation cost from this cooler station to the Kushiro port is higher than that from other cooler stations. Fresh milk has been transported by rail since the opening of the Seikan Tunnel in 1988. But the amount of rail transport has decreased since the starting of RORO ship service and it accounts for only 6.7% of all fresh milk shipments in Kushiro and Nemuro districts.

b. Imports (Figure 27)

Cargoes are transported from the Kushiro port to 86 municipalities. A large amount of cargoes are transported to the eastern part of Hokkaido and they account for 99.1% of the total imports³⁶⁾. Especially, cargoes to Kushiro city account for 48.2% of the total cargo, so the port city is the biggest arrival place. Obihiro city, Kitami city, and Betsukai town are the next largest. The share of the Kushiro port accounts for over 50% in municipalities in Kushiro, Tokachi, and Nemuro districts except Nemuro city and Shimizu town (Tokachi district), so three districts are within the hinterland of the Kushiro port. In Abashiri district, the share

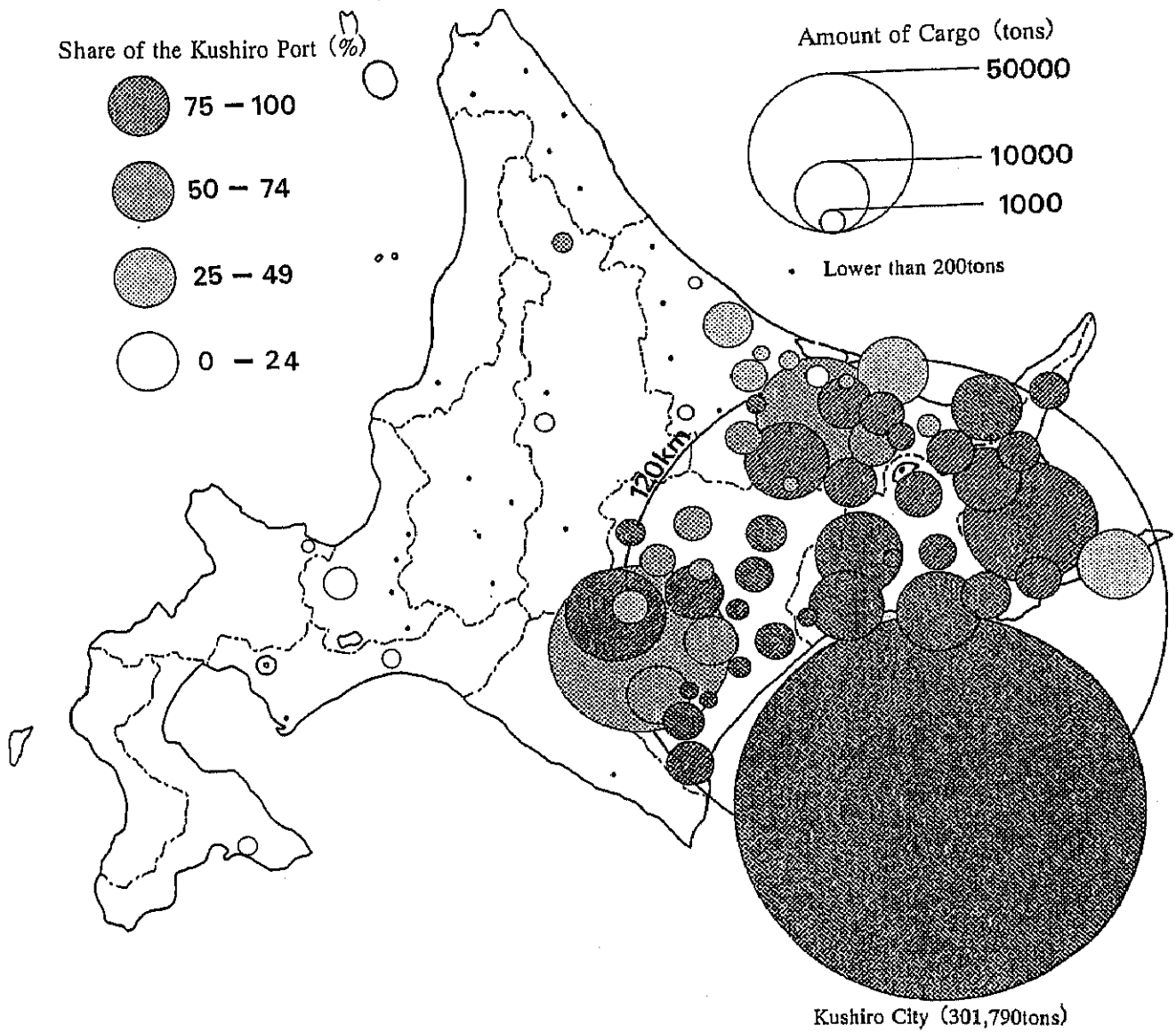


Figure 27 Share and Amount of Total Import Cargo of the Kushiro Port in Oct. 1993
 Source: as Figure 13.

the Kushiro port is high in the southeast part and low in the northwest and the coastal part. On the other hand, the amount of transport from the Kushiro port to regions other than the eastern part of Hokkaido is only 0.9% of the total imports. As for transportation means of the cargo from the Kushiro port, trucks account for 89.6%, railways account for 3.1%, and others account for 7.3% (Figure 14 (b)). Only oil products, heavy oil, and some rubber products are transported by rail. And the container cargo accounts for 1.0% of the total imports. A container is chiefly used for the transport of food industrial goods.

Oil products, heavy oil, cement, other wood, fodder, fishery processing goods and fishery goods, which are the major import goods of the Kushiro port, as cases and characteristics of their hinterlands are discussed as follows.

- Oil Products (Figure 28)

Oil products are transported to all municipalities except one village in Abashiri district. Especially large amounts of cargo are transported to densely populated cities such as Kushiro city, Obihiro city, and Kitami city. Oil products from the Kushiro port account for 89.2% of Tokachi district, 99.7% of Kushiro district, 75.1% of Nemuro district, and 70.2% of Abashiri district. These four districts are within the hinterland of the Kushiro port. Its share is a little low in Nemuro and Abashiri districts, because some oil products are transported from the Nemuro port to Nemuro district and from the Abashiri port to Abashiri district. And also in Tokachi district, some oil products are transported from the

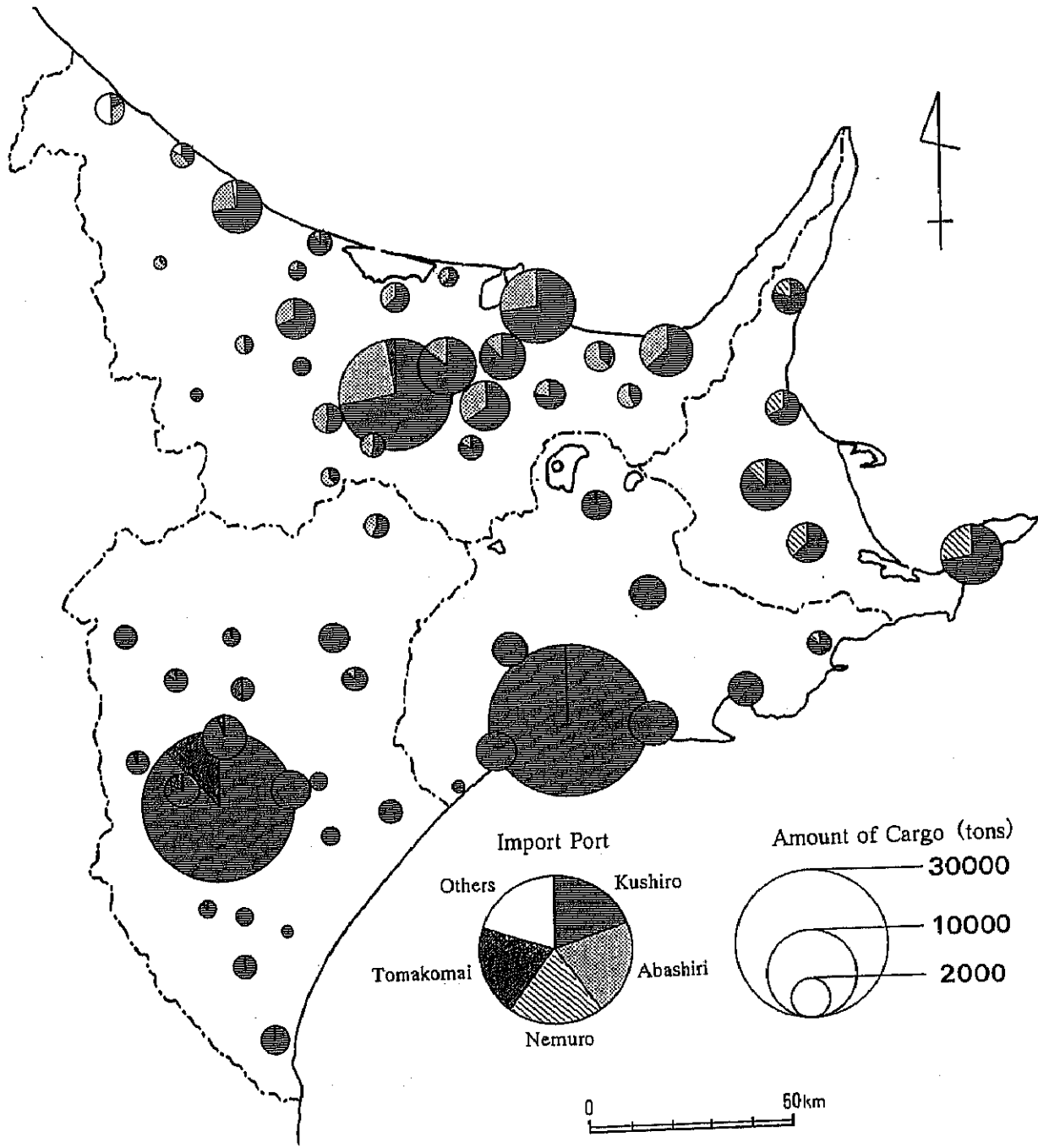


Figure 28 Inbound Movements of Oil Products in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

Tomakomai port. The amount of oil products from the Kushiro port to regions other than the eastern part of Hokkaido are small and account for 0.6% of the total imports.

- Heavy Oil (Figure 29)

Heavy oil is transported to the whole area of the eastern part of Hokkaido, like oil products. Kushiro city is the largest destination and accounts for 37.7% of the total imports. A large amount of heavy oil is also transported to Shari town and Memuro town where a sugar plant and a starch plant are located. Heavy oil from the Kushiro port accounts for 97.4% in Tokachi district, 100% in Kushiro district, and 78.9% in Abashiri district. But it accounts for only 41.9% in Nemuro district and the rest is imported from the Nemuro port. The share of the Kushiro port is a little low in Abashiri district, because some heavy oil is transported from the Abashiri port. Heavy oil is transported from three ports situated outside of the eastern part of Hokkaido, but its amount is only 413 tons.

- Cement (Figure 30)

Cement is transported to Tokachi, Kushiro, Nemuro districts, and the southeast part of Abashiri district. Kushiro city is the largest destination and accounts for 21.5% of the total imports because the Kushiro port plays the role of a transit base of cement as well as fodder. Cement from the Kushiro port accounts for 97.0% in Kushiro district, and 99.6% in Nemuro district. These districts are within the hinterland of the Kushiro port. While the share of the Kushiro port is 50.8% in Tokachi district and

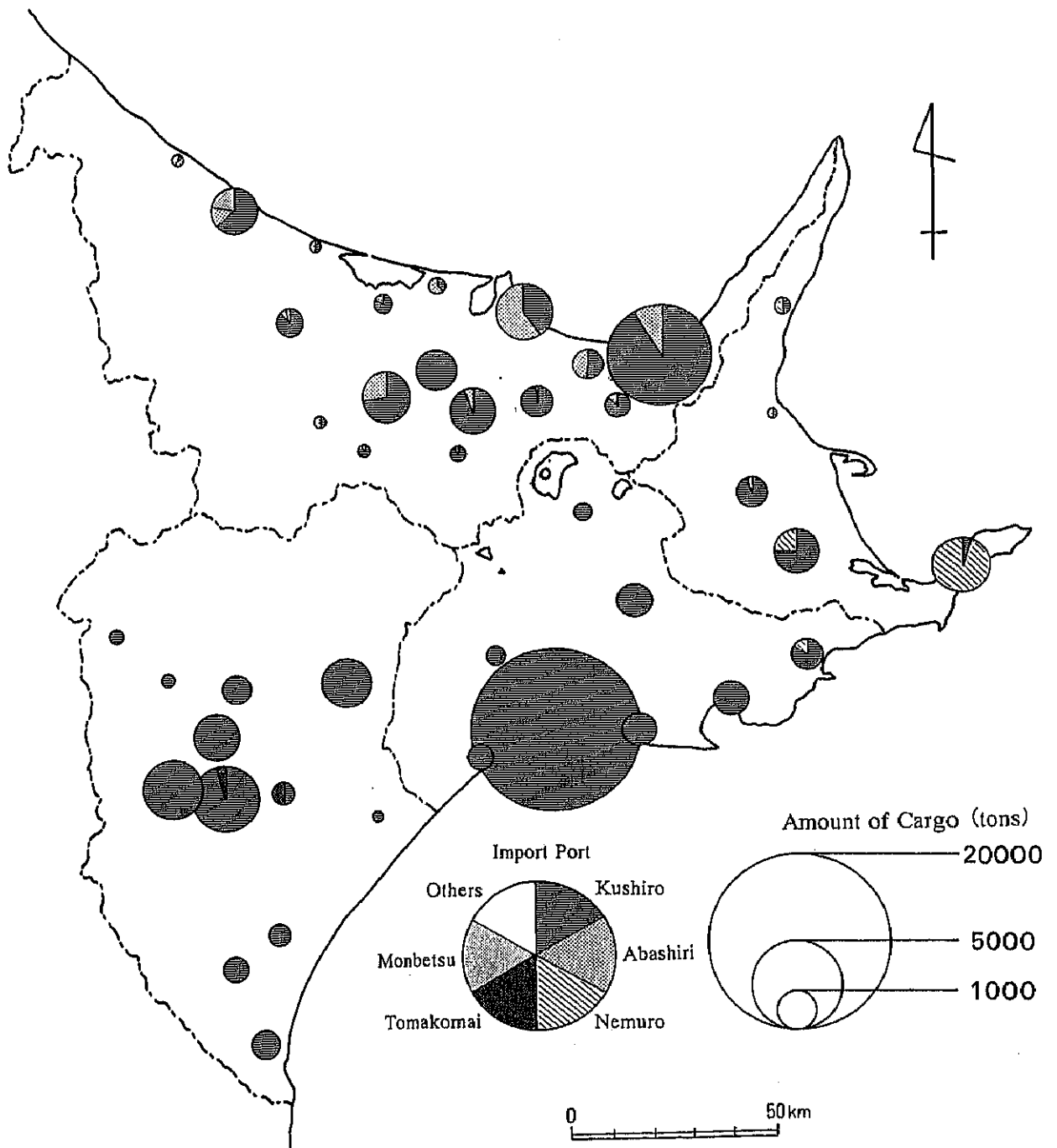


Figure 29 Inbound Movements of Heavy Oil in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

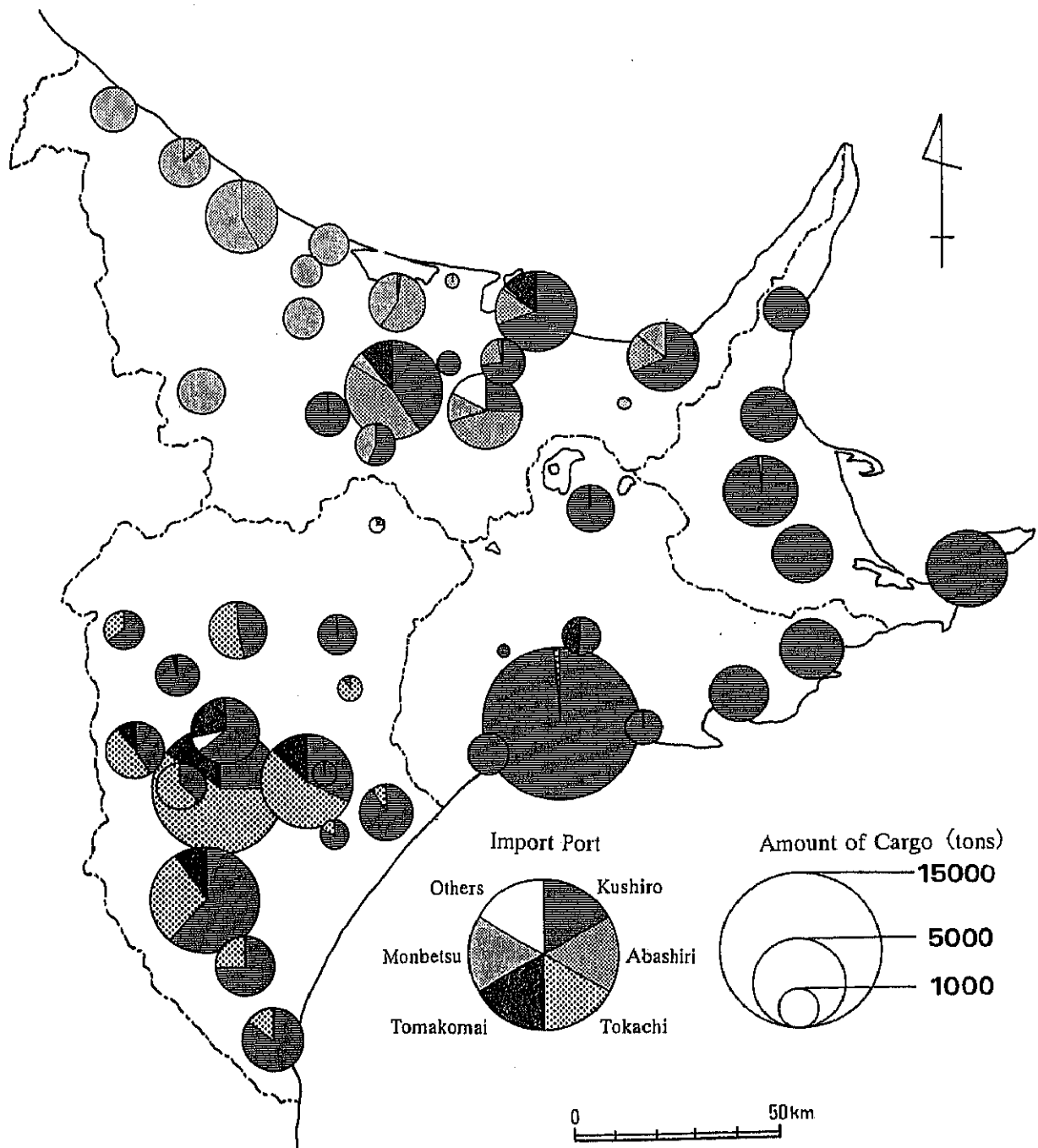


Figure 30 Inbound Movements of Cement in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

29.8% in Abashiri district. The share in these districts is a little low. This is because cement is transported from the Tokachi port to Tokachi district and from the Abashiri port and the Monbetsu port to Abashiri district. And some cement is transported to Tokachi and Abashiri districts from the Tomakomai port. Cement is not transported from the Kushiro port to outside of the eastern part of Hokkaido.

- Other Wood

As other woods (wood chip) are used for raw material of paper and pulp, 99.8% of them are transported to Kushiro city where two large-scale paper manufacturing plants are located. And a small amount of other wood is transported to Obihiro city, Kitami city, and Asahikawa city.

- Fodder³⁷⁾ (Figure 31)

Fodder is transported to only 14 municipalities, because destination of fodder is restricted to the place with a storage facility of fodder. Kushiro city is the largest destination and it accounts for 50.9% of the total import. Obihiro city, and Betsukai town are the next largest. Fodder from the Kushiro port accounts for 83.7% in Tokachi district, 97.5% in Nemuro district, and 76.1% in Abashiri district. These districts are within the hinterland of the Kushiro port. Fodder is transported from the Tokachi port to Tokachi and Abashiri districts, but its amount is small. And fodder is not unloaded in the Abashiri port. Fodder is transported from the Tomakomai port to the eastern part of Hokkaido and it accounts

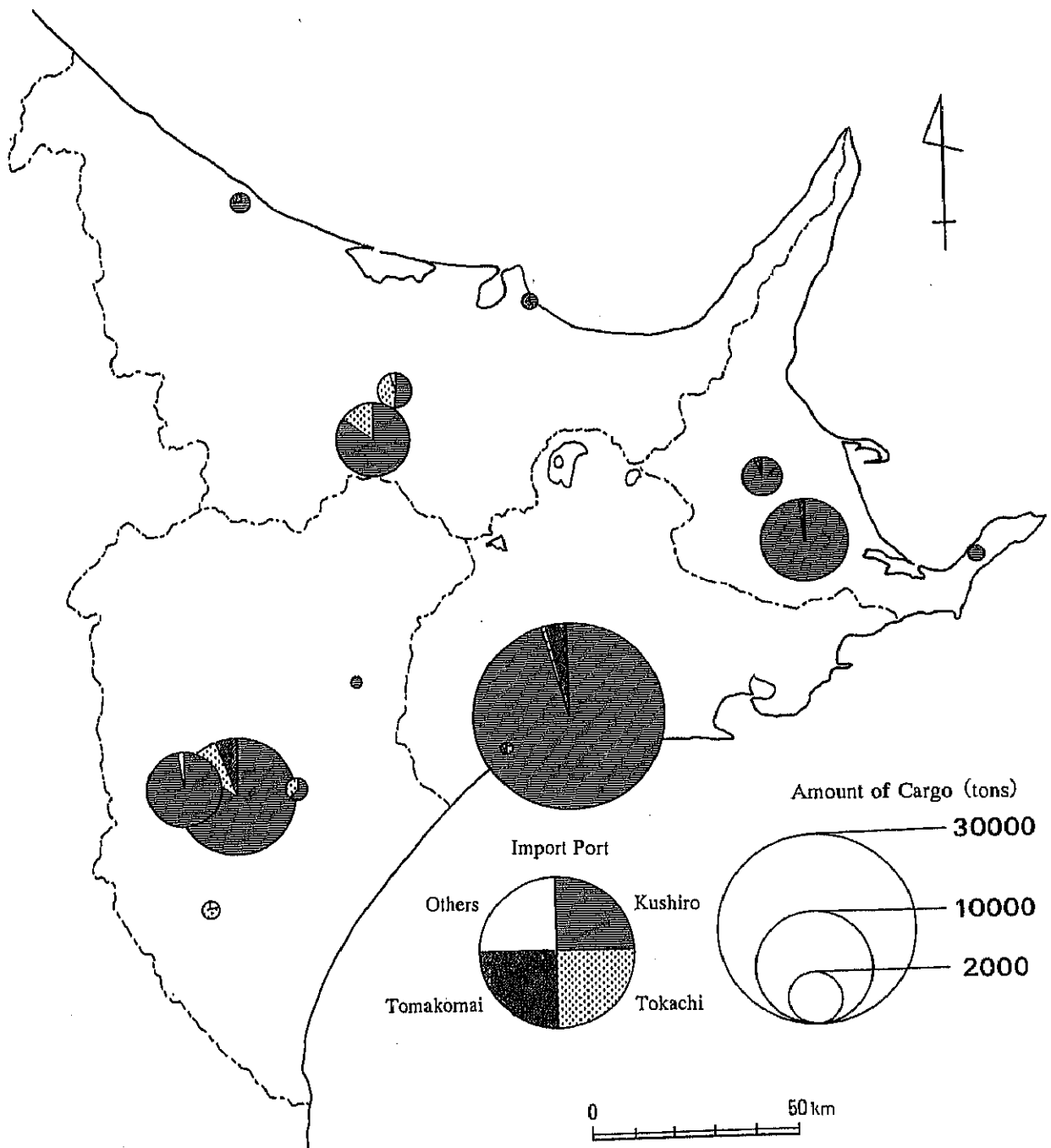


Figure 31 Inbound Movements of Natural Fertilizer in the Eastern Part of Hokkaido in Oct. 1993
 Source: as Figure 13.

for 6.5% in Tokachi district and 12.2% in Abashiri district. Kushiro city is the largest destination of fodder, because some large fodder plants are located there. Fodder is mixed and stored here, then transported to municipalities in the eastern part of Hokkaido. Therefore, the Kushiro port plays the role of the fodder supply base in the eastern part of Hokkaido. Now the flows of fodder are discussed taking the case of H company, Z company, and N company which are located in the port.

The Kushiro plant of H company ships 303,699 tons of mixing fodder in 1998 fiscal year and it accounts for 41.0% of the total shipment in Kushiro city. Fodder is transported from the eastern part of Hokkaido to Soya and Rumoi districts (Figure 32 (a)). And a small amount of fodder is forwarded from the Kushiro plant to the Tomakomai plant and the Asahikawa plant. Fodder is transported from the Kushiro plant to each farm by way of stock points in Shibechea, Kitami, Obihiro, Nakashibetsu, and Tenpoku. Stock points in Obihiro and Kitami have a fodder plant and produce fodder from raw materials which are transported from the Kushiro port. 140,600 tons of fodder produced in the Obihiro plant are transported to Tokachi district and 91,900 tons of fodder produced in the Kitami plant are transported to Abashiri district. Figure 32 (b) (c) shows the destinations of fodder in Z company and N company. The share of Z company in Kushiro city is 14.0% and N company is 34.3%. Fodder in Z company is transported to the eastern and the northern part of Hokkaido and fodder in N company is transported only to the eastern part of Hokkaido. The hinterland of fodder produced in the plants in the Kushiro port extends to the eastern and the

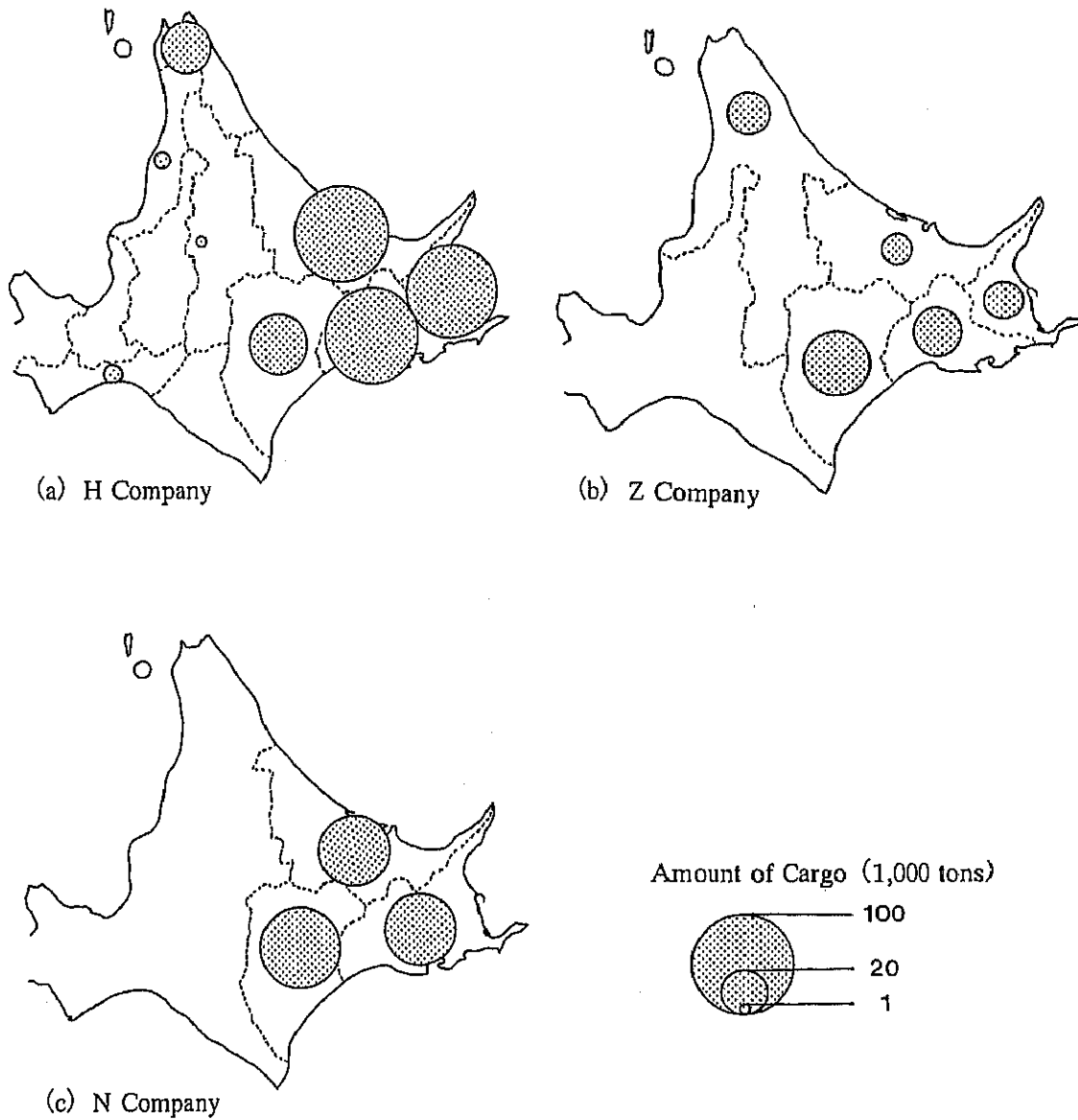


Figure 32 Destination of Fodder from Fodder Plant in Kushiro in 1998

(Note) Regional division is based on data of each company.

Source: Compiled from data provided by fodder companies.

northern part of Hokkaido.

- Fishery Goods and Processed Fishery Goods

99% of salmon and trout, 98% of sardine, and 90% of pollack landed or imported in the Kushiro port are processed in the processed fishery products plants in Kushiro city and Shiranuka town. The Kushiro port and these plants behind the port are closely related with each other. In this section, salted fish, roe, canned fish, fish meal which are the main processed fishery goods, and fresh fish are taken up as examples.

Salted Fish and Roe

Abe Company is one of the biggest processed fishery products companies in Kushiro city and the amount of production of salted fish (salmon and trout) and roe (salmon roe) is largest in Kushiro city. About 14,000 tons of material fish (salmon and trout) are processed in 1998. 11,000 tons of them are landed in the fishing ports in Hokkaido and the rests are imported from Russia, Canada, Alaska, Chile, and Australia. About 4,000 tons of material fish in Hokkaido are landed in the Kushiro port.

10% of salted fish are shipped to Hokkaido, 60% of them are shipped to Kanto district, and 30% of them are shipped to Kansai district. And about 5% of roe are shipped to Hokkaido and 50% of the rest are shipped to Kanto district and almost the same amount are shipped to Kansai district. To Kanto district, 20% of roe are exported from the Kushiro port and 80% of roe are exported from the Tomakomai port, while to Kansai district all roe are exported from the Otaru port. The

processed fishery goods are transported from the plant to each port by truck, then they are exported from the Tomakomai port or the Otaru port by ferry and from the Kushiro port by ferry or RORO ship.

Canned Fish

Nichirei Company, which mainly produces the canned salmon and trout, is one of the major fishery companies. About 1,300 tons of trout are processed in 1999. 46.6% of trout are from the Nemuro port, 28.8% are from the Hiroo port, 15.5% are from the Akkeshi port, and only 9.0% are from the Kushiro port. 30.8% of canned fish are shipped to Kanto-Koshinetsu district, 27.2% of them are shipped to Kinki-Chugoku-Shikoku district, 19.6% of them are shipped to Chubu district, 12.0% of them are shipped to Tohoku district, 7.2% of them are shipped to Hokkaido district, and 3.2% of them are shipped to Kyushu-Okinawa district.

Fish Meal

Kushiro Fish Meal Company has the biggest fish meal plant in Kushiro city and produces fodder for chickens. About 10,000 tons of fodder are produced in 1998. 3,000 tons of the mackerel pikes which are the main raw materials are from the Kushiro port, 2,000 tons of them are from the Nemuro port, and 2,000 tons of them are from the Abashiri port and the Monbetsu port, and 1,000 tons of them are from the Akkeshi port. Additionally, the remnants of the fish from the fishery processing plants in Kushiro city are used for fodder. 10% of fodder are shipped to Hokkaido and the rest are shipped to outside of Hokkaido. A large amount of fodder are shipped to the poultry farms in Kyushu district and

Shizuoka prefecture.

- **Fresh Fish**

About 1.7% of fish landed in the Kushiro port are shipped as fresh fish in 1998. Most of them are shipped to municipalities in Kushiro district by way of Shinfuji Fish Market. The amount of fresh pollack, sardine, and mackerel pike which were landed in the Kushiro port are small. Especially, a lot of pollack, sardine, and mackerel pike are landed in the Kushiro port, but their amount of shipment as fresh fish are small. For example 123,000 tons of pollack are landed and 2,000 tons of them are shipped as fresh fish. About 10,000 tons of pollack are shipped to the processed fishery products plants in Abashiri and Monbetsu. The rest are shipped to the processed fishery products factories in Kushiro as materials of minced flesh. The landing amount of flatfish, lockington, squid, smelt, and arctoscopus japonicus are small, but a large percentage of them is shipped as fresh fish.

- c. Ferry Cargo**

Hokkaido and Honshu are connected with 14 ferry routes in 1993. In Hokkaido six ports have a ferry service with Honshu and in the eastern part of Hokkaido only the Kushiro port has a ferry service with the Tokyo port³⁸⁾. Ferry cargo of the Kushiro port accounted for 3.1% of the whole ferry cargo in Hokkaido.

- Exports (Figure 33 (a))

Ferry cargo are transported from four districts in the eastern part of Hokkaido to the Kushiro port. Ferry cargo from Kushiro district is the largest and accounts for 64.4% of the total ferry cargo export. The share of the Kushiro port is 34.8% in Kushiro district. Its share is higher than that of other ports but is low compared with cargo other than ferry cargo and many ferry cargoes are transported to the Tomakomai port, the Muroran port, and the Otaru port. In Tokachi district and Abashiri district, the share of the Tomakomai port, the Otaru port, and the Muroran port is higher than that of the Kushiro port. And in Nemuro district the share of the Otaru port and the Muroran port is higher than that of the Kushiro port. That is, the eastern part of Hokkaido, except Kushiro district, are within the hinterland of three ports located in the central part of Hokkaido

- Imports (Figure 33 (b))

Ferry cargoes are transported from the Kushiro port to four districts in the eastern part of Hokkaido. Ferry cargo to Kushiro district is the largest and accounts for 64.9% of the total ferry cargo imports. The share of the Kushiro port is 43.5% in Kushiro district and 45.8% in Nemuro district, and 33.5% in Abashiri district. But the Tomakomai port has the highest share in Tokachi district and accounts for 40.8%, while the Kushiro port accounts for only 8.7%. A large amount of ferry cargo is transported from three ports in the central part of Hokkaido to Abashiri district. The Kushiro port and these three ports are in rival relations in

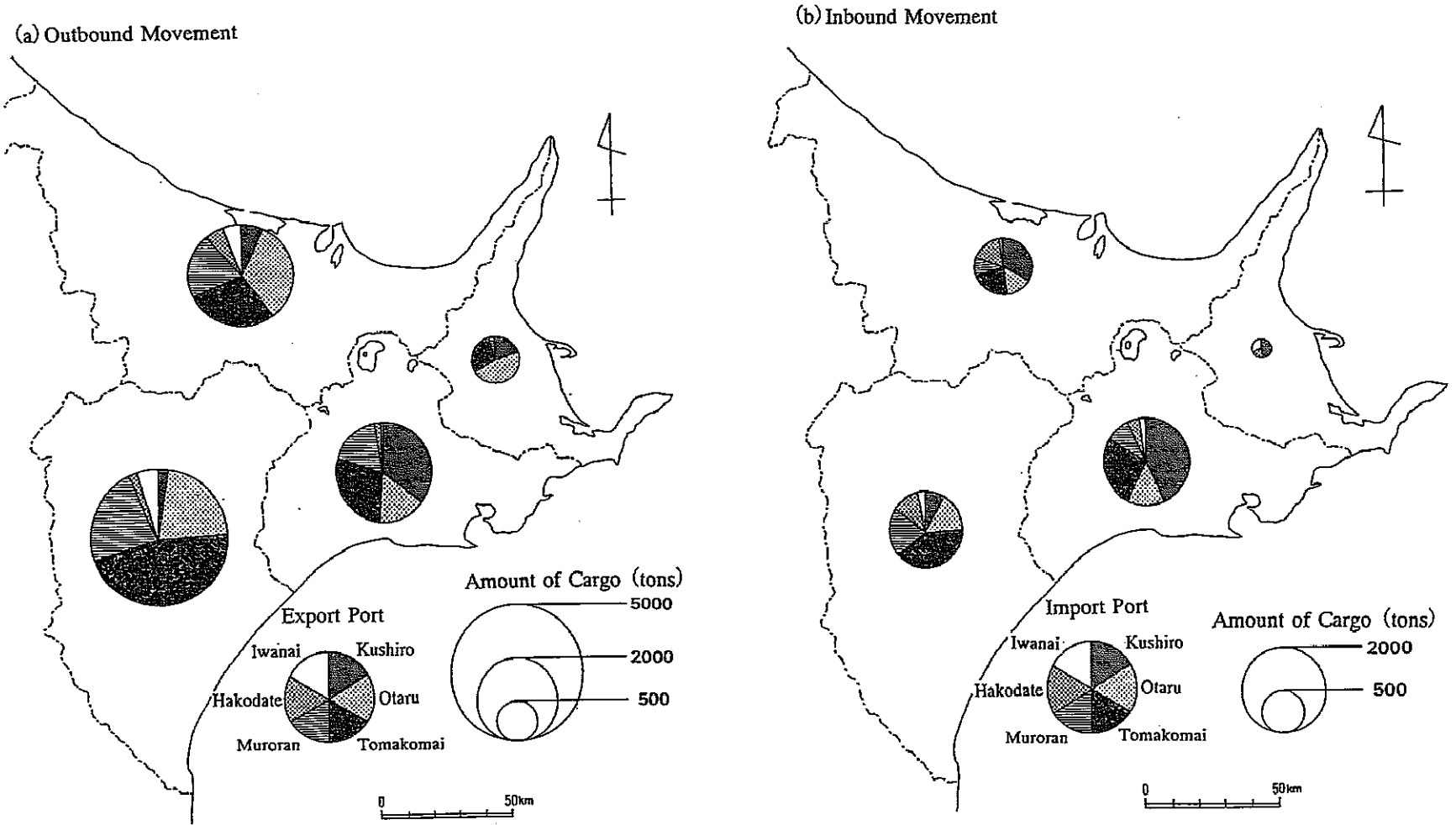


Figure 33 Outbound and Inbound Movements of Ferry Cargo in the Eastern Part of Hokkaido in Oct.1993
Source: as Figure 21.

Abashiri district.

4.3. Port Space in the Era of Truck Dominance

4.3.1. Characteristics of Port Space

a. East Port

East Port consists of five wharves, one quay, and fishing port. And the length of the quay is 4,131m in 1998. A lot of cargoes of East Port came to be shipped in West Port and the amount of cargo in East Port has decreased. The amount of cargo in the 1997 fiscal year is 4,456,555 tons and accounts for 25.5% of the total cargo (except ferry cargo) of the Kushiro port. For purposes of discussion about characteristics of port space based on Figure 34, East Port is divided into four areas: South Wharf and South New Wharf, Old Kushiro River mouth area, Central Wharf and North Wharf, and Sub-Port.

In South Wharf, coal is chiefly exported and cement is chiefly imported. Coal accounts for 44.1% of the total cargo in East Port. Coal is transported from the coal pit of Taiheiyo Coal Mining Co. to the coal yards in Shireto coastal area³⁹⁾ by rail and stocked here for a time. Then, coal is carried to South Wharf by belt conveyer and loaded into a coal ship by two coal loaders. Meanwhile, cement is unloaded from a cement ship and stocked in four cement silos of South Wharf. In South New Wharf, oil products and heavy oil are mainly unloaded. Oil products

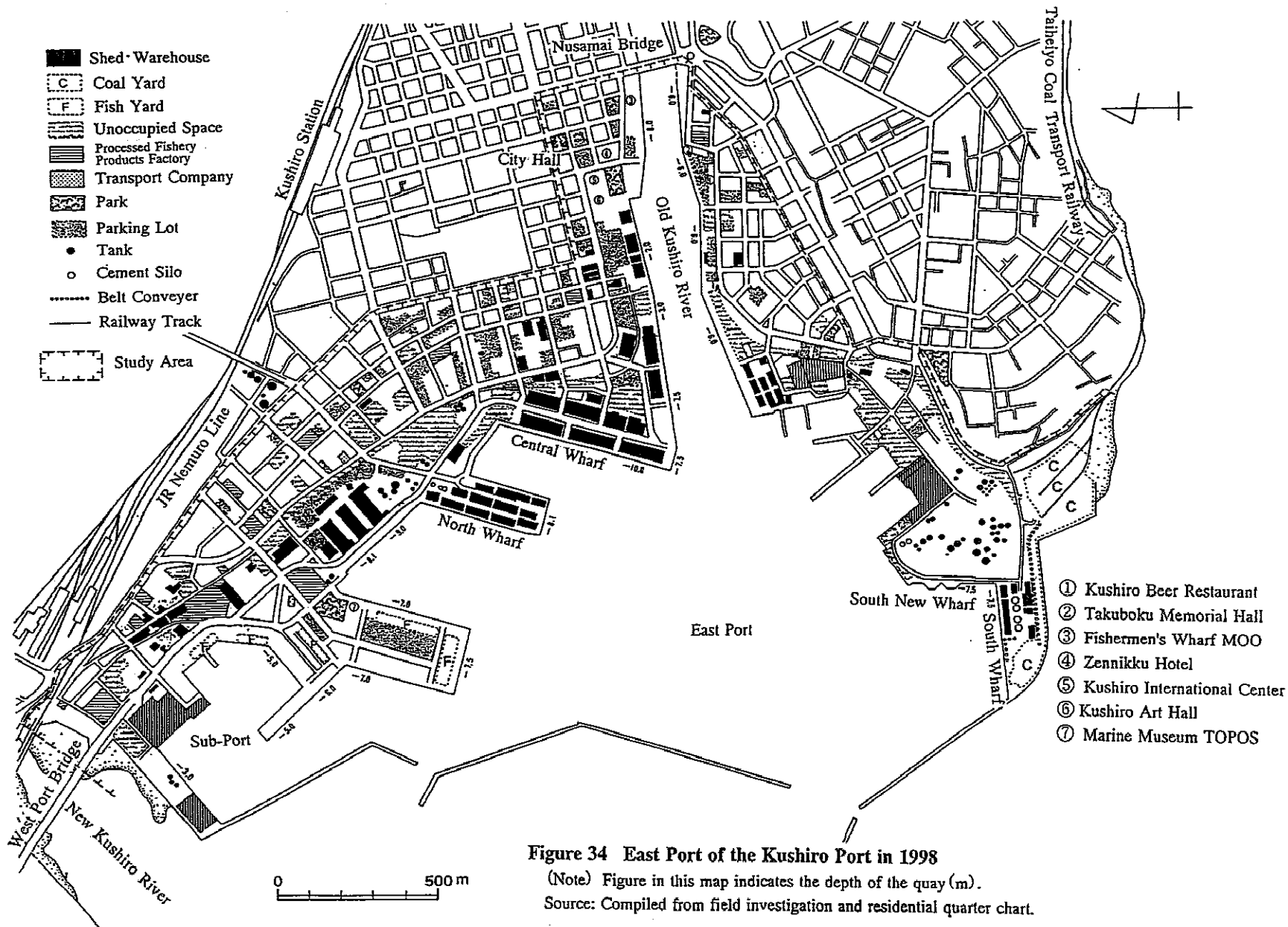


Figure 34 East Port of the Kushiro Port in 1998

(Note) Figure in this map indicates the depth of the quay (m).

Source: Compiled from field investigation and residential quarter chart.

account for 18.5% and heavy oil accounts for 4.8% of the total cargo in East Port. Storage facilities of oil products and heavy oil which are connected with a quay by pipelines are located behind South New Wharf. Land use of South Wharf, South New Wharf, and the area behind is specialized for the import and the export of the energy resources.

Cargoes are hardly ever shipped at the river quays from South New Wharf to Nusamai Bridge⁴⁰⁾. Open space, stockyards, and parking lots are remarkable land use behind the quays. Warehouses, sheds, and fishery processing plants are located there also, but most of them have become obsolete. On the other hand, new movements coping with the waterfront development project are seen behind the quay adjacent to Nusamai Bridge such as the construction of a local beer restaurant and Takuboku Memorial Pavilion. The area from Nusamai Bridge to Central Wharf became the target of the waterfront development project at the end of 1980s and Kushiro Fisherman's Wharf, International Cultural Exchange Center, Art pavilion, a hotel, a multi-story parking garage, and park have been constructed. So commercial, cultural, and sightseeing facilities are superior here. Cargo is not shipped from here and the quay in front of Kushiro Fisherman's Wharf is used for a landing space of an excursion ship.

Central Wharf and North Wharf were main wharves in the Kushiro port before the construction of West Port. In East Port, the share of Central Wharf is 6.3% and North Wharf is 4.7% in 1993. In Central Wharf, material woods and chemical fertilizers are mainly loaded. Behind Central Wharf, there are four facilities which serve a double purpose of

shed and warehouse, and behind them there are five port warehouses. But some cargoes which are not imported or exported in Central Wharf are stored in these sheds and warehouses, so these port facilities do not fill their primary functions. In North Wharf cement is mainly imported. Cement is loaded at the quay between North Wharf and Sub-Port and is stored in cement silos behind the quay. The amount of loading and unloading cargoes in the pier part of North Wharf are small. Some cargoes which are not imported or exported in North Wharf are stored in the warehouses at this wharf like Central Wharf. In a zone behind Central Wharf and North Wharf, undeveloped lands use such as unoccupied space, material yard, and parking lots are remarkable. And behind this zone unoccupied space and parking lots are remarkable. Recently, multi-story apartment houses and large-scale pachinko parlors have been constructed one after another.

Sub-Port is used for a fishing port. Quays are used for fish landing and a lot of fishery facilities such as a fish market, refrigeration warehouse, and parking lots are located behind the quays. And a lot of fishery processing plants are located behind Sub-Port.

Figure 35 is a schematic diagram of port space and the surroundings of East Port, based on the above-mentioned results. East Port has characteristics as follows: large spaces in the port area are not used for cargo transport. Unoccupied spaces are located between the port area and built-up area. The built-up area adjacent to these unoccupied spaces is a transition zone where land use is changeable. Waterfront development is done in the Old Kushiro River mouth area. Port spaces related to energy

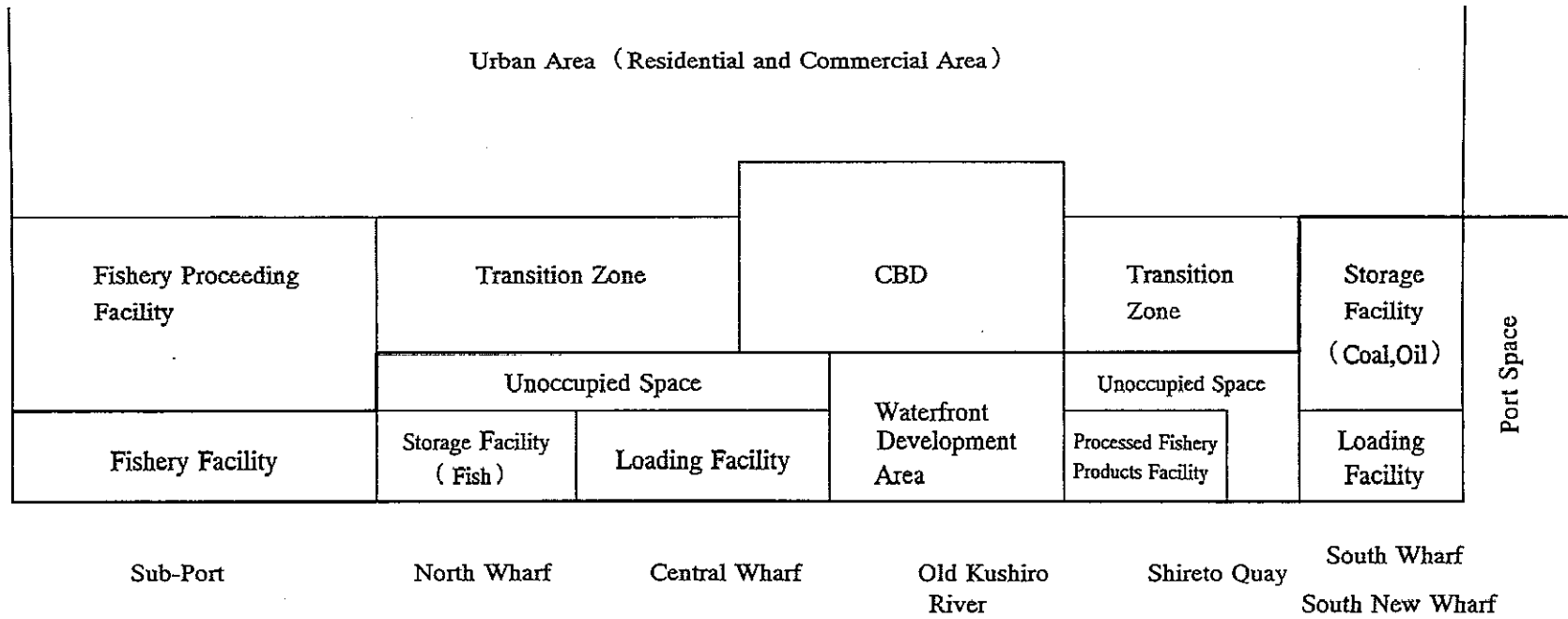


Figure 35 Schematic Diagram of Port Space and Surroundings of East Port in Sep. 1998

or fishery are formed at both ends of the port.

b. West Port

Oil piers in West Port started to be used in 1974. First Wharf, Second Wharf, and Third Wharf are used in 1999. And the length of the quays are 3,960m. Characteristics of port space are shown at every wharf, based on figure 36.

In oil piers of First Wharf, oil products and heavy oil are imported. Oil products and heavy oil are transported from oil tankers to the storage site behind the oil piers by pipeline. Oil products and heavy oil are transported to the hinterland by tank lorry and some heavy oil is transported by rail. There are fifty oil tanks in this storage site which is the largest oil distribution base in the eastern part of Hokkaido⁴¹⁾.

In First Wharf, paper and pulp are exported and wood chips are imported. Wood chips account for 63.0%, and paper and pulp account for 11.4% of the total cargo in First Wharf. Wood chips are unloaded from chip ships by two unloaders and transported to a chip yard behind the wharf by belt conveyer. Then, wood chips are transported to Nihon Paper Co. by belt conveyer and to Oji Paper Co. by truck. Then, paper and pulp are mainly transported from the two paper companies to First Wharf by truck and loaded into a ship there. And the ferry terminal is located at First Wharf and the ferry connects the Kushiro port with the Tokyo port. Four sheds, three warehouses, three cement silos, open yards and parking lots for trucks are located inside the wharf and large parking lots for trailers are located behind the wharf.

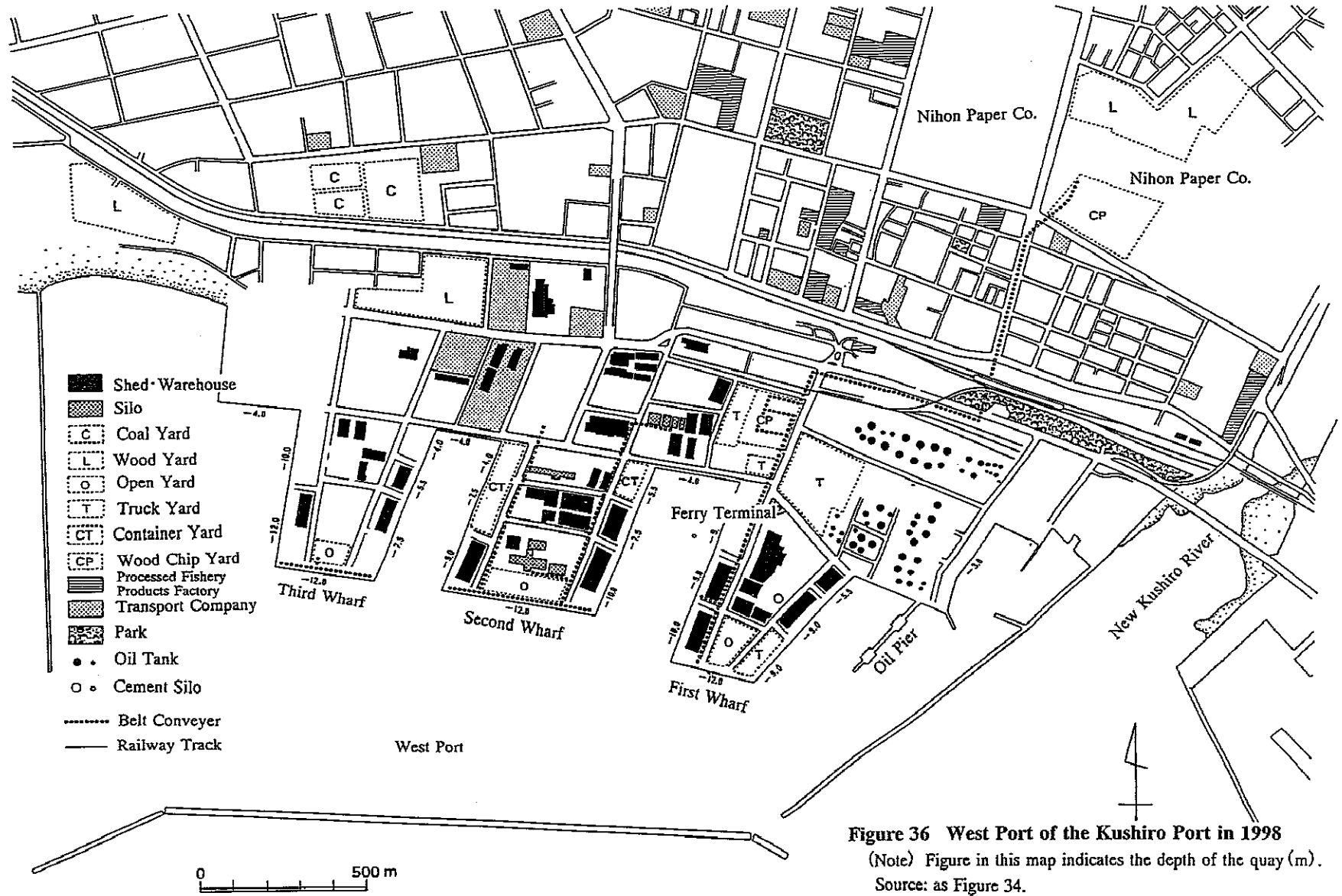


Figure 36 West Port of the Kushiro Port in 1998
(Note) Figure in this map indicates the depth of the quay (m).
Source: as Figure 34.

In Second Wharf, rice, grain, bean, and fodder are mainly imported and paper and pulp are mainly exported. Total fodder for domestic animals including rice, grain, and bean account for 37.8%, and paper and pulp account for 18.2% of the total cargo in Second Wharf. Fodder for domestic animals are unloaded from grain ships by two unloaders and are transported to fodder silos inside or behind the wharf by belt conveyers (Figure 37). There are 152 fodder silos whose storage ability is 99,680 tons. This is the largest storage ability north of Tohoku region. Paper and pulp, which are the largest amount next to fodder, are transported from the two paper companies to Second Wharf by truck and loaded there. Sugar, food industrial goods, vegetables, and fruits are exported by container ship or RORO ship⁴²⁾. Also, three sheds are located inside the wharf. Offices, warehouses, and parking lots of big transport companies occupy a vast area behind the silos.

In Third Wharf, fresh milk is mainly exported and coal is mainly imported. Fresh milk accounts for 60.7% and coal accounts for 18.4% of the total cargo in Third Wharf. Fresh milk is transported to Third Wharf by fresh milk container and loaded into a fresh milk ship. Coal is unloaded from a coal ship by unloader in Third Wharf and transported to the coal storage yard on the north side of the JR Nemuro line by truck. Material wood accounts for only 1.9% of cargo in Third Wharf. They are stored in wood yards behind or west of Third Wharf. There are three sheds and two warehouses inside the wharf. This wharf has some unoccupied spaces and material yards, because this wharf is under construction. And Kushiro City Central Wholesale Market, distribution

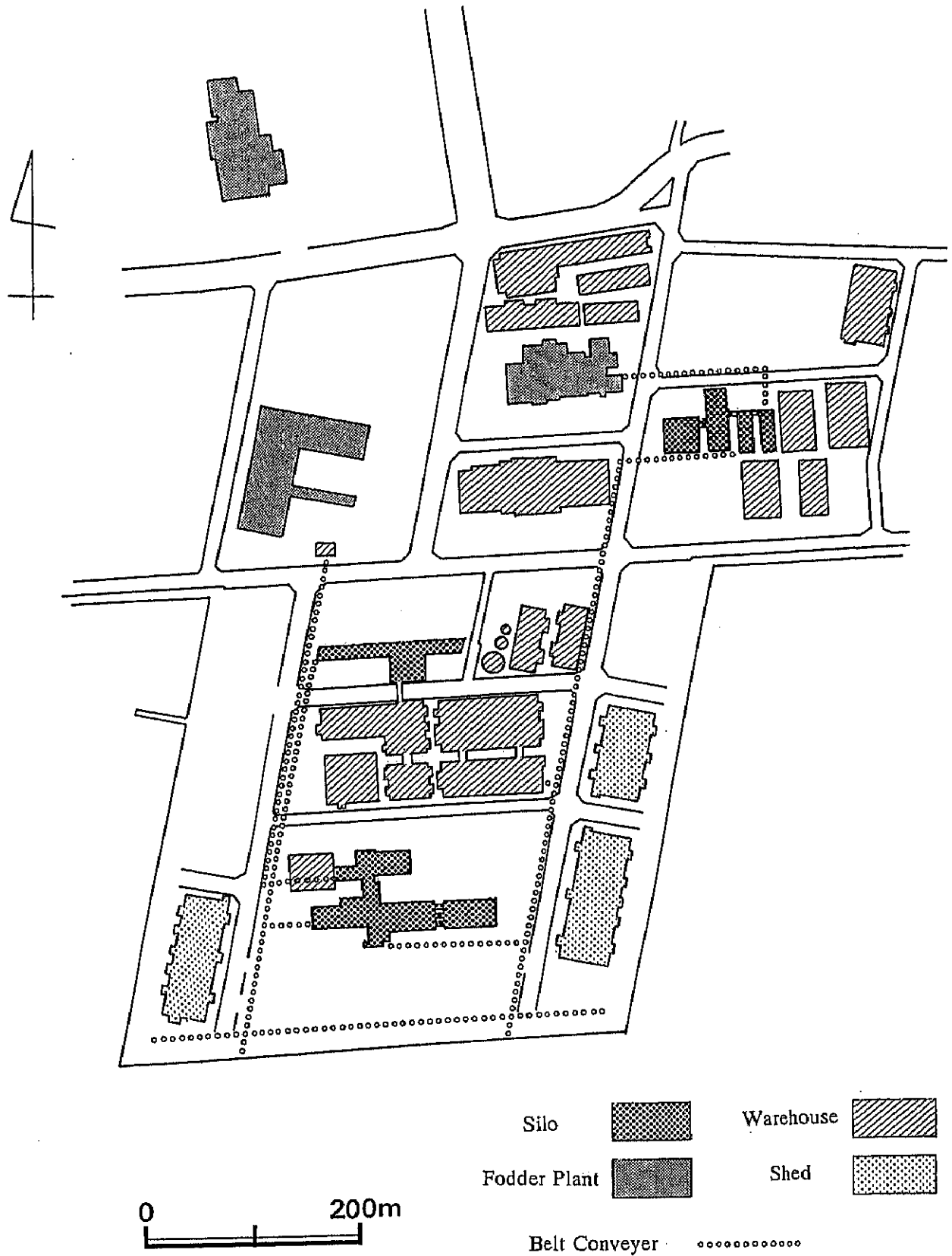


Figure 37 Location of Port Facilities in Second Wharf of West Port in Sep.1999
 Source: Compiled from field investigation and planning map of the Kushiro port

centers, and transport companies are located behind Second Wharf and Third Wharf.

Figure 38 is a schematic diagram of port space and surroundings of West Port, based on the above-mentioned results. West port has characteristics as follows: Port area specializes to a distribution function. Cargo loading facilities and storage facilities specialize for a specific cargo for each wharf. Large-scale productive facilities are located in and behind port space, so a port has characteristics of an industrial port. Percentage of truck transport facilities for port space is large. Facilities related to the distribution function are located behind port.

4.3.2. Reorganization of Port Space

Changes of transportation means and industrial structure in the port hinterland cause the reorganization of port space. In the central part of Hokkaido, the Tomakomai port and the Ishikari Bay New port were newly constructed to cope with changes. Because (1) The Otaru port and the Muroran port were surrounded by a hill or mountain and expansion of port space was difficult. (2) Road network connecting a port with a hinterland was poor. (3) The Otaru port and the Muroran port were away from Sapporo city which was the largest city in Hokkaido. While the Kushiro port coped with changes by expanding port space to the west of the New Kushiro River where a sand beach spread. Because the obstruction on cost and technique were small and also Kushiro city, where the Kushiro port is located, was the largest

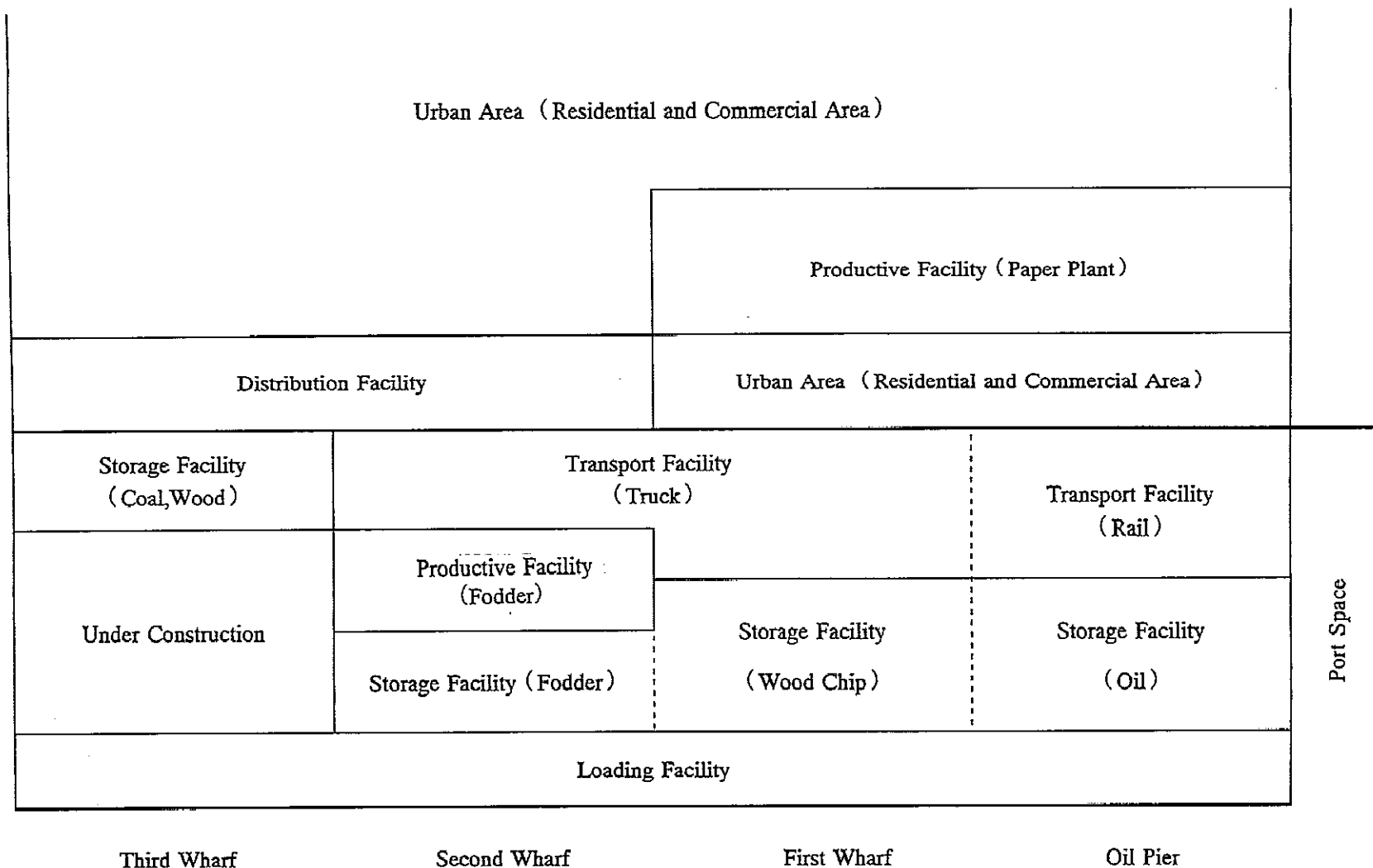


Figure 38 Schematic Diagram of Port Space and Surroundings of West Port in Sep. 1998

hinterland of the Kushiro port. On the other hand, inland areas were the main hinterland of the Otaru port and the Muroran port and these ports played the role of an outport of these areas.

According to the construction of a new port, port functions had moved from the old port to the new port one by one and port space of the old port was reorganized. Next, the reorganization of East Port is referred based on the land use maps of East Port in 1968 and 1998 (Figure 17, Figure 34) .

Port space was reorganized remarkably in the area from Nusamai Bridge to Old Kushiro River mouth which has an easy access with CBD. Loading facilities such as warehouses, sheds, and aprons along the Old Kushiro River and freight yards of the National Railway became targets of waterfront development project and commercial, cultural, and sightseeing facilities have been constructed since the middle 1980s. While in Central Wharf, North Wharf, and Shireto Quay adjacent to the waterfront developing region, loading facilities became obsolete and rail transport facilities behind loading facilities are left as unoccupied space after their removal. In Central Wharf, North Wharf, and area behind these wharves, the redevelopment projects are planned coping with the removal of the port functions to West Port. Distribution spaces near CBD are being reorganized into amusement spaces and CBD has a tendency to expand into these areas. In an area behind the rail transport facilities, where many fisherman's houses and some fishery processing plants were located in 1968, urbanization is remarkable. For example, some processed fishery products plants moved to the suburbs or closed their business

because of an expansion of the plant and the bad smell. And parking lots, unoccupied spaces, apartment houses, and amusement facilities (pachinko parlors) have extended here. Characteristics of a fishing settlement have been reduced by extension of these facilities. Behind Sub-Port some fishery processing plants are located and four large refrigerated warehouses (21,580 m²) were constructed in the former coal yard of Yubetsu Colliery Company. That is, a fishery processing base has been formed around Sub-Port.

Construction of West Port was almost completed in 1992, but Fourth wharf and Fifth wharf are under construction in the west of West Port. Because the present Kushiro port cannot cope with the needs of its hinterland. The following problems are concretely caused: time of the ship at anchor is long⁴³⁾: loading quay are often away from storage facilities: there are no quay of 14 m or more in a depth which the Panamax type ship (50,000 weight tons class ship) can come alongside the quay: as specialization of wharves are imperfect, a wharf is congested with cargoes: West Port will be cramped according to still more removal of port functions from East Port. Changes of the regional structure in the port hinterland always demands the reorganization of port space. It is thought that regional structure in the present hinterland of the Kushiro port will be reflected on port space when this new West Port will be constructed.

As mentioned above, distribution space of the Kushiro port are converging to West Port or South Wharf, South New Wharf, and Sub-Port in East Port. They are located in places far from CBD.

Distribution of port space gradually separates from town space because of motorization, development of the port hinterland, and construction of storage facilities and productive facilities in the port space. Meanwhile, port space as amusement space such as commercial, cultural, and sightseeing facilities, which have no relation with distribution function, is connecting with town space and a new type of port city is growing.