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Coastal cities, port activities and logistic constraints in a socialist developing country: The case of North Korea

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Abstract

This paper analyses the interplay of transport and development in North Korea, one of the most state-controlled and underdeveloped countries of the world. While broader aspects have been well described by various studies, logistics have been given little attention as permissive or restrictive factors in the country's development. Despite the recent reforms and the growth of trade, the development of North Korea is confronted to the weaknesses of the transport system and inland logistics. An analysis of vessel movements at North Korean ports (1985-2006) shows that although coastal economies may increasingly use maritime transport to overcome inland blockages, the evolution of port traffics better reflects broader trends such as general economic decline, westward shift of populations, and the polarization of economic

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activities around Pyongyang area. Beside those trends, the research also estimates the importance of maritime transport in North Korean trade and it provides a base upon which further studies can be conducted, so as to better evaluate the place of North Korea among transport studies.

Keywords: DPRK, North Korea, Port city, Socialist Developing Country, Transition

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1. Introduction

Following the crisis of the 1990s, provoked by the collapse of socialist countries and accentuated by natural disasters, Kim Jeong Il's military-oriented government has favoured a number of measures for the Democratic People's Republic of Korea (DPRK, hereafter North Korea)'s economic and social improvement. This radical break from the country's past attitude toward the outside world is based on institutional reforms, territorial management and increased relationships with other countries. Moreover, the ongoing changes are making transportation and logistics breathtakingly important, given the strategic location of North Korea within Northeast Asia and its potential for the processing and exportation of both raw material and manufactured goods. Its emerging status as a "transition" economy thus allows comparison to the role of ports and transport activities in such countries (Ledger and Roe, 1996; Thorez, 1998a; Jauernig and Roe, 2000 and 2001; Brodin, 2000). Notably, it is interesting to analyse the North Korean case because of its original identity, between developing and socialist countries, in terms of territorial planning and ideological constraints (Jo and Adler, 2002a).

Although transportation issues have been analysed in the case of transition countries and developing countries, it has never been confronted with the specific case of North Korea, a socialist developing country. Its proximity to major markets like China, South Korea, Japan and Russia gives to North Korea a particular advantage compared to other socialist developing countries like Vietnam and Cuba. Port studies have been 'few and dated' outside developed countries (Airriess, 1989), whereas 'the role of seaports - and indeed of transport facilities in general - as economic enablers and sometimes as stimuli to development is frequently underestimated' (Hoyle and Hilling, 1984). Although North Korea is still far from reaching the development stages of new port construction in Thailand (Robinson, 1981) or the problem related to industrial, port and urban concentration in Africa (Hoyle, 1981), it offers

an original case for studying the political factors influencing port development as seen in the Polish (Taylor, 1984) and Baltic (Brodin, 2003) cases. Given the limited information about North Korea, this paper adopts a broader view on the links between transport and development in a socialist developing country by refining a number of dispersed information which help to understand the importance of transport among - and in relation with - other issues. The level and nature of port activities are a good indicator of the evolution of the related hinterlands. Thus in this paper, ports in North Korea are seen as windows on internal and external changes rather than enablers of economic development.

One may argue that studying transport and development in an isolated and declining country might not bring anything new to port studies; however, the study of ports in North Korea is based on several arguments. Despite the militarist and unstable attitude of the North Korean regime, foreign investment is growing in North Korea, notably after the reforms. Also, two maritime façades, eight international trading ports in such a small country, and the coastal location of most large cities are advantages in favouring economies of scale for industries. Such argument is also founded on the logistic constraints in moving goods inland. Energy shortages and the dereliction of road and railway infrastructures result in cost and delays for connecting the urban system. Furthermore, it is believed that coastal cities are differently confronted to the country's difficulties.

The first section introduces the methodological problems of the research and the main data sources for studying transport issues in North Korea. The second section offers a descriptive explanation of the recent changes in one of the world's less known countries, in terms of economic reforms, territorial management, trade evolution and industrial development, by using updated data from the most reliable organisations. The third section reviews the different sources for analysing the North Korean transport system as a means to acknowledge the scarcity of data about ports and maritime transportation, and provides an overview of

logistics issues. The fourth section analyses the main trends in the evolution of North Korean maritime transportation (1985-2005), and develops the comparison between the traditional port-city functions of coastal cities and the evolution of vessel movements. Finally, concluding remarks are given about the relation between institutional reform, technical constraint and transport development in North Korea, for a contribution to the study of ports and logistics as permissive or restricting factors in development (Hoyle, 1974).

2. Methodological issues

Throughout the literature about North Korea, transport-related issues have not yet been consistently developed. Moreover, port-related issues in North Korea are not a core subject, because most works deal with land transport and the connection of North Korea to continental networks (e.g., estimations of freight flows by train), except for the Rajin-Seonbong Free-Trade Zone experiment. Although regular announcements can be found in the press about the development of North Korean ports, most projects cannot be verified because of the high level of protectionism since the army controls ports in North Korea.

Thus, this research proposes an overview of the economic situation of the country by synthesising a large part of the existing English-based literature, dispersed through research reports, governmental papers, worldwide directories, newspapers, professional websites, and working papers from various countries and scholars. Korean sources include publications from the South Korean Ministry of Unification, the Bank of Korea, and the Korea Trade Investment Promotion Agency (KOTRA). Non-Korean organizations or researchers, willing to provide estimates about this unknown country in general, provide all other sources. In all cases, figures should be used with caution, as no data comes directly from North Korea itself, and one may even doubt the capacity of the North Korean regime to furnish any coherent information about the country.

Sea transport statistics on North Korea are limited to the yearly figures of the International Road Transport Union available until 1990 (IRU, 1996), and the estimations and forecasts of the Korea Maritime Institute until 2020 (Kim et al., 1998) on a national scale. The South Korean Ministry of Unification provides some port-based statistics, but it is limited to inter-Korean shipments. The main source used in this paper allows overcoming such limitations, and it has the advantage of coming from an independent and reliable organisation. Although such data cannot indicate the real amount of cargo loaded and unloaded at the ports, it provides the possibility to compare their activity in terms of ship capacity, along a period of 20 years. Furthermore, it helps to avoid relying on mismatched estimations from published statistics.

The database on vessel movements provides information about the daily arrival and departure of trading vessels above 100 Gross Registered Tons (GRT) together with their Deadweight Tonnage (DWT), container capacity, year of construction, flag, ship owner, origin and destination by foreign port, and many others. The type of ships can be used as a surrogate for the nature of the goods transported. Given the cost of shipping to this country, one can acknowledge that most ships have not been empty when calling at North Korean ports. Another very important argument in favour of this source is that it allows bypassing the army itself for accessing local-based data related to ports. Of course, the data has also important lacks such as the difficulty to:

- distinguish commercial flows and humanitarian aids;
- get a more detailed measure of “bulk” and “general cargo”, which represent more than 80% of cargoes on an average basis, with the other cargoes divided between cement, chemical, container, fish products, reefer, ro-ro, tanker, vehicles, and wood;
- separate import and exports, as the same ships come and go without indicating the amount of cargo loaded and unloaded.

3. Changes in North Korea

3.1 Economic reforms and territorial management

In July 2002, reform measures were launched for the entire economy, following the June 15 Joint Declaration with South Korea in 2000 and the announcement of the ‘new way of thinking’ in January 2001. It aimed at adjusting consumer prices, wages and foreign exchange rates, together with expanding the autonomy of businesses to increase flexibility and productivity. Despite its former negative connotation, the concept of market is officially recognized since March 2003 as part of the ‘practical socialism’ inspired by the Chinese model. This was made possible by a gradual empowerment of the cabinet at the expense of the party’s influence. This led to the development of commercial distribution, with an increase in general markets, and shops and stores managed individually and advertised through trademark signs in public places (e.g. Pyeonghwa Automobiles). Factories, farms and private businesses were given greater decision power to buy land and raw materials, to receive loans from banks instead from the state, to hire employees, to profit from the selling of surplus products, and to invest in labour welfare or the facility improvement.

A major planning instrument to open DPRK to the outside world and increase its profits is the free-trade zones and the reorganization of administrative units. Following the Joint Venture Law in 1984, the first Special Economic and Trade Zone was launched in 1991. This act covered the city of Rajin and the district of Seonbong (746 km²), part of the wider *Tumen River Economic Zone*, a border region with China and Russia created for enhancing the logistic, port and industrial advantages of the area, named Raseon since 2000. The development of Rajin-Seonbong has often been constrained by its remoteness and by the lack of transparency of its management following its creation (Jung et al., 2003). However, with recent Chinese investment, the interest in the region has been growing. Though the Raseon

Special Economic and Trade Zone had not been successful due to accessibility problem, recent Chinese effort to expand port activity in the Pacific Area has been making this special zone prospective in development.

These three major achievements were made in 2002: the city of Sinuiju with around 50 surrounding local units was designated a Special Administrative Region under the control of the central authority; the Mount Geumgang was chosen as a Tourism District in Gangwon province; and the Gaeseong Industrial District was created close to the ancient capital of the Goryeo Kingdom. Discussions are in progress about the designation of Nampo port and the outlying Wawoo district as a Special District. The *Special Administrative Region* of Sinuiju, bordering the Chinese city of Dandong along the Amrok River, is a strategic path through which almost 80% of North Korean exports pass. Its major focus is to reconvert its industrial facilities within a multifunctional district of 130 km². Though it was not successfully launched due to subtle diplomatic difference between China and North Korea, growing Chinese interests tend to enlarge outer recognition of this region. Chinese government expects some positive effects on Liaoning province while supporting the project with energy. As in Rajin-Seonbong, the lack of an inland connection from the zone to the capital city has been a major obstacle.

Two other specialized zones concern the specific relationships with South Korea. South Korean players pursuing balanced growth between the two countries and hoping for eventual reunification mostly financed these. The *International Tourism Free Zone* of Geumgang mountain has been linked since 1999 by a maritime route from Donghae port, which is scheduled to become a Free Economic Zone. After success attracting South Korean visitors (from 12 000 in 1998 to more than 1.2 million in 2005), the area has been inserted in a wider project opening more mountain area and expanding the zone to the northern Wonsan city. The *Gaeseong Industrial Complex*, located at 160 km south of Pyongyang in North Korea and 60

km north of Seoul in South Korea, has been developed near the Demilitarised Zone (DMZ). It covers 24.5 km² among the forecasted 65 km², which shall include a new town of 6.47 km² between 2007 and 2012. A qualified and cheap workforce (US\$57.5 a month against US\$449 in South Korea in 2003) is the main attraction for companies, which are mainly Korean. However, the United States' embargo on DPRK, through the Wassenaar Agreement (1996), restrains exports in general and controls the importation of technological products. As a consequence, most products made in Gaeseong are sent to South Korea before completion and are registered as South Korean products before being exported.

3.2 Geographic and economic situation

With a population of 23 million, North Korea has approximately half the population of South Korea on a slightly larger but more mountainous surface. The population concentrates mostly along the east and west coasts (see Figure 1), especially Pyongyang city and South Pyongan province, which have been the most dynamic in the recent years, questioning the ideology of balanced regional development in a socialist country (Jo and Adler, 2002b).

[INSERT FIGURE 1 ABOUT HERE: Population evolution]

Industrial activities were sustained until North Korea could no longer rely on its neighbours for energy supplies, especially after the collapse of the socialist block (1989-1991). Thus, the end of former informal agreements had immediate consequences on the overall economy, as North Korea did not have enough capital to buy energy instead of exchanging it against other products. Mining, farming and transporting declined rapidly, leading the country to starvation, general crisis and stagnation. The other factor causing difficulty for North Korea was its substantial investments in defence and the heavy industry,

which were not competitive in the age of globalisation marked by light industry and tertiary activities (Jo and Adler, 2002b).

The evolution of the North Korean economic structure reveals two distinct stages: the rise of mining and manufacturing sectors, which were up to 60% of the GDP at the expense of agriculture and services, and then the rapid decline of industrial activities from 60% to 26% around 2001 in favour of services (43.6%) and agriculture (30.4%) (Ahn, 2003). The growth of the service sector can be attributed to the increased role of the army in the economy, and to its construction projects related to hydro power plants, housing and highways.

Outside free trade zones and specialized zones, two other locations are of prime concern for economic development: the Nampo-Pyongyang corridor for manufacturing activities, and the northeastern coastal area for mining and raw material exports. The Daean Friendship Glass Factory opened in 2006 as a Chinese investment in the Nampo area of US\$24 million. The Nampo-Pyongyang corridor has received increased recognition from foreign players (Korea Times, 2000), because of its connection to DPRK's unique international airport and its 10-lanes highway.

Recently, major projects have been launched to restart the extraction of raw materials in DPRK. In Danchon, the world's third largest magnesite mine, a French company has obtained permission to mine for 50 years in exchange of providing hydro power plants to North Korea. The Korea Resources Corporation (KORES) and a North Korean company have also launched a joint-venture in Jeongchon, to exploit 1,830 tons of graphite a year, covering 20% of South Korea's needs. Rajin port is being leased to China for 50 years, together with the improvement of the highway link to the Chinese city of Hunchen and the creation of a logistics free zone in Namyang, Onsong County, at the border along the Tumen River. It aims at developing trade with the Chinese Jilin province and at fostering relationships between Japanese, South Korean companies seeking to establish manufacturing export plants in the

area, and Chinese companies located in the neighbouring cities (Hankyoreh, 2006).

According to UNCTAD estimates, North Korea's Foreign Direct Investment (FDI) stock increased from US\$572 in 1990 to US\$1,022 in 2003, representing 3% and 10% of national GNP respectively. This points to an increasing trend, but the amounts remain small. On one side, it can be argued that the low level of inward FDIs in North Korea is caused by its unattractive environment and by the failure of its government 'to convince the international business community regarding its economic reform policy' (Lee, 2005). On the other side, according to Chabaud-Latour (2006), who manages the sole European consulting company registered in North Korea since 2001 involved in logistics, confection, energy and automobile parts, the very well educated and skilled manpower offers a considerable advantage over other Asian countries, even China. North Korea's decision to use the Euro as its foreign currency is definitely a political gesture against the U.S., but it also signifies the potential investment of European companies in North Korea as no historical or geopolitical issue is involved (Bridges, 2003).

3.3 Foreign trade

The foreign trade of North Korea has evolved through two major trends between 1990 and 2005. The first important trend is the distinction between a period of declining and unstable trade (1990-1998) and a period of stable growth (1998-2005). The second important trend is that, whatever the general evolution of foreign trade, the share of inter-Korean trade is constantly growing (Table 1). Overall foreign trade is known to be chronically in deficit as imports surpass exports.

The growth of north-south trade must not hide the more important increase of trade with China. Trade between the two nations has almost doubled between 2001 and 2005, and according to the Korea Trade and Investment Promotion Agency (KOTRA), 120 Chinese

companies have already invested in North Korea, representing around US\$ 150 millions and 48% of North Korean exports (Pons, 2005). The modest but rapidly growing trade with Russia and Thailand has almost tripled in the same period, reflecting North Korea's increasing dependence on imported food and energy. In contrast, trade with Japan has dramatically decreased due to worsening diplomatic relations.

Also, north-south trade growth is hiding different realities, including the importance of humanitarian shipments which constitute between 25% and 60% of the products exported from south to north since 1998 (Table 2). In general, non-commercial exports make up a significant portion of the exports from south to north, of which the different cooperation projects (e.g. Mount Geumgang) and the material aid are major components.

[INSERT TABLE 1 ABOUT HERE: Trade by main partners]

[INSERT TABLE 2 ABOUT HERE: Trade between North Korea and South Korea]

General commercial exports to the north concern machinery and transport equipment, textile and chemical products through a regular larger share (more than 60%), and exports related to processing trade are dominated by textile, electric and electronic products (80% to 90%). Imports from north to south are increasing regularly in quantity, notably after 2002. These are mainly textile, metal and agricultural products for general imports and textile products for imports related to processing trade.

4. The North Korean transport system

4.1 Logistics and inland transportation

Transport infrastructures in North Korea are unsurprisingly less developed than its neighbours in terms of road network, airports and merchant fleet, but the railway network is

highly electrified (Table 3). This reflects the effects of the Japanese occupation (1910-1945), and the strategy of developing a ‘fully integrated and containerised transport system’ (Ahn, 2003) centred on inland transportation, with a priority given to railways as in the Russian model (90%). The modal split in North Korea is distributed among railways (73.8%), roads (18.3%), sea (7.9%) in 1989 (Tsuji, 2000), what is confirmed by recent estimates with railways (70%) roads (17%), sea (10%) and air (3%) in 2005 (Roussin and Ducruet, 2006).

[INSERT TABLE 3 ABOUT HERE: Transport infrastructures]

Despite their importance, railways have been highly struck by the economic crisis that started to spread in every sector of DPRK in the 1970s. The lack of energy has forced using old Japanese steam trains fuelled with second-hand tires. Despite the abundance of coal in the country, it is now estimated that 70% of the entire power generation facilities are either abandoned or need urgent repairs, while 20% only of all factories are said to keep some activities (Ministry of Unification in South Korea, 2006).

Another consequence of isolation and energy shortages is the low road pavement rate of 7% (Bang, 2004). This also reflects the governmental restriction and military control of circulation within the country, notably for Pyongyang where a special permit is required to enter. As a result, the time-distance by truck from Pyongyang to main cities is unrealistic and constantly increasing (Table 4), and truck drivers tend to avoid a voyage to the Northeast where several accidents have been reported (Cotton, 1996).

[INSERT TABLE 4 ABOUT HERE: Time and distance from Pyongyang to main cities]

The regional distribution of domestic transport activity shows a strong unbalance and

relative disconnection between the western area, which occupies 40% of the total (30% in South Pyongan, 10% in North Pyongan), and the eastern area, accounting for 41% of the total (24% in North Hamgyeong, 17% in South Hamgyeong) (Tsuji, 2005). Thus, South and North Korean companies involved in processing trade have to spend 40% of their manufacturing costs on logistics.

4.2 Ports and maritime transportation

Because the army controls North Korean ports, it is impossible to verify the published statistics on port infrastructures. Different estimations collected from various sources are not well matched (Table 5), notably for Cheongjin and Wonsan which show very contrasting profiles in terms of quay length and nautical depth.

[INSERT TABLE 5 ABOUT HERE: Port infrastructures]

Although maritime transport was destined ‘to ensure coastal transport, expand railway connections and, in particular, improve foreign trade using ships’ (Ahn, 2003) by the 1961 7-year Development Plan of North Korea, it has remained very limited as it is the case of former Soviet countries (Thorez, 1998b). Due to economic decline and isolation, port facilities have stagnated except for some investment in oil berths in the 1970s and storage facilities in the 1980s.

Nowadays, several sources indicate institutional and technical barriers affecting shipping, excessive logistics costs, and prolonged shipping time (Ahn, 2002). Still, the Incheon-Nampo round trip takes 24 hours for 100km, and it costs as much as the route to Europe: US\$1,000 to transport for one TEU (Ahn, 2001). Furthermore, ports collect exorbitant port-entry fees, making the cost three times higher than for connecting Tianjin in China. Especially, 45% of

containers sent to North Korea return empty (Forster-Carter, 2001). Despite the failure of South Korean investments in new port facilities around Nampo (Yonhap News, 2005), following the strategy announced by Korea Container Terminal Authority (Lloyd's Register, 2005), a new container terminal has opened in 2006 (Lloyd's Register, 2006). This terminal is seen as a complement to the general cargo quay of Songgwan port built in 2001 closer to the West Sea Barrage (Jo and Ducruet, 2006). Although no specific facilities for handling containers are said to exist in North Korea (Kim, 2005), the Incheon-Nampo line carries most of inter-Korean containerised shipments (Korea Times, 2001; Ahn, 2002), notably with the South Korean company Kook Yang Shipping and the *Trade of Fortune*, sponsored by the South Korean Ministry of Unification through the Maritime Agreement signed in 2005 between the two countries.

4.3 North Korean border trade in the Northeast Asian transport system

The prospects for improving logistics at the borders reflect the strategies of North Korea's neighbours (Figure 3). China plans a six lane 67km highway construction to connect Hunchen city, China and the Raseon Free-Trade Zone, as well as a dedicated terminal in Rajin. This would allow a shorter path for exporting Chinese manufactured goods to Japan and the Pacific. The strategy for the Raseon area is to attract Chinese trade by offering lower costs, enabling shipments to bypass the Yellow Sea and the Russian ports, which are frozen during winter and have lower capacity (Vladivostok, Vostochny, Nakhodka, Posyet and Zarubino). For Japan, the plan is for a direct maritime connection to the Trans-Siberia-Railroad (TSR) and the Trans-China-Railroad (TCR) transport system, given the recent rejection of the South Korean government to connect Busan, South Korea and Tsushima, Japan by a submarine tunnel. China also plans a second bridge to Sinuiju, a railway connection and the so-called green road which, in the future, could connect to the core region of Pyongyang and use the

Amrok River (Yalu in Chinese) for barging to and from the border cities of Sinuiju, Dandong and the small island.

[INSERT FIGURE 3 ABOUT HERE: Development projects in North Korea]

South Korea seeks long-term interaction based on mutual benefits, but the scope of its projects in the North, apart from Gaeseong and Geumgang, are still limited because of politics. To strengthen regional cooperation, the South Korean government has proposed to make better use of the Han River, as a common resource for sand and barging, and of the Yaeseong River, to enable more direct exports from the Gaeseong Industrial Complex. Still, the demilitarised zone (DMZ) is a constraint and the inter-Korean railway has yet to be reconnected, but recent cancellation of the joint rail test-runs by North Korea reveals the unstable cooperation taking place between the two Koreas (Ministry of Unification in South Korea, 2006).

5. Maritime transport and the economy

5.1 General trends and economic weight

When comparing total trade and total shipping capacity (Figure 3), it is interesting to see that maritime activity has maintained in times of trade decline, notably from the mid-1990s to the early 2000s. This is better seen when estimating the share of sea trade in total trade (Figure 4). One ratio (a) is based on US\$250 per DWT, retained from the average ton-dollar values of Japanese and South Korean trade with North Korea, which occur dominantly by sea, and have been applied to total North Korean maritime traffic. Another ratio (b) distinguishes different types of traffics including container & roll-on roll-off, general cargo, solid bulks, chemicals, and liquid bulks. It applies the reducing coefficient proposed by Charlier (1994) to

obtain 'weighted tons' as a more realistic measure of the value of cargoes. Weighted tons are then transferred to dollars with the same value of US\$250. As a result, the two ratios give a very different importance to sea trade, with average shares of 26.7% for ratio (a) and 15.2% for ratio (b) along the period. In both cases, the importance of sea trade is higher than previous estimations - the intermediate share is likely to oscillate around 20% - but it varies over time. The different periods affecting the importance of sea trade can be distinguished as follows:

- the contraction of forelands stemming from the disconnection from the world system and the sudden ceasing of trade relationships with socialist countries (1985-1991);
- the effect of the construction and operation of the Rajin-Seonbong Free-Trade Zone experiment (1991-1993), for which maritime transport has been necessary to carry goods to the remote location;
- the continuous relationship with Japan and growing humanitarian aids (1994-2001) at a time of isolation, famine, and reinforced militarist government after the death of former president Kim Il-Sung;
- the effects of inter-Korean cooperation projects after the summit, and the increased trade with China (2002-2005), for which trade relationships are mostly continental and result in border trade through Sinuiju and the Demilitarised Zone (DMZ).

5.2 Evolution of the port system

The relative share of North Korean ports is a good indicator of the evolution of the whole economy (Figure 5). It clearly shows the shift of main port activities from the East to the West coast as a result of combined factors such as declining trade with Japan, growing isolation and economic decline of Eastern coastal cities, the increased primacy of the Pyongyang core region, and the emergence of the Pyongyang-Nampo corridor as the only area where

industries keep a regular activity, benefiting from the highway network and the international airport. For the biggest eastern cities such as Cheongjin and Heungnam-Hamheung, one must not forget the importance of aids in the revival of their port activity, from 1999. The continued activity of Wonsan until 1998 can be attributed to the regular ferry link with Niigata, Japan. Since 2002, several issues have been regularly reported by Japanese authorities. These issues are drug trafficking, passenger safety and overloading, technical problems (e.g., lack of evacuation route signs, radio communication, and engine room fire extinguisher), oil spills, spying, and transfer of illegal money and nuclear weapons components. This has resulted in the banning of North Korean ships from Japanese ports (Lloyd's Register, 2002).

Compared to Taaffe et al.'s (1963) model that is defined by the concentration on one main port at the expense of smaller and peripheral ports in underdeveloped countries, we have in North Korea another phenomenon. The disconnection of landside relationship between port cities and the existence of two maritime facades enjoying privileged relationships with neighbouring trading partners is reducing the formation of a unique and dominant load centre which would concentrate the flows in order to serve the country's primate city. Notably, Nampo's share of total shipments by sea has exceeded 50% only in 1997, 1998, 2003 and 2004, remaining around 30 or 40% for most of the last two decades. One explanation of the restart of port activities in smaller ports such as Haeju and Songjin may be the increased inland logistic barrier, as previously unused ports start to serve for transportation, either for commercial flows or aid imports. For Haeju, the current growth could also reflect recent barging activity with Incheon since 2004. But despite its proximity to Gaeseong Industrial Complex, there is no reported activity between the two areas because of poor road connection. The recent growth of Rajin, though it remains very modest, may also illustrate the impact of Chinese transit trade.

Although this analysis shows partly the interplay of transport and development in North Korea through the evolution of vessel movements by port, a qualitative approach of the nature of the goods transported is needed.

[INSERT FIGURE 5 ABOUT HERE: Evolution of the port system]

5.3 Maritime trade and port city specialization

Given the irregularity of North Korean maritime activity based on tramping, the total vessel capacity by port has been distributed among three periods of seven years. Those periods correspond to important changes such as the collapse of the socialist block and the reforms, which have significantly affected the entire economy. As a base for analysing port activities, a synthesis of port and urban functions is provided (Table 6). It shows the traditional activities of the main port cities and the resources located in their close hinterland. As most cities tend to become isolated from each other because of logistic costs stemming from inland transport dereliction, it is believed that some factories maintain their activity in relation to their ports. Table 7 provides a synthesis of the vessel movements by type of ship and total capacity by North Korean port among the three periods.

The seafood processing and fish industry is probably one of the most stable in North Korea. This is because it does not necessitate large amounts of energy and is surrounded by a large consumer market consisting of Japan and South Korea. For most cities specialized in this activity (Haeju, Nampo, Rajin, Wonsan), the vessel traffic of fish products and refrigerated containers (reefer) is stable or increasing in recent years, except for Cheongjin and Heungnam where this was not specified as a core activity.

Two other sectors show a good number of coincidences. For chemical products, the distribution of vessel traffics echoes the specialization of four cities except Haeju, with a

recent growth in Cheongjin and Heungnam-Hamheung, and a regular decline in Nampo and Wonsan. For machinery, the traffic of vehicles matches the specialization of Cheongjin, Heungnam-Hamheung, Nampo (Pyonghwa Automobiles), except from Wonsan. This traffic might also represent the imports of second-hand cars from Japan rather than the local industry. Finally, wood traffics coincides with the specialization of Heungnam-Hamheung, and Wonsan welcomes the majority of ro-ro and passenger traffics. Another interesting trend is that most cement traffics occur at the biggest cities (Cheongjin, Heungnam-Hamheung, and Nampo), reflecting the trend of construction, but not in Haeju where a cement factory is reported to exist, or Wonsan, which is supposed to handle cement flows. For oil and other liquids, the largest amounts in the first period well reflect the importance of Wonsan and Heungnam's petrochemical industries, but this traffic has been dramatically reduced and redistributed to Nampo and Cheongjin, the main markets (including Pyongyang).

[INSERT TABLE 6 ABOUT HERE: Port-urban specialization of coastal cities]

[INSERT TABLE 7 ABOUT HERE: Distribution of traffics by type of ships, port & period]

The two remaining categories can be distinguished according to their broad function, with bulks serving more heavy industries and construction, while general cargoes are better represented for the local consumer market and light industries. Although this distinction is obviously not perfect, it can help to assess the relative evolution of urban economies. As seen in Table 8, both traffics indicate the dramatic decline of the eastern cities. While Wonsan and Heungnam show a regular loss of traffics, Cheongjin and Rajin have increased their bulk traffics during the first period, probably because of their strategic situation between Japan and China. For Rajin, the growth is better explained by the import of primary products and construction materials for the preparation of the Rajin-Seonbong free-trade zone. Haeju and

Songjin enjoy the highest growth rates, notably for general cargo, but the volumes remain small. At the end, Nampo is the only major port to maintain its activity along the period, with the lowest decline, thanks to its proximity to North Korea's largest industrial complex and primate city. General cargoes have dropped more rapidly than bulks, showing the specific tendency of the North Korean regime to support heavy rather than light industries. This global snapshot of the situation clearly indicates which coastal cities have been more struck by the economic collapse and isolation.

[INSERT TABLE 8 ABOUT HERE: Growth rates of bulk and general cargo traffics by port]

6. Conclusion

This paper has proposed an analysis of cargo vessel movements at North Korean ports to evaluate the current situation of coastal urban economies and the effects of broader changes such as economic decline, isolation, economic reforms, and inland logistics dereliction on port activities. On one side, the activity of North Korean ports confirms the evolution of local industries, as their specialization is visible concerning minor traffics such as chemicals, vehicles, fish products, and oil products. On the other side, main traffics of bulk and general cargo are all reducing, reflecting the trend of economic decline throughout the country. However, coastal cities are responding differently to change. Smaller and peripheral ports such as Haeju and Songjin have seen their recent traffics growing rapidly, while Nampo, the port of Pyongyang, has the lowest decline and concentrates most of investments and traffics.

Given the difficulties of land transport, the application of a Chinese model of port development in North Korea could appear as one solution for upgrading coastal industries. However, this strategy is not yet adopted for a number of reasons. First, the inland location of main industrial areas (Pyongyang, Gaeseong) and the dereliction of eastern cities hamper the

establishment of new industrial zones around port areas. Second, the current state of port infrastructures in North Korea and the distance to already existing foreign load centres such as Incheon, Busan, and Dalian, do not allow the replication of the Chinese model. In fact, the proximity of Hong Kong for spreading container technology and upgrading neighbouring Shenzhen ports has been crucial (Song, 2002). Since the Open Door Policy in 1978 followed by the creation of Special Economic Zones on coastal areas, Chinese industries have not been able to bypass Hong Kong for connecting directly global regular shipping lines through domestic ports until 1995 (Wang, 1998). Even today, Chinese hinterlands are not yet accessible to foreign freight forwarders, except for OOCL, the Hong Kong company, for ideological, historical and cultural reasons.

Despite the economic reforms, North Korean exports still face the Japanese and U.S. embargoes. Because the Peace Treaty is not yet signed by the U.S., accessing the Gaeseong Industrial Park either through the Demilitarised Zone (DMZ) or from Pyongyang faces several constraints, such as military control and unstable diplomatic relationships between the two Koreas. Thus, the improvement of logistics in North Korea, despite the new economic environment provided by the reforms, is hampered by a contradiction between closure and openness. This contradiction delays the possible effects of economic reforms on the transport system itself, such as infrastructure modernisation and free circulation. Still in North Korea, transport issues seem to be a restrictive factor for development, and it will take time until the country gains better recognition from the global community for its efforts towards openness, its comparative advantages for labour and industries, and its strategic location within Northeast Asia.

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¹ <http://www.portguide.com>

² <http://www.unikorea.go.kr/index.jsp>

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Table 1: Main trading partners of North Korea, 2001-2005 (Unit: millions US\$)

	2001		2002		2003		2004		2005	
	Trade	Share	Trade	Share	Trade	Share	Trade	Share	Trade	Share
China	737	27.6	738	25.4	1022	32.8	1385	39.0	1580	39.0
South Korea	403	15.1	641	22.1	724	23.2	697	19.6	1044	25.8
Thailand	130	4.9	216	7.5	254	8.2	329	9.3	329	8.1
Japan	474	17.8	369	12.7	265	8.5	252	7.1	194	4.7
Russia	68	2.6	80	2.8	118	3.8	213	6.0	232	5.7
India	157	5.9	191	6.6	158	5.1	135	3.8	<i>N/A</i>	<i>N/A</i>
Singapore	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	56	1.5	80	1.9
EU countries	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	261	7.3	292	7.2
Others	702	26.3	633	22.9	572	18.4	226	6.3	294	7.2
Total	2673	100.0	2902	100.0	3115	100.0	3554	100.0	4045	100.0

Sources: Korea Trade and Investment Promotion Agency

Table 2: Trade between North and South Korea, 1998-2006 (unit: 000s US\$)

	1998	%	1999	%	2000	%	2001	%	2002	%	2003	%	2004	%	2005	%	2006	%
TOTAL TRADE	1693000	100.00	1790000	100.00	2395000	100.00	2619000	100.00	2839000	100.00	3018000	100.00	3547000	100.00	4044000	100.00	4044000	100.00
INTER-KOREAN TRADE	251158	14.83	310024	17.32	425686	17.77	349172	13.33	579476	20.41	627488	20.79	687874	19.39	1044431	25.82	129590	3.18
IMPORTS FROM NORTH	123357	49.12	113697	36.67	152912	35.92	155988	44.67	249051	42.98	245464	39.12	257946	37.50	340916	32.64	55159	42.56
Agriculture, forestry and fishing	29319	23.77	43903	38.61	72108	47.16	74602	47.83	92634	37.19	103696	42.25	98992	38.38	112242	32.92	16975	30.78
Chemical products	2260	1.83	1992	1.75	1162	0.76	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Electric and electronic products	3596	2.92	2726	1.88	402	0.26	0	0.00	0	0.00	0	0.00	0	0.00	22500	3.61	4272	5.16
Iron, steel and other metals	22624	18.34	14982	13.18	11697	7.65	8786	5.63	14875	5.97	20941	8.53	39702	15.39	47784	14.02	6206	11.25
Machinery and transport equipment	651	0.53	815	0.72	1467	0.96	1704	1.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Mineral and mine products	482	0.39	2141	2.40	8264	0.26	7011	0.00	7541	0.00	0	0.00	0	0.00	12306	6.60	2846	7.75
Textile products	54129	43.88	43183	37.98	53957	35.29	52886	33.90	75575	30.35	87656	35.71	99233	38.47	122034	35.80	19643	35.61
Other	6035	4.89	2108	1.85	3759	2.46	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial imports							103392	66.28	248360	99.72	241349	98.32	257818	99.95	344712	99.92	55159	100.00
Processing trade							48286	46.70	91697	36.92	99672	41.30	115152	40.84	194029	56.91	21769	39.47
Commercial transactions							42198	40.81	156663	63.08	145877	60.44	142666	59.11	29637	8.69	6549	11.87
General trade							0	0.00	0	0.00	0	0.00	0	0.00	132855	38.97	26841	48.66
Non-commercial imports							12239	7.85	978	0.39	4115	1.68	128	0.05	279	0.08	0	0.00
Mount Geumgang							2168	99.96	160	16.36	0	0.00	0	0.00	0	0.00	0	0.00
Cooperation projects							5	0.04	816	83.44	0	0.00	0	0.00	0	0.00	0	0.00
LWR project							0	0	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00
EXPORTS TO NORTH	127801	50.88	196327	63.33	272774	64.08	193184	55.33	330425	57.02	382024	60.88	429928	62.50	703515	67.36	74431	57.43
Agriculture, forestry and fishing	2962	2.32	0	0.00	0	0.00	0	0.00	97944	29.64	114220	29.90	56774	13.21	110313	15.68	5200	6.99
Chemical products	4251	3.33	42586	21.69	95526	35.02	59336	30.71	75222	22.77	76577	20.05	128461	29.88	224891	31.97	11963	16.07
Electric and electronic products	4235	3.31	5359	2.49	28101	10.30	10035	5.20	20480	6.20	19523	5.11	29392	6.84	27134	3.86	8631	11.60
Household products	2639	2.06	3289	1.68	4910	1.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Iron, steel and other metals	8780	6.87	15732	8.01	13998	5.13	10376	5.37	25008	7.57	22810	5.97	14290	3.32	21468	3.05	5443	7.31
Machinery and transport equipment	29019	22.71	25253	12.86	32128	11.78	21198	10.97	36761	11.13	23897	6.26	43678	10.16	104737	14.89	12775	17.16
Non-metallic mineral products	21346	16.70	43820	22.32	20202	7.41	7036	3.64	0	0.00	0	0.00	0	0.00	24312	3.46	4644	6.24
Plastic, rubber and leather products	3437	2.69	4894	2.73	5031	1.84	279	0.14	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Primary products	14956	11.70	15744	8.02	25901	9.50	20967	10.85	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Textile	27068	21.18	34448	17.55	43423	15.92	41777	21.63	59256	17.93	76890	20.13	85877	19.97	84453	12.00	11346	15.24
Others	1646	1.29	3053	1.56	3565	1.31	1697	0.88	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Humanitarian assistance	31850	24.92	46880	23.88	113760	41.70	135390	70.08	138820	42.01	177950	46.58	256200	59.59	212540	30.21	16670	22.39
NGOs	20850	65.46	18630	39.74	35130	30.88	64940	47.97	51170	36.86	70610	39.68	141080	55.07	88660	41.71	14320	85.90
Korea National Red Cross (%)	20850	100.00	13065	70.13	9416	26.80	22000	33.88	6923	13.53	5860	8.30	37000	26.23				
NGOs (%)	0	0.00	5565	29.87	25174	73.20	42940	66.12	44247	86.47	64750	91.70	104080	73.77				
Government	11000	34.54	28250	60.26	78630	69.12	70450	52.03	87650	63.14	107340	60.32	115120	44.93	123880	58.29	2350	14.10
Bilateral	0	0.00	28250	100.00	78630	100.00	65770	93.36	69670	79.49	89250	83.15	300	0.26				
World Food Programme (WFP)	11000	100.00	0	0.00	0	0.00	100	0.14	17390	19.84	16190	15.08	24000	20.85				
World Health Organization (WHO)	0	0.00	0	0.00	0	0.00	460	0.65	590	0.67	660	0.61	870	0.76				
WMO	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00				
UNICEF	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	500	0.47	1000	0.87				
FAO	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00				
Other	0	0.00	0	0.00	0	0.00	4120	5.85	0	0.00	740	0.69	88950	77.27				
Non Commercial Exports	54703	42.80	48675	24.79	170396	62.47	51446	26.63	267600	80.99	252017	65.97	339809	79.04				
Cooperation project	900	1.65	0	0.00	0	0.00	5889	11.45	10363	3.87	1218	0.48	47922	14.10				
LWR project	1800	3.29	6761	13.89	35609	20.90	16701	32.46	55260	20.65	20307	8.06	448	0.13				
KEDO heavy oil	12830	23.45	20059	41.21	0	0.00	2878	5.59	2041	0.76	0	0.00	0	0.00				
Material aid	15052	27.52	2906	5.97	104478	61.31	20128	39.12	188995	70.63	217317	86.23	250076	73.59				
Mount Geumgang	24121	44.09	18810	38.64	14606	8.57	4438	8.63	10941	4.09	13175	5.23	41363	12.17				
Other joint ventures	0	0.00	139	0.29	6943	4.07	1412	2.74	0	0.00	0	0.00	0	0.00				
Other	0	0.00	0	0.00	8760	5.14	0	0.00	0	0.00	0	0.00	0	0.00				
Commercial Exports	0	0.00	44754	22.80	99111	36.33	39325	20.36	62725	18.98	109979	28.79	90123	20.96				
Business-based transactions	0	0.00	12414	27.74	36499	36.83	10025	25.49	4193	6.68	45932	41.76	25641	28.45				
Processing on commission	0	0.00	32340	72.26	62612	63.17	29300	74.51	58532	93.32	64047	58.24	64482	71.55				
PROCESSING TRADE							103465	29.63	150222	25.92	163519	26.06	175506	25.51	207837	19.9	40525	31.27
Imports from North							62166	100.00	91690	100.00	99472	100.00	107674	100.00				
Agriculture, forestry and fishing							2107	3.39	1669	1.82	0	0.00	0	0.00				
Textile							47219	75.96	75244	82.06	87252	87.72	92679	86.07				
Electric and electronic products							7124	11.46	7233	7.89	6373	6.41	7979	7.41				
Chemical products							546	0.88	0	0.00	0	0.00	0	0.00				
Machinery and transport equipment							0	0.00	1790	1.95	0	0.00	0	0.00				
Household products							0	0.00	739	0.81	0	0.00	0	0.00				

Table 3: Basic territorial characteristics of North Korea and neighbouring countries, 1995-2005

Country	Land surface (km ²)	Coastline (km)	Waterways (km)	Year	Population (000s)	GDP per capita (\$)	Airports (no)	Pipelines (km)	Road length (000s km)	Paved roads (%)	Railway length (000s km)	Electrified railways (%)	Merchant fleet (no ships)	Merchant fleet (000s DWT)
DPRK	120,410	2,495	2,250	1995	23,486	920	49	37	30	6.2	4	69.1	87	1,149
				2005	22,912	1,800	78	154	31	6.4	5	67.1	238	1,389
ROK	98,190	2,413	1,608	1995	45,553	11,270	114	455	63	72.4	3	7.7	412	9,985
				2005	48,422	20,300	179	2,260	97	76.5	6	38.6	601	11,081
RUSSIA	16,995,800	37,653	72,000	1995	149,909	4,820	2,517	203,000	934	22.3	87	24.6	800	10,128
				2005	143,420	10,700	640	239,439	537	32.5	154	46.2	1,194	5,505
JAPAN	377,835	29,751	1,770	1995	125,506	20,200	175	2,006	1,111	67.8	23	40.4	851	27,292
				2005	127,417	30,400	174	2,949	1,177	77.7	27	70.0	702	12,680
CHINA	9,326,410	14,500	121,557	1995	1,203,097	2,500	204	17,000	1,029	16.5	65	10.9	1,628	24,027
				2005	1,306,313	6,200	472	33,648	1,809	79.9	71	25.1	1,649	27,749

Source: CIA, *The World Factbook*, 1995 & 2005

Table 4: Time and distance from Pyongyang to main cities

Pyongyang to:	Distance (km)	Travel time by truck (hours)	
		2000	2005
Nampo	60	N/A	1
Sariwon	70	N/A	2
Haeju	120	N/A	3
Gaeseong	160	N/A	8
Sinuiju	230	5	7
Wonsan	230	2.5	7
Hamheung	430	5.5	48
Kanggyae	500	20	Out of reach
Cheongjin	960	15	Out of reach
Hyesan	1260	22	Out of reach
Raseon	1400	25	Out of reach

Sources: World Food Programme, 2003; Korea Strategic Data, 2006

Table 5: Infrastructure characteristics of North Korean ports

	Stevedoring capacity (tons)	Maximum Quay length (m)	Minimum Quay length (m)	Maximum Depth (m)	Minimum Depth (m)	Berth capacity (tons)
Cheongjin	800	5,270	2,138	10	8.5	20,000
Haeju	240	1,350	1,305	12	7	10,000
Heungnam	400	2,061	1,630	13	6.7	20,000
Nampo	750	2,510	1,694	13.5	10	25,000
Rajin	300	4,340	2,280	11	10	15,000
Seonbong	200	2,515	456	23	7	5,000
Songrim	100	700	400	11	10	15,000
Wonsan	169	2,970	470	12.8	6.1	10,000

Sources: Asia Trade Hub, 2005; Lloyd's Ports of the World 2005; Portguide 2006

Table 6: Traditional functions of North Korean port cities

Port city	Main port functions	Main urban functions	Hinterland (natural resources)
Cheongjin	Coals Containers General cargo Grains Steel	Chemicals	Coal field Cobalt Nickel
		Equipollent industry	
		Locomotive plant	
		Machinery	
		Rubber factory	
Haeju	Cement Ore Zinc concentrates	Steel and fiber industry center	Graphite
		Shipyards	
		Agriculture (granary area)	
		Cement factory	
		Chemical products	
Heungnam (Hamheung)	Fertilizers Magnesia clinker	Marine products	Tungsten Zinc
		Shipbuilding & repair	
		Steel	
		Chemical & fertilizer industrial complex	
		Machines	
Nampo	Cements Coals Sundries	Textiles	Coal Iron ore Zinc
		Wood chip processing	
		Chemicals	
		Electronics	
		Nampo Glass Corporation	
Rajin (Raseon)	Coals Crude oil Fertilizers Petrochemical products Timber Sundries	Nampo Fishery Complex	Uranium mine Coal field
		Nampo Smelter Complex	
		Pyonghwa Automobiles	
		Shipbuilding & repair industry center	
		Construction	
Songjin (Kimchaek)	-	Electric power plant	Coal Copper Graphite Iron ore Lead Magnesite
		Oil-fired power plant and oil refinery	
		Real estate	
		Retailing	
		Seafood & food processing	
Songrim (Pyongyang)	Coals Iron ore Oil	Tourism	Gold Silver
		Transport	
		Steel mill	
		Hwanghae Steel Mill	
		Aquatic product processing plant	
Wonsan	Cement Marine products	Cement factory	-
		Chemistry enterprise	
		Fish & rice processing	
		Leather goods	
		Machines	
		Manufacture of locomotives	
		Shipyards	
		Textiles	

Source: compiled from various sources

Table 7: Specialisation of North Korean ports (Unit: 000s & %DWT)

Port city	Period	BULK		CEMENT		CHEMICAL		CONTAINERS		FISH PRODUCTS		GENERAL CARGO		OIL		ORE		OTHER LIQUID		PASSENGER		REEFER		RO-RO		VEHICLE		WOOD		
		DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	DWT	%	
Cheongjin	85-91	892.9	13.6	0.0	0.0	1.7	0.7	54.4	26.5	0.0	0.0	3384.0	22.5	2.1	0.2	34.0	3.1	199.5	15.0	0.0	0.0	8.3	7.2	13.8	14.3	15.4	27.1	0.0	0.0	
	92-99	932.3	14.4	0.0	0.0	0.0	0.0	18.2	9.9	1.5	9.1	1331.2	15.7	76.6	5.2	0.0	0.0	0.0	0.0	10.7	7.1	49.9	39.4	15.8	8.6	24.8	40.7	0.0	0.0	
	00-06	505.0	9.9	4.1	6.7	44.4	28.3	32.1	39.0	1.7	3.6	892.3	13.5	26.2	1.4	8.8	100.0	256.3	32.5	6.4	6.5	3.9	2.6	0.0	0.0	0.0	0.0	0.0	0.0	
Haeju	85-91	29.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	201.5	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	92-99	22.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.8	16.9	413.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	4.4	0.0	0.0	0.0	0.0	44.1	48.3	
	00-06	37.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	9.2	19.3	499.9	7.5	286.2	14.9	0.0	0.0	0.0	0.0	0.0	0.0	24.0	16.1	0.0	0.0	0.0	0.0	0.0	0.0	
Heungnam	85-91	1371.5	20.9	0.0	0.0	0.0	0.0	50.8	24.8	11.2	81.3	2850.0	19.0	60.6	4.9	34.0	3.1	0.0	0.0	0.0	0.0	11.7	10.1	0.0	0.0	2.2	3.8	0.0	0.0	
	92-99	602.0	9.3	8.2	18.2	4.6	3.5	21.4	11.6	1.5	9.1	592.1	7.0	102.7	6.9	0.0	0.0	96.0	39.5	2.0	1.3	14.6	11.6	14.8	8.1	4.2	6.8	23.6	25.9	
	00-06	425.1	8.3	0.0	0.0	0.0	0.0	0.0	0.0	1.5	3.2	539.3	8.1	0.0	0.0	0.0	0.0	38.4	4.9	0.0	0.0	11.1	7.4	48.6	26.5	42.6	45.9	401.6	94.4	
Nampo	85-91	2814.4	42.9	219.7	100.0	53.4	23.0	39.0	19.0	0.4	3.2	4202.8	28.0	19.4	1.6	864.9	78.2	140.0	10.5	1.3	100.0	31.0	26.7	47.9	49.6	39.2	69.1	0.0	0.0	
	92-99	3365.9	52.0	36.8	81.8	26.0	19.6	103.4	56.0	0.0	0.0	3818.1	45.1	418.5	28.2	154.7	80.6	25.6	10.5	0.0	0.0	24.1	19.0	0.0	0.0	19.1	31.3	23.6	25.9	
	00-06	2743.7	53.9	45.0	73.3	5.1	3.3	25.3	30.7	6.2	12.9	3443.4	52.0	434.0	22.5	0.0	0.0	179.0	22.7	0.0	0.0	12.6	8.5	15.1	8.2	21.4	23.1	0.0	0.0	
Rajin	85-91	84.3	1.3	0.0	0.0	3.0	1.3	0.0	0.0	0.0	0.0	703.3	4.7	3.0	0.2	68.1	6.2	0.0	0.0	0.0	0.0	40.7	35.1	11.4	11.8	0.0	0.0	0.0	0.0	
	92-99	449.1	6.9	0.0	0.0	0.0	0.0	11.5	6.2	0.0	0.0	378.9	4.5	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	9.2	0.0	0.0	0.0	0.0	
	00-06	33.7	0.7	0.0	0.0	0.0	0.0	4.8	5.8	0.3	0.7	232.0	3.5	1.7	0.1	0.0	0.0	2.1	0.3	0.0	0.0	65.8	44.2	0.0	0.0	0.0	0.0	23.6	5.6	
Songjin	85-91	77.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	92-99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.3	12.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	18.2	14.4	0.0	0.0	0.0	0.0	0.0	0.0	
	00-06	54.5	1.1	8.2	13.3	12.2	7.8	8.1	9.9	0.0	0.0	201.1	3.0	94.8	4.9	0.0	0.0	91.0	11.5	0.0	0.0	1.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	
Songrim	85-91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	92-99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	21.2	0.0	0.0
	00-06	0.0	0.0	0.0	0.0	3.4	2.1	0.0	0.0	0.5	1.1	12.1	0.2	8.4	0.4	0.0	0.0	30.0	3.8	0.0	0.0	0.0	0.0	10.5	5.7	28.7	31.0	0.0	0.0	
Wonsan	85-91	592.6	9.0	0.0	0.0	164.4	70.7	20.1	9.8	1.8	13.3	2043.6	13.6	1119.7	90.4	8.7	0.8	985.8	74.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	92-99	68.2	1.1	0.0	0.0	49.7	37.6	0.0	0.0	9.3	56.1	897.7	10.6	352.2	23.7	0.0	0.0	0.0	0.0	137.2	91.5	0.4	0.3	135.9	74.1	0.0	0.0	0.0	0.0	
	00-06	0.0	0.0	0.0	0.0	22.8	14.6	0.0	0.0	25.8	54.1	343.8	5.2	106.2	5.5	0.0	0.0	4.9	0.6	90.6	92.4	11.4	7.7	90.6	49.3	0.0	0.0	0.0	0.0	

Source: Lloyd's Marine Intelligence Unit

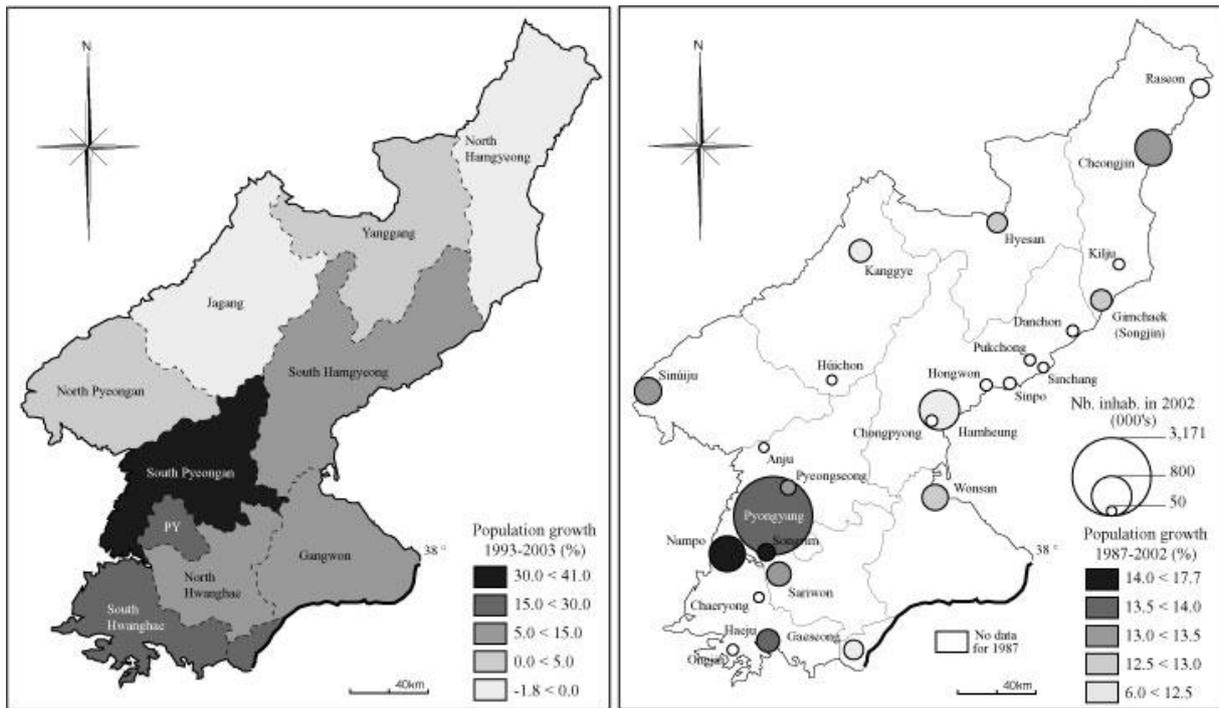
* percentages refer to the share of traffics in North Korea's total

Table 8: Growth rates of bulk and general cargo traffics at North Korean ports (Unit: %)

Port city	Bulk			General cargo		
	(85-91) / (92-99)	(92-99) / (00-06)	(85-91) / (00-06)	(85-91) / (92-99)	(92-99) / (00-06)	(85-91) / (00-06)
Cheongjin	+4.4	-45.8	-43.4	-60.7	-33.0	-73.6
Haeju	-24.9	+68.0	+26.2	+105.4	+20.8	+148.1
Heungnam	-56.1	-29.4	-69.0	-79.2	-8.9	-81.1
Nampo	+19.6	-18.5	-2.5	-9.2	-9.8	-18.1
Rajin	+432.7	-92.5	-60.1	-46.1	-38.8	-67.0
Songjin	-100.0		-29.2	+137.6	+776.9	+1983.4
Songrim					-25.9	
Wonsan	-88.5	-100.0	-100.0	-56.1	-61.7	-83.2
Total	-1.5	-21.3	-22.5	-43.7	-21.7	-55.9

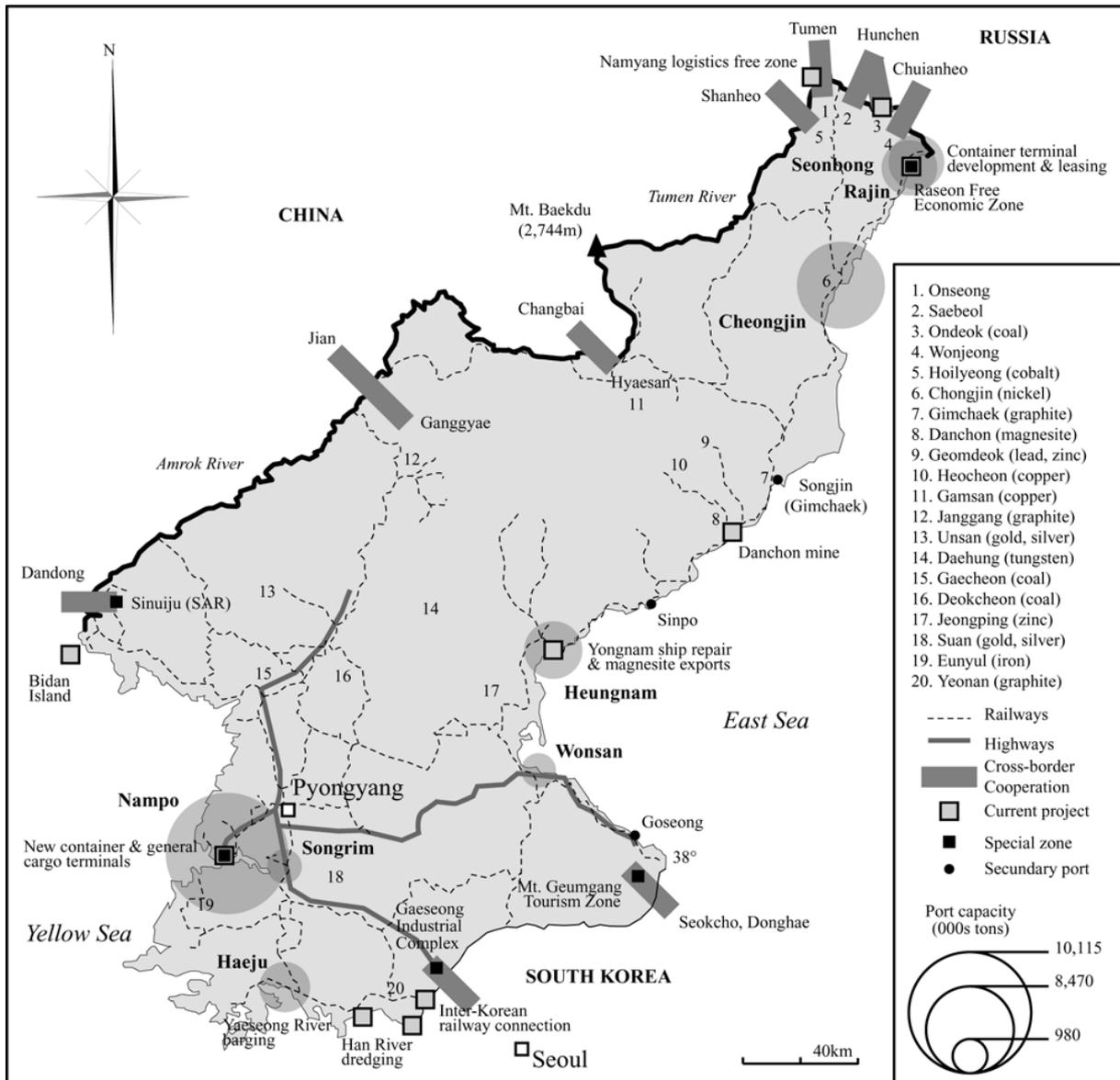
Source: Lloyd's Marine Intelligence Unit

Figure 1: Evolution of regional and urban population in North Korea



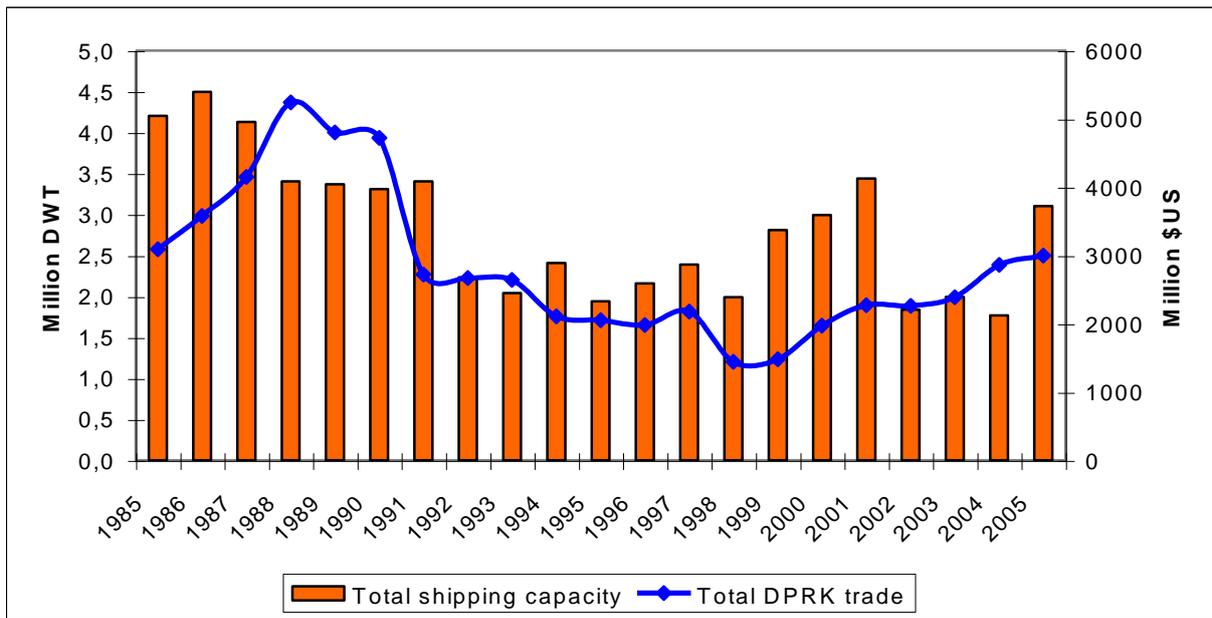
Sources: Jo & Adler, 2002; World Gazetteer, 2006

Figure 2: Current development projects in North Korea



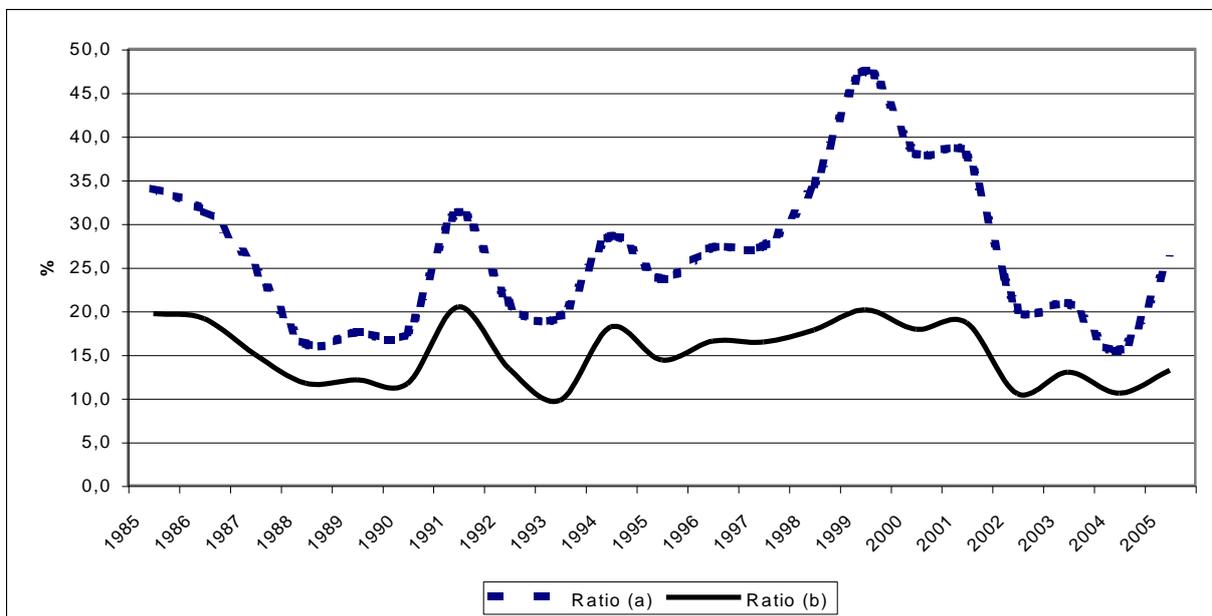
Source: compiled from various sources

Figure 3: Evolution of total North Korean trade and shipping capacity, 1985-2005



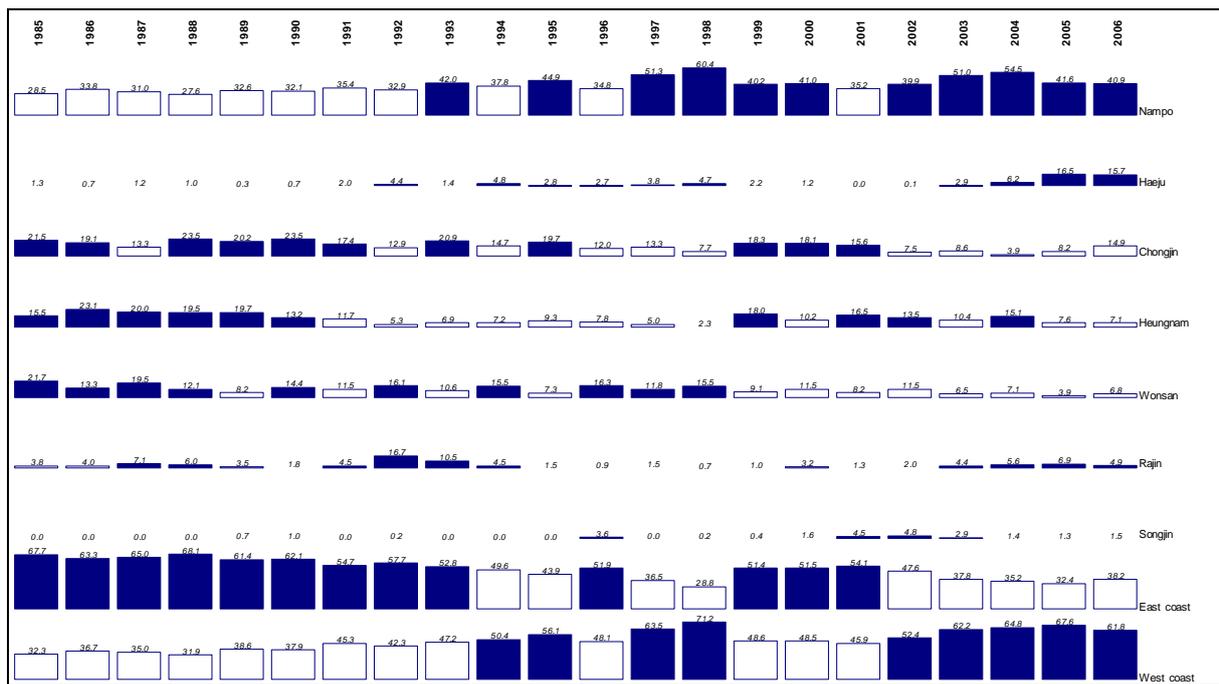
Sources: Lloyd’s Marine Intelligence Unit; Korea Trade and Investment Promotion Agency

Figure 4: Estimated share of sea transport in North Korean trade, 1985-2005 (Unit: %\$US)



Sources: Lloyd’s Marine Intelligence Unit; Korea Trade and Investment Promotion Agency

Figure 5: Evolution of the North Korean port system, 1985-2006 (Unit: %DWT)



Source: Lloyd's Marine Intelligence Unit

- (a) Figures for 2006 are available until August
- (b) Percentages refer to the share of weighted tons
- (c) Dark colours are above the average of the row