JR Freight Approach to Infrastructure Development for Modal Shift

Ikuo Funahashi

Introduction

Japan's current freight transport market sees on-demand truck transport—with its seamless door-to-door and convenient service—taking about a 60% share on a tonne-km basis. Marine transport is also strong with about a 36% share of heavy cargo. On the other hand, rail freight only has about a 4% share of the total market. However, in land freight transport exceeding 1000 km, rail freight has a 33% share.

Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLITT) defines modal shift as a shift of freight transport on main routes from trucks to less polluting and more efficient large-scale transport modes, such as railway and coastal shipping. This means persuading customers needing to transport freight to use railways.

Because economics is a factor in choice of transport mode, JR Freight is pushing forward with developing infrastructure for terminals and trunk line transport as an all-out effort to promote a modal shift. In addition to cutting costs for businesses, the aim is to improve services by enhancing capacity in response to customer needs and reducing freight transport times.

Other factors affecting the modal shift have also come into play in recent years. These include changes in the labour environment with declining population, the impact of spiking global energy costs on economic growth, and JR Freight's approach to global environmental issues.

This article explains JR Freight's approach to infrastructure development contributing to a modal shift and covers issues such as future measures. It also discusses current transport logistics in Japan.

Transition of Rail Transport in Japan

Japan's first passenger railway opened between Shimbashi and Yokohama in 1892 and freight transport followed the next year. Secondary industries grew, factories and warehouses were built near ports, and private sidings were built. Freight trans-shipment tracks were set-up in station yards across Japan to move freight to inland consumers, and wagonload freight services started.

After WWII, Japanese National Railways (JNR) was established as a public corporation to help the country recover from the ravages of war. Domestic transport relied heavily on JNR, and the company secured about a 53% share of rail freight on a tonne-km base in 1955.

In rail passenger transport, the Tokaido and San'yo shinkansen were built to connect the nation's megalopolises and meet increasing demand for transport between large urban areas in line with the surge in economic growth. Furthermore, a commitment was made to diversify urban rail networks (quadruple tracking and separate freight and passenger tracks) and otherwise increase transport capacity to handle the rapid increase in people commuting between the suburbs and large city centres.

Without Japan's extensive shinkansen network, domestic air travel would probably be higher than it now is, people would not be able to move around so easily, and today's economic growth may never have been achieved. Suburban single-family dwellings near large cities may never have appeared without railways.

Focussing back on freight transport, freight railways undoubtedly played a major role in Japan's postwar high economic growth. But freight transport at that time mainly used wagonload services like before the war, meaning single freight wagons were assembled into train loads and moved between freight yards across Japan. Using wagonload services, trucks deliver freight to the departure station for loading by hand into wagons and movement to the delivery station where the freight is unloaded by hand before final delivery. This loading and unloading by hand requires considerable time, labour and costs. As the road network developed and trucks became larger and more reliable, direct transport from the point of freight pickup to the final destination became possible, cutting transport times greatly and offering manufacturers more freedom in production schedules. Of course, truck transport soon had an image of better convenience than rail freight.

To combat the increase in truck transport, JNR started container services between Tokyo and Osaka in late 1950. Such service was expected to expand because the need for manual freight loading and unloading at stations was eliminated, and transport time reached a level comparable to trucks. However, freight transport at the time was mainly bulk loading and transport of large objects. Five-tonne containers that could only carry a third of the load of freight wagons did not match the needs of shippers, so demand for wagonload services did not diminish and container service was resigned to simply modifying stations and gradually increasing the number of stations handling the service. The amount of rail freight on a tonne-km base at the height of JNR freight transport in 1970 had a wagonload to container ratio of about 10 to 1.

Furthermore, the level of freight fees is greatly affected by the value of transported freight. Low-value freight cannot be transported at high freight fees, so the trend is to choose a cheaper mode of transport, when there is no great quality difference.

JNR was faced with frequent strikes and increasing freight fees, resulting in a continuing drift to trucks. In the end JNR was broken up and privatized, but the timing of the breakup did allow for a major system change. The ratio of wagonloads to containers just before JNR breakup was 1:1; today, it is 1:8 with container transport being the main method.

While rail freight evolved on one hand, the trucking industry grew to handle large-volume transport with the flexibility provided by rapid development of expressways and highways. Just as the shinkansen took the major part of passenger transport, trucks came to occupy the majority of trunk freight transport.

So what became of conventional lines as the shinkansen network developed? The intercity passenger transport role was transferred to shinkansen, temporarily relieving the tight main line capacity. But frequent trains departing at regular intervals also boosted intra-city transport in urban areas due to improved convenience, especially following the establishment of the JR group of companies. As a result, line capacity has tightened and coordination of time slots for long-distance freight trains running on tracks owned by the JRs requires close cooperation with the passenger operators. In such a situation, it is impossible to increase capacity for freight trains needing speedy transport.

Modal Shift in Japan

Countries worldwide have been proceeding rapidly with specific approaches to tackle global warming since the 1997 adoption of the Kyoto Protocol.

One typical example is the development of large-scale infrastructure projects in the EU where advanced environmental policies aim to reduce the absolute number of trucks emitting high levels of CO_2 and other pollutants. Two such projects designed to transfer heavy truck traffic to rail are the Gotthard Base Tunnel under the Swiss Alps and the Betuwe freight-only line between the Netherlands and Germany. These developments show how railways in some parts of the world are regaining their lost stature.

In Japan, the MLITT is calling for measures to combat global warming in its New Comprehensive Program of Logistics Policies. Specifically, the aim is to achieve a 50% or greater modal shift (share of railway and coastal shipping in long-distance general freight transport) by fiscal 2010 by enhancing transport capacity and cutting freight times, constructing ships promoting a modal shift, and advancing use of greener and large-capacity rail freight and coastal shipping.

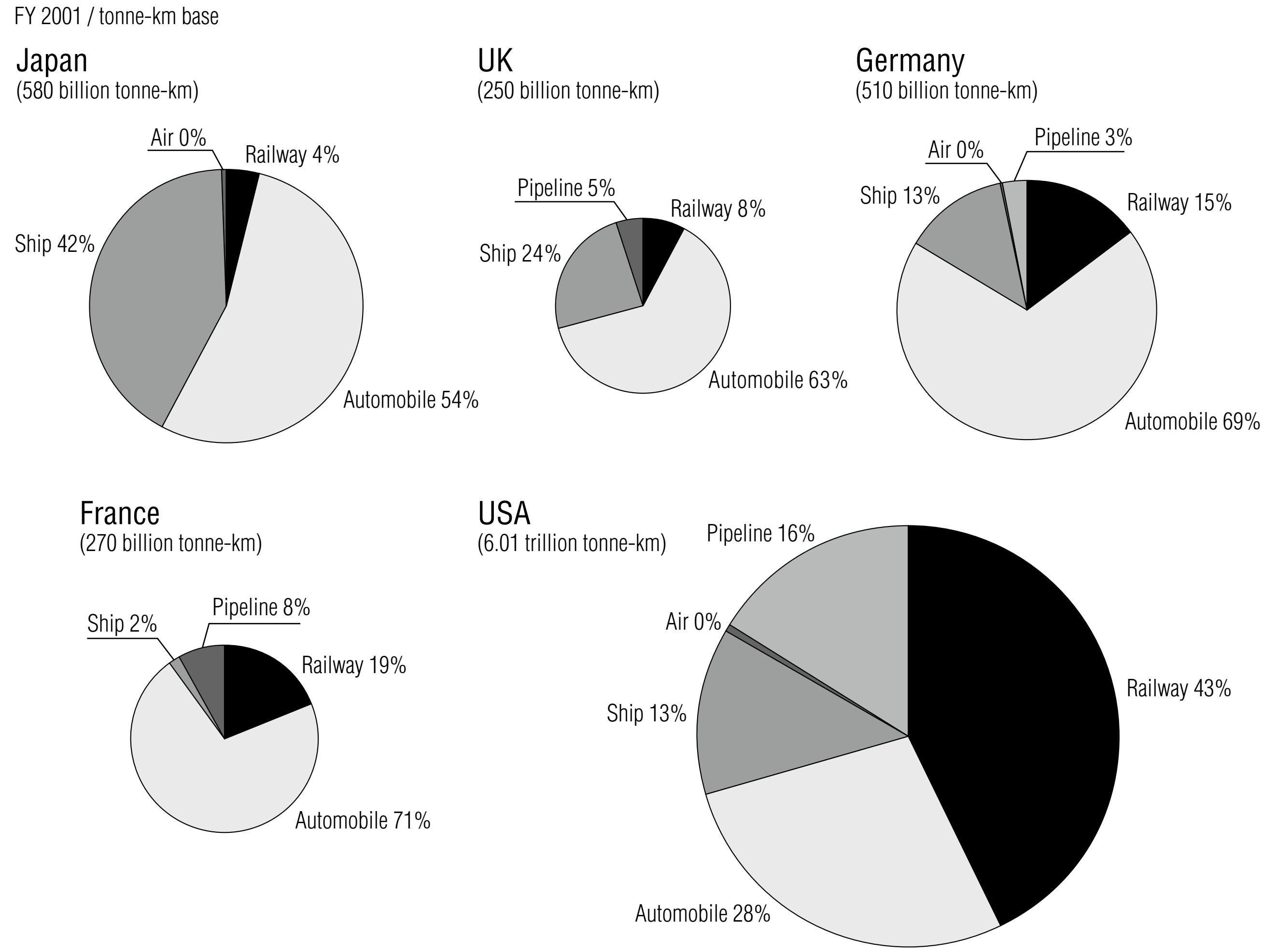
The Ministry is also going forward with multimodal measures for domestic inter-regional logistics, promoting efficiency by aiming to build an appropriate transport system with good distribution of roles by competition and cooperation between modes and free choice of users. Specifically, it will work to enhance access to airports, seaports, stations, and other transport nodes. In this way, the government is creating targets and starting work in fields where work needs doing. However, it is also waiting to see the results of private-sector large-scale infrastructure developments.

On the other hand, the April 2006 passage of the revised Energy Conservation Law requires all larger companies to create and submit energy conservation plans and report energy-conservation measures. For example, efforts are mandated to improve efficiency in freight loading and promote use of public transport. Moreover, the rapid sharp increase in prices for petroleum products and raw materials is creating severe business conditions for truck transport. If this situation continues coupled with the decline in the younger population creating a shortage of truck drivers, there will be inadequate road transport capacity.

Japan could probably still achieve sustainable growth if the situation remained unchanged with an adequate workforce, expanding economy, and vibrant production and consumption. However, the reality is that the nation is entering a new phase with declining population, movement of manufacturing to overseas, and tremendous competitive economic growth in developing nations. Against this severe background, what is needed to maintain current economic growth and living standards into the future?

Logistics is indispensable for increasing the vitality and prosperity of any country. The August 2008 Comprehensive Immediate Policy Package—Easing Public Anxiety—announced a policy of enhancing energy efficiency in transportation systems and promoting modal shifts. Specifically, this includes promoting energy-efficient transport modes through a modal shift, as well as introduction of eco-cars and efficient logistics.

Figure 1 Transport Share in Major Countries



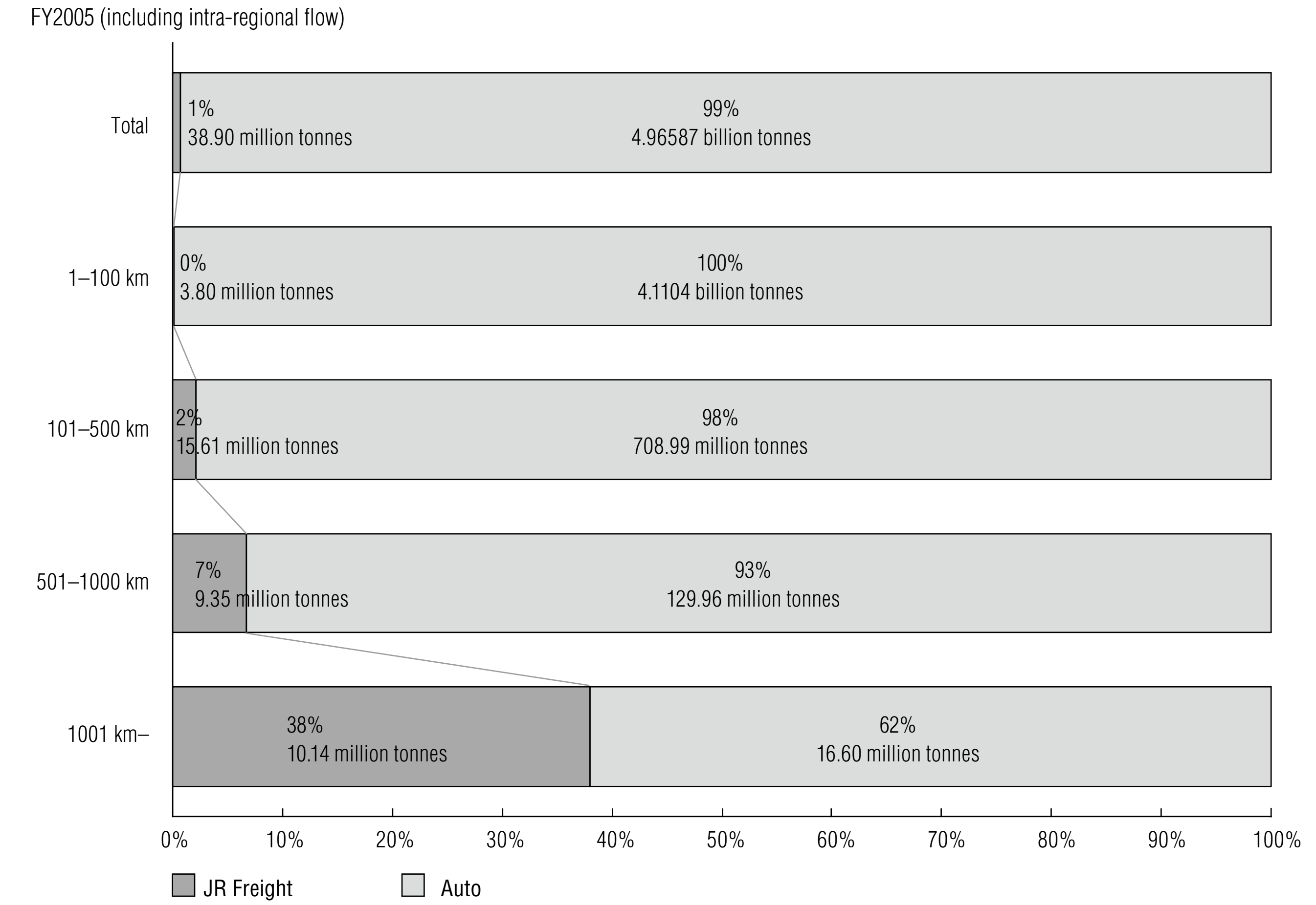
Features of Rail Freight and Relationship with Road Transport

Although Japan is an island nation and most prefectures have at least one port, good land transport infrastructure is required to cut costs and assure reliability. Short- and mid-range distances are covered almost exclusively by cars and trucks, with railways having a share of the longer-haul market (Figures 1 and 2).

Rail freight has benefits of a low environmental burden as well as the ability to carry large loads over long distances with just-in-time delivery matching timetables. However, inherent difficulties of rail are the inability to get freight on the desired train, the need to get freight for shipment to the station by a set time, and the non-availability of alternative routes when lines are closed and time is needed to restore closed lines. These problems have led potential customers to focus on truck transport. JR Freight was lucky that it started business during Japan's bubble economy when transport demand was very strong while there was also a labour shortage leading to expectations that railways could transport large volumes of freight cheaply and effectively. However, the new company had inherited a lot of out-of-date infrastructure, rolling stock and other equipment so it could not respond to the need for more transport capacity. To meet demand for more freight stations closer to the customer, plans were drawn up for construction of new container stations but the huge development costs for access roads, etc., forced the company to abandon the plans. The sense of crisis that if things were left unchanged other transport modes would eventually take the entire market led to a new policy. To meet customers' expectations, a project was implemented to increase rail freight capacity through infrastructure developments.

Fundamentally, the rail-freight mode is perfectly matched to a low-carbon society because its tonne-km CO_2 emissions are about 15% those of trucks, while NO_x is less than 10%, and energy consumption is about 17%. Furthermore, annual freight transport volume per capita on a tonne-km base is about 12 times that of trucks, meaning rail freight is superior

Figure 2 Share of Land Freight Transport by Distance



in terms of labour productivity. Rail also has a much lower accident rate than trucks, resulting in lower total social costs too. However, we must not forget that trucks still connect the freight consignor and consignee with the rail freight mode. As a result, JR Freight's strategy so far has been to pursue optimal placement of each transport mode in the logistics chain and to enhance linkages between modes, much in the same way that shinkansen carry passengers who access the shinkansen via other flexible intra-city modes.

Development of Modal Shift Facilities

Domestic freight flows on two major arteries—the western route from the greater Tokyo area through the Tokai, Kinki, and San'yo regions to Fukuoka; and the northern route from the greater Tokyo area or Kansai region through Tohoku to Hokkaido (Sapporo mainly).

The route connecting greater Tokyo and Kyushu, in particular, runs through the Tokaido–San'yo belt, a region supporting the backbone of Japan's economy. This is also the largest section for rail freight with more than 70% of all container freight volume. As a result, it is an extremely important area where work to improve service is never ending.

Development concept

In the difficult business environment and with its restricted investment capacity, there are limits to what JR Freight can do alone. Consequently, it is going forward with development based on the support of the national and local governments.

It is difficult to relieve local bottlenecks as a key goal in fundamentally improving facilities, so an improvement-first/construction-second concept has been adopted.

Improving terminal facilities

JR Freight still has many stations using old wagonload service facilities and a system using optimized facilities, such as the Effective & Speedy Container Handling System (E&S) where freight can be loaded and unloaded on an arrival and departure line without shunting, would enhance efficiency

Figure 3 E & S Stations

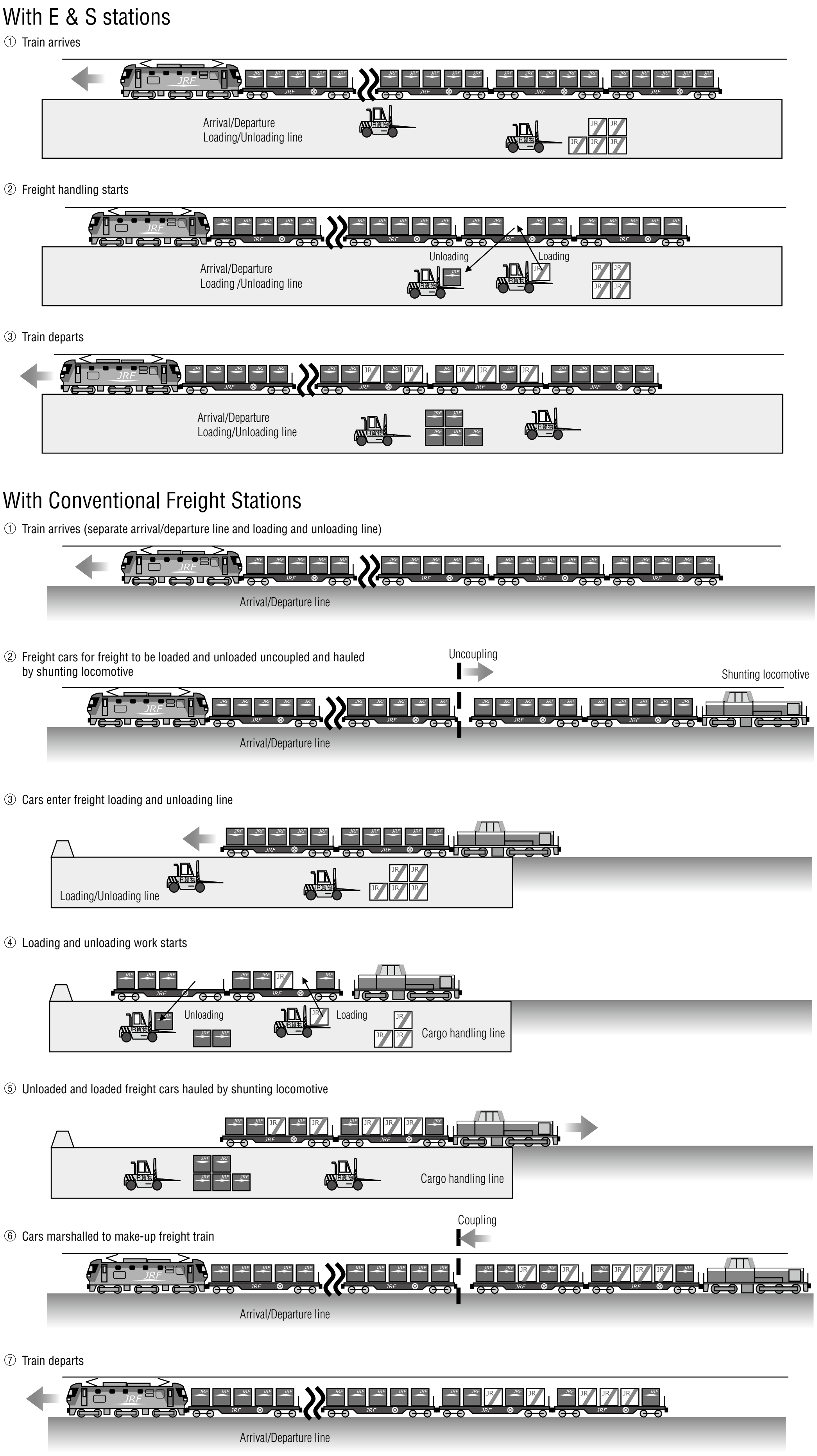
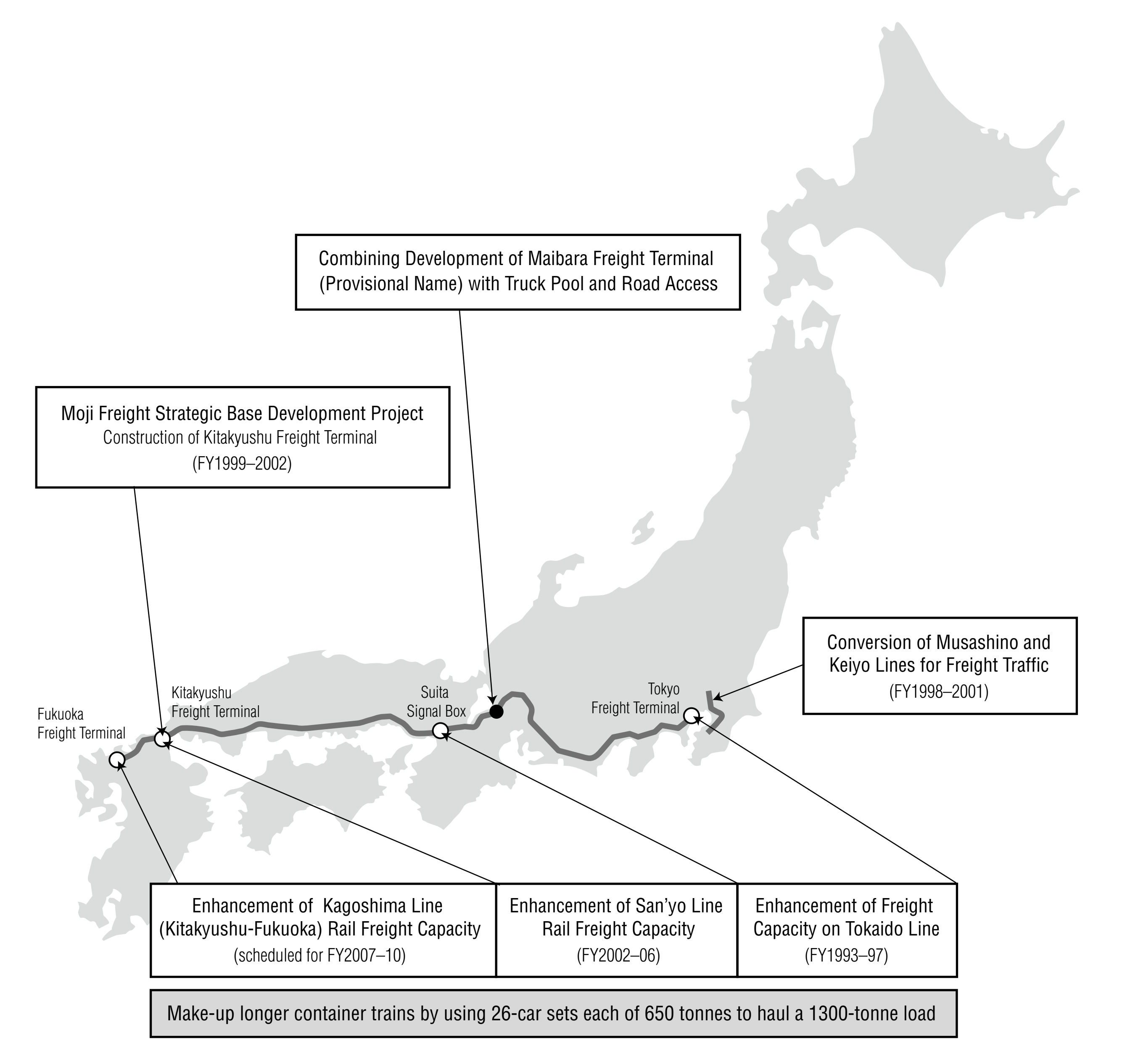


Figure 4 List of JR Freight Modal Shift Projects



greatly, conferring benefits like better freight collection deadlines; improved services; energy saving; reduced space; lower construction costs, and more (Figure 3).

Relieving bottlenecks

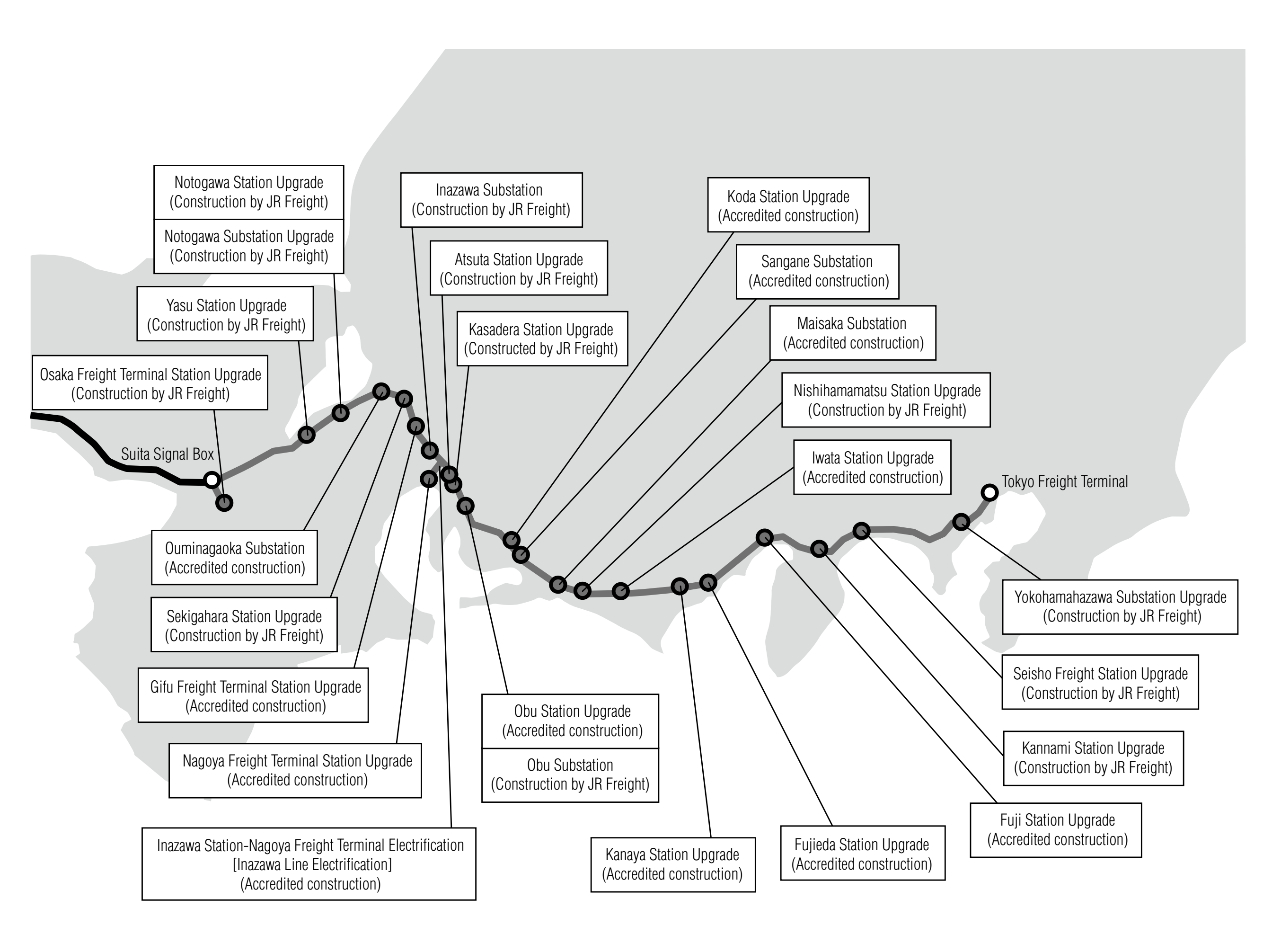
JR Freight is a category-2 railway operator, so it must coordinate freight train services closely with the infrastructure owners. Moreover, increasing the number of freight lines and other track infrastructure to support more freight traffic requires capital investments of tens of billions of yen, well beyond the range of what JR Freight can do on its own. The company was created at the JNR privatization and division based on the premise of keeping capital expenses in check and balancing income and expenses, which has been largely achieved. However, rolling stock expenses, such as updating locomotives and freight wagons, take a very large part of JR Freight's expenditure, making track construction and improvement impossible.

In these circumstances, instead of increasing the number of freight trains or otherwise enhancing line capacity, relatively small improvements are made, such as enhancing freight capacity per train by coupling sets to make longer trains.

Route and network improvements

The freight network in larger urban areas uses track time slot sharing with passenger operators so both parties are interested in efficient routes. Developing more efficient routes for long-distance rail freight passing through urban areas

Figure 5 Enhancement of Freight Capacity on Tokaido Line



makes a very large contribution to better service and also helps resolve bottlenecks too. This school of thought has led to selection of new routes based on making small-scale improvements to existing lines to develop shorter, efficient routes.

Development of Infrastructure with Public Money

Promoting a modal shift from road to rail would help relieve environmental problems and has other large socioeconomic effects too. Measures to improve rail's share of both passenger and freight transport are projects with high nationwide (and global) public benefits. As a result of recognizing the environmental and social importance of railways, Japan's national and local governments as well as other bodies have offered public money as support. This section overviews these developments chronologically (Figure 4).

Enhancing Freight Capacity on Tokaido Line

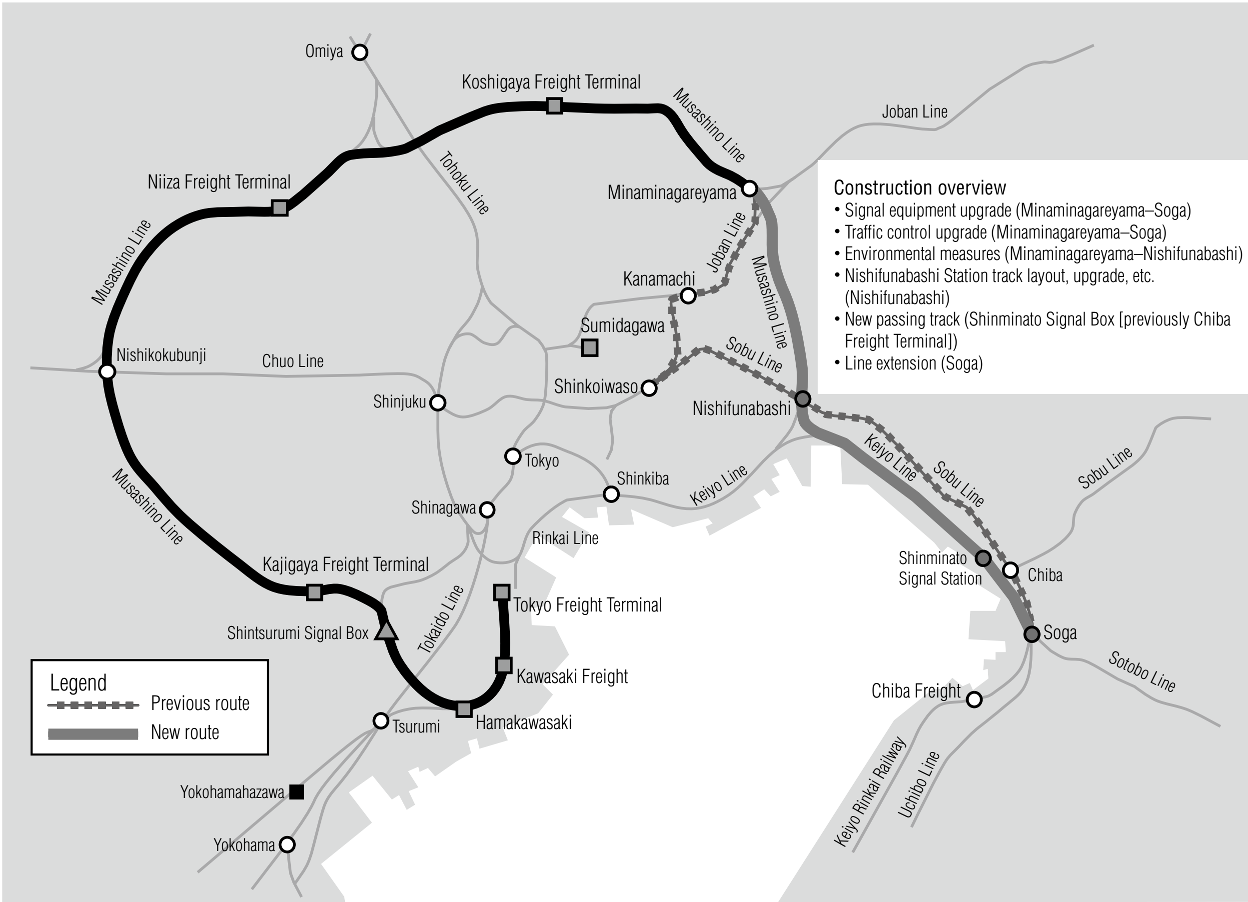
Passenger services on the Tokaido Line were already stretching the capacity to the maximum in the 1990s, causing freight bottlenecks between the Tokyo and Osaka terminals. The solution was to make-up longer container trains by using 26-car sets each of 650 tonnes to haul a 1300-tonne load, which is a 30% increase over the previous 1000-tonne loads.

Construction details

Accommodating longer freight trains required lengthening station departure and arrival tracks as well as passing tracks while the increase in electricity consumption caused by the electric locomotives hauling heavier loads required building or upgrading substations. Simultaneously, the lines between Inazawa Station and Nagoya Freight Terminal were electrified to accommodate electric locomotives (Figure 5).

Out of ¥12.4 billion in construction costs, ¥4.9 billion was accredited construction funded by an interest-free loan

Figure 6 Conversion of Musashino and Keiyo Lines for Freight Traffic



from the Railway Construction Fund and by Japan Railway Construction, Transport and Technology Agency (JRTT) obtained from special bonds and investment loans. The remainder was financed by JR Freight. Construction took 5 years from fiscal 1993. In cooperation with the three main-island JRs and JRTT, service started in autumn 1998 as container trains were gradually lengthened to meet demand.

Effect

About fifty 1300-tonne container trains can be hauled per day, increasing the total freight capacity of the Tokaido Line by 10%. This increased shift of road freight to rail offers potential savings in CO_2 emissions of 68,000 tonnes a year.

Converting Musashino and Keiyo Lines for Freight Traffic

During the JNR era, there were plans to haul freight over the passenger-only Keiyo Line. However, the high density of passenger services left no free time slots for freight so it was hauled via the Musashino Line and Joban Line, which required switching the locomotive at Shinkoiwaso Station and caused considerable time delays.

Changing the route to run via the Musashino Line (Minaminagareyama to Nishifunabashi) and the Keiyo Line cut haulage time, offered more daily departures, and increased freight transport to and from Chiba Prefecture (Figure 6).

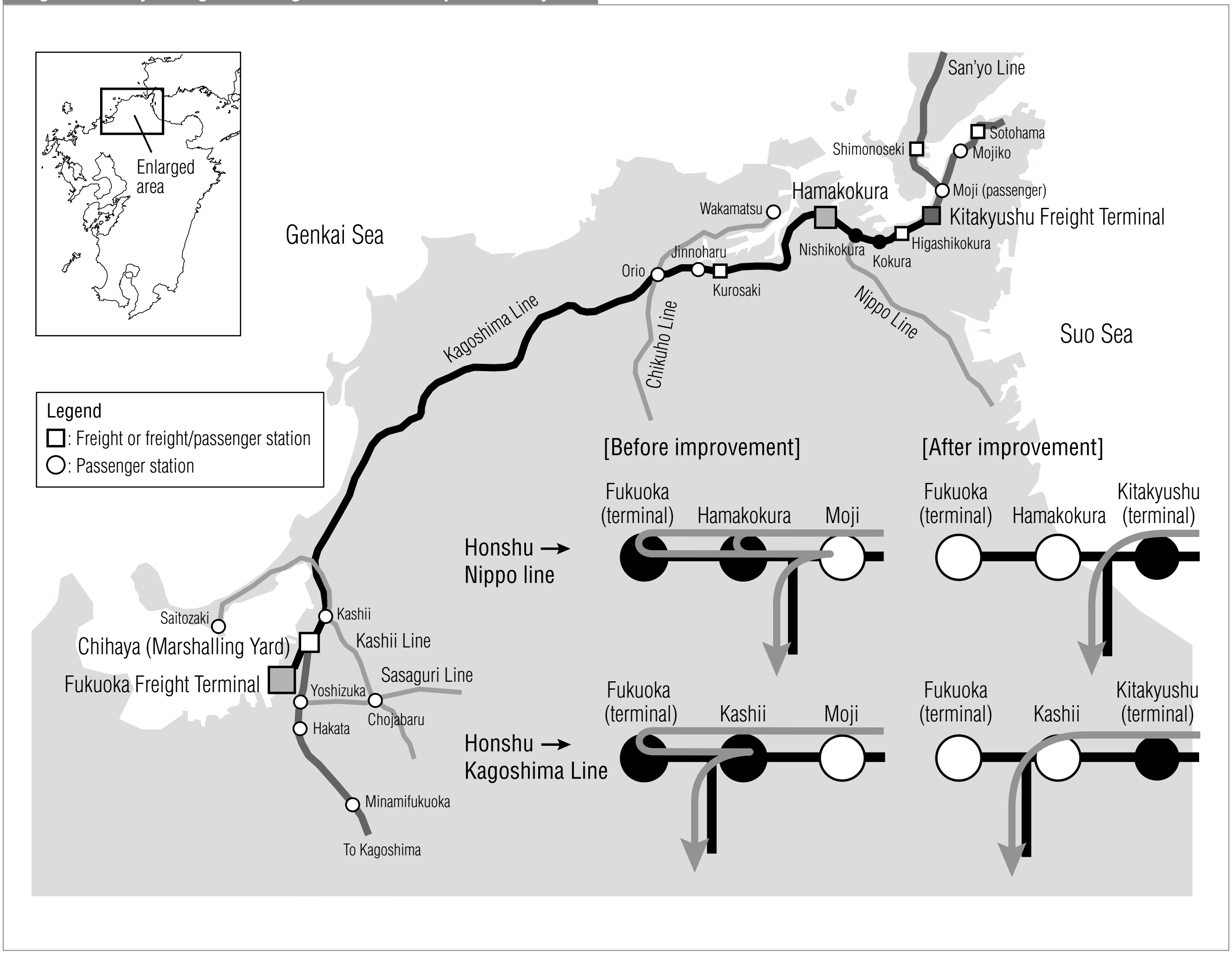
Construction details

The re-tasked track section is mainly elevated. However, there was no need for large-scale improvements because it was initially constructed for freight use. As a result, the only improvements were to operation facilities (passing tracks, freight train ATS, etc.) and to environmental measures.

The project came under the Special Reserves for Economic Structural Reform through Logistics Efficiency Improvement, which is for promoting a modal shift by making transport more efficient and increasing capacity. As a result, 30% (about ¥1.2 billion) of the ¥4.1 billion in construction costs was eligible for subsidies from the Reserves.

Construction (with JR East's cooperation) took about 4 years from fiscal 1998 to finish but services started after 3

Figure 7 Moji Freight Strategic Base Development Project



years in December 2000. Although the project was handled as a key railway development project in partnership with Keiyo Rinkai Railway Company, it was funded partly by Chiba Prefecture, which constructed and owns the subsidized facilities that it leases to JR Freight.

Effect

The new route cut about 11 km off the previous route and eliminated locomotive switching. As a result of this and other improvements, freight haulage times to and from the Keiyo area were cut by 1.5 hours, freeing-up timetable slots and allowing an increase of about 8 train departures daily (equivalent to an annual modal shift to railways of about 600,000 tonnes). The 5-year Assessment of Public Works in fiscal 2005 showed that the desired annual increase in transport volume of about 140 million tonnes was achieved. Moreover, the socioeconomic/environmental spinoffs included annual savings of 9000 kl of crude oil, 8000 tonnes of CO_2 emissions, and 120 tonnes of NO_x emissions.

E&S Moji Freight Strategic Base Development Project

The Tokyo-Kyushu and Nagoya-Kyushu freight markets have high load levels and the distances are long enough to demonstrate the advantages of rail freight.

However, in the early 1990s, Fukuoka freight terminal was the only strategic base in Kyushu and although it handled the largest freight volumes in Kyushu, it still faced insufficient capacity and a wasteful empty back-haul system, resulting from the concentration of freight trains there. Problems like low service quality and an inability to develop potential demand were often pointed out.

At the same time, the small Hamakokura Station was the only freight container station in the Kitakyushu City area, but it had limited handling capacity and was inefficient.

On the other hand, although the population of Kitakyushu City was similar to that of Fukuoka City, its industrial production far outstripped Fukuoka. Even so, the number of rail freight containers was only about one-third that of Fukuoka.

Figure 8 Kitakyushu Freight Terminal Layout

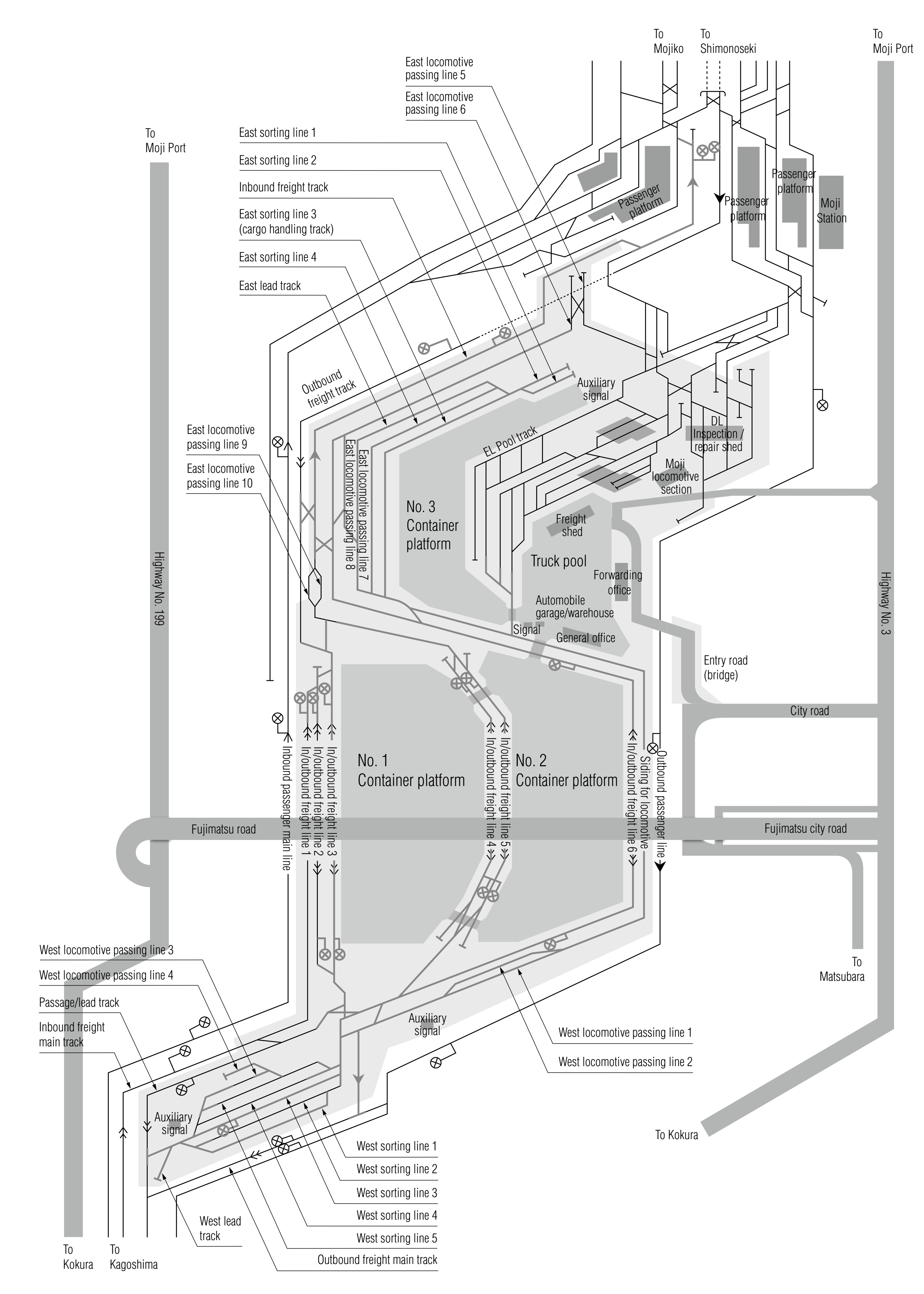
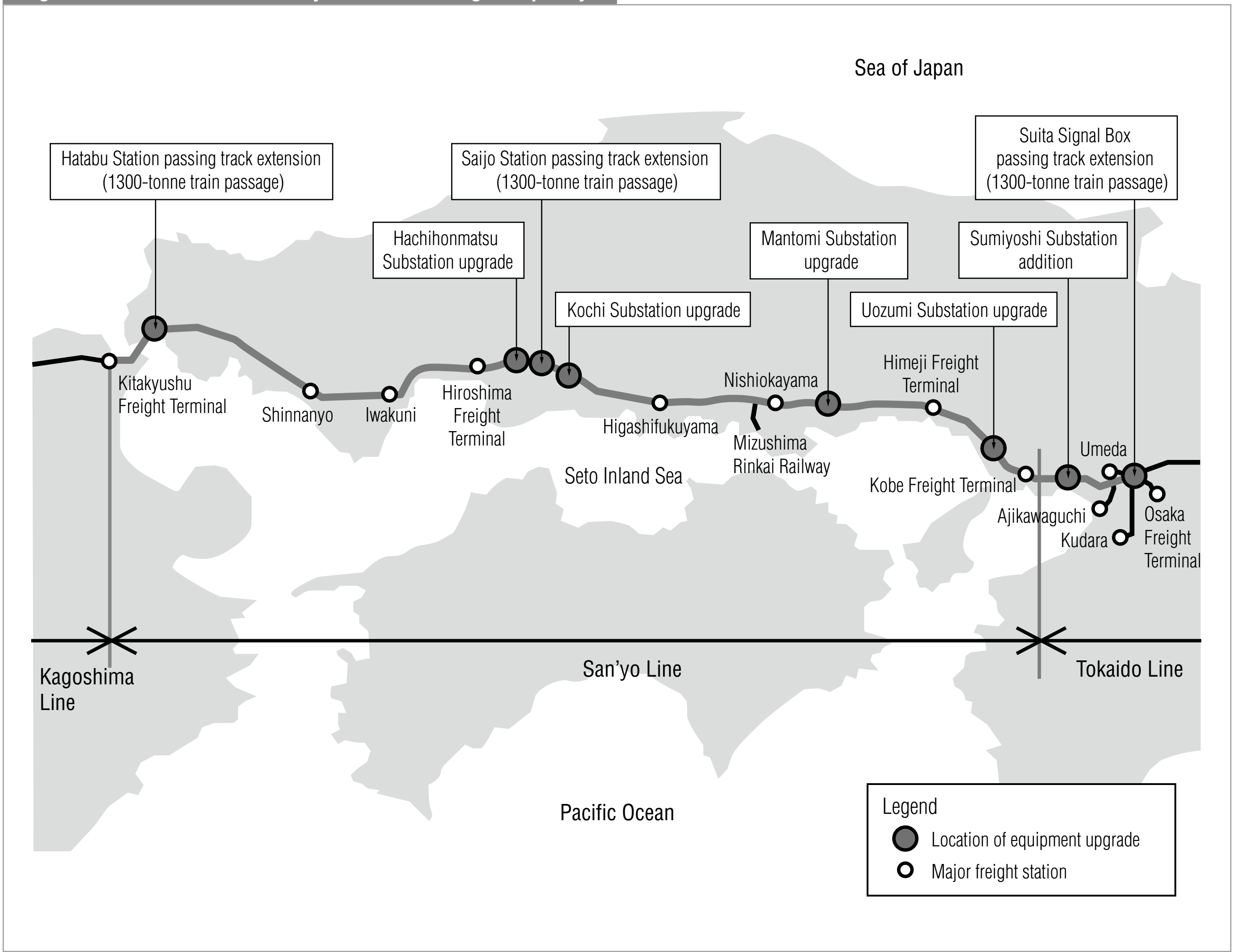


Figure 9 Enhancement of San'yo Line Rail Freight Capacity



Against this background, the obvious solution was to build an efficient E&S Moji freight strategic base in Kitakyushu City—the doorway to Kyushu and a transport node for the Nippo Line and Kagoshima Line—to increase freight arriving in and departing from Kyushu. Construction would also allow feeder trains in Kyushu, which were carrying bigger volumes year-on-year centred on Fukuoka freight terminal, to be concentrated at Moji. By acting as a relay hub, Moji would increase freight capacity throughout the Fukuoka region.

The duties of the two stations were divided functionally to promote higher service levels. Specific improvements included smoother Honshu-bound connections, enhanced transport capacity, and reduced haulage time.

In addition, because Kitakyushu City is a large port, the nearby freight terminal at Moji facilitates trans-shipment of sea containers to and from rail (Figures 7 and 8).

Construction details

A new freight terminal for handling mainly containers was constructed. The work included using some marshaling yard functions, constructing new arrival/departure lines and container platforms, and improving track and signalling equipment.

The central government subsidized about ¥2 billion of the ¥6.5 billion in construction costs and Kitakyushu City, which had a policy of becoming a logistics hub city, subsidized a further 20% (about ¥1.3 billion including capital for establishing quasi-public corporation). The project was also selected as a trunk railway development project, making it eligible for funding from the Special Reserves for Economic Structural Reform through Logistics Efficiency Improvement. Kitakyushu City established the quasi-public Kitakyushu Freight Railway Establishment and Holding Company to build and own the subsidized facilities, which JR Freight now rents. Construction took about 4 years from fiscal 1999 and business started in March 2002 with assistance from JR Kyushu.

Effect

Wasteful back-haul between Moji, Hamakokura and Fukuoka is relieved by the hub function, making the regional transport system more efficient; loading and unloading have been shortened and shunting is reduced by the E&S handling system.

Specifically, six more container trains departing from and arriving in Kyushu every day have been added from the start of operations until now. Moreover, the volume of container freight arriving at and departing from the Kitakyushu Freight Terminal exceeded 1 million tonnes in fiscal 2007, including about 4000 TEU of sea container freight departing from and arriving at Hibiki. Container transport times have also been reduced. For example, times between major stations across Japan and in Kyushu have been reduced by 6.4 hours on average compared to March 2006.

Furthermore, the 5-year Assessment of Public Works in fiscal 2006 showed an annual increase in transport volume of about 460 million tonne-km, which is still increasing. Moreover, the socioeconomic/environmental spinoffs included annual savings of 45,000 kl of crude oil, 40,000 tonnes of CO_2 emissions, and 600 tonnes of NO_x emissions.

Enhancing San'yo Line Rail Freight Capacity

As noted above, the project to lengthen freight trains on the Tokaido Line (about 600 km between Tokyo and Osaka) met with some success. However, longer-distance transport is the mainstream of container transport, which averages distances of about 900 km, or the distance from Tokyo to Hiroshima via Osaka. Furthermore, the tipping point between fare based on actual transaction for rail and road freight in recent years is around 600 km, with railways having the advantage at longer distances.

Considering this situation, facilities on the Tokaido and San'yo lines were developed to support longer trains (1300 tonnes). JR Freight aims to further the modal shift to rail by increasing capacity on the Tokaido Line west of the Suita Signal Box, which is the major artery for main-line logistics, and on the San'yo line, as well as by providing transport services meeting shippers' needs.

Furthermore, enhancing capacity between the Kanto, Chubu, and Kansai regions, and the San'yo and Kyushu regions will allow more efficient use of capacity secured by lengthening trains on the Tokaido Line (Figure 9).

Construction details

As mentioned above, passing tracks were lengthened at three locations (Suita Signal Box, Saijo, and Hatabu) between Suita Signal Box and Kitakyushu Freight Terminal, a new substation was added at one location (Sumiyoshi), and substations were upgraded at four locations (Uozumi, Mantomi, Kochi, Hachihonmatsu).

Total project expenses were about ¥3.4 billion and about ¥1 billion of the about ¥3.2 billion eligible for subsidies was subsidized by the national government. The primary contractor was the quasi-public Mizushima Rinkai Railway established jointly by Okayama Prefecture and Kurashiki City. It constructed and owns the subsidized facilities, which JR Freight rents. Construction with the full cooperation of JR West started in fiscal 2002 with operations starting in March 2007.

Effects

This project aimed to increase transport capacity by about 250,000 tonnes/year (approx. 25,000 trucks/year using 10-tonne trucks) by adding twenty-one, 1300-tonne container trains to the Tokaido Line and San'yo Line each year. However, the first year of operations saw addition of nineteen 1300-tonne trains (approx. 210,000 tonnes/year); freight on the San'yo Line in fiscal 2007 increased by about 60,000 tonnes over fiscal 2006. Further increases are planned for the future.

Moreover, the socioeconomic/environmental spinoffs included annual savings of 36,000 tonnes of CO_2 emissions, and 50 tonnes of NO_x emissions.

Combining Development of Maibara Freight Terminal (Provisional Name) with Truck Pool and Road Access

Currently, Shiga Prefecture on the Tokaido Line has no stations that can handle containers. As a result, freight is collected and delivered by trucks to and from container stations in neighbouring prefectures. Shiga Prefecture is on the Pacific belt zone of Japan, where high population increase is expected along with good potential demand, so there is good reason to build a new freight terminal at Maibara, which is a strategic transport node between the Tokaido Line and Hokuriku Line (Figure 10).

Construction details

A multi-modal freight station is being built combined with simultaneous development of road access to link rail and road transport logistics.

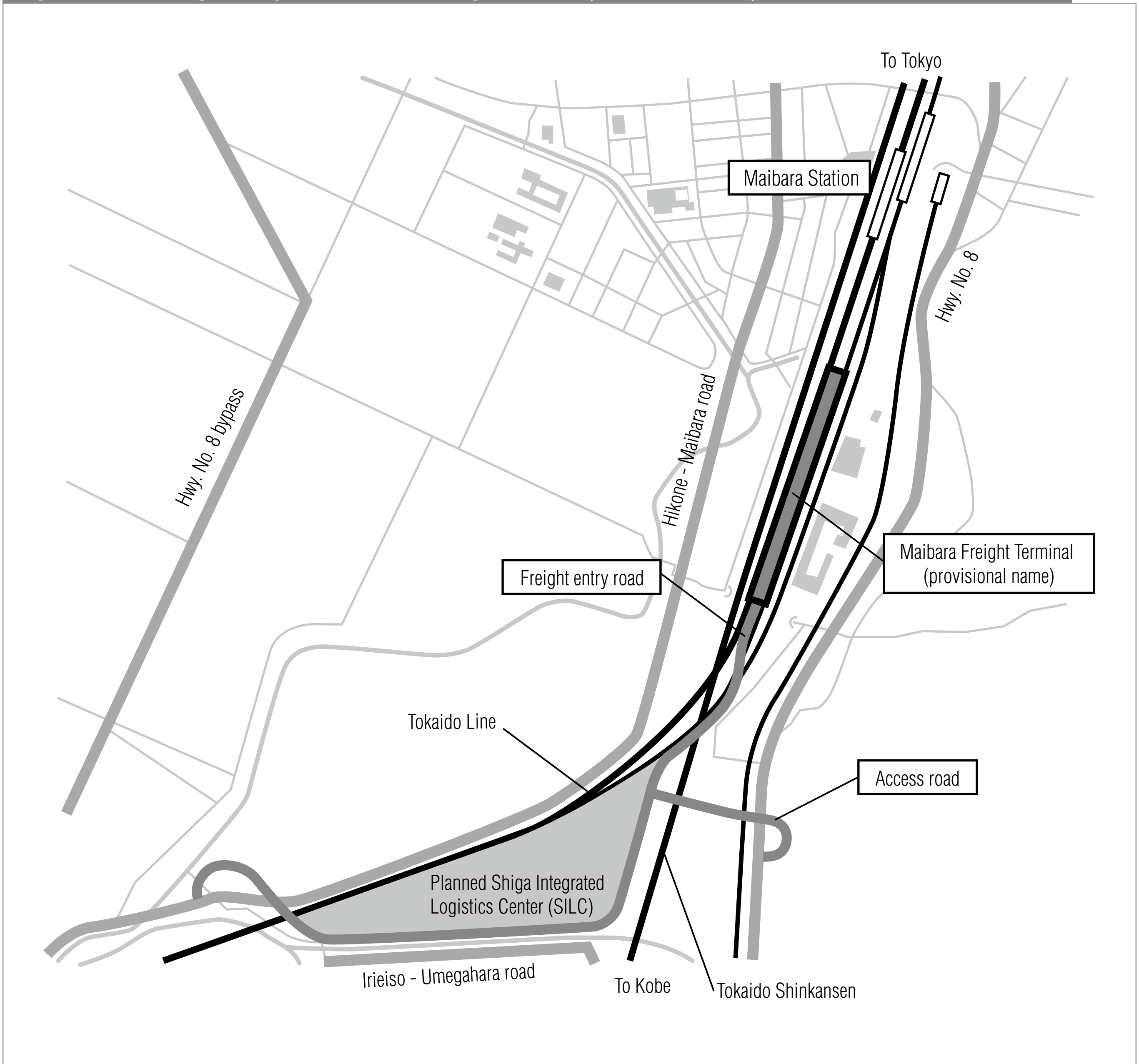
The railway part of the project plans to remove some facilities, such as arrival and departure lines and signals, and construct a container platform in cooperation with JR West. A freight handling building, station office, and other structures are being built adjacent to the truck pool accessed by a bridge and other facilities linking the main highway.

Planning started in fiscal 2002 and the first ground will soon be broken when issues on siting the connection to the trunk road and truck pool have been decided.

Effects

This plan aims to shift about 400,000 tonnes a year (about

Figure 10 Combining Development of Maibara Freight Terminal (Provisional Name) with Truck Pool and Road Access



40,000 trucks/year using 10-tonne trucks) of road freight to containers, relieving neighbourhood road congestion and pollution too. Locating the Maibara Freight Terminal near the junction of the Meishin and Hokuriku expressways will facilitate smooth freight transfer between rail and road.

If other container stations like this can be constructed in the future to facilitate modal trans-shipment, the benefits might extend to optimized division of rail and road freight.

Enhancing Kagoshima Line (Kitakyushu–Fukuoka) Rail Freight Capacity

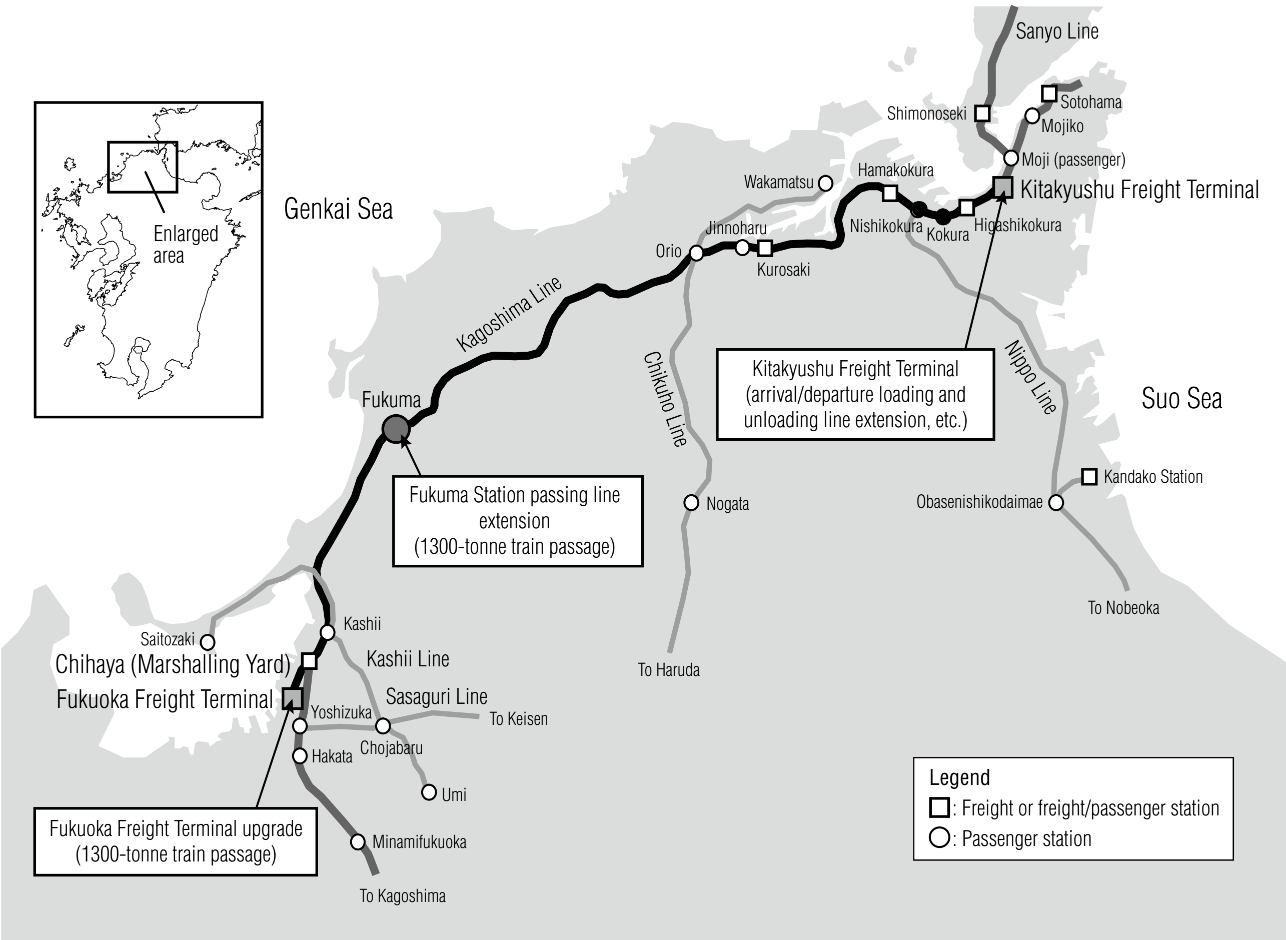
As previously mentioned, operation of 1300-tonne freight trains from Tokyo via Suita Signal Box to Kitakyushu Freight Terminal was achieved by enhancing the freight capacity of the San'yo Line. Extending the increased capacity further west to Fukuoka Freight Terminal would help increase the robust freight transport market throughout Kyushu (Figure 11).

Construction details

The plan calls for lengthening passing tracks at Fukuma to handle longer trains as well as for improvements to two freight terminals at the ends of the operation section between the Kitakyushu and Fukuoka freight terminals. It also calls for the extension of arrival/departure and loading/unloading lines at Fukuoka Station.

Of the ¥2.5 billion of the project eligible for subsidies, about ¥750 million is scheduled to be subsidized by

Figure 11 Enhancement of Kagoshima Line (Kitakyushu-Fukuoka) Rail Freight Capacity



the central government. Construction with JR Kyushu's cooperation will last 4 years from fiscal 2007 and operations are scheduled to start in March 2011. The primary contractor is the quasi-public Kitakyushu Freight Railway Establishment and Holding Company established at the time of the E&S Moji freight strategic base development. The company is constructing and will own the subsidized facilities that it will lease to JR Freight.

Effects

The plan is to transfer about 170,000 tonnes/year (about 17,000 trucks/year using 10-tonne trucks) to container trains on the Tokaido Line and San'yo Line using long trains (1300 tonnes), Moreover, the socioeconomic/environmental spinoffs included annual savings of 32,000 tonnes of CO_2 emissions, and 27 tonnes of NO_x emissions.

Promoting Future Modal Shift

None of these projects contributing to a modal shift so far could have been done by JR Freight alone no matter how much the company's management would have liked to—they were all achieved with subsidies from central and local governments. In other words, in exchange for government and others supporting the importance of increasing transport capacity, JR Freight's business results must show increasing rail freight volumes.

Looking back, JR Freight faced an extremely tough business environment with year-on-year drops in volumes and 8 years of consecutive losses from fiscal 1993 until a return to profitability in 2001. However, the individual projects focused on container transport are showing gradual success. Undeniably, from now on, bringing freight railway business into independent profitability is a major issue for JR Freight's management while balancing safe transport with updated equipment and increasing transport capacity.

Infrastructure will have to be developed steadily to accomplish these goals, starting with projects where increased freight volumes can be expected. Existing infrastructure must be used to maximum effect, freight tariffs

Class EF210 electric locomotive hauling freight

must cover costs, and new infrastructure must be planned based on studies of what infrastructure is lacking. These planning points are outlined below.

Modal shift infrastructure development

Twenty-seven freight stations have been constructed using the E&S method to promote a modal shift; three more are expected to open soon. Of these, only the Kitakyushu Freight Terminal was constructed using public subsidies for railway facilities. All the others—except the multi-modal Maibara Freight Terminal—were either structural improvement projects resulting from the JNR division and privatization or urban planning projects carried out by local governments to remove obstructions.

So far, line development to enhance rail freight capacity has been spurred by public subsidies. However, the new school of thought is that there are limits to new infrastructure development using current public subsidy schemes to assume the cost burden. As a result, establishment of a new development method is an urgent issue in promoting a modal shift.

Developing new transport fields in sea and rail

International sea container transport is growing steadily with the increasing shift of Japanese industrial production overseas. Railways can play a role in domestic transport of these sea containers. Recently, a method has been devised for loading a set of three JR Freight 12-foot containers inside rack containers owned by All Japan Express Co., Ltd., creating a new form of international intermodal transport for ISO 40-foot containers. As a result, domestic transport volume is growing steadily by meeting the needs of Japanese companies setting up overseas operations.

JR Freight has also formed alliances for ISO container transport with China's COSCO and South Korea's national railway operator KORAIL.

ISO sea containers are larger than JR containers and use different fasteners. Consequently, special loading equipment is required. Currently, major stations from Shinfuji and Obihiro in Hokkaido in the north to Kumamoto in Kyushu in the south have systems to handle sea containers. Domestically, ISO 40-foot containers and 9-foot 6-inch high containers are becoming standard too. Increased demand for these containers is allowing JR Freight to consider enhancing its network for carrying large sea containers. As a result, from this fiscal year, facilities are being constructed to trans-ship sea containers directly to freight wagons. Studies are also being made on building inland port depots with bonded warehouses and yards to speed export and import.

Dealing with structural change in domestic industry

Japan's industrial structure is changing; heavy industry in coastal areas is switching from using domestic raw materials to imported raw materials, new high-tech industries are growing, and sundry and day-to-day consumables once made in Japan have been switched to overseas production. For example, steel refineries are switching to imported limestone because domestic supplies have dried up, meaning bulk limestone haulage has disappeared. Also, the domestic auto industry ships it vehicles overseas while domestic electronics manufacturers manufacture overseas and import into Japan.

When focussing on China, Korea, and other East-Asian regions, the Tokaido–San'yo–Kyushu corridor is the optimum location for industry. However, moves are also underway towards development from northern Kanto through Tohoku to Hokkaido for production bases in Russia and the USA. Against this background, development of northern rail routes needs studying.

Links between transport modes

The trend towards overseas production by industry and stockless sales will probably grow in the future along with globalized shopping by telephone and the Internet.

Meeting these needs naturally requires smooth links between all transport modes as well as punctuality and stability. JR Freight is working to promote widespread understanding of the advantages of maximizing use of rail freight and creating good links with other transport modes.

Furthermore, containers are now the mainstream of Japanese rail freight, making trucks indispensable for transport between container freight terminals and customers. Promoting a modal shift to optimize division of roles will make work such as wide-area, intra-city, collection and delivery using expressways and major trunk roads more convenient. And using intercity rail freight will probably be an efficient replacement for truck transport.

Creation of high-level linkages with sea, air and other transport modes is a key issue for JR Freight's management, which is keenly aware of the need to search out the various possibilities.

Conclusion

To conclude, let's review the features of each transport mode.

Air freight greatly reduces transport times while sea freight is excellent for transporting heavy and bulk goods. Because both these modes use the natural environment as their infrastructure, the only major expenses are terminals. However, the actual transport vehicles are very expensive and not easily increased. Automobiles are excellent in terms of mobility and individualized transport but one driver is required for each vehicle. Also, the road infrastructure is developed and maintained by government, and the vehicles are relatively inexpensive. All three modes use petroleum as fuel.

On the other hand, railways use electricity to transport large volumes of freight, although the capacity is lower than sea freight. The cost of railway infrastructure such as tracks is relatively high and is maintained by income from passenger fares and small track use charges paid by JR Freight.

Separating land freight transport from other modes, there are two modes—intracity where collection and delivery involves short distances and can only be handled by trucks, and intercity connecting relatively distant bases, which is suited for rail transport.

Currently, rail freight operations on conventional lines in some—mainly urban—areas is very congested due to conflicting demand for passenger time slots so demand for transporting large volumes in the available limited time slots cannot be met. Moreover, shifting just 7% of road freight (tonne-km base) to rail would double the present volume of rail freight. Clearly, the current congestion and potential new freight volumes due to a modal switch require major enhancement of trunk rail freight capacity by quadruple tracking—if only in some sections. However, JR Freight does not have the capital needed for these developments.

On the other hand, Japan is facing a crunch in truck capacity due to its aging society and lack of young drivers. In addition, the recent surge in the price of oil suggests a long-term need to build new transport systems using technologies that will be unaffected by changes in oil prices and oil shortages. Similar opinions have recently been expressed by Hideo Nakamura, President of Musashi Institute of Technology and Chairman of the Highway Train Committee. JR Freight also believes that a country like Japan with an excellent railway network can offer a perfect solution for low-carbon freight transport if the right policy decisions are implemented to support JR Freight's central role in Japan's rail freight. ■

Ikuo Funahashi

After Joining JR Freight in 1988 and working at the Niigata branch Nuttari freight station, Mr Funahashi moved to the JR Freight Kanto branch office where he was engaged in development of the FRENS freight information network system and on improving the freight network infrastructure. His recent work has been on promoting the modal shift to rail freight.