

## New Developments in Transportation (1955–1980)

### Policy

*Katsumasa Harada*

#### Rapid Growth and Transportation Policy

The Korean War was the impetus propelling the post-World War II economic recovery and reconstruction of the capitalist system. In the mid-1950s, technical innovation, especially basic automation technology derived through the use of applied electronics engineering, dramatically improved the productivity of materials used for both production and consumption.

This is the basis on which the phenomenon known as rapid economic growth evolved. The cabinet of Prime Minister Ikeda Hayato, formed in 1960, made rapid growth its central policy and set out to actively strengthen economic development. This policy caused widespread changes in transportation, the most important one being the rapid spread in the use of motor vehicles that shook the underpinnings of the reigning transportation monarch, the railroads, and changed the distribution of shares for each transport mode.

This fundamental change was related to the government's policies on energy and public works investment. The conditions determining the course of that change can be seen in government economic policies of the mid-1950s. When considering the effects of the remarkable increase in productivity in the motor-vehicle industry, it is necessary to give thought not just to transportation policy but to industrial policy in general from the latter half of the 1950s. At the same time, it is necessary to look at what the trends were in transport policy within government economic policy and, second, what progress there was in public works investment.

The New Long-Range Economic Plan was adopted in 1957; it sought to further strengthen the base of the capitalist economy, now fully recovered

through the infusion of Korean War special demand, targeting the active development of the domestic economy and improved productivity and transport capability. The transportation programme emphasized that, despite increasing transport demand, present conditions could not accommodate an increase in transport strength and that therefore building that strength was an urgent task. This consisted, in particular, of building such facilities as ports and harbours, roads, and rail tracks, the basis of transport power. As long as the standards for trains, motor vehicles, ships, and their basic facilities had not come back up to prewar levels, there was no way that transportation could handle the rapidly increasing postwar demand. Lack of upgrading would lead not just to a reduction in transport functionality but also invite the accidents that were being caused by substandard equipment.

Policy also took the view that inadequate transport power is an obstacle to long-term economic growth. Thus, it saw the problem of strengthening transport as one of removing one of the obstructions preventing progress in growth. Large amounts of investment would be needed to build the transportation facilities that the policy called for. Railroads, roads, and ports were special targets for investment, and in the twelfth year of the postwar period, it was decided that public works investment would be systematically used for these purposes. This was a major step forward when one considers the haphazard way that public works investment had been handled previously.

A five-year plan was formulated to strengthen transport power on both trunk and commuter railroads that would allow the trains to handle transport demand that was much higher than anything during the prewar years. Additionally, the plan was also directed at building up basic facilities so that these facilities, too, could handle future increases in demand.

However, in the 1960s, when rapid economic growth began, the improvements achieved in transport power through the first five-year plan were not sufficient to handle actual demand. Planned improvements in facilities that had not been achieved or had been delayed in completion proved to be enormous obstacles to improving transport power. The country still had not adequately recovered from the destruction of the war, and emergency priority was given to achieving much higher levels of transport power through giant projects to expand roadbed, especially to increase the number of tracks on railroads that were only single-track and to replace roadbed and make improvements in steeply graded areas.

The plan to build the Shinkansen was a part of the response to this new demand. The first Shinkansen plan was devised in 1957. The planners came to the conclusion in 1958 that the international 1,435 mm standard gauge would allow them to use distributed motive power and attain speeds of 200 km per hour. National Railway officials called the project the building of a new Tokaido Main Line, and by laying separate sets of tracks at the wider gauge, the fast trains would cut travelling time between Tokyo and Osaka to three hours. Construction started in 1959. The plan made refer-

ence to the World War II standard-gauge Shinkansen plan touched on earlier, but of course this time there were no wartime contingencies, and another point of difference was that locomotion would be by means of electric multiple units. Freight trains originally planned as steam trains were also electrified at this time. But we can trace the historical roots for the inception of the Shinkansen back much further, to the standard-gauge reconstruction plan advocated by leading politicians in the 1910s. It took a full half-century for Japan to finally run trains on the international standard gauge.

The Shinkansen made use of state-of-the-art automation technology in rolling-stock and in signal and safety equipment. Combining the already developed central train control (CTC) with the applied electronics of the automatic train control (ATC) allowed train speed to be controlled with no intervention from the engineer. The speed indicators switch the signal indicators in the most complete system of speed control ever achieved. This provided an automatic train control that was a dramatic leap forward in train-safety technology. Conventional signal technology had already reached its limits, and the increasing number of trains called for the use of an automatic block system in single-track zones where there were 90 or more round trips per day and in multi-track zones having 250 or more round trips per day. But these systems also had great disadvantages. They shortened block length and increased the number of blocks, thus requiring superhuman powers of observation if the engineer was going to be able to keep up with all signals. Even if the engineer just had to be on the look out for stop signals, he would also have to have a method by which he could instantly stop the train. Thus an automatic stop system would have to be adopted. Many operating accidents occurred at this time because improper control systems were being used that caused the engineer to fail to see the signal. To overcome these obstacles, the automatic train stop (ATS) system was developed and by 1966 was installed on all National Railway lines. The Shinkansen ATC was a further improved version.

In addition to this type of equipment, the number of tracks needed to be increased to handle the greater train traffic. As mentioned, the tracks for the Shinkansen were constructed as an adjunct to the existing Tokaido Main Line, and it was necessary that additions of this kind be made as quickly as possible. The second five-year plan, started in 1961, set out to solve the problems that delayed the completion of the first five-year plan.

The second five-year plan was designed to handle the transportation situation in a rapidly growing economy. It was a large-scale plan that, in addition to building the Tokaido Shinkansen, allocated ¥975 billion to build multiple tracks on 1,100 km of main trunk line (in 1960, 12.7 per cent of tracks were multiple; this plan raised it to 18.5 per cent), electrify 1,800 km of track, chiefly for the main trunk lines (raising the amount of electrified zones from 13.2 per cent to 22 per cent), put into use less-smoke-producing motive sources in non-electrified zones, and improve urban commuter lines in the large cities.

There was an especially large increase in postwar transport volume on the Tohoku and Hokuriku main lines, the Joetsu Line, and the Kagoshima Main Line between Moji and Kumamoto. Converting these lines over to multi-track was a major priority. However, the soaring price of right-of-way land prevented the plan from proceeding as hoped, and at the end of the fourth year, fiscal 1964, 531 km, or 62 per cent, of the proposed length had been multi-tracked. The plan was completed at the end of the 1960s by being carried over into the third seven-year plan that began in 1965.

No adequate measures had been adopted at this time to increase the number of tracks in commuter areas; they would have to wait until the third long-term plan.

Thus, we can see that track improvements tended to get less attention than other improvements, and this tendency was a major factor preventing solutions to the problems of transport power.

The rapid growth of the economy demanded a greater number of trains. In October 1961 revised schedules were set up, and while reconstruction work was progressing, the entire country-wide system of train operations was revised. Up to this time, limited express trains ran only on the Tokaido, San'yo, Kagoshima, Tohoku, and Joban lines, but the introduction of diesel multiple units placed limited expresses on all the major trunk lines. The use of diesel multiple units led to a revision of the limited express network, of train schedules for all lines connected to it, and reduced travel times throughout the system.

The schedule revisions coincided with the long-awaited improved standard of living of the Japanese people and stimulated more leisure travel. From these revisions through to the opening of the Tokaido Shinkansen in October 1964 to the schedule revisions of October 1968, the National Railways made substantial progress in its aim to increase transport power. This was a period of dramatically upgraded performance not just in passenger service but in freight service too, with the adoption of container transport, an increase in limited express freight trains, the adding on of new inter-regional express freight trains, and the mechanization of freight loading and unloading.

### Changes in Energy and the Transportation System

In the mid-1950s, Japanese were becoming more aware of the usefulness of the motor vehicle. The multi-functionality of this form of transportation, its mobility, ability to carry goods and people door-to-door, and its individuality made it highly suitable as a new means of transport. Concomitant with this increasing awareness was the awareness that roads had to be improved.

The Law on Motor-Vehicle Road Construction for National Development was enacted in April 1957, and in March 1958, the Law on Emergency Measures for Road Improvement was passed. The consensus being that the totally revised Road Law of June 1952 had not been effective in stimulating road construction, these two laws were adopted to ensure that actual im-

provements and expansion of the road network would be realized. Legal standards for toll-road construction were established by the Law for Special Measures on Road Improvement, enacted around the time of the 1952 revised Road Law, and, in 1956, with the setting up of Nihon Doro Kodan, the government body concerned with toll-road construction, the building of toll-roads commenced.

However, constructing toll-roads did little to improve the particularly poor conditions of the interurban trunk roads. These roads demanded significant improvement, which entailed greater road widths, better paving methods, and the construction of urban motorways.

The conditions of width and pavement of Japanese roads were very poor, hardly befitting a "civilized country." This had been pointed out by the Occupation authorities, and the first improvements made were those demanded by these forces. The 1952 Road Law served as the legal basis for a complete re-examination of the way in which Japanese roads would be administered after the Occupation.

Thus, legal measures taken in 1957-1958 provided for a more active push toward road-improvement projects based on forecasts of long-run economic growth. Of these legal measures, the Road Construction for National Development Law provided for the construction of motorways that would connect major cities throughout Japan. Based on the law, construction began first on the Meishin Motorway connecting Nagoya and Kobe and then on the Tomei Motorway connecting Tokyo and Nagoya. These motorways had been planned since the 1930s and were adaptations of the *autobahns* that Nazi Germany built for both military and economic goals. However, none of these plans came to fruition during the Second World War. (The same thing happened in railroad transport: construction on the new international standard-gauge trunk line between Tokyo and Shimonoseki was halted in 1943. This line was to feature high-speed trains that could cover the distance between Tokyo and Osaka in four and one-half hours and the distance between Tokyo and Shimonoseki in nine hours.) Thus it was not until the postwar period that construction began on Japan's first motorway. In making its decision to begin construction on a motorway along the Tokaido, the Japanese government invited the Watkins group from the United States to survey the situation. Their advice convinced the government of the highway's feasibility. The motorway construction plans resemble somewhat the prewar plans for the new standard-gauge trunk line, whose construction only began in 1959 with the materialization of its eastern portion, the Tokaido Shinkansen.

The Law on Emergency Measures for Road Improvement, which, as a source of financing, relied in part on the tax on volatile fuels that had been abolished during the war but restored in 1949, was aimed at the construction of national highways and indeed was a key factor in the speedy improvement in the national highway system.

Such were the legal foundations that allowed progress of the kind that was seen in trunk-line construction throughout the 1960s. However, the

pace of motor-vehicle increase was always ahead of road improvement. Add to that the increasing problems of urban traffic, and we find that road policy was always behind.

The surge in motor-vehicle production that had begun in the 1950s contributed to the explosion in motor vehicles. The reconstruction of Japanese capitalism had progressed more rapidly than technical innovation. The income-doubling plan that the Ikeda cabinet created in 1960 not only rapidly filled in the gaps in the economy that had not been taken care of by the economic growth plan, it spurred on economic growth more than had been envisioned in the growth plan. Even this plan strongly emphasized the need for public works investment in order to strengthen transport and build a transport base in which all transport sectors would be balanced. However, the plan contained elements that would in fact destroy the balance between railroads and motor vehicles, elements that had been ignored and would lead to very powerful consequences. The rapidity with which the production of motor vehicles grew was a major factor in the worsening road conditions.

In the 1960s, the motor-vehicle manufacturers were ready to mass-produce, and they set up a sales network unprecedented in the domestic motor-vehicle market. A major reason for developing this network was the realization that the motor car had become a necessary business tool not just for large corporations but for small and medium-sized ones, and that these corporations were rapidly increasing the demand for passenger cars. To supply that demand, the motor-vehicle manufacturers produced motor cars in numbers that were far beyond what the roads were capable of handling.

As a result, modernization and strengthening of all transportation facilities were made a part of the income-doubling plan, which also called for emergency measures to improve roads. The consequent policies on road improvements produced two major results. First, when railroad transport power, i.e., that of the National Railways, was increased, the National Railways was never removed from the framework of commercial self-support that it had been placed in during the Occupation, which eventually put it in heavy debt and ultimate financial crisis. In contrast, money for road improvements came from the general budget. This created an unbalanced distribution of public works investment funds and inequality between the shares each transportation sector held in the transport market. The other effect of this policy was that it directed road funds more to roads that were needed by heavy industry, putting general-use roads at a disadvantage and creating hazards that destroyed the environment along the roadways.

The volume of mass-produced motor vehicles had become a linchpin in the reconstruction and growth of capitalism. Increasing that volume required constant infusions of public works funds into road construction, created an imbalance in the share of transport between motor vehicles and railroads, and destroyed the environment.

Subsequent transport policy not only was unable to solve the problems, it actually made them worse. The 1964 report of the Survey Group on Basic Problems in Transportation submitted to the prime minister stated that,

while previous transportation policy had been based on the railroads having a monopolistic position in land transport and had emphasized its central place in the transportation market, considering the changed situation in transportation structure, policy should now recognize the need for competition between transport means, the introduction of the principle of the user paying the transport costs, and the establishment of a self-supporting system for each means of transport.

Free competition, the user paying for all services, and the system of self-support resulted in the free and uncontrolled distribution of each segment of the transportation configuration: motor vehicles, ships, aeroplanes, and conventional railroads. The result was fierce competition for a share in the transport market, and, under the guise of using customer fares to improve facilities, fares and rates were increased, leading to a reduced quality of service.

The 1967 Plan for Economic and Social Development called for the building of transport facilities so that national land would be used effectively. This plan also emphasized harmony between the various modes of transport and their maximum effective use overall. It also required the use of public works funds to build and repair transportation facilities. But here again, while the policy was calling for the building of transport facilities as a part of rapid economic growth, it imposed, on the other hand, the burden of responsibility for the provision of these facilities on to the users, a burden they could not evade due to the system of self-sufficiency that was being forced on them.

The environmental destruction that had become widespread since the implementation of the income-doubling plan was being virtually ignored. An alarming increase in traffic accidents, in noise, vibration, air and water pollution were becoming evident not just in the cities but throughout the country. The culprits were motor vehicles, aeroplanes, trains, ships – every sector of transportation. The cause would remain and the hazards worsen as long as the cooperation of the people affected was not obtained in the building, expansion, and improvement of facilities.

Continued fare increases based on the system of user responsibility and imposed self-sufficiency worked to reduce the number of customers, induced a worsening of corporate operations, and began to threaten the self-sufficiency system itself. The operations of each private railroad and bus company and of transportation systems operated by the National Railways and the local governments deteriorated. The operational crisis threatening the National Railways was evidenced by expanding investment, an explosive increase in the debt burden resulting from the issuance of user bonds, and an increase in the number of unprofitable rural lines – all of which forced the company into a pattern of adopting ever more ambitious reform plans even before current goals had been met, thus the first five-year plan was adopted in 1957, followed by the second in 1961, and finally the long-term plan of 1965 was adopted. More than a lack of administrative effort,

the central problem was to be found in the basic position underpinning the policies of the high-growth period.

As Japan entered the 1970s, both the government and general public became increasingly aware of these problems. With the adoption in 1971 of the "Integrated Transportation Network" by cabinet council, the government recognized that making free competition the basis of its policy on transportation had been destructive and that the government itself should be involved in regulating transportation demand. Nevertheless, the government continued to follow the principle dictating that the user or the beneficiary pays, and, not surprisingly, the Basic Plan of the Economy and Society adopted by cabinet decision in 1973 incorporated the principle that fare hikes were necessary to meet rising costs.

After the oil crisis in 1973, it was recognized that changes would have to be made in transportation policy. In particular, a debate arose as to whether the parties responsible for generating transport should pay part of the cost for public works investment and whether priority should be given to mass transit while applying restraint on motor vehicles. However, the question of whether the motor-car manufacturers should pay a part of transportation costs never really arose, while the costs of construction for mass transit soared and the burden on the user continued to enlarge. Moreover, the rate of construction and improvements dropped off noticeably, and plans were continually revised, indicating that little could be expected in the way of economic benefit from the government's policy.

As long as nothing was done to resolve this conflict, transport problems would only become a serious social problem, affecting the welfare of everyone. After 100 years of dramatic progress and modernization, transportation now confronted very serious problems.

## Railroads

*Eiichi Aoki*

### Revolution in Rolling-stock Technology

#### Establishment of the Distributed Power System

All Japanese trains before the Second World War consisted of a string of non-powered passenger or freight cars pulled by a locomotive. Systems in which individual passenger carriages were fitted with an engine – such as electric or diesel multiple units – were limited to trains with few cars that generally operated in short-haul service. At least, with regard to the National Railways, this was the system to be found, and it was the system characterizing most of the world's railways.

But in the early half of the 1950s, the National Railways started putting long trains together for middle-distance travel using several electric or