



# SELECTED PROCEEDINGS

## CONSTRUCTION OF TSUKUBA EXPRESS AND URBAN DEVELOPMENT BASED ON THE INTEGRATED DEVELOPMENT LAW

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# **CONSTRUCTION OF TSUKUBA EXPRESS AND URBAN DEVELOPMENT BASED ON THE INTEGRATED DEVELOPMENT LAW**

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## **ABSTRACT**

In August 2005, Tsukuba Express opened its operation connecting city center of Tokyo Metropolitan Area and its suburb at a distance of 58.3km. This railway line was developed based on the Integrated Development Law, which aims to promote both railway construction and urban development along the railway in an integrated manner. The Integrated Development Law has solved the inconsistency between railway planning and regional planning, and made comprehensive regional development possible. Since the concepts of the Integrated Development Law are expected to be applied to other projects, this paper investigates the Law and the results of Tsukuba Express project. For further application of the model to other projects, the paper also discusses about possibilities for modifying the management model applied to Tsukuba Express project.

*Keywords: railway construction, regional planning, integrated development*

## **1. INTRODUCTION**

Prior to the enforcement of the Integrated Development Law discussed in this paper, regional development was implemented after the opening of the railway line in many cases. The inconsistency between railway planning and regional planning often resulted in many problems, such as insufficient provision of public infrastructure and disordered development of residential area around stations. Therefore, the regional development should be implemented along with the construction of railway systems, such as stations. In order to attain the coordinated development, the Integrated Development Law was enacted in 1989. This paper examines the characteristics of this Law, and investigates how the railway construction is implemented based on this Law. As this Law was applied to the construction project of Tsukuba Express Line connecting city center of Tokyo Metropolitan Area and its suburb, the outcome of the project and management of the line will be investigated as well.

As railway lines have large external economy and can raise the value of land around the stations, the coordinated development between railway construction and real estate development can be recommended to other projects in overseas as well. Thus, this paper tries to investigate the concepts of the Integrated Development Law and learn lessons from Tsukuba Express project. Some measures to modify the management model would be also discussed for further application of the concepts to other railway projects.

## **2. BACKGROUND TO THE INTEGRATED DEVELOPMENT LAW**

This chapter discusses the characteristics of construction of passenger railway line, and the background to the establishment of the Integrated Development Law.

### **2.1 Characteristics of railway construction**

#### *External economy of railways*

As railway operation has a large external economy, it will increase the value of the land around the stations. This means that the benefit of railways belongs not only to the passengers but also to the land owners around the stations. As improvement of transportation services increases the land value as well, railway construction is effective to develop residential areas and business districts. In addition, if this external economy of railways can be internalized, it can improve the management of the railway company as well.

#### *Necessity of integrated development*

The increase of real estate value can be attained more effectively in the case regional development is implemented in cooperation with railway construction. As railway stations and facilities can become important infrastructure within the region, these stations and facilities should be planned in coordination with regional planning in the district.

For example, in order to develop the potential of railway transportation, other public transportations such as buses and taxis should be available from stations. In order to attain this objective, bus stations and taxi stops are required to be placed in front of the stations. Thus, it is necessary to plan and make a certain space for them in the station front. Moreover, roads and other social infrastructure should be planned and constructed in coordination with stations and related railway facilities.

#### *Kobayashi Ichizo's model in Japan*

In Japan, some private railway companies have implemented real estate development along with construction of railway lines. This kind of management and development model is

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named “Kobayashi Ichizo’s model” referring the name of the person who firstly performed this business model. In 1907 Mr. Kobayashi founded Hankyu Corporation, which carries out passenger railway transportation as a private company. He constructed a railway line in the less populated region and developed residential areas and amusement parks along the railway line. He also developed a department store at the railway terminal station. Hankyu Corporation succeeded through this business model and other private railway companies followed the similar business model in Japan.

From an economic point of view, it can be explained that Kobayashi Ichizo’s model had succeeded in utilizing external economy of railways as long as gaining an income from transportation business itself. Thus, historically, private railways in Japan have been very active in affiliated businesses, such as constructing station buildings and promoting real estate development, along with railway transportation businesses.

Nevertheless, in these cases, the regional development was implemented by the private railway company itself. As investment to the railway and regional development amounts to huge, nowadays it is practically impossible for the private sector to invest in both the railway systems and real estate around the line by itself. Thus, involvement of the public sector is actually required to promote the comprehensive development these years.

### **3. RESEARCH DESIGN AND METHODOLOGY**

In order to understand the background to the enactment of the Integrated Development Law, firstly, the authors will closely investigate the concept of the Integrated Development Law. In addition to the study on the Law through the available literature, the authors make an interview to an academic professor who had advised on establishing the law. This interview would be effective to deepen the understanding of the aims and concept of the Integrated Development Law.

As this law was applied to Tsukuba Express Line project, this research also investigates the outline and results of this project. Although one of the authors, Mr. Ogura, was engaged in the construction process of Tsukuba Express Line project, the authors have made an interview to an engineer who was in charge of the construction process and is still working for Metropolitan Intercity Railway Company (MIR), which operates Tsukuba Express Line. In addition to the investigation into literature about the project, this interview would be useful for understanding the implications and lessons for the application of the law into practical railway construction projects.

Based on the investigation into the Integrated Development Law and practical application into Tsukuba Express Line, this paper tries to learn lessons which can be applied to other railway projects.

## **4. INTEGRATED DEVELOPMENT LAW**

This chapter investigates the Integrated Development Law which aims to solve inconsistency between railway planning and regional planning. The official name of the law is “the Special Measures Law for coordinated development of residential areas and railways in metropolitan areas”. As the name indicates, this law aims to promote both railway construction and real estate development along the railway line in an integrated manner to supply a large area of residential districts.

### **4.1 Problems of railway construction inconsistent with regional development**

Prior to the enactment of this law, regional development along the new railway line usually occurred after the railway line started its operation. The lack of coordination between railway construction and real estate development often resulted in serious problems such as inconsistency with road planning and inappropriate urban development. If roads and other infrastructure are planned and constructed properly, the area around the stations can be developed as a business/commercial district and wider surrounding area can be developed as residential areas. Nevertheless, this kind of regional development can not be attained without consistent planning and strict regulations. In other words, in order to utilize external economy of railways, proper planning and regulations are required in coordination with railway planning and construction.

Without proper regulations, sometimes some private sectors might speculate in the land around planned stations expecting the increase of land values. This kind of activities not only prevents the consistent regional development but also becomes the reasons for a delay of railway construction works. In other words, consistent regional planning and proper regulations are required for preventing disorder in the development process.

### **4.2 Aims of the Integrated Development Law**

The Integrated Development Law intends to promote comprehensive regional development along with railway construction. In order to solve the problems described in the former section, the Integrated Development Law was enacted in June 1989. The law makes it possible to promote integrated regional planning in coordination with railway planning and construction.

### **4.3 Railway construction and regional development based on the law**

The Integrated Development Law promotes railway construction and urban development based on the approach called “land readjustment”. In other words, the main characteristic of the Integrated Development Law is the integration of railway construction and land readjustment.

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The approach of land readjustment is effective for comprehensive regional development converting the land from agricultural to urban/residential area. In the process of land readjustment project, infrastructure, such as roads, parks and other public facilities, are provided. In many cases, their finance is covered by the sale of a part of the reserved area for commercial purposes.

Before the project, many of the inhabitants own the land of a different physical shape without sufficient infrastructure. In the project, the owner would be provided with re-plotted land, which has been reshaped but reduced in size to provide the reserved area. Although the re-plotted land has less space, it is possible that the value would be higher as the re-plotted land is reshaped and has infrastructure.

There are several advantages in land readjustment (United Nations, 1995):

- 1) It provides an opportunity for a planned development of the land and infrastructure network and it avoids the problem of the so-called “leap-frog” development where different types of land uses and densities are mixed;
- 2) Land readjustment is an attractive method to influence the location and timing of new urban development;
- 3) It provides an opportunity for the provider of infrastructure and services to recover the incurred costs as well as to get access to land for this purpose;
- 4) If administered properly it could provide increased equity in land distribution.

The flow of the railway construction based on the land readjustment project is shown in Figure 4.1.

As the flow shows, at the stage before construction works, the public entities, such as local governments, purchase the land in the priority area. Because of the land readjustment project which will be implemented afterwards, it is not necessary for them to directly purchase the land of railway facility district. Thus, the public sector can buy the land in advance with less difficulty. Based on the authorization of the land readjustment project, they would re-plot the purchased land to the railway facility district. In this process, the law stipulates that only the public entities, such as public/joint-venture railways, regional governments and a public developer, can re-plot the purchased land to the railway facility district.

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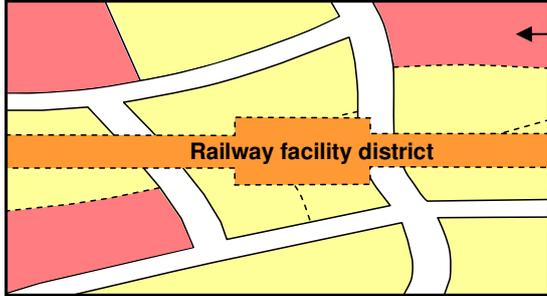
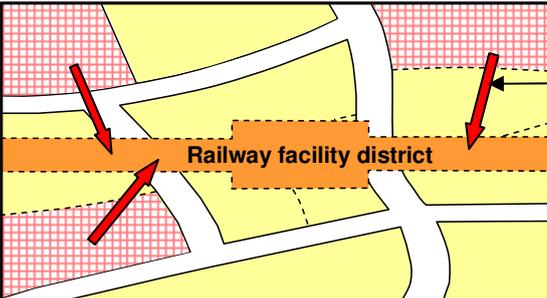
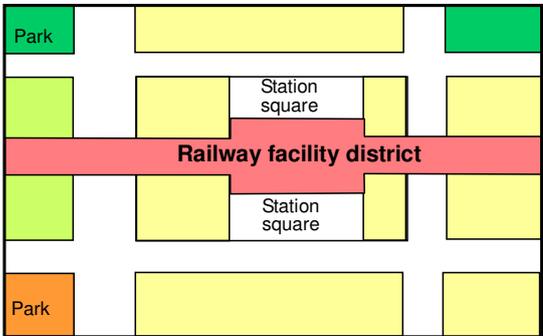
Step	Explanation and Image
<b>1st Stage</b>	<ul style="list-style-type: none"> <li>· “Priority area” is specified around planned stations.</li> <li>· “Railway facility district **” is also specified within a priority area. *: “Railway facility district” covers the area of the planned station and railway route. This district is specified in the land readjustment plan.</li> <li>· A part of the land within a priority area is purchased in advance by the public entities, such as a local government, a public railway company, and a public urban developer.</li> </ul>
	 <p style="text-align: right;">Land purchased in advance</p> <p style="text-align: center;"><b>Railway facility district</b></p> <p style="text-align: right;"><i>(a part of priority areas)</i></p>
<b>2nd Stage</b>	<ul style="list-style-type: none"> <li>· “The land readjustment plan” is authorized, and usage of the land within a priority area is also determined.</li> <li>· The land purchased in advance is re-plotted and consolidated into the railway facility district.</li> </ul>
	 <p style="text-align: right;">Re-plotting the land</p> <p style="text-align: center;"><b>Railway facility district</b></p> <p style="text-align: right;"><i>(a part of priority areas)</i></p>
<b>3rd Stage</b>	<ul style="list-style-type: none"> <li>· Railway facilities and public facilities are constructed.</li> <li>· Public facilities such as roads and parks are also constructed along with development of other buildings.</li> <li>· Comprehensive urban development is completed by the land readjustment project.</li> </ul>
	 <p style="text-align: right;"><i>Completion of comprehensive urban development</i></p> <p style="text-align: center;"><b>Railway facility district</b></p> <p style="text-align: right;"><i>(a part of priority areas)</i></p>

Figure 4.1: The flow of land readjustment plan  
(Source) Author’s revision of MIR (2011)

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Based on the Integrated Development Law, the concerned regional governments along the line make a fundamental regional plan including:

- 1) the location of the stations and routes of railways;
- 2) fundamental planning for the development of residential areas;
- 3) priority areas for the integrated development;
- 4) planned schedule for the development; and
- 5) other issues necessary for the integrated development.

In order to make this fundamental regional plan, the concerned local governments and the railway company ought to cooperate with each other. The Integrated Development Law also stipulates that the government, the concerned regional governments and public entities should make efforts to develop public facilities essential for the development of the residential area within the stipulated priority area.

In addition to the procedure for promoting the integrated development, the law includes some measures for smooth development preventing expected difficulties. For example, if some private entities try to promote some development works without comprehensive regional planning, it would disturb coordinated regional development. Therefore, the Integrated Development Law permits the regional government to specify the observation area so as to prevent rapid price increase of the land. When the observation areas are specified, it would be difficult for the private sector to buy the land in advance for speculation purposes. Based on these characteristics, the concept of this law is especially applicable to the area where a large residential area is expected to be developed around metropolitan area.

United Nations (1995) notes five important prerequisites for the successful implementation of land readjustment:

- 1) It must be supported by the national, regional and municipal governments. It is important that the national government provides regulations and guidelines to ensure fairness in the system;
- 2) The land readjustment agency must be given powers to coordinate and to get access to assistance from various government departments;
- 3) The land registration and cadastral system needs to be efficient;
- 4) There has to be a sufficient number of skilled and highly dedicated negotiators at the local level as well as objective and well-trained land valuers;
- 5) As the method is based on public/private cooperation, the majority of the landowners should support the use of the technique. Forceful acquisition of land should be avoided.

It seems that the Integrated Development Law and conditions in Japan satisfy most of the above-mentioned conditions. Based on these conditions, construction of Tsukuba Express Line was implemented as it will be described in the following chapter.

## **5. CONSTRUCTION OF TSUKUBA EXPRESS LINE**

This chapter investigates the construction and management of Tsukuba Express Line, as it is the only project which the Integrated Development Law has been applied since its enactment in 1989.

### **5.1 Background of the Construction of Tsukuba Express Line**

Construction of Tsukuba Express Line had an aim to develop residential areas in the north-eastern part of Tokyo Metropolitan area, from Akihabara to Tsukuba. More specifically, it has the following four main objectives (MIR, 2001).

*1) Improvement of the transportation network in the north-eastern part of Tokyo Metropolitan Area*

The north-eastern part of Tokyo Metropolitan area did not have sufficient railway lines which connect to the city center of Tokyo. Thus, Tsukuba Express Line is aimed to shorten the commuting time to the city center of Tokyo.

*2) Easing severe passenger congestion on JR Joban and other commuting lines, which connect the center and the north-eastern part of the Tokyo Metropolitan Area*

Because there were not sufficient railway lines going to the north-eastern part of Tokyo Metropolitan area, congestion of the existing lines were very severe. Thus, Tsukuba Express Line aimed to ease severe passenger congestion on these lines.

*3) Development of new residential areas in Tokyo Metropolitan Area*

The areas had sufficient land to be developed along the line. Thus, Tsukuba Express Line aimed to promote regional development and supply residential areas in coordination with construction of Tsukuba Express Line.

*4) Industrial and commercial development along the line.*

Tsukuba Express Line connects two distinct cities: Akihabara has various IT suppliers and Tsukuba has several universities and institutes for the advanced researches. Thus, Tsukuba Express is expected to develop Tsukuba city further as a research center in Japan.

Based on the above-mentioned necessities of the construction of Tsukuba Express, the construction planning was developed as follows.

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Table 5.1: Progress of the Planning for Tsukuba Express

Time	Progress of the Planning
July 1985	Council for Transport Policy recognizes the need to construct a new railway line to moderate congestion of commuting trains to and from the direction of Ibaraki prefecture in Tokyo Metropolitan Area.
June 1989	The Integrated Development Law passes in June and takes effect in September.
March 1991	Metropolitan Intercity Railway Company (MIR) is founded.
January 1992	Minister of Transport grants Class 1 Railway Licence to MIR.
October 1994	Construction of Tsukuba Express Line commences.
August 2005	Operation of Tsukuba Express Line starts.

Source: Author's revision of MIR (2012)

The location of Tsukuba Express is shown in Figure 5.1.

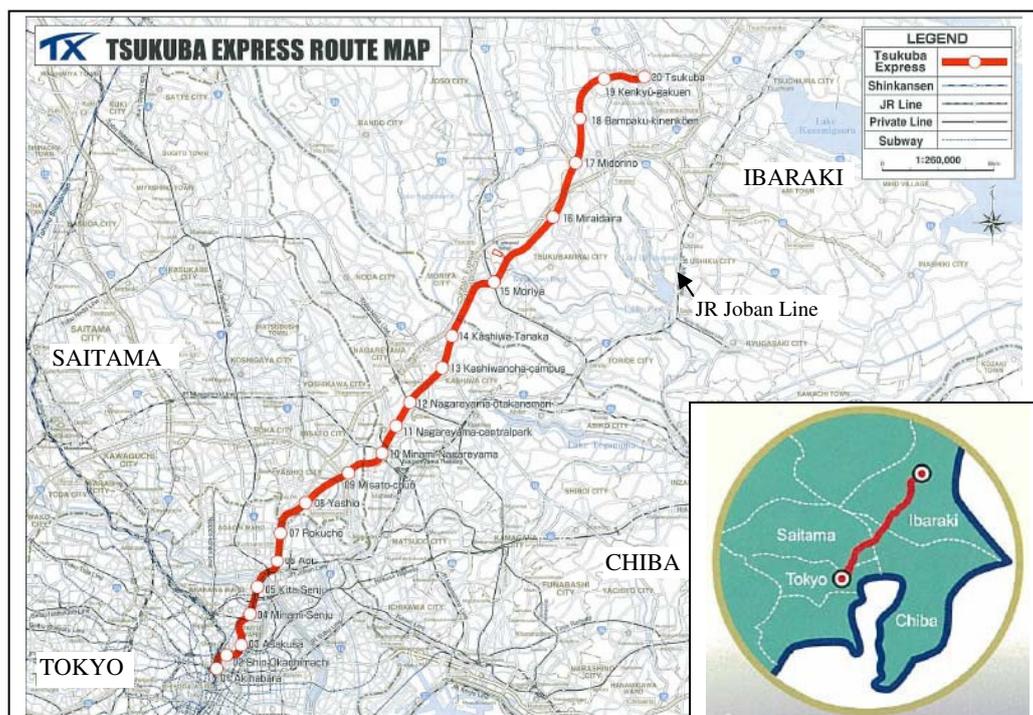


Figure 5.1: Route Map of Tsukuba Express

Source: MIR (2012) and Tsukuba Express Route Map (as of March 2008)

## 5.2 Railway construction and regional development

In order to promote railway construction along with regional development, the Integrated Development Law was applied. Based on the concept of the law, Tokyo Metropolitan Government and three prefectures, Saitama, Chiba and Ibaraki, reached an mutual

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agreement and made a fundamental principle for the regional development along with Tsukuba Express Line.

As a practical procedure of the development, the concerned regional governments have promoted the land readjustment projects around the planned stations. The concerned regional governments and public entities made their land readjustment plans and executed the land readjustment projects respectively.

In order to promote the land readjustment projects, each project has its own financial account independent from their municipal account. As it could be expected that the land value would increase along the line, the conditions were advantageous to receive an agreement about the land readjustment projects from the people within the district. As a result, relatively smooth negotiation was implemented with the land owners, and the projects were promoted without much delay behind the schedule.

The main land readjustment projects based on the Integrated Development Law are shown in Table 5.2.

Table 5.2 Outline of land readjustment projects for Tsukuba Express Line

<b>Regional Government</b>	<b>City &amp; Ward</b>	<b>Name of the Region</b>	<b>Area (ha)</b>	<b>Executor of the project</b>
Tokyo Metropolitan Government	Chiyoda Ward	Around Akihabara Sta.	9	Tokyo Metropolitan Gov.
	Adachi Ward	Around Rokucho 4 Chome	69	Tokyo Metropolitan Gov.
Saitama Prefecture	Yashio City	Yashio-South-West	99	Saitama Prefecture
		Yashio-South-Central	72	Urban Renaissance Agency
		Yashio-South-East	88	Yashio City
	Misato City	Misato-Central	115	Urban Renaissance Agency
Chiba Prefecture	Nagareyama City	Ki	68	Chiba Prefecture
		Nshihirai-Hiregasaki	52	Nagareyama City
		Around Athletic Park	232	Chiba Prefecture
		New City District	286	Urban Renaissance Agency
	Kashiwa City	Kashiwa-North-Central	273	Chiba Prefecture
		Kashiwa-North-East	170	Urban Renaissance Agency
Ibaraki Prefecture	Moriya City	Around Moriya Sta.	39	Moriya City
		Moriya East	40	Association
	Tsukubamirai City	Ina · Yawara	275	Ibaraki Prefecture
	Tsukuba City	Kayamaru	293	Urban Renaissance Agency
		Shimana-Hukudatsubo	243	Ibaraki Prefecture
		Kamikawarazaki-Nakanishi	168	Ibaraki Prefecture
		Katsuragi	485	Urban Renaissance Agency
Nakane-Kondadai	190	Urban Renaissance Agency		

Source: MIR (2011)

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In the project of Tsukuba Express Line, based on the Integrated Development Law, land readjustment projects were executed especially around stations and the executed area amounted to over 3,000 ha.

### **5.3 Profile of MIR and Tsukuba Express Line**

#### *Metropolitan Intercity Railway Company (MIR)*

Tsukuba Express Line is operated by Metropolitan Intercity Railway Company (MIR). Similar to most of the other railways in Japan, as a Class 1 Licensed railway, MIR owns railway infrastructure and operates railways independently. Thus, not only rolling stock and railway systems but also the land for its infrastructure belongs to MIR after the completion of land readjustment projects.

MIR was established in March 1991 and is a joint-venture company invested by the public sector and the private sector. Its shareholders are Tokyo Metropolitan Government, Saitama Prefecture, Chiba Prefecture, Ibaraki Prefecture, some of their municipal governments and 196 private companies.

The Japan Railway Construction Transport and Technology Agency (JRJT) executed the construction works, and construction funding consists of some kinds of loans shown in Table 5.3. As the table shows, 80 % of the loans are consisted of non-interest bearing loans.

Table 5.3 Construction funding for Tsukuba Express

Source of Funding	Share
non-interest bearing loans	80%
Development of Metropolitan Railway Fund (JRJT Fund)	40%
regional governments & organizations	40%
other investments	14%
JRJT bonds	6%

Source: MIR (2011)

As the entire railway assets were transferred to MIR at the completion of construction works, MIR expended all costs of the railway systems at that time. Accordingly, MIR's liabilities amount to more than one thousand billion yen because of its heavy assets including the land and civil structures for railway operation.

In overseas passenger railways, the public sector invests into railway infrastructure and vertical separation has been frequently introduced for railway operation. Nevertheless, regarding MIR, it keeps an integrated structure and owns all of the railway systems including the land for them. As MIR inherited liabilities for the whole assets, it has been repaying the liabilities utilizing the income through railway operation. Thus, this management status can be regarded as distinct especially as compared with many overseas passenger railways.

### Tsukuba Express Line

Regarding Tsukuba Express Line operated by MIR, total length of the operating route is 58.3km connecting from Akihabara (Tokyo) to Tsukuba (Ibaraki). The line is operated in Tokyo (13.2km), Saitama (7.4km), Chiba (13.5km) and Ibaraki (24.2km). The line has 20 stations, of which 8 stations are underground. An average distance between stations is 3.07km. All trains form 6 car formation and their capacities are over 900 passengers per train. The train runs from end to end, between Akihabara and Tsukuba, with maximum speed of 130 km/h in 45 minutes on fastest trains, and it has introduced one-person operation assisted by ATO. Functional facilities, such as automated platform gates, elevators, escalators, and multi-functional restrooms are installed at all stations. As the above specifications show, Tsukuba Express has modern railway technologies and provides passengers with comfortable and competitive commuting services against private cars.

## 6. OUTCOME OF TSUKUBA EXPRESS PROJECT AND THE INTEGRATED DEVELOPMENT LAW

### 6.1 Outcomes of Tsukuba Express Project

Owing to high-level transportation services in accordance with the regional development along the line, the number of passengers of Tsukuba Express has been improving steadily. Figure 6.1 shows the trend of daily rider-ship of Tsukuba Express since the start of its operation in August 2005.

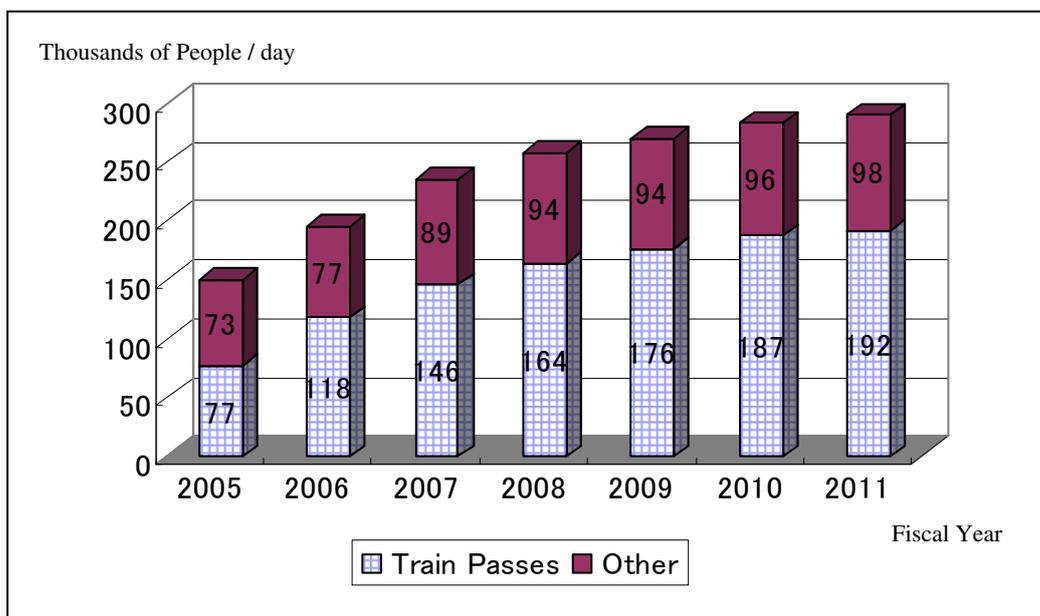


Figure 6.1 Trend of the daily rider-ship of Tsukuba Express  
Source: Author's revision of MIR (2012)

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Along with the steady increase of daily passengers, the management of MIR has been stable. Considering the fact that Japanese economy faced depression and conditions for the railway operation have not been favourable as it was expected originally, the outcome of MIR can be regarded as a very successful one as a railway project.

## **6.2 Outcomes of the Integrated Development Law**

Owing to the efforts by regional governments and other public entities, purchase of the land, re-plotting and construction works have been implemented relatively smoothly. Because of some engineering works, the project was completed 5 years late compared with the original plan. Nevertheless, this delay was not resulted from the application of the Integrated Development Law. Although smooth coordination within a land readjustment project is required, as compared with direct purchase, it is possible to say that the land procurement and re-plotting procedures based on the Integrated Development Law were successful in Tsukuba Express project.

Certainly, the steady increase of the number of passengers based on high standard transportation services also contributed to the favourable regional development, but the regional development along the line has been promoted mainly based on the Integrated Development Law. As apparent consequences, disordered development could be avoided and consistent regional development could be carried out based on the Integrated Development Law. In addition, people enjoy inter-relationship between the developed regions along the line these years. This kind of establishment of new suburban cities along the railways can be regarded as one of the consequences of the comprehensive development based on the Law as well.

Figure 6.2 compared the rate of population increase during the period between 2005 and 2010. This figure indicates that the average rate of population increase is less than 4.0 % even in Tokyo and the rates are much lower in other three prefectures. On the other hand, when it is focused on areas along the line, the rate is much higher than the average. As for Ibaraki prefecture, although the average rate has decreased by 0.8% in five years, the rate in 3 cities along the line increased by 9.2% in the same period.

This comparison shows that the population along the line improved in much higher rate than other areas. Thus, it was statistically clarified that a larger number of people started to inhabit the cities along Tsukuba Express Line than other cities. In practice, the residential areas along the line have been developed since its opening in 2005.

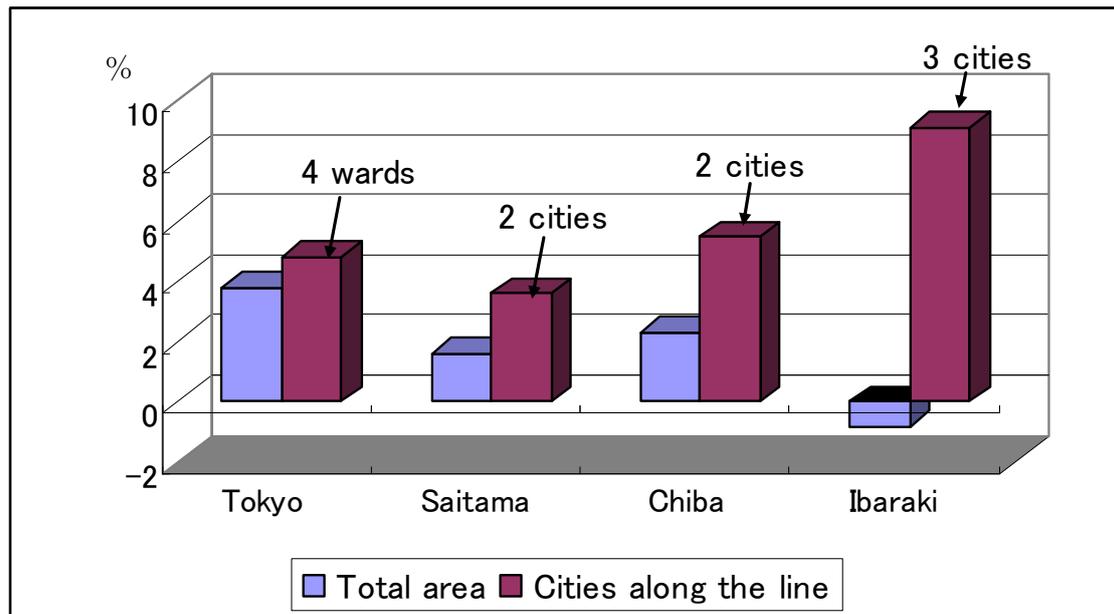


Figure 6.2 Comparison of Population Increase between 2005 and 2010

Since the population increase contributes to the increase of taxes to the regional governments, it can be said that the regional governments, which had invested into MIR, have been receiving the external economy of Tsukuba Express Line. They can utilize these taxes for developing residential areas with infrastructure and public facilities. In addition, industrial and commercial activities along the railway line have also become more active since the opening of Tsukuba Express.

Based on the above-mentioned outcomes, it seems that, utilizing the Integrated Development Law, the project of Tsukuba Express Line has achieved its four objectives described in Section 5.1.

## 7. DISCUSSIONS AND CONCLUSIONS

### 7.1 Discussions

#### *Application of the concept*

Since the number of population is decreasing these years in Japan, the Integrated Development Law has been only applied to the project of Tsukuba Express so far. Nevertheless, the concept of integration between railway construction and urban development along the railway is essential. Therefore, even though a future project would not accompany a large scale development of residential areas, the concept of comprehensive development around stations should be taken into consideration.

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Especially, a station front is a very important area because:

- 1) it will become connecting place with other transportation modes such as buses and taxis;
- 2) the area has large potential to be developed as a business/commercial district.

Thus, even in the modification projects such as elevating the existing railways, comprehensive development around the station should be considered.

On the other hand, there are several overseas countries where the number of population is increasing and the railway network is expanding to enlarge residential areas. In these countries, integration of railway construction and regional development is expected to be essential especially, and they should consider external economy of railways when they plan and construct railway lines. Under this kind of circumstances, the concept of the Integrated Development Law should be utilized and the experiences of Tsukuba Express project appear to be applicable to their projects. Utilization of external economy by a railway company contributes to the increases of the revenue from the non-rail businesses and can improve the management of the company.

*Some modification of the management model*

In the case of Tsukuba Express Line, the land for railway system was also transferred to MIR when the construction works had completed. Thus, MIR commenced its operation with the large amount of liabilities. When the construction of Tsukuba Express Line was planned in 1980's there were some forecasts that its management would not be sustainable because of its heavy liabilities for construction costs and land procurement. In practice, the current management status is better than some forecasts which were made before the construction of the line. Different from some original expectations, fortunately, it has been possible for MIR to meet its balances despite its liabilities. Nevertheless, in other cases it might be difficult for a railway company to repay the full amount of liabilities which include the cost of land/infrastructure.

In these cases, railways can be operated under vertically separated structure, which the land and infrastructure are retained by the public sector even after the completion of construction works. Under this structure, as the railway company does not need to expend the cost of land and infrastructure, the liabilities of the railways can be minimized. In such cases the railway operator and the owner of the land and infrastructure would be different. In this case, instead of depreciation of the assets, the railway company pays some amount of access charges to the infrastructure owner (Figure 7.1).

When Tsukuba Express was planned in 1980s, vertically separated model was not usual in the railway sector in Japan. Nevertheless, in these years, owing to the concerned laws which permit vertical separation, the number of vertically separated railways is increasing even in Japan, such as Shinkansen extension lines after the reform of the Japanese National Railways in 1987. As overseas cases and recent examples in Japan show, capabilities to repay all the liabilities for land and infrastructure are not prerequisite to promote railway projects.

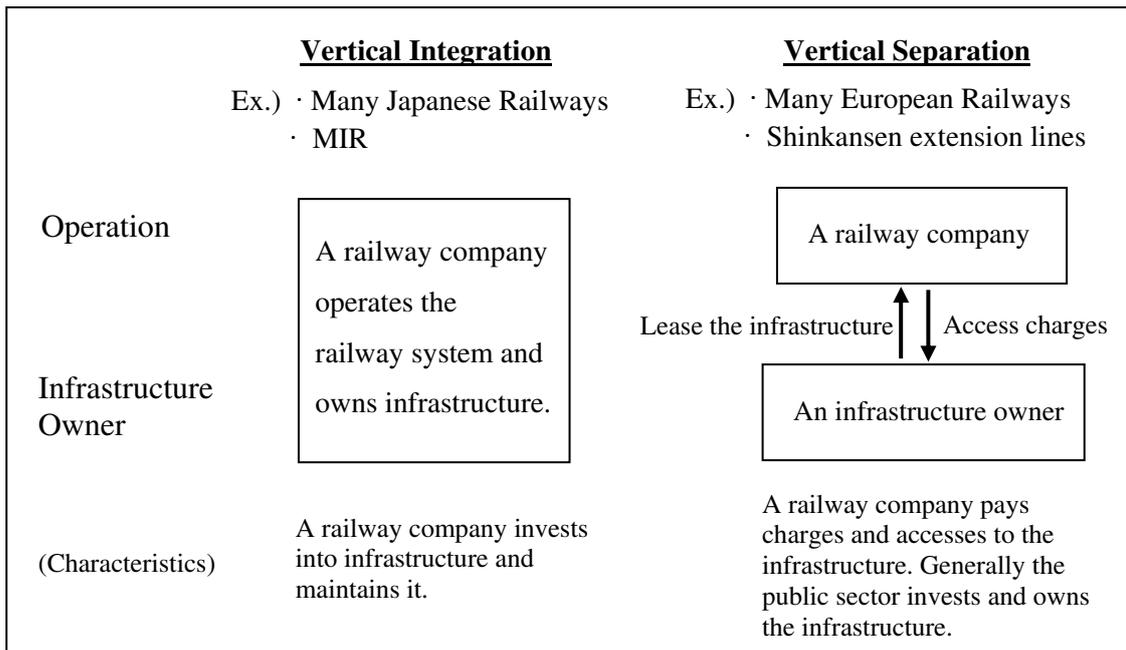


Figure 7.1 Vertical Structures of Railways  
 Source: Author

In future cases, vertical separation seems to be effective measures to construct railways which the investment costs can not be repaid fully after the opening of operation. In addition, it would be effective in the case it is difficult to forecast the management status of the railway company after starting its operation since the management status can be adjusted by revising the amount of access charges (Figure 7.2).

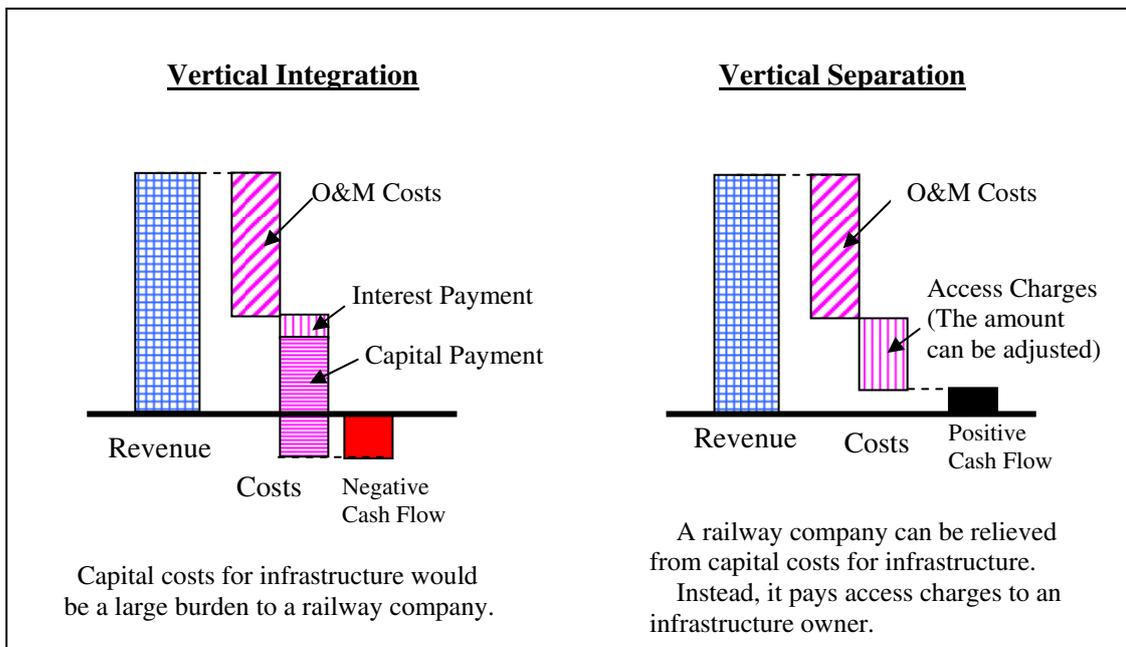


Figure 7.2 Vertical Structures and the Financial Flow of a Railway Company  
 Source: Author

In the case of Tsukuba Express Line, though the local governments supported the project through a land readjustment project but they did not supported the management of the railways financially except providing the non-interest bearing loans.

Nevertheless, railway construction projects require a certain financial support from the public sector in many cases. Therefore, the management structure of railways can be modified in future cases even though the Integrated Development Law would be applied.

## **7.2 Conclusion**

This paper, firstly, investigated the background of enactment of the Integrated Development Law. In the case regional planning and development is implemented after the construction of the railway line, inconsistency between railway planning and regional planning often results in various problems, such as insufficient provision of public infrastructure, disordered regional development around stations, and so on. In order to avoid such inconsistency, the regional development should be planned and carried out along with railway development. To achieve this coordinated and comprehensive development, the Integrated Development Law was enacted in 1989.

Railways have large external economy and can raise the land value around the lines. In order to make full use of this external economy, construction of railways is an advantageous chance for the public sector to promote regional planning through land readjustment projects. This paper also discussed the steps of land readjustment projects based on the Integrated Development Law.

In many cases, the concept of comprehensive development between railways and the areas along the line is essential. Although the Integrated Development Law has been applied only to Tsukuba Express project so far, the concept of comprehensive development, which the Integrated Development Law stipulates, can be applied to other projects as well. This study also discussed about possibilities for modifying the management model by means of vertical separation. Thus, the methodology for railway construction discussed in this paper can be applied to other projects which are less profitable. The investigation and study implemented in this research work indicated essential implications beneficial for other railway projects not only in Japan but also in other countries.

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