

# Quality Infrastructure Investment

## Japanese Case Studies

# TOYAMA CITY

## Compact City Development

Tokyo  
Development  
Learning  
Center



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Japanese Case Studies**

**Toyama City  
Compact City Development**

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Launched in 2004 in partnership with the Government of Japan, the Tokyo Development Learning Center (TDLC) is a pivotal World Bank program housed under the Global Practice for Urban, Disaster Risk Management, Resilience and Land (GPURL). Located in the heart of Tokyo, TDLC serves as a global knowledge hub that aims to operationalize Japanese and global urban development knowledge, insights, and technical expertise to maximize development impact. TDLC operates through four core activities: Technical Deep Dives (TDDs), Operational Support, Insights and Publications, and the City Partnership Program (CPP). For more information, visit [www.worldbank.org/tdlc](http://www.worldbank.org/tdlc)

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## DISCLAIMER AND CONTEXT

This case study builds on the G20 Principles for Quality Infrastructure Investment (QII) adopted at the Osaka Summit 2019. It is the first attempt to showcase examples where QII has been operationalized in urban infrastructure projects in Japan. In principle, the case study leverages existing data and evaluations available either in existing literature or through interviews with cities and public organizations.

World Bank Tokyo Development Learning Center (TDLC) works extensively in areas such as urban infrastructure and urban service delivery and, therefore, it has a ready stock of documentations in the urban sector produced during Phase III (2016 to 2020) of the TDLC Program. To prepare input for the G20 Infrastructure Working Group, the project team reviewed the compiled documents and reclassified the contents through the lens of QII.

The team selected this case on the basis of a rigorous review of studies accumulated by TDLC. The key selection criterion was whether the case appropriately highlights the operationalization of QII Principle 2 “Economic Efficiency” and Principle 6 “Infrastructure Governance.”

The case study highlights how the selected Japanese cities have operationalized quality aspects in urban infrastructure. Detailed impact evaluation is not included in the scope of this case study; however, it is an area for future works to address.

## CONTENTS

<b>EXECUTIVE SUMMARY</b>	<b>VII</b>
<b>IMPLICATIONS FOR EMERGING ECONOMIES</b>	<b>VIII</b>
CONCEPTUAL TAKEAWAYS	VIII
TECHNICAL TAKEAWAYS	VIII
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 TOYAMA CITY—AN ORDINARY JAPANESE CITY	1
1.2 A ROLE MODEL FOR COMPACT CITY DEVELOPMENT	2
1.3 LRT AS THE BACKBONE OF COMPACT CITY DEVELOPMENT	4
<b>2 QII PRINCIPLE 6: EFFECTIVE LEADERSHIP AND ORGANIZATIONAL COMMITMENT</b>	<b>5</b>
2.1 ALIGNMENT TO THE NATIONAL POLICY	5
2.2 LEADERSHIP AND ORGANIZATIONAL SETUP	6
2.3 INJECTING PRIVATE SECTOR EXPERTISE INTO LRT OPERATIONS	8
<b>3 QII PRINCIPLE 2: CREATIVE PREPARATION AND TIMELY DELIVERY FOR ECONOMIC EFFICIENCY</b>	<b>9</b>
3.1 USE OF EXISTING ASSETS	10
3.2 TIMELY DELIVERY	11
3.3 WORST-CASE SCENARIO	12
<b>4 QII PRINCIPLE 1: BENEFITS OF A COMPACT CITY</b>	<b>13</b>
4.1 IMPACT OF LRT ON CITIZENS' BEHAVIORS	13
4.2 ENHANCED ATTRACTIVENESS OF THE CITY CENTER AND LRT CORRIDORS	14
<b>REFERENCES</b>	<b>16</b>
<b>END NOTES</b>	<b>17</b>



## FIGURES

Figure 1.1. Location of Toyama City	1
Figure 1.2. GDP per capita and Financial Capacity of Toyama City	2
Figure 1.3. Compact City Model of Toyama City	3
Figure 1.4. LRT Network in Toyama City	4
Figure 1.5. Ridership of Portram and Centram	5
Figure 2.1. Schedule of the Portram Project	8
Figure 4.1. Number of Daily Passengers for JR and LRT by Age Group	13
Figure 4.2. Modal Choice of LRT Users on Weekdays before the Development of LRT	14
Figure 4.3. Net Migration into the City Center and LRT Corridors	14
Figure 4.4. Land Prices in the City Center and LRT Corridors	15
Figure 4.5. Increase in Land Prices in Selected Areas	15

## TABLES

Table 3.1. Economic Preevaluation by Toyama City (2003)	9
Table 3.2. Modified Economic Postevaluation	10
Table 3.3. Impact of Using Existing Assets	10
Table 3.4. Impact of Timely Delivery	11
Table 3.5. Economic Evaluation of Worst-Case Scenario	12

# EXECUTIVE SUMMARY

**Toyama City is a global role model for compact city development, but becoming a role model was not an easy journey.** Toyama was a typical Japanese city challenged by urban sprawl and demographic changes. Its population density was one of the lowest among prefectural capitals, its overdependence on cars had led to the deterioration of public transport services, and the city's central areas had lost their vibrancy because of suburban development. Furthermore, the national trend of an aging and declining population had aggravated the situation. In response to these challenges, Toyama City took a more integrated approach to urban and transport planning. Today, the city is widely recognized as the role model in developing a compact city.

**Toyama City gained momentum in its journey by aligning with national policy.** In 2003, the words “agglomeration” and “compact” first appeared in national law. Toyama City, which had just started working on its new integrated approach to urban and transport planning, aligned its efforts with the national “Compact Plus Network” policy. Since then, the city has closely communicated with the national government throughout the process to ensure smooth implementation of this policy.

**Effective governance and dedication were major factors in Toyama's success story.** Effective governance starts with a vision and clear objectives. In Toyama, the grand vision laid out by the city's mayor were broken down into clear objectives, which successfully translated the city's vision into strong organizational commitment and buy-in from key stakeholders including citizens and the private sector. Organizational setup also was key to the city's success. The city's development of the light rail transit (LRT) system is a good example of this agile organizational setup. Because of multiple constraints, the city had to construct the first full-scale LRT project in Japan in three years when typical LRT construction today would take six to nine years. The LRT project unit reported almost to the mayor via the vice mayor, who was a seconded official from the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). The city completed the planning and financing for the project in the first year, the licensing and legal matters in the second year, and the track construction and vehicle preparation in the third year.

**Toyama City received strong support from the private sector particularly for LRT operation.** For the LRT project, the city adopted a scheme whereby it prepares the tracks and vehicles and a private company operates the LRT. In this way, the city injected operational expertise from the private sector into the LRT service. Specifically, Toyama City and local companies jointly founded Toyama Light Rail Company, Ltd., as a public-private entity. The local companies funded 50 percent of the ¥500 million capital of the entity. Furthermore, many of the key technical staff were dispatched or recruited from an existing local railway operator. Such collaboration was possible because Toyama City had a good understanding of the private sector, had built relationships over time, and had approached the companies as equal partners. The city's attitude formed a collaborative mindset within the private sector; the companies felt obliged to contribute to the public cause.

**Using existing assets and timely delivery led to economic efficiency.** Because Toyama City is not a megacity, it had limited resources to construct capital-intensive infrastructure and, therefore, it had to explore creative ways to reduce capital expenditures. For the LRT project, Toyama City reused old rail tracks to construct, at a lower cost, the new LRT tracks. This decision reduced initial investments by nearly 75 percent compared with constructing new LRT tracks from scratch. Another key factor was the completion of the LRT project within three years,

which enhanced the economic value of the project. The net present value (NPV) of the actual LRT project was ¥24.9 billion—it could have been negative ¥13.6 billion if Toyama City had not used existing tracks and had taken nine years to complete the project. Using existing tracks improved NPV by ¥16.9 billion and reducing the construction period by six years improved NPV by ¥21.6 billion. Worst-case scenario, the cost-benefit ratio could have been 0.4; however, the actual project's cost-benefit ratio was 5.2.

**Toyama City was mindful that the wide range of benefits of a compact city would allow it to maximize development impact.** Some of these benefits were included in economic evaluations (for example, reduction of traffic congestion and CO<sub>2</sub> emissions), but other benefits were difficult to measure in quantitative terms. For example, the LRT made life in the city more vibrant. In addition, citizens, particularly the elderly, benefited from more exterior activities. The Compact City initiative reversed negative trends in net migration and land prices along LRT corridors. Being mindful of these benefits was key to maximizing development impact.

## IMPLICATIONS FOR EMERGING ECONOMIES

### Conceptual Takeaways

- An integrated approach to urban and transport development is key to tackling urban challenges:
  - Urban planning and transport planning both play a critical role in determining a city's physical structure and are highly dependent on each other.
  - Defining a city's physical structure is a necessary first step for targeted interventions to address urban challenges and accumulate social capital.
- Governance is not just about preventing trouble and justifying actions; effective governance can be a powerful driver of transformation, and it can also lead to economic efficiency:
  - Effective leadership with a firm vision can be translated into strong organizational commitment, which is key to promote citywide initiatives.
  - In the case of Toyama, effective governance enabled the timely delivery of the LRT project, which prevented a potential loss in the economic value of the project.

### Technical Takeaways

- It may be worthwhile for cities to look for existing assets that can be used to reduce capital expenditures:
  - Unused or precedent buildings or facilities may be reusable for a new project.
- Time is money. Delays in project delivery can greatly hamper economic efficiency:
  - Project delays not only increase construction costs but also reduce the economic value of the project through discounts over time and possible reduction in the number of beneficiaries.



# 1. INTRODUCTION

## 1.1 Toyama City—An Ordinary Japanese City

Toyama City is the prefectural capital of Toyama Prefecture and it has a population of 420,000, ranking 22nd of 47 prefectural capitals in Japan. The city is located at the middle of Honshu Island (Figure 1.1). With ¥3.2 million in gross domestic product (GDP) per capita, Toyama City falls just behind the government-designated major cities, which are the top 20 cities in Japan (Japan, Cabinet Office 2016). In terms of financial capacity, Toyama City's annual revenue of ¥166 billion and its fiscal index of 0.83 are above average of core cities, which are defined as cities with populations greater than 200,000 (nonexhaustive) (Figure 1.2) (Japan, Ministry of Internal Affairs and Communications 2018).

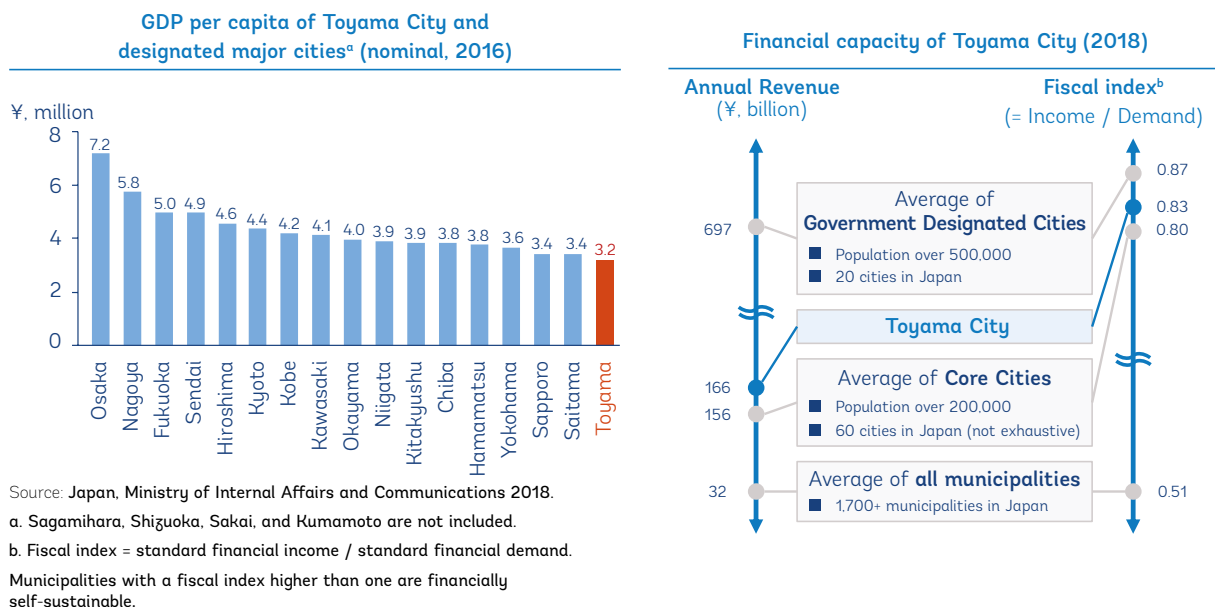
**FIGURE 1.1**  
Location of Toyama City



As with many other cities, in the 2000s, Toyama City faced many challenges caused by urban sprawl and an aging and declining population. The city had a population density of about 330 people/km<sup>2</sup>, which was one of the lowest among prefectural capitals. An overdependence on cars led to the deterioration of public transport services, and central areas were losing vibrancy due to extensive suburban development (Higashide 2020).

To better understand the challenges Toyama City faces, it is important to understand the demographic and economic situation in Japan. After the World War II, Japan experienced a rapid growth period from 1950 to 1970. During this period, the economy grew nearly 10 percent per annum and the population grew around 1 percent per annum. However, the oil shock in 1973 triggered a transition to a more moderate economic growth of about 4 percent per annum. The population growth rate began to decline, and by the 1990s, it was well below 0.5 percent. From the 1990s to present, Japan has muddled through a long and persistent recession. The annual GDP growth rate dropped to about 1 percent and the population growth rate turned negative around 2010 (Japan, Cabinet Office 2020). Furthermore, population aging is now a nationwide issue. The percentage of the population aged over 65 was 4.9 percent in 1950—today it is nearing 30 percent and it is still rising (Japan, Cabinet Office 2019).

Municipal finance has been hit hard by an ailing national economy. Since the 1990s, many local governments have been faced with fiscal issues that are still persistent today. Amid the long recession, local governments' expenditures have increased in part because of an aggressive increase in public works by the national government as an economic stimulus. As a result, many local governments are issuing more bonds and withdrawing cash from their reserves to sustain their essential public services. At the same time, the revenue of local governments is decreasing mainly due to a reduction in tax revenues (Japan, Cabinet Office 2001). As a result, the fiscal index of an average Japanese municipality is about 0.5, which means local governments are getting only half of what they actually need (see Figure 1.2).

**FIGURE 1.2****GDP Per Capita and Financial Capacity of Toyama City**

## 1.2 A Role Model for Compact City Development

To address urban challenges, Toyama City took an integrated approach to urban and transport planning. The city set a goal to become a compact city and it introduced policies to attract people and businesses along transit corridors. In doing so, the city aimed to provide better access to public transport and to rejuvenate the city center. This action was important from the viewpoint of city finances as well; the city center covered only 0.4 percent of the city in terms of area yet it accounted for 22.5 percent of the city's property tax and city planning tax revenues in 2019. The city's efforts have paid off—the percentage of citizens living along transit corridors<sup>2</sup> increased from 28 percent in 2005 to 39 percent in 2019 (Toyama City 2020a).

The starting point for Toyama City's efforts was the creation of the Central District Revitalization Plan and the Public Transport Revitalization Plan in 2003. In 2006, the city revised its original plan to obtain national certification. This revised plan became the Downtown Revitalization Plan, which is the underlying basic plan for the city's Compact City initiative.

The first Downtown Revitalization Plan was in effect from February 2007 to March 2012. During this time, the urban population decreased, public facilities were relocated to the suburbs, and large commercial facilities were built in the suburban areas. With the increase in vacant lots and buildings and a decrease in trips to the city center, the city center rapidly deteriorated. To turn the tide, Toyama City aimed to physically reconstruct the city structure in the first Downtown Revitalization Plan. This plan envisioned a city structure with a dense urban core and a series of secondary hubs interconnected with public transit (Figure 1.3). The plan set out three pillars:

- **Enhanced convenience of public transport**
  - Project examples: LRT development, station area upgrade, community bus service
- **Creation of local hubs for vibrancy**

- Project examples: Park/plaza development, urban redevelopment projects, construction of public facilities for community development, revitalization of local markets, hosting of events and festivals.
- **Promotion of urban residence**
  - Project examples: Building upgrades, urban redevelopment projects, welfare facilities.

The second Downtown Revitalization Plan covered the period from April 2012 to March 2017. Having worked on the physical transformation of the city during the first plan, the city aimed to enhance the quality of urban space in the second plan. The city ramped up public investments for urban renewal projects to attract private investment and to reinforce essential urban facilities. In addition to developing physical assets within the city center, the city also partnered with the private sector, nonprofits, academia, and local communities to develop and accumulate social capital. Specifically, the second plan set out the following three pillars:

- **Creating movement and vibrancy in the city center by providing high-quality mobility with multiple options**
  - Project examples: Station plaza, pedestrian-friendly passages, bicycle-friendly environments
- **Cultivating a new “Toyama” culture within the city center**
  - Project examples: Urban redevelopment projects, historical facilities, commercial development
- **Offering high-quality and diverse urban lifestyles in the city center**
  - Project examples: Nursing facilities, water storage facilities, urban redevelopment projects, public facilities for community development, promotion of urban residence, urbanscape upgrade

The third Downtown Revitalization Plan was enforced in April 2017 and is in progress until March 2022. In this phase, the city aims to further enhance the livability of the city center by bringing public facilities back to the city center, improving health care and welfare services, and further strengthening partnerships with external stakeholders such as the private sector, nonprofits, academia, and local communities. In particular, the Urban Facility Location Plan adopted in 2017 is proving to be a key instrument in the relocation of public facilities. Moreover, the city continues to improve mobility for citizens—the north-south connection of the two LRT networks was completed in March 2020 (Toyama City 2014).

Key performance indicators for the Compact City initiative include the following:

- **LRT ridership:** Shows the convenience of public transit and of walking and cycling
- **Number of pedestrians in the city center on weekends:** Shows the vibrancy of the city center
- **Increase in the number of residents:** Shows the attractiveness of the urban lifestyle offered

**FIGURE 1.3**  
Compact City Model of Toyama City



### 1.3 LRT as the Backbone of Compact City Development

A key initiative for the city's transformation into a compact city was the development of the LRT system. The LRT network in Toyama consists of two lines: Portram and Centram (Figure 1.4). Portram began operation in 2006 as the first full-scale LRT in Japan. The line extends north from Toyama Station and connects the station and the port area (7.6 km). Portram was constructed over an existing rail line (the Japan Railways Port Line) that had ceased operation. The cost of the project was ¥5.8 billion. Following the success of the Portram project, in 2009 Toyama City completed the construction of the Centram Line. This line merges with an existing tram line to form a 3.4 kilometer loop around the central business district south of Toyama Station. The cost of the project was ¥3 billion. In 2020, Toyama City completed the North-South Connection project and reinforced the city's LRT network. The cost of the project was ¥4 billion.

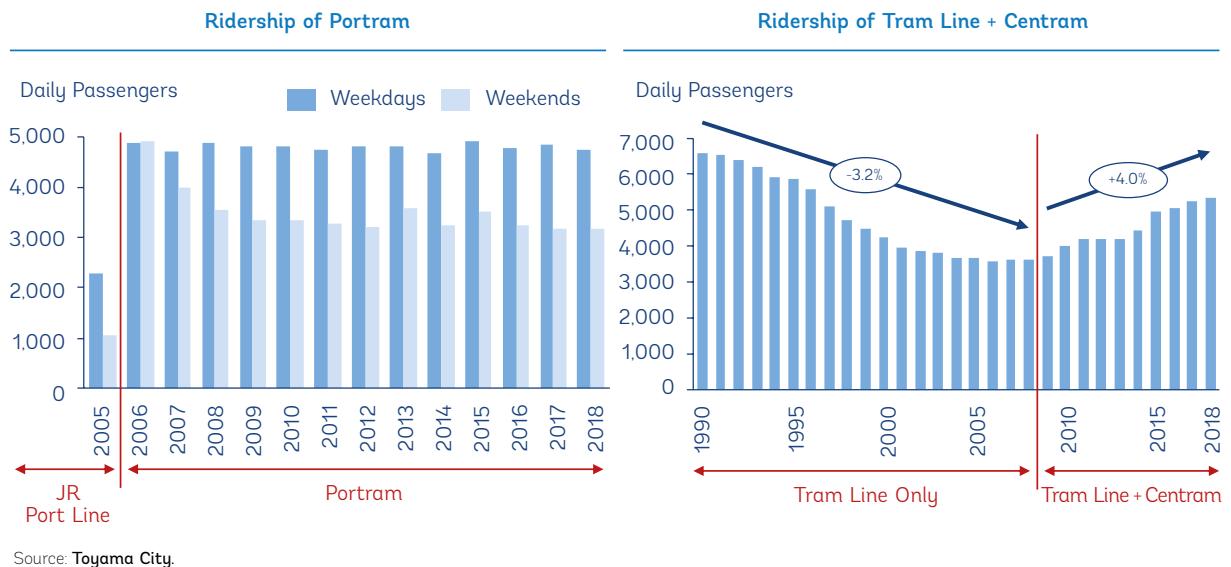
According to the ridership data, the LRT lines are performing well. On weekdays, the Portram Line has nearly 5,000 passengers per day, which is double the ridership of the original Japan Railways Port Line. The Centram project reversed the downtrend of the tram's ridership. Before Centram, the tram line was losing passengers at 3.2 percent per annum. After Centram was constructed, ridership increased 4 percent per annum (Figure 1.5). The Portram and Centram lines are the backbone of Toyama City's Compact City initiative (Toyama City 2020b).

**FIGURE 1.4**  
LRT Network in Toyama City



Source: Toyama City

**FIGURE 1.5**  
Ridership of Portram and Centram



## 2. QII Principle 6: Effective Leadership and Organizational Commitment

### 2.1 Alignment to the National Policy

Toyama City gained momentum by aligning with the national agenda. In 2003, Toyama City kick started its efforts with the creation of the Central District Revitalization Plan and the Public Transport Revitalization Plan; in the same year, the words “agglomeration” and “compact” first appeared in the national Urban Reconstruction Vision. During this time, many Japanese cities were suffering from deteriorating city centers; the national government began promoting the transition from expansive urban structures to more aggregated urban structures by promoting densification and agglomeration of various urban facilities. In 2006, the national government revised the Downtown Revitalization Act, promulgated in 1998, to establish a certification system in which the prime minister directly certifies Downtown Revitalization Plans submitted by local governments requesting subsidies. In response, Toyama City revised its original plans to create the city’s Downtown Revitalization Plan, which received certification in 2007 and was incorporated into the Toyama Urban Master Plan in 2008. Since then, Toyama City has aligned its initiatives to the national “Compact Plus Network” policy. In doing so, the city has built a strong relationship with the national government, which has led to the smooth implementation of various projects (explained in the following sections) and to the city being recognized as a leading model of compact city development in Japan (Ministry of Land, Infrastructure, Transport, and Tourism 2017).

In 2014, the national government amended the Urban Revitalization Special Measures Law to introduce the Urban Facility Location Plan system. This new initiative aimed to further promote compact city development by encouraging local governments to optimize the distribution of public facilities within their city. In 2017, Toyama City created its Urban Facility Location Plan. In this plan, the locations of public facilities providing key urban functions, such as hospitals and care centers, were predesignated in the central areas of the city. As a result, those facilities were brought back to the city center from the suburbs. With the creation of its Urban Facility Location Plan, Toyama City became a role model for other cities and greatly contributed to the rollout of this national initiative (Japan, Ministry of Internal Affairs and Communications 2018).

## 2.2 Leadership and Organizational Setup

According to Toyama City officials interviewed for this case study, effective governance and dedication were essential for Toyama City's successful transformation into a compact city. Effective governance starts with a vision and clear objectives. In Toyama City, the grand vision laid out by the city's mayor were broken down into clear objectives, which successfully translated the city's vision into strong organizational commitment and buy-in from key stakeholders including citizens and the private sector. Furthermore, the city has adopted organizational setups that best allow it to tackle challenges. For instance, the Portram project, which was particularly challenging because the city only had three years to complete it because of political constraints and timing of events, would have been impossible to complete without strong leadership and an agile organizational setup.

As Toyama City began its efforts in 2003, Japan Railways (JR) and Toyama Prefecture asked Toyama City to assume management responsibility for the existing JR Port Line. The trigger was the extension of the Shinkansen Line through Toyama City. In 1996, the Japanese government and the ruling party announced a memorandum of understanding on the extension of the Shinkansen Line that designated the Toyama section as one of five priority sections. The memorandum also stipulated that local governments must assume management responsibility for existing JR lines to obtain construction permits for the new Shinkansen tracks. Because Toyama Prefecture had already agreed to take over the JR Hokuriku Line, a different JR line, it requested that Toyama City take over the JR Port Line. It should be noted that the JR Port Line was accompanied by a big challenge: to meet the opening schedule of the new Shinkansen Line, the construction work at Toyama Station had to commence by 2006—but this work required the removal of platforms and tracks of the JR Port Line at Toyama Station.

Toyama City agreed to take over the JR Port Line. It had two options: (a) close the JR Port Line and reinforce the city's bus fleet or (b) complete the necessary construction work at Toyama Station within three years and continue operations of the JR Port Line. Because the city had positioned the railway as a core element of its urban revitalization policy, it decided to take the hard path and continue operating the JR Port Line. Moreover, a survey showed that the corridor along the JR Port Line still had a population of 50,000 at the time, which implied that the residents were still relying on the line as a major mode of transport. After the city decided to continue the JR Port Line, it made two more vital decisions that underscore the current success of the LRT system. First, the city decided not only to continue operations as is, but also to make major upgrades to the JR Port Line, which ultimately gave birth to Portram. These upgrades included new vehicles with a modern design and low floors that provided easy access for the elderly and handicapped. The city also increased the service frequency to improve service levels.



Second, the city minimized the time between the closing of the JR Port Line and the opening of Portram. The mayor firmly believed that discontinuing the service for a prolonged period would cause irreversible modal shifts to other means of transport, or worse, would cause depopulation of the transit corridors. This belief was shared across the organization, leading to the consensus that time was of the utmost importance for this project.

As previously explained, Toyama City had to complete all phases of the Portram project—planning, financing, designing, tendering, licensing, and construction—within three years. This was a huge challenge considering the fact that it was the first full-scale LRT project in Japan, and that a typical LRT construction takes six to nine years. Toyama City pulled off this feat by completing the planning and financing in the first year, the licensing and legal matters in the second year, and the track construction and vehicle preparation in the third year (Figure 2.1). An agile organizational setup was essential to making this happen. For the Portram project, the city formed a project unit that reported almost exclusively to the mayor via the vice mayor, who was a seconded official from the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). This unit undertook various public duties related to the LRT including financing, founding of the Toyama Light Rail Company, Ltd., obtaining operation licenses and construction permits, and holding public hearings. After the Toyama Light Rail Company, Ltd., was established as the operating entity for the LRT system, the company oversaw the designing, the tendering, and the procurement of vehicles. Initially, the company was headed by the mayor, who played an important role in recruiting the most dynamic and technically seasoned managers from inside and outside Toyama City. Once the team was in place, the mayor delegated most of the responsibilities to these managers and focused on making final approvals and decisions on important issues.

Coordination was also a key aspect of the project. For the construction of the tracks, three organizations had to divide tasks and coordinate. Toyama City was in charge of the civil work to modify roads to accommodate the LRT; Toyama Light Rail Company, Ltd., undertook the construction of the track itself; and JR worked on the renewal of the existing tracks of the JR Port Line. JR was involved because the JR Port Line continued operations until two months prior to the opening of the Portram Line. Effective coordination allowed the smooth implementation of this highly complex operation.

Furthermore, the mayor went to great lengths to ensure that the Portram project would be welcomed by the public. The mayor and manager-level city officials held more than 50 public hearings during the planning stage. On every occasion, the mayor tirelessly advocated the necessity of a compact city for the city's aging population. To win trust from the public, the mayor did not simply repeat the importance of public transit for the revitalization of central areas. The mayor was honest about the difficulty of operating the new LRT in a profitable manner. Acknowledging that the LRT is likely to lose money every year, the mayor emphasized that the social benefits outweigh the expected financial losses. The sincerity of the mayor and city officials increased public confidence in the LRT project and in city management in general.

As one indicator of public confidence, there was a change in how the mass media viewed the project. When the project plan was first disclosed, the mass media unanimously criticized the plan as a "project in the red." However, as a result of the city's efforts described above, the mass media became positive and cooperative towards the project, introducing the project to the public as a "socially integral component of the Compact City plan." Furthermore, one specific aspect that worried the public was the conflict between existing road transport (i.e. cars and bicycles) and the new LRT line. This was also resolved over time.

**FIGURE 2.1****Schedule of the Portram Project**

	2003												2004												2005												2006											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Planning and financing																																																
Overall planning																																																
Detail planning and budget preparation																																																
Committee on conversion from rail to LRT																																																
Approval by city council																																																
Licensing and establishment of joint venture																																																
Founding of Toyama Light Rail Co., Ltd.																																																
Police approval for use of road space																																																
Cooperative agreement with JR West																																																
Acquisition of national license																																																
Track construction																																																
Engineering design and tender preparation																																																
Acquisition of construction permit																																																
Contracting																																																
Construction of tracks																																																
Vehicle preparation																																																
Technical and financial specification																																																
Tender preparation																																																
Contracting																																																
Vehicle manufacturing																																																
Test run																																																
Commencement of Portram																																																

Source: Toyama City.

## 2.3 Injecting Private Sector Expertise into LRT Operations

According to Toyama City officials who were interviewed for this case study, Toyama City received strong support from the private sector particularly for LRT operations. For the LRT Project, the city adopted a scheme whereby the city prepares the tracks and vehicles and a private company operates the LRT. In this way, the city injected operational expertise from the private sector into the LRT service. Specifically, Toyama City and local companies jointly founded Toyama Light Rail Company, Ltd., as a public-private entity. The local companies funded 50 percent of the ¥500 million capital of the entity. Furthermore, many of the key technical staff were dispatched or recruited from an existing local railway operator. As such, the private sector played a key role in the success of the city's transformation.

The city's relationship with the private sector was developed over time. The starting point of the relationship was the mayor's personal network among local private companies. Prior to election, the mayor was a judiciary lawyer and he had worked with many key people within the local economy. Once elected, he maintained and expanded his network among local private companies and, when in need, approached them as equal partners to make Toyama City a better place. In doing so, the city looked at development challenges through the lens of the private sector, and worked to create a win-win situation for both public and private entities. This approach gradually formed a collaborative mindset within the private sector. Today, many local companies feel obliged to contribute to the public cause when requested.

## 3. QII Principle 2: Creative Preparation and Timely Delivery for Economic Efficiency

This study conducted an economic post-evaluation of the Portram project by making minor modifications to the framework developed by the committee for evaluation of Portram, which was established in 2002 and comprised transport experts mainly from the academia. The committee conducted an economic preevaluation by comparing three options: (1) close the JR Port Line and reinforce the city's bus fleet, (2) elevate tracks at Toyama Station to maintain the JR Port Line as is, or (3) upgrade the JR Port Line to an LRT. The report concluded that the third option had the highest net present value (Table 3.1). The calculation assumed a period of 30 years with a discount rate of 4 percent (Toyama City 2003).

**TABLE 3.1**  
Economic Preevaluation by Toyama City (2003)

			OPTION 1: Replace by bus (¥, billion)	OPTION 2: Continue as is (¥, billion)	OPTION 3: Upgrade into LRT (¥, billion)
Benefits	User benefits	Travel time reduction	0	5.7	9.0
		Travel cost reduction	0	0.9	0.9
	Wider benefits	Traffic accident reduction	0	0.3	0.4
		CO <sub>2</sub> emission reduction	0	0.1	0.2
		Traffic congestion alleviation	0	11.9	20.1
	Total		0	18.9	30.6
Costs	Operational expenditures (OPEX)		2.2	0	-0.3
	Capital expenditures (CAPEX)		0.2	6.0	4.5
	Total		2.4	6.0	4.2

Source: Data available from the Toyama City committee on evaluation of Portram.

Table 3.2 shows the modified framework used in this case study. The net present value (NPV) is ¥24.9 billion, and the cost-benefit ratio is 5.2. Key assumptions are as follows:

- User benefits and wider benefits are increased by 4 percent because the actual ridership of Portram is 4 percent higher than the ridership expected at the timing of preevaluation
- For the net profit from operations, the actual financials used for Portram are from 2006 to 2018, and the cash flow is assumed to be constant from 2018 to 2035
- Capital expenditures (CAPEX) is the actual project cost for the construction of Portram

**TABLE 3.2.****Modified Economic Postevaluation**

			Portram project (¥, billion)
Benefits	User benefits	Travel time reduction	9.4
		Travel cost reduction	0.9
	Wider benefits	Traffic accident reduction	0.4
		CO <sub>2</sub> emission reduction	0.2
		Traffic congestion alleviation	20.9
	Provider benefits	Net profit from operations	-1.1
	Total		30.8
Costs	Capital expenditures (CAPEX)		5.9
Net present value (B-C)			24.9
Cost-benefit ratio (B/C)			5.2

Source: World Bank calculations based on Toyama City committee on evaluation of Portram data.

### 3.1 Use of Existing Assets

Because Toyama City is not a megacity, it had limited resources to construct capital-intensive infrastructure and it had to explore creative ways to reduce capital expenditures. In the Portram project, Toyama City reused the existing tracks of the JR Port Line as part of the new LRT tracks. Of the 7.6 kilometer extension of Portram, 6.5 kilometers were JR Port Line tracks and only 1.1 kilometers were newly constructed. By reusing existing tracks, Toyama City reduced CAPEX for the Portram project to ¥5.9 billion, whereas the standard CAPEX for a new LRT line of this distance in Japan would be ¥22.8 billion. Toyama City achieved a cost reduction of nearly 75 percent. The NPV of the project was improved by ¥16.9 billion, and the cost-benefit ratio increased from 1.3 to 5.2 (Table 3.3).

**TABLE 3.3****Impact of Using Existing Assets**

			Portram projectwith JR Port Line tracks (¥, billion)	Portram projectwithout JR Port Line tracks (¥, billion)
Benefits	User benefits	Travel time reduction	9.4	9.4
		Travel cost reduction	0.9	0.9
	Wider benefits	Traffic accident reduction	0.4	0.4
		CO <sub>2</sub> emission reduction	0.2	0.2
		Traffic congestion alleviation	20.9	20.9
	Provider benefits	Net profit from operations	-1.1	-1.1
	Total		30.8	30.8
Costs	Capital expenditures (CAPEX)		5.9	22.8
Net present value (B-C)			24.9	8.0
Cost-benefit ratio (B/C)			5.2	1.3

Source: World Bank calculations based on Toyama City committee on evaluation of Portram data.

## 3.2 Timely Delivery

As described in section 2.2, Toyama City completed the construction of Portram in three years. To recap, this timely completion was possible because of the city's strong organizational commitment, which originated from a shared vision and consensus from all parties that time was of the utmost importance, and because of the swift sourcing and adequate allocation of human resources both internally and externally. Moreover, the city did not consider shortening or skipping processes to make the deadline. Underlying its success was its meticulous preparation and coordination to run various procedures simultaneously.

The extraordinary speed at which the Portram project was completed may not have saved cash for the city, but it certainly contributed to maximizing the economic value of the project. As explained earlier, Toyama City completed the Portram project in three years. Because a typical LRT construction would take six to nine years, Toyama City saved three to six years, doubling or even tripling the NPV of the project.

Table 3.4 shows the comparison between completion of the Portram project in three years, six years, and nine years. If Toyama City had completed the project in six years, the NPV would have become half, and if the city had completed it in nine years, the NPV would have been less than 15 percent of the actual project. The cost-benefit ratio would have decreased to 2.9 with a three-year delay and to 1.6 with a six-year delay. Key assumptions are as follows:

- Ridership would fall by 30 percent with a three-year delay and 50 percent with a six-year delay, thus reducing user benefits and wider benefits by the same percentages. This assumption originates from the mayor's firm belief that an irreversible modal shift would have happened if the rail service was discontinued for a prolonged period.
- User benefits and wider benefits are discounted by 4 percent per annum for three years.
- Net profit from operations decreases because fare revenues would decrease because of the fall in ridership. As stated in the first assumption, fare revenues decrease by 30 percent with a three-year delay and 50 percent with a six-year delay. The variable cost for operations is constant because of maintained service frequency.

**TABLE 3.4**  
Impact of Timely Delivery

			Complete in 3 years (Portram case) (¥, billion)	Complete in 6 years (Typical length) (¥, billion)	Complete in 9 years (Slight delay) (¥ , billion)
Benefits	User benefits	Travel time reduction	9.4	5.8	3.7
		Travel cost reduction	0.9	0.6	0.4
	Wider benefits	Traffic accident reduction	0.4	0.3	0.2
		CO <sub>2</sub> emission reduction	0.2	0.1	0.1
		Traffic congestion alleviation	20.9	13.0	8.3
	Provider benefits	Net profit from operations	-1.1	-2.5	-3.4
	Total		30.8	17.3	9.2
Costs	Capital expenditures (CAPEX)		5.9	5.9	5.9
Net present value (B-C)			24.9	11.4	3.3
Cost-benefit ratio (B/C)			5.2	2.9	1.6

Source: World Bank calculations based on Toyama City committee on evaluation of Portram data.

### 3.3 Worst-Case Scenario

If Toyama City did not use the existing tracks of JR Port Line and could not complete the project within three years, the Portram project would have been economically inviable. The NPV would have been reduced to negative ¥5.5 billion with a three-year delay and negative ¥13.6 billion with a six-year delay. The cost-benefit ratio would have decreased to 0.8 and 0.4, respectively (Table 3.5). These results illustrate how critical the use of existing tracks and the timely delivery were for the success of the Portram project.

**TABLE 3.5**  
Economic Evaluation of Worst-Case Scenario

			Actual Portram Project (¥, billion)	Complete in 6 years without existing tracks (¥, billion)	Complete in 9 years without existing tracks (¥, billion)
Benefits	User benefits	Travel time reduction	9.4	5.8	3.7
		Travel cost reduction	0.9	0.6	0.4
	Wider benefits	Traffic accident reduction	0.4	0.3	0.2
		CO <sub>2</sub> emission reduction	0.2	0.1	0.1
		Traffic congestion alleviation	20.9	13.0	8.3
	Provider benefits	Net profit from operations	-1.1	-2.5	-3.4
	Total		30.8	17.3	9.2
Costs	Capital expenditures (CAPEX)		5.9	22.8	22.8
Net present value (B-C)			24.9	-5.5	-13.6
Cost-benefit ratio (B/C)			5.2	0.8	0.4

Source: World Bank calculations based on Toyama City committee on evaluation of Portram data.



## 4. QII Principle 1: Benefits of a Compact City

Toyama City was mindful that the wide range of benefits of a compact city would maximize development impact. Some of the benefits were included in the economic evaluations (for example, reduction of traffic congestion and CO<sub>2</sub> emissions), while other benefits were not because they are difficult to capture in quantitative terms. This section provides key perspectives for understanding the benefits the LRT project has brought to Toyama City.

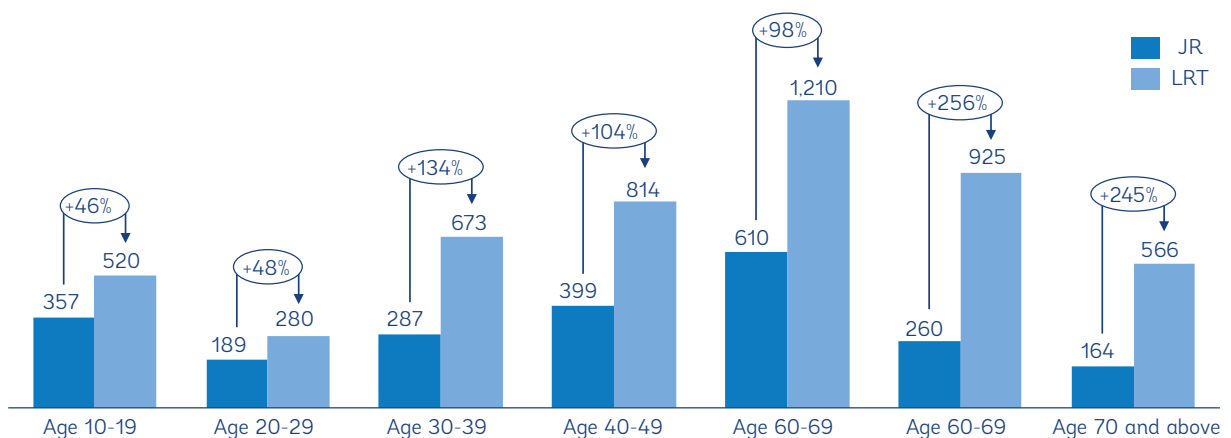
### 4.1 Impact of LRT on Citizens' Behaviors

One of the key contributions of LRT to Toyama City's compact city policy is a positive change in citizens' behaviors, particularly those of the elderly. Figure 4.1 shows the number of daily passengers for LRT and JR (the railway replaced by LRT), by age group. The renewal of the JR lines to the new LRT increased ridership in all age groups, but the increase was particularly large for citizens aged 60 and above. Specifically, the ridership for this age group increased by about 250 percent. Figure 4.2 shows the modal choice of LRT users on weekdays before LRT was developed. Among current LRT users, 25 percent used to rely on cars and buses, and 21 percent did not go out very often on weekdays. However, the results shown in Figure 4.2 indicate that LRT triggered a modal shift away from cars and buses and encouraged citizens to adopt a more active lifestyle (Japan, Ministry of Internal Affairs and Communications 2018).

**FIGURE 4.1**

**Number of Daily Passengers for JR and LRT by Age Group**

Number of Daily Passengers by Age Group



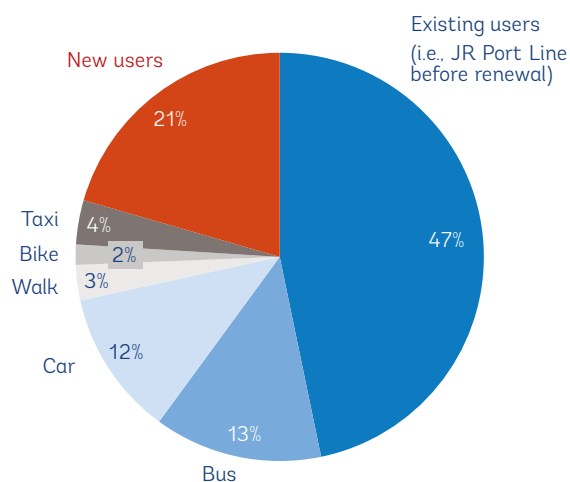
Source: Toyama City.

Notes: JR = Japan Railway; LRT = Light rail transit.

**FIGURE 4.2**

Modal Choice of LRT Users on Weekdays before the Development of LRT

Breakdown of LRT ridership



Source: Toyama City.

Note: Total number of users is 4,988.

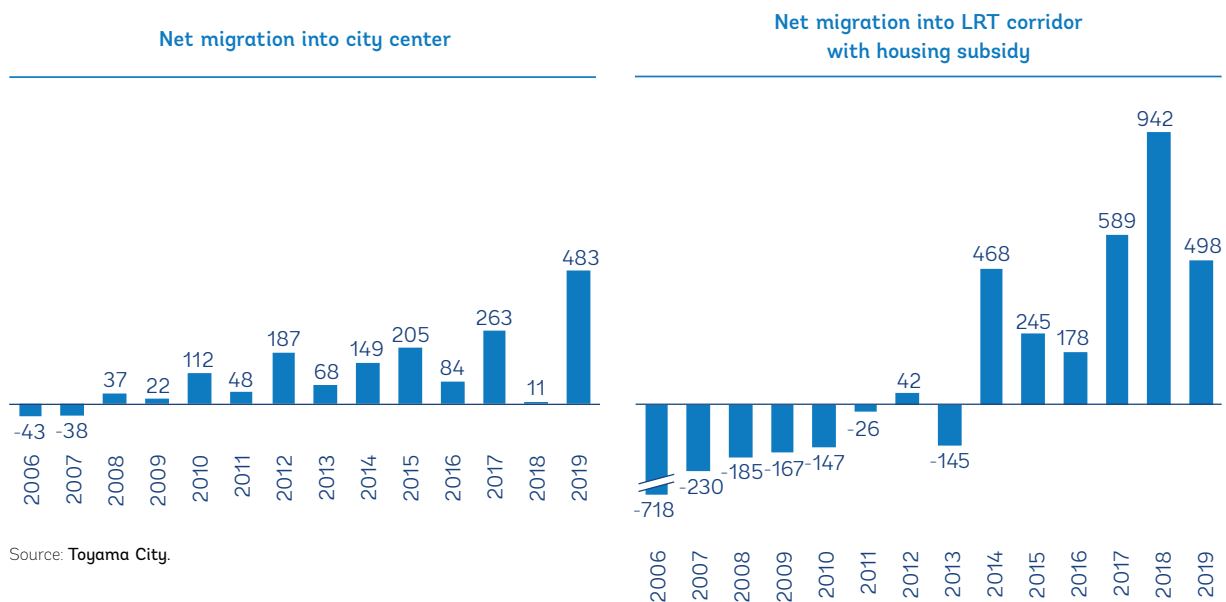
## 4.2 Enhanced Attractiveness of the City Center and LRT Corridors

A key outcome of the city's compact city policy is the enhanced attractiveness of the city center and LRT corridors. Although it is difficult to capture the full extent of development outcomes in numbers, key indicators implying the positive impacts of the compact city policy are provided below.

Figure 4.3 shows net migration to the city center and LRT corridors from 2006 to 2019. Net migration was negative for both areas around 2006 but turned positive in 2008 in the city center and in 2012 in LRT corridors. Since then, net migration has been positive for most years, and in general, the number of migrants has increased. These indicators imply that more and more citizens regard these areas as attractive and that they are deciding to move in (Japan, Ministry of Internal Affairs and Communications 2018).

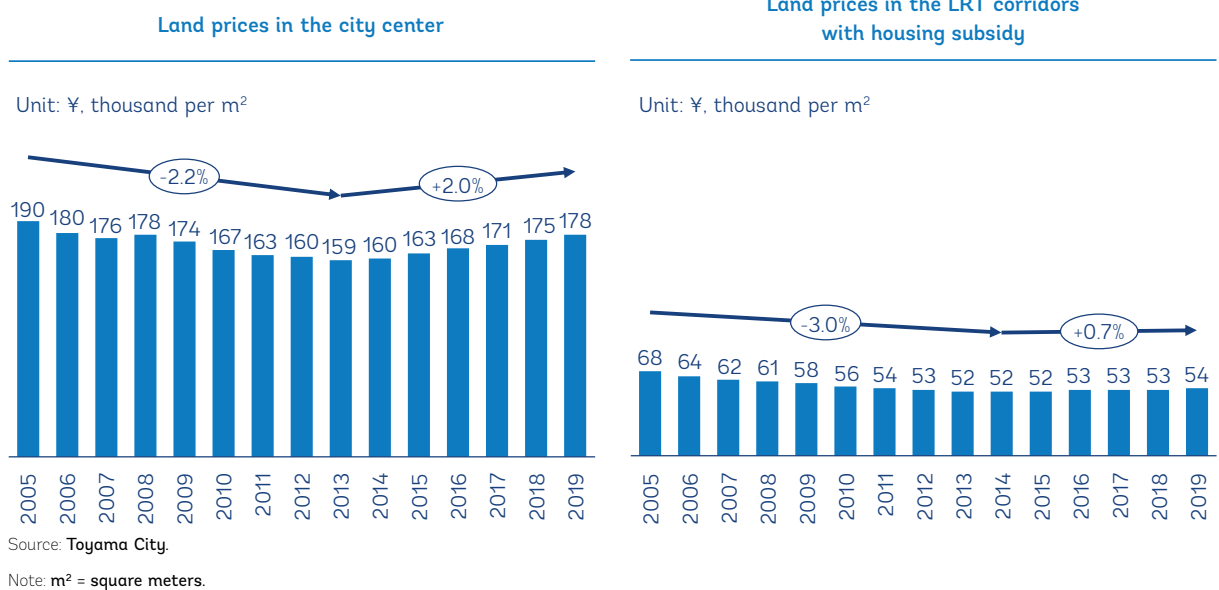
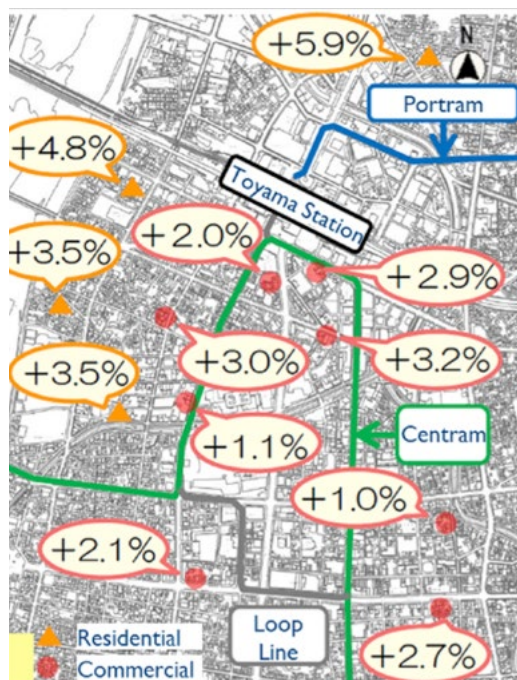
**FIGURE 4.3**

Net Migration to the City Center and LRT Corridors



Source: Toyama City.

Figure 4.4 shows the land prices in the city center and LRT corridors from 2005 to 2019. In both areas, land prices were decreasing by 2 to 3 percent per annum until around 2012, after which land prices began to increase at 1 to 2 percent per annum. Figure 4.5 shows examples of selected areas where increases in land prices were particularly large. Both commercial and residential land in the city center and LRT corridors benefited from increases in land prices. Furthermore, eight large-scale projects were implemented between 2005 and 2020 as urban reconstruction projects. The total cost of the projects was nearly ¥80 billion. Public investments in the city center and LRT corridors have brought in a significant amount of private investments (Toyama City 2020c).

**FIGURE 4.4****Land Prices in the City Center and LRT Corridors****FIGURE 4.5****Increase in Land Prices in Selected Areas**

Source: Toyama City

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## END NOTES

- <sup>1</sup> Fiscal index = standard financial income/standard financial demand. Municipalities with a fiscal index higher than one are financially self-sustainable.
- <sup>2</sup> Citizens living within 500 meters from LRT and railway stations or 300 meters from bus stops.

