

Public Disclosure Authorized

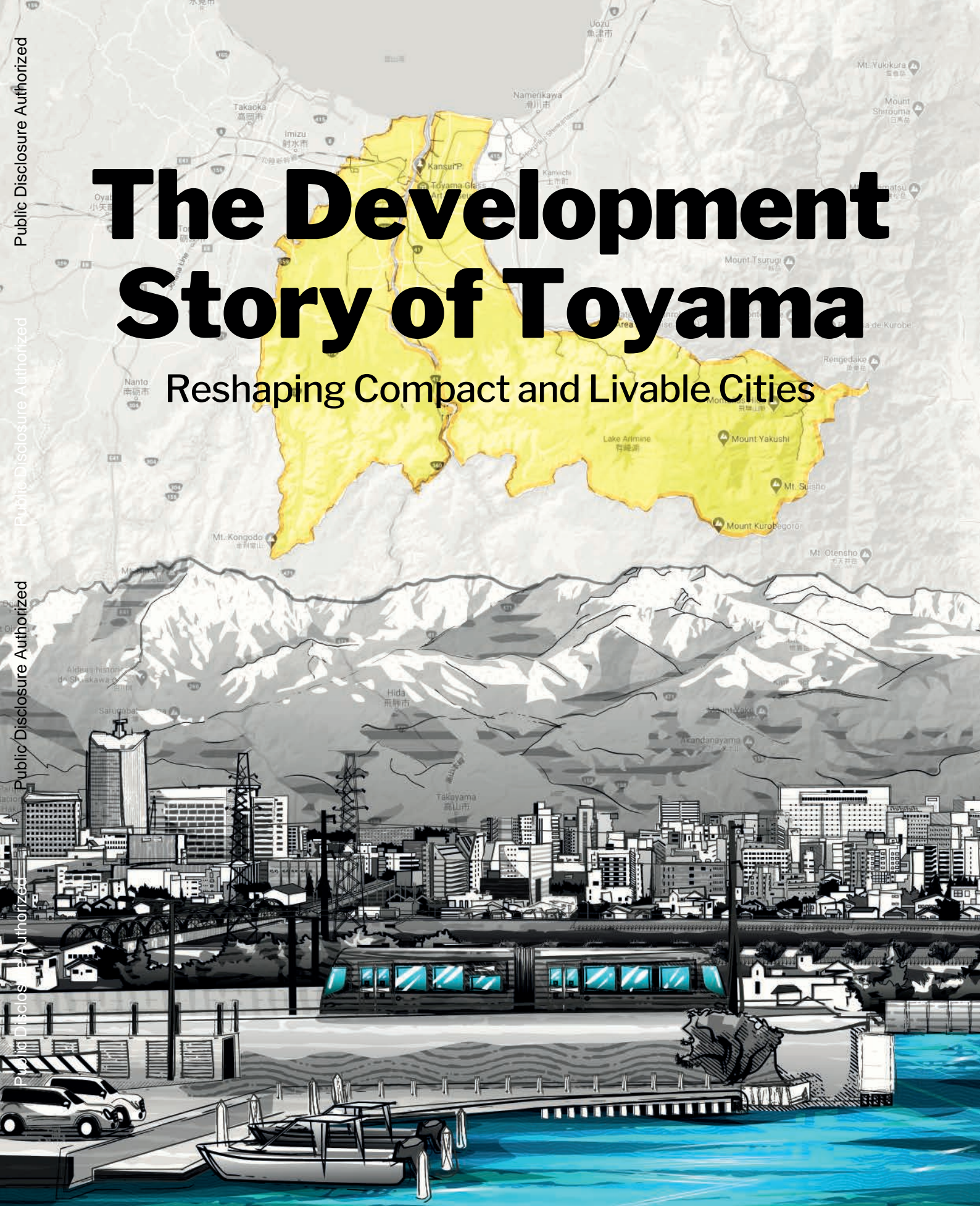
Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

The Development Story of Toyama

Reshaping Compact and Livable Cities



Tokyo
Development
Learning
Center

 **WORLD BANK GROUP**
Urban, Disaster Risk Management, Resilience & Land

 The Government of Japan

 **TOYAMA**
city



The Development Story of Toyama

Reshaping Compact and Livable Cities

Yuko Arai, Daniel Levine, Haruka Miki-Imoto, Mitsuhiro Yamazaki

© 2020 International Bank for Reconstruction and Development / The World Bank
1818 H Street NW
Washington, DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org
All rights reserved.

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Rights and Permissions

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2625; e-mail: pubrights@worldbank.org.

About Tokyo Development Learning Center (TDLC)

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.

Background and Acknowledgements

This research was prepared by the Tokyo Development Learning Center (TDLC) under the auspices of the Urban, Disaster Risk Management, Resilience and Land Global Practice of the World Bank Group. Its objective is to learn how Toyama City was able to achieve comprehensive urban development against a backdrop of challenging socioeconomic contexts, such as a predominantly aging population and its associated fiscal implications, and to extract key lessons learned for World Bank Group staff, academia, development partners, and practitioners on this emerging development challenge worldwide.

The team would like to acknowledge gratefully the government of Japan through the Tokyo Development Learning Center (TDLC) program. The original publication was jointly developed by Yuko Arai (Urban Specialist) and Daniel Levine (Senior Officer), in collaboration with PADECO Co. Ltd.

Taking stock of the original publication, “Development Knowledge of Toyama City” (2017), this report added the executive summary and updated the chapter 1: Introduction, chapter 2: Compact City Planning (the financial analysis of the light-rail transit projects and the urban regeneration case study), and chapter 7: The Next Stage. The rest of the chapters will merit a separate analysis in the future. The updates were jointly led by Haruka Miki-Imoto (Operations Officer) and Mitsuhiro Yamazaki (Senior Urban Consultant) of TDLC.

The team would like to extend special thanks to the city of Toyama, led by Mayor Masashi Mori, Joseph Runzo-Inada (Chief Resilience Officer), Shinji Honda (Senior Policy Administrator), and Tetsuya Aoyama (Director). The team also gratefully acknowledges guidance and inputs on the updated sections by the following World Bank Group colleagues: Valerie Joy Santos (Senior Urban Specialist), Guillermo A. Siercke (Disaster Risk Management Specialist), and Yuko Arai (Urban Specialist).

Victor Mulas (Senior Urban Specialist), Shin Tanabe (Knowledge Management Analyst), Shoko Tawara (Knowledge Management Analyst), Michiko Kadono (Urban Consultant), Chiyuki Mifuji (Event Coordinator), Yumi Sarumaru (Event Coordinator), Asami Otsuka (Program Assistant), and Koichi Ito (Urban Development Research Intern) of TDLC have contributed through coordination with the city, preparation and translation of the documents, working with the designer, and updating figures and tables. Sergio Vargas (Designer) worked on the design and illustrations.

Contents

Executive Summary	2
1. Introduction	4
Objective	5
Approach and Outputs	5
Background and History of Toyama	6
2. Compact City Planning	14
Background and Challenges	15
Strategies Adopted	16
Case Studies and Lessons Learned	19
3. Inclusive Community Planning	40
Background and Challenges	41
Strategies Adopted	42
Case Studies and Lessons Learned	43
4. Disaster Risk Management (Flood Risk Management) ...	52
Background and Challenges	53
Strategies Adopted	56
Case Studies and Lessons Learned	58
5. Waste Management	66
Background and Challenges	67
Strategies Adopted	67
Case Studies and Lessons Learned	68
6. Effective Resilience Management Approach	78
Background and Challenges	79
Strategies Adopted	80
Case Studies and Lessons Learned	81
Future Direction—The Resilience Strategy (30-Year Plan)	87
7. Next Stage	90
Background and Challenges	91
Strategies Adopted	92
Case Studies and Lessons Learned	94
8. Conclusion	100
Conclusions and Main Takeaways	101
About Toyama City and World Bank Partnership	102



Executive Summary

Toyama City has become synonymous with the idea of a compact and livable city in Japan. It is a pleasant regional city with a population of about 420,000, situated in a dramatic landscape between the steep Tateyama mountain range on the east and deep Toyama Bay on the north side. The city has been consistently ranked among the best cities to live within the Hokuriku region.

Although most common understanding of compact cities is in the context of managing rapid growth to contain urban sprawl and protect the natural environment, in Toyama's case, the issues are quite the opposite. The city has experienced a shrinking and aging population with a lower revenue base. Thus, Toyama's compact city model focuses on more efficient public service delivery through realignment of infrastructure, financial resources, and land use. Public investment in Toyama Light-Rail Transit (LRT) was combined with fiscal incentives to guide private development within the urban center and along the mass transit corridors.

In addition to the key characteristics of the compact city discussed, the following five sub characteristics, which relate directly to the potential contribution to successful compact and livable city development, were identified:

(a) Advantageous national policy

Toyama has aggressively pursued and taken a full advantage of a series of national urban planning policies and related technical and financial support from the national government over the past two decades. As the national government developed a new plan to solve pressing issues for the country, the city acted quickly to adopt the national plan and created a local version to show successful implementation of early plans. Toyama City built on each achievement and established a trusting partnership with the key agencies. Ultimately, Toyama became one of the testing grounds for the national urban policies, including for Japan's first modern LRT development.

(b) Unwavering commitment

Japan's population was expected to peak in 2008, and so was Toyama City's. In anticipation of full-scale population decline and a progressively aging society, the municipal government declared that Toyama would shift toward a more compact and efficient urban plan and created a series of policies to swiftly embark on establishing sustainable urban structures for future generations. The city's project members have held over 200 two-hour public meetings to explain the plans and tirelessly listened to feedback from local citizens and businesses. As a result, the city's visionary approach gained the trust and support of local communities and businesses as well as of the prefecture and the central government. The effort helped build many effective partnerships and increased coordination and coherence in the design of urban development policies.

(c) Integrated policy development

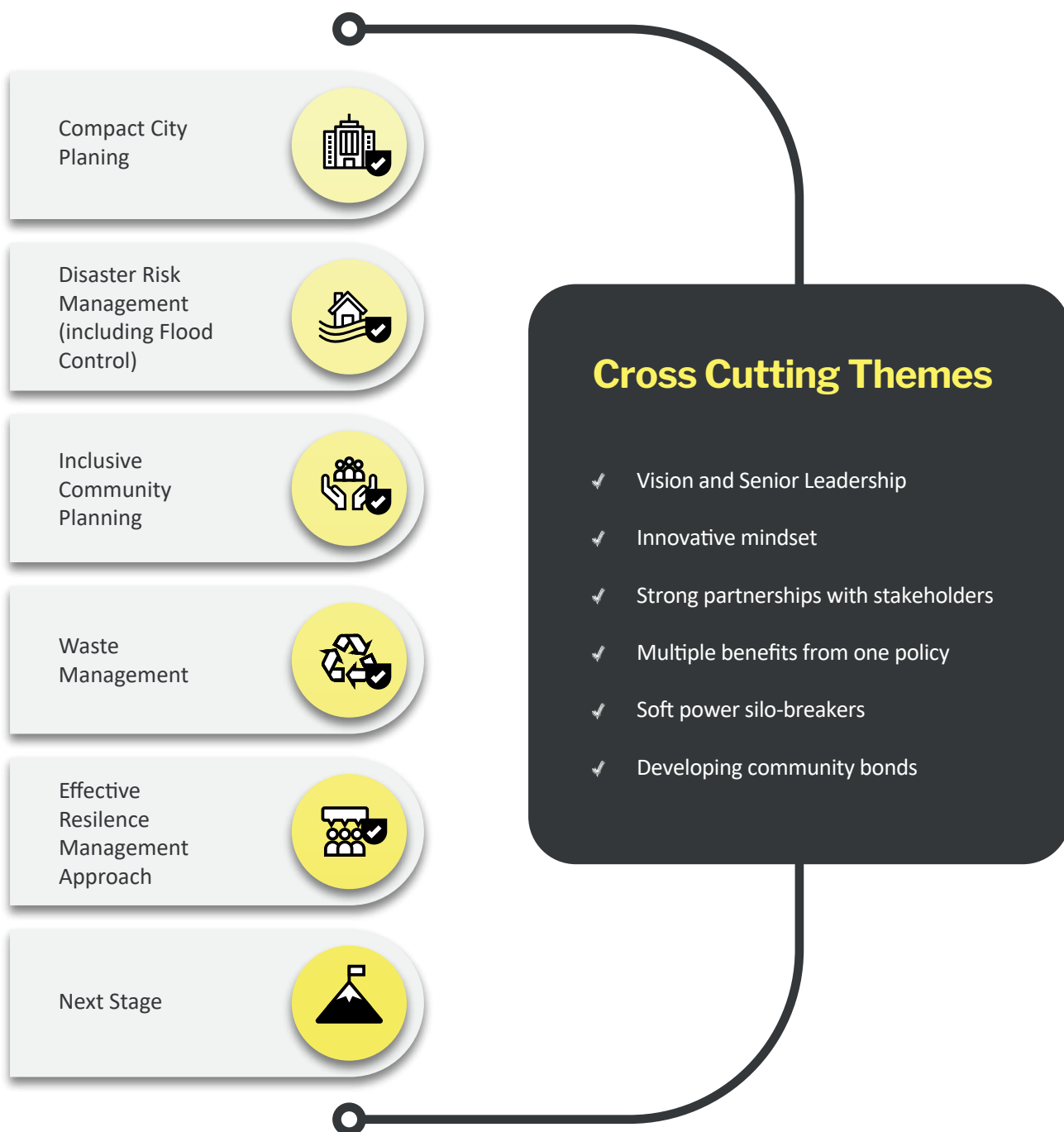
At the heart of Toyama's urban development planning lies creative thinking in integrating the development of multiple measures that are useful and budget friendly. For example, the compact city plans called for LRT lines to reduce dependency on cars. Elderly people who don't go out and tend to be less healthy need more help. When the city decided to build a preventive care center as a part of a community development strategy for elders, it renovated a former elementary school near one of the LRT stations. There are no barriers in the stations and no steps up onto the trams, so it is easy for frailer passengers to use. Riders ages 65 and over can buy a senior discounted pass at an annual cost of ¥1,000 to travel anywhere on the network for ¥100 (\$0.90) a trip. The number of passengers using the LRT more than doubled from when the first line was opened in 2006; the number of passengers in their 70s rose by more than three times. The city center is now home to 39 percent of residents, up from 28 percent in 2005. The boom in the center has brought new shops and other businesses, helping to stabilize tax revenues, and the city has started to see some operational cost savings.

(d) Implementation factor

The report will also showcase Toyama City's unique integrated planning model, which centers on the Office of Strategic Planning and Resilience (SPR) to help reduce silo mentality between heads of the city departments, an issue that many cities struggle with. Rather than assembling a superpower unit to bring different silos together, Toyama has a very soft yet effective approach to string intersectoral channels together, which will be detailed in this report.

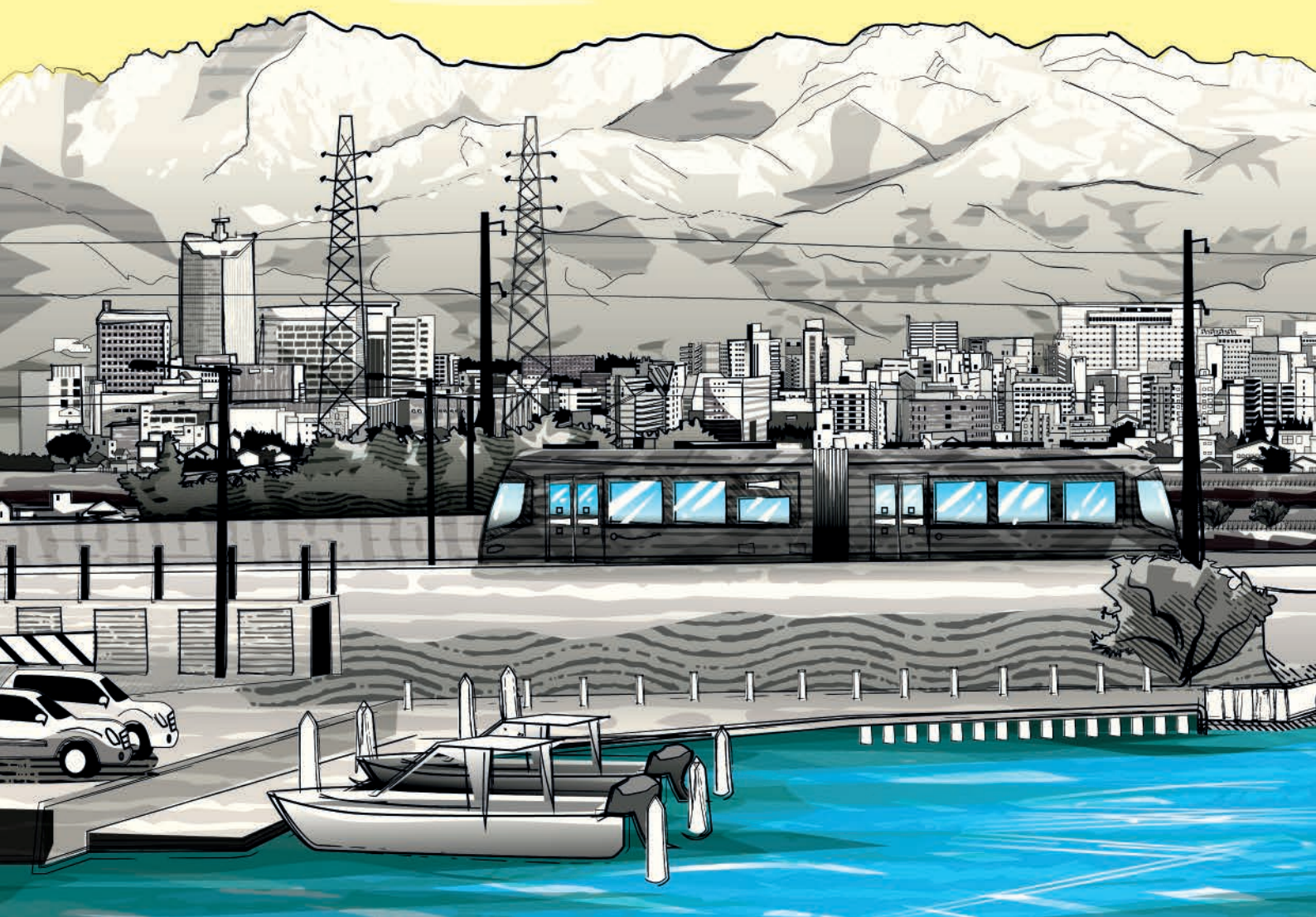
(e) Socioeconomic factors

As is true in many rural communities in Japan, intergenerational relationships remain strong in Toyama compared with larger urban counterparts. Older people are more respected in general, and three-generation households are not unusual. To keep the traditions strong, the city has implemented a series of small-scale community initiatives to foster intergenerational social bonds. Projects include providing neighborhood community gardens and subsidizing grandchildren's admission fees when they visit cultural facilities with older adults.



1

Introduction



Objective

This report provides a glimpse into the future through the development story of Toyama City. The goal of this report is to take a deep dive into the local context in Toyama, Japan, and narrate how the mid-sized regional city with less than 500,000 inhabitants has acknowledged and acted on early signs of prospective global challenges: declining population and aging. The case aims to provide specific knowledge catered for urban practitioners in cities of similar size and particularly those cities that may expect dramatic demographic changes in the next decades.

More people live in cities now than at any other point in history, and this trend is creating increasing imbalance between rural and urban populations. By 2030, approximately 60 percent of the world's population will live in urban areas. Although the trend of urban migration is expected to continue in the foreseeable future, some cities have started to experience population decline in recent years.

Worldwide, from 2000 to 2018, of 1,146 cities with less than 500,000 inhabitants, 52 cities have experienced population decline since 2000. ¹ Although some of this demographic change was triggered by natural disasters, much of the population stagnation has occurred as a result of lower fertility rates.

Moreover, the world population is aging fast. For the first time in history, people ages 65 years and over worldwide outnumber children under 5. By mid-century, there will be more than twice as many older people than young children.

Particularly in cities, this change results from increasing longevity and declining birthrates. In the case of Toyama, this trend is coupled with migration to larger cities because of the lack of higher education and employment opportunities, and many other regional cities in Japan have been facing the same situation. The United Nations' World Cities report predicts that similar trends will be seen in some other countries, regions, and districts in Eastern and Central Europe, Eastern Asia, and some selected neighborhoods in Southeast Asia and Latin America. ²

So, how can cities be designed to be more livable, age-ready, and more attractive? Does the solution lie in changing fiscal incentives? Is it in rethinking urban service delivery and housing?

There is no simple answer, but in Toyama's case, it was clear that a new approach to urban interventions was needed. The following section describes six sets of approaches and outcomes taken by Toyama City that will be detailed in this report.

Approach and Outputs

Chapter 2 Compact City Planning

The case walks through why and how Toyama City decided to implement compact city policies to address their socioeconomic challenges. The city has long been physically divided by the existing conventional railway station, leading to the North-South divide of the urban form. This physical division has led to spatial imbalance in growth, limited north-south accessibility, and other problems. The recent elevation of the two railway lines—one for the conventional train and another for the high-speed bullet train—allowed the city to complete the light-rail transit (LRT) tram connectivity, and city officials called it the completion of a “hundred years dream.” Reconnecting the north and south areas and boosting the robustness of this north-south transport corridor are meaningful for the city's growth and the redensification of the corridor. Regenerating land and property along this boosted corridor will increase land value and investment opportunities and improve north-south intracity accessibility.

Chapter 3 Inclusive Community Planning

This chapter describes how Toyama City adopted holistic strategies to enhance the physical and mental welfare of two targeted, historically underserved populations: elderly people and young mothers. All the strategies mentioned in this chapter are based on the compact city plans, including providing mobility options and easier access to the city center and developing multipurpose community facilities as well as workplaces and schools in the central business district. Consequently, family-friendly, intergenerational community spaces and activities have contributed to activating liveliness in the urban core and have

provided opportunities for senior citizens and young mothers alike to be socially and physically more active.

Chapter 4 Disaster Risk Management

Surrounded by a few of the world’s steepest rivers and active fault lines, Toyama City has adopted a range of approaches in disaster risk management. These include investments in antiflooding infrastructure; flood control using storage in rice paddies; pilot projects for innovative systems, including rainwater management and flood forecasting technology; and a strong focus on community engagement and partnership building, such as the initiatives of the Toyama prefectural Association of Disaster Prevention Officers (ADPO).

Chapter 5 Waste Management

The chapter outlines Toyama City’s Basic Environmental Plan and the Basic Plan for General Waste Disposal. It further highlights the innovative waste management facilities owned by the city and by a local firm called Toyama Kankyo Seibi, Japan’s most advanced waste management business.

Chapter 6 Effective Resilience Management Approach

The chapter profiles insights from the city’s 30-year “resilience strategy,” which was published as a part of the city’s work on resilience planning with the Rockefeller Foundation’s 100 Resilient Cities (100RC) program.

Chapter 7 Next Stage

The chapter addresses measures to integrate physical space and cyberspace in cooperation with the Japanese government’s Society 5.0 initiative. The city of Toyama established a set of strategies to incorporate smart technologies, created a sensor network, and developed a common online platform to be shared by the utility companies in case of emergency. The city also developed open data systems for civic innovation.

Background and History of Toyama

Overview

Located nearly 250 kilometers (km) northwest of Tokyo on the central Japanese island of Honshu, Toyama City is a key center for the high tech, robotics, banking, and pharmaceutical industries and is also home to a major hydroelectric power industry.



Map 1.1 Toyama City Location Map

Source: City of Toyama

The city’s natural setting is on an alluvial plain, with two major rivers and eight minor rivers, and is situated between the 1,200-meters-deep waters of Toyama Bay and the 3,000-meter peaks of the Northern Japan Alps. Toyama covers a large area of 1,242 square kilometers with the land ranging from sea level at Toyama Bay to the 3000 meter-high (10,000 feet) crest of the Northern Japan Alps, which is only 34 kilometers from the city

center. The recorded annual snowfall on the Northern Japan Alps is among the highest in the world. The heavy snowmelt and loose volcanic soils under the city can combine to produce major floods. In addition, 70 percent of city lands are forested, and there are abundant agricultural lands within the city limits.

Socioeconomic Profile

In 2016, the gross domestic product (GDP) of Toyama City was 1,928 billion yen and the growth rate was -4.8 percent. Income per person in the city was 3.24 million yen, which is more than 10 percent higher than the national average. After the rapid growth of the 1980s, the income per capita was approximately 3 million yen stabilized. The majority of income comes from manufacturing (25.3 percent), wholesale and retail (12.0 percent), and real estate (8.7 percent), whereas earnings from agriculture are minimal (0.5 percent).

Toyama Prefecture and Toyama City regularly earn high scores in quality of life indicators in Japan. The average income of a worker's household per month in Toyama City is always ranked highly. In fact, the income in 2019 was 593,210 yen (national average 586,149 yen), which was the third highest in Japan. The average number of workers in a household is higher in Toyama City (1.94 per household) than the national average (1.77 per household), which increases household income.

Figure 1.1 illustrates the labor characteristics of Toyama City. For example, 81.5 percent of employees work within tertiary industries, which is 14 percent higher than the national average and 19 percent higher than the prefecture average. In addition, in Toyama City, 18 percent of wage earners work in secondary industries, 15 percent lower than the prefecture average and 4 percent higher than the national average. Primary industry accounts for only 0.5 percent of workers, which is around 3.0 percent lower than the national labor force.

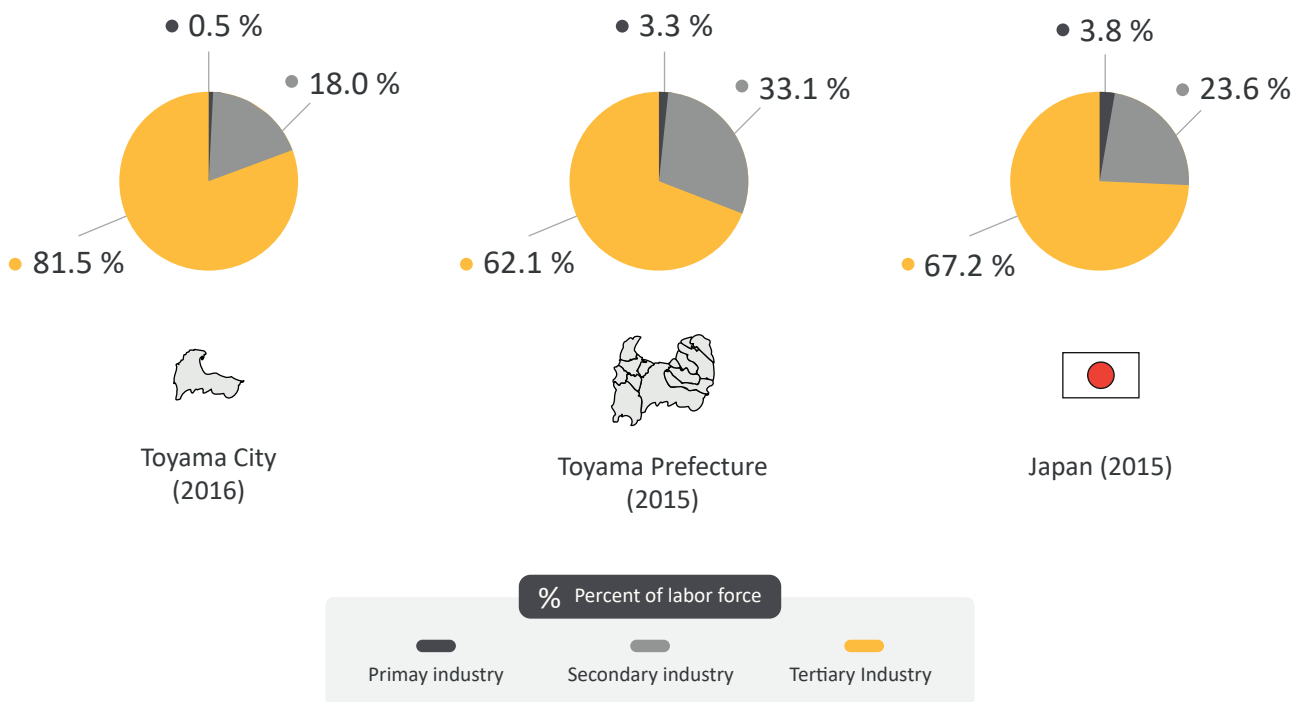


Figure 1.1 Labor Characteristics of Toyama City

Source: Toyama City, *Economic Census for Business Activity* [経済センサス-活動調査], 2016. Government of Japan, *Japanese National Census* [日本国勢調査], 2015.

Demography

The following figure from the *Toyama City Population Vision*³ analyzes the influence of natural variation and social change on total population, under quadrants plotting the values of each year, with natural change on the vertical axis and social change on the horizontal axis.

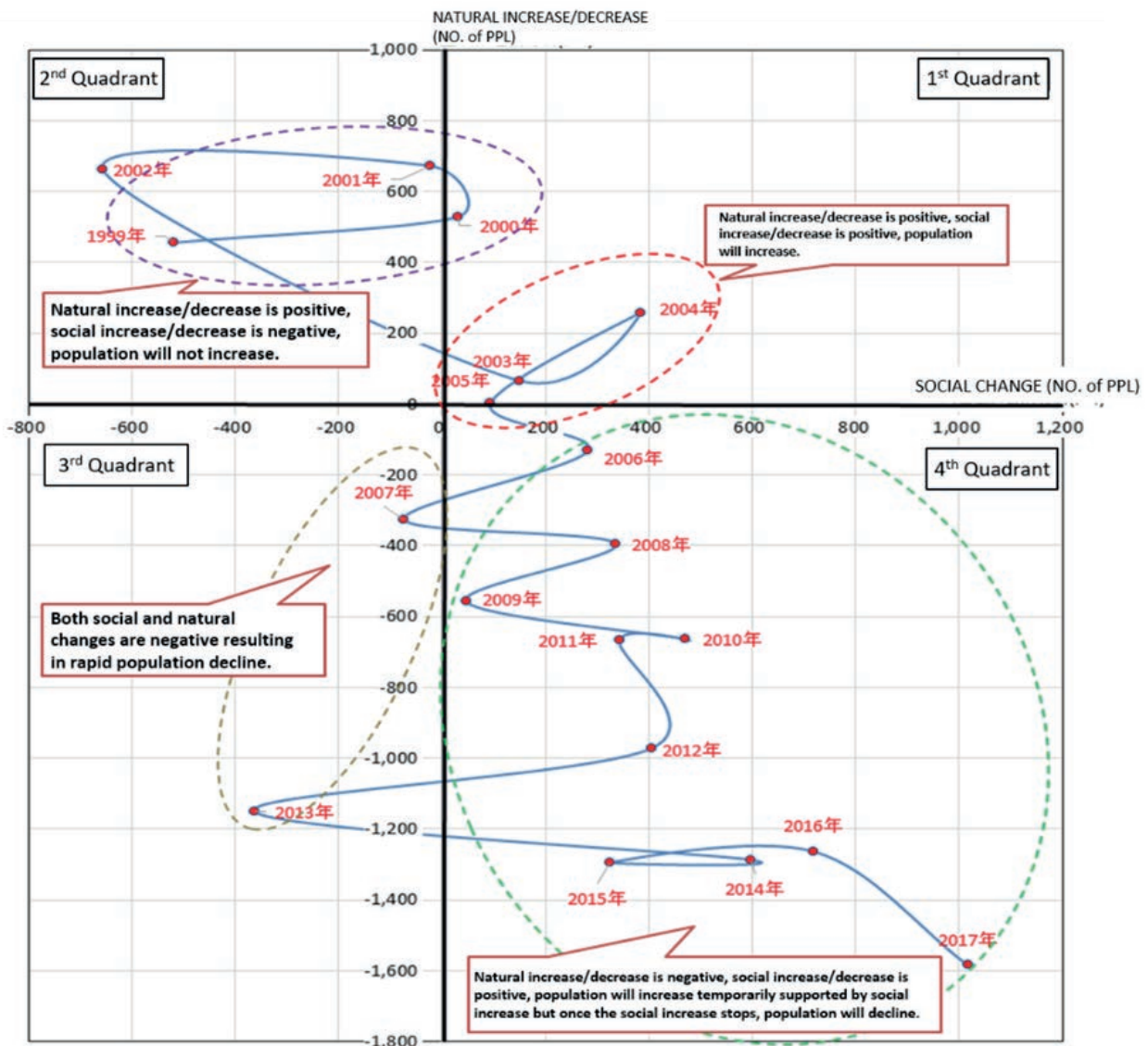


Figure 1.2 Effects of Natural Change and Social Change on Total Population in Toyama

Source: Toyama City, *Toyama City Population Vision*, 2020.

As shown in the “second quadrant” between 1999 and 2002, population growth was largely stagnant because the natural increase began to be offset by the social change decrease.⁴

From 2003 to 2005, the city moved to the “first quadrant,” and the population increased steadily because of the synergies between natural increase and social increase. Starting in 2006, the city moved toward the “fourth quadrant” and population decline has continued. It is said that the rate of population decline will accelerate with the synergy of natural reduction and social reduction as the city enters the “third quadrant,” which was observed in Toyama in both 2007 and 2013.

Historical Urban Development Context

Since the establishment of the city in 1889, Toyama has undertaken a number of significant urban development projects to build a modern city. Over the past 130 years, these projects went through three phases:

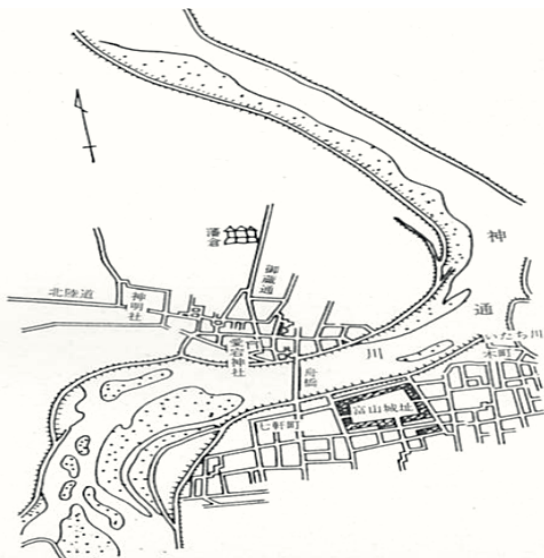
- Flood control of the Jinzu River
- Postwar reconstruction
- Consolidation and Compact City Plan

Known in Japan since the medieval period as the “City of Medicine,” for when it was the center for all traditional medicine in Japan, Toyama has continued to develop as a thriving pharmaceutical, biotech, and advanced metal manufacturing city. Today it is one of the most productive coastal cities on the Japan Sea.

• First Stage: Flood control of Jinzu River

The history of full-scale urban planning for the formation of a modern city in Toyama begins with the reconstruction of the Jinzu River between 1901 and 1920. The Jinzu River, which meandered in the city center, had flooded on many occasions at the river bend, causing severe damage to the city.

To mitigate the floods, the prefecture embarked on construction work to widen the Jinzu River and develop aqueducts to bypass the river bend (maps 1.2 and 1.3). The work also included digging the Fugan Canal to the Toyama Bay to prevent flooding. However, the reclaimed riverbeds became a wasteland and divided the city area from north to south. The redevelopment of the reclaimed riverbed became priority for the city.



Map 1.2 Jinzu River in 1868



Map 1.3 Jinzu River in 1926

Source: Toyama City, *Comprehensive History of Toyama* [富山市史通史下巻], vol. 2, 1987, 273.

- **Second Stage: Postwar reconstruction**

During World War II, Toyama was bombed extensively and was the most devastated Japanese city; 99.5 percent of the city center was destroyed. ⁵ As soon as the war was over, Toyama began great efforts to rebuild the city. Using intensive transfer of landownership and building relocation, the city planned wider, more organized road systems to replace historically fire-prone medieval-era curved streets. The streets were transformed into major thoroughfares decorated with prominent civic and commercial buildings. By the late 1960s, Toyama was reborn as a leading city on the coast of the Sea of Japan.



Photo 1.1 Burning Toyama City Area during World War II



Photo 1.2 Kimachi Street immediately after World War II (current Honmachi Street)

Source: Toyama City, Toyama War Reconstruction Magazine [富山戦災復興誌], 1972.

Devastation in Toyama from World War II:

- War damage area: approximately 1,400 hectares
- Number of houses affected: 24,914
- Population affected: 109,592
- Percentage of households: 69
- Percentage of population: 66
- Casualties: 2,718 dead, 1,900 with serious injuries, and 6,000 with mild injuries ⁶

- **Third Stage: Consolidation and Compact City Plan**

After decades of economic boom, significant portions of Japan’s workforce migrated to large cities, a shift which led to declining population in remote cities like Toyama. In 2005, the national government of Japan instituted a program to encourage municipalities to merge, especially in rural areas, to reduce costs, increase efficiency, and transfer more administrative control to the local level. As a result, Toyama merged with six smaller municipalities (Osawano Town, Oyama Town, Yatsuo Town, Fuchu Town, Yamada Village, and Hosoiri Village), bringing the population to approximately 420,000 inhabitants.

The new “Toyama City” was established by an equal merger, with the city hall located at the Toyama City Hall and comprehensive administrative centers established in the other six towns and villages.

This merger vastly increased the responsibility of the new city government, which had to support a 30 percent higher population and a land area of 1,242 square kilometers, five times larger than the largest of the pre-consolidation municipalities. This expansion presented both a management challenge and an opportunity for increasing government efficiency, financial savings, and resilience. The successful merger was also a catalyst for fostering a culture of strong stakeholder partnerships and collaboration, innovative thinking, and silo-breaking.

In 2003, Mayor Masashi Mori declared that the city of Toyama would shift toward a compact city development approach based on downtown revitalization, new public transport networks, and efforts in local business retention and expansion. It was a significant point in the history of urban planning in Japan that Toyama City, in anticipation of full-scale population decline and progress as a super-aging society,⁷ moved ahead with a policy to create a compact town and swiftly embarked on establishing a sustainable urban structure for future generations.

Between 2006 and 2020, three phases of LRT projects were developed. Toyama Light Rail was Japan's first full-fledged LRT using the public-build and private-operate method, which will be further explained in the following chapter.

Because the city actively invested in public transport to increase the accessibility of downtown, those citizens who pursue an urban lifestyle have spent more time in the central city traveling on foot or by public transit. This activity increased the use of public spaces and foot traffic in the commercial areas, which enhanced vibrancy of downtown and eventually fostered civic pride. Overall, the series of compact city development efforts led to less sprawl—hence the reduction of administrative costs and, gradually, emissions of carbon dioxide (CO₂).

These efforts have created a positive spiral and contributed to the realization of a compact city.

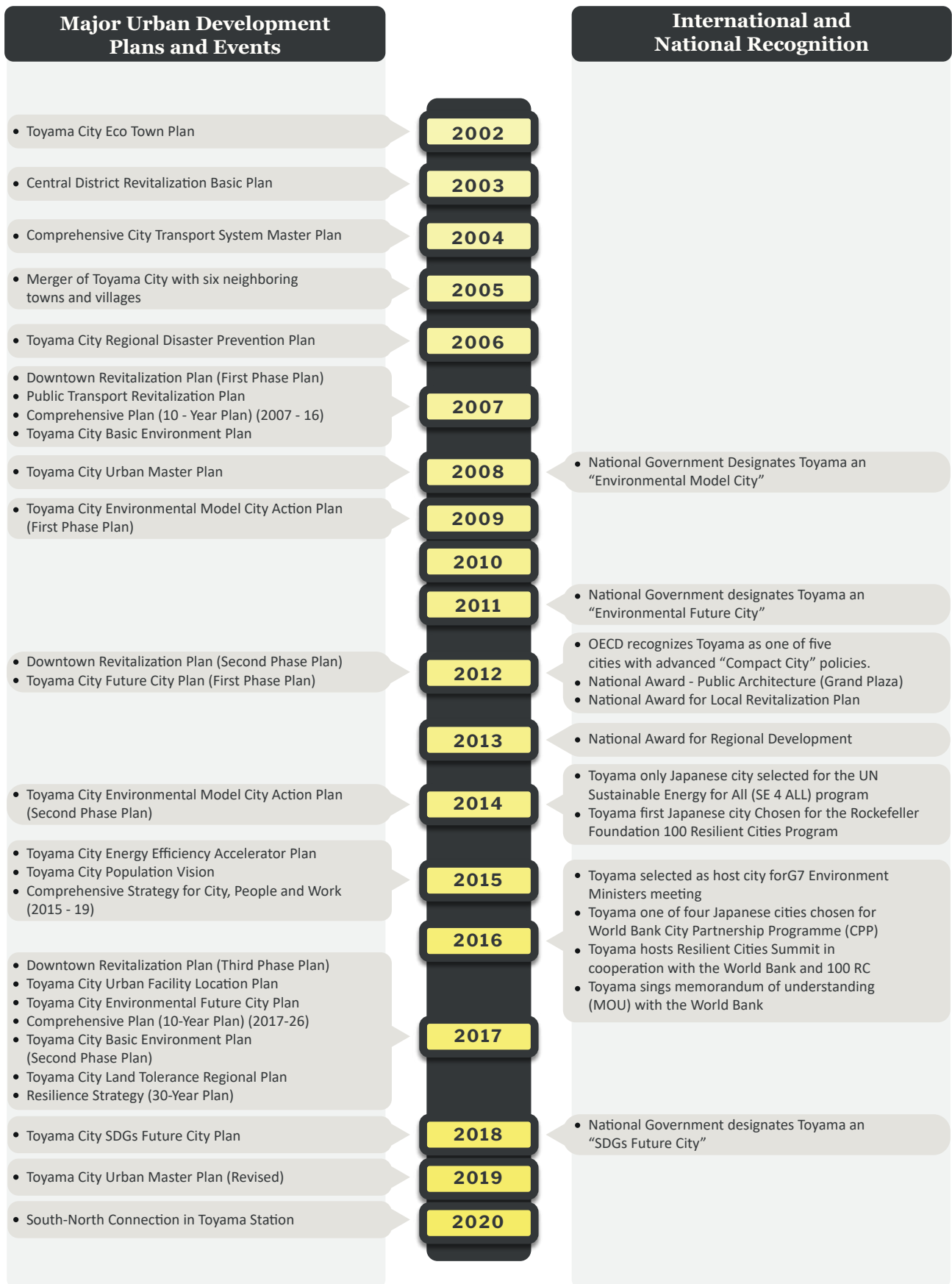


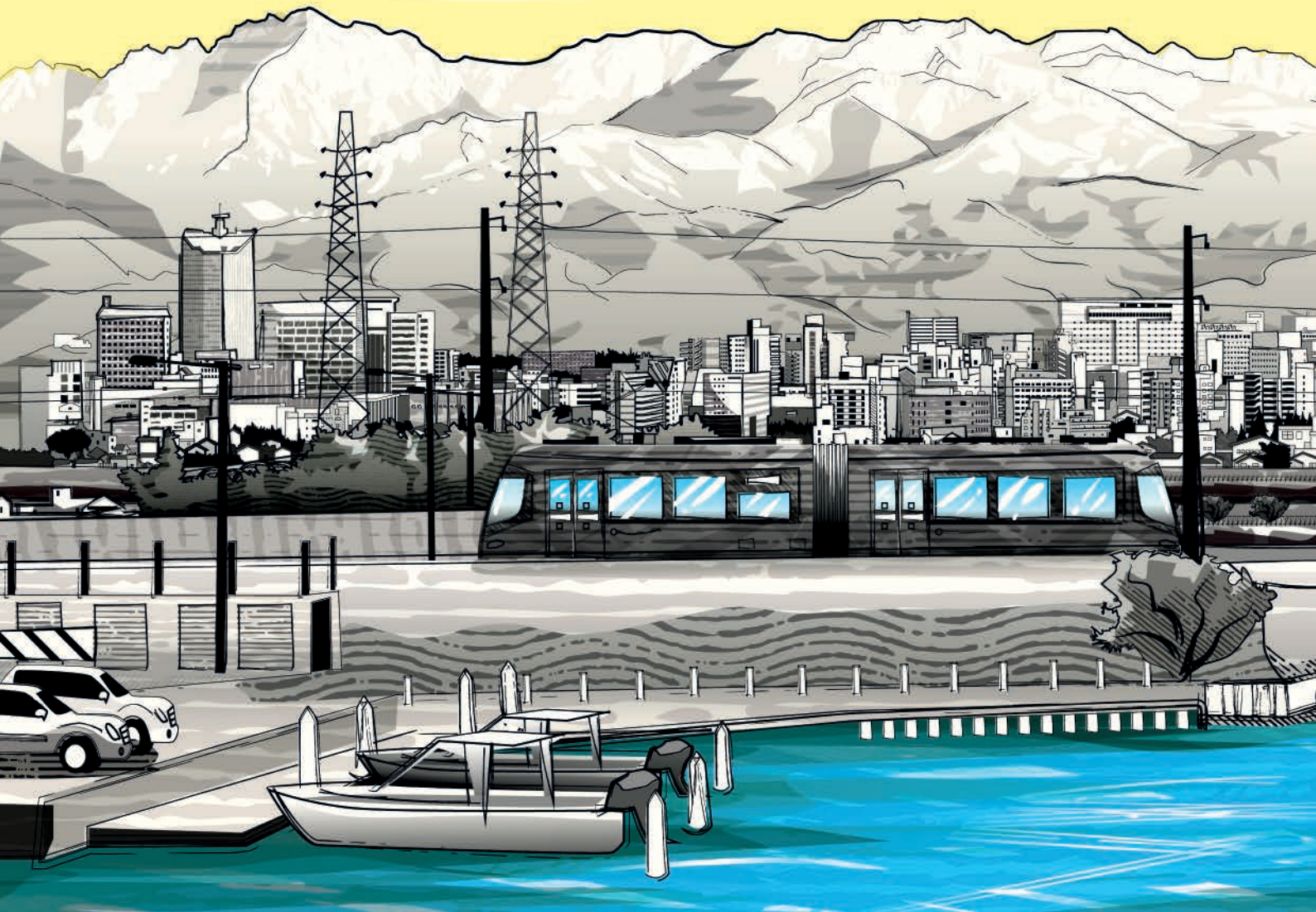
Figure 1.3 Toyama Urban Development Timeline: Major Plans and Recognition

Note: OECD = Organisation for Economic Co-operation and Development; SDGs = sustainable development goals; 100 RC = 100 Resilient Cities; UN = United Nations.

Source: World Bank.

2

Compact City Planning



Background and Challenges

Introduction

Comprehensive compact city development goes beyond addressing spatial issues. Compact city development is not an end in itself but the means to achieve desirable policy goals. For example, by addressing the provision of infrastructure in an economically efficient way for an aging society, the city can assure the welfare of citizens and intergenerational integration. Toyama provides a good case study of this approach because it has addressed a diverse range of issues through comprehensive and integrated urban and transport planning policies. The city's success in these efforts is well known among policy makers and researchers.

Issues and Challenges

In the 2000s, Toyama City was facing a multifaceted array of issues and challenges, including

- **Low population density:** The city has one of the lowest densities of all prefectural capitals, with a backdrop of a large habitable area across the Toyama Plain, a strong road network, and a prevalence of detached housing.
- **Aging and declining population:** As in other Japanese cities, an aging society and declining population forced Toyama to rethink its urban planning and development approach (figure 2.1).

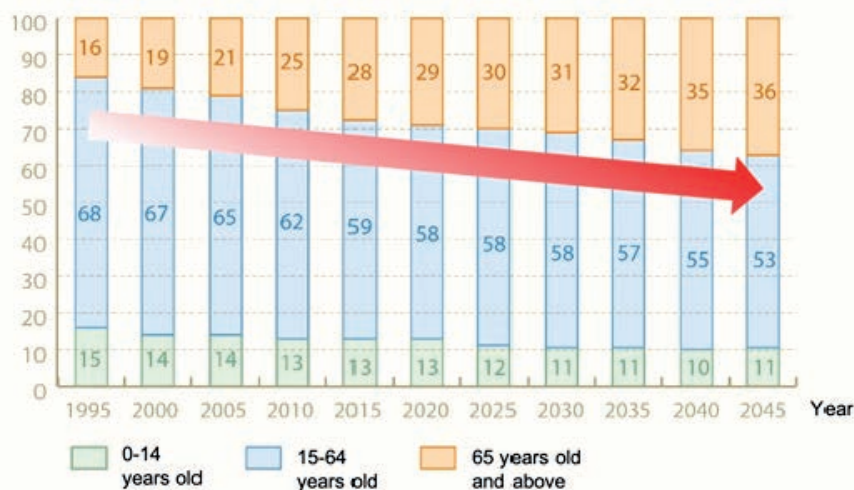


Figure 2.1 Toyama City's Aging Population

Source: Toyama City, Creating a Compact City Centering on Public Transportation, 2019.

- **Car dependence and poor accessibility:** Although the population has been declining, private car use and dependence has been increasing, growth that has resulted in increased CO₂ emissions and in further deterioration of public transport services. For example, Japan Railways (JR) passenger numbers declined by 30 percent between 1989 and 2008. The number of bus routes decreased by 70 percent over the same period. Furthermore, as the population has aged, the proportion of senior citizens with reduced accessibility due to lack of a private car has been a growing concern.
- **Declining central business district and urban sprawl:** Greenfield developments in suburban areas, increased motorization, and emptying of the central business district (CBD) reduced the attractiveness of the city as a whole.
- **Unsustainable administrative cost structure:** Toyama's population decline is likely to result in higher per capita maintenance costs for urban infrastructure and facilities. The city was aware that continued urban sprawl would also lead to higher costs for infrastructure investment and maintenance.

Strategies Adopted

Background

Toyama began making progress in 2003 through the preparation of the Central City Revitalization Basic Plan (2003) and the Public Transport Revitalization Plan (2007). Key projects that soon followed included the Toyama LRT “Portram” in 2006, which created better access to the central city and catalyzed further investment projects in the city core.

Nationally, the challenges for city centers included year-on-year decreases in resident population, retail sales, and pedestrian traffic and the relocation of large-scale commercial facilities, and hospitals, to the suburbs. Therefore, the Downtown Revitalization Act was revised in August 2006 to include the establishment of a certification system by the Prime Minister (called the “Certified Basic Plan” or “Downtown Revitalization Plan”) and enhancement of supporting measures.

Downtown Revitalization Plan

First Phase Plan, February 2007 – March 2012

In response to the amendments to the Downtown Revitalization Act in 2006, Toyama City established the Central City Revitalization Council, composed of the Toyama Town Management Organization and Toyama Chamber of Commerce and Industry. The Downtown Revitalization Plan set out compact city goals to create a sustainable, compact city of the future that addresses the challenge of its decreasing population and aging society. The associated compact city vision set out three main pillars:

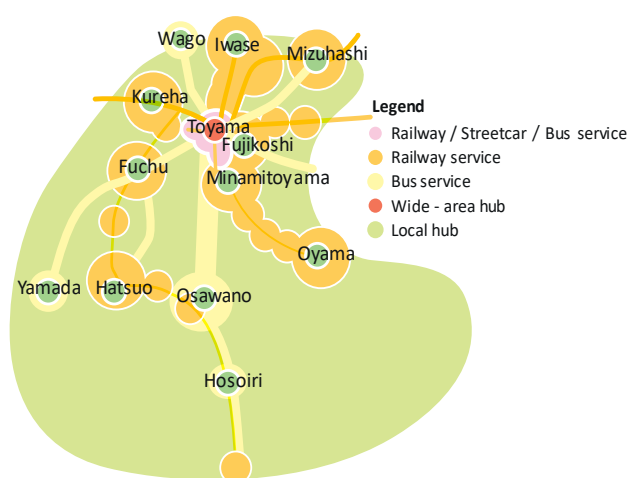
- **Establish a compact city based on efficient public transport.**
 - ◇ Revitalize the public transport network to reduce car dependencies.
 - ◇ Consolidate city functions in the city center and along the public transport corridors.
- **Increase the quality and range of civic life amenities.**
 - ◇ Redevelop commercial, cultural, and civic facilities in the central city.
 - ◇ Develop various urban housing types, including multifamily residences, commercial/residence mixed-use buildings, and assisted living care residences.
- **Take full advantage of the city’s strengths.**
 - ◇ Nurture existing local industries such as the pharmaceutical industry, increase the use of renewable energy, and attract new businesses and incubate new industries.

To achieve this, the plan set out Toyama’s Compact City model which defined a dense center and a series of dense hubs interconnected by strong public transport as below.

On February 8, 2007, Toyama received Japan’s first national certification and was then able to pursue the projects listed in the basic plan. Citizens, businesses, and various city departments came together to work toward the revitalization of the central urban area. This basic plan was also then incorporated into the Toyama’s overall City Master Plan (2008).

Some of the key catalytic projects included development of the LRT system, revitalization of the City Center (including the Grand Plaza), and housing development along public transport lines. Those projects are set out as case studies in the next section of this report.

From 2006 to 2010, after the Downtown Revitalization Plan was approved, the pace of population decline gradually slowed by 1.87 percent over four years (average 0.47 percent per year).



Map 2.1 Toyama’s Compact City Model

Source: Toyama City.

Downtown Revitalization Plan Second Phase Plan, April 2012 – March 2017

Following the end of the planning period of the first phase, Toyama formulated the second-stage Toyama City Downtown Revitalization Plan, which was approved by the national government in March 2012.

In the second phase, Toyama aimed to further revitalize the central city by increasing public urban renewal investment to lure private development. It also continued focus on essential public facility development. The plan also noted the importance of close collaboration among private enterprises, non-profit organizations (NPOs), universities, community-based organizations (CBOs) and the government entities. The participation from the diverse group enabled holistic approaches to develop more effective social and physical public infrastructure.

Downtown Revitalization Plan Third Phase Plan, April 2017 – March 2022

Toyama City has most recently formulated the third phase, “Basic Plan for Downtown Revitalization in Toyama City,” receiving national certification on March 24, 2017.

In this third plan, the city aims to connect the north and south sides of Toyama Station and integrate the entire tram network around the central city. It further attempts to strengthen collaboration among the stakeholders. In addition, it intends to support longevity and high quality of life for all citizens by concentrating the medical, cultural, and commercial amenities and connecting them with the public transit network.

Urban Facility Location Plan, 2017

The national government recognized that the current zoning codes have become obsolete and required change to fit with compact urban development.

Against this backdrop, the amendment of the Urban Revitalization Special Measures Law was enacted in August 2014. This law enabled municipalities to realign the zoning to scale down the urban areas by relocating residential, medical, welfare, commercial, and other critical facilities, which had supported the growth of suburbs for the past several decades.

In 2017, Toyama City adopted the Toyama City Urban Facility Location Plan and became the leading model for the nation. The city continues to collaborate with the national government today, and some of Toyama's innovative approaches have also been adopted by the national government to counter those challenging issues.

Walkable City Strategy, March 2019–present

This newly created strategy aims to build on Toyama City's successful development of its urban transport network and increased ridership. According to the World Health Organization (WHO), light physical activities such as walking are considered one of the most effective measures of preventive care in older adults.⁸ The strategy suggests that walking will not only bring about personal health and medical benefits, but also increase the vitality of the entire city, such as active streets, increased public transport usage, event participation, and community building.

The strategy requires various city departments to develop comprehensive policies to encourage citizens to go out and experience the urban scenes on foot. The city created a tagline and a mobile app called “Tohokatsu” (active walking) (see figure 2.2).

Participants can accrue points by walking, using public transport, and participating in public events, and exchange the points with special prizes. The app has functions such as a pedometer, distance measurement, calorie calculation, and an event calendar. Each function can also be displayed as a daily chart, so the users can track the cumulative status of the activities. The app helps initiate the fusion of citizens' health promotion and compact town development.



Figure 2.2 Tohokatsu Mobile App

Source: Toyama City,
Tohokatsu: App [とほ活アプリ], 2020,
<https://tohokatsu.city.toyama.lg.jp/app/>.

Between 2003 and 2020, Toyama has worked continuously to develop its urban core. Highlights of the work on downtown revitalization, public transit, and resilience can be seen in figure 2.3.

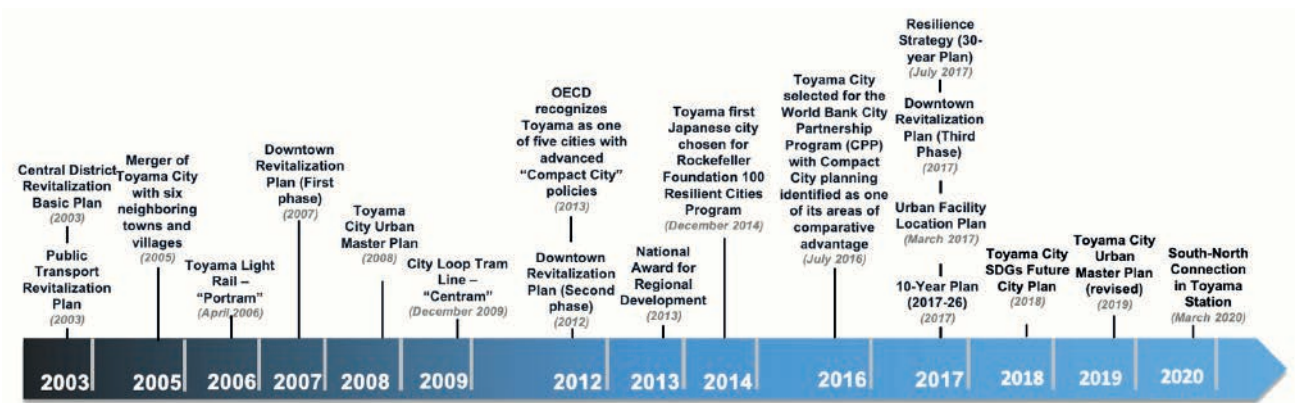


Figure 2.3 Toyama Urban Development Timeline: Compact City Planning and Events

Source: Toyama City.
Note: OECD = Organisation for Economic Co-operation and Development; SDGs = sustainable development goals.

CASE STUDIES AND LESSONS LEARNED

Case study ①

DEVELOPMENT OF TOYAMA LIGHT RAIL TRANSIT LINES

- Multiple benefits from one policy
- Strong partnerships with stakeholders (private sector)
- Innovative mindset
- Soft-power silo breakers



The development of LRT lines signifies the backbone of Toyama's compact city plan, offering easy accessibility around the central city and creating development opportunities along the transit lines to further activate the downtown core. The following case study unrolls three distinct phases of the LRT line development. The formation of the LRT network aimed to deliver a shift from the existing automobile dependency and create a city where key amenities are all within walking distance.

Phase I: Portram

Background

The local JR Port Line originally opened in 1924. During and after World War II, the line ran from JR Toyama Station to Toyama Port along the Fugan Canal, a key transport route for cargo from the port. However, over the years the line became ill favored and had declining ridership, mainly because of infrequent service.

In 2006, as part of Toyama's efforts to revitalize public transport through compact city planning, the JR Toyama Port Line was revitalized as a tram line and reintroduced as Japan's first full-scale LRT system, Portram (photo 2.1).



Photo 2.1 Portram, Toyama City

Source: Toyama City.

Approach

In 2006, ownership of Toyama Port Line was transferred from West Japan Railway Company to a newly formed joint public-private company, called Toyama Light Rail Co. Ltd, which reintroduced Japan’s first full scale LRT system—Portram. Stretching from Toyamaeki-kita (north gate of Toyama Station) to Iwasehama terminal at the Toyama Port, it comprises a total length of 7.6 km. The travel time along the route was about 25 minutes.

The LRT was delivered by two-tiered public-private partnership. The city of Toyama, with significant support from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), covers the entire expense for the railroads, stations, electric infrastructure, train cars, and subsidies on ongoing maintenance and capital upgrade costs. Meanwhile, the private railroad company is responsible for the operations.

Of the initial investment for Toyama Port Line, 16 percent came from the prefectural government and that 33 percent came from the city government. The national government also subsidized the line significantly as a strategic project of the MLIT. The maintenance cost of these facilities is also covered by the public sector (figure 2.4).

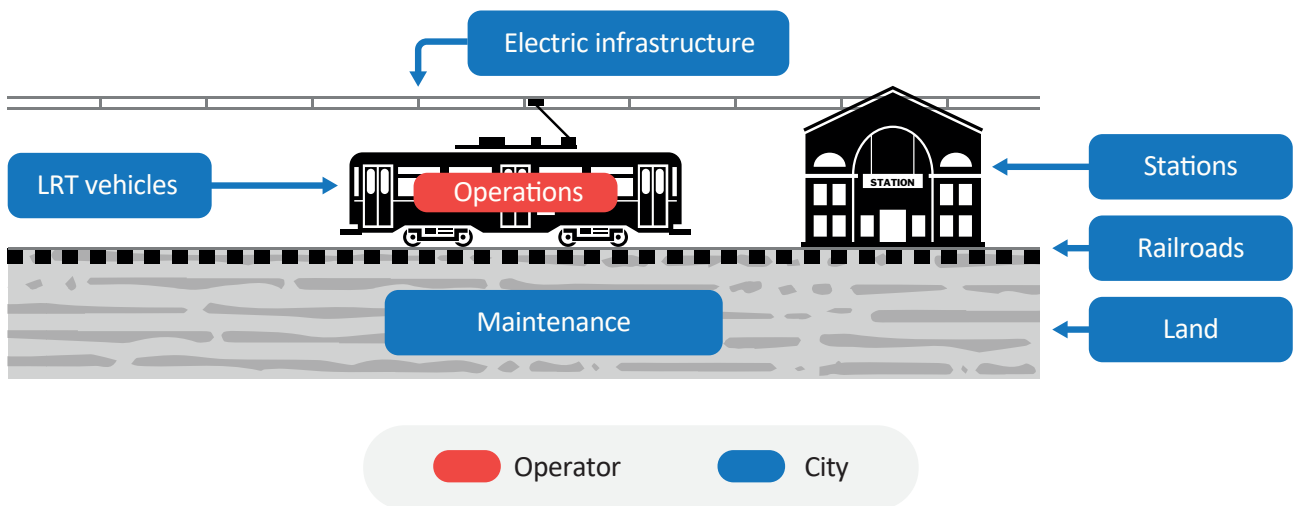


Figure 2.4 Ownership Structure of Toyama Port Line

Source: Y. Doi, Toyama Port Line Conversion and Challenges [JR 富山港線の LRT 転換と課題(下)], 2005, 29, <https://core.ac.uk/download/pdf/60530647.pdf>.

The transit operator, Toyama Light Rail, was founded by several local government entities and private companies, and it recovers operation costs from fare revenues as well as from the city’s subsidies, which come from the national government’s road improvement program funding (figure 2.5). The city also saved land acquisition costs with the former JR’s right-of-way.

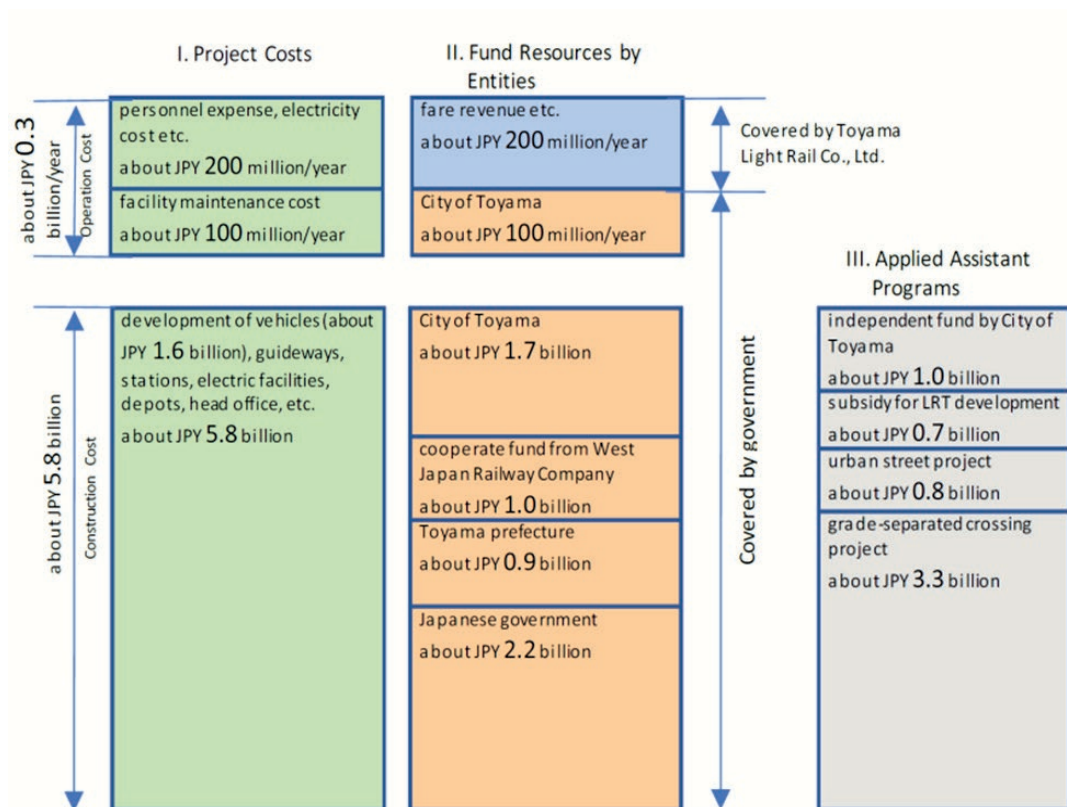


Figure 2.5 Cost Breakdown and Allocation of Toyama LRT

Source: Toyama City, “Creating a Compact City Centering on Public Transportation” [公共交通を軸としたコンパクトなまちづくり], 2019.

A sizable step-change in service and operation levels was delivered:

- Super-low floor cars were introduced to enhance accessibility.
- Five new stations were added.
- Service hours were extended.
- Coordinated scheduling offered feeder bus services every 30 minutes on weekdays and every 60 minutes on weekends.
- Park-and-ride locations were established.
- Bicycle parking was added at stations (box 2.2).
- Service frequency was increased nearly 3.5 times.
- Discount passes were introduced for elders over 65 years old.
- Staffed stations.
- A flat-fare system.

Other infrastructure improvements were introduced:

- Barrier-free infrastructure at stations,
- Vibration reduction and green verge,
- IC card (smartcard) ticketing, and

Phase II: Centram (Toyama City Tram Loop Line)

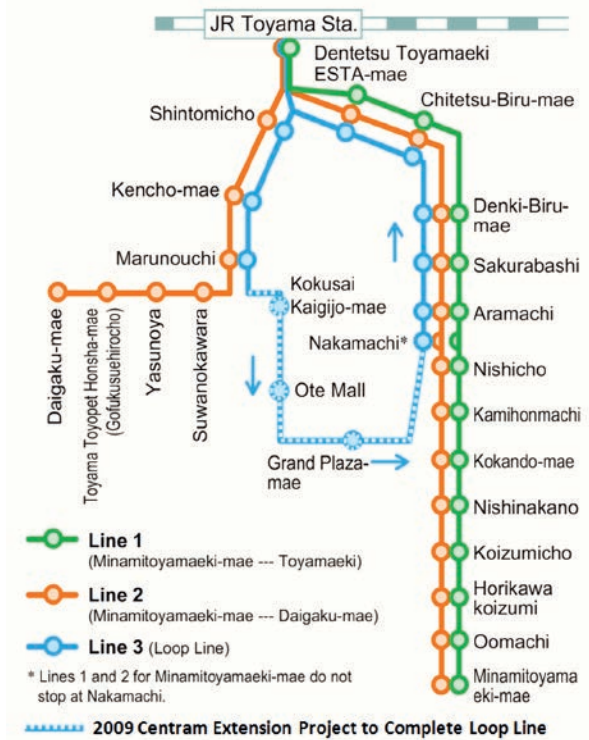
Background

Following the implementation of Portram, the strategy moved to extending the existing city center tramline to form a loop.

Approach

The Centram city tram loop line was created by providing a 0.9 km tram line extension with three new stations in order to reactivate the central downtown area and make it more accessible. The existing two tram routes were then supplemented with an additional 3.4 km counterclockwise loop service as shown in map 2.2. The Loop Line started operating in December 2009 (photo 2.2).

To create a more attractive streetscape with less invasive construction work, the connecting rails were laid on an existing car lane, a plan which eliminated the need to acquire new right-of-way, reduced construction time, and achieved more pleasant road design. Three new low-floor trams and matching platforms were also introduced for improved accessibility at each station.



Map 2.2 Centram Network (including Loop Line), Toyama City

Source: Toyama City, *Outline of Project for LRT Networks* [富山市路面電車事業概要], 2020, https://www.city.toyama.toyama.jp/data/open/cnt/3/4162/1/pamphlet_low.pdf?20200807092846.

The completed central loop (map 2.3) increased ridership on the entire tram system and better access to the downtown area. Since the loop line opened, overall tram use in Toyama City is up 19 percent.



Photo 2.2 Centram, Tram Loop Line, Toyama

Source: Toyama City



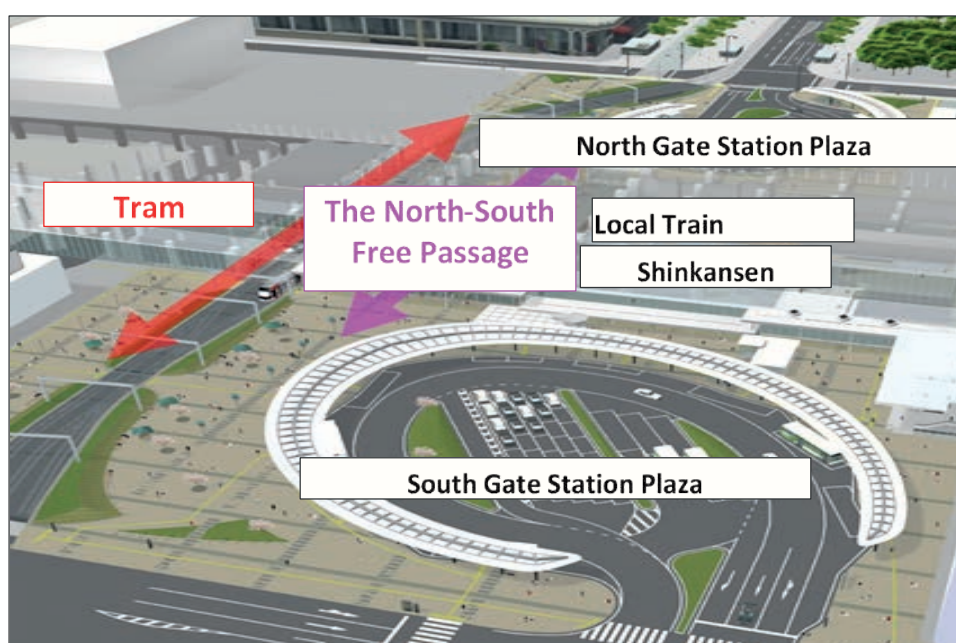
Map 2.3 LRT Network Centering on Toyama Station

Source: Toyama City, “(2020) Building the Toyama Model for City Management with the Compact City Strategy”. Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.

Phase III: Completion of Intermodal Transport Connectivity in Toyama Station

Background

With the opening of the Hokuriku Shinkansen, a high-speed bullet train connecting major cities along the Sea of Japan coast, in 2015 and the corresponding development of an elevated railway at Toyama Station, the North-South connection of tramlines was completed in March 2020. This connection of two LRT systems forms a new network with a total length of about 15 km that centers on Toyama Station (map 2.4).



Map 2.4 North-South Connection at Toyama Station

Source: Toyama City.

Approach

Portram and Centram lines were separated by about 250 meters on both sides of Toyama Station. The connection line was constructed in two stages. In stage 1, the Centram's loop line was extended to the north underneath the elevated section of Toyama Station to coincide with the commencement of the Shinkansen service. In stage 2, Toyama Port Line, located at the northern side, was extended to connect to the loop lines.

Taking advantage of the opportunity arising from this development, Toyama Chihou Railway Co. Ltd., the operator of the Centram, acquired Toyama Light Rail Co. Ltd., the operator of the Portram. The acquisition not only reduced operational costs, but also brought more efficient services and reduced fares to customers. The service integration made systemwide flat fares and new direct services possible. Now customers can take the tram from the northern end of the Portram to the southern ends of the LRT lines without making a transfer or paying additional fares.

This development also marked the first time in Japan that a city tram was constructed to operate right under a Shinkansen station building, creating a convenient transfer experience between the high-speed railway and the regional light rail.

Impacts of the development

Overall ridership has increased dramatically since the introduction of the LRT lines (figure 2.6). Compared with the daily user count of original Toyama Port Line in 2005 (2,266 riders on weekdays, 1,045 on weekends), there has been a 110 percent increase during the weekdays and 230 percent increase on the weekends.

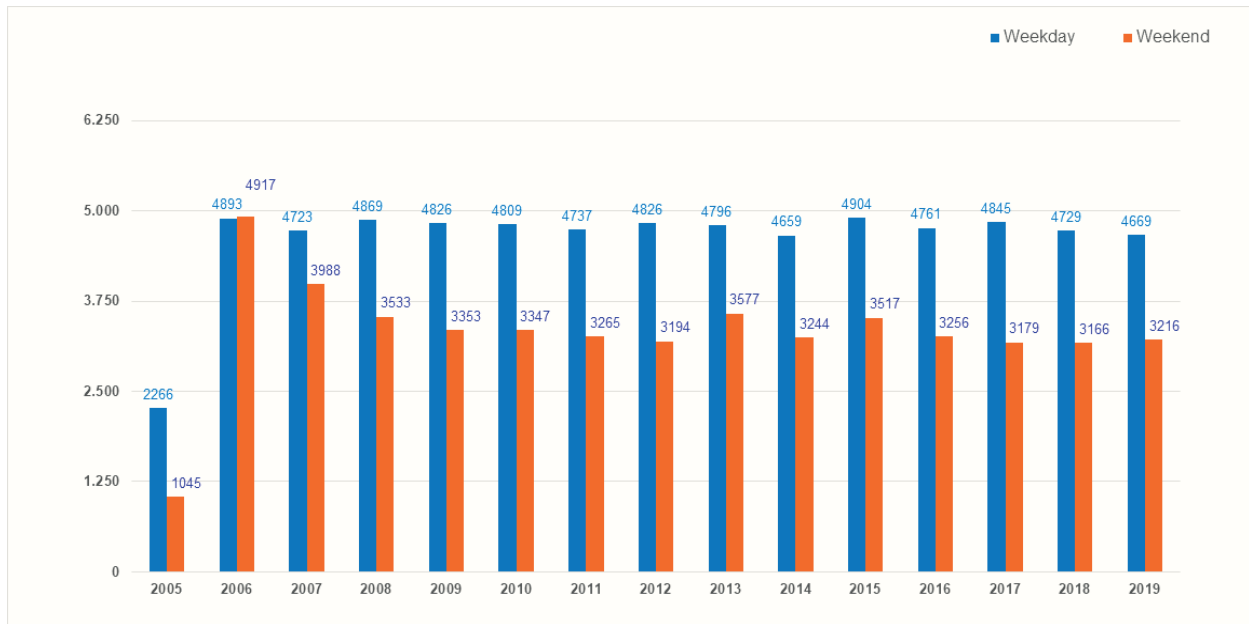


Figure 2.6 Trends in LRT Ridership 2005–19

Source: “Outline of Project for LRT Networks” in Toyama City, *Creating a Compact City Centering on Public Transportation* [公共交通を軸としたコンパクトなまちづくり], 2019.
 Note: LRT = light-rail transit.

A significant ridership increase in the daytime indicates that more people are traveling around downtown by rail. The number of riders between 9 a.m. and 5 p.m. increased by 365 percent from 620 people before LRT and 2,266 people today (figure 2.7). Also notable is the increase in usage by elderly customers (50 years old and older), which increased 266 percent during the same period (figure 2.8).

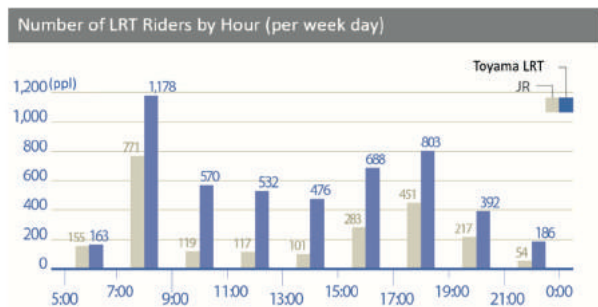


Figure 2.7 LRT Riders by Weekday Hour

Source: “Outline of Project for LRT Networks” in Toyama City, *Creating a Compact City Centering on Public Transportation* [公共交通を軸としたコンパクトなまちづくり], 2019.
 Note: JR = Japan Railways; LRT = light-rail transit.

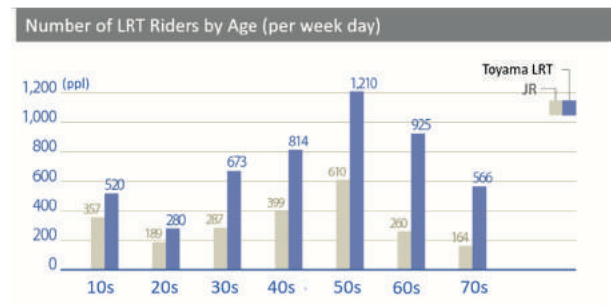


Figure 2.8 Number of LRT Riders by Age

Source: “Outline of Project for LRT Networks” in Toyama City, *Creating a Compact City Centering on Public Transportation* [公共交通を軸としたコンパクトなまちづくり], 2019.
 Note: JR = Japan Railways; LRT = light-rail transit.

The city has also been successful in gradually reducing overall annual CO₂ emissions. They dropped from 4.00 million tons in 2005 to 3.56 million tons in 2017, a 11.4 percent reduction in a little over a decade.

The connection of the north and south LRT lines also marks a historical triumph against one of the biggest urban development challenges for Toyama. The downtown was separated into two parts 100 years ago when the river route was modified to control recurring floods following the development of Toyama Station. The LRT helps link the previously divided areas of the city.

It is expected that transit development will result in a multifaceted improvement in the lifestyle of citizens, including changes in their daily lives and economic activities, the revitalization of commercial activities in the central urban area, and the overall extension of healthier lifestyles for elderly people due to increased opportunities to spend time away from home.

Lessons Learned

Toyama City's LRT development provides the first complete LRT network in Japan and the first public-private tram line, thus demonstrating a leading example of strong partnerships with stakeholders. This strong policy measure also delivers multiple benefits, including

- Increasing public transport ridership and improving accessibility for the elderly,
- Reducing dependence on private cars,
- Revitalizing the central business district (CBD),
- Reducing greenhouse gas (GHG) emissions,
- Reducing city budget costs, and
- Encouraging tourism.

While the project certainly requires strategic subsidies from the government, it is a focal point of the compact city policy of Toyama and part of a holistic and inclusive approach to sustainable urban development and accessibility for all.

Box 2.1:

Financial and Economic Analysis of the Centram LRT Project

Because the Japanese government has not established standard guidelines to evaluate the financial return of public LRT investments, this analysis attempts to illustrate the value of LRT investment over time using a simplified calculation of net present value. The results of the analysis have been prepared to inform readers about what to expect financially when planning similar developments. For this purpose, Centram was chosen. It is important to note that the Centram project was carried out as one of the core strategies within the compact city urban planning approach, and the city's main motivation was aimed more toward catalyzing additional developments in the central city and enhancing the overall values and attractiveness of the city than toward pure financial profitability of the LRT itself. Thus, the ultimate return of the LRT and the host of other urban development projects referenced within this report have been presented in each chapter in the form of social and economic impacts.

Financial Analysis

When looking at the overall financial profitability of the investment (as indicated by the net present value) the result is negative (-2,292), as expected for a project for which project operating revenues are lower than the operating expenditures, which is typical in the urban public transport sector (table 2.1).

However, when the analysis is based on only the city's initial outlay (¥1.7 billion), because the rest came from the central government in a form of grants, the figures improve significantly, resulting in a positive net present value between 15 and 20 years in operation (table 2.2).

This result indicates that in the long run, the project not only returns profit from the LRT operations, but it also promotes financial sustainability as the city, as the majority sponsor, provided a relatively small contribution to the operation. ⁹

Year	2009	2010	2011	2012	2013	2014	2019	2024	2029
Years in Operation	0	1	2	3	4	5	10	15	20
Discount Rate	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cash Flow (MJY)*	-4,262	162	187	133	114	148	144**	144**	144**
Present Value (MJY)*	-4,262	156	173	118	97	122	97	80	66
Net Present Value (MJY)*		-4,106	-3,933	-3,815	-3,718	-3,596	-3,083	-2,649	-2,292

* MJY= Million Japanese Yen
** Estimated

Table 2.1 Net Present Value of Centram Development

Year	2009	2010	2011	2012	2013	2014	2019	2024	2029
Years in Operation	0	1	2	3	4	5	10	15	20
Discount Rate	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cash Flow (MJY)*	-1,700	162	187	133	113	148	144	144	144
Present Value (MJY)*	-1,700	156	173	119	97	121	98	80	66
Net Present Value (MJY)*		-1,544	-1,371	-1,252	-1,155	-1,034	-521**	1,068**	270**
* MJY= Million Japanese Yen ** Future Net Present Value									

Table 2.2 Net Present Value of Centram based on Toyama City's Investment

The following key assumptions have been used in the financial analysis:

- The analysis consolidates cash flows and expenses between Toyama City (owner of all project assets bearing maintenance and future replacement costs) and the transport operator (bearing all operational costs).
- The reference period for the analysis has been set at 20 years on the basis of the average life of assets (usually 25 years for the rail infrastructure and 20 years for the railcars).
- The analysis does not include replacement costs, which typically occur at 25-year intervals.
- The analysis is carried out at constant prices. For cash flows in real terms, a 4 percent discount rate in real terms is used.
- Where there was a lack of actual cashflow or revenue data from the operator (2013 and 2016), the most recent five-year average was applied to the analysis.
- The residual value is calculated on the basis of the residual nondepreciated accounting values.
- A discount rate of 4 percent has been used, as suggested by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japan.
- The numbers have been rounded up to million Japanese yen, where appropriate, to simplify the calculation for this illustration.

Box 2.2:

Pedestrian-Level Project: Cyclocity Bike-Sharing System

Another integration measure undertaken by Toyama was the development of Japan's first full-scale bicycle share scheme, AVIRE. With 23 well-advertised bicycle stations around the city tram (Centram) loop lines, AVIRE provides convenient intermodal connectivity for local public transit users and tourists for their first- and last-mile travel needs as well as leisurely rides around town.

A new public-private partnership was formed between Toyama city and a global service provider, Cyclocity, owned by JCDecaux of France. While Cyclocity provided a suitable business model, the facility design, and ongoing operations and maintenance, the city covered the initial development costs of approximately ¥150 million, which was mostly subsidized by the national Ministry of the Environment.

The growing ridership over the past 10 years has contributed to Toyama's efforts to revitalize the city center, improve accessibility, and reduce CO2 emissions.



Map B2.1.1 Bicycle Share Program and City Tram Loop Line

Source: Toyama City.
Note: LRT = light-rail transit.
Circles with numbers denote bicycle-sharing stations.



Photo B2.1.1 Cyclocity Bike-Sharing System

Source: Toyama City.

Case study ②

REVITALIZING THE CITY CENTER

- Multiple benefits from one policy
- Strong partnerships with stakeholders
- Development of community bonds



Background

In addition to delivering comprehensive public transport improvements to increase accessibility in the CBD, another core component of Toyama's compact city approach is revitalizing the city center to make it a more attractive and active hub. As in other regional cities, Toyama's city center experienced some degradation in the past as the city's population decreased and sprawl to the suburbs grew.

Approach

Therefore, Toyama has taken steps to provide integrated development in the downtown area, including large commercial centers and multipurpose, all-weather plazas, and other key facilities. The structures have been developed along the LRT lines for convenient access. A selection of showpiece examples follows.

- **Grand Plaza**

Opened in 2007, Grand Plaza is an all-weather multipurpose plaza covered with a glass roof and equipped with a large LED screen, surround-sound system, public Wi-Fi, and a portable stage (photo 2.3). The plaza has become the focus point of community-based local events and cultural activities in the central city. Over 100 events are held there every year.



Photo 2.3 Grand Plaza and the Centram Loop Line

Source: Toyama City.

Grand Plaza was established by consolidating a multistory parking facility, a shopping mall, and the city road that runs between the two facilities. It was developed by combining the setbacks of two redevelopment projects. Planners projected that the creation of a plaza in the middle of the parking lot and department store would create a lively place and enhance the prosperity of the area. The old municipal roads were abolished to provide freedom in the use of the open space. The city enacted the “Toyama City Ordinance for Making a Lively Urban Plaza,” and set almost no restrictions on usage, except for violating the public order and morals and for pasting up posters or damaging the facilities.

- **Toyama Glass Art Museum and other facilities**

The Glass Art Museum Development (photo 2.4) was first identified in concept form in 2001 as part of the plan for the “Basic Idea of a Glass Museum of Toyama” and was then later included in the plan for “Toyama City as Glass Town Planning” in 2009. In 2010 the “Basic Concept on Improvement of a Public Service Project in Nishicho Area” was formulated and in 2012 the “Nishicho-Minami District Utility Facility Improvement Plan” was agreed upon. Then, in August 2015, the Toyama Glass Art Museum was opened.

Located a two-minute walk southeast of the Grand Plaza, the museum was designed by Japan’s famed architect Kengo Kuma. A mixed-use building includes the Toyama Glass Art Museum, a municipal library, and a private bank. The largest glass art museum in Japan, the museum exhibits a monumental installation by the American contemporary glass art virtuoso Dale Chihuly.



Photo 2.4 Toyama Glass Art Museum

Source: Toyama City.

The development of glass art in Toyama reflects a longstanding cultural heritage of glass making, which comes from medicine bottles. In the Meiji and Taisho eras, the city excelled in handmade glass medicine bottle manufacturing, boasting the top share of glass medicine bottles in Toyama Prefecture. At the peak, more than 10 glass factories with melting furnaces were located around the Toyama station before World War II. In 1981, Toyama City began working on the creation of a new glass culture, aiming to promote education, art and culture, and industry in the new era. To this end, the museum works with two related facilities to enhance its value:

- ◇ Toyama Institute of Glass Art: Opened in April 1991 as the first public glass education institution in Japan. With their well-equipped facilities and the guidance of top-class instructors, the city works to develop excellent glass artists who will carry on the city's glass culture. To date, more than 540 graduates have been produced, many of whom have been active in various fields of the glass industry in Japan and overseas.
- ◇ Toyama Glass Studio: As a primary facility of the glass industry, a new local industry, the studio trains artists, displays and sells works, and provides glass art production equipment. It also enables citizens and tourists to experience making glass art.

• Transit Mall Social Experiment

Since fiscal year (FY) 2017, Toyama City has implemented its first transit mall social experiment in the LRT section. The project aims to create liveliness in the city center, raise citizens' awareness of existing stores along the city tram loop line, and create an interesting cityscape (photo 2.5).



Photo 2.5 Transit Mall in the City Center

Source: Toyama City, “(2020) Building the Toyama Model for City Management with the Compact City Strategy”. Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.

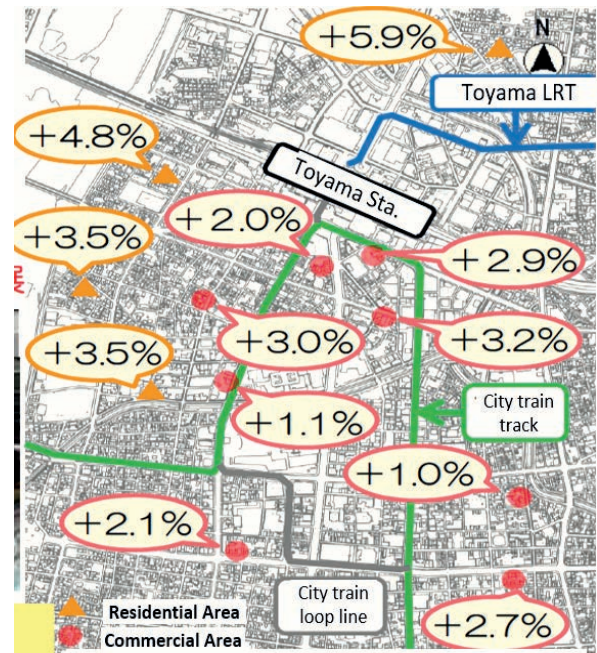
The transit mall is located in the 150m to 290m section of the Major City Street (Nickname: Ote Mall) that runs along the city tram loop line. On the road space where only pedestrians and trams can pass, local merchants cooperate to host the “Etchu Ote Market,” where pedestrians can enjoy exploring 40 to 50 booths handling food, drinks, and miscellaneous goods. The road space is also used for holding children-friendly events and live music where chairs and tables are set up so that visitors can eat and drink and take a break. It is a space where visitors can enjoy the liveliness of the city.

Impact of Development

Increase in Land Value

As these recent injections of development capital produce results, property values in the central city have increased accordingly over the past six years. On average, property values went up about 0.7 percent in the city, while some parts of the central city witnessed increases of as much as 3.2 percent for commercial areas and 5.9 percent for residential areas (map 2.5).

When city officials recently examined the financial viability of the city's financial assistance to the central city redevelopment projects, the analysis concluded that the city's investment will break even in 15 years through increased property tax and other income and that the area will produce positive return in the years that follow. For one project, the city determined that with the increase in property taxes and other income after the project is completed, ¥888,200,000 in city subsidies could be recovered in the 15th year. After that, the increase in taxes over the initial taxable amount would be a net increase (figure 2.9).



Points where land values rose

Map 2.5 Changes in Land Values in Toyama's Central City

Source: Toyama City, "(2020) Building the Toyama Model for City Management with the Compact City Strategy". Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.
Note: LRT = light-rail transit.

Redevelopment Projects are Investments for the Future Case of Commercial Buildings in CBD

Recovering the Investment Costs while Creating Future Income for Citizens

With an Increase in Property Tax etc. after the Project Completion, 888,200,000 Yen City Subsidies Can be Recovered in the 15th Year. After that, Taxable Amount without Property Tax before the Project will be Net Increase.

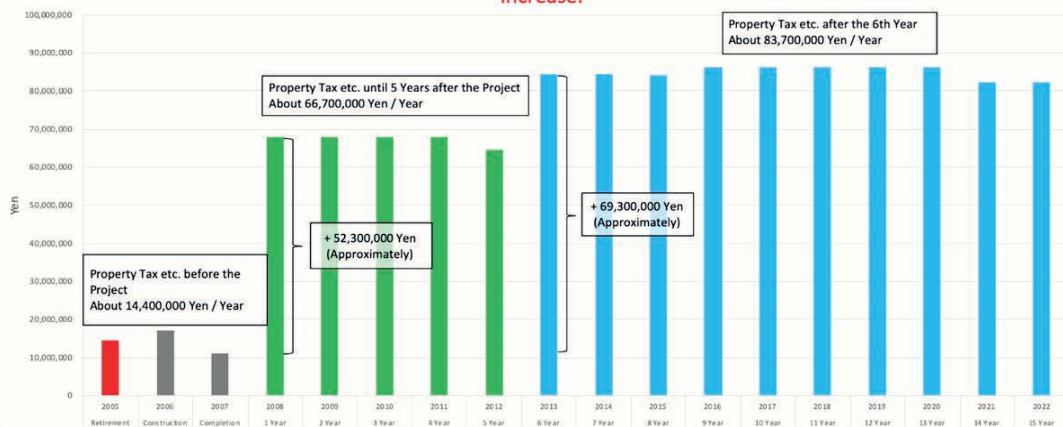


Figure 2.9 Changes in Commercial Building Values in Toyama's Central City

Source: Toyama City, "(2020) Building the Toyama Model for City Management with the Compact City Strategy". Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.

Lessons Learned

Toyama was struggling to attract urban renewal in the city center and so set about its compact city strategies, which included a number of new facilities to help revitalize the city center. The Grand Plaza demonstrates successful partnerships with the private sector and citizens. The glass art museum is rather new, and evaluations are not yet available, but it is based on a strong concept rooted in Toyama’s history and culture, and the facility is appreciated by the citizens of Toyama. These projects also form part of wider proposals for the stimulation of private investment through urban redevelopment projects, as shown in figure 2.10. Toyama has succeeded in inducing investment from the private sector by leading the way with public investment.

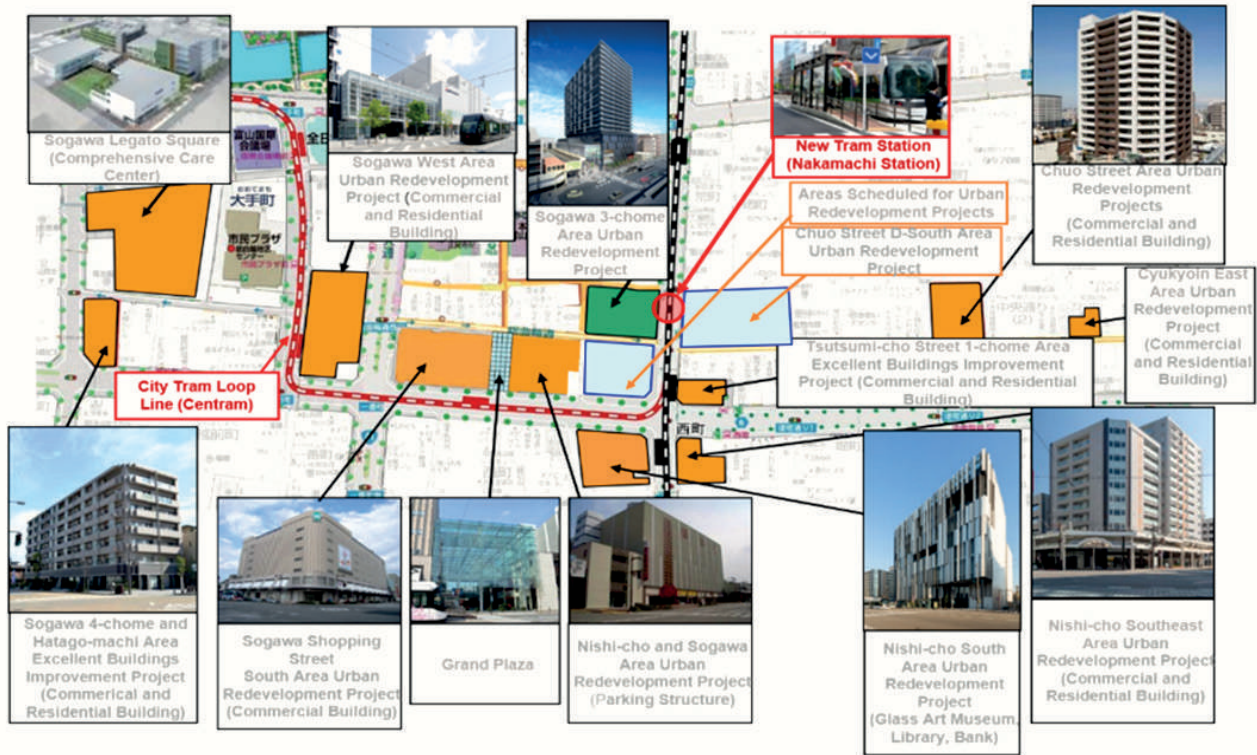


Figure 2.10 Urban Redevelopment Projects for which Private Investment Was Stimulated by Public Investments

Source: Toyama City, “(2020) Building the Toyama Model for City Management with the Compact City Strategy”. Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.

Case study ③

PROMOTION OF RESIDENCE IN THE CITY CENTER AND ALONG PUBLIC TRANSPORT LINES

- Multiple benefits from one policy
- Innovative mindset



Background

As shown in the previous sections, Toyama City has significantly improved public transport systems to help deliver its compact city policies. Rather than strengthening regulations for the realization of compact urban development, the city chose to gradually guide residential construction by increasing the attractiveness around each station. For this reason, the city provides support for the construction and purchase of housing, as well as other assistance, in the city center and along public transport lines in residential promotion districts.

Approach

Community Development Promotion Project 1: Machinaka (City Center Zone) Development

To promote the housing in the downtown area that was set out in the Toyama City comprehensive plan, the city supports business operators who build new high-quality apartment housing and citizens who newly build, purchase, or lease housing. The Machinaka is one such development area in the city center of about 436 hectares and borders Shinonome Street to the east, Azami Street to the south, Keyaki Street to the west, and Hokuriku Shinkansen, Itachi River, Boulevard, and Fugan Canal Park to the north. The Machinaka development (City Center Zone) is also shown in the map 2.9 overleaf.

To accommodate high-quality housing and living in the town center in Machinaka, the city adopted “Housing and Living Environment Guidelines” (HLE Guidelines) and provides support when new housing is acquired according to the guidelines.

The main policies and subsidies targeted at supporting developers/construction companies include:

- **Promoting the construction of apartment housing.** The city assists businesses whose newly built apartment housing conforms to HLE Guidelines. (¥500,000/house]

- **Regional high-quality rental housing improvement expenses subsidy.** In accordance with the certification of regional high-quality rental housing in Toyama City, the subsidy assists developers who develop residential housing for senior citizens with services. (¥1.2 million/house)
- **Support for installation of biological wastewater treatment systems.** Subsidies for disposer drainage systems to be installed in co-houses or detached houses for housing with the certification of the Toyama City Community Planning Housing Promotion Project. (¥50,000/house)
- **Support for facilities that are part of residential buildings.** Machinaka support projects for housing with commercial and other facilities. If the new apartment building or housing conforms to the HLE Guidelines, the program assists those businesses that register at the lower floors and provide medical and welfare facilities. (¥20,000/square meter)
- **Machinaka housing conversion support project.** The project promotes diverting office and commercial use buildings into housing. Funding assist converting unused office and commercial buildings into communal residences that conform to HLE Guidelines. (¥500,000/house)

The main policies and subsidies targeted at supporting citizens who wish to buy or rent include:

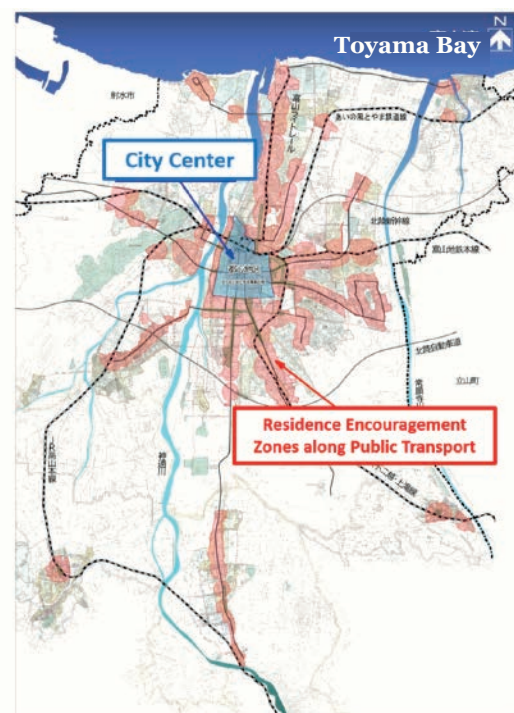
- **Promotion of housing acquisition—Machinaka housing purchase support project.** the project assists those who acquire single-family homes and condominiums of a certain quality inside Machinaka. (¥500,000/house)
- **Rent subsidies for rental housing.** Home rent is subsidized for households moving into rented apartments in the Machinaka area from outside of Machinaka. (¥10,000/month for three years or for university students until graduation)
- **Machinaka reform assistance subsidies.** The program assists those who will acquire secondhand houses in Machinaka and renovate them for themselves, or those who will renovate the house they currently live in to increase the number of households who live there. (¥300,000/house)

Community Development Promotion Project 2: Transit Station Buffer Areas

To promote living in the Residential Promotion Along Public Transport District (RPPT) stated in the city basic plan, the city supports business operators who build new high-quality apartment housing and citizens who build and purchase new houses. RPPT districts are located within a 500-meter radius of rail/tram stations, within 300-meters of bus stops on high-frequency corridors. The city provides citizens with assistance when they acquire new houses that conform to “Housing along the public transport/living environment guidelines” for housing along public transport corridors.

The main policies and subsidies targeted at supporting developers/construction companies include:

- **Promotion of construction of joint housing along a public transport project.** The city will assist businesses building new apartment housing that conform to “Housing along the public transport / living environment guidelines.” (¥350,000/house)
- **Area high-quality rental housing development subsidy.** With approval within the supply plan for the area’s high-quality rental housing in Toyama City, the city will assist those who build new housing for senior citizens with services in RPPT districts. (¥700,000/house)



Map 2.6 Residence Encouragement Zones

Source: Toyama City.

- **Promotion of housing land development project along public transport.** The city will assist people who develop a high-quality residential section in RPPT districts. (¥500,000/development)

The main policies and subsidies targeted at supporting citizens who wish to buy or rent (map 2.6) include:

- **Housing acquisition support project.** The project assists citizens who build or acquire qualified privately owned houses or condominiums in the residential area along public transport. (¥300,000/unit, ¥100,000 additional assistance when the citizen moves from outside the area or when the house is occupied by two generations of a family.)
- **Renovation support project for houses along the public transport.** The city supports citizens who acquire and settle in second-hand housing in the residential area along the public transport lines or who renovate their houses along the public transport lines to increase the number of households. (¥300,000/house)

Lessons Learned

Compact city–related residential policies have provided citizens with increased opportunities to live in the central areas with the many subsidy options. The subsidies are a unique approach for a Japanese city and demonstrate the innovative mindset of Toyama. The results from Toyama City show a favorable population shift to the city center and to transport corridors. As a result, the population, including natural fluctuations (birth-death), has been increasing in recent years (figures 2.11 and 2.12).¹⁰

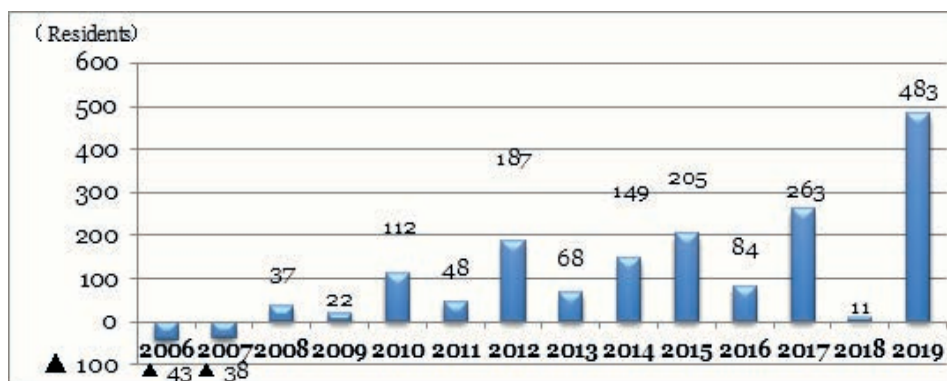


Figure 2.11 Population Shift Back into the City Center

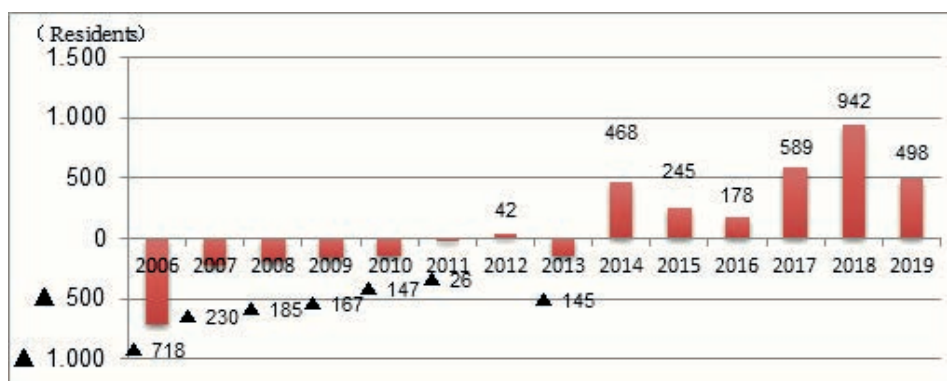


Figure 2.12 Population Shift to Transport Corridors

Source: Toyama City, “(2020) Building the Toyama Model for City Management with the Compact City Strategy”. Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.

Case study 4

RIDER INCENTIVE PROGRAMS

- Multiple benefits from one policy
- Innovative mindset



Background

Rider incentive programs have been implemented as a multi-layered measure to create opportunities for elderly people to go out, socialize, and enjoy urban activities which improves vitality, commercial activities and the use of transit systems.

Approach

Senior discount pass. Seniors 65 years and older living in Toyama can ride any public transport for ¥100 (about US\$1) per ride.

- Pass holders can also receive small gifts or discounts at participating shops (about 70 shops) in the city center by showing the pass.
- Pass holders can use municipal facilities such as museums and gyms at half price or free of charge.

Free tickets with grandchildren. For any grandparents in Toyama and surrounding cities traveling with grandchildren (or great-grandchildren) to visit museums and other facilities, the entrance fee will be free of charge (figure 2.13).

Target area: As of 2019, Toyama City collaborates with 12 other cities in Toyama Prefecture, including Tonami City, Oyabe City, Nanto City, Imizu City, Takaoka City, Himi City, Namerikawa City, Funahashi Village, Kamiichi Town, Tateyama Town, Uozu City, and Kurobe City.

Target facilities: In cooperation with these municipalities, the program has been widely implemented at 59 facilities, including 14 facilities in Toyama, such as the Toyama Science Museum and the Toyama Glass Art Museum.



Figure 2.13 Poster to Promote the Free Tickets with Grandchildren Program

Source: Toyama City, *Creating a Compact City Centering on Public Transportation* [公共交通を軸としたコンパクトなまちづくり], 2019.

Lessons Learned

The project has various benefits, including fostering family ties, promoting intergenerational communication, increasing opportunities for the elderly to go out, and revitalizing the city center. The project has gained popularity and the target facilities increased the number of visitors from 616,529 in 2011 (before the project was introduced) to 642,183 in 2018, an increase of about 4.2 percent. The numbers include 33,227 grandparents and grandchildren.¹¹

The city also analyzed the latest status of elderly people who were 75 years or older to see how the use of senior discount passes related to changes in primary nursing care level between 2011 and 2018. The results were clear. Elderly people who have continued to use their senior discount pass have maintained their nursing care status (the level of nursing care requirement) compared with elderly people who have never used them (table 2.3). Actively going out using the commuter passes has been linked to preventive care for users.

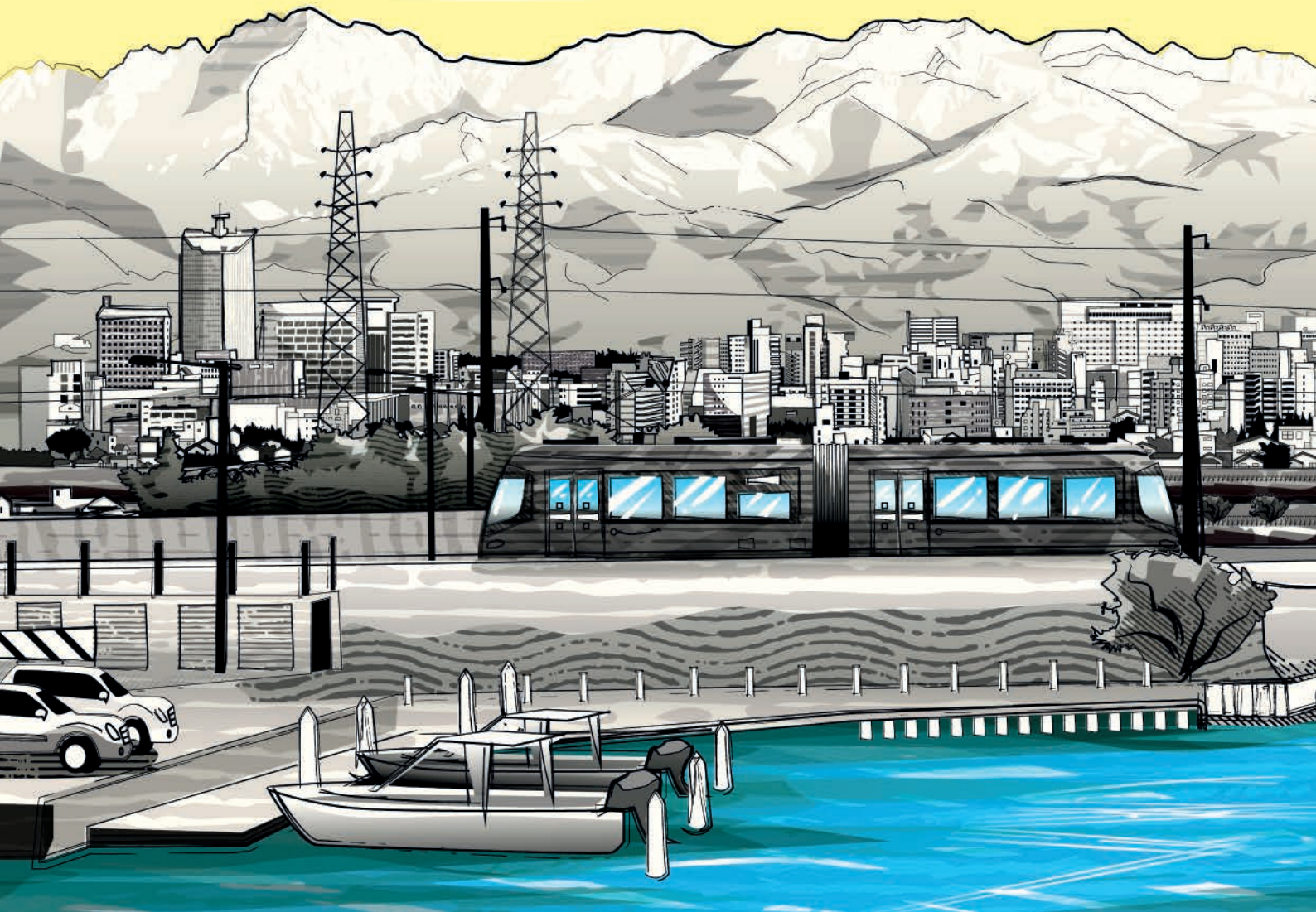
	Continued use	No use
Total (people)	3,571	16,544
Standard nursing	70.6% (2,521)	44.6% (7,374)
Critical care	28.8% (1,028)	52.8% (8,743)

Table 2.3 Number of Senior Discount Pass Users by Care Levels

Source: Interviews with city of Toyama officials.

3

Inclusive Community Planning



Background and Challenges

Aging Population and Increased Levels of Nursing Care

Forecasts in Japan estimate that by 2025 one in three people will be aged 65 or over, one in five will be over 75, and one in five people who are aged 65 or over will have dementia. In addition, single elderly, elderly couple, and elderly parents-only households are expected to increase. Furthermore, communities need regional care systems that provide holistic care, including nursing care, medical care, care prevention, and living support. Reflecting the national picture, Toyama currently faces an aging and declining population.

The proportion of the population aged 65 or over is predicted to increase from 29 percent in 2015 to 40 percent in 2045. The aging population also means increased health care costs (figure 3.1). In fact, nursing care costs in Toyama increased by 45 percent between 2007 and 2018.

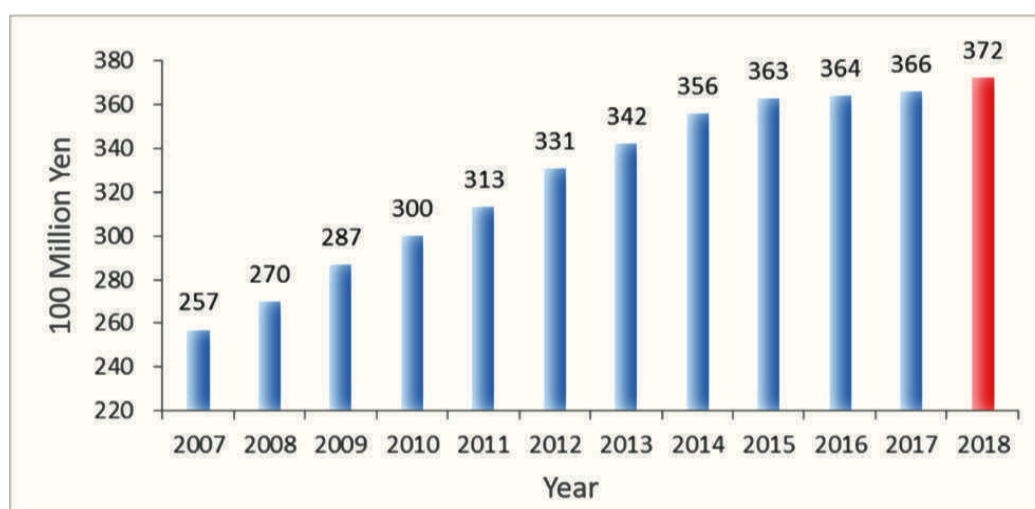


Figure 3.1 Expenditures for Long-Term Care

Source: Toyama City, *Creating a Compact City Centering on Public Transportation* [公共交通を軸としたコンパクトなまちづくり], 2019.

Change in Childcare Environment

Further enhancement of child-rearing support is required to respond to changes in the environment surrounding families with young children, such as the advancement of the nuclear family and the increase in dual-income households. The issues include providing childcare services to meet the diversification of working styles and lifestyles, developing facilities to secure childcare services, and securing childcare workers. Meanwhile, as the nationwide concern over child abuse increases, it is necessary to progress preventive measures, to make efforts to detect and promptly deal with abuse, and to enhance support for abusing children and their families.

Accessibility and Mobility

In the context of an aging and declining population, as well as the low population density of Toyama, accessibility for all—especially for senior citizens—has been a longstanding concern for the city. Furthermore, the past deterioration of public transport services and a growing number of senior citizens with reduced accessibility, as well as a declining CBD, urban sprawl and higher administrative costs were compounding factors.

Accessibility was therefore a key policy focus of Toyama's compact city development. Toyama's compact urban form contributes to enhanced mobility, accessibility, and the independence of senior citizens. Toyama has delivered accessibility by improving public transport, revitalizing the downtown area, and encouraging residence along public transport corridors.

Strategies Adopted

Introduction

Toyama City has implemented a comprehensive and holistic array of strategies for more inclusive community planning, including a range of innovative solutions to assist an aging population and to address health and welfare issues. This chapter provides an overview, reflecting the 10-Year Plan 2017–26, which reaffirmed and developed these key strategies. Specific case study examples are included in the following sections.

Preventive Measures to Reduce Nursing Care Needs

The overarching goal is to reduce the number of older people needing nursing care and to encourage physical mobility. This is being achieved through the provision of preventive care facilities in the downtown area as part of wider care management and local community care networks.

Welfare and Community Facilities

Toyama City has implemented a variety of unique measures to improve welfare and revitalize local communities, with the aim of realizing a safe and inclusive society for all. The city has the highest level of participation in senior citizen clubs, at 32 percent of senior citizens over 60 years old, among core cities in Japan.

Furthermore, the city has made strong efforts to help facilitate and foster intergenerational exchange and nurture family bonds through innovative community activities and initiatives. The city is also training individuals to promote nursing care prevention as well as supporting projects to maintain and strengthen local communities.

Promotion of Physical Health Awareness

The city helps raise awareness of health management by providing various types of health information and health consultation so that citizens can improve their lifestyle habits and maintain and promote their health. The city is carrying out such promotion in close coordination with citizens and businesses.

Promotion of Mental Health Awareness

Related organizations from areas such as health, medical care, welfare, labor, and education collaborate to tackle mental health measures in communities, workplaces, and schools.

Improving childcare and making working mothers' lives easier

Toyama has numerous strategies to aid in childcare, including

- Development and improvement of nurseries;
- Provision of diverse childcare services;
- Enhancement of child rearing support;
- Improvement of child health development;
- Maintenance of children's playgrounds;
- Support for single-parent families;
- Improvement of the child abuse prevention system;
- Enhancement of an environment that supports people with difficulties with pregnancy, childbirth, and child rearing; and
- Support for balancing child rearing and work.

For more than a decade, Toyama has worked to enhance programs for its citizens. Highlights of the efforts in inclusive community planning can be seen in figure 3.2.

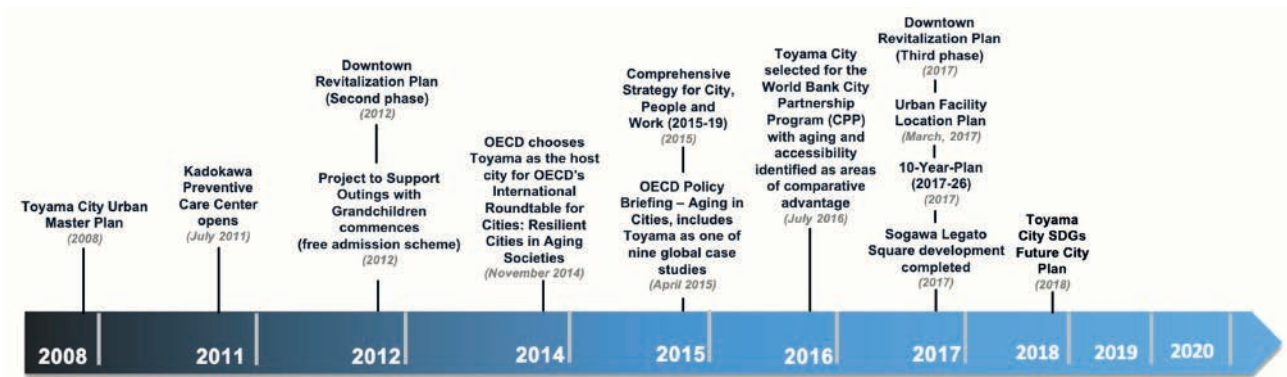


Figure 3.2 Toyama Urban Development Timeline: Inclusive Community Planning

Source: Toyama City.

Note: OECD = Organisation for Economic Co-operation and Development;
SDGs = sustainable development goals.

CASE STUDIES AND LESSONS LEARNED

Case study ①

ESTABLISHING A DOWNTOWN COMMUNITY CARE CENTER (SOGAWA LEGATO SQUARE)

- Strong partnerships with private sector
- Multiple benefits from one policy
- Innovative mindset
- Development of community bonds



Background

In the context of the aging population in Toyama and under the framework of a comprehensive set of policies for providing welfare, inclusive community, and compact city planning, a number of elementary schools that had become surplus have now been repurposed. One of the highlights is the Sogawa Legato Square development, completed in 2017, which provides a strong example of establishing an inclusive health and care center in the downtown area through public-private partnership (PPP) collaboration. Toyama delivered this model urban community care center hub using the site of one of the closed elementary schools.

Approach

Toyama City aimed to create a fully inclusive medical, health, and welfare hub where diverse generations from infants to disabled people and the elderly could live with peace of mind. To this end, the city repurposed the former site of Sougawa Elementary School and established a public facility—the Machinaka General Care Center—as well as a number of other private sector facilities as part of the development. The Sogawa Legato Square development (Figure 3.4) now delivers a synergetic effect between public and private facilities to provide comprehensive community care for local senior citizens and younger generations. Elements of the development are the following:

- **Machinaka General Care Center**

This is the focal point of the Legato Square development, which is dedicated to developing businesses to promote childcare support and home medical care and to foster local communities (by increasing social capital) and to promote the development of a healthy community where all local citizens including infants, the elderly, and people with disabilities can live in peace and health. The center is unique in that it has delivered two new programs that are a first in Japan for a public entity: childcare program for sick children and postpartum care support program.

1st floor	<ul style="list-style-type: none"> ▪ Machinaka (neighborhood community) salon ▪ Regional collaboration room ▪ Child Development Support Office ▪ Patio (square)
2nd floor	<ul style="list-style-type: none"> ▪ Childcare room for sick children ▪ Machinaka clinic ▪ Medical care collaboration room ▪ Conference room
3rd floor	<ul style="list-style-type: none"> ▪ Postpartum care support room

Figure 3.3 Facilities in Machinaka General Care Center

Source: Toyama City.

• **Private Sector**

The PPP development includes four active private sector facilities that won the bid to provide services under Toyama’s concept for the welfare and health neighborhood renewal plan:

- ◇ **School corporation, Aoike Gakuen:** Aoike Gakuen is a vocational school that cultivates specialists for medical welfare, such as physical therapists and specialists such as cooks. More than 600 students now attend the school. The school is open to the community, with some students studying confectionery, cooking, and restaurant operation.
- ◇ **Gunze Sports Club:** This club promotes intergenerational exchanges through sports, creating a sense of living for the elderly and improving health awareness for all.
- ◇ **Barzer:** Barzer is a restaurant that offers Italian cuisine with seasonal ingredients from Toyama. It is run by a major pharmaceutical company in the city for the purpose of promoting physical and mental health through food and providing a quality lifestyle.
- ◇ **Convenience store and pharmacy:** The convenience store and dispensing pharmacy were installed to support the healthy lives of local residents.

• **Other facilities**

The development maximizes the benefits of the Toyama City Medical Association Nursing School, which had already been planned at the site. It is well aligned with the overall concept and goals.

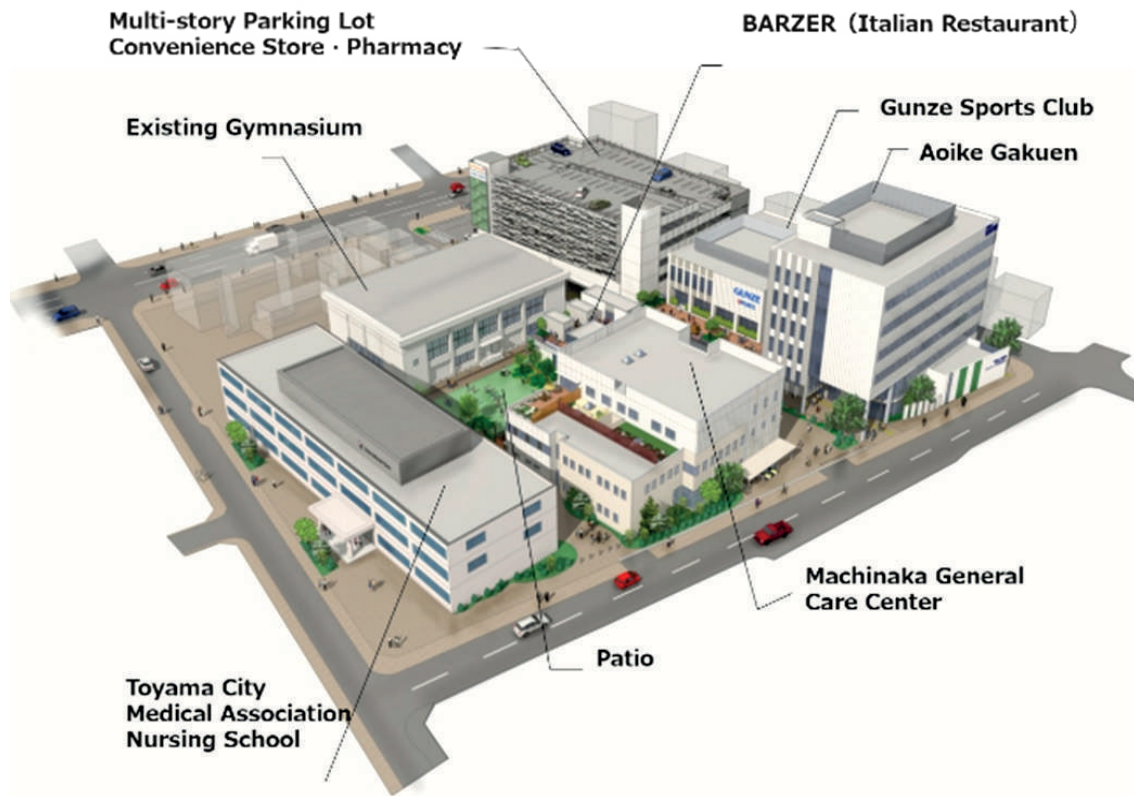


Figure 3.4 Legato Square Development

Source: Toyama City.

Lessons Learned

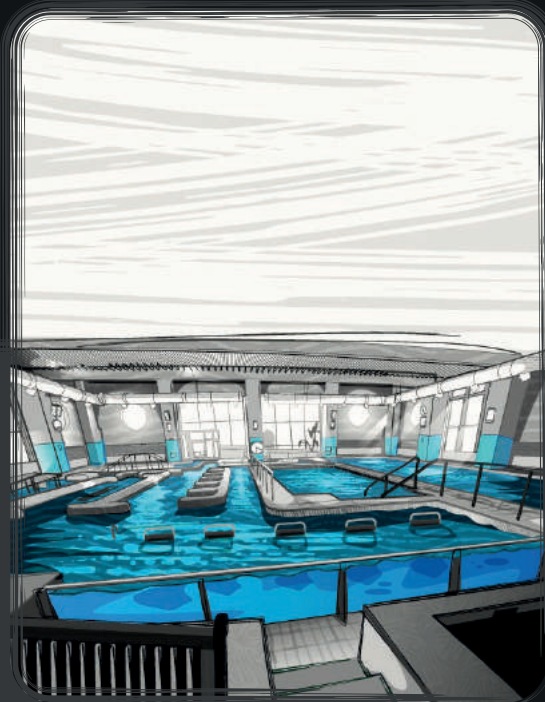
From project inception, strong partnerships between the public and private sector developed to deliver a comprehensive facility to promote citizens' welfare and healthy lifestyles. As a result, multiple benefits and synergies are emerging across social welfare, health, mobility, community, and intergenerational bonds. Bringing together facilities with similar goals has enabled mutually beneficial collaborations. For example, the sports club and pharmaceutical company are helping the Machinaka General Care Center provide sports education and disability prevention. The project works toward breaking down silos and spanning not only the health and welfare sectors but compact city planning through infill development.

CASE STUDIES AND LESSONS LEARNED

Case study ②

KADOKAWA PREVENTIVE CARE CENTER

- Innovative mindset
- Strong partnerships with stakeholders
- Multiple benefits from one policy
- Development of community bonds



Background

Also aligned with Toyama City's comprehensive framework of policies to provide welfare, preventive care, and compact city planning, the Kadokawa Preventive Care Center opened in July 2011 and became one of Japan's first preventive care facilities and the first using hot spring water (photo 3.1).



Photo 3.1 Kadokawa Preventative Care Center – Aquakinetik Therapy

Source: Toyama City.

Located in the core urban area, the center offers accessible health and community-oriented activities, many of which are focused on preventive care, including activities to stabilize or improve the mobility of people in their later years. The overarching goal is to reduce the number of older people needing nursing care and to encourage physical mobility.

Approach

The Kadokawa Preventive Care Center was constructed on the former site of Hoshii-cho Elementary School in 2011. Leading up to the development, donations for the center were received from citizens seeking to support the welfare of seniors in the city. This effort helped build momentum for a PPP project. The center was built through a combination of private donations and funds from the Toyama Department of Welfare, totaling US\$17.69 million (¥1,943 million), with the center then operated and managed by the private sector.

The center is an innovative preventive care facility that uses spring water for hydrotherapy, employs resident doctors and exercise experts, and develops unique exercise programs for the elderly. A variety of programs are offered, including aquakinetetic therapy and spa therapy using hot spring water, physical therapy and other fitness activities, and regular medical checkups by specialized health care practitioners.

Before citizens join the center, they are offered a “Quality of Life (QOL) Tour” to introduce the care prevention program that combines various activities after measuring their physical condition. The center records the users’ athletic performance continuously to monitor care prevention effects. The programs seek to increase the mobility of the aging population and make clients more active. In addition, the center provides lifestyle support services and community activities to give their clients increased confidence and a better quality of life and to harness community bonds.

Lessons Learned

The project demonstrates the city’s innovative mindset and multiple benefits from one policy through the repurposing of a school that was no longer required in the context of the aging population. The project also provides a unique health and community facility in Japan that includes private sector involvement and is located centrally in the city as part of the compact city policy.

More strategically, and as set out in the second Toyama’s Environmental Future City Plan (2017), the center is not a standalone measure. The center contributes to a strategy to deliver preventive care through wider local networks. The strategy, as seen figure 3.5, includes important dialogue, information sharing, and synergies with the municipal government, citizens, and Comprehensive Community Support Centers (of which the city now has 32—twice average in core cities of 15).

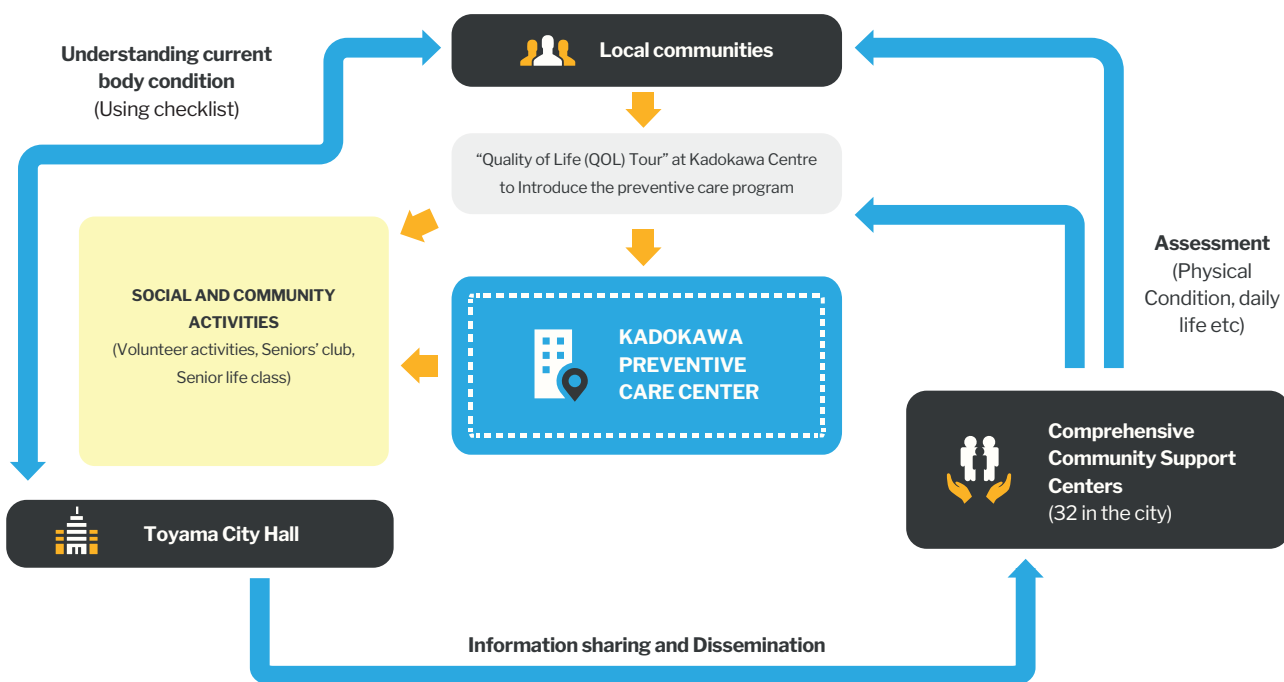


Figure 3.5: Preventive Care Through Local Network

Source: World Bank figure based on interviews with Toyama City officials.

Case study ③

CITY PLANNING TO FOSTER INTERGENERATIONAL BONDS

- Development of community bonds
- Strong partnerships with stakeholders



Background

In the context of an aging population, this case study concerns the small-scale city efforts to help facilitate and foster intergenerational exchange and nurture family bonds through innovative community activities and initiatives.

Approach

Toyama has championed local community initiatives and projects to inspire all generations, including senior citizens, to participate by providing community places and activities that foster social bonds. Some example initiatives include the following:

- **Community Garden Project**

Traditionally, it was common to grow flowers but not vegetables in the flower beds of parks. However, planners had the idea that growing vegetables in the parks would extend healthy lives for the elderly and contribute to the development of local communities. Thus, in a new way of using the park that suits the times, the city is instituting one of the few attempts nationwide to grow not only flowers but also vegetables in the park flower beds.

As of 2019, the project has been implemented in seven parks (photo 3.2). Cultivating potatoes and sweet potatoes and sharing the joy of harvesting with children motivate the elderly to go outside and gain a new purpose in life. Many of them are voluntarily managing the park gardens. The city supports both soft and hard work by consulting on vegetable cultivation and lending out small-sized cultivators for harvesting and baked sweet potato makers for roasting the products.



Photo 3.2 Toyama Community Garden Project

Source: Toyama City.

- **Project to Support Outings with Grandchildren**

A second example involves a project to encourage and facilitate opportunities for multigenerational social outings. The scheme provides free admission into a range of facilities across the city for senior citizens when visiting with their grandchildren or great-grandchildren. This program offers multiple benefits including nurturing family bonds, encouraging intergenerational communication, offering increased opportunities for senior citizens to be mobile, and contributing to revitalizing the city center.

As of 2019, the program is offered in 13 cities, towns, and villages: Toyama City, Tonami City, Oyabe City, Nanto City, Imizu City, Takaoka City, Himi City, Namerikawa City, Funahashi Village, Kamiichi Town, Tateyama Town, Uozu City, and Kurobe City. The program offers admission to 59 facilities, including 14 facilities in Toyama City, including the Toyama Science Museum and Toyama Glass Art Museum.

The project has proved popular. Toyama City statistics for 12 facilities in the program show that the number of visitors increased by 4.2 percent from 616,529 in 2011 (before the scheme) to 642,183 in 2018, which included 33,227 grandparents and grandchildren.

- **Walkable Zone Community Workshops**

The city's strategy for locating key community care facilities in the city center, including Machinaka General Care Center and Kadokawa Preventive Care Center, enables the facilities to act as hubs for walking and mobility programs that offer outings and social interaction.

Walkable zone community workshops are walking tours of the city center for senior citizens that are led by students, mainly from the University of Toyama. In addition to providing opportunities for mobility and intergenerational social activity, the program offers "Machinaka walking carts" to enable less mobile senior citizens to participate.

- **Retrofitting Financial Support (suburbs and mountainous areas).**

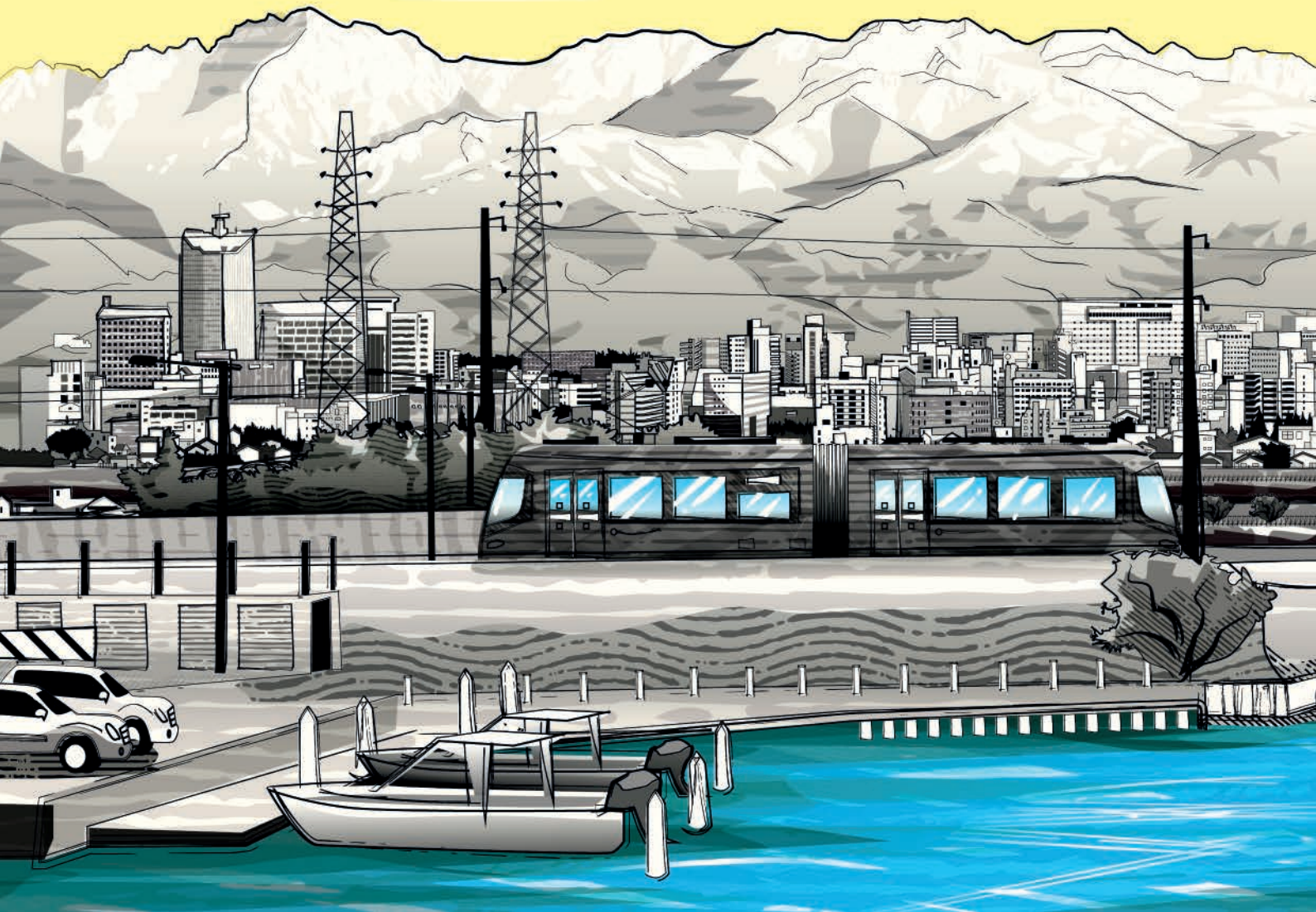
This city program encourages citizens to retrofit their old houses to enable them to live with their children and grandchildren. The subsidy targets the entire city, excluding Machinaka and areas along public transport. The program subsidizes one-half of the cost required for remodeling, up to ¥3-million.

Lessons Learned

These small-scale local community initiatives form part of wider measures undertaken by the city to address issues with an aging population and create a compact and inclusive city. They reflect the innovative mindset of the city and demonstrate good examples of practical measures to help facilitate the development of community bonds, partnerships with local communities, and intergenerational communication and increased mobility.

4

Disaster Risk Management (Flood Risk Management)



Background and Challenges

Situated in a landscape that tests the limits of human ingenuity, Toyama City faces the challenge of increasing the resilience of the land, infrastructure, and community. The key lessons in this chapter are diverse but can be summarized in one simple phrase: the need to cultivate partnership and resourcefulness at every level. The biggest issue posed by Toyama’s location was how to safely release large amounts of water, sand, and debris from the mountains into the Toyama Bay when storms or earthquakes strike. To solve this age-old problem, the national, prefectural, and city governments as well as local associations and volunteer groups at the neighborhood-level formed various types of partnership that made successful disaster risk management in Toyama possible. At the national level, various ministries worked together to create a vision of a nation that is more resilient against natural disasters. Interrelated strategies to strengthen preventive infrastructure include building a series of sand trapping dams in steep valleys in Tateyama and other mountain ranges.

As mentioned in earlier chapters, the national government, Toyama prefecture, and Toyama City worked together to straighten the major rivers to prevent flooding in the urban areas around Toyama Station. And to implement national resilience strategies at the local level, Toyama City reached out to targeted communities to involve local people in disaster preparedness and to elevate local leaders’ survival and relief skills, so they could train others.

Topography and Geography

Flood control and flood risk management are critical challenges for Toyama. Historically, flooding has been the most common disaster in Toyama, principally because of the city’s topography and geography. Toyama is located between the Sea of Japan and the crest of the Northern Japan Alps on an alluvial plain formed by the Jinzu and Joganji rivers (map 4.1). With steep gradients over loose volcanic soils, both rivers often caused flooding. A number of branch rivers from the hilly areas above the plain have been controlled by over a hundred years of continuous river engineering, but they still exist as channels.

In fact, Toyama has some of the world’s steepest rivers behind Northern Japan Alps (figure 4.1), namely, the Joganji River and the Jinzu River.



Map 4.1 Toyama’s Jinzu and Joganji Rivers

Source: Toyama City.

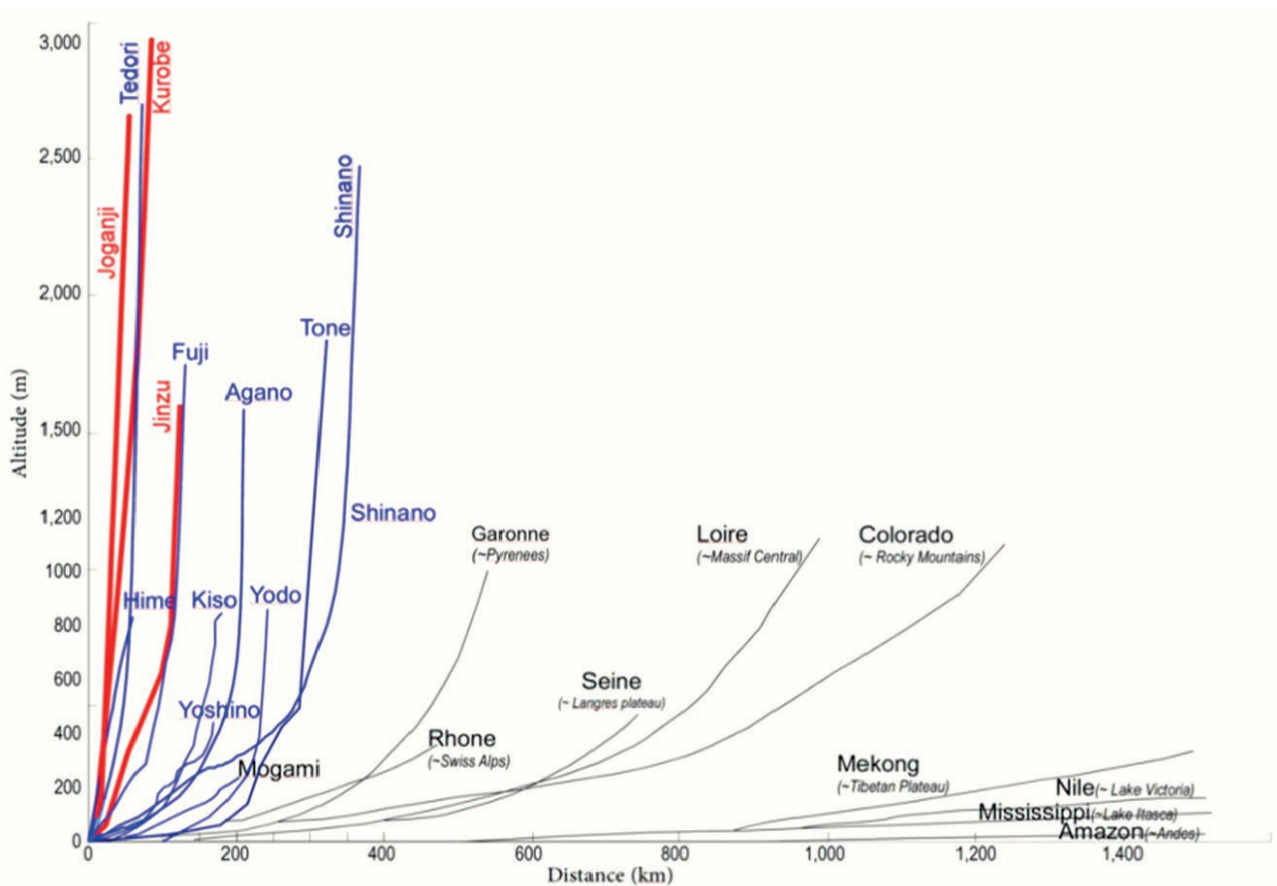
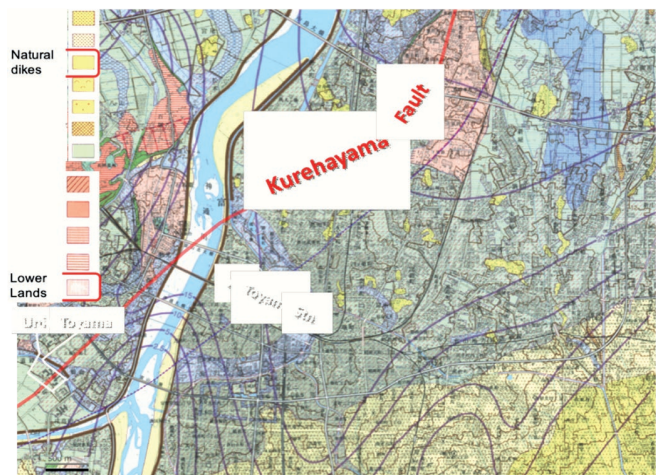


Figure 4.1 Steepest Rivers in the World

Source: Provided by Akira Takeuchi, emeritus professor of Toyama University, for the first edition of this report.

Toyama City includes several active faults, such as the Kurehayama fault, with additional faults in the surrounding area (map 4.2). These faults have an estimated potential to cause earthquakes of up to 7 degrees magnitude, which would cause severe damage to people and assets. Toyama has not experienced large-scale earthquakes over the past one hundred and few decades and is therefore categorized as one of the safest cities in Japan. This perception could hinder communities from taking effective action to prepare for earthquakes, and therefore Toyama has identified this complacency as an important consideration in resilience planning and community engagement.



Map 4.2 Kurehayama Fault Line and Land Conditions

Source: Provided by Akira Takeuchi, emeritus professor of Toyama University, for the first edition of this report.

Joganji River and the Sabo Dam

The headwaters of the Joganji River begin at 2,662 meters on Mount Kitanomata, and from there it flows through an alluvial fan, the Toyama Plain, into Toyama Bay. The river's length is 56 kilometers and the basin area is 368 square kilometers with a bed gradient of 1/30 in the mountain area and 1/100 in the plains. It is one of the leading torrential rivers in Japan, having caused frequent flooding in the past.

In 1858, the Ansei Earthquake with a magnitude of 7.3 struck the mountains above Toyama and caused Mount Otombi and Mount Kotombi to collapse, damming the Joganji River in the Tateyama Caldera with 410 million cubic meters of debris. When the earthquake dam broke, a devastating flood occurred, destroying most villages and Toyama castle town on the plain.

Although Toyama City and the neighboring villages suffered devastating damage in the event, the tragedy subsequently harnessed a longstanding legacy of resilience in the citizens. As a direct response, the Shiraiwa Sabo Dam (photo 4.1) was constructed in 1939 to prevent further debris-laden flooding. Approximately 200 million cubic meters of sediment still remain in the Joganji River watershed. Therefore, Sabo Dam construction continues.

Knowledge transfer of Sabo technology and best practices has since disseminated from Japan across the world. More than 1,000 Japanese Sabo engineers have been engaged in international technical cooperation projects since 1967.

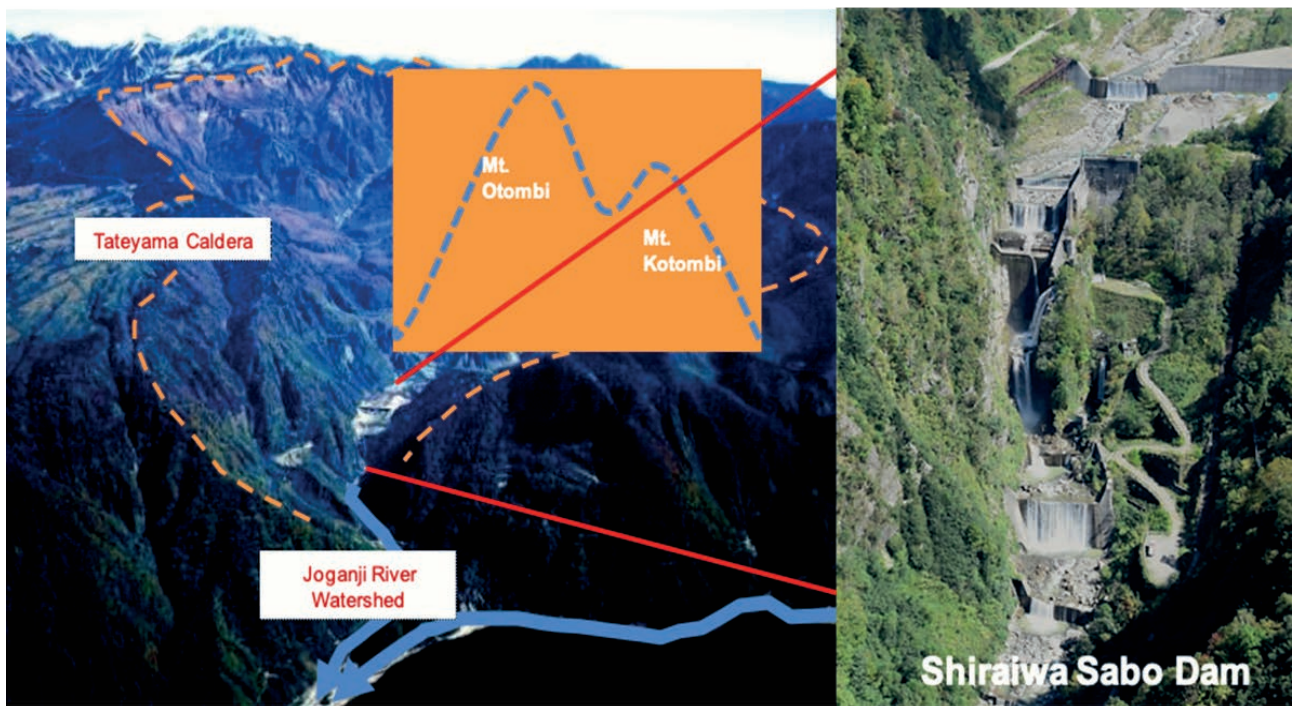


Photo 4.1 Shiraiwa Sabo Dam

Source: Toyama City.

Jinzu River

The Jinzu River flows directly through downtown Toyama and into Toyama Bay. The basin area is approximately 2,700 square kilometers in size, with the length of the main stream being 120 kilometers. The Jinzu's headwaters are at 1,626 meters, and the river has a bed gradient of about 1/20 in the mountains. Torrential waters from the mountain come to a more gentle gradient of about 1/250 on the plain, but the course of the river is winding, causing frequent flooding. A major bend in the river that had caused frequent downtown flooding was straightened between 1901 and 1920 (photo 4.2).

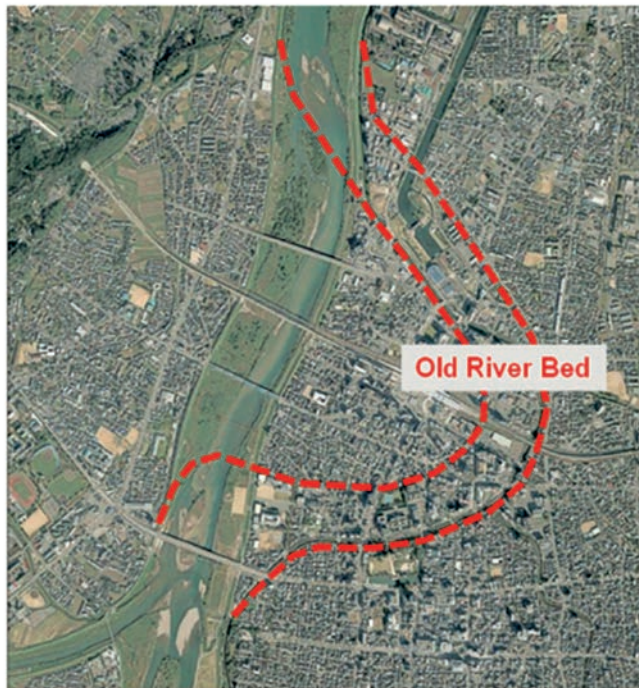


Photo 4.2 Straightening the Jinzu River in the Downtown

Source: Toyama City.

Increased Frequency of Torrential Rain

In recent years the frequency of torrential rains has increased nationwide. The amount of rainfall per hour can reach 100 millimeters. Climate change has contributed to the increased frequency of torrential rains, which cause flooding of both medium and small rivers and overwhelm city center urban drainage.

Combination of Shocks

Combinations of shocks make the prefecture-wide response, operation, and coordination complex—for example, functions such as information gathering and circulation, evacuation, and relief work. Furthermore, in addition to the physical shocks, social risks such as declining population, declining birthrate, and an aging population, as well as aging of social capital (lagging earthquake preparedness) can be further compounded when combined in the disaster risk discussion. For this reason, it is necessary to strengthen the city from aspects of both hard and soft infrastructure across all sectors.

Strategies Adopted

Introduction

Following the historic physical measures for flood control, such as the Sabo Dam and realignment of the Jinzu River, formulation of Toyama City Regional Disaster Prevention Plan in 2006, as well as severe flooding in 2008, helped pave the way for comprehensive hard and soft strategies.

As will be illustrated in the following case studies, Toyama has adopted a range of approaches that include to flood control, including

- Infrastructure investment, such as the Matsukawa rainwater storage facility;
- Maximizing the city's assets, such as flood control using storage in paddy fields;
- Piloting innovative systems, including rainwater management and flood forecasting technology;
- Strong focus on community-level partnerships and engagement, such as the initiatives of the Toyama prefectural Association of Disaster Prevention Officers (ADPO).

Background on Toyama City National Resilience Regional Plan

In 2013, the Japanese government set out the “Basic Law for National Resilience to Contribute to Disaster Prevention and Reduction and Realization of a Strongly Flexible Life of the People.” It was a comprehensive and systematic set of measures for “toughening” the country and promoting disaster resilience. In 2014, the Cabinet set out the Basic Plan of toughening of the land, which guides the plan of the relevant regions (Land Resilience Regional Plan). To strengthen the country’s land, both national and local governments must promote comprehensive measures.

Toyama City Land Resilience Regional Plan

In 2017, the Toyama City Land Resilience Regional Plan (LRRP) was formulated under Article 13 of the Basic Law for Strengthening the National Land, and through coordination and harmony with Toyama City’s comprehensive plan. The LRRP directs the city to include resilience comprehensively and systematically as a guideline for each sectoral plan.

The Toyama City Regional Disaster Prevention Plan defines disaster prevention measures for the city and was formulated from the Basic Law of Disaster Countermeasures. The plan sets out how to implement preventive measures, emergency measures, and recovery measures for each disaster risk, such as wind, flood, earthquake, or tsunami.

Unlike the Regional Disaster Prevention Plan, the LRRP does not set individual measures for each disaster risk but targets holistic preventive measures, looking at all risks. It is a comprehensive guideline on “toughening” the city as a whole, through such areas as administrative functions, local society, the regional economy, and so on. Therefore, the plan works well for cities like Toyama where there are not only high disaster risks but also high social risks.

Toyama City LRRP Vision and Objectives

The city will aim for a tough, resilient, safe, and secure city. In addition, the city will promote sustainable town development through comprehensive policy development focusing on its compact city policy, enhancement of the necessary urban functions, maintenance and revitalization of local communities, and efforts to toughen the entire city.

Regardless of the scale and type of the natural disaster, Toyama will promote “toughening” the city with the following objectives:

- Maximize protection of citizen’s lives.
- Maintain important functions such as infrastructure that supports urban activities without catastrophic obstacles.
- Minimize damage to public facilities, thus supporting the citizens’ property and civic life
- Implement prompt restoration and reconstruction.

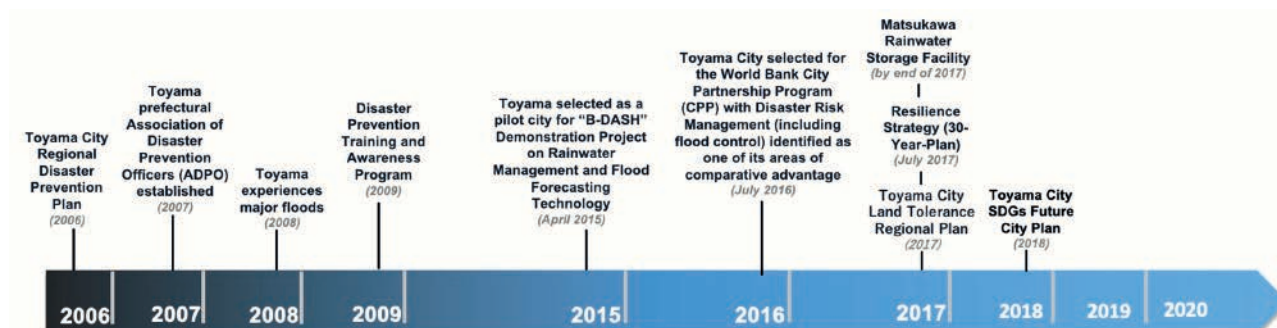


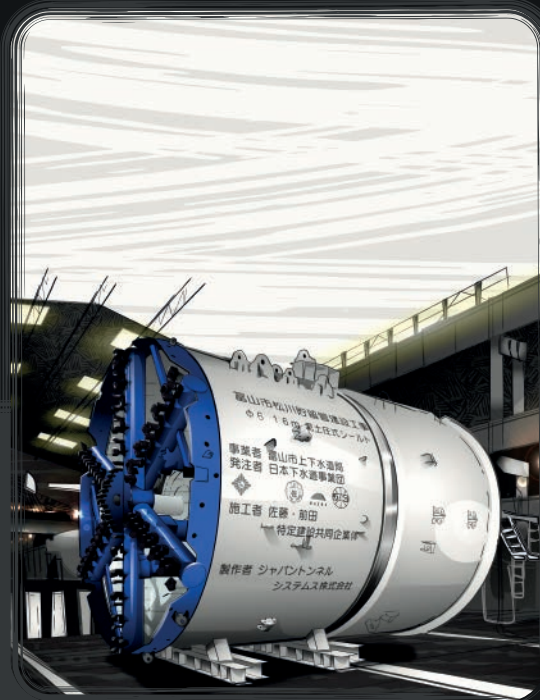
Figure 4.2 Toyama Urban Development Timeline: Disaster Risk Management, including Flood Control

Note: B-DASH = Breakthrough by Dynamic Approaches in Sewage High Technology; SDGs = sustainable development goals.

Case study ①

MATSUKAWA RAINWATER STORAGE FACILITY

- Multiple benefits from one policy
- Strong partnerships with stakeholders



Background

The confluent sewer area of Toyama City starts from the areas of Toyama Castle and the Toyama City Science Museum from the south side of Toyama Station. It is approximately 277 hectares up to the South Park. The combined sewer system in Toyama can deploy simultaneous countermeasures for wastewater and rainwater. However, the design criteria at the time of construction had a constraint that the sewage pipe's failing level is lower than the current standard, and it cannot respond adequately to heavy rains such as locally concentrated torrential rains, which have been increasing in recent years.

In addition, because of the progress of urbanization and concentrated torrential rain caused by abnormal weather in recent years, flooding damage has occurred more frequently. In particular, the city experienced large flooding in 2008 that was a precursor for the development of the Matsukawa Rainwater Storage Facility project. Previously in the urban area, if heavy rain fell and the underground sewage pipe was full, there was no way for water to escape, so flooding occurred in the lower land areas.

Approach

Because of the stated problems, in 2012 the Matsukawa Rainwater Storage Facility project was initiated for the dual purpose of conserving water quality in Matsukawa and alleviating future flood damage (figure 4.3). The project consists of a 1,069-meter rainwater storage tank (Matsukawa Rainwater Storage Facility) with a diameter of about 5 meters and was completed in 2018. After construction, the huge tank is able to store excessive water (up to 20,200 tons), and reduce flooding damage in the low land area of the city center.

The Toyama City Waterworks & Sewerage Bureau notes that the city carefully considered the option of a separated system for wastewater and rainwater in the area. However, after a detailed cost-benefit analysis, the city decided to continue with the existing combined system because it was less expensive but safe and effective. This approach also allowed for a more effective allocation of the city's internal resources.

Furthermore, Toyama City was keen on gaining consensus from its citizens on this project. Numerous public hearings were held in about 50 communities, and people became interested in the project from the beginning. A field visit to the construction site in 2014 created great interest, with 1,300 applications received for 80 positions.

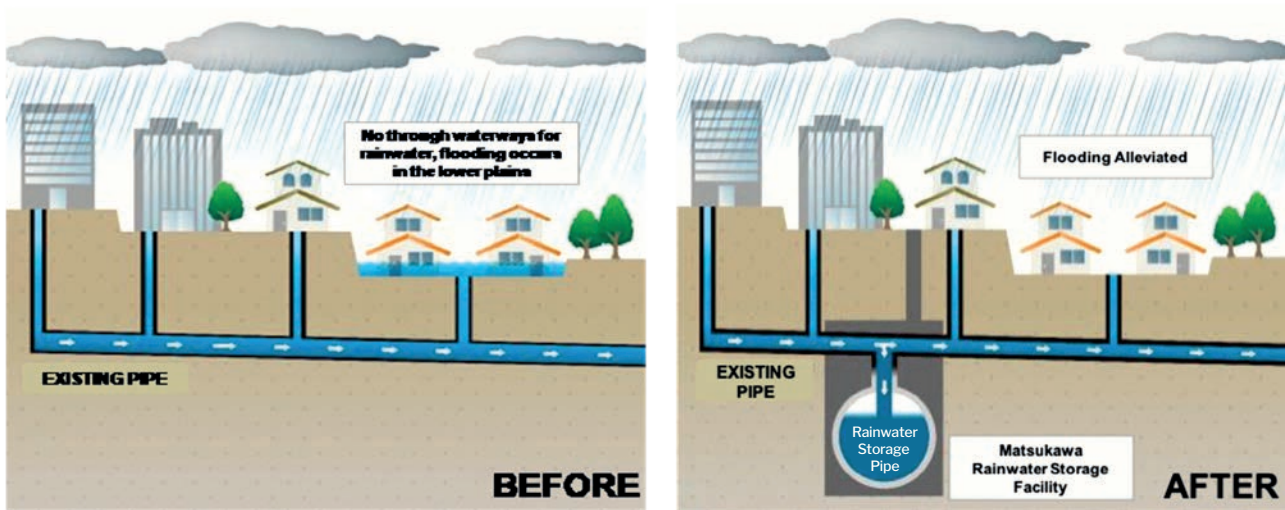


Figure 4.3 Matsukawa Rainwater Storage Facility

Source: Toyama City, "Outline of Toyama City Sewerage Works"
[富山市下水道事業の概要], 2016.

Lesson learned

The Matsukawa Rainwater Storage Facility will deliver multiple benefits, including conserving water quality in Matsukawa and alleviating flood damage. The efforts to combat flooding were carefully examined in the context of the city's internal resource allocation to achieve the best possible project. In addition, the partnership and consensus between the city and its citizens was prioritized and has been very effective.

Case study 2

FLOOD CONTROL USING STORAGE IN PADDY FIELDS AND AGRICULTURAL CANALS

- Strong partnerships with stakeholders
- Innovative mindset



Background

Urban development and flood control in Toyama City came together in the case of water storage in paddy fields and agricultural canals. As noted, Toyama City has suffered from frequent flooding caused by the Jinzu and Joganji rivers. Therefore, urban development planning in the city has had to fully consider flood control and erosion control, particularly in the current context of increased overflow of small-scale rivers and drainage canals in downtown area due climate change. Urban flooding caused by concentrated torrential rain has been occurring more and more frequently. Although drastic measures to combat flooding may include major river improvement projects, because of the extensive time and expense necessary, the city has implemented other simpler, immediate, and more cost-efficient measures.

Approach

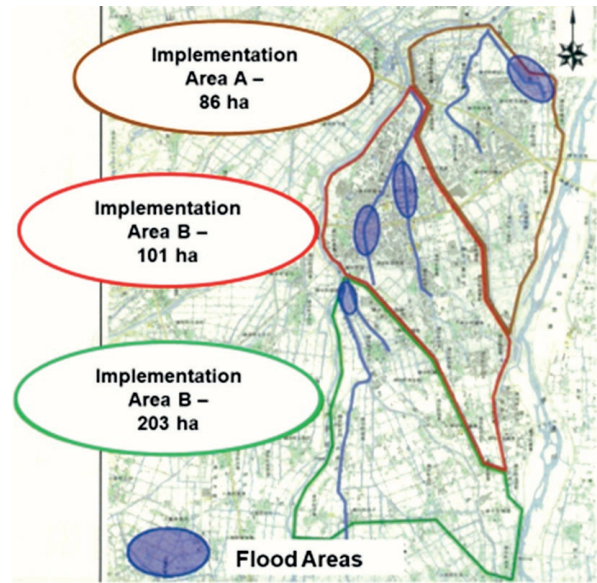
This case study introduces a successful measure used in Toyama against flooding using paddy field storage as a unique system for flooding management. The project seeks to temporarily store excessive rainwater in paddy fields to suppress the flow into rivers and waterways and reduce flooding in urban areas (photo 4.3 and map 4.4). In the Fuchu area of Toyama City, which is located directly between the Jinzu and Ida rivers, paddy field storage is carried out in cooperation with the community. By temporarily storing water in the rice paddy fields, the outflow of rainwater is 4.4 times gentler than before. By lowering the water level of rivers and waterways, flooding damage in the downstream area of the city has been reduced.

The effectiveness of the system can be demonstrated by comparing the case of heavy rains in July 2004 along the Tsubono River, where 60 households suffered river flood damage. After this project was implemented, no households suffered damage in the heavy rains of 2007.



Photo 4.3 Paddy Field (Rice Planting)

Source: Toyama City.



Map 4.3 Areas of Paddy Field Storage for Flood Control

*Source: Toyama City.
Note: ha = hectares.*

With the close cooperation of the farming communities, weir boards with small holes are built into the drainage ports of the paddy fields. By temporarily storing the rainwater that falls in the paddy field and gradually flow over time, flooding damage is reduced. In Toyama City, workers' wages are subsidized to the cultivators who cooperate with the paddy field storage program. In 2019, the subsidized areas of the scheme in Toyama totaled 390 hectares.

Lessons Learned

The system is simple, but it fully takes advantage of the abundant areas of rice fields. This system also is in place in other areas of Japan, but the subsidy scheme for the farmers who participate is unusual. The cooperation of both rice field farmers and communities are indispensable to the scheme and a further example of strong partnerships in Toyama.

Case study ③

RAINWATER MANAGEMENT AND FLOOD FORECASTING TECHNOLOGY

- Innovative mindset
- Strong partnerships with stakeholders
(private sector and academia)



Background

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) facilitated the Breakthrough by Dynamic Approaches in Sewage High Technology (B-DASH) initiative. The goal is to implement a series of demonstration projects for using innovative technology to strengthen regional disaster prevention capacity in cooperation with residents as part of comprehensive structural and nonstructural flood control efforts.

Approach

One of the key B-DASH initiatives was the Demonstration Project on Rainwater Management and Flood Forecasting Technology for Localized Concentrated Heavy Rainfall in Urban Areas. Toyama City (200-hectare Kureha drainage area) and Fukui City were designated as the two pilot cities for demonstration of the project in the field in April 2015.

The rainwater management and flood forecasting technology project incorporated three key systems:

(1) Urban Area Radar System.

Early detection of cumulonimbus cloud through the installation of multiple small and inexpensive high-resolution radar systems.

(2) Rainwater Estimation System.

Prediction of rainfall amount and rainfall intensity through a short-term rainfall prediction model.

(3) High Speed Outflow Analysis System.

A real-time, high-speed rainwater outflow prediction analysis system that uses information from (1) and (2) above. It allows forecasting of where the rainfall will be, how far it will overflow and its effect on rainwater / wastewater storage facilities.

Lessons Learned

The combined rainwater management technology allows the Toyama City to fully maximize the capacity of rainwater storage facilities in real time in order to reduce flood damage. Furthermore, the forecast distribution information makes it possible to secure enough time to respond and implement coping mechanisms, such as sandbags and evacuations. Importantly, the demonstration project showcased strong partnerships with stakeholders and collaboration in both the academic and private sectors. The pilot project implementers and their roles are listed in table 4.1.

Partners	Roles
Meta Water Co., Ltd.	Overall coordination using synthetic engineering
Shinnihon Consultant Co., Ltd. Nissui Kon Corporation	Construction of the simulation model
Furuno Electric Co., Ltd.	Construction of the radar system
Emori Corporation Co., Ltd.	Construction of out flow analysis software
Kobe University	Rainfall prediction technology
Toyama City/Fukui City	Offer of fields

Table 4.1 Partners and Their Roles in the Rainwater Management and Flood Forecasting Pilot Project

Case study 4

COMMUNITY AWARENESS AND TRAINING

- Strong partnerships with stakeholders
- Developing community bonds



Background

The final case study under disaster risk management relates to community awareness and training measures, which is consistently a priority across all sectors for Toyama City. In 2007 the Toyama prefectural Association of Disaster Prevention Officers (ADPO) was established. It now comprises 235 volunteers, most of whom are in other full-time employment.

Approach

The ADPO provides assistance to the city's internal disaster emergency team and in 2008 implemented the Disaster Prevention Training and Awareness Program, which had four key components:

- **Training for Disaster Prevention Leaders in the Region.**
Training is offered for volunteer disaster prevention organization leaders, especially leaders of local groups (photo 4.4). Lectures are given on the importance of disaster prevention organization and preparation with case study examples, interactive questions and answers, and exchange of ideas. The volunteer leaders are then tasked with disseminating increased disaster preparedness in the community.
- **Disaster Prevention Awareness Leaflet.**
A disaster prevention awareness leaflet is regularly issued electronically by the Disaster Prevention Agency and distributed to each representative of voluntary disaster prevention organizations. The leaflet includes characteristics of natural disasters, examples of awareness activities, and knowledge dissemination and advice on what to do during a disaster.
- **Voluntary Disaster Prevention Organization Activity Adviser.**
The city offers advisory services to voluntary disaster prevention organizations seeking advice on activities and evacuation drills. By giving advice through city officers, the city can advise on plan formulation and training content. It also ensures on-the-ground support and guidance and consultation between city and voluntary disaster prevention organizations.

- **Shelter Management Training.**

This part of the program is targeted at evacuation (shelter) center management training for Toyama City staff, particularly district center personnel. Held in district centers such as at elementary schools and gymnasium, each shelter management training session accommodates 40 Toyama City staff members and is held three times a year, enabling 120 city staff to participate annually.



Photo 4-4 Toyama City Comprehensive Disaster Prevention Drill

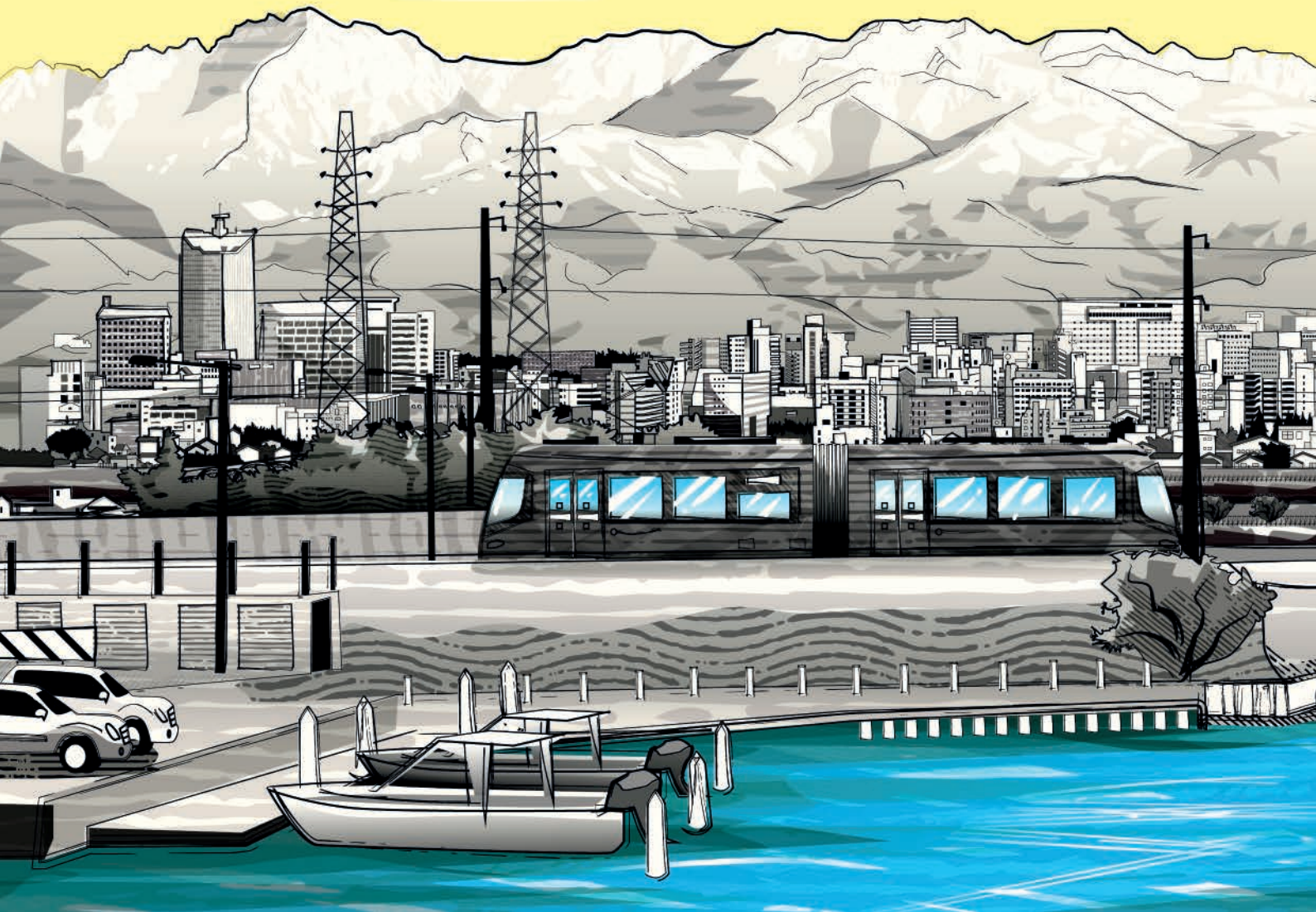
Source: Toyama City.

Lessons Learned

Toyama City and the ADPO recognize that despite progress, challenges still remain, including the need to increase awareness, provide more easily understandable hazard maps for citizens, and address gaps between voluntary disaster prevention teams. The Disaster Prevention Training and Awareness Program is a key public partnership and demonstrates the culture of volunteerism and community engagement, which are key aspects of disaster awareness and preparedness and also help to further strengthen community bonds.

5

Waste Management



Background and Challenges

Overview

Toyama City's citizens have had a longstanding, strong connection and respect for its unique and extensive natural environment. To protect the environment, it is essential for officials to promote effective waste management and recycling with environmental education to further improve citizen's awareness of environmental issues.

Building a Recycling-Based Society

Toyama City formulated the Toyama City Basic Environmental Plan, as well as the Toyama City Basic Plan for General Waste Disposal (2012–16). These plans helped set out a comprehensive approach to greater application of 3R principles (reduce, reuse, and recycle), the proper disposal of waste, and efforts to tackle global warming and handle disaster-related waste. The plans also seek to foster a recycling-based society and address the challenges of gaining support from citizens who live near waste-processing facilities.

Strategies Adopted

Innovative Waste Management and Recycling Approach

With the goal of developing an environment-friendly recycling city, the city implemented the Raw Garbage Recycling Project in 2006. The project produces biogas from raw garbage at the Eco-Town Industrial Park and uses it to generate electrical power. In June 2008 the national government selected Toyama as one of the first six Environmental Model Cities, recognizing its systematic efforts to reduce greenhouse gas emissions, including the development of Eco-town, a city-supported industrial park that includes seven waste-to-useable-product companies. Toyama is also home to one of Japan's most advanced forerunners of industrial waste management and waste-to-energy (WtE) business—Toyama Kankyō Seibi.

Education, Cooperation, and Promotion

A key component of building a recycling based society in Toyama is its extensive education, cooperation and promotion approach. The waste recycling education center at Toyama Eco-Town increases citizen awareness of the methods and importance of waste recycling and fosters collaboration among citizens, businesses and the government. In recent years Toyama has continued its international cooperation and promotion through waste management partnerships and collaborations with international cities and international bodies and institutions.

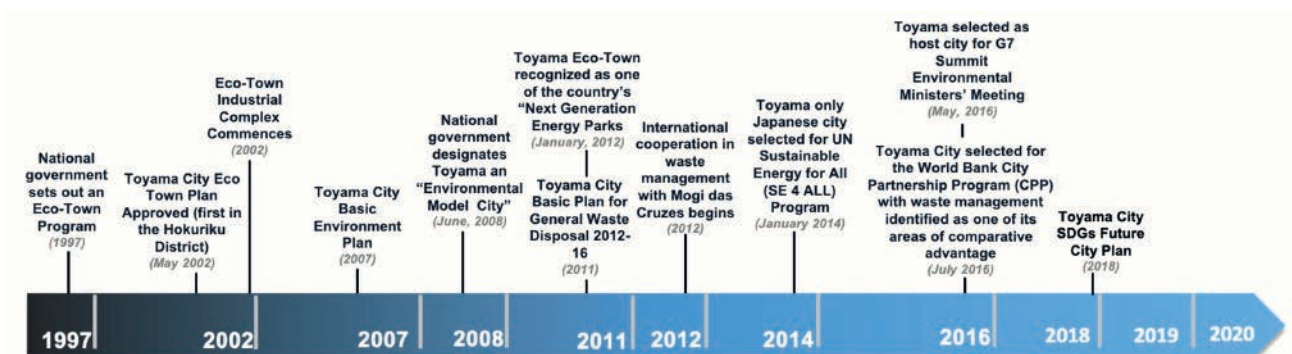


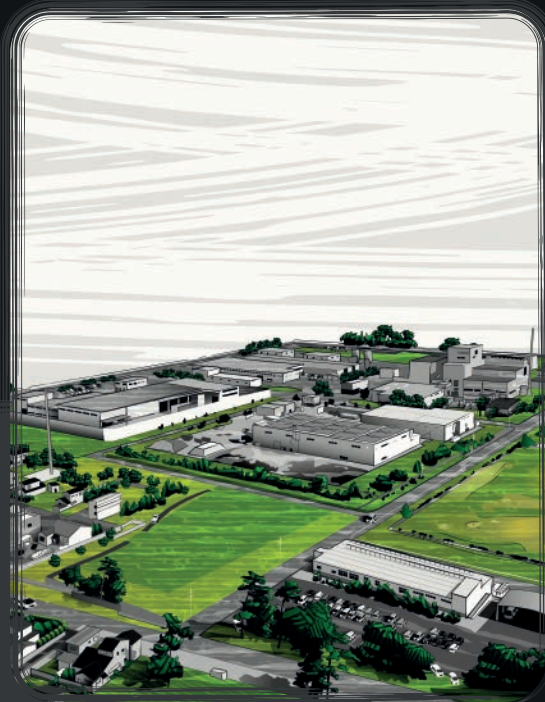
Figure 5.1 Toyama Urban Development Timeline: Waste Management

Note: OECD = SDGs = sustainable development goals; UN = United Nations.

Case study ①

TOYAMA CITY ECO-TOWN

- Innovative mindset
- Strong partnerships with stakeholders
- Multiple benefits from one policy



Background

In 1997 the Ministry of Economy, Trade and Industry (METI) and the Ministry of the Environment (MoE) set out the Eco-Town Program to tackle waste generation and provide the basis for establishing environmentally harmonious towns while developing local communities. In response, Toyama City formulated the Toyama City Eco-Town Plan in April 2002; it was adopted as the 16th plan in Japan and the first in the Hokuriku District. Toyama City then began to implement advanced community planning through the reduction and recycling of waste while taking the distinctive characteristics of the region into consideration.

Approach

The key principles of the Toyama City Eco-Town Plan include the following:

- Prioritizing regional recycling
- Realization of a “human-friendly and environment-friendly town Toyama” by taking advantage of civil activities
- Promotion of phased material recycling and effective use of refuse-derived fuel (RDF)
- Consideration of profitability
- Cooperation between enterprising bodies and consumers
- Disclosure of information

The Eco-Town Industrial Complex opened in 2002. The 18-hectare Toyama City Eco-Town site promotes the establishment of a recycling-oriented society through energy-saving and waste-recycling efforts.

As noted, the Eco-Town program is a national government initiative to help create a more recycling-oriented society across the country and also to act as a showcase of new technologies for recycling economies. To this end, the program provides some subsidies for disposal sites and public promotions. The industries participating in Eco-Town can receive the economic benefits of agglomerating recycling industries.

The Eco-Town industrial complex (photo 5.1) is managed by seven private business operators who turn “waste” into usable products, including a recycling facility to turn food waste and clipped branches into methane. Another facility processes refractory fibers and mixed waste plastic.

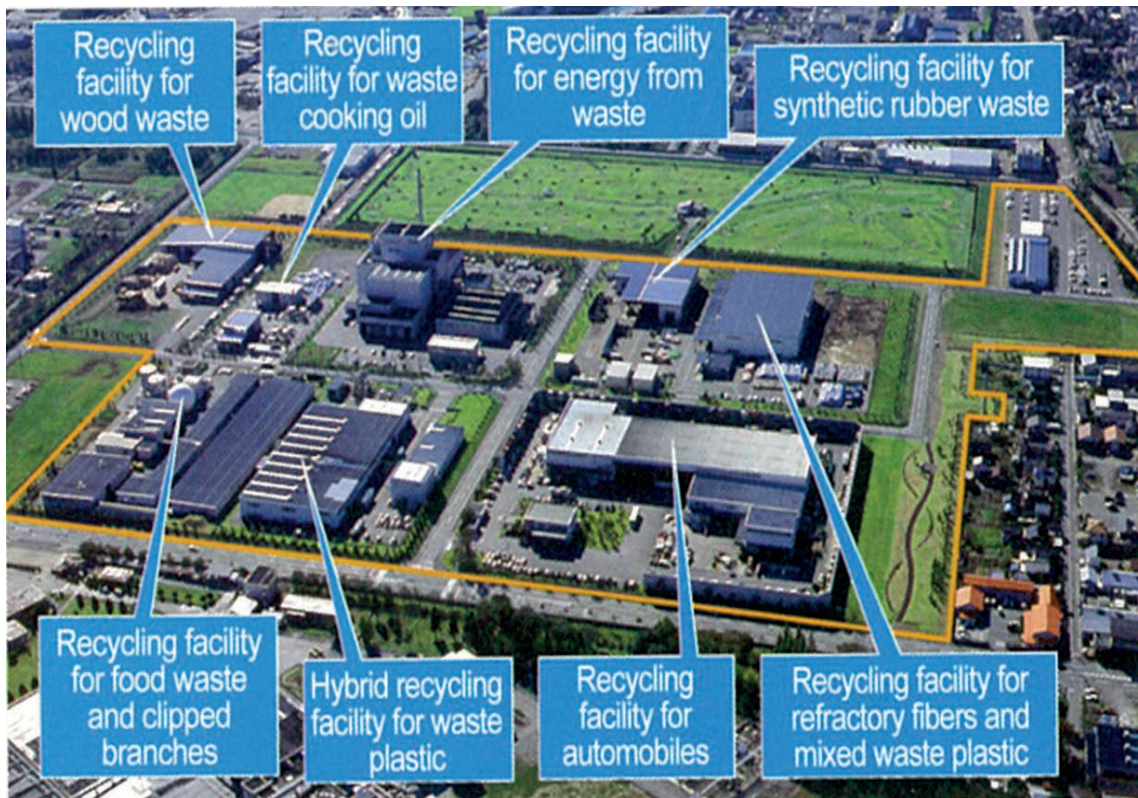


Photo 5.1 Toyama Eco-Town Industrial Park

Source: Toyama City.

Lessons Learned

The Toyama City Eco-Town policy has yielded multiple benefits through increased recycling, reduction in carbon dioxide emissions, wider environmental improvements, facilitation of strong private sector partnerships, and enhanced community awareness and engagement.

Stakeholder consensus was obtained by finalizing the Environment Preservation Agreement, which declares the project as an environmentally friendly enterprise, between Toyama City and business operators and between Toyama City and its citizens. The approach whereby the city administration has mediated between business operators and citizens has helped provide strong support to business operators in the project.

In addition, the Eco-Town industrial complex was complemented by the inclusion of an extensive waste recycling education center, which focuses on bringing citizens, business operators, and government together through learning activities and promotion of the Eco-Town Plan. Education of the next generation in the awareness of the methods and importance of waste recycling is a priority for Toyama City. The goal is for all elementary school pupils to make at least one visit to Eco-Town.

Case study 2

TOYAMA KANKYO SEIBI: INNOVATIVE INDUSTRIAL WASTE MANAGEMENT

- Innovative mindset
- Strong partnerships with stakeholders
- Multiple benefits from one policy



Background

In 1972, Toyama Kankyo Seibi (former Toyama Road Service) was founded as a waste management company dealing with cleaning roads and removing discarded waste. At that time, handling this waste was not well regulated and there were issues with road safety. A few years later, the company was granted a license for industrial waste and began to expand into Fuchu-machi, on the southwest side of the present city.

When the founder established the company, city residents generally considered the Toyama Kankyo Seibi facility as undesirable in their neighborhood. However, with the company's advanced system of waste management and innovation, and after long efforts in community awareness and contributions to community activities, the communities began to welcome the company as a dependable and important enterprises in the area.

This, the first of two case studies on Toyama Kankyo Seibi, highlights its industrial waste management operations.

Approach

Toyama Kankyo Seibi is one of Japan's forerunners in industrial waste management and associated businesses (figure 5.2). It has around 350 employees and collects 300,000 tons of waste per year. The company possesses several important licenses, including being Container and Packaging Recycling Law certified. Its business is varied and includes:

- Collection and transporting of industrial waste,
- Collection and transport of general waste (Toyama City, Imizu City, Tonami City, Nanto City),
- Reclamation disposal of industrial waste,
- Intermediate treatment of industrial waste,
- Treatment of harmful waste, including PCBs,
- General waste intermediate treatment,
- Reclamation disposal of general waste,
- Plastic recycling,

- Production of plastic products,
- Production of wood products,
- Road maintenance and repair work,
- General civil engineering work, and
- Cleaning in various tanks.

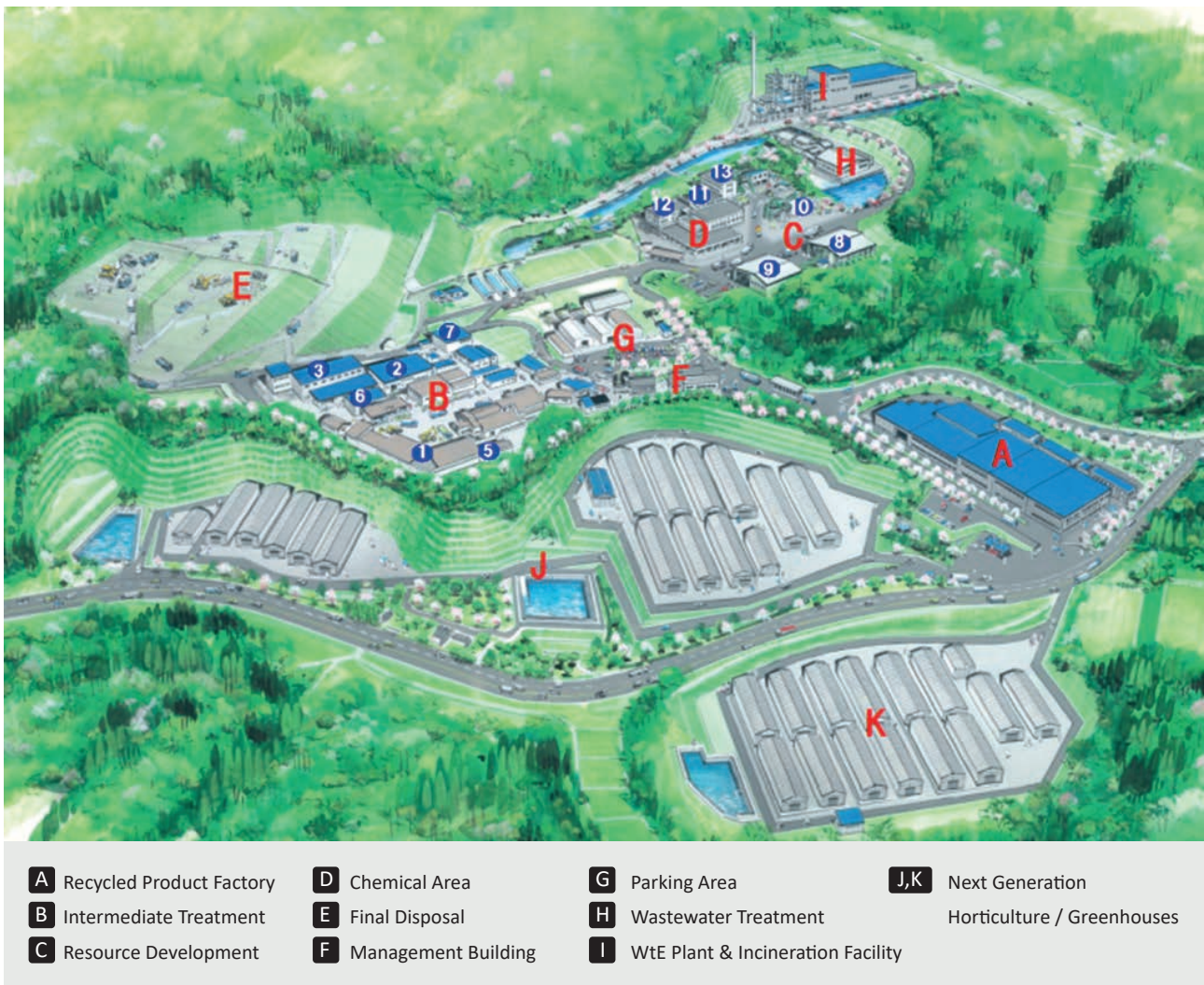


Figure 5.2 Toyama Kankyo Seibi Facility

Source: Kankyo Seibi.
Note: WtE = waste-to-energy.

The company has adopted many innovative systems, including:

- **Regeneration of high-quality plastic resources.**

Japan enacted the law pertaining to the recycling of plastic containers in 1995. Toyama Kankyo Seibi, as the accredited operator of container packaging recycling, recycles containers and packaging materials as the law requires. However, Toyama Kankyo Seibi takes this a step further as a recycling business operator and, according to waste separation standards, converts the materials into new resources. The company manufactures recycled plastic products as part of its “re-commodity products business” on the same premises.

- **Unique one-stop system of handling industrial waste.**

The company carries out all processes of (a) crushing and sorting, (b) incineration, and (c) reclamation disposal on the same premises. In this way, it realizes safety, security, adequacy, high efficiency, and energy savings, and it is only facility in Japan that uses this integrated system.

- **Combustion incineration facility (reverse power).**

Toyama Kankyo Seibi adopts a rotary kiln system for incineration. This system generates electricity using waste heat after complete combustion in primary combustion/secondary combustion. At the same time, operation of the facility keeps the load on the incinerator within an appropriate range and ensures that stable combustion can be continued.

In addition, advanced exhaust gas treatment equipment, such as a bag filter, is employed. During the operation, exhaust gas temperature and the concentration of hazardous substances are continuously measured and the combustion state is checked. The incinerator handles not only construction-related combustibles (such as wood chips, paper scraps, fiber scraps, and waste plastics), but also waste generated from business activities, sewage sludge, waste oil, and the animal and plant residues from food processing companies. Using the heat obtained through the incineration of waste, the facility can then generate electrical power of up to about 1,500 kilowatt-hours.

- **Disposal and collection of various waste types.**

Using various types of vehicles and equipment, the company also cleans the waste of river dredging; mows the grass of national roads, river beds, and private lands; and cleans town roadways, including national highways and the road surface of sidewalks.

- **Community Safety Programs.**

While the waste-generated electricity is used by Toyama Kankyo Seibi for its own functions, the electricity is also used as a power source for crime prevention facilities, such as nighttime lighting in the wider area.

- **Community Awareness Programs.**

Toyama Kankyo Seibi provides community awareness programs for citizens of the surrounding neighborhoods. It welcomes site visits to its recycling facilities from community organizations, and staff members explain the system of the container recycling law and basics of industrial waste management.

Lessons Learned

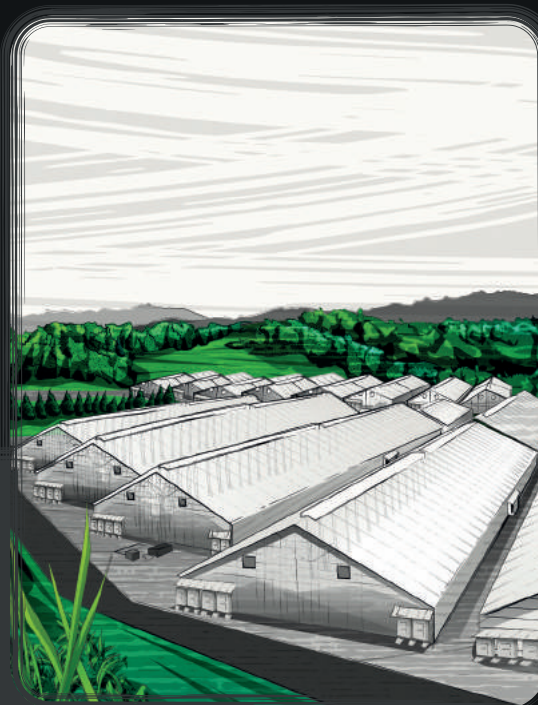
Since its establishment 40 years ago, Toyama Kankyo Seibi has innovated and developed into a leading waste management, recycling, and environmental corporation and is now recognized as one of the most advanced industrial waste management companies in Japan. In addition to its technical innovation, the company dedicates time to developing citizen awareness of waste management and contributes to the safety and well-being of the surrounding neighborhoods and communities.

CASE STUDIES AND LESSONS LEARNED

Case study ③

TOYAMA KANKYO SEIBI: NEXT-GENERATION WASTE TO ENERGY GREENHOUSE HORTICULTURE & DISASTER WASTE TREATMENT SYSTEMS

- Innovative mindset
- Strong partnerships with stakeholders
- Multiple benefits from one policy



Background

This second case study for Toyama Kankyo Seibi highlights more recent components of its operations. Toyama Kankyo Seibi is undertaking next-generation waste-to-energy (WTE) greenhouse horticulture for the purpose of effective use of the final disposal site. The company has set up a vinyl house at the final disposal site where a landfill is completed and cultivates fruit tomatoes and flowers throughout the year. It also works as a collaborator for the national disaster waste management alliance.

Approach

• Next-Generation Greenhouse Horticulture

Toyama Kankyo Seibi has been committed to reusing and creating value from the surplus energy created by its combustion system. In 2014 it received a subsidy from the national government to reuse the generated electricity and heat from waste combustion and built sophisticated greenhouses under a program called Project to Accelerate Adoption of Next Generation Greenhouse Horticulture from the Ministry of Agriculture, Forestry and Fisheries (MAFF).

MAFF developed this agriculture subsidy program to help reduce the costs for farming businesses, create jobs, and promote initiatives including smart agriculture using information and communication technology and next-generation greenhouse horticulture. The subsidy (for operating costs) was awarded to companies or organizations that had contributed to using renewable energy in horticulture. Toyama Kankyo Seibi, along with a variety of collaborators, was selected as 1 of 10 awardees across Japan.

For the Next-Generation Greenhouse Horticulture project Toyama Kankyo Seibi constructed 28 greenhouses (with a total area of 4 hectares) in 2015. The electricity generated from incinerating waste is used for all the electric devices in the greenhouses and premises (table 5.1).

The targeted annual yields from the project are 500 tons of fruit tomatoes and 1.4 million ornamental plants (including eustoma, ranunculus, and campanula). Toyama Kankyo Seibi's tomatoes and flowers are highly

avored for their high quality and are sold in luxury markets and stores across the country. The tomatoes are also exported to Thailand and Singapore. ¹²

In 2015, the company was awarded JGAP (Japan Good Agriculture Practice) certification, which is given to the nation's top agricultural companies. The company now seeking the Global GAP profile in the Ecolabel Index, the independent global directory of ecolabels and environmental certification schemes.

Toyama Smart-Agri Next-Generation Greenhouse Horticulture Base Development Council	
Members	Toyama Prefecture, Toyama Agriculture Forestry Promotion Center, Toyama City, Toyama Kankyo Seibi, JA Aoba, Wagoen, Smart Forest, NTT Data Institute of Management Consulting, ATGREEN
Crops, Area, and Targeted Yields (Unit Crop):	
Fruit tomatoes	Area: 2.8584 ha Targeted yield: 505 tons (17.67 tons/10 acres)
Ornamental plants (eustoma, ranunculus, campanula)	Area: 1.2 ha Targeted yield: 1.43 million units
Project Implementation Summary	
Development of the base	(a) greenhouses and air-conditioning facilities: 28 buildings (4 ha), (b) two seed and seedling supply facilities, (c) one shipping/preparation facility (collection facility), (d) cogeneration system from generator-equipped boilers (about 1,500 kw) using fuel made from waste
Technical demonstration	(a) demonstration of the introduction of the advanced environmental control system using information and communication technology and other technology, (b) demonstration of the use of wearable terminals for sharing knowledge from the data created
Other measures	(a) effort to cooperate with different industries (health care and others), (b) employment of the handicapped and contribution to their welfare, (c) assessing the needs of users and consumers (in the field of ornamental plants, for example)

Table 5.1 Key Facts: Next-Generation WTE Greenhouse Horticulture Project

Note: ha = hectare; kw = kilowatt.

It is of note that all eight other operations using the MAFF subsidy in Japan are using wooden pellets as fuel. This method has limitations; therefore Toyama is regarded as one of the most successful cases. Furthermore, Toyama Kankyo Seibi recognizes that there are applications of its technological experiences that could be used in times of disaster to support communities.

• Disaster Waste Treatment Systems.

The company has also been a member of the national initiative Japan Disaster Treatment Systems since 2016, along with the country's other largest industrial waste management companies. This organization was created in response to the amendment of the Waste Disposal and Public Cleansing and Basic Disaster Countermeasures Law in 2015 after the unprecedented catastrophes related to the earthquake and tsunami in Japan. Under the revised law, it is necessary to flexibly use existing waste disposal facilities after ensuring proper disposal to strengthen mutual cooperation and collaboration among national and local governments and private enterprises.

In this context, the national “D waste-Net” initiative was formed, and Japan disaster treatment systems play an important role in designated waste treatment organizations. Waste disposal companies must act collectively to meet the critical social demands on waste disposal business operators during times of disaster. Toyama Kankyo Seibi, along with other prominent industrial waste management companies, plays an important role in this national initiative.

Lessons Learned

Toyama Kankyo Seibi has created networks of innovative agriculture and disaster management. Strong partnerships are enormously active in each initiative with different levels of government (national, prefectural, and governmental agencies) and other private companies. Also, an innovative mindset is shown in the company’s continuous efforts to seek higher-quality agricultural products and ways to improve efficiency and output.

Case study 4

INTERNATIONAL COOPERATION IN WASTE MANAGEMENT: MOGI DAS CRUZES, BRAZIL

- Innovative mindset
- Strong partnerships with stakeholders
- Multiple benefits from one policy
- Development of community bonds



Background

In recent years, Toyama City has undertaken a number of domestic and international cooperation and promotion initiatives with other cities to disseminate best practice and lessons learned from its urban development story. Toyama City has collaborated with Mogi das Cruzes in Brazil in the knowledge transfer of waste management techniques. In fact, Toyama City and Mogi Das Cruzes, Brazil, have had longstanding cooperation and support, having been sister cities since 1979.

The city of Mogi das Cruzes had underdeveloped waste separation and recycling processes. It faced challenges around the burdens of relying on landfills, lack of advanced and efficient separation and recycling systems, and waste treatment. Most recycling was undertaken by citizens or catadores, and the city lacked appropriate environmental education and awareness initiatives. Therefore, during 2012–14, with the support of the Japan International Cooperation Agency (JICA), Toyama City provided waste treatment techniques and human resource knowledge exchange to help solve the issues Mogi das Cruzes faced (photo 5.2).



Photo 5.2 Toyama and Mogi das Cruzes Collaboration

Source: Toyama City.

Approach

The overall goal of the initiative was to reduce the amount of landfill waste and offer more holistic help to foster a recycling-oriented society. The two main strands of the assistance included (a) environmental education to improve the awareness of citizens on the separation of garbage and (b) an organized system for recycling that built on the catadores collectors.

In cooperation with JICA, Toyama City was able to provide the following:

- Staff from Toyama City dispatched to Mogi das Cruzes to give guidance on current problems and remedial measures in waste disposal
- Facilitation of training in Japan for staff of the Environment Bureau of Mogi das Cruzes
- Creation of garbage separation rules and guidance for efficient sorting and collection in Mogi das Cruzes
- Improved communication and public awareness of the household garbage separation policy
- Creation of an environmental education program centering on the 3R approach
- Environmental education for primary schools, junior high schools, environmental volunteer organizations, and the catadores
- Provision of advice on the registration, organization, and support of catadores

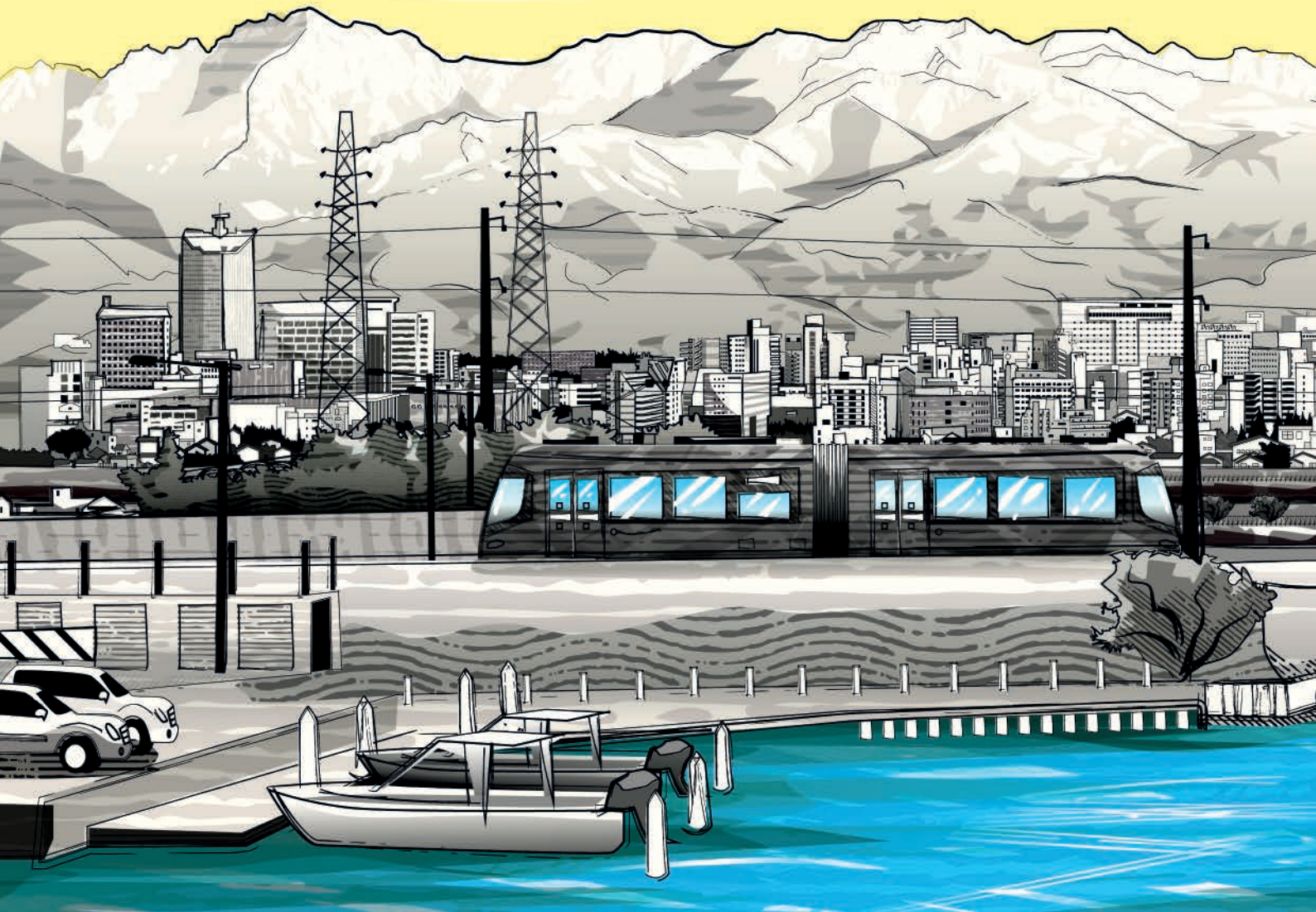
As a result of the collaboration and knowledge transfer, the recycling rate in Mogi das Cruzes increased around sevenfold in two years, from 0.6 percent in 2012 to 4 percent in 2014. It is expected to reach 10 percent by 2017. Furthermore, the environmental education program is now practiced in 60 percent of schools in the city. It is hoped that the environmental knowledge gained by Mogi das Cruzes will be passed on to other cities in Brazil.

Lessons Learned

The fostering of city partnerships has helped Toyama City grow its reputation with international organizations, such as the Organisation for Economic Co-operation and Development (OECD) and United Nation's Sustainability for All initiatives. International cooperation reflects Toyama City's longstanding approach of being outward looking and innovative, developing strong partnerships, and strengthening community bonds and pride in the city.

6

Effective Resilience Management Approach



Background and Challenges

Introduction

Although the past challenges and solutions of Toyama's development are important, it is equally important to outline the next steps and proposed strategies for its future development. Building on its policies and strategies since 2007, as summarized in this report, and working with the 100RC program, Toyama City prepared a 30-year Resilience Strategy, released in July 2017.

This chapter sets out the city's resilience management approach, which overarches and brings together many of the good practices from earlier chapters and, in particular, showcases case study examples of having a visionary senior management team, strong partnerships with stakeholders, soft-power silo-breaking, and efforts to develop community bonds.

Challenges and Issues

Toyama has identified four shocks and five stresses as the most challenging resilience issues facing the city; many of these have already been introduced in this report:

Shocks

- Flooding
- Land slides
- Earthquakes
- Potential infrastructure failure

Stresses

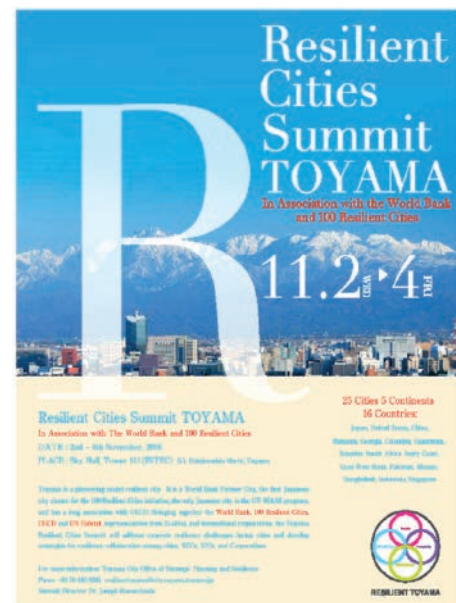
- Aging declining population
- Aging infrastructure
- Lack of economic resilience
- Potential environmental degradation
- Insufficient education for citizen self-realization

Thus, the resilience strategy initiatives outlined in the next section were designed to address these shocks, stresses, and various challenges in a comprehensive and integrated way.

Introduction to Toyama and 100 Resilient Cities

Pioneered by the Rockefeller Foundation, 100 Resilient Cities (100RC) was created to helping cities around the world become more resilient to the physical, social, and economic challenges that are a growing part of the 21st century. Cities in the 100RC network have been provided with four main components of resources necessary to develop a roadmap to resilience: (a) hire chief resilience officers (CROs), (b) complete resilience strategies, (c) connect with platforms and partners, and (d) join in a peer-to-peer network.

In 2014 Toyama became the first Japanese city chosen for 100RC. In 2016 Toyama held the Resilient Cities Summit, in association with 100RC and the World Bank, which brought together key stakeholders such as the OECD, UN Habitat, the private sector, and 23 cities from across the world, including 12 World Bank partner and client cities.



Strategies Adopted

Resilience Strategy Development Process

Toyama's Resilience Strategy in the formulation of its Resilience Strategic Plan with 100RC draws on a rich and diverse array of stakeholders and sources. Two of the major components are;

- Formulation of a Resilience Advisory Committee of prominent chief executive officers and presidents from the business community, presidents of nongovernmental organizations (NGOs) and directors general of key city government departments; and
- Establishment of four resilience working groups to generate new initiatives under themes of resilient people, resilient infrastructure, resilient prosperity, and resilient environment, with a cross-section of members of the business community, NGOs, city government leadership, and citizens.

Outputs from those components are added to that of the mayor's separate task forces (on a set of specific issues including on working women), advice from the mayor's policy advisers, wide-ranging discussions with citizens and city experts, and the city's various 3-year, 5-year and 10-year plans. The newest 10-year plan required by the national government was completed in March 2017.

Resilience Strategy Organizational Structure

The Toyama Resilience Strategy has six key components:

- Direct relationship between the CRO and the mayor, which is supported by the Office of Strategic Planning and Resilience (SPR), which is, in turn, directly linked to pivotal city departments;
- Resilience Advisory Committee of prominent stakeholders to advise the CRO, SPR, and the mayor throughout the process;
- Working groups of diverse stakeholders to research and develop initiatives;
- Consensus-vetting process, overseen by the CRO and SPR director, which flows from the city advisers and accumulated research and then through the Resilience Advisory Committee, city department directors general, city Executive Committee, and the mayor;
- Final presentation by the SPR director of the Resilience Strategy to the City Assembly, which oversees the city budget during the implementation of initiatives; and
- Understanding of all parties in this process that genuine and effective city resilience plans depend on all city policies working in concert across departments toward the one goal of long-term comprehensive resilience.

The process ensures that diverse stakeholders are invested in the Resilience Strategy and enables initiatives to move outside the typical hierarchical structure and be more integrated in planning (figure 6.1).

In the next sections, a selection of case studies and lessons learned from some of these components is explored in more detail, with the final sections introducing the policies and initiatives of the Resilience Strategy.

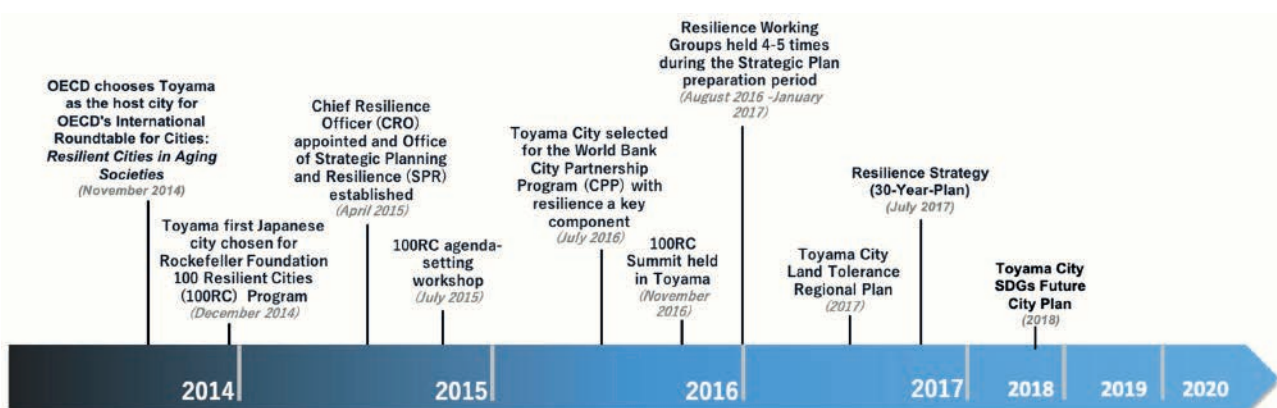


Figure 6.1 Toyama Urban Development Timeline: Effective Resilience Management

Note: OECD = Organisation for Economic Co-operation and Development; SDGs = sustainable development goals.

Case study 1

OFFICE OF STRATEGIC PLANNING AND RESILIENCE (SPR)

- Visionary senior management team
- Innovative mindset
- Soft-power silo-breakers



Background

In 2015, 100RC provided funding for Toyama City to appoint a chief resilience officer, Joseph Runzo-Inada. Runzo-Inada was the first American to serve as a senior policy adviser to a major Japanese city. The CRO is an innovative position in city government, and Runzo-Inada reports directly to the mayor. The CRO is Toyama's point person for resilience building, helping to coordinate all the city's resilience efforts. More widely, the 100RC has defined the role of a CRO as the following:

- Works across government departments to help a city improve internal communications, address complexities, and create new collaboration;
- Brings together a wide array of stakeholders to learn about the city's challenges and build support for individual resilience initiatives;
- Leads development of the city's Resilience Strategy; and
- Ensures the city applies a resilience lens to everything it does.

At the same time it appointed the CRO, the city established the Office of Strategic Planning and Resilience, which currently has a staff of 11, with 7 working full time in SPR. The SPR staff members were selected from a wide range of key departments and have diverse backgrounds from law and economics to engineering.

Approach

The SPR is unlike any other unit in Japan. Rather than assembling a superpower unit to bring different departments together, Toyama has a very "soft" yet effective approach that strings intersectoral channels together. Each member of the SPR comes from a line unit in the city administration, including construction, environment, and human resources management departments.

These staff members retain strong connections with their "home" units that allow exposure of SPR initiatives to the units and sparks communication and spontaneous involvement from different areas of government. The heads of the city departments, also, are actively consulted about resilience policies as part of a Resilience Advisory Committee and help carry out broad resilience directives within their respective departments.

To further enable soft-power silo-breaking, Toyama City officials point to the mayor’s proactive leadership, the mayor’s task forces, the strong connections SPR members maintain with their original units, and the advantages of having SPR comprise a mix of planners and engineers.

Lessons Learned

This approach has proved to be an effective model for integrated planning that many cities aspire to both in Japan and internationally. The CRO and SPR unit provide a structure that crosses goals and sectors and that has been pivotal in ensuring that strategic and holistic issues are fully addressed. In Toyama, the CRO holds a very senior position at the vice mayor level (figure 6.2) and has extensive contact with the mayor. The 30-year strategy prepared by the CRO and the SPR in association with the 100RC Program is profiled later in this report.

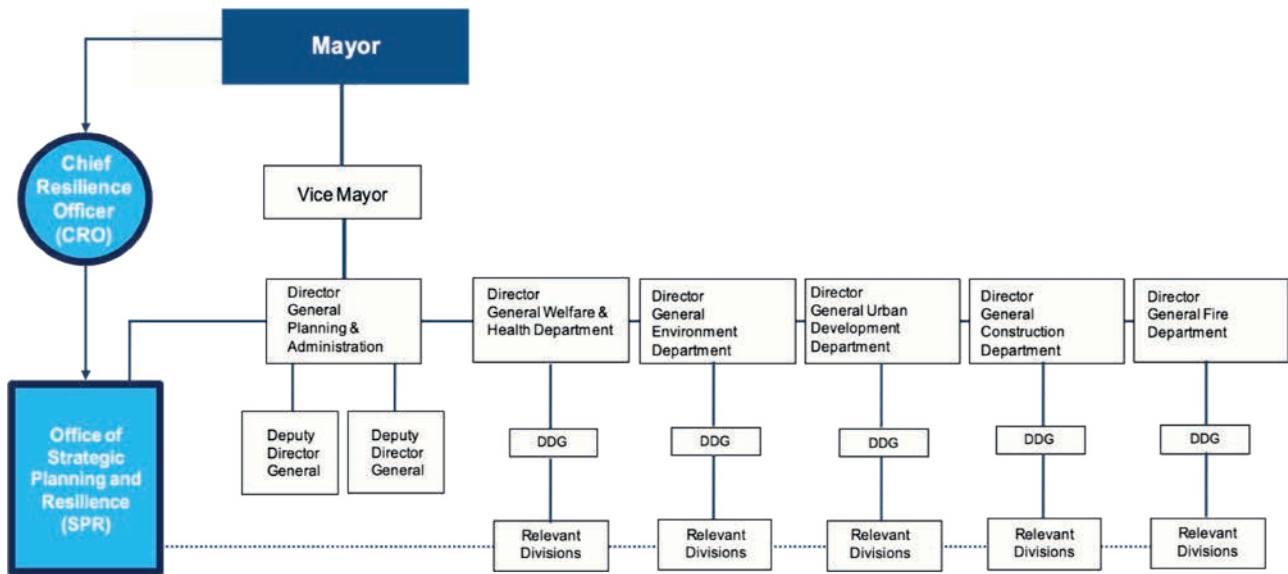


Figure 6.2 Organization Chart of CRO, Resilience Office, and Departments of the Resilience Advisory Committee

Source: Toyama City.
Note: DDG = deputy director general.

Case study 2

RESILIENCE WORKING GROUPS

- Strong partnerships with stakeholders
- Innovative mindset
- Soft-power silo-breakers



Background

In July 2015 as part of the 100RC launch in Toyama, a roundtable agenda-setting workshop brought together a diverse range of city officials, directors general, the vice mayor, businesses, nongovernmental organizations, and representatives from diverse communities.

Using the 100RC framework, the stakeholders discussed the direction of resilience in Toyama City and formed four resilience working groups along the following themes: resilient people, resilient infrastructure, resilient prosperity, and resilient environment (figure 6.3).



Resilient Toyama

Figure 6.3 Four Themed Resilience Working Groups

Source: Toyama City.

Approach

The role of the four resilience working groups was to undertake analysis and diagnostic work as part of the strategy process leading up to the City Resilience Strategy, including generating new initiatives. The resilience working groups included a diverse cross-section of influential members of the business community, NGOs, municipal government leadership, academia, individual experts, and citizens. The working groups reported their findings and conclusions to the SPR, which assessed and organized the findings and reported them to the Resilience Advisory Committee (figure 6.4).

Each resilience working group met four or five times during the Strategic Plan preparation period from August 2016 to January 2017. Each group researched specific questions and generated a set of proposed initiatives for the Resilience Plan. After being compiled and integrated, the results yielded three common concepts of focus: (a) applying cutting-edge technologies, (b) building comprehensive networks, and (c) pursuing the uniqueness of Toyama. As drivers, these concepts will lead to strengthening comprehensive resilience in Toyama.

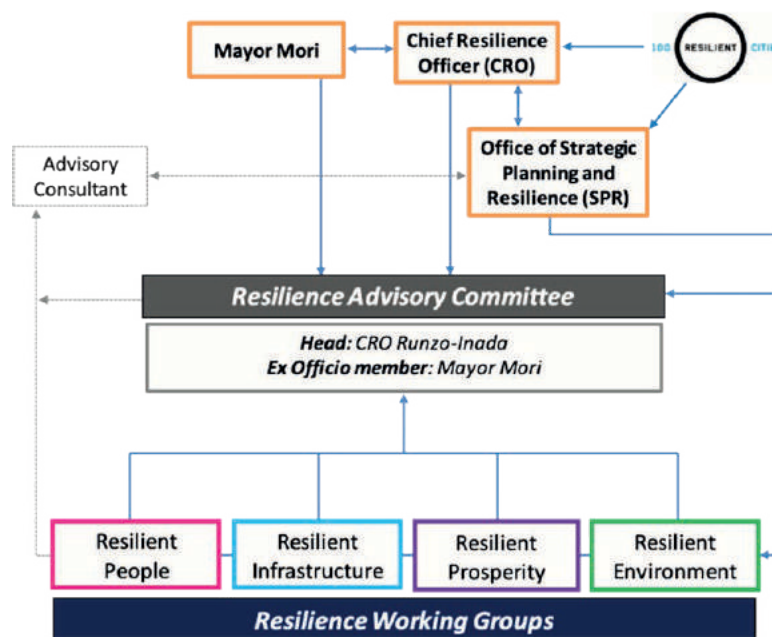


Figure 6-4 Flowchart for Resilience Working Groups and Advisory Committee

Source: Toyama City.

The results of the discussions were added to those of the mayor’s separate task forces, advice from the mayor’s policy advisers, wide-ranging discussions with citizens and city experts, and the city’s various 3-year, 5-year, and 10-year plans, such as the Urban Development Comprehensive/Compact City Plan, to help generate the strategy.

Lessons Learned

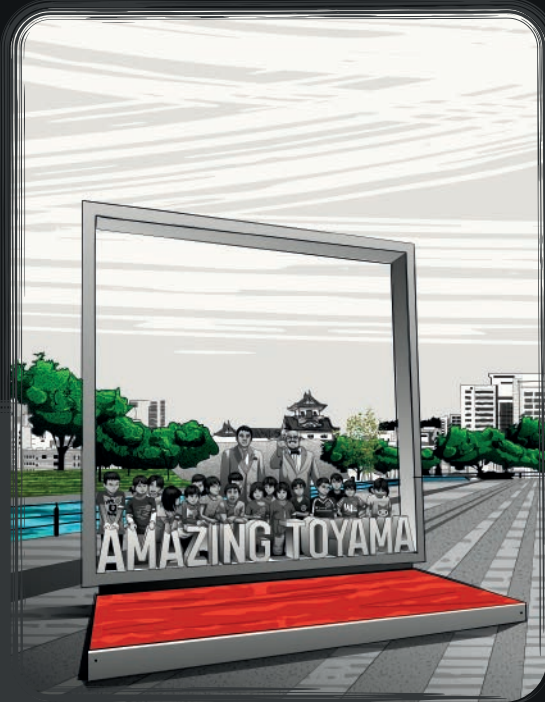
The use of resilience working groups is a reflection of the best practice participatory leadership approach taken by Toyama City. Hands-on involvement of the city’s leadership and strong connections between the public sector, local businesses, and citizens are keys to city planning and development in Toyama. The four resilience working groups addressing specific research questions with equal representation of city officials, local businesses, academia, and civic groups were important success factors in establishing specific interventions for development strategies.

Moreover, this process helped foster an innovative mindset and deliver integrated planning solutions during Toyama’s resilience strategy development process, enabling the city to draw on a rich and diverse array of stakeholders and ideas. Stakeholder buy-in to the working groups was harnessed as the group’s directly shaped and generated the initiatives to be included in the Resilience Strategy.

Case study ③

MAYOR'S TASK FORCES AND INTERDISCIPLINARY URBAN POLICY TRAINING

- Soft power silo-breakers
- Innovative mindset



Background

In addition to the four themed resilience working groups introduced in the previous section, Toyama City has also been using two other key complementary approaches to provide a focus for studying immediate problems the city faces, as well as future issues. These approaches employ a range of activities to raise capabilities to detect and solve and improve policy formation capacity.

Approach

• Mayor's Task Forces

Under the auspices of the mayor, the following four task forces have been established:

- ◇ **Empowerment of Senior Citizens**—investigates and proposes policies to promote the employment of citizens aged over 65 years old.
- ◇ **Empowerment of Women**—proposes broad policy measures for the empowerment of women in Toyama.
- ◇ **Promotion of Health Tourism**—proposes policies to increase health tourism in view of Toyama's strengths in the area of health and pharmaceuticals.
- ◇ **World Bank City Partnership Program**—completed the works associated with the successful application to the World Bank in April 2016 for the City Partnership Program.

The task forces comprise directors, deputy directors, and section chiefs from a range of Toyama City government departments and policy divisions and seek to reinforce and assist the resilience working groups.

• Policy Proposal Training in a Variety of Areas

One of the city's long-standing programs is policy proposal training (community development policy proposal training). This program has been implemented in one form or another since 1990. The training

not only helps improve the creative skills staff members need to find solutions, but also increases their ability to identify problems. During training, staff members up to the section chief level who have been nominated by their departments or divisions attempt to identify the city's challenges and then carry out studies on them and make proposals for how to deal with the challenges. Training is held from May to November, or during a similar period. Participants are divided into three groups and undertake the following steps:

- ◇ Learn skills such as policy planning through a course taught by external lecturers.
- ◇ Exchange opinions in the group about the many issues faced in daily life as well as social challenges for the city because these relate to the work they are carrying out to set a research theme.
- ◇ Conduct a study on the research theme, including gathering information, conducting field work, and gaining advice from the external lecturers as well as hearing from relevant organizations related to the research theme that has been chosen.
- ◇ Prepare a report on the study.
- ◇ Present the results of the study to the mayor, deputy mayor, and head of the relevant department and division for final review by the mayor.

The report that is prepared as a product of the students' research is not only distributed to every department and division, but also posted on the staff portal site. With respect to this training, a number of proposals have been put forward, and some of them have been made into projects by the city government.

Lessons Learned

Both task forces and the policy proposal training show how Toyama City is promoting creative and innovative thinking in the process of policy planning.

Future Direction

The Resilience Strategy (30-Year Plan)

Introduction

Although noting the past challenges and solutions of Toyama's development is important, it is equally important to outline the next steps and proposed strategies for the city's future development. Building on policies and strategies developed since 2007 as summarized in this report, and working with the 100RC program, Toyama City prepared a 30-year Resilience Strategic Plan (July 2017). This section introduces a brief overview of the plan, including the emerging new initiatives.

Resilience Vision 2050

The overarching vision set out by Toyama in the Resilience Strategic Plan is “To be a vibrant city of innovation and a tourism gateway, a model of resilience and environment-friendly living, where strong community bonds help citizens flourish, and the high quality of an active lifestyle for all its residents achieves a harmonious balance between traditional arts and modern technology and between economic prosperity and the inspiring natural surroundings of the pristine Northern Japan Alps.”

Resilience Themes

The Resilience Strategy is underpinned by four resilience themes that Toyama defines as the following:

- (1) Resilient People:** The Toyama Vision for People is a flourishing, mutually supportive community for all generations. As Toyama supports its seniors to live active lives, they can support younger people with families, while Toyama encourages youth to support their seniors. The aim is to strengthen social bonds, enhance civic pride, and increase opportunities for self-realization regardless of age, gender, or ability, a Toyama vision of mutual support which will be passed on to the next generation.
- (2) Resilient Infrastructure:** The Toyama Vision for Infrastructure is a resilient network connecting urban, suburban, and rural areas. The heart of Toyama's vision is a sustainable compact city that includes social infrastructures and integrates disaster risk management into a labor- and cost-saving, technology-driven infrastructure that through public-private collaborations radiates from the central city into the regional hubs and agricultural and rural areas.
- (3) Resilient Prosperity:** The Toyama Vision for Prosperity is an entrepreneurial and flexible response to demographic change and the needs of every generation of citizens. While continuing to enhance its current strengths in the information technology, pharmaceutical, and manufacturing industries, Toyama will attract business, create jobs, and engage young people through its innovative promotion of advanced technology industries, such as aviation nanotechnology, robotics, and biotechnology, and through its infrastructure modifications and efforts to increase tourism.
- (4) Resilient Environment:** The Toyama Vision for the Environment is a harmonious balance between human health, animal health, and the health of Toyama's bountiful nature. Working with organizations like United Nations Environment Programme (UNEP), Northwest Pacific Action Plan (NOWPAP), Sustainable Energy for All (SE4ALL), International Union for Conservation of Nature (IUCN), and Institute for Global Environmental Strategies (IGES), Toyama will continue to vigorously support ecofriendly socioeconomic practices, efficient waste management systems, green industries, and long-range conservation plans.

Strategic Plan Goals and Guiding Principles

Toyama has set out five goals for the 30-year Plan: (a) create a model resilient city; (b) develop a 30-year plan for resilience with a step-by-step progression; (c) focus on the four interrelated resilience themes; (d) set out specific plans for urban, suburban, and rural areas that are mutually integrated; and (e) set out specific and integrated plans for each generation of citizens.

The guiding principles in developing the plan were centered on ensuring that plan is (a) comprehensive; (b) integrated (with cross-silo communication and cooperation); (c) efficient (with multiple results from each project); (d) flexible; (e) underpinned by wide stakeholder engagement; and (f) able to maximize the use of PPPs and cutting-edge technologies

Major Cross-Cutting Initiatives and Subinitiatives

Toyama has a long history of developing innovative solutions to shocks and stresses. The Resilience Strategy initiatives identified by Toyama are designed to both address the shocks, stresses, and various challenges facing the city and also to nourish the foundational resilient spirit of Toyama's citizens in a comprehensive and integrated manner.

To break down silos and achieve a comprehensive approach to resilience, Toyama City has developed 10 major cross-cutting initiatives with specific subinitiatives (figure 6.5). The initiatives include a focus on Toyama's successful solutions in the four areas of comparative advantage identified with the World Bank for the City Partnership Program (CPP) in 2016—compact planning, flood control, aging and accessibility, and waste management.

Implementation and Delivery

A clear implementation plan will be required with specific actions and outcomes. Toyama City has already established a strong and effective resilience planning structure that will be essential to successful implementation.

Working closely with the mayor and the directors general of the city's departments, the CRO and SPR will provide a coordinating role to support the implementation of the resilience initiatives and subinitiatives by the relevant departmental teams. The CRO and SPR will be able to leverage resources to support the departments' work, including the 100RC network, platform partners, and the World Bank and its partner and client cities. The SPR will work with city departments to monitor the progress of initiatives and subinitiatives as they are carried out, and it will offer additional resilience support as needed in view of each department's progress.

The CRO and SPR will also oversee working groups, which will be organized in specific resilience policy delivery areas in consultation with the relevant city departments and divisions. The working groups will offer advice to ensure that the resilience initiatives and subinitiatives bring together the best knowledge and innovation in each area.

Progress with implementing the resilience strategy will be monitored in part by using the key performance indicators for each subinitiative. Progress will be reported on a yearly basis, to take stock of the successes, review new opportunities, and articulate the next actions.

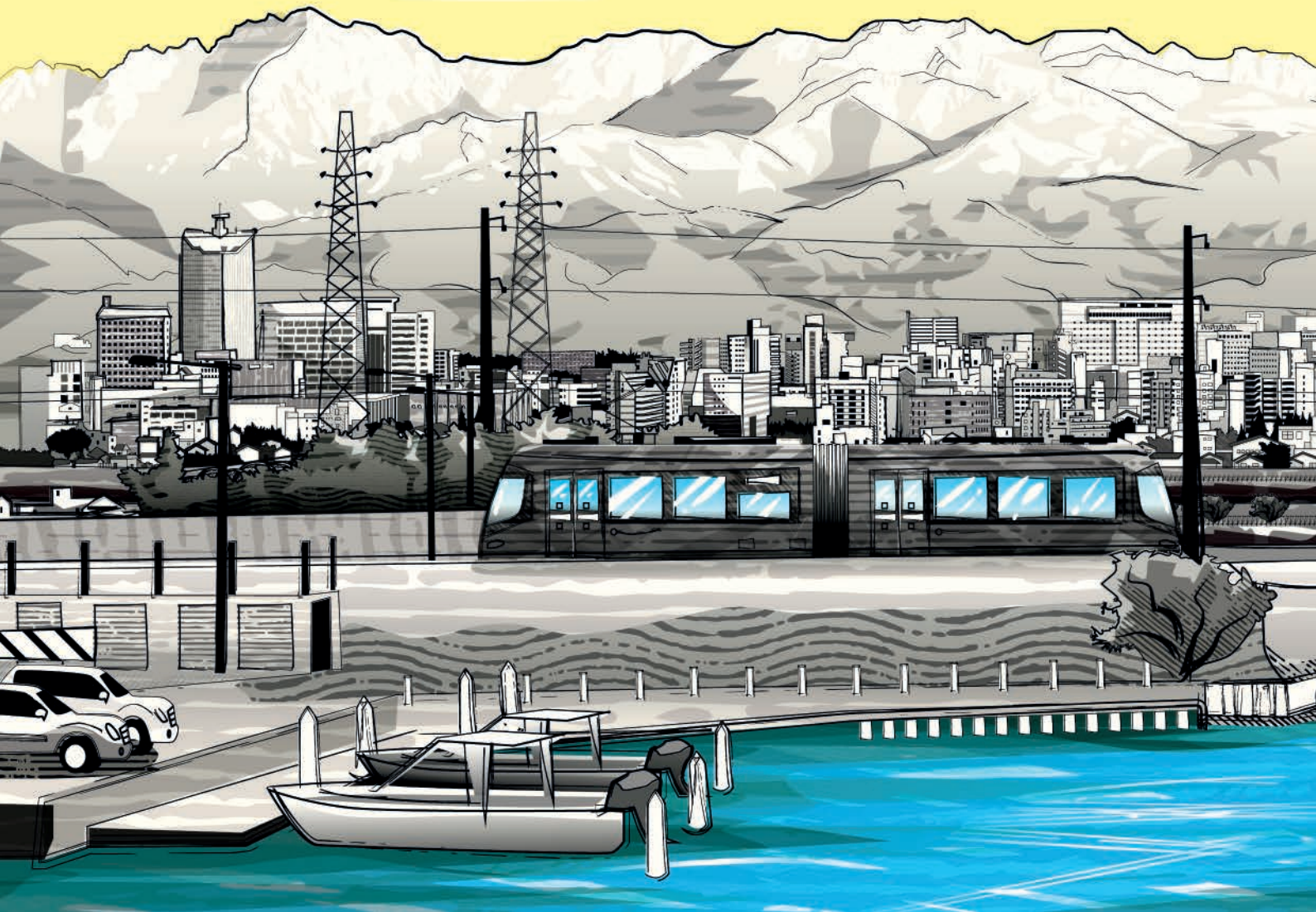
1 COMPREHENSIVE SMART CITY INITIATIVE	
1.A	Create a 30-Year Smart City Plan. [NEW]
1.B	Build an integrated lifeline platform. [NEW]
1.C	Create and promote the use of an open data platform. [EXTENSION]
2 PUBLIC TRANSPORT	
2.A	Complete north-south tram line connections under Toyama Station to fully integrate the system and increase light rail transit passenger numbers. [EXTENSION]
2.B	Promote the city center and other well-connected zones as residential and commercial areas to increase use of public transport. [ONGOING]
2.C	Modernize and build new train stations in congested and underserved areas. [NEW]
3 WATER/WASTE/ENERGY MANAGEMENT	
3.A	Revise comprehensive Toyama City Basic Environment Plan [EXTENSION]
3.B	Develop the city's waste-to-energy industry. [EXTENSION]
4 DISASTER PREPARATION AND RESPONSE	
4.A	Embed resilience as a principle of infrastructure design and maintenance. [EXTENSION]
4.B	Improve access to community infrastructure. [EXTENSION]
4.C	Improve flood control. [ONGOING]
4.D	Create community disaster management teams. [ONGOING]
5 INTEGRATION OF CITY CENTER-TO-COAST AREA	
5.A	Develop a masterplan for revitalization of the city center-to-seacoast corridor. [NEW]
5.B	Attract new business activities to locate in the city center-to-seacoast area [NEW]
6 RURAL TOYAMA AND AGRICULTURAL SUSTAINABILITY	
6.A	Conserve the rural landscape and forests. [Ongoing]
6.B	Promote high-value agricultural products. [Ongoing]

6.C	Expand agricultural skills. [Extension]
6.D	Introduce electric vehicles at rural city facilities. [NEW]
7 BUSINESS INVESTMENT	
7.A	Develop a comprehensive 30-year Business Investment Plan. [NEW]
7.B	Promote second-home ownership. [ONGOING]
7.C	Establish an incubator program for start-ups. [Alignment]
8 TOURISM	
8.A	Develop Toyama's digital services. [NEW]
8.B	Promote Toyama, both internationally and domestically, as a tourist destination. [NEW]
8.C	Create an international identity for Toyama. [Ongoing]
8.D	Create a healthy lifestyle plan and city branding. [NEW]
9 CITIZEN HEALTH, WELLBEING AND PARTICIPATION	
9.A	Upgrade community centers. [Ongoing]
9.B	Implement intergenerational programs for community participation. [Extension]
9.C	Implement intergenerational programs for local conservation. [Extension]
9.D	Facilitate employment opportunities for elderly and disabled people. [NEW]
9.E	Introduce initiatives to ensure working parents can continue to participate in the workplace. [Extension]
9.F	Promote cultural events. [Ongoing]
9.G	Encourage an active lifestyle for the older generation. [Extension]
10 CONSERVATION AND ENVIRONMENTAL EDUCATION	
10.A	Host an international summit on the marine environment. [NEW]
10.B	Promote a 3R project (reduce, reuse recycle). [Ongoing]
10.C	Increase environmental education at Eco-Town. [Ongoing]

Figure 6.5 Cross-Cutting Initiatives and Subinitiatives in Key Areas of Comparative Advantage

7

Next Stage



Background and Challenges

Aspirational Future Vision

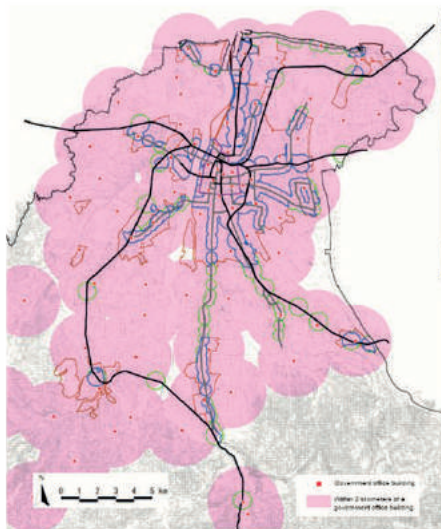
As a result of the Toyama compact city design, the city has seen not only residential relocation along public transport routes but also upward trends in public transport ridership. The efforts to “slim down the city,” in addition to the increased convenience of public transport, have improved the lifestyle of its citizens, and as a result has contributed not only to the creation of outing opportunities for elderly citizens and others and revitalization of the city center, but also to broader regional revitalization efforts that have started to bear fruit. For example, since 2008 there has been a continuous increase in population moving toward the transportation corridors and since 2014 there has been an increase in land values.

In addition, the Toyama’s goal is not a single core central city, but a hub-and-spoke urban structure where urban nodes are developed along public transport lines. Furthermore, by establishing 79 branch offices throughout the city, Toyama’s government is trying to provide day-to-day administrative services in person, so the city officers and the citizens can deal with local issues together (map and table 7.1).

Analysis example of urban functions

- Population ratio within 2 kilometers of government office buildings including the city office -

■ Approx. 98.9% of city residents live within a 2-kilometer radius of government office buildings*.



■ Population and ratio within 2 kilometers of government office buildings

	Population within 2 km	Ratio (%)	Population
Toyama City	413,349	98.9	417,856
City center and residential promotion areas along a railway line	161,027	99.9	161,197
City center	21,543	100.0	21,543
Residential promotion areas along a railway line	139,484	99.9	139,654
Others than the two areas above	252,322	98.3	256,659

*Government office buildings: 80 in total

- 1) City office: 1
- 2) Administrative service centers: 4
- 3) Core community centers: 2
- 4) Community centers: 73

Community centers:

These are the city government’s local branches in which city officials are stationed, placed basically according to primary school districts. They provide administrative services and information covering family registers, resident registration, seal impression registration, issue of certificates such as resident cards and tax-related certificates, National Pension System and National Health Insurance, having the functions of public halls. So they support community activities of various groups including self-government promotion associations.

Map and Table 7.1 Toyama City Services Coverage

Source: Toyama City.

Although the concept of community development for the city so far has been based on physical space, Toyama City is now trying to simultaneously establish a parallel city in cyberspace that achieves both economic development and the resolution of social problems by fusing the physical and virtual spaces. This effort accords with “Society 5.0,” Japanese government initiative to develop ultra-smart cities throughout the nation.

Challenges to Be Met

Toyama City has been implementing its programs within the concept of compact community development based on the concentration of hubs centering around public transport. Officials need to consider how to keep developing as a sustainable city while ensuring a high quality of life for the people who live in Toyama City. This has become one of the most important challenges.

Despite the efforts, it is estimated that the future population of Toyama City will decline from the current level of over 416,000 to under 398,000 by 2025, with 30 percent of the population being over 65 years old. This

decline will present a challenge to the vitality of the region. Another challenge will be to maintain the quality of infrastructure. For example, figure 7.1 shows that the length of city roads (in blue bars) is increasing while the road maintenance budget (the red line) stays flat.

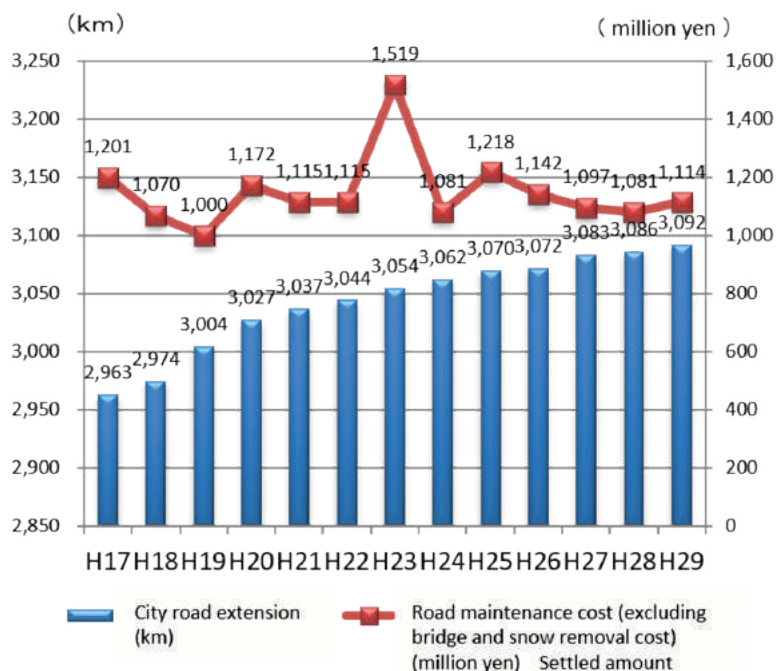


Figure 7.1 Expanding City Road versus Flattening Maintenance Budget, 2005-17

Source: Toyama City, “Data on Toyama City” [データから見る富山市], 2019.

Note: Years represent Japanese Heisei era years – e.g., H17=2005, H18=2006...H28=2016, H29=2017.

In the future, as Toyama progresses into the age of Society 5.0, the city must further consider how to continue to provide new services for citizens, revitalize its industries, and create new partnerships between the local government and the private sector to use the acquired data through new sensors, the internet of things (IoT), and other digital technologies.

Strategies Adopted

Toyama City Smart City Promotion Project

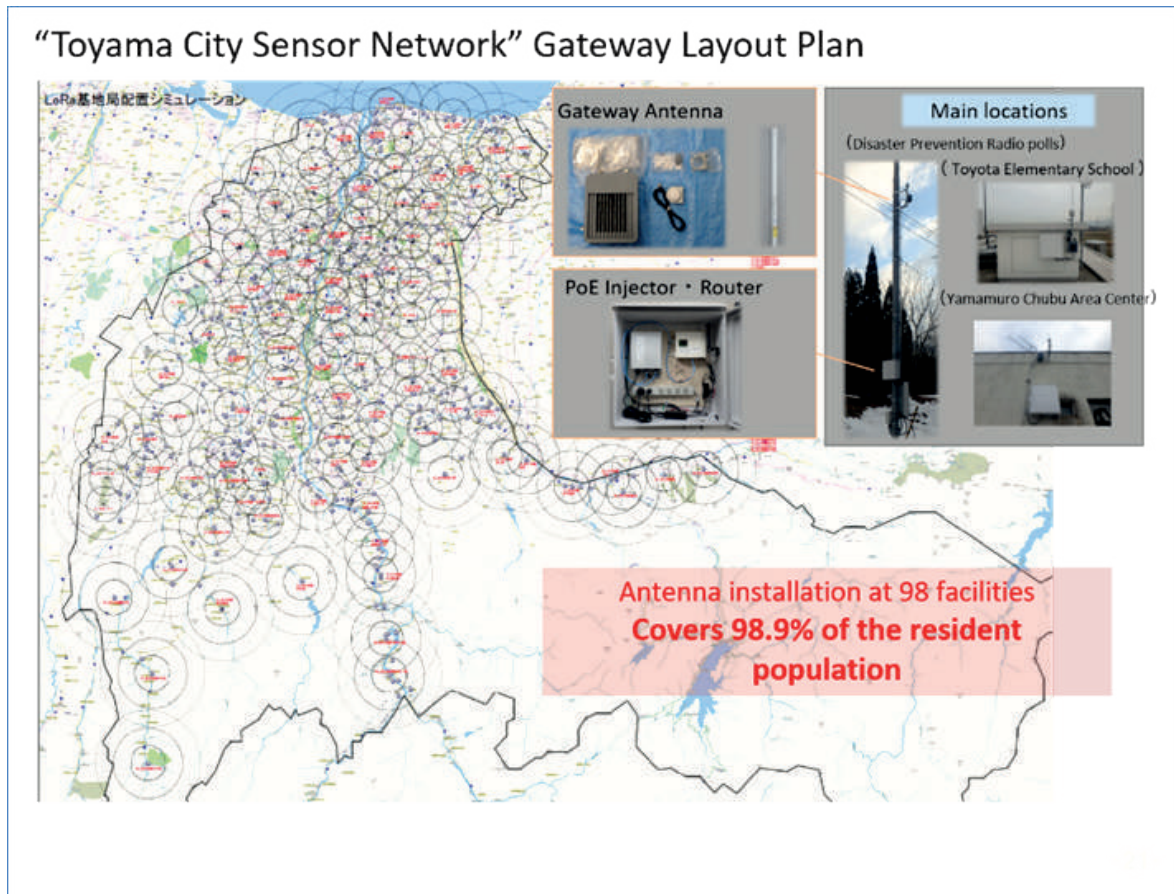
This project aims to achieve the creation of new values in the age of Society 5.0, to improve city services and the quality of life (QOL) in a new age, and to revitalize business activities by promoting the integration of information from cyberspace. New information acquisition methods will include IoT technology and data sharing between the local government and the private sector.

Sensor Network

The Toyama City Sensor Network was built to provide new administrative services and reduce administrative costs in relation to government infrastructure through the collection of a variety of variable real-time data from a range of sensors and through analysis of the accumulated data as big data. Built as the FY2018 Toyama City Infrastructure Development Project for the Promotion of the Smart City, the Toyama City Sensor Network consists of wireless communication networks that can be used via IoT sensors and others and the system to manage the information collected from sensors (platform).

Using a group of LoRaWAN communication standard receiving antennas, the wireless communication network is expected to cover 98.9 percent of the population in the city because it is installed at government facilities such as schools and local community centers (100 places as of January 2020) (map 7.2). In addition, work has begun on the system to manage the collected information from IoT sensors (platform) stored in the Cloud and to analyze and use collected data and exchange information with other systems in a smooth manner.

By using this network, the city government can perform the role of a telecommunications carrier to offer a communication network that can be used via IoT sensors. With the installation of a variety of sensors, it is expected that the network will perform an important role as a monitoring device for disaster mitigation—for example, in the prevention of flooding during heavy rain by collecting information that includes the movement of people and things and environmental information such as river water level and atmospheric temperature.



Map 7.2 Toyama Sensor Network

Source: Toyama City

Lifeline Common Platform

Toyama City Lifeline Common Platform is used to visualize information on a map in a uniform manner. It is also used to share information such as infrastructure data, including locations of utility poles and underground pipes owned by the local government, electricity companies, and telecommunication carriers, and information concerning damaged roads reported by residents. The shared information will be used not only to support the day-to-day lives of residents and businesses, but also to assess the situation, disseminate information, and assist the speedy recovery of operations during times of disaster.

The platform will not only be used to disseminate road work and traffic restriction information and emergency activity information that is integrated on the platform separately, but it will also create new value through collaboration with the Toyama City Sensor Network on a reciprocal basis.

Case study ①

REGIONAL COOPERATION PROJECT TO WATCH OVER CHILDREN

- Strong partnership with stakeholders
- Multiple benefits in one policy
- Development of community bonds



Background

In FY2018, as a pilot project, children at two elementary schools (Shibazono Elementary School and Hayahoshi Elementary School) were asked to carry a global positioning system (GPS) sensor that used IoT technology, and a survey was conducted on the actual conditions children faced traveling to and from school. The obtained data was shared with elementary schools and the Association for the Promotion of Self-Government to grasp the current situation and discuss future use of the collected data.

Approach

Using the data obtained from the GPS sensor, in collaboration with the University of Toyama, city officials were able to visualize the actual conditions of children going to and from school. The city of Toyama aims to use the knowledge obtained to carry out projects for all elementary schools in the city by 2023. In FY2019, data collection will be implemented in 14 schools starting in September, and of 3,093 children in the target schools, 1,758 parents gave permission for their children to participate in the project.

Lessons Learned

By helping planners visualize the actual conditions of children going to and from school, the data can be used for various decisions such as proper placement of transport volunteers, the amount of basic materials needed for moving residents to participate in local organizations, the adequacy of children's centers, and so on. City officials expect to propose a new model that uses IoT to determine how to implement a regional cooperation project for watching over children and that will lead to more efficient regional activities and the discovery of new players.

CASE STUDIES AND LESSONS LEARNED

Case study ②

TOYAMA CITY LIFELINE COMMON PLATFORM

- Visionary senior management team
- Strong partnership with stakeholders
- Multiple benefits in one policy



Background

Toyama aims to speed up disaster recovery and improve citizen services to create a high-quality city where everyone can live with peace of mind. This vision can be realized by sharing information owned by local governments and lifeline businesses (such as the locations of water, sewer, and gas pipes and of utility poles as well as construction information and the like) and building a database (common platform) that aggregates information received from citizens, such as road collapse information.

Approach

In FY2016, Toyama built the system (common platform) that serves as the basis for information sharing and established a city lifeline common platform council with the lifeline operators, such as electricity, gas, water and telecommunications operators; city transport operators; and Toyama Prefecture.

In FY 2017, Toyama started trial operation of a common platform between the members of the council and companies and improved the operation method and system (figure 7.2). In FY2018, discussions were held to build an electronic system to apply for permission to occupy roads and to publish construction information on the Web. In FY2019, Toyama started operation of the electronic application system for permission to occupy roads and started automatic cooperation on the common platform for construction information of businesses based on their application. In addition, Toyama has started to publish construction schedule information on city streets on the Web.

Lessons Learned

Engaging more stakeholders is essential to making the platform more useful.

Toyama City is investigating a mechanism that can disclose information in real time on emergency vehicles dispatched to fires, information on suspicious persons from the Toyama Prefectural Police, and the status of traffic obstacles. In addition, Toyama aims to strengthen the system to protect the safety of the region’s citizens and improve their quality of life by providing citizens real-time information directly related to their lives. The city will be able to provide the data by linking the information acquired from the IoT sensor installed by a city-owned company and a private company and collected in the Toyama city sensor network with the lifeline common platform.

Outlines of information linkage to the common platform to utilities

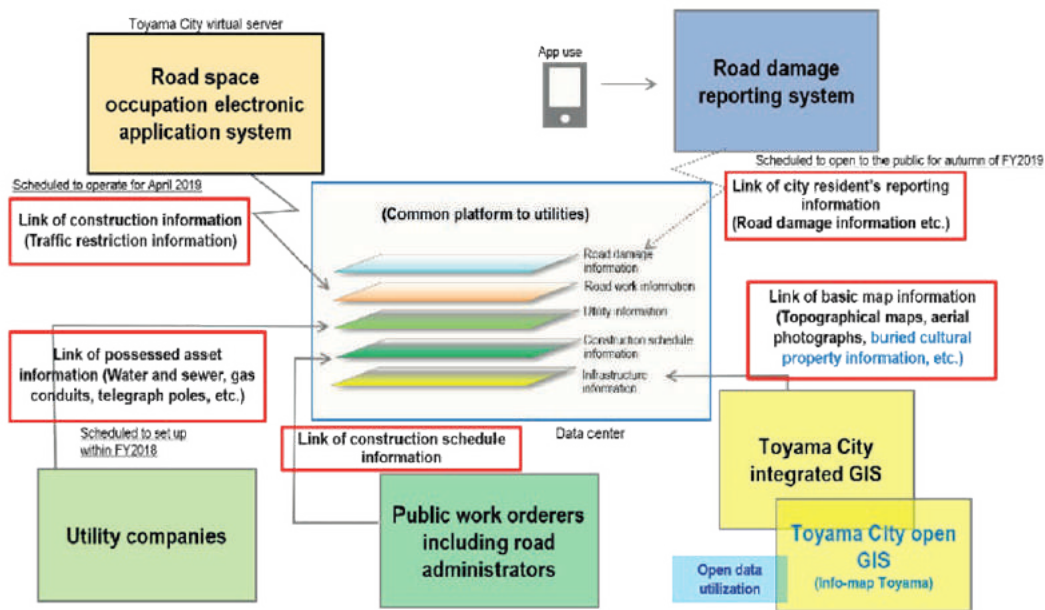


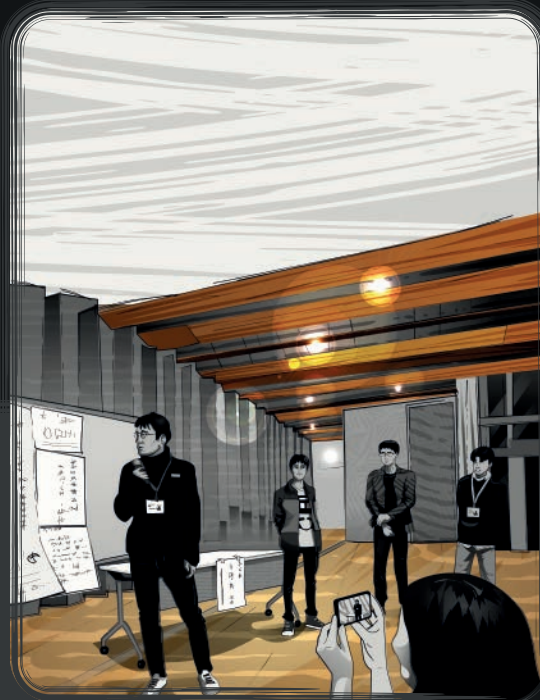
Figure 7.2 Toyama’s Common Infrastructure Platform

Source: Toyama City.
Note: GIS = geographic information system.

Case study ③

OPEN DATA INITIATIVES

- Strong partnership with stakeholders
- Multiple benefits in one policy
- Development of community bonds



Background

The progress of the advanced information society continues to accelerate, and with the explosive spread of smartphones equipped with PC-like functions and the wide variety of large amounts of data that come and go over networks, it is difficult to talk about modern social life without the achievements of information and communication technology (ICT) development in entertainment, administration, medical and nursing care, health, corporate activities, and more.

In such a situation, civic technology is actively used to open up the information held by the government as open data so information technology can be used in collaboration with citizens to solve local problems. In addition to converting various types of administrative information into open data, Toyama will actively promote the conversion of the data collected using the Toyama City sensor network to open data, which may be useful for various purposes beyond the boundaries of industry, academia, and government.

Approach

In FY2015, an open data promotion project team was set up across departments and an open data promotion policy was formulated. Working among agencies was one of the features.

In FY2016, Toyama constructed and opened the Toyama City Open Data Site and held an Ideathon with citizens using the city's open data in collaboration with Code for Toyama City. From FY2017 to FY2019, Toyama operated the Toyama City Open Data Site and expanded the open data.

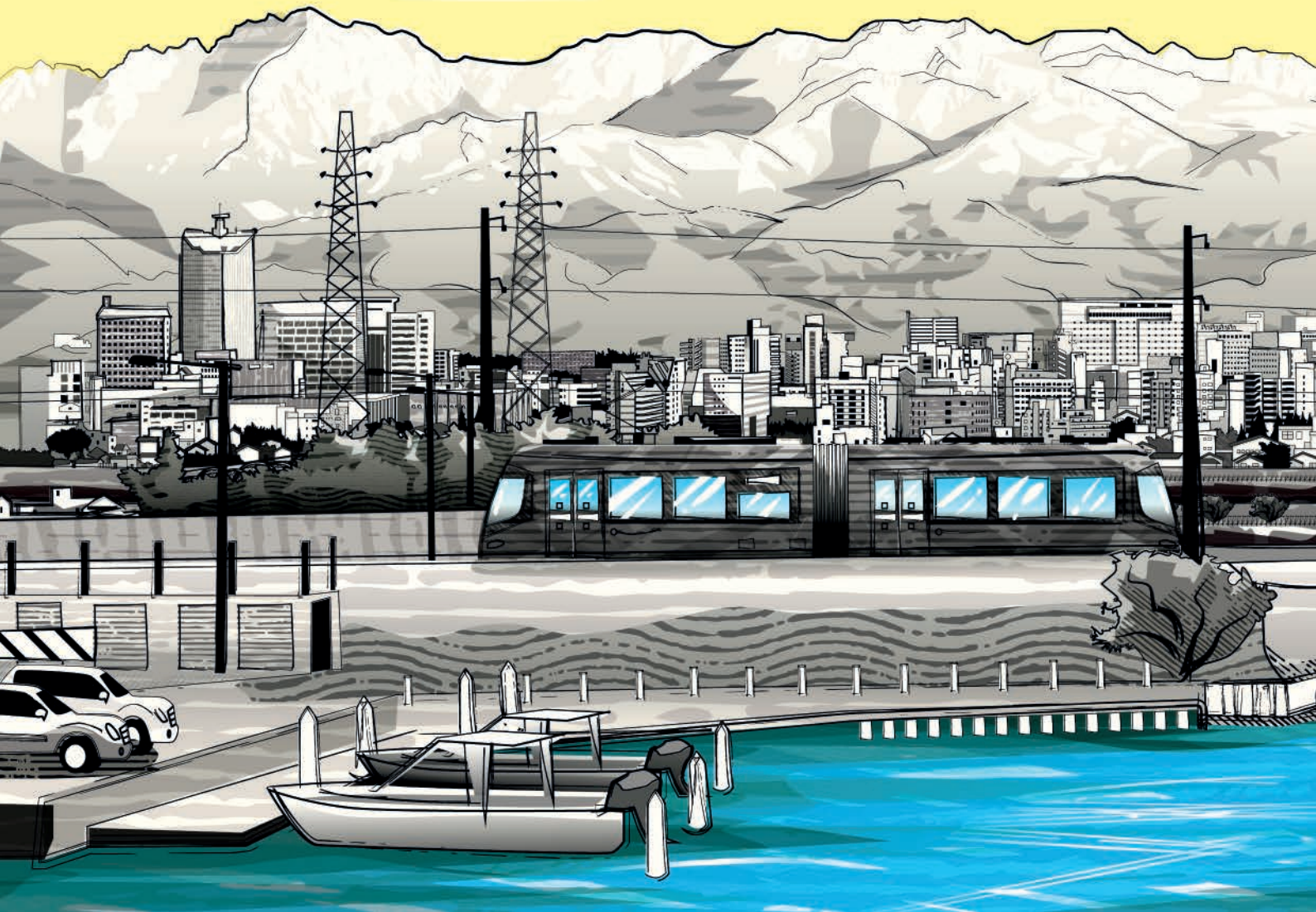
In FY2018, Toyama City sensor networks were provided to 36 research institutes, such as private enterprises and universities, free of charge as a field for demonstration experiments. There are 23 public offerings now available, such as "visualization of changes in the flow of people due to north-south connection of trams."

Lessons Learned

The implementation of the open data initiative became the starting point of many new projects to test advanced ICT in developing a much more connected smart city. By experimenting with new ways of treating and using the data, Toyama is quickly becoming a laboratory for cutting-edge technology applications and is leading the nation in what a regional city can achieve. This success also encourages the participation of local citizens and the businesses that had not had access to such information before.

8

Conclusion



Conclusions and Main Takeaways

Toyama's development model can serve as one of the approaches for many of the medium-sized cities in Japan and abroad that are combating various issues in an aging society. Many municipalities across Japan are facing municipal financial stress caused primarily by an aging and decreasing population. Toyama is not an exception. The mayor has successfully created a shared development vision and led the establishment of core strategies that address these issues. Toyama overcame these challenges by focusing on creating vibrancy in the city center, building better transit connectivity, and offering services catered to the elderly. By doing so, the city elevated the quality of life for everyone who calls Toyama home. The following factors led Toyama to achieve these successes:

Comprehensive compact city development beyond addressing spatial issues

Toyama's compact city policy demonstrates a comprehensive approach to addressing demographic and financial challenges that is highly applicable for other cities not only in Japan but in other countries. Compact city development per se is not the end but the means. That is, it is a way to address infrastructure provision in an economically efficient way in an aging society, it is a welfare policy in some ways, and it is about intergenerational integration as well. The policy also is about bringing together intersectoral issues and not just about spatial development.

Visionary senior management team

Strong leadership has been extremely important to Toyama City in the formation and implementation of its plans and initiatives. Mayor Mori and his team have provided the can-do attitude required to form partnerships with, and to mobilize support from, citizens and the private sector and across government departments.

Innovative mindset

Although Toyama may appear to have locational disadvantages being distant from both of the major economic agglomerations in Japan—Tokyo and Osaka—this distance, in fact, has led to a longstanding culture of innovation. This report has profiled a range of innovative projects and initiatives that include collaborations with the national government, the private sector, and academia. Toyama's international openness also has helped form numerous international partnerships and collaborations, helping to nourish innovation and attract investment.

Strong stakeholder partnerships in city planning and development

Hands-on involvement of local businesses and citizens is a key aspect to urban development in Toyama. This report has showcased a range of projects and initiatives in which Toyama has maximized meaningful involvement and strong partnerships with the public sector, businesses, academia, and citizens. The mayor's ability to work with local businesses and communities and the commitment of the CRO are another key driver connecting people in the city. Toyama focuses on clear and pragmatic messages and ensures that action planning is at the heart of dissemination, allowing the public to see evidence of short-term progress as well as the bigger picture.

Multiple benefits from one policy

At the heart of Toyama's urban development planning is the notion of seeking multiple payoffs from one policy. Each policy intervention is carefully crafted to have multiple payoffs. For instance, revitalizing public transport can reduce greenhouse gas emissions, improve accessibility for the elderly, increase public transport ridership, revitalize the CBD, reduce city budget costs, and encourage tourism.

Soft-power silo-breakers

The report has also showcased Toyama City's unique integrated planning model centering on the SPR unit, which has helped reduce "silo" mentality between heads of the city departments. Rather than assembling a superpower unit to bring different agencies together, Toyama has a very "soft" yet effective approach to string intersectoral channels together. The CRO and SPR unit provide a structure that extends across goals and sectors and has been pivotal in ensuring strategic and holistic issues are fully covered.

Developing community bonds

Toyama's urban development model includes varied initiatives that encourage and nourish community bonds, particularly intergenerational bonds in the context of an aging society. A people-focused approach is also at the core of its resilience planning effort.

About Toyama City and World Bank Partnership

City Partnership Program Background: Japan is home to a number of cities offering world-class and unique insights on a variety of development challenges facing cities around the globe. As part of an ongoing partnership with the government of Japan to share development experience through the World Bank’s Tokyo Development Learning Center (TDLC), the World Bank has introduced a new City Partnership Program (CPP). It is one of the first major initiatives directly engaging with multiple cities in Japan to conduct joint research, identify good practices, share knowledge and experience, and identify opportunities to link Japanese expertise with project-level engagements in developing countries.

Toyama City and the City Partnership Program: In July 2016, following an open call for expressions of interest and evaluation by a selection committee comprising technical specialists from the World Bank and relevant Japanese organizations, the cities of Toyama, Kitakyushu, Kobe, and Yokohama were selected as the first group of cities for the new program. For each city, the World Bank and the local government identified a series of thematic experience and solution areas that match the demands of cities in World Bank client countries. The key thematic areas of advantage put forward by Toyama for the CPP are (a) compact cities, (b) disaster risk management, (c) aging and accessibility, and (d) waste management.

Memorandum of Understanding: In November 2016, the World Bank and the city of Toyama announced their collaboration plans through the signing of a memorandum of understanding (MOU) to intensify collaboration to conduct joint research, identify good practices, share knowledge and experience, and identify opportunities to link Japanese expertise with project-level engagements in developing countries.



Photo 0.1 Memorandum of Understanding (MOU) Signing

Source: World Bank Group

The MOU commits both of the stakeholders to document experiences and lessons on various development challenges and solution areas through joint research and through knowledge delivery and learning activities designed to share experience around specific development solutions. The collaborators will also engage in capturing and documenting practical “how to” experiences from relevant agencies in Toyama City, and in producing outputs such as knowledge notes, toolkits, good practice guides, and videos.

Knowledge Exchange Events: One of the first collaborations between Toyama City and the World Bank was the jointly held Technical Deep Dive (TDD) on “Compact but Livable Cities” and the Resilient Cities Summit from October 30 to November 4, 2016, to discuss compact cities, explore policy decisions, and share examples of successful interventions (photo O.2). TDDs are an innovative approach to knowledge exchange—comprising workshops, site visits, peer-to-peer knowledge sharing, and action planning—which aim to foster operational development of World Bank–funded projects on specific issues.

The intensive five-day TDD in Tokyo and Toyama on Compact but Livable Cities was held in collaboration with the government of Japan, city of Toyama, Rockefeller Foundation, Singapore’s Centre for Livable Cities (CLC), Organisation for Economic Co-operation and Development (OECD), and New York University. More than 55 participants, including city government officials, staff from line ministries, and other members of 12 country delegations, and the World Bank Urban and Transport Task Team Leaders gathered together with Japanese and global experts to discuss the development of compact cities, explore policy decisions, and share good practices for the efficient implementation of compact cities approaches.



Photo 0.2 World Bank Technical Deep Dive Event in Toyama

Source: Toyama City

A portion of the TDD was held in the city of Toyama, including a series of peer-to-peer learning sessions and technical presentations. The aforementioned MOU was signed during this event. Additionally, the TDD delegation took part in the Resilient Cities Summit held in Toyama City jointly organized by the 100 Resilient Cities and made study tour visits across the city, including to the Toyama Eco-Town Industrial Park.

Furthermore, the World Bank and Toyama City collaboration is a reciprocal relationship that also allows for representatives and engineers from Toyama City to visit other cities for knowledge sharing. In particular, Toyama City is benefiting from the World Bank’s leading expertise in urban development and resilience.

Endnotes and References

- 1 United Nations, “The World’s Cities in 2018—Data Booklet (United Nations, Department of Economic and Social Affairs, Population Division, New York, 2018).
- 2 United Nations, “The World’s Cities in 2018—Data Booklet (United Nations, Department of Economic and Social Affairs, Population Division, New York, 2018).
- 3 Toyama City, Toyama City Population Vision [(Translated by author. Original title: 富山市人口ビジョン], 2020.
- 4 Toyama City, Toyama City Population Vision [(Translated by author. Original title: 富山市人口ビジョン], 2020.
- 5 Toyama City, Toyama War Reconstruction Magazine [富山戦災復興誌], 1972.
- 6 Toyama City, Toyama War Reconstruction Magazine [富山戦災復興誌], 1972.
- 7 The United Nations defines a country as “super-aging” when the share of people ages 65 and over exceeds 20 percent. See “Approach Paper: World Bank Support to Aging Countries,” World Bank Independent Evaluation Group, May 28, 2019.
- 8 World Health Organization, “Physical Activity and Older Adults,” Global Strategy on Diet, Physical Activity and Health website, n.d., . (2020). Retrieved from https://www.who.int/dietphysicalactivity/factsheet_olderadults/en/.
- 9 Based on interviews with city of Toyama officials in 2020.
- 10 Toyama City, “(2020) Building the Toyama Model for City Management with the Compact City Strategy”. Presentation by the mayor. (Translated by [author. Original title: コンパクトシティ戦略による富山型都市経営の構築]), presentation by Mayor Masashi Mori, 2020.
- 11 Based on interviews with Toyama City official in 2020.
- 12 Based on interviews with Toyama City officials in 2017.

