

Protecting from Catastrophic Floods while Boosting Shared Prosperity with Super Levees

The case of Arakawa River

Japan Project Brief

Background and Objectives

The Arakawa River was the cause of devastating floods over the course of history. Particularly heavy rainfall in 1910 caused the collapse of riverbanks in several places, leading to catastrophic damages to the Tokyo metropolitan area including 369 casualties, 1.5 million affected people, and 270 thousand inundated houses. Since then, the national government has been in charge of controlling the river. The Arakawa Flood Control Channel completed in 1930 has prevented any collapse of banks and levees for the last 80 years. It also served as a channel for river transportation and promoted economic growth along the channel. However, this rapid economic growth in Tokyo caused another problem, i.e. land subsidence. During the period of economic growth, excessive pumping of underground water caused substantial land subsidence. Consequently, large areas along the downstream of the Arakawa River, including some parts in Adachi City, became lower than the mean sea level of Tokyo bay. Once one of the dikes and levees collapse, catastrophic floods would occur. The population in low-lying areas in Tokyo is about 1.8 million. To respond to the risk of catastrophic floods, the national government developed a comprehensive flood control policy in the 1970s. However, due to rapid urbanization, there is no more land available for constructing new large flood control infrastructure such as flood channels. In this context, a super (high-standard) levee project began in 1987.

The Shinden district in Adachi City is geographically surrounded by the Arakawa and Sumida Rivers, which makes the district vulnerable to floods. The Shinden district in Adachi City with its mix of warehouses, residential houses, and small factories, was selected one of the districts for the construction of a super levee. When a large factory in the area was closed in 1996, the city government needed to develop city plans including the use of the site of the large factory.

Project Overview

A super levee is a river embankment with a broad width and a mild slope of 1:30 (i.e. a super levee with 10-meters height has a 300-

meters width (Figure 1)). Furthermore, super levee projects are implemented with urban redevelopment and land rezoning. In the past,

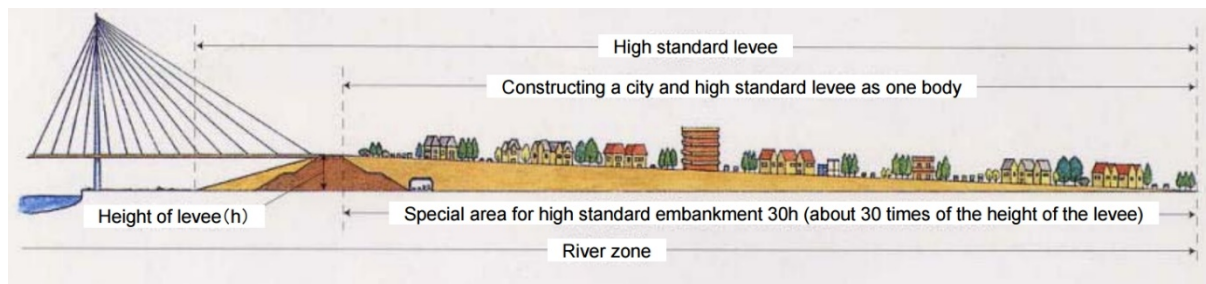


Figure 1: Schematics of a super levee

Source: Atsumi, M. January 2009. River management in Japan – With focus on river levee –. http://www.mlit.go.jp/river/basic_info/english/pdf/conf_05.pdf

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land use in river zones was strictly regulated by the River Law. However, the revision of the Law in 1991 stipulates that embankment surface of a super levee is a special zone, enabling the embankment surface being used for urban development (Figure 1).

Development of the Shinden District, Adachi City

Before the introduction of a super levee in the Shinden district, in April 1994, a partnership organization was formed among local residents, the Adachi City government, river administrators of both the national and Tokyo Metropolitan governments, and the Urban Renaissance Agency (UR)¹. The partnership organization served as a platform for stakeholders to discuss the development of a

plan for the Shinden district, and the district plan was developed in January 2001 reflecting the opinions of citizens. In line with the 2001 district plan, super levees were constructed including the new development of a bridge to Kita City, condominiums, a school, and a public park.

In 1996, the Adachi City government developed a master plan for the future Arakawa. One of three pillars is for flood management. Under the component of flood management, there are four focused areas: heightening levee, increasing earthquake resistance of levees, constructing and maintaining roads on riverbeds for emergency, and building and maintaining a ship dock. In addition to flood management, the project has two main goals: restoration and revitalization of riverbeds, and conservation of wildlands.

Table 1: Major goals of the Adachi City's Master Plan with planned measures

Major goals	Planned measures
Flood management	<ul style="list-style-type: none"> • Heightening levee • Increasing earthquake resistance of levees • Construct and maintaining roads on riverbeds for emergency • Building and maintaining a ship dock.
Restoration and revitalization of riverbeds	<ul style="list-style-type: none"> • Designing and maintaining a park while constructing a “super” levee. • Creating lawn fields • Creating play fields
Conservation of wildlands	<ul style="list-style-type: none"> • Maintaining large areas of wildlands • Increasing natural habitats of a gold course • Designing a row of cherry blossoms

Project Impacts

Flood Management:

Due to the extraordinary width, a super levee will be resistant to overtopping, seepage, and earthquakes (Figure 2). Compared to ordinary levees, a super levee is more resistant to large-scale floods. Not only for flood management, but also for redevelopment in the Shinden district, this project has brought several co-benefits to the community (Table 2).

Economic Impact:

The rate of the increase of the population in the district is 10% higher than other areas in Adachi City. The project expanded road networks with construction of a new bridge in the Shinden area. The increased population brought economic benefits to Adachi City.

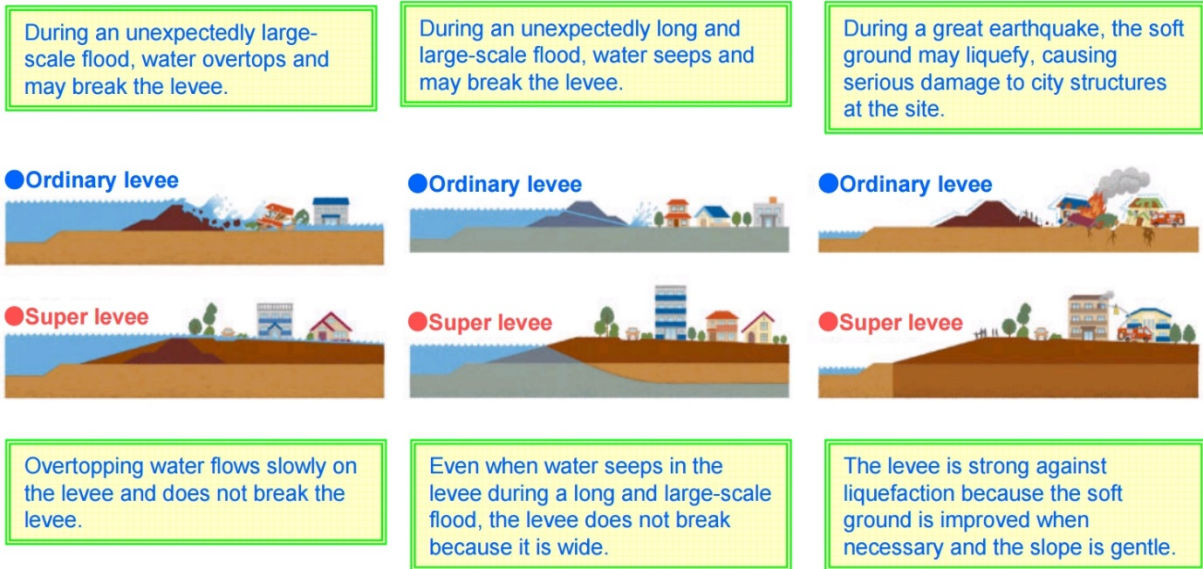


Figure 2: Comparison of a super levee and an ordinary levee in terms of the preventions of overtopping and seeps of river water and earthquakes

Source: Atsumi, M. January 2009. River management in Japan – With focus on river levee –. http://www.mlit.go.jp/river/basic_info/english/pdf/conf_05.pdf

Social Impact:

The project has increased a livability of the district. For example, Shinden Waterfront Park used to be a golf course with an area of 14.6 hectares. It was converted into a waterfront area where there is grassland public space for citizens to enjoy recreation activities such as walking and picnics. Other social benefits are summarized in Table 2.

Environmental and Disaster Preparedness Impacts:

Shinden Waterfront Park has tideland and wetland where the natural environment is conserved. The observational decks and paths in the park provide learning opportunities for children in urban areas to learn about the natural environment. The park also has a multifunctional open public space, which also serves as a temporary evacuation area. Benches can be converted quickly to cooking stoves in the event of a disaster. Heart-island Shinden, as a large evacuation area, has also increased disaster preparedness in the area.






Photo 1: Shinden Waterfront Park

Source: <http://www.city.adachi.tokyo.jp/koen/shisetsu/images/13070401.jpg>

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Table 2: Positive impacts of the project

Economic prosperity	<ul style="list-style-type: none"> • 3,000 residences are built. • Population has grown: 10% more than other areas in the city. • Road networks with a new bridge in the Shinden area have expanded. 	 <p>Shintoyohashi Bridge</p>
Livability	<ul style="list-style-type: none"> • Number of people per household increased to 2.14 per house in 2015 from 2.20 per house in 2010. • Interaction increased among residents through recreation activities and green space in the newly designed Shinden Sakura Park. • A school and kindergarten with new system are built (a school that combines elementary and junior high school and a temporary childcare service run by a private company). 	 <p>Shinden Sakura Park</p>
Disaster preparedness	<ul style="list-style-type: none"> • Heart-island Shinden, as a large evacuation area, has increased disaster preparedness in the area 	 <p>Heart-island Shinden</p>

Source: Photo of Shintoyobashi Bridge: <http://www.ur-net.go.jp/urbandesign/awards/shintomibashi.html>
 Photo of Shinden Sakura Park: <http://www.city.adachi.tokyo.jp/koen/shisetsu/koen/shinndennsakura.html>
 Photo of Heart-Island Shinden: http://www.ur-net.go.jp/urbandesign/images/works6_new_ph1.jpg

Lessons Learned

Multi-Purpose Infrastructure:

We cannot forecast when a catastrophic flood will happen. Therefore, public investment in large-scale infrastructure for flood management is essentially difficult to justify a cost-benefit ratio if the benefit is only to mitigate flood damage. In this sense, other economic, social, and environmental benefits are key to justifying the investment. The Super Levee project in Shinden District shows how to achieve these co-benefits.

Multi-Stakeholder Involvement:

Since its inception, the project has included various stakeholders into the decision-making process. Local citizens and relevant public agencies have been involved. The multi-stakeholder involvement ensured that the decision-making process was on a consensus-building basis and increased attractiveness for residents. Nonetheless, it was not perfect in a sense that the project has encountered some criticisms.

¹ Urban Development Corporation and the Regional City Development Division of the Japan Regional Development Corporation were merged in 2004, and Urban Renaissance Agency (UR) was established.

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Contact:

World Bank Group
 Social, Urban, Rural and Resilience Global Practice
 Tokyo Development Learning Center (TDLC) Program
 Fukuoka Seimei Bldg. 10F,
 2-2-2 Uchisaiwai-cho, Chiyoda-ku,
 Tokyo **100-0011** Japan
 Phone: +81 (3) 3597-1333
 Fax: +81 (3) 3597-1311
 Web: <http://www.jointokyo.org>