TECHNICAL DEEP DIVE ON INTEGRATED URBAN FLOOD RISK MANAGEMENT

SUMMARY REPORT

THE WORLD BANK
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GFDRR
Global Facility for Disaster Reduction and Recovery

Tokyo Development Learning Center

UFCOP
Urban Floods Community of Practice

TECHNICAL DEEP DIVE (TDD) ON INTEGRATED URBAN FLOOD RISK MANAGEMENT

APRIL 18-21, 2016

Co-organized by the World Bank Disaster Risk Management Hub, Tokyo, and the World Bank Tokyo Development Learning Center in partnership with the government of Japan (Ministry of Finance and Ministry of Land, Infrastructure, Transport and Tourism), the Urban Floods Community of Practice, and Global Facility for Disaster Reduction and Recovery

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ACRONYMS AND ABBREVIATIONS

CoP ..... Community of Practice

DRM ..... disaster risk management

GFDRR ..... Global Facility for Disaster Reduction and Recovery

ICHARM ..... International Centre for Water Hazard and Risk Management

IFAS ..... Integrated Flood Analysis System

IUFRM ..... Integrated Urban Flood Risk Management

JICA..... Japan International Cooperation Agency

LAC ..... Latin America and the Caribbean

MLIT..... Ministry of Land, Infrastructure, Transport and Tourism (Japan)

MOF ..... Ministry of Finance (Japan)

O&M ..... operations and maintenance

ODA..... official development assistance

PPP ..... public-private partnership

PUB..... Public Utility Board (Singapore)

PWRI ..... Public Works Research Institute

TDD ..... Technical Deep Dive

TDLC..... World Bank Tokyo Development Learning Center

UFCOP ..... Urban Floods Community of Practice

UNESCO ..... United Nations Educational, Scientific and Cultural Organization

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EXECUTIVE SUMMARY

The first Technical Deep Dive (TDD) on Integrated Urban Flood Risk Management (IUFRM) was held on April 18–21, 2016. It was co-organized by the World Bank Disaster Risk Management Hub, Tokyo, and the World Bank Tokyo Development Learning Center in partnership with the government of Japan (Ministry of Finance [MOF] and Ministry of Land, Infrastructure, Transport and Tourism [MLIT]), the Urban Floods Community of Practice, and the Global Facility for Disaster Reduction and Recovery.

The TDD on IUFRM offered firsthand knowledge-exchange opportunities for clients and World Bank staff from Argentina, Ghana, Indonesia, the Lao People's Democratic Republic, Madagascar, Nigeria, the Solomon Islands, and Vietnam. It included expert presentations from MLIT, the Japan International Cooperation Agency (JICA), and the International Centre for Water Hazard and Risk Management (ICHARM), as well as from Singapore's Public Utility Board. It was also an opportunity for MOF to highlight identification and mitigation of flood risks as important means of safeguarding communities.

The participating clients were a diverse mix: 42 percent were from infrastructure or public works departments, 37 percent from water resource management or hydrology departments, and 21 percent from disaster risk management agencies. A little over half of participants (56 percent) worked for national agencies, and the remainder worked for subnational governments. The eight participating countries represented approximately 3.5 million people exposed to floods every year.

A short survey of participants, conducted prior to the TDD, identified some of the key challenges participants' countries face in flood management: lack of or ineffective institutional frameworks, land use or land management issues, financial issues, and lack of capacity for holistic approaches to flood risk reduction. . The participants expressed interest in gaining practical knowledge, in benefiting from Japan's experience and expertise in managing urban flood risks, and in sharing experiences with peer countries.

More specifically, participants were interested in learning about nonstructural measures, investments, and operations and maintenance of structural measures. The TDD facilitated knowledge sharing on a range of relevant issues, including institutional frameworks and integrated planning processes, resilient structural investments, best practices for nonstructural measures, and capacity development measures designed to meet current and future challenges. Participants expected that the TDD would help them create plans for an integrated flood management system in their countries.

In showcasing the experience of countries such as Japan, the TDD strengthened participants' knowledge of the challenges they faced in their own cities and countries. By the end of the four-day interactive event, a number of key lessons had emerged:

Institutional and legal frameworks are important. Almost all participant countries recognized the importance of clearly defined institutional and legal structures, as well as clearly defined stakeholder roles and responsibilities, in flood risk management. The historical development of the legal framework for flood risk reduction in Japan—specifically the River Law and Flood Disaster Management Law—provided particularly useful insights.

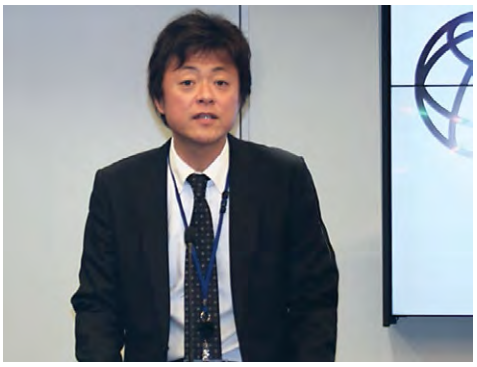
Stakeholders should act in coordination. In many countries, multiple agencies and departments are responsible for flood risk reduction, mitigation, recovery and resilience, and other aspects of IUFRM. Interagency coordination with synchronized information/data flow is essential in such cases.

Structural and nonstructural measures should be integrated. Many countries rely primarily on structural measures in their attempt to mitigate flood risks, but nonstructural measures are equally important. Combining the two will ensure robust flood risk management and help in achieving long-term results. For example, Japan's flood risk reduction efforts include nonstructural measures such as river basin planning and river improvement planning, as well as information networking, innovative research, and capacity building.

Land use planning is key. Rapid urbanization, which stresses existing infrastructure through overuse and disproportionate allocation, was the key concern for most of the client countries. It was widely agreed that governments should take measures to address this challenge in their spatial urban planning, simultaneously incorporating resilience in infrastructure development.

Technical solutions can mitigate flood risk. Japan and other countries have developed innovative solutions for IUFRM. Use of advanced technology, and optimal use of resources more generally, can help mitigate flood risks in future.

OPENING & WELCOME REMARKS



Mr. Noriyoki Mita

Deputy Vice Minister, Ministry of Finance (MoF), Government of Japan (at the time of the TDD)

Last year, Japan signed both the Sendai Framework for Disaster Risk Reduction 2015–2030, which targets finance for development and sustainable development goals, and the Paris Agreement to combat climate change. These steps highlight the importance of addressing risks from natural disasters and climate change in order to make societies more resilient to risks. Disaster risk management (DRM) is a priority for Japan because it helps to safeguard communities. Thus MOF seeks to integrate DRM in its fiscal policy and financial policy for development, primarily through the following:

- **Post-disaster finance:** These arrangements make it possible to transfer risk and respond to disasters quickly.
- **Resilient infrastructure.** Investment in high-quality infrastructure promotes sustainable, inclusive, and resilient growth and development.
- **A comprehensive disaster risk management system.** This type of system addresses both pre- and post-disaster trends and covers issues such as risk identification, public awareness, reduction and mitigation measures, regulations and standards, and conservation as a preventive measure.

This TDD was organized by the World Bank Tokyo Development Learning Center (TDLC) and the World Bank DRM Hub, Tokyo, in collaboration with the Japan International Cooperation Agency (JICA). It is designed to facilitate fruitful discussions on urban flood risk management; to further exchange of views, ideas, and experiences; and to promote change.

Ms. Jolanta Kryspin-Watson

Lead Disaster Risk Management Specialist, World Bank

Measured in terms of yearly losses and number of affected people, floods are the dominant hazard confronted by countries and cities. They tend to affect the poor disproportionately and are a significant development challenge. The severity of flood impacts in recent years, influenced by rapid urbanization and climate change, made a compelling case for organizing the Integrated Urban Flood Risk Management (IUFRM) TDD and bringing together people to discuss and exchange knowledge on urban flood risks..

The World Bank launched the Urban Floods Communities of Practice (UFCOP) last year. Since then, many opportunities to exchange knowledge and notes have been provided to client countries and internal teams. The portfolio of World Bank projects supporting flood risk reduction is steadily growing. Over the last 17 years, there have been 220 lending projects in urban flooding, and many more are in the pipeline. These projects have offered lessons about flood preparedness and about the failure of protection measures—lessons that are relevant even for the most developed nations. There is now a clear need to focus on adaptable solutions, including flexible and soft measures, which were not given as much emphasis in the past as they deserved. By the end of the TDD, it is expected that participants will have learned from each other's experiences as well as from those of Japan.

TECHNICAL DEEP DIVE: INTRODUCTION AND OBJECTIVES

TDDs bring together experts and practitioners through workshops, site visits, peer-to-peer knowledge sharing, and action planning. Their objective is to provide specific support to World Bank clients and their projects by addressing topics of high interest to clients and on which Japan has relevant experience and solutions. TDDs offer firsthand opportunities for developing countries to exchange and deepen their knowledge through intensive study tours and peer learning.

TDDs are demand-driven programs focused on specific client objectives. They are part of TDLC's mission to link demand for knowledge and expertise from Bank clients with relevant Japanese expertise. Client demand is identified through a demand survey conducted by the World Bank. Demand is met by offering participants structured learning before they arrive in Japan, while also providing ongoing support to connect them with technical experts and best practices in close collaboration with the Bank's Communities of Practice (CoPs).

The TDD on IUFRM was the first pilot program of a knowledge series designed to share good practice and experience on key development challenges. It is a collaboration between TDLC and the DRM Hub, Tokyo, in partnership with the UFCOP, the Global Facility for Disaster Reduction and Recovery (GFDRR), Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and the Japan International Cooperation Agency (JICA). It is part of the DRM Hub's Knowledge Program on IUFRM, which focuses on knowledge development and adaptation through a series of targeted knowledge notes highlighting Japan's successful approaches to managing the risk of river basin flooding and through knowledge exchange and dissemination (by such means as operational knowledge exchanges and public seminars).

Held on April 18–21, 2016, in Tokyo, and bringing together 30 officials from eight developing countries as well as members of World Bank project teams and key experts from Japan and Singapore, the TDD on IUFRM was a highly interactive platform that provided client countries with useful information about Japanese and global experiences. Developing country clients learned how Japan fundamentally rethought flood risk at the beginning of the 20th century; how it continues to invest, operate, and evolve to manage and reduce flood risk thoughtfully and systematically; and how these lessons can be applied to their own investments.

The TDD has four core elements:

- **Challenge objective**, which reflected the demand-driven nature of the program and involved problem solving and technical assistance, including expert consultation and expert visit to client nations

- **Knowledge development for operational development**, which involved knowledge exchange and just-in-time assistance and potential technical assistance for clients and World Bank task teams

- **Structured learning** for clients and partners, delivered through e-learning courses and a package of selected knowledge exchange instruments before, during, and after the TDD in Japan

- **Application to knowledge networks**, which involve contribution of relevant inputs to CoPs to support development of case studies and best practice lessons and to diffuse knowledge to the broader community

The learning was structured around four themes:

1. **The evolving approach in Japan**
2. **Planning to reduce flood risk**
3. **Integrating nonstructural measures in flood risk management**
4. **Turning planning into investment in key structural measures**

By bringing together practitioners and experts from DRM institutions, governments, and academia, this TDD set the stage for collaboration and sharing of ideas and experiences. The key messages to emerge from the TDD—relating to the challenges faced by the client countries, lessons learned, necessary action plans, and outcomes and conclusions—are summarized in this report.

SESSION SUMMARIES

An Evolving Approach: The Case of Japan

Mr. Takafumi Nakui
MLIT, Tokyo

Japan: "Evolving Approach to River Management in Japan"

Japan's notable progress in flood disaster risk reduction is due to its adoption of different approaches in response to changing conditions, such as rapid urbanization. The legal framework for flood risk management has also evolved over the years, with implementation and revision of two major laws, the River Law (1896 and two major revisions) and the Flood Control Act (1949). The River Law focuses on river management (comprising flood risk reduction, water resources management, and environment creation and preservation). The flood management aspect of the River Law includes planning and implementation of flood risk reduction along with a regulatory framework that prevents an increase in flood risk. The Flood Control Act focuses on two complementary components, flood risk communication (hazard mapping, flood forecasting, and warning) and emergency response. There is a designated river management authority that manages each of Japan's rivers and that acts as the first respondent for early recovery and reconstruction of river infrastructure in case of a disaster. In principal, Class A rivers are managed by MLIT and Class B rivers by prefectural governments. Water resource management, including flood management, is conducted by river managers.

The Flood Disaster Management Act focuses on human activities to protect lives and properties from flooding and to minimize damage when a flood disaster is occurring or about to occur (flood warning, flood fighting, etc.). Municipalities also bear responsibility for flood risk management activities and give directions to the flood fighting corps—the groups formed by residents living near rivers that become active when floods occur.

The concentration of population and assets in Japan is limited to the available plain areas. The rivers have steep gradients and are short, resulting in rapid flow. Before the 19th century, each community implemented river management and flood control in its own region without coordinating with other communities. However, there is now an imperative need for coordinating regional interests because of rapid urbanization and population increases in catchment areas, increases in water demand due to economic growth, and increases in dam construction to generate electric power. Thus after the 20th century, Japan adopted an integrated river management system, with the roles and responsibilities of each of the river management authorities clearly defined.

Key Challenges Faced by Client Countries

Argentina

- The city of Buenos Aires is built on eight basins. High volumes of rainfall and rapid haphazard urbanization are the key challenges faced. Choking of drains, at times leading to overflowing and subsequent flooding, adds to the problems.
- Buenos Aires has had a master plan for flood prevention for the last three to four decades. The plan lays out structural measures but does not specify nonstructural measures.
- The basins of Buenos Aires are within the city limits, so coordination with other cities is minimal; but the coordination between the central and provincial governments is very weak.

Indonesia

- Jakarta is located on low-lying ground, and currently 40 percent of the city is below mean sea level. It is at risk of floods and tidal events because of its proximity to the sea and its exposure to the monsoon rainy season occurring between December and April.
- Jakarta is one of the fastest sinking cities in the world. From 1974 to 2010, total subsidence increased from 25 cm to 400 cm; and the subsidence rate increased from 0.5 cm/year to 17 cm/year.
- Currently, the greatest challenges are relocating the informal settlers occupying the waterways and retention ponds to low-cost rental apartments, providing resettlement assistance (free education, health, transport etc.), and restoring livelihoods.

Madagascar

- Rapid unplanned urbanization and environmental degradation are the key concerns.
- Institutional fragmentation—resulting from lack of coordination among agencies and unclear definition of roles and responsibilities—is a major challenge.
- Other issues include inadequate solid waste and wastewater management systems, failure to maintain flood protection infrastructure, filling in of floodplains, and lack of drainage systems, as well as limited access to housing, limited service provision, and increasing congestion.

Nigeria

- Ibadan, the third-largest city in Nigeria, is highly exposed to frequent flooding. The city has experienced an increasing number of flood events during the last 50 years (16 major events recorded). The latest flood event—in 2011—caused deaths and serious damages to key infrastructure.
- Key issues are rapid urbanization, lack of planning, and climate change.
- There are disaster management plans in place, but insufficient finances make implementation, enforcement, and maintenance of a good system a challenge. In Nigeria, there is no forecasting or early warning system, so resources are not mobilized in time.
- The formulation of an effective and sustainable urban flood risk management program for Ibadan is a long, complex, and costly process. Promoting an integrated and effective urban flood risk management program, combining both structural and nonstructural measures, requires a good understanding of available alternatives and must also consider the future growth of the city.

Vietnam

- Vietnam's government has approved a number of legal documents for general flood management (including laws, government decrees, decisions, standards, and methodologies) but has not approved the national Integrated Framework on Flood Management for urban areas.
- In Vietnam, the consistent coordination between state agencies needed for integrated flood management is lacking. The lack of coordination between the ministries and localities causes functions to overlap.
- Vietnam does not have tools or a system for monitoring flooding; nor has it developed guidelines on safety criteria .
- Vietnam's urban planning method is obsolete and needs to be updated with new methodologies; new technology is not integrated in urban water management.
- Inadequate sources of finance are a major financial issue.
- Communities do not adequately participate in flood prevention.
- Projects incorporating natural disaster prevention are not prepared or implemented.

Understanding the Current Approach and Planning Efforts

Mr. Takayuki Kubo
Water and Disaster Management Bureau, MLIT, Tokyo

Japan: "Planning to Reduce Flood Risks in Japan"

Japan is a flood-prone country whose assets and population are frequently affected by flooding. In order to address flooding, Japan has developed a flood management system that focuses on preparedness, prevention, emergency response, and recovery. It has also developed a basin-based comprehensive flood risk management plan, which uses a combination of structural and nonstructural measures. In Japan, investing in an effective flood management system has led to more sustained and stable economic growth. The River Law of 1896 was the birth of the modern river system, and it has been amended in three stages to suit the context of Japan's flood risk management. In 1964, Japan developed and adopted an organized approach to river basins for flood risk reduction and water resources management. By 1997, this had developed into a comprehensive river system for flood control, beneficial water use, and environmental protection.

Japan's framework for flood management planning, prescribed under the country's River Law, outlines both long-term policy for river improvement and a medium-term (20- to 30-year) concrete improvement plan (see Figure 1). Both long-term policy and medium-term planning are based on analysis by scientists and engineers. Consensus building with local residents, academic institutions, and government officials is done during the planning stage. This approach facilitates a continuous budget allocation.

Japan has comprehensive flood control measures, including **(a) river measures**—river channel improvement avnd construction of dams, retarding basins, and discharge channels; **(b) basin measures**—maintenance of urbanization control areas, conservation of fields, and construction of reservoirs, rainwater tanks, permeable pavements, and seepage pits; and **(c) measures to alleviate damage**—establishment of the evacuation warning system, maintenance of suibo systems (flood fighting/flood damage prevention activities), and promotion of awareness among local residents.

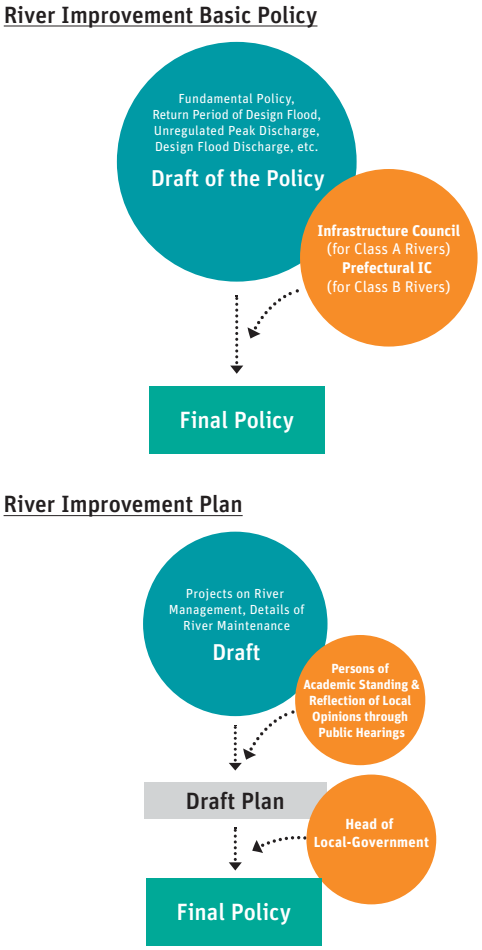


Figure 1. Framework for flood management planning under the River Law

Key Highlights from Client Engagement:

Solomon Islands

Challenges include limited land availability, rapid population growth, and rural-to-urban migration, resulting in unmanaged growth of informal settlements on marginal land in high-hazard floodplains and steep slopes. Limited land use planning and development controls with weak implementation are suspected to worsen flooding.

There is limited capacity to implement legislation and policies related to watershed management, and inadequate financial allocation for disaster risk reduction. Generating accurate risk assessment information is difficult because only minimal hydrological data for calibration of flood models are available (a result of infrastructure being vandalized and data records poorly maintained). Institutional management of flood risk reduction is characterized by silos rather than integration. Intense rains (likely exacerbated by climate change) and fast-rising, debris-laden floods present a challenge for effective flood warning systems. Highly dynamic river channels test the standard engineering solutions for flooding and riverbank erosion.

The Solomon Islands' government is carrying out initiatives to address flood risk concerns, including a project to improve resilience for vulnerable urban populations (Rapid Employment project) and a project focused on community-level investments (Community Resilience to Climate and Disaster Risk Project). Another important step is the preparation of the Honiara Flood Risk Management Study and Plan, which is under way and aims to understand flood risks, modify flood and erosion hazards, modify exposure and vulnerability, and enhance institutional coordination.

Lao PDR

The country is highly exposed to flood hazards. Roads are continuously damaged by landslides and floods, and growing cities are struggling to keep up demand for infrastructure such as drainage. There is a need for capacity building of line ministries and technical agencies involved in flood risk management at the central and subnational levels. Water-related vulnerability will increase if, as expected, floods and droughts become more frequent and intense, a product of increasing temperatures, annual rainfall, and runoff. The result will be increased economic losses.

The government aims to promote better preparedness and management of flood risks, through rehabilitation, strengthening, and flood proofing of infrastructure such as river embankments, flood gates, and drainage systems; dredging; and enhancement of early warning systems. The Mekong Integrated Water Resource Management Project, an active project supported by the World Bank that includes flood risk management investment in priority river basins, is part of this effort. The Lao PDR Southeast Asia Disaster Risk Management Project, a proposed project supported by the World Bank, would include select flood risk management investment to strengthen hydrometeorological and early warning systems and support the government's financial resilience.

Integrating Non-Structural Measures

Mr. Yoichi Iwami

Chief Researcher, International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Public Works Research Institute (PWRI), Japan

Japan: "Nonstructural Measures with Advanced Technology for Flood Risk Reduction"

The International Centre for Water Hazard and Risk Management was established in March 2006 as a Category 2 center of UNESCO. The mission of ICHARM is to serve as the global center of excellence for water hazard and risk management by observing and analyzing natural and social phenomena, developing methodologies and tools, building capacities, creating knowledge networks, and disseminating lessons and information in order to help governments and all stakeholders manage risks of water-related hazards at global, national, and community levels. ICHARM's mandates lie in efficient information networking, innovative research, and effective capacity building.

Mr. Iwami's presentation highlighted the following key points:

- Comprehensive flood risk management includes structural measures, land use management, and nonstructural measures.
- Developing countries face common challenges, but these challenges also have solutions:
  a) A lack of observed data (past and real-time data) makes flood forecasting, risk assessment, and future planning difficult. One solution is to use global data from satellites with in situ data inputted to the distributed model.
  b) Budget limitations make developing infrastructure and establishing a flood forecasting system difficult. One solution for establishing a flood early warning system is to use free software that has been developed and provided others.
  c) The inability to build needed capacity makes system operations and maintenance (O&M) difficult. One solution is to facilitate training in the necessary knowledge and skills for operating and upgrading the system.
- Early warning system software—Integrated Flood Analysis System (IFAS)—is available free of charge. Indus-IFAS is a localized version used in Pakistan, but many applications are used in other countries as well.
- Nonstructural measures are useful in mitigating floods and should be implemented before the occurrence of disasters. Simulation technology is important for early warning and long-term planning (see Figure 2).
- ICHARM IFAS/RRI (rainfall-runoff-inundation) models are strong tools for flood simulation. Developed using global data, they require training for use.
- Satellite rainfall data need calibration with ground-gauged data. Collecting in situ data, using a step-by-step approach, increases the accuracy of flood forecasting models. Science and technology should be integral to flood disaster risk reduction and part of the foundation for comprehensive policy making.

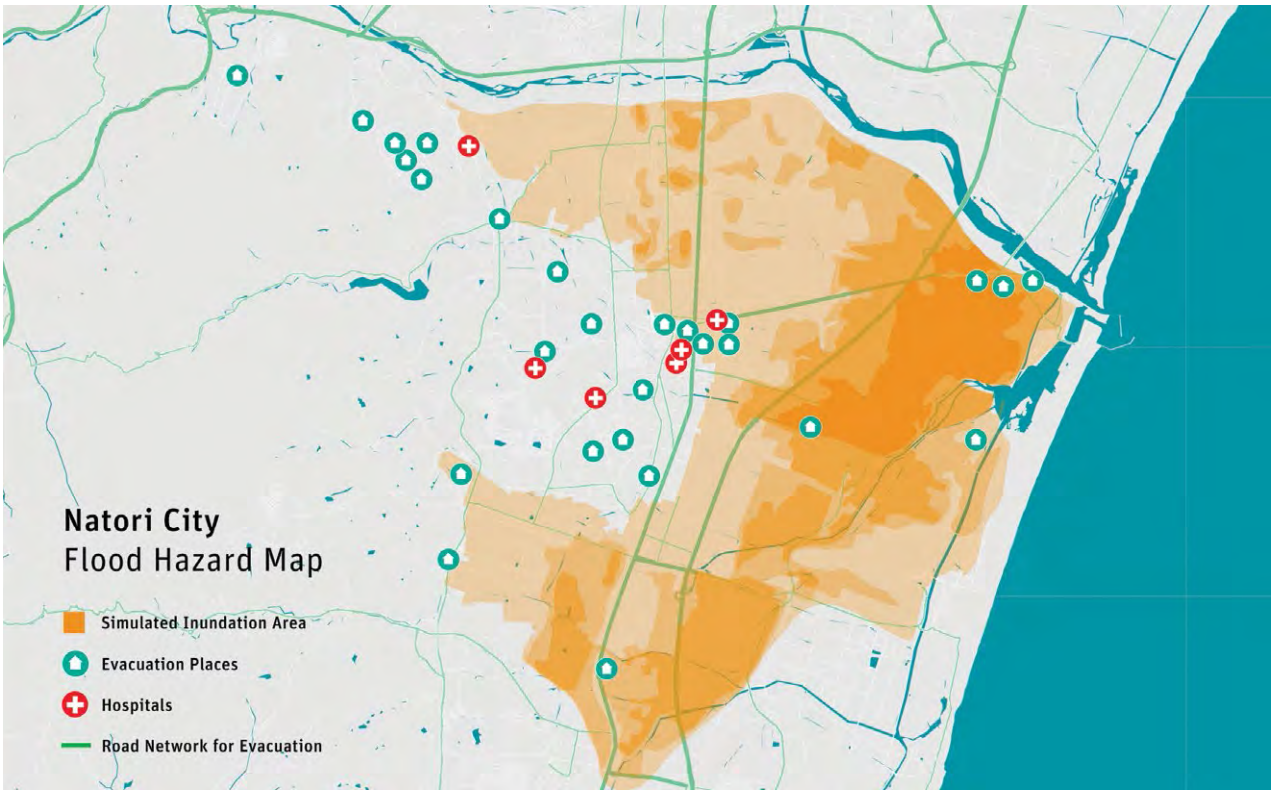


Figure 2. Flood Hazard Map (example of Non-structural measure);

Summary of Discussion

Ghana developed its flood forecasting early warning system following the 2001 floods. It used ground-based data and an expansive collaborative system, with support from local and national governments as well as communities. Now the system provides real-time warnings and is useful in determining crop times for different seasons. Plans to expand the system to Togo, neighboring Ghana, are under way. Communities are engaged through schools as well as radio and other media. Historical data were always present in Ghana's hydrological records, but now, with technological advances, the data are more accurate.

Lao PDR offered examples of how it is integrating nonstructural measures in flood risk management. The new Water Resources Law calls for developing an advanced forecasting system. Presently, the lack of technology makes Lao PDR dependent on Thailand and other neighboring countries. For small countries like Lao PDR, it may not be cost-effective to develop independently the kind of comprehensive technologies used by other nations.

Nigeria focuses on financial planning and budgeting over nonstructural measures. The need for certain structural measures makes clear the importance of early planning. Nigeria has adopted some interesting technologies to move toward a well-functioning system, but capacity building and cost-effective technological intervention are still required.

The Solomon Islands delegation suggested that a high level of engagement by the local population is required, in part to reduce the risk of vandalism to infrastructure. Radars and other equipment are unused because the community doesn't understand their value. Solid waste management is understood to affect flood risks, so communities should be engaged to make behavioral changes that will improve it. Any investments in technology should be based on the skills and willingness of people to maintain them. For this reason, it is important to retain talent and invest in human capital in addition to other nonstructural activities.

Argentina developed its master plan for flood risk reduction, which includes both structural and nonstructural measures, 10 years ago. However, at the time of implementation, structural measures were given priority, resulting in a shortage of available funds for nonstructural measures and an unsatisfactory outcome. Implementation of the plan was later shifted to MOF, which prioritized nonstructural measures and gave the hydrological system and related plans their due importance. MOF realizes that although flood hazards may not be eradicated, the risks can be mitigated. Populations should be involved to reduce the risk further.

Madagascar faces the classic problem of poor planning and lack of maintenance of flood protection infrastructure, land filling in floodplains, etc. Sometimes its planning fails due to delays in implementation.

Flooding in **Jakarta** is a long-standing issue. Some people, especially informal settlers on the floodplains, see floods as an opportunity to receive donations and food. This mentality is challenging because it ignores the huge economic losses caused by flooding and encourages people to continue building on floodplains illegally. Jakarta is increasingly adopting advanced technologies to counter floods, including early warning systems.

Vietnam noted that communities should be consulted and accordingly engaged in a two-way communication process. It is important to adopt modern technology, but simple technologies that communities can understand and operate also have an important role to play. Communities should be involved in flood management plans and contingency plans. The government has started integrating the hydrometeorological system and is prioritizing two-way interventions between the center and the people at the grassroots level. The goal is to improve early warning messages and ensure communities understand how to act based on these messages.

Investing in Key Structural Measures

Mr. Ismail Ridzuan
Director, Catchment & Waterways Department, Public Utility Board (PUB), Singapore

Singapore: "Singapore's Approach to Storm Water Management"

Singapore is surrounded by sea on all sides, has a tidal range of about 3 m, and receives annual rainfall of 2,400 mm. Over 3 percent of the land area is below 102 mRL (minimum reporting level). It is a 100 percent urbanized country and continues to face the challenges of urbanization. Singapore had a history of floods but through planning as well as structural and nonstructural measures it has tackled the issue well. As a result, floods are now localized and usually subside within an hour.

Singapore has developed 8,000 km of drains and waterways over the years. These are categorized as **(a) major canals**—large waterways that lead to reservoirs or the sea; **(b) outlet drains**—tributaries that discharge to major canals; and **(c) roadside drains**—drains along the sides of roads.

Among the structural measures undertaken to manage storm water are securing drainage reserves for upcoming developments, building in compliance with development control codes, building flood barriers and gates for to address development constraints, and improving drainage works (Figure 3).

Initiative by Japan Bosai Platform (JBP)
The Japan Bosai Platform is an initiative of the Japanese government, under the direction of MLIT, that brings together academia, the private sector, government, international organizations, and other stakeholders to provide technology-driven solutions for disaster management to Japan and other countries. The government of Japan aims to leverage its advanced technology and experience in disaster reduction to help partner countries manage their disasters scientifically through this innovative platform. For flood risk management, JBP installs a community-based flood monitoring system near the river; the system uses geospatial data to observe and detect signs of floods and facilitate early warning. The system has been installed in Bangladesh, Myanmar, the Philippines, and Brazil as well as in Japan.

1. **Providing adequate drainage ahead of new developments.**

2. **Implementing flood protection measures by stipulating requirements such as minimum platform levels and crest levels in the Code of Practice on Surface Water Drainage.**

3. **Improving drainage in flood prone areas continually by widening or deepening drains, and/or by raising low-lying roads.**

Figure 3. PUB's Stormwater Managment

Key Highlights from Client Engagement

Vietnam

In Ho Chi Minh City, a combination of nonstructural and structural interventions is needed to address the challenges of rapid urbanization in low-lying areas, increasing rainfall, and increases in tidal levels linked to climate changes. However, lack of available financing for interventions, land acquisition for construction sites, and lack of coordination among city departments and institutions deter necessary investments.

The ongoing Ho Chi Minh City Flood Risk Management Project has two aims: first, to strengthen the government's capacity for IUFRM through (a) incorporation of plans for flood risk reduction investment in urban development plans, (b) preparedness, (c) institutional coordination mechanisms, (d) flood forecasting, early warning dissemination, and emergency response, and (e) policy mechanisms to influence basin–scale planning by cities and regions; and second, to enhance flood management infrastructure along with nonstructural measures.

Ghana

Accra has experienced rapid growth in the last 15 years: during this period the urban extent tripled. Prolonged periods of economic decline, accompanied by political instability from the late 1960s to the 1980s, have resulted in old and poorly maintained infrastructure.

Accra is working to mitigate flood risks through structural measures like drainage network improvement and development (Figure 4), but it continues to face challenges posed by logistical inadequacies, staff inadequacies, and delays in securing project funding.

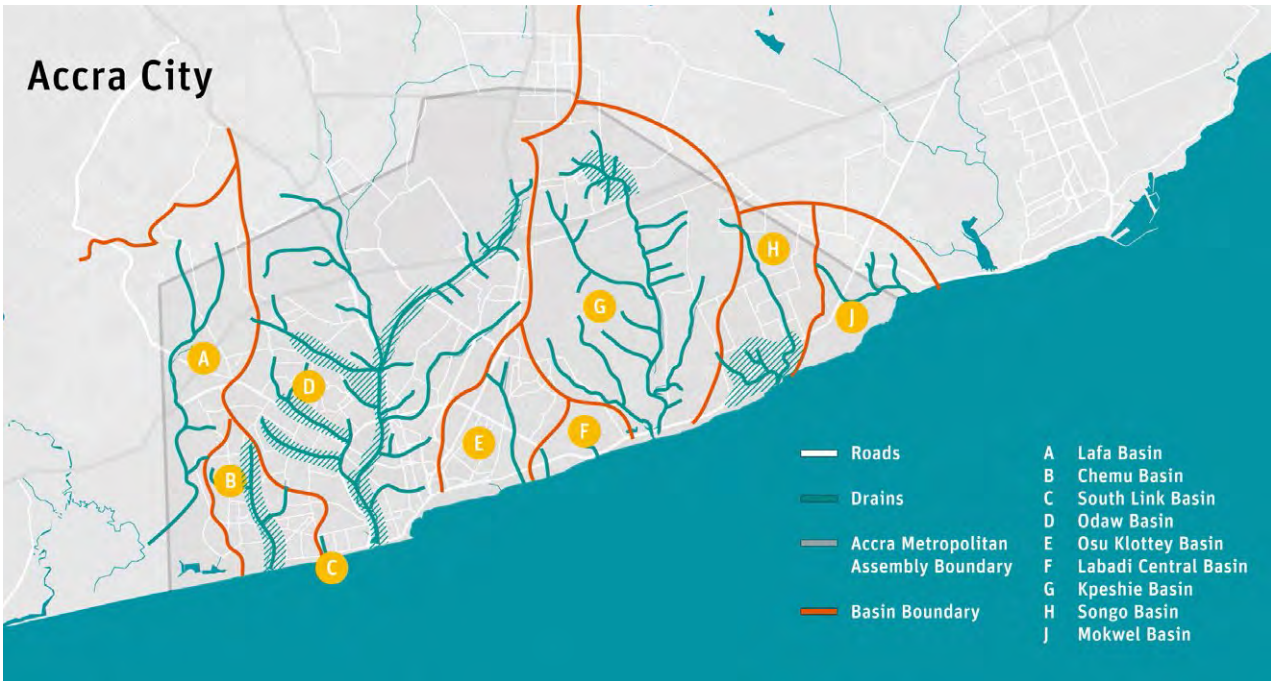


Figure 4: Flood Prone Basins and Areas of Intervention in Accra Metropolitan Area

SITE VISITS

Photo: Guilhem Vellut

Arakawa Office and Museum

Participants visited the Arakawa Office and Museum to understand (i) the flood risk and (ii) management approaches to address it along the Arakawa River, the large river flowing through the center of Tokyo.

The river has a long history of flooding, presenting risk to the surrounding development. Heavy rainfalls in 1907 and 1910 caused loss of life and substantial damage to property, overwhelming existing levels of protection, which included a system of levees. These events prompted construction, starting in 1911, on the Arakawa Flood Diversion Channel, a massive flood control measure. Completed in 1930, the project included construction of the Iwabuchi Lock Gate to divide the flow of the main river, as well as excavation works stretching 22 km and a 500-meter-wide river channel from the Iwabuchi Lock Gate to the river's mouth (which is included in Figure 5).

While the risk has been substantially managed through this massive structural investment, low-probability risks to residents remain. According to government estimates, a breach of the Iwabuchi levee, for example, could endanger the lives of 680,000 people and cause approximately 22 trillion yen in damage.

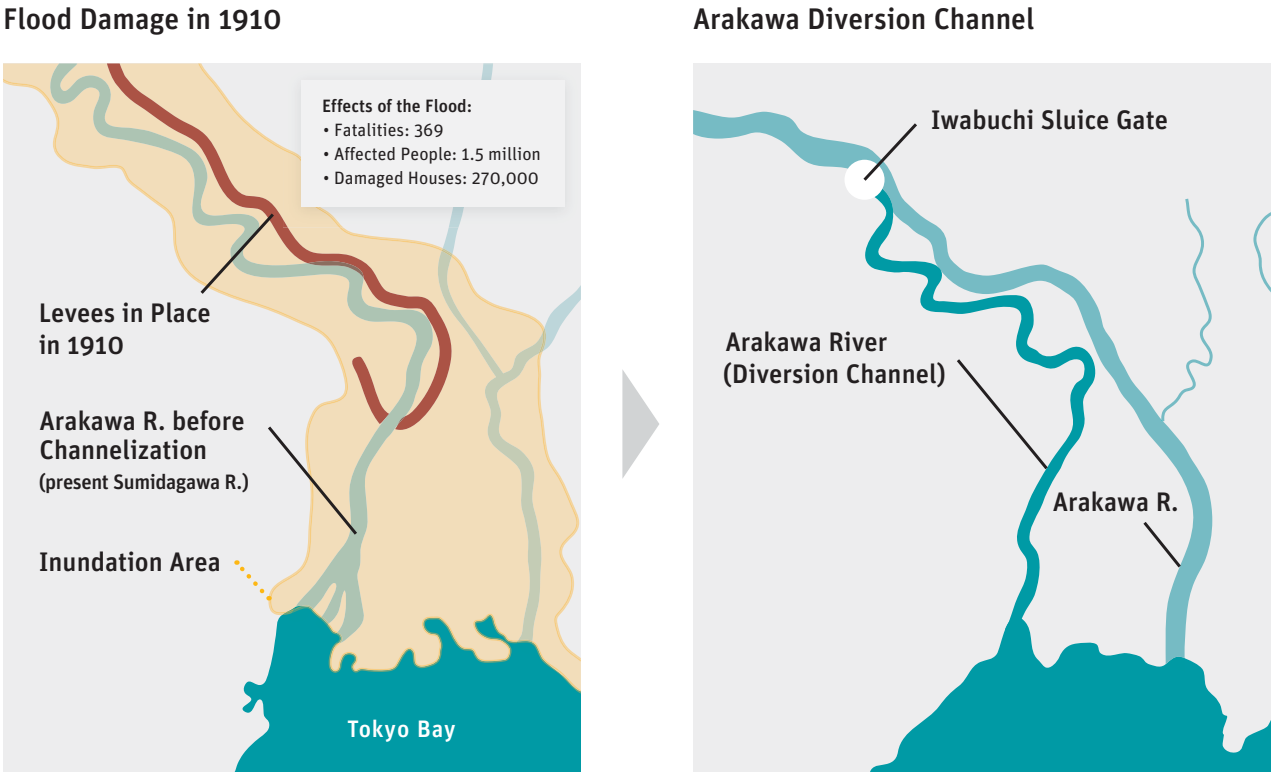


Figure 5: Development of Arakawa Flood Diversion Channel

Shinden Area Super Levee

A super levee is a high-standard river embankment with a broad width that can withstand an overflowing river. Typically the width of a levee (about 200 m to 300 m) is about 30 times its height, so that if it is overtopped, the water does not breach the levee but rather flows slowly across its top surface. A high-standard levee was built in the Shinden district as part of a comprehensive residential area development project (figure 6), carried out in association with relocation of a large-scale production plant.

The project was started in 1997 in the Adachi ward of Tokyo and was completed in 2011. The participants visited the project site in order to understand the complexities of such a large-scale project, including identification of need, development process, role of agencies, cost-benefit implications, and outcomes. The site visit enabled them to learn from the Japanese experts associated with the Shinden levee project.

Super embankments have mounding in more extensive urban areas than existing embankments.
The advantages of super embankments are:

1) no collapse at floods,
2) no collapse against inundation, and
3) earthquake-resistant.

River bank land development is strictly restricted pursuant to the River Law. However, the whole slopes at the back of super embankments are designated as the special areas, for which land development is deregulated.

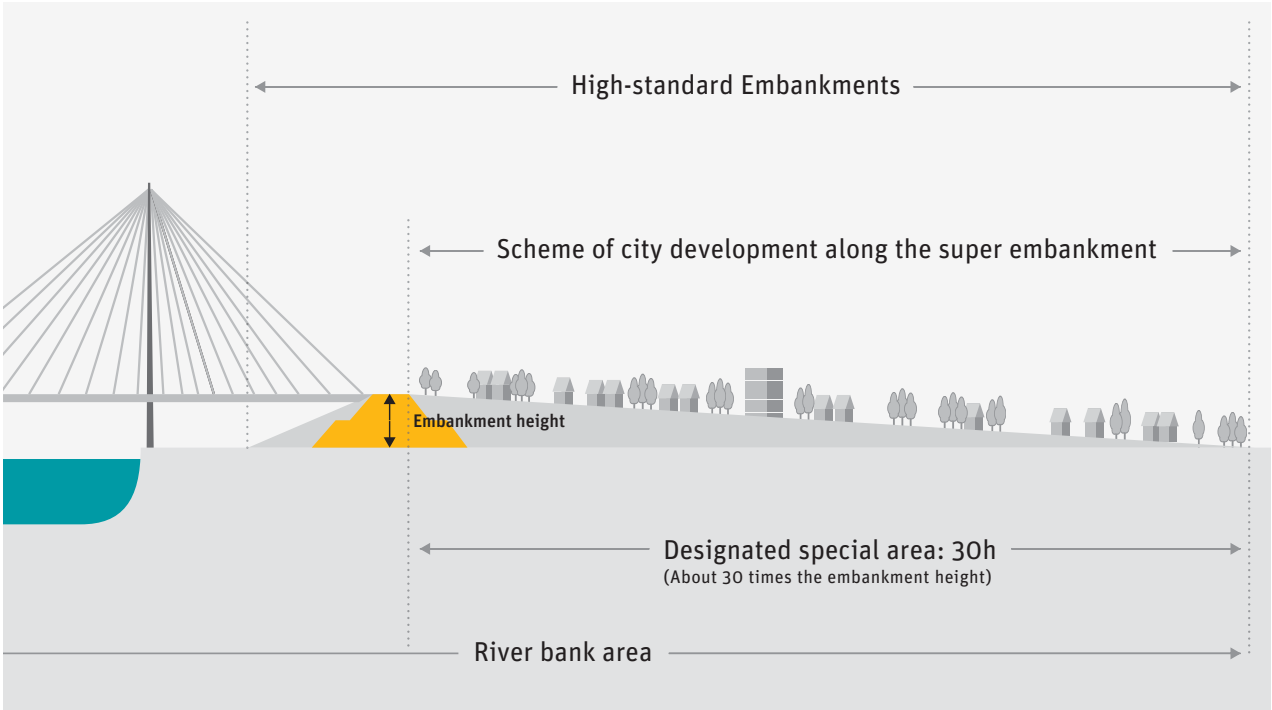


Figure 6: High standard levee project in Shinden district

Miyagase Dam

The Miyagase Dam is one of the largest dams in the Tokyo Metropolitan Area. Built in 2001 on the Nakatsugawa River, a branch of the Sagamigawa River system, the dam is located about 50 km from central Tokyo and 40 km from the urban districts of Yokohama and Kawasaki. It is a major water resource in Kanagawa Prefecture and has one of the largest storage capacities in the Kanto region. It is also one of the largest concrete gravity dams in Japan. The Miyagase Dam is an indispensable source of drinking water; it also generates electricity while helping to prevent floods caused by typhoons and heavy rainfall. Furthermore, the dam incorporates various environmental measures and other measures utilizing state-of-the-art technologies.

The multipurpose Miyagase Dam performs four basic functions: (a) prevention of flooding, (b) preservation of a healthy river environment, (c) storage of drinking water, and (d) electricity generation. The dam has an array of different water discharge facilities to cope with various situations, so that water always is discharged from the dam in the most effective way. The facility is under operation 24 hours a day to ensure round-the-clock safety. Comprehensive management of the dam is undertaken on a daily basis to ensure safe operation of all dam facilities. Thorough inspections and other monitoring activities are also carried out frequently.

Communities in the vicinity of the Miyagase Dam have formulated the Lake Miyagase Charter, hoping to fully utilize the facility as a revitalized water resource and major tourist attraction in the area. Based on this charter, local municipalities are working with the Kanagawa prefectural government to enhance the environment of the dam. Three lakefront areas have been singled out for improvements as foundations for locally promoting the lake.

The construction of the dam sought to minimize negative impacts on the surrounding natural environment and its many ecosystems. This goal led authorities to focus on developing and utilizing various new measures to preserve the natural environment after completion of the dam.

Tsurumi River Catchment Center

The Tsurumi River is 42.5 km long and has a basin area of 235 km^2 with a population density of 8,000 people/km^2. Some 70 percent of the river basin land area is hilly terrain with plateau zones, and the remaining 30 percent is alluvial lowlands. The Tsurumi River water system is managed by MLIT, the Tokyo Metropolitan government, the Kanagawa prefectural government, and Yokohama city. The basin has undergone massive urbanization in the last 60–70 years, starting at 10 percent in 1958 and increasing to 85 percent in 2000. Rapid urbanization has resulted in a decrease in the basin's natural water retention and retarding functions. Simultaneously, it has led to an increase in the volume and speed of inflow to the river. In response to a series of typhoons—in 1958, 1966, 1976, and 1982—a comprehensive flood risk reduction program was established for the Tsurumi River basin. The program aimed to preserve the basin's natural retention and retarding functions and to establish overflow retention facilities in developed areas. Flood risk reduction procedures were established for the whole river basin.

These procedures can be divided into river measures, sewer measures, river basin measures, and risk communication measures:

- River measures included
  - a) Banking and dredging, which doubled the quantity of river flow
  - b) Development of a flood control reservoir, including development of the Tsurumi River multipurpose retarding basin, the Kawawa River retarding basin, the Onmawashi park regulation reservoir, and the Toriyama River retarding basin
- Sewer measures included
  - a) A pump station installation and storm water storage pipe installation
- Basin measures included
  - a) Building up of flood control reservoirs
  - b) Flood control reservoirs in the Tsurumi River, in the form of 4,000 ponds with a total 3 million m3 storage capacity
  - c) Conservation of natural environment and agricultural land, and retention of agribusiness
  - d) Public participation
- Risk communication measures included
  - a) Measures for safe evacuation of residents even if torrential rain occurs

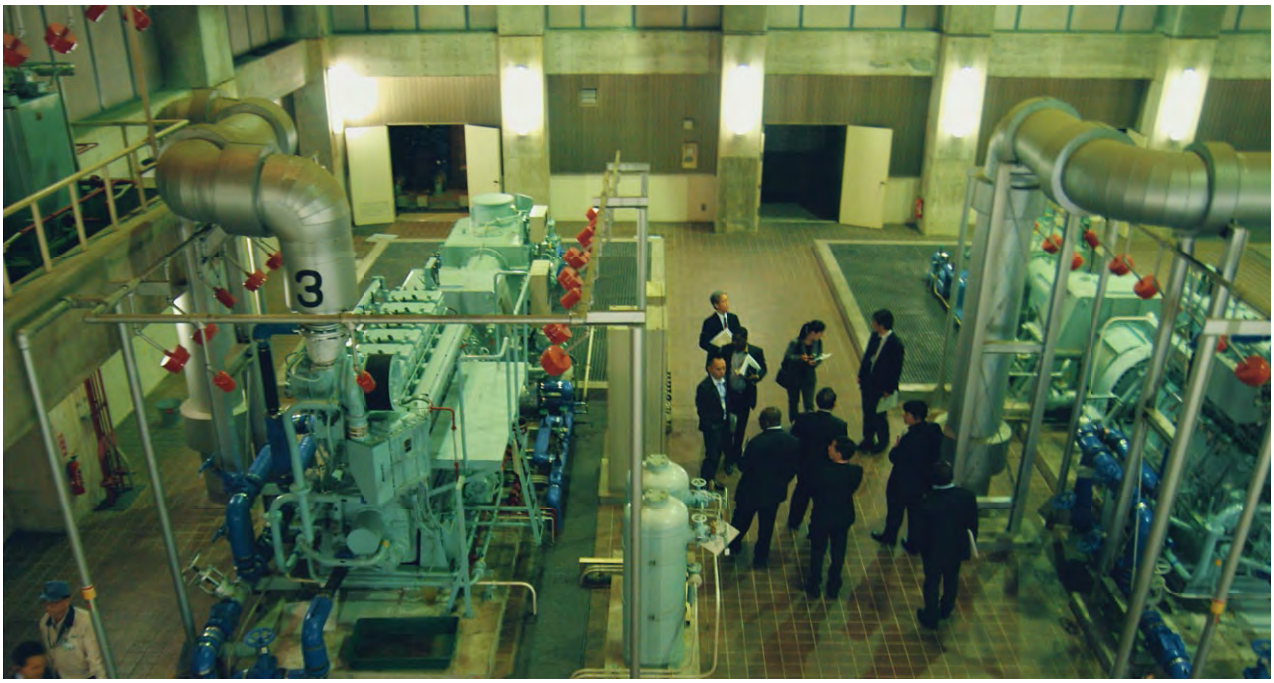
Koto Flood Control Office & Kiyosumi Pump Station

From west to east, Tokyo's geography consists of mountains (west), hills and uplands (center), and lowlands (east). With its large rivers and soft ground, the eastern part of the city is prone to flooding and storm surges. Subsidence caused by pumping of groundwater—the result of industrial development in the area—makes the city even more vulnerable to flooding, earthquakes, and other natural disasters. The Koto Delta area, a part of the eastern lowlands bordered by the Sumida and Arakawa Rivers, has been especially vulnerable to flood damage. To address the challenge of flooding in the Koto delta area, a series of drainage pump stations were set up, including the Kinegawa drainage pump station, the Onagigawa drainage pump station, and the Kiyosumi drainage pump station.

Participants visited the following facilities in order to understand the operations for preventing floods in the eastern lowlands.

1. The Koto Flood Control Office works to protect Tokyo's eastern lowlands by maintaining and improving earthquake and flood resistance. It also conducts periodic inspections of flood control facilities to ensure their operating condition. The office manages 13 floodgates, two embankment gates, one lock gate, and five drainage pump stations, for a total of 21 flood control facilities. The day-to-day management of facilities on rivers running wholly within a single ward is entrusted to that ward.

2. The Kiyosumi Drainage Pump Station is located at the crossing of the Sumida and Sendaiborigawa Rivers and is designed to prevent a possible flooding disaster to the district. It works by draining interior river water (from the Tatekawa, Onagigawa, and Sendaiborigawa Rivers, among others), which rises as a result of typhoons, high tides, and tsunamis, into the Sumida River. Participants were enlightened to see how technology and coordinated efforts by authorities and officials could help to prevent flood risks.



OUTCOMES AND CONCLUSIONS

Results of Action Planning

Participants discussed the challenges—institutional, legal, structural, and nonstructural—that their countries face, the lessons learned, and the follow-up required after the TDD to improve flood risk management.

Argentina

Challenges

The various stakeholders need to act in coordination, and the various agencies involved in flood risk management need to be assigned definite roles and responsibilities. It is also important that existing instruments function effectively and that there be continuity across the political cycle.

Operations and maintenance needs continual updating, capacity building, and budgetary allocations and should be part of the day-to-day landscape.

Lessons learned & follow-up

Risk mitigation measures must be mandatory for new properties and incentive-based for old ones. Japan's experience offers an opportunity to learn about developing flood management plans and contingency plans. There is interest in assistance from the World Bank in dealing with residual risk and pro-poor risk management.

Ghana

Challenges

The legal system could be improved through 100 percent compliance with existing laws and through upgrading of laws as necessary. A unified and coordinated approach to flood risk management by all stakeholders should be planned.

Taking structural measures requires assessment and identification of areas that need structural interventions, followed by design of adequate solutions for mitigation. Investment in and implementation of the identified solutions must take both short- and long-term needs into consideration, including maintenance of structures. Similar planning should be undertaken for nonstructural measures.

Lessons learned & follow-up

Efficient implementation of the legal framework, collaboration and coordination of institutions in all areas of flood risk management, and involvement of communities are essential. Technical assistance for capacity building and for training of staff of relevant agencies is also key, as are review of designs and plans for structures, extension of early warning systems to urban areas, and expansion and consolidation of the hydrometeorological system.

"Legislative and institutional frameworks and plans are in place—the question is how to implement them." – Ghana

Indonesia

Challenges

Indonesia's legal framework, especially with respect to river management, must be improved. Lessons could be drawn from Japan with respect to allocation of responsibilities between national and subnational governments. Formulation, implementation, and institutional coordination of a flood mitigation plan can be complicated and should be simplified.

Nonstructural measures are being taken up in Jakarta, but other Indonesian cities need interventions, too, such as real-time water-level monitoring. Improving communities' awareness of flood risks is also critical. Communities and the private sector must trust that flood mitigation measures are being carried out in a way that makes a real contribution to flood risk reduction..

Lessons learned & follow-up

There is keenness to adopt the holistic approach seen in Singapore and Japan, in which flood risk management incorporates both structural and nonstructural measures and involves all relevant stakeholders. There is a lot to learn from Tokyo that could be applied in Jakarta and other cities in Indonesia, as there seem to be similarities in the challenges they face—for example, a high urbanization rate, reliance on pumping stations in low-lying areas, and land subsidence issues. A separate TDD for Indonesian clients, targeting their specific problems, is requested.

Lao PDR

Challenges

The legal and institutional framework must be amended to take into account existing draft laws and revisions, and adequate funds and resources must be devoted to implementation of the improved framework. In addition, the policy framework and capacity to integrate flood risk management must be improved, and a strategy for reducing the financial impact of disasters must be developed and adopted. Lao PDR wants to develop a sustainable framework with a priority list of structural and nonstructural investments, implementation guidance, and a comprehensive O&M strategy.
Structural measures to be adopted are flood proofing of critical infrastructure and site-specific flood and drought mitigation measures. For example, in Oudomxay Province this would include improvements of the Nam Ko Bridge, protection of river banks, and construction of dikes, a riverside park, and other flood- and drought-level control measures. Nonstructural measures include improvement of risk information, collection, analysis, and sharing; forecasting and early warning systems; institutional capacity; and financial management for long-term resilience and for urgent disaster response.

Lessons learned & follow-up

The legal mandate of relevant institutions to plan, implement, and oversee flood risk management needs to be clear, and resources and training need to be extended to fulfill institutions' roles. Flood management plans need to consider structural and nonstructural investments. Technical assistance is sought for the following: development of a sustainable integrated action plan; support in implementing the legal and institutional framework; capacity building for integrating flood risk reduction into planning; support in making key structural and nonstructural investments; and strengthening of the hydrometeorological observation and monitoring frameworks to create a reliable system. Medium- to long-term assistance is required for strengthening financial resilience and for improving understanding of the potential impacts that urbanization and climate change could have on floods and droughts in Lao PDR.

Madagascar

Challenges

For improved sanitation and flood protection coverage, the Water, Sanitation and Hygiene Law needs to be updated, and all sanitation services and institutions need to be harmonized. Stakeholder involvement needs to be made more effective.

The country needs to develop buffer zones, construct pumping stations and wastewater treatment plants, extend drainage systems and dikes, and develop evacuation shelters and the trunk infrastructure required to guide urban development. Necessary nonstructural measures include improving flood hazard mapping and risk modeling, rehabilitating the Antananarivo Flood Forecasting and Monitoring System, operationalizing contingency plans and evacuation plans, establishing land reserves, and integrating all the master plans.

Lessons learned & follow-up

Clear vision is needed for integrated flood management. Flood risks can be better understood through better data acquisition and modeling. Urban land should be developed according to a plan and optimally used. The challenges of leadership stability, technical skills, and funding of flood risk management must be overcome. Technical support, new knowledge, and relevant experiences are sought from the TDD.

Nigeria

Challenges

There is a need to review the current legal system to include immunity from political interference and appropriate penalties for contraventions, and to empower agencies to perform effectively. Institutions must have clearly defined roles and sources of funds. Some of the planning measures to be adopted include establishment of a robust planning process that outlines the decision-making process, identification of flood amplifiers, estimation of social and economic stakes (including vulnerable persons and properties), continuous updating of flood-related master plans, and proper information sharing and dissemination.

All physical works should comply with best practices, and spaces and resources should offer social usefulness and economic benefits. Reconstruction, reinstatement, and rehabilitation of critical structures should be undertaken from time to time. Important nonstructural measures include promotion of flood resilience policies, urban and land use planning, building code enforcement, flood forecasting and early warning systems, human capacity development, public awareness, coordination of stakeholders, and post-flood rehabilitation planning.

Lessons learned & follow-up

Among the key lessons learned are the importance of interagency cooperation, involvement of stakeholders, best practices in planning systems, efficient O&M, deployment of reasonable economic and human commitment, private sector participation, public-private partnership (PPP) initiatives, and consideration and patronage of best technologies. Follow-up assistance is required for technology transfer, knowledge sharing, funding assistance, technical assistance in O&M (especially for early warning systems), and urban planning.

Solomon Islands

Challenges

Effective enforcement of the River and Water Act is currently lacking, and revision of the act should be speeded up. There is also a need for flood modeling that is easy for people to understand. The importance of water resources management is not recognized in national policy statements. At the provincial level, schemes to integrate flood risks into planning should be improved. The formation of an institutional steering committee is urgently needed.

There is a need to strengthen the flash-flood warning system and include state-of-the-art hazard maps in the River and Water Act. Accurate data for flood risk assessment and identification mechanisms to handle illegal settlements are also needed. Reducing the disposal of solid waste in creeks and improving bridge design and riverbank protection works in Honiara are among the structural measures to be implemented.

Lessons learned & follow-up

Expertise is sought to conduct a flood risk management study of the islands and to implement urgent actions. JICA may provide support in flood modeling, community engagement, and early warning systems. The World Bank is requested to prepare an investment project based on the recommendations of the study.

Vietnam

Challenges

Decentralization of river basin management for flood risk control and establishment of risk reduction entities for each of the river basins are needed. Coordination between the hydrometeorological monitoring stations and the flood risk management entity needs to be strengthened. Consistent and synchronized legal regulations are required for managing drainage of both storm water and wastewater.

There is a need to integrate flood risk reduction into spatial urban planning and develop community awareness. Incorporation of green structures in structural measures is important for environmentally friendly and lower-cost works. It is also necessary to prioritize invested works for flood prevention, since there are too many plans and not all can be implemented under the current budget.

Lessons learned & follow-up

A functional command center for flood forecasting and early warning is required. O&M of the infrastructure for flood prevention is critical. Drainage systems need to be developed before residential areas are developed. Technical support is required for building capacity to develop the legal framework for flood risk management, as well as for flood forecasting, flood modeling, flood map preparation, flood monitoring, flood impact assessment, and development of an early warning system.

"Communities should be consulted and accordingly engaged in a two-way communication process." – Vietnam

Outcome Statements / Conclusion

Argentina:

Argentina needs to advance an action plan for flood management that involves all stakeholders, and local government should oversee the project.

Old problems require innovation and creative thinking. Both structural and nonstructural measures should be incorporated in the master plan for flood management.

Ghana:

Investments in structural and nonstructural measures for urban floods are crucial to sustainable development. Effective institutional collaboration, enforcement of land use planning regulations, and involvement of the private sector are also important.

Indonesia:

Learning from others by sharing knowledge and experiences, and relying on both structural and nonstructural measures, are key for flood risk mitigation.

Lao PDR:

Well-coordinated institutional arrangements between stakeholders are important for flood risk management, as is the sharing of risk information and knowledge among emergency response and planning institutions.

Adequate planning and resources are needed for O&M of flood risk reduction projects.

Madagascar:

The use of advanced technology and optimal use of resources should be promoted. The government should focus on better land use planning. Stakeholders at all territorial levels should be integrated into the flood management system and should be assigned clear responsibilities. It is important to generate community awareness.

Nigeria:

Proven technologies—developed out of disaster situations and through painstaking research—should be adapted by hazard-prone cities and countries.

Solomon Islands:

Collaboration between the government, private sector, communities, and other stakeholders is key for sustainable flood risk management. Functional regulation and enforcement mechanisms should be in place. There is a need for flood risk reduction engineering activities along rivers. The Solomon Islands government should learn to provide coordinated flood response, and different sectors should work and act together in the event of floods.

Vietnam:

Reducing urban flood risk requires an integrated urban flood management legal framework, coordination among national and local agencies, integration of nonstructural and structural measures (especially early warning systems and flood forecasting), and integration of the flood prevention system into spatial urban planning.

Follow-Up: Public Seminar

Organized by the World Bank Disaster Risk Management Hub, Tokyo, in conjunction with the World Bank Tokyo Office, the Public Seminar on "Integrated Urban Flood Risk Management: Obstacles and Opportunities in East Asia–Pacific and Lessons from Japan" brought together experts and practitioners in East Asia and the Pacific to address the serious challenge of urban flooding in the region. This was a part of the Public Seminar series undertaken by the Hub. It complemented the TDD very well and presented the key lessons and solutions from the TDD for developing countries in East Asia and the Pacific to make use of.

The seminar explored the flooding challenges faced by two countries in the region—Vietnam and the Solomon Islands—and the approaches, structural investments, and nonstructural operational practices they are putting in place to better manage their flooding risks. Most importantly, the seminar highlighted the major takeaways from the TDD among the options and lessons from Japan and around the globe that could enhance the countries' efforts at home.

Participants in the IUFRM TDD and the Public Seminar pointed to the importance of key elements modeled in Japan's integrated urban flood risk management approach:

- **Institutional and legal framework that clearly defines structures and responsibilities**
- **Interagency coordination and information/data flow, operational procedures; system approach**
- **Integration of structural and nonstructural measures**
- **Land use planning that uses flood risk management infrastructure for multiple purposes**
- **Public and private stakeholder engagement**
- **Technical excellence of engineering solutions and training**
- **Attention to O&M**
- **Consideration of multiple hazards**
- **Continuous improvement/upgrading based on current knowledge and predictions**

Ensuring Follow-On Support and Next Steps

The World Bank has helped to connect high-value Japanese experience and expertise in IUFRM to client countries to enable them to draw key lessons as they plan and invest in improved urban resilience. Clients and task teams are engaging the DRM Hub and TDLC for just-in-time operational support and are connecting with expertise in Japan to enhance the quality and inform the solutions under their projects.

The DRM Hub is now actively engaged in developing a series of targeted knowledge notes highlighting Japan's successful approaches to river basin flood risk management based on feedback from the clients and survey results of the TDD. For continued knowledge support, a second TDD on IUFRM is planned for early 2017.

TDD Follow-On Support for Ho Chi Minh City, Vietnam (June–September 2016)

In June 2016, Ho Chi Minh City, Vietnam—a TDD client—requested support in enhancing the quality of the terms of reference for a flood control center as part of a larger-scale investment in flood risk management. The DRM Hub and TDLC worked together to solicit key inputs for the client, engaging MLIT, JICA, the University of Tokyo, Toyo University, and GFDRR. The DRM Hub also engaged Japanese private sector firms to provide supplemental information on the solutions these firms currently offer.

In September 2016, the DRM Hub and TDLC supported the Vietnam DRM team's Flood Risk Consultation Workshop in Ho Chi Minh City. Together, the teams worked to bring expert practitioners from the City of Yokohama to the workshop to advise Ho Chi Minh City officials. The workshop focused on monitoring and data capture, institution and capacity building, and the importance of setting operational competencies during the implementation phase. It brought together experts from Japan and the United States to discuss their countries' flood operations centers and the centers' role in influencing investment design and implementation.

ANNEXES

Annex 1. Agenda

April 18, Monday

AM

8:50 – 9:30	Breakfast provided at World Bank TDLC/ DRM Hub, Tokyo
9:00	Registration at TDLC/DRM Hub, Tokyo
9:30	**Introduction / Moderation** By Mr. James (Jay) Newman, DRM Specialist, World Bank DRM Hub, Tokyo
9:35	**Welcoming Remarks** By Mr. Noriyuki Mita, Deputy Vice Minister of Finance, Government of Japan
9:45	**Introduction to the Technical Deep Dive and Engagement Approach** By Mr. Daniel (Dan) Levine, Senior Officer, TDLC, WB
9:55	**Setting the Stage: Integrated Urban Flood Risk Management and the Urban Floods Community of Practice** By Ms. Jolanta Kryspin-Watson, Lead DRM Specialist and Regional DRM Coordinator for East Asia and the Pacific, lead of Urban Flood Community of Practice
10:10	**Visualization of clients' learning objectives** By Mr. Jay Newman and Ms. Haruka Imoto, Knowledge Management Analyst, TDLC
10:25	Group photo
10:30	Coffee Break
11:05 – 11:45	**Client Engagement** Lightening Talks from INDONESIA, VIETNAM and NIGERIA on legal, policy, and institutional frameworks for flood risk management and key elements on how they have evolved in their country (15 min) Exchange of views in liberating format (Buzz sessions – Small group discussions) (15 min) Comment: Ms. Jolanta Kryspin-Watson (WB), Mr. Satoru MIMURA (JICA), and WB experts (TTLs) (10 min)
12:05 – 12:45	**Client Engagement** Lightening Talks from LAO PDR and SOLOMON ISLAND on its approach to planning and implementing flood risk management in practice (15 min) Exchange of views in liberating format (Buzz sessions – Small group discussions) (15 min) Comment: Mr. Satoru MIMURA, JICA; Mr. Toshihiro SONODA, Sr. DRM Specialist, GFDRR, WB and WB task team leaders (10 min)
12:45	Lunch (Bento Box) at TDLC

April 18, Monday

PM

13:30	**Action Planning on Key Question 1 and 2**
	(Small groups of 4-6)
	Activity Instruction: Mr. Phil E. KARP, Lead Knowledge Management Officer, WB (5 min)
	Discussion and Action Planning (15 min per question, transition)
14:10	
14:10	**Small Group Reporting**
	A representative from each group presents key discussion points to the full TDD group
14:30	
14:50	**Client Engagement**
	Lightening Talks from MADAGASCAR and ARGENTINA on how it integrates non-structural measures, particularly those engaging communities and integrating technology (15 min)
	Exchange of views in liberating format (Buzz sessions – Small group discussions) (15 min)
	Comment: Mr. Satoru MIMURA, JICA; Mr. Toshihiro SONODA, Sr. DRM Specialist, GFDRR, WB and WB task team leaders (10 min)
15:30	
15:30	Coffee Break
15:50	**Action Planning on Key Question 3**
	(Small groups of 4-6)
	Activity Instruction: Mr. Phil E. KARP, Lead Knowledge Management Officer, WB (5 min)
	Discussion and Action Planning (15 min)
	Small Group Reporting - Representative from each group presents key points (10 min)
16:20	
16:30	**Feedback to sum up the learning needs from each TTL** (20 mins)
16:50	Mr. Jay Newman, DRM Hub
16:50	**Overview of Day 2 and Day 3 and Wrap-up**
	Mr. Toshihiro SONODA, WB and Mr. Kenichiro TACHI, Director for International Coordination of River Engineering, River Planning Division, Water and Disaster Management Bureau
17:10	
17:30	Reception and Dinner (TDLC/DRM Hub will take participants to restaurant)

April 19, Tuesday

AM

8:30	Depart from Hotel (Breakfast box provided in the bus)

ARAKAWA

9:30	**Arrival to Arakawa Museum of Aqua** *adjacent to the Arakawa Office (MLIT) Explanation of the outline of the flood control of Arakawa Emergency response Center of the Arakawa Office
10:25	Leave from Iwabuchi boat boarding place

SHINDEN AREA

10:40	**Arrival at Super Levee Shinden Area** Explanation of the Super Levee Shinden Area
10:50	Leave from Super Levee Shinden Area
10:50	Bus Ride

PM

MIYAGASE DAM

12:50	Arrival at Miyagase Dam
12:50 – 13:30	Lunch at local Restaurant
13:30	Explanation of the plan, flood control and multi-purpose operation, maintenance, environmental measures, tourism, reservoir area development plan
15:00	Leave from Miyagase Dam
15:00 – 16:30	Bus
16:30	Arrive at Tsurumi River Catchment Center *adjacent to the multi-purpose retarding basin (Yokohama Stadium)
17:30	Leave from Tsurumi River Catchment Center
18:30	Arrival at Hotel

April 20, Wednesday

AM

8:30 – 9:00	Breakfast provided at TDLC / DRM Hub
9:00 – 9:10	Welcome for Day 3
9:10 – 10:00	**Stocktaking from Day 1 and Day 2** Small Group Discussion (50 min)
10:00 – 10:15	Coffee Break
10:35 – 11:15	**Client Engagement** Lightening Talks from HCMC, VIETNAM and GHANA on its how it is investing in key structural measures (15 min) Exchange of views in liberating format (Buzz sessions – Small group discussions) (15 min) Comment: Ms. Jolanta Kryspin-Watson, and World Bank Task Team Leaders and WB task team leaders (10 min)
11:15 – 11:45	**Action Planning on Key Question 4** (Small groups of 4-6) Activity Instruction: Mr. Phil E. KARP, Lead Knowledge Management Officer, WB (5 min) Discussion and Action Planning (15 min) Small Group Reporting - Representative from each group presents key points (10 min)
12:00	Lunch at TDLC / DRM Hub

PM

13:00	Depart for Koto Flood Control Office by bus
14:30	**Arrival at Flood Control Facilities Management Center, Koto Flood Control Office, Tokyo Metropolitan Government** *The center is responsible for the operation of flood control facilities of the low-lying area in the eastern part of Tokyo. Explanation of the followings: Outline of the of the flood control of low-lying area in the eastern part of Tokyo; and Drainage operation (at the operation room). Kiyosumi Pump Station
16:00	Leave from Flood Control Facilities Management Center, Koto Flood Control Office, Tokyo Metropolitan Government
16:30	**Reception and Conversation with the Japan Bosai Platform** - Moderator (Mr. Jay Newman, DRM Hub, World Bank) and Opening Remarks (JBP)
16:40	**Three Presentations (7-10 min) by JBP** members on Integrated Urban Flood Risk Management solutions in practice / case studies
17:10	Q&A
17:20	Joint Reception (Location: DRM Hub/ TDLC Lobby)
18:30	Dinner at the Soba Restaurant in Basement Floor 2 of Fukoku Seimei Building

April 21, Thursday

AM

9:30 – 10:00	Breakfast at TDLC/DRM Hub
10:00 – 10:30	**Stocktaking from Day 3 site visit:** Multi-stakeholder dialogue (30 min) Opening - Mr. Jay Newman, World Bank DRM Hub (5 min) Brief Reflection on Day 3 - Ms. Jolanta Kryspin-Watson (WB) (10 min) Mr. Phil E. Karp, Lead Knowledge Management Officer, WB (5 min) Clients (10min)
10:30 – 11:15	**Task 1: Country-Specific TDD Action Plan Development (Grouping by Clients and TTLs)** Experts Available to Client Teams: Mr. Mikio ISHIWATARI, Senior Advisor, JICA; Mr. Toshihiro SONODA, Sr. DRM Specialist, GFDRR, WB, Ms. Jolanta KRYSPIN-WATSON, WB, and additional experts, as available
11:15 – 11:30	Coffee
11:30 – 12:10	**Task 2: Presenting Action Plans through Client-to-Client Sharing (2 countries pair up)**
12:10	Lunch

PM

13:15 – 14:35	**Task 3: Action Plan Pitch Session to Full TDD Panel (5 min presentation + 5 Q&A)** Expert Panel Providing Feedback to Client Teams: Mr. Mikio ISHIWATARI, Senior Advisor, JICA; Mr. Toshihiro SONODA, Sr. DRM Specialist, GFDRR, WB, Ms. Jolanta KRYSPIN-WATSON, WB, Mr. Phil E. Karp, WB, and additional experts, as available
14:50 – 15:10	**Comment sessions from TTLs**
15:10 – 15:30	**Comments from Clients**
15:30	**Conclusion**
17:30	Dinner at Gonpachi Ginza (TDLC/DRM Hub will take participants to restaurant)

Annex 2. Speaker and Collaborator Biographies

at the time of the TDD

Noriyuki Mita

Noriyuki Mita served as Japan's Deputy Vice Minister of Finance at the time of the TDD.

Takafumi Nakui

Takafumi Nakui has been Senior Deputy Director, International Affairs Office, Water and Disaster Management Bureau, MLIT, since 2015. His experience as a Japanese government official is in the field of river management and disaster management, including policy making, project planning, project implementation, facility O&M, emergency response, and rehabilitation and reconstruction after disasters.

Before assuming his current position, he worked for the Cabinet Office as Deputy Director of the Council for Science, Technology and Innovation. He was engaged in developing a comprehensive strategy for technical innovation in Japan. He also served as Director of the River Improvement and Management Division in the branch office of the Hokkaido Regional Development Bureau, MLIT, and was engaged in the planning and implementation of dam construction projects in the office.

His current focus is supporting the mainstreaming of disaster reduction, both through assisting with Japan's official development assistance (ODA) projects in the water and disaster management sector and through promoting the application of Japanese DRM technologies and experiences to developing countries.

Takayuki Kubo

Takayuki Kubo is Senior Deputy Director, River Improvement and Management Division, Water and Disaster Management Bureau, MLIT. He is responsible for setting technological standards for river basin structure and implementation. Prior to assuming his current position, he coordinated river plans, architecture of river construction, and implementation management for MLIT, which he joined in 2003.

Yoichi Iwami

Yoichi Iwami is Chief Researcher on Hydrology and Hydraulics, ICHARM, PWRI. His main areas of research include evaluation of flood and drought through hydrological observation and simulation, river planning processes with information sharing, and environment of rivers and reservoirs. After graduating from Osaka University, Department of Civil Engineering, Faculty of Engineering, he obtained a master's degree in civil engineering from Osaka University. Before assuming his position in ICHARM, he had a long career in the Ministry of Construction (now MLIT), and he also worked as the Director of Research (Environmental Impact Assessment of Dams) in Water Resources Environment Center (Public Foundation), and as Head of the River Environment Research Division, National Institute of Land, Infrastructure Management.

Ridzuan Ismail

Ridzuan Ismail is Director of the Catchment and Waterways Department in Singapore's Public Utility Bureau (PUB). He has extensive experience in the planning and design of drainage infrastructure and used water infrastructure, as well as in the construction, operation, and management of drainage and water reclamation facilities. Ridzuan's professional experience also includes stints at the Ministry of Environment and Water Resources, where he oversaw various water policy and regulatory issues, among other responsibilities. Ridzuan has a bachelor of civil engineering degree from the National University of Singapore and a master of business administration (Nanyang Fellows) from the Nanyang Technological University, Singapore.

Yusuke Amano

Yusuke Amano has been Director, International Affairs Office, Water and Disaster Management Bureau, MLIT, since 2013. His experience as a Japanese government official is in the field of water resources management and disaster management, particularly policy making, project programming, project planning, project implementation, facility O&M, emergency response, and rehabilitation and reconstruction after disasters.
Before assuming his current position, he worked for JICA as Senior Advisor to the Director General and was responsible for providing institutional and technical assistance to various international cooperation projects in the water and disaster reduction sectors. He also served as Deputy Director General, Department of Civil Engineering, Kumamoto Prefectural Government, and in this capacity was involved in development projects, including the construction of flood control facilities and roads, and countermeasures for sediment-related disasters. The focus of his current work is raising political and public awareness of the importance of mainstreaming disaster reduction, and supporting Japanese ODA projects in the water and disaster sectors.

Toshio Okazumi

Toshio Okazumi is Director, International Cooperation and Engineering for Infrastructure, Overseas Project Division, Policy Bureau, MLIT. He holds a PhD in engineering and has expertise in flood risk assessment, river basin management, hydrology, dam and river O&M, disaster management, water resources management, and flood forecasting and warning.

Kenichiro Tachi

Kenichiro Tachi is Director for International Coordination of River Engineering of the Water and Disaster Management Bureau, MLIT. He is responsible for international aspects of water and river management, including water-related disaster risk reduction. He is also responsible for technical assistance to foreign countries.
Kenichiro Tachi joined the Ministry of Construction (former MLIT) in 1998 after earning a master's degree in civil engineering from the Tokyo Institute of Technology. Utilizing his knowledge and experience in the field of civil engineering, he has dedicated himself to water and river management—and specifically to researching, planning, designing, and implementing river management works—for more than 15 years. During 2011–2013, as the head of MLIT's river work office, Mr. Kenichiro Tachi was responsible for integrated river basin management of a Class A river, the Hii River in Japan.

Jolanta Kryspin-Watson

Jolanta Kryspin-Watson is Lead Disaster Risk Management Specialist and Regional DRM Coordinator for East Asia and the Pacific at the World Bank. For over 18 years, she had worked to advance disaster risk reduction around the world, including in Turkey, Albania, Croatia, Romania, the Philippines, China, Vietnam, Indonesia, and Algeria. She has led large-scale reconstruction and disaster mitigation investment projects as well as analytical work and knowledge-exchange initiatives in a range of areas, including seismic retrofitting, emergency preparedness, climate adaptation, disaster risk financing and insurance, community-driven DRM, catastrophe risk assessment, flood protection, weather forecasting and early warning, and post-disaster recovery and reconstruction. Jolanta holds a master of public administration degree from the State University of New York–Albany and a master of business administration degree from the University of Warsaw, Poland.

Daniel (Dan) Levine

Dan Levine is the Senior Operations Officer / Team Lead of the TDLC and manages the Tokyo-based operations and staff of the program. He has over 12 years of experience at the World Bank and International Finance Corporation dealing with finance and private sector development, knowledge and portfolio management, jobs and growth, and most recently infrastructure and urban development. Within the World Bank Group, Dan has developed a reputation for the application of knowledge in direct support of lending and analytical operations. He has conducted knowledge exchanges with clients and staff in China (Beijing), India (Chennai and Delhi), Sri Lanka (Colombo), Kenya (Mombasa), Singapore, and Austria (Vienna). In the private sector, Dan worked in government affairs, private equity, and management consulting. As a Wolcott Fellow, Dan obtained an MBA from the George Washington University.

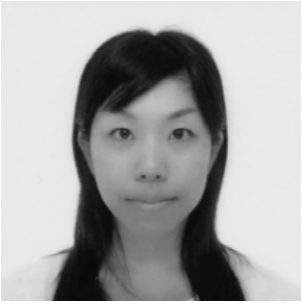
Toshihiro Sonoda

Toshihiro Sonoda is a Senior Disaster Risk Management Specialist at the World Bank and a member of GFDRR's Hydromet Team. He brings over 20 years of experience on water-related disaster management, including formulation of comprehensive flood and water resources management policy, implementation of integrated flood risk management through structural and nonstructural measures, supervision of flood and tsunami reduction infrastructure projects, and direction of emergency responses for water-related disasters. Prior to joining GFDRR, Mr. Sonoda was a program specialist with UNESCO, where he led on-site disaster risk reduction and capacity development projects, as well as the production of a series of guidelines on integrated water resources management at the river-basin level, including flood management, water resources utilization, and environment restoration. He also contributed to JICA's Toward Mainstreaming Disaster Risk Reduction project as an external lead researcher. A Japanese national, Mr. Sonoda holds a bachelor's degree and master's degree in civil engineering from the University of Tokyo.

James P. Newman

James Newman is a Disaster Risk Management Specialist at the World Bank DRM Hub, Tokyo, where he leads the Hub's Knowledge Program and its engagements on urban resilience. Since joining the World Bank in 2013, Mr. Newman has worked at GFDRR, serving as focal point for urban resilience and regional portfolios in the South Asia as well as the East Asia and Pacific regions. He contributed to the development of the CityStrength Diagnostic and Medellin Collaboration on Urban Resilience, and has supported World Bank projects and technical assistance in India, Nepal, South Africa, and Vietnam. Prior to joining GFDRR, he worked for the City of Baltimore, contributing to the city's 10-year financial plan and its CitiStat performance management program, also serving as Acting Deputy Procurement Agent. As an adjunct professor at University of Baltimore's master of public administration (MPA) program, he taught courses on statistics, urban management, and public policy. A United States national, Mr. Newman holds a master's degree in applied economics and public policy jointly from Georgetown University and Universidad Alberto Hurtado in Santiago, Chile, as well as a bachelor's degree in economics and Spanish from Washington University in St. Louis.

Yuko Okazawa



Yuko Okazawa is the Operations Officer of the TDLC. She received a master's degree in civil engineering from the University of Tokyo and worked as an Urban Planning Consultant at ALMEC Corporation before joining the Bank. Throughout her years with ALMEC she resided in Vietnam, but she has also worked in Indonesia, the Philippines, Thailand, Mongolia, and Japan. Among the major projects on which she has worked are urban development master plan projects, technical assistance in nurturing collaboration on urban development between cities in Japan and developing countries, formulation of urban planning and management manuals for training courses targeted at planning authorities in client countries, and transport planning projects. She recently earned her second master's degree in planning, growth and regeneration at the Department of Land Economy, University of Cambridge.

Haruka Imoto

Haruka Imoto joined the TDLC as a Knowledge Management Analyst. After receiving dual master's degrees—one in public policy and administration from the London School of Economics, the other in political science from L'Institut d'Etudes Politiques de Paris—Haruka has worked with cities in Europe, Japan, and other parts of Asia to promote sustainable urban policy and project implementation. Haruka worked for CHAdeMO Association in Paris to implement infrastructure for electric vehicles in Europe, and joined the Institute for Global Environmental Strategies (IGES) as a policy researcher focused on low-carbon and resilient cities. At IGES, she worked closely with the City of Yokohama to foster knowledge sharing and capacity building for greener and smarter cities. She was also active in communicating local municipalities' climate actions in the international arena, including at UNFCCC/COP (United Nations Framework Convention on Climate Change/Conference of the Parties).

Zuzana Stanton-Geddes

Zuzana is an Operations Analyst for the DRM team of the Sustainable Development Department of the East Asia and Pacific Region of the World Bank. She works on projects focusing on urban resilience, flood risk management, and integration of gender concerns into disaster risk management programs.

Atsushi Nagahashi

Atsushi Nagahashi is the Resource Management Assistant for TDLC. Atsushi joined the World Bank TDLC team in August 2013 as a Resource Management Assistant. After receiving master's degrees in linguistics (Tagalog) and international labor economics from (respectively) Osaka University and Waseda University, he started his career as a local employee of the U.S. foreign mission in Japan. After a few years, he moved to Japan's Ministry of Foreign Affairs as a researcher in the Public Affairs section of the Embassy of Japan in Washington, DC, where he disseminated official remarks of the Japanese government to the U.S. media, including the Washington Post and CNN. After coming back to Japan, he worked for the United Nations at United Nations University and the World Food Program.

Iain Mitchell

Iain Mitchell joined the World Bank TDLC in August 2004 to support videoconferencing and technical operations for distance learning seminars, SS knowledge exchange seminars, and roundtable business meetings. After managing a wide variety of events over a 10-year period, Iain was remapped to ITSCU as a Senior IT Assistant, Engineering, where he was appointed the task team leader and system architect for the facility upgrade project involving renewal of all videoconference and multimedia equipment in the center. In his current position, Iain is responsible for technical operations and engineering support at TDLC, including videoconference bridging.

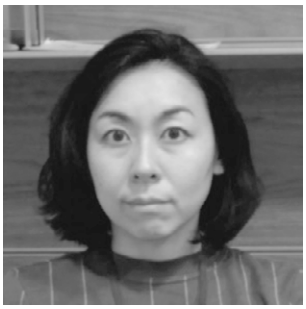
Yukiko Daikai

Yukiko Daikai is the Program Assistant for the TDLC partnership. She obtained her bachelor's degree in international relations from Syracuse University and a master's degree in computer science from Hosei University. She started her career at J.P. Morgan Japan as a business analyst and has worked at Daiwa Capital Markets Singapore as a trader's assistant and at Credit Suisse Japan as a controller. After working in the financial sector, Yukiko worked at the Embassy of Canada in Japan as an executive assistant/program assistant and at the Ministry of Foreign Affairs Japan as an official. Before joining TDLC she was working as a business navigation and operations manager at IKEA Japan.

Asako Sato

Asako Sato is a Knowledge Management Associate at the TDLC partnership. She started her career at the Asian Productivity Organization, where she organized training programs and study missions and worked with Japanese stakeholders in the industrial and environment sector to disseminate knowledge and provide technical assistance services to member countries in the Asia Pacific region. She joined the Bank in July 2010 as a Senior Knowledge Management Assistant of the TDLC partnership, and was responsible for delivering TDLC blended learning programs and GDLN services, as well as coordinating videoconference/ WebEx events and CoP administration.

Tomoko Kobayashi



Tomoko Kobayashi joined the TDLC in September 2015 as a Video Editor Associate. She edits videos for seminars, meetings, and presentations as well as for other video packages recorded at TDLC's Tokyo offices. She also supports studio operations and archiving video sources. She started her career in Bloomberg Television Tokyo, where she worked for 12 years editing financial program packages, executive interviews, and company promo videos, and she also has experience as a video librarian. She is currently learning web design at a Japanese web company.

Mariko Tanaka

Mariko is a Communications Associate at TDLC. She has more than 10 years of communications background in multilateral and bilateral organizations. For over six years, she worked for the World Bank as a Communications Consultant in the Sustainable Development Network as well as in the Latin America and the Caribbean (LAC) Department, where she conducted communications analyses to understand outside perceptions of the World Bank. Mariko created a strong LAC network in Japan among international organizations, Japanese ministries, LAC embassies, the public and private sector, academia, and the media, and she ensured that information on World Bank work on LAC issues was widely disseminated. Mariko also worked for Japan's Ministry of Foreign Affairs as Chief for World Bank Affairs and for JICA as a Research Assistant. Mariko holds a master's degree in international affairs and development from George Washington University.

Vibhu Jain

Vibhu Jain is an Urban Specialist Consultant who supports two teams in Tokyo—one at the Global Infrastructure Facility and one at the DRM Hub. She holds a master's degree in urban regional planning and public policy. She has worked with the World Bank since 2012, first on urban development projects in the New Delhi Office and now on DRM and infrastructure PPPs in the Tokyo office. Before joining the World Bank, she worked with PricewaterhouseCoopers Ltd. and Deloitte Touche Tohmatsu. Much of her work has been on infrastructure sector projects, including solid waste management and transport, focusing on project design, PPP transaction advisory, and implementation support. Currently, she works on integrated flood risk management, hydrometeorology, geohazard risks, and other related aspects of DRM. She also works on PPP in infrastructure and resilient infrastructure PPPs in Tokyo.

Annex 3. List of Participants

Re-gion	Country	City	Organization	Client Name	Client Position
AFR	Ghana	Accra	Hydrological Services Department	Mr. Sylvester Darko	Operational Hydrology
AFR	Ghana	Accra	Accra Metropolitan Assembly	Mr. Victor Tekutey Mensah	Metropolitan Director of Works
AFR	Nigeria	Ibadan	Ministry of Environment and Warer Resources	Mr. Gabriel Olusoji Oguntola	Permant Secretary
AFR	Madagascar	Antanana-rivo	Ministerè de l'Eau, de l'Assainissement et de l'Hygiène (MEAH)	Ms. Josephine Angele Rasoanandrasana	Secretary General
AFR	Madagascar	Antanana-rivo	Urban commune of Antananarivo	Mr. Jaona Andrianaivo	Responsible for Risk Manage-ment and m Care for Urban commune of Antananarivo
AFR	Madagascar	Antanana-rivo	Ministry of State in charge of Presidential Projects, Spatial Planning and Infrastruc-ture	Mr. Hery Haja Andrianaivo Harijaona	Technical Advisor to the minister
EAP	Indonesia	Jakarta	Ministry of Public Works and Housing	Mr. Marojahan Lumban Gaol	Director of Rivers and Coast
EAP	Indonesia	Jakarta	Water Resource Ageny of the Provincial Government oj Jakarta	Mr. Teguh Hendrawan Didin	Head of Provincial Disaster Management of Agency of DKI Jakarta
EAP	Indonesia	Jakarta	Provincial Disaster Management Agency (BPBD) of DKI Jakarta	Mr. Denny Wahyu Heriyanto	Head of Provincial Disaster Management of Agency of DKI Jakarta
EAP	Lao	Vientian	Ministry of Public Works and Transport	Mr. Hoangla Sengmuang	General Director
EAP	Lao	Oudomx-ay	Provincial Public Works and Transport Division	Mr. Bounmay Sengchan-thala	Director
EAP	Lao	Vientian	Ministry of Public and Transport	Mr. Lonechanh Yanghoubou-lom	Senior Officer
EAP	Vietnam	HCMC	PMU of Works Construc-tion	Ms. Dang Thi Minh Nguyet	Head of PPTAF Division
EAP	Vietnam	Hanoi	MARD	Mr. Le Quang Tuan	Head of Science Technology and International Cooperation Division
EAP	Solomon Island	Honoria	Ministry of Mines and Energy	Mr. Jack Kaobata	Senior Hydrologist
LAC	Argentina	Buenos Aires	Ministry of Finances	Mr. Pablo Souto	Economic and Risk Management Coordinator
LAC	Argentina	Buenos Aires	Water Authority	Mr. Pablo Rodorigue	President of Water Authority
LAC	Argentina	Buenos Aires		Ms. Mariela Soledad	Deputy Director

Collaborators

Organization	Name	Title
Ministry of Finance (MOF)	Mr. Noriyuki Mita	Deputy Vice Minister of Finance
Ministry of Land, Infrastructure, Transport and Tourism (MLIT)	Mr. Yusuke Amano	Director
MLIT	Mr. Kenichiro Tachi	Director for International Coordination of River Engineering, River Planning Division, Water and Disaster Management Bureau
MLIT	Dr. Toshio Okazumi	Director
MLIT	Mr. Ryotaro Hayashi	Director for International Cooperation, Overseas Projects Division, Policy Bureau
MLIT	Mr. Toshiyuki Tanaka	Chief Official
MLIT	Ms. Kazuko Ishigaki	Director for International Negotiations Management
MLIT	Mr. Daisuke Takeshita	Chief Official
MLIT	Ms. Saya Usami	Chief Official
MLIT	Mr. Takafumi Nakui	Senior Deputy Director, International Affairs Office, Water and Disaster Management Bureau
MLIT	Mr. Takayuki Kudo	Senior Deputy Director, River Improvement and Management Division, Water and Disaster Management Bureau
MLIT	Dr. Hirotada Matsuki	Senior Advisor to Director-General, Water and Disaster Management Bureau
MLIT	Mr. Kunihiro Moriyasu	Senior Advisor to Director-General, Water and Disaster Management Bureau
PUB, Singapore	Mr. Ismail Bin Ridzuan	Director, Catchment & Waterways Department
PUB, Singapore	Mr. Chengxi Li	Engineer, Catchment & Waterways Department
JICA	Mr. Satoru Mimura	Deputy Director General, Group Director for Disaster Risk Reduction, Global Environment Department
JICA	Mr. Mikio Ishiwatari	Senior Advisor
ICHARM	Mr. Yoichi Iwami	Deputy Director General, Group Director for Disaster Risk Reduction, Global Environment Department

World Bank

Organization	Name	Title
World Bank HQ	Jonas Ingemann Parby	Urban Specialist
World Bank HQ	Salim Rouhana	Urban Specialist
World Bank Mozanbique Office	Michel Matera	Senior Urban Specialist
World Bank Indonesia Office	Kian Siong	Environmental Specialist
World Bank Vietnam Office	Dzung Huy Nguyen	Disaster Risk Management Specialist
World Bank Australia Office	Denis Jean-Jacques Jordy	Senior Environmental Specialist
World Bank Argentina Office	Christophe Prevost	Sr Water & Sanitation Specialist
World Bank HQ	Jolanta Kryspin-Watson	Lead Disaster Risk Management Specialist
World Bank HQ	Toshihiro Sonoda	Senior Disaster Risk Management Specialist
World Bank Tokyo DRM Hub	James P. Newman	Disaster Risk Management Specialist
World Bank HQ	Zuzana Stanton-Geddes	Operations Analyst
World Bank HQ	Philip E. Karp	Lead Knowledge Management Officer
World Bank Tokyo Development Learning Center	Daniel Levine	Senior Operations Officer
World Bank HQ	Hywon Cha Kim	Knowledge Management Officer
World Bank Tokyo Development Learning Center	Yuko Okazawa	Operations Officer
World Bank Tokyo Development Learning Center	Haruka Imoto	Knowledge Management Analyst
World Bank Tokyo Development Learning Center	Yukiko Daikai	Program Assistant
World Bank Tokyo Development Learning Center	Iain Roland Mitchell	Senior IT Assistant, Engineering
World Bank Tokyo Development Learning Center	Mariko Tanaka	Consultant
World Bank Tokyo Development Learning Center	Asako Sato	Consultant
World Bank Madagascar Office	Gael Fetraniaina Raserijaona	Consultant

Contact

World Bank Disaster Risk Management Hub, Tokyo
Phone: +81-(0)3-3597-1320
Email: drmhubtokyo@worldbank.org
Website: http://www.worldbank.org/drmhubtokyo

Tokyo Development Learning Center (TDLC)
Phone: +81-(0)3-3597-1333
Email: jointokyo@worldbank.org
Website: http://www.jointokyo.org

The World Bank Disaster Risk Management Hub, Tokyo supports developing countries to mainstream DRM in national development planning and investment programs. As part of the Global Facility for Disaster Reduction and Recovery and in coordination with the World Bank Tokyo Office, the DRM Hub provides technical assistance grants and connects Japanese and global DRM expertise and solutions with World Bank teams and government officials. Over 37 countries have benefited from the Hub's technical assistance, knowledge, and capacity building activities. The DRM Hub was established in 2014 through the Japan-World Bank Program for Mainstreaming DRM in Developing Countries – a partnership between Japan's Ministry of Finance and the World Bank.