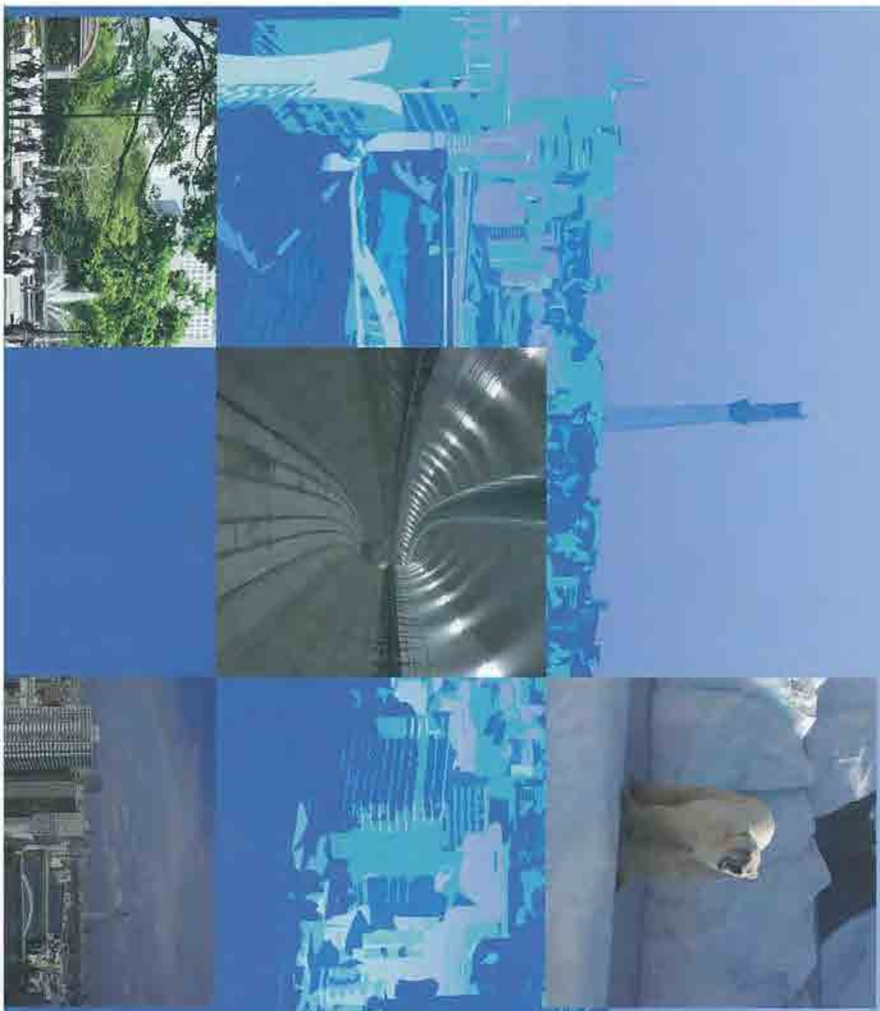
BUREAU OF CONSTRUCTION OVERVIEW 2012

CREATING OUR FUTURE
Roads・Water・Greenery



The Work of the Bureau of Construction, Tokyo Metropolitan Government

Creating Our Future: Roads – Water – Greenery

Tokyo is the mind and heart of Japan, and with the many political, economic, cultural, and other functions it contains, it has been a driving force behind Japan's development.

The Bureau of Construction creates and manages the urban infrastructure that supports this development, including the city's roads, rivers, and parks. The metropolis also faces numerous challenges, including chronic traffic congestion, urban flooding, and a shortage of open space, as well as readiness for major earthquakes.

For these reasons, the Bureau of Construction is working to expand and reinforce its existing efforts, and also to address new issues such as energy policy and improving disaster readiness – the need for which was shown by the Great East Japan Earthquake. The Bureau has established clear objectives in the "Tokyo 2020" plan which was formulated to achieve these goals, and is carrying out the necessary road, river, and park operations.

In terms of roads, we are performing construction and maintenance work on the Three Ring Roads of the Tokyo Metropolitan Area as well as the main roads which form the framework of the city in order to create a road network that both improves Tokyo's disaster readiness capability and relieves traffic congestion. In addition, we are also accelerating the formulation of key city planning roads which will form fire breaks in areas of closely-packed wooden buildings where particularly large damage is expected in the event of a major earthquake.

In terms of rivers, we are repairing river channels and constructing retention reservoirs, seawalls, and other structures which protect the lives and property of city residents from urban flooding caused by the heavy localized rains that have occurred frequently in recent years, and also from tsunamis and storm surges.

In terms of parks, in order to further improve the city's disaster readiness functions as well as improve the urban environment, we are constructing parks and green spaces that can serve as evacuation sites and emergency operation centers in the event of a major earthquake. We are also constructing and operating zoos and aquariums which are popular among city residents, as well as cemetery parks and other facilities.

Through these efforts, the Bureau of Construction will construct assets for a better future and ensure that the facilities themselves are able to fully deliver their intended functions. At the same time, we will continue to carry out appropriate maintenance and management, as well as systematic upgrades, so that these assets can be passed on to future generations.

As the environment surrounding the public works sector grows increasingly difficult, the role of the Bureau of Construction has become extremely important, and all of our employees will join together in future enterprises to make Tokyo a city that we can present proudly to the world.

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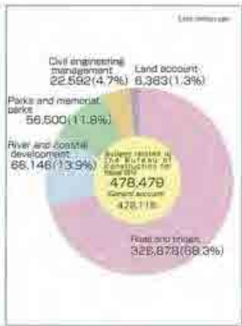
Budget



Balance Sheet

Balance Sheet
(as of March 31, 2011)

Item	Amount (million yen)	Item	Amount (million yen)
Assets		Liabilities	
I Current assets	2,338	I Current liabilities	93,621
II Fixed assets	16,050,394	TMG bonds	93,621
1 Administrative assets	2,461,685	II Fixed liabilities	2,891,158
2 Other public assets	15,263	TMG bonds	2,871,170
3 Important articles	4,163	Reserve for retirement allowance	19,988
4 Infrastructure assets	13,069,746	Total liabilities	2,984,779
5 Construction in progress	492,935	Net worth assets	
6 [illegible]	5,602	Net assets	13,067,953
		(Current changes in net assets)	96,896
		Total net assets	13,067,953
Total assets	16,052,732	Total liabilities and net assets	16,052,732

Road Construction

Roads are the most essential of urban facilities and play a crucial role in the lives of Tokyo residents. This role includes meeting the massive demand for transportation while serving as routes for evacuation and delivery of relief supplies during disasters, and providing spaces for the installation of other facilities such as telephone, gas, water and sewage lines.

The improvement of roads is particularly important in eliminating chronic traffic congestion, which is Tokyo's biggest challenge. Moreover, it is also crucial for raising Tokyo's international competitiveness and realizing a city that is comfortable and convenient, and with a low environmental impact. Road improvements are also essential in order to make Tokyo a city with advanced disaster readiness, including protecting central government functions for rapid restoration of transport for relief supplies and launch of reconstruction activities in the event of a major earthquake, and making the city resistant to large-scale fires by creating fire breaks. As such, we will promote the improvement of roads based on the policies described below.

Development Policy

1. Facilitation of traffic within the Tokyo Metropolitan Area through construction and maintenance of the Three Ring Roads of the Tokyo Metropolitan Area, which underpin the social and economic activities of Japan as a whole while simultaneously focusing on improving the access roads of these ring roads.
2. Construction of bridges and trunk roads in areas where roads are not connected to one another, giving priority to the construction of loop and radial roads in the 23 wards, north-south roads in the Tama region, and east-west roads connecting the 23 wards to the Tama region.
3. Protection of the residential environment by adopting roadside environmental policies, and construction and maintenance of trunk roads to ensure smooth transportation in urban periods. In mountainous areas and islands, construction and maintenance of roads to enhance residential infrastructure for living and facilitation of industrial development.
4. Construction and maintenance of intersections, traffic safety facilities, and grade-separated railroad crossings to allow both road and rail traffic to flow more smoothly and enhance safety.
5. Promotion of the advantages of efficient automobile use and changing to public transport, and facilitating the elimination of traffic congestion through newly completed or upgraded transit systems and the necessary management of transportation demand, including park & ride facilities.
6. Constructing and upgrading key city planning roads which will form fire breaks in areas of closely-packed wooden buildings where particularly large damage is expected in the event of a major earthquake.

24 Hours Average Traffic Volumes

Source: 2010 Road Traffic Census

Average Traveling Speed during Congestion Time Comparison with Other Cities

Source: 2010 Road Traffic Census

Improving the Three Ring Roads of the Tokyo Metropolitan Area

The Three Ring Roads of the Tokyo Metropolitan Area are the Central Circular Route, the Tokyo Outer Ring Road and the Metropolitan Inter-City Expressway. These roads not only contribute to relieving traffic congestion, improving the environment, strengthening international competitiveness, and revitalizing local communities, but also in the event of disaster can provide solid support for central government functions, smooth transport of supplies and other materials, and recovery activities. As these are key roads for preventing an east-west interruption of traffic in Japan, their immediate upgrade and maintenance is of the utmost importance.

Central Circular Route

Of the Three Ring Roads of the Tokyo Metropolitan Area, the Central Circular Route is closest to the city center; its total length is approximately 47 km. By rerouting and distributing the traffic passing over the central city loop expressways, it enables the expressway network to be used more efficiently and eases the chronic traffic congestion that concentrates in the city center. Moreover, by ensuring smooth traffic flow, it will improve the roadside environment.

Central Circular Route-Shinagawa Route

This road, from Yashio in Shinagawa Ward to Aobadai in Meguro Ward, is about 9.4 km long. It connects with the coastal expressway and Expressway No. 3 Shibuya line. The Metropolitan Government has commenced upgrading and maintenance on this route and is anticipating a completion date for fiscal 2013. The Tokyo Metropolitan Government has been working on this project in collaboration with and the Metropolitan Expressway Company, Limited.

Central Circular Route-Shinjuku Route

This road, approximately 11 km in length, extends from Aobadai in Meguro Ward to Kumano-cho in Itabashi Ward. It connects with Expressway No.3 Shibuya line, Expressway No.4 Shinjuku line and Expressway No.5 Ikebukuro line. The entire line has been completed, with the section between expressways No. 4 and 5 completed in December 2007 and between expressways No. 3 and 4 in March of 2010.

Tokyo Outer Ring Road (Between Kan-etsu Expressway and Tomei Expressway)

The Tokyo Outer Ring Road (Gaikan) is an 85 km road that connects in a loop extending approximately 15 km from the city center. By distributing the flow of traffic into the city center, the Tokyo Outer Ring Road will alleviate the chronic traffic congestion in the metropolitan area. In addition, smoothing the flow of traffic and increasing vehicle travel speeds is expected to result in a large reduction in emissions, helping to create a highly comfortable and convenient city.

The approximately 16 km of ward area extending from the Kan-etsu Expressway to the Tomei Expressway will utilize a tunnel structure that runs deep underground in order to minimize the effects on the residential environment and natural environment along its length. It will link to the Kan-etsu, Central Circular and Tomei routes and include connections with the Mejiro, Ome and Tohachi roads. The project was approved in May 2009, and the target for completion is 2020.

The Tokyo Metropolitan Government opened the Bureau of Construction Outer Ring Road Oizumi Office close to the Oizumi Junction in fiscal 2010, and we are currently engaged in surveying the site, acquiring property, and other preparation work under contract from the national government.

Tokyo Outer Ring Road (Between Kan-etsu Expressway and Tomei Expressway)

Names including Junction/Interchange are tentative only (except for ward road sections already open to traffic)

Metropolitan Inter-City Expressway (Between Takaosan Interchange and the Kanagawa Prefecture Border)

The outermost of the Three Ring Roads of the Tokyo Metropolitan Area, the Metropolitan Inter-City Expressway (Ken-o-do), is a road approximately 300 km long that runs in a circle extending 40 to 60 km from the city center. The Ken-o-do connects core business districts and freight transport complexes in the Tokyo Metropolitan Area with the Port of Yokohama and Narita Airport. It also plays an important role in the further development of the Tama region and Tokyo Metropolitan Area, with plans that include the development of an international freight transport network.

In the Tokyo ward areas, the road from the border along Saitama Prefecture to the Takaosan Interchange (Route 20) is opened to traffic. Of the remaining ward areas, the national government and the Central Nippon Expressway Company are working towards opening the section from the Takaosan Interchange to the Sagamihara Interchange (provisional name) that includes the Kanagawa Prefecture border in fiscal 2013, and the section to the Shiroyama Interchange (provisional name) in fiscal 2014.

Building and Improving Urban Highways

Harumi Route

This road extends from Ariake in Koto Ward to Harumi in Chuo Ward for a distance of about 2.7 km. It provides a direct connection for traffic in the Tsukiji, Tsukishima, and Harumi sections, which now use the Inner Circular Route. In the future, it will directly connect the traffic from the waterfront sub-center area and other locations with the Bayshore Route. It will not only improve the traffic situation in the neighboring areas, but also facilitate the development of the waterfront sub-center, the Toyosu area, and the Harumi area.

The Ariake-Toyosu area was opened to traffic in February 2009, and the Metropolitan Expressway Company, Limited is working towards the completion date of fiscal 2014 for the remaining Toyosu-Harumi area.

Construction and upgrading of city planning roads in areas of closely-packed wooden buildings

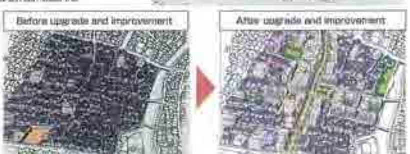
Areas of closely-packed wooden buildings contain many aging wooden residences and narrow streets. As a result, these areas are at high risk for damage by spreading fire in the event of a major earthquake, and therefore it is extremely important to construct and upgrade city planning roads in order to create spaces that can block the spread of fire, provide safe passage to evacuation areas, and serve as roads for emergency vehicles.

In the past when designating priority roads for upgrade in the Third Business Plan, the Tokyo Metropolitan Government had selected roads with consideration for the approximately 2,400 ha of key infrastructure areas which were designated in the Urban Development Plan for Disaster Prevention and carried out the upgrade and improvement of city planning roads.

In the future, the scope of city planning roads which contribute to the formation of fire breaks will be expanded to cover ordinary infrastructure areas in addition to key infrastructure areas, and upgrades and improvements will be accelerated for an area of approximately 7,000 ha (11% of the ward area), aiming to create a city which can resist the spread of fire in the areas of closely-packed wooden building that are one of the challenges Tokyo faces.

Areas of closely-packed wooden buildings where particularly large damage is expected in the event of a major earthquake (7,000 ha of infrastructure area)


Areas of closely-packed wooden residences



Source: Ministry of Land, Infrastructure, Transport and Tourism

Roads in the 23 Wards

In the area of the 23 wards, the radial roads and the loop roads are especially important thoroughfares. However, maintenance and upgrades of the radial roads and the loop roads have fallen behind, and these roads suffer from chronic congestion.

In response, we are emphasizing the development of sections of loop routes and arterial highways between the wards and Tama for which there are no connections as yet. The major roads being worked on for that purpose are Radial Road No. 5, Radial Road No. 7 (Mejiro Road), Loop Road No. 2, and Loop Road No. 6 (Yamate Road).

Loop Road No. 6 (Yamate Road) is a key arterial road running for approximately 26 km from Higashi Shinagawa 2-chome in Shinagawa Ward to Hikawa-cho in Itabashi Ward. A project to expand the width of this road from 22 m to 40 m over an approximately 4.6 km section from Shoto 2-chome in Shibuya Ward to Kaname-cho 1-chome in Toshima Ward is being carried out as part of upgrades and improvements to the Tokyo Metropolitan Expressway Central Circular Route - Shinjuku Route.

These roads are important arterial roads that are expected to help distribute traffic into the city center to smooth the traffic flow and also to improve disaster readiness and safety.

The automobile portion of these roads will consist of four traffic lanes and a shoulder, while the pedestrian portion will ensure an ample bicycle path, pedestrian space, and large green belt on all roads. In ways such as these, construction is proceeding with consideration for the environment along the length of the routes.

Loop Road No. 2 is a key arterial road running for approximately 14 km from Ariake in Koto Ward to Kanda Sakuma-cho in Chiyoda Ward. Construction is proceeding on an approximately 4.8 km section of this road from Toyosu to Toranomon. This is an important arterial road that strengthens the links between the waterfront areas and the city center, and will help to smooth the flow of traffic in the region, and also to improve disaster readiness by serving as an alternative evacuation route.

New urban development projects are already in progress in areas such as Harumi, Kachidoki, and Shinbashi Toranomon. Construction is currently underway and it is important that these upgrades and improvements to roads be completed quickly in order to accommodate the traffic demand generated by these development projects.


Miyashita Intersection (Nakano Ward) on Loop Road No. 6 (Yamate Road)


Loop Road No. 2 (Shimbashi and Toranomon, Minato Ward)

Roads in Tama Region

The crucial roads in the Tama region are planned as a grid-work of east-west and north-south roads.

Presently, we are moving ahead with north-south roads, such as the delayed installation project of the Chofu-Hoya route and Fuchu-Tokorozawa-Kamakura route (Kamakura Highway) with work also presently underway on the Shin-Takiyama Highway which provides access to east-west roads such as the Tohachi Road, and the Metropolitan Inter-City Expressway.

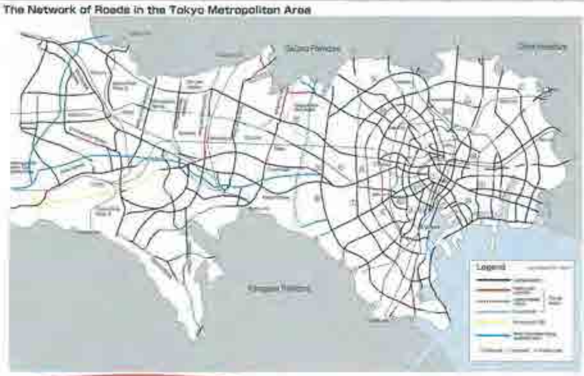
The Chofu-Hoya Route (14.2 km) is an important road that is urgently being updated and improved as one of the main north-south arterial roads in the Tama region, running from Yanokuchi, Inagi City to Kitamachi 3-chome, Nishitokyo City.

Improving this route will be effective in relieving chronic traffic congestion, improving transportation convenience and promoting local development in the eastern Tama region (Chofu City, Mitaka City, Musashino City, Nishitokyo City), and also in improving disaster readiness and protecting the local environment.

In order to preserve the living environment along the route, when the road is improved a 10 m environmental buffer zone will be created on each side of the 16 m wide roadway, for a road with a total width of 36 m. This environmental buffer zone will combine green belts, bicycle and pedestrian paths, frontage roads, and other facilities according to the conditions along the road. This ensures that pedestrians are provided with spaces which are lush with greenery, safe, and comfortable.


Shin-Takiyama Highway (near Yanagimachi 1-chome, Hachioji City)

The Network of Roads in the Tokyo Metropolitan Area



Tunnels

Tunnels are being built in the mountainous areas of the Tama region, on islands, and in other natural areas where topography is steep. Constructed with care for preservation of the natural environment, tunnels are necessary for ensuring the smooth flow of traffic, as well as for preventing hazards such as falling rocks, eliminating sharp curves where visibility is poor, and relieving congestion during peak tourist seasons.

In the western part of Tama, because there are sections of main arterial roads which may be closed to traffic due to inclement weather, we are constructing a high-safety tunnel bypass road on the southern banks of the Tamagawa River and Akigawa River in order to prevent the areas from becoming isolated and unreachable.

For the tunnel on the southern bank of the Tamagawa River, approximately 3 km of a planned total length of 7 km has been completed. Construction on the Shiroyama Tunnel (provisional name) in Okutama town in the western part of Tama was started in June 2010.


Mouth (west side) of the Shiroyama Tunnel (Provisional Name) (Concept drawing of completed tunnel)

Bridges

Bridges are important structures for the creation of a safe and comfortable road network, not only because they join areas which are separated by rivers, rail lines, or other obstacles, but because if they are damaged in the event of a disaster, they can result in secondary damage to the roads, riverways, rail lines, and other infrastructure which they cross.

Through work such as replacing old bridges and constructing new bridges, we are strengthening the road network by improving the earthquake resistance and load-bearing capacity and eliminating traffic bottlenecks, and are working to ensure the safety of evacuation and transport routes in case of disaster.

In addition to work that is currently in progress on the Koremasabashi over the Tamagawa River, Matsuedobashi over the Arakawa River, and Wakasuhobashi over the Tennozu South Canal, we are also conducting studies for other bridge projects including the Todoroki Ohashi (provisional name) which spans the border between the Tokyo Metropolitan Area and Kanagawa Prefecture, and the Sekidobashi which crosses the Tamagawa River. We completed the Nagatabashi over the Tamagawa River and opened it to traffic in March 2011.

Nagatabashi (Tamagawa River, Fussa City and Akiruno City)

Grade-Separated Intersections

Roads and Railways

In Tokyo, there are approximately 1,130 railroad crossings. They impede road traffic and are obstacles to safe and efficient urban activity. The Tokyo Metropolitan Government is moving forward with the conversion to grade separated road and railway crossings in order to alleviate congestion caused by railway crossings and improve urban function and convenience.

◆ Grade-Separated Railway Crossings

One sort of road construction projects is to create railways that are continuously elevated in order to eliminate large numbers of railway crossings. This provides great benefits such as alleviating traffic congestion at railway crossings, linking urban neighborhoods that were previously divided by a railway, allowing the effective use of spaces under overpasses, and contributing to the revitalization of the surrounding city.

Currently, the Bureau has completed 17 lines and 32 sections for a length of approximately 80 km, and has removed 328 crossings as a direct result. Operations are currently being undertaken on eight sections of seven lines, including the Keikyu Main Line and Kuko Line (near Keikyu Kamata Station), and JR Nanbu Line (between Inagizutsumi Station and Fuchu Hommachi Station).

In fiscal 2012, we are planning to remove 42 crossings on the Keikyu Main Line and Kuko Line (near Keikyu Kamata Station), and the Keio Line and Keio Sagamihara Line (near Chofu Station). By completing railway elevation projects at the locations in progress now, we will remove an additional 80 crossings.

Furthermore, we will be starting new projects for routes including the Keio Line (between Sasazuka Station and Hachimanyama Station and between Hachimanyama Station and Sengawa Station) and the Seibu Shinjuku Line (between Nakai Station and Nogata Station, near Higashimurayama Station).

◆ Grade Separation of Individual Portions of Intersections

Crossing congestion is being alleviated by building just the road portion of an intersection on a separate elevation, or by doing that along relatively short stretches of the railroad.

In May 2000, the Koyasu Grade-Separated Intersection where Higashimurayama Route No. 3-4-7 Fuchu-Kiyose Route and the Seibu Kokubunji line meet was completed, allowing for smoother traffic flow, such as alleviation of the chronic traffic congestion occurring at the railway crossing at Koganei Road. Currently, 16 sections are under construction, including Auxiliary Route No. 74 (Takadanobaba) and Nishitokyo Route No. 3-2-6 (Nishitokyo).

Grade Separation between Roads

Intersections beset by heavy traffic volume give rise to problems such as traffic congestion, increased exhaust emissions and other issues. To resolve this we are developing grade-separated intersections between roads by elevating one of the intersecting roads, or redirecting them underground.

With the Shin-kiwa overpass, we elevated Kuramaebashi Street in order to relieve traffic congestion and improve the environment along the road.

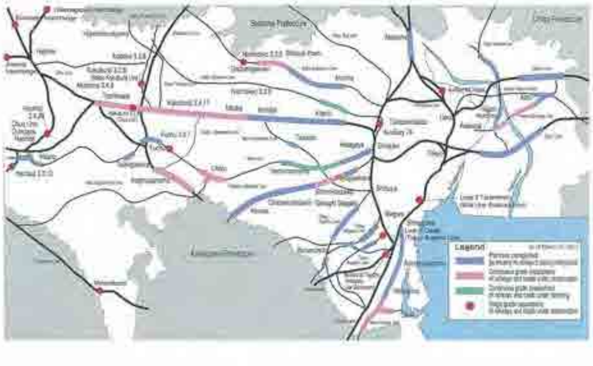
Before removal of rail crossing

(Congestion at the Shakuji Park No. 1 crossing reaches up to 330 m.)

After removal of rail crossing

Seibu Ikebukuro Line consecutive elevated crossing project (near Shakujiikoen Station)

Grade-separated intersection projects for roads and railways



Improving Public Transportation

Automated people movers and urban monorails constitute new modes of transportation. Running on dedicated pathways utilizing the space above the roads, they offer a transport capacity that is midway between a bus and a railroad. Of the elevated path which the automated people mover travels on, the infrastructure parts (primary structures including pillars, beams, and stations) are constructed by the city as part of the roads. The parts which are not infrastructure (such as vehicles and electrical systems) are constructed by the operator who manages the people mover.

Three lines have already been constructed: the Nippori-Toneri Line (Nippori-Toneri Liner) in the northeastern ward area, Tokyo Waterfront New Transit Line (Yurikamome) in the coastal area and the Tama Urban Monorail in Tama. All of these are used by large numbers of passengers.

In addition, Subway Line No. 13 (Fuku-Toshin Line) was constructed to relieve traffic congestion on Meiji Avenue and other thoroughfares and to strengthen links with the three city subcenters of Ikebukuro, Shinjuku, and Shibuya. The infrastructure parts (station walls, floors, pillars, stairs and other structures, and ordinary tunnel framework) which were created directly underneath Meiji Street were constructed as a road project.

Nippori-Toneri Liner

Grade-Separated Intersections

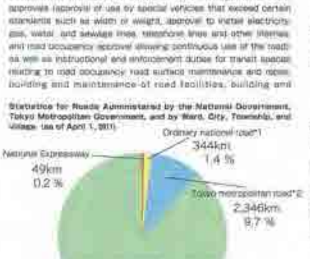
As of April 1, 2011, the total length of roads in Tokyo was approximately 24,342 km (of which 2,346 km was Tokyo metropolitan road). Their total area was approximately 182.54 km² (of which 44.98 km² was Tokyo metropolitan road).

The duties of the Bureau in road management are as follows: Procedures established by the Road Act (road certification involving determination of the road name and its start and end points; determination or change of the region of coverage, which establishes the specific scope of road management, etc.); approvals (approval of use by special vehicles that exceed certain standards such as width or weight, approval to install electricity, gas, water, and sewage lines, telephone lines and other items, and road occupancy approval allowing continuous use of the road); as well as instructional and enforcement duties for transit special relating to road occupancy, road surface maintenance and repair, building and maintenance of road facilities, building and maintenance of spaces for bicycle transit, and work on the roadside environment. These duties are carried out while at the same time preserving and harmonizing with the living environment.

The Bureau is also conducting studies concerning the use of ubiquitous technologies for effective maintenance and management of underground road facilities.

The Great East Japan Earthquake which struck in 2011 generated a renewed understanding of the important functions of roads in the transport of relief supplies and in reconstruction following a disaster. In order to ensure the function of emergency transport roads in the event of a major earthquake, we are actively carrying out the programs indicated in the "Tokyo 2020" plan, including seismic reinforcement of bridges and eliminating utility poles by changing to underground power wires.

Statistics for Roads Administered by the National Government, Tokyo Metropolitan Government, and by Ward, City, Township, and Village (as of April 1, 2011)



Top: Type of road
Middle: Length of road
Bottom: Percentage of total(%)

*1 Some ordinary national roads are classified as designated sections, while 73 km is classified as non-designated sections which are managed by TMG.

*2 Tokyo metropolitan roads include 191 km of Tokyo metropolitan highway.

Note: The length of roads managed by TMG is approximately 2,230 km (9.2% of the total).

Current Status of Roads in Tokyo (as of April 1, 2011)

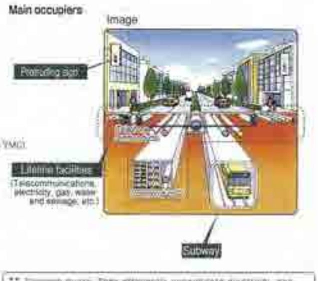
Sector	Area under Administration (k m²)	Road Length (km)	Road Area (km²)	Road Ratio (%)
Wards	621.98	11,841	101,290	16.3%
Tama District	1,159.89	11,025	74,130	6.4%
Islands	405.78	1,476	7,122	1.8%
Total	2,187.65	24,342	182,542	8.3%

Number of Road Occupancy Approvals Issued in Fiscal 2010

(Roads managed by TMG)

Main occupiers

Image



** Common ducts: They efficiently consolidate electrical, gas, water, and other underground facilities for safe and secure protection and management. They reduce the need to repeatedly dig up the road and have the benefit of preventing urban disasters.

Maintenance and Repair of Roads, Bridges and Other Structures

Maintenance and Repair of Roads

To ensure smooth traffic flow and roadside environment, the roads must always be in good condition.

The Bureau of Construction, by checking on road surface conditions and making repairs, strives to ensure that vehicular road surfaces are smooth in order to reduce vibration and noise, and to prevent traffic accidents. For pedestrian walkways, the circumstances of the elderly and persons confined to wheelchairs are taken into consideration by eliminating level differences and lessening the steepness of slopes.

Implementation of Water-Absorptive Pavement

Solar heat-blocking pavement and water absorptive pavement are being employed as a countermeasure against heat islands, which are a particular problem in large cities. This is mainly being carried out in areas emphasized as center core areas, as a means of reducing rising temperatures on road surfaces during the summer season.

◆ Solar Heat-Blocking Pavement

Solar heat-blocking pavement is pavement to which thermal material has been applied reflecting some of the sunlight (infrared rays) responsible for raising the temperatures on road surfaces. It is designed to prevent heat from being trapped in the pavement and suppress increases in the road surface temperature by reflecting a portion of the sun's light.

◆ Water-Absorptive Pavement

Water-Absorptive Pavement is designed to inhibit road surface temperatures from rising by utilizing the vaporization heat given off when the water absorbed through rainfall evaporates. It is constructed of water-absorptive material which absorbs and retains water that is packed into paving filled with numerous openings like those in a sponge.

Changing Streetlights to Energy-Saving Lighting

We are replacing the current mercury lamps in city streetlights with ceramic metal halide lamps and other energy-saving lighting which produces the same brightness but consumes less energy.

Changing to energy-saving lighting reduces both power consumption and CO_2 emissions by approximately 40% compared with existing mercury lamps.

Maintenance and Repair of Bridges and Other Structures

In regard to bridges, tunnels and retaining walls, facilities that are assessed as in need of repair based on regular routine inspection, suitable retrofit and repairs are implemented to treat the damage and maintain efforts in maintenance management in order to ensure optimal transit conditions.

Improving Earthquake Resistance in Bridges

Although the Great East Japan Earthquake which struck in March 2011 saw some bridges washed away by the tsunami, almost no bridges fell due to the earthquake tremors themselves, and it was possible to quickly establish transportation functions to support emergency response activities. In Tokyo, based on the lessons learned from the Great Hanshin-Awaji Earthquake in 1995 we have been working for seismic retrofit of bridges on roads such as the emergency transport routes that are considered important for disaster readiness, for example by wrapping bridge piers with supporting concrete or other materials, or by installing seismic bridge restrainer systems that prevent bridges from falling due to the motion of an earthquake. We are working to ensure that rescue and relief operations, and transport of emergency supplies, can proceed smoothly in the event of a large-scale earthquake.

Example of seismic retrofit (Shin Arakawa Ohashi)

■ Extending the Operating Life of Bridges ■

This work aims to extend the operating life of bridges by 100 years or longer after the upgrade by using the latest technologies and materials so that the bridges can meet present day engineering standards. It is particularly important for famous bridges such as the Kiyosubashi, Eitaibashi and Kachidokibashi bridges across the Sumidagawa River, and other bridges which must be preserved as valuable assets for future generations; large-scale bridges whose overhaul work costs vast sums of money and has a large impact on surrounding areas; bridges that cross roads and railways; and bridges built over major arterial roads.

Through these measures, reduction of overall costs and CO_2 emissions can be realized by minimizing replacement work, while maintaining safety and security with improvements in bridges that excel in being even safer and more earthquake resistant.

In fiscal 2010, work was completed on a project to extend the operating life of the Minedanibashi in Okutama town.


Example of extending bridge operating life (Minedanibashi: Tozura, Okutama town)

■ Road Asset Management and Medium-Term Plan for Bridge Management ■

Many of the road facilities in the Tokyo Metropolitan Area were constructed during Japan's high growth period following the Tokyo Olympics, and as a result will all be requiring overhaul at approximately the same time in the near future. Overhauling all these facilities at the same time presents a number of concerns, including the vast expense required at a time when financial resources are limited, and the large impact on residents' lives caused by traffic congestion and other problems resulting from carrying out all this work at once.

As a result, it has become necessary to standardize the overhaul timing and minimize the costs and the effects on the residents by working for further cost reductions and carrying out efficient and effective management aimed at extending the operating life of road facilities. We therefore decided to introduce asset management based on information including the results from previous inspections of road facilities, and to change our road management from a corrective type of management to a preventive type.

In March 2009, we utilized asset management methods and formulated the "Medium and Long Plan for Bridge Management", which covers all bridges that are managed by the Bureau. In addition beginning from fiscal 2010, we began working to introduce asset management for tunnels and have been conducting detailed inspections of the health of our tunnels.

Preserving and Utilizing Historical Civil Engineering Facilities

The three bridges, Kiyosubashi, Eitaibashi, and Kachidokibashi which span the Sumidagawa River were designated as important cultural properties of Japan in June 2007.

In order to preserve and utilize historical civil engineering assets, the Bureau of Construction has refurbished the Kachidokibashi Bridge's transformer building into the Kachidokibashi Bridge Museum, which has been opened to the general public.

Tours of the bridge pier interior and operating room are offered on Thursdays.


Kiyosubashi


Eitaibashi


Kachidokibashi


The Kachidokibashi Bridge Museum

Road Damage Control Projects

On roads in hilly terrain such as the Tama region and on islands, it is necessary to prevent disasters from falling rock, soil, or sand and gravel flows caused by slope collapses and the like resulting from typhoons, heavy rains, earthquakes and other such natural phenomena.

Accordingly, the Bureau of Construction periodically conducts slope investigations and conducts inspection patrols of the mountain roads. It also implements disaster-prevention measures beginning with the most hazardous slopes, including netting and enclosures to prevent rock falls, and concrete framing on slopes.

These are accompanied by measures to improve the environment, such as spraying the area with seeds for vegetation and coloring the concrete.


Kawanokamikawanori line (No. 200) Okutama Circular Route

Road Damage Restoration Projects

These activities involve rebuilding, in accordance with the Law for Bearing of Costs of Public Civil Engineering Facilities Damage Recovery Work by the National Treasury, road facilities that have been damaged in disasters caused by abnormal natural phenomena such as torrential rains, earthquakes, and volcanic eruptions.

Recently, a landslide occurred in Akiruno City, and the disaster forced metropolitan roads to close. Under these conditions, temporary roads were built to facilitate emergency rehabilitation while main rehabilitation projects were underway, and approximately one year later, rehabilitation work was completed.

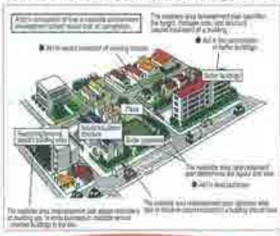


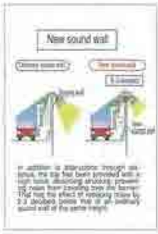
Itsukaichi-Mitake Depot Line (No. 201) Left: Scene from the disaster (April 2008) Right: Rehabilitation work complete (July 2009)

Roadside Upgrades

The Tokyo Metropolitan Government implements several measures to promote the building of facilities along the sides of trunk roads, which are characterized by loud traffic noise. They include home soundproofing assistance and bearing part of the construction cost of buffering structures(structures that prevent passage of road traffic noise).

Also, to address road structure, in areas where traffic noise surpasses a certain standard, low-noise paving or dual-layer low-noise paving, as well as new types of sound wall are being provided.



Tokyo Fureai Road Program

This program consists of road cleaning, plant care and other beautification activities conducted by community citizen groups, companies and other organizations with the cooperation of the Tokyo Metropolitan Government. The goals of the program include improvement of road etiquette as well as creation of attractive spaces along roads.

Participants in the program include community citizen groups, mercantile associations, schools, companies and other organizations, and they work to improve walkways along Tokyo Metropolitan roads.

Applications for participation are accepted by the Administration Sections of the various Bureau of Construction offices and the Civil Engineering Sections of the Tokyo Metropolitan Government branch offices. After an application is submitted, the location and nature of the proposed activities are verified, an agreement is entered into by the Metropolitan Government and the participating organization, and the activities begin. There is also a system for reimbursement of part of the costs of the activities, such as tool costs.


A glimpse of the activities

Creating Urban Landscapes

■ Removing Utility Poles ■

In order to strengthen urban disaster readiness functions, ensure safe and comfortable pedestrian spaces, and create favorable urban scenery, we are using common power wiring conduits and other means to move the power cables and other wiring that is now strung above the streets and install it underground so that the utility poles can be removed.

Based on the "Tokyo 2020" plan, the Tokyo Metropolitan Government is aiming to complete the removal by 2015 of utility poles from the city core area on all municipal roads that have been constructed as city planning roads. The removal of utility poles is also progressing in areas such as on the emergency supply routes that are important in the event of a major earthquake, and in areas surrounding major train stations frequented by large numbers of people.


Before upgrading


After upgrading
Kawasaki Road (Takahata, Hino City)

■ Building Roadscapes ■

To create an attractive and pleasant road environment, scenic improvements are being made in an integrated fashion. The sidewalk surfaces along existing roads are being given more color, and greenery and lighting are being supplied. On 30 roadways serving as the "faces" of their neighborhoods, landscape improvements are being made through the Symbol Road Project, and road beautification projects are underway in areas such as shopping districts and the regions surrounding stations.


Symbol Road Sotobori Avenue (Ginza, Chuo Ward)

Traffic Safety Policies and Alleviating Traffic Congestion

■ Building Facilities for Traffic Safety ■

A number of steps are being taken to prevent traffic accidents and to ensure the safety of pedestrians. They include building of sidewalks, removal of sidewalk barriers, bicycle transit space and installing road signs.

◆ Building Sidewalks

Sidewalks are a type of facility that is exceedingly important in ensuring the safe and comfortable passage of pedestrians. However, there still remain areas where sidewalks are lacking or are too narrow.

For such locations, we are constructing wide sidewalks on which everyone can walk safely, and which have a width of 2 m or greater, wide enough for two wheelchairs to pass one another.

Before the Improvements

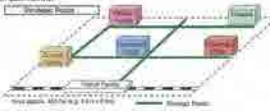
After the Improvements


Yoshino Road (Tomoda Township, Ome City)

◆ Barrier-Free Sidewalks

In order to adapt to our rapidly aging society and ensure the safety of persons with disabilities, we are working to create barrier-free roads as municipal roads are constructed, widened, and repaired.

Barrier-free programs are proceeding with a focus on roads which are used by large numbers of people, including elderly and disabled persons, and which join the stations and public facilities which are used in everyday living with hospitals and similar facilities. These programs include removal of steps on walkways, improving gradients, and installing guide blocks for persons with vision impairments.



◆ Bicycle Transit Space Installation

Bicycles are one major mode of transportation used widely among urban residents. Bicycles are used extensively for everyday activities such as buying goods, work and school commutes and recreational cycling.

In light of this and in order to provide roads where pedestrians, bicycles and automobiles can pass safely and securely, in cooperation with the Metropolitan Police Department we are moving forward with the installation of bicycle transit space and are taking a multifaceted approach, including the use of wide sidewalks with bicycle and pedestrian pathways that are separated structurally and visually, and bicycle lanes that share roadway space with automobiles.

◆ Installing Road Signs

Based on the new Tokyo Signpost Plan, we are installing road signs that are easy to read and understand. As part of that program, information signs (including maps) with tourist information and information on barrier-free facilities to assist the handicapped are being installed together with TMG's Bureau of Industrial and Labor Affairs.


Ginza, Chuo Ward

■ Traffic Congestion Policy ■

◆ Second SUISUI Intersection Plan

Focusing on the Tama region, land is being acquired and right-turn lanes are being established to alleviate traffic congestion by vehicles waiting to make right turns at intersections along two-lane roadways.

The intersections with new right-turn lanes will benefit from shorter lines and quicker passage of vehicles. Moreover, by building and improving walkways near the intersections, pedestrians and bicycle riders will be safer. Since that is a narrowly focused activity, its benefits can be realized in a relatively short time with small investment.


Before upgrading
After upgrading

◆ Operation Hyper-Smooth
(Intensive countermeasures to alleviate traffic congestion employing existing stock)

To ease Tokyo's chronic traffic congestion, it is necessary to improve the road network. Because of their ability to bring about immediate benefit, the Bureau of Construction also implements means of combating congestion through the effective utilization of existing roads. Working in coordination with the concerned bureaus, the Metropolitan Police Department, and the Ministry of Land, Infrastructure and Transport, from 2008 the Bureau will implement an eight-year plan. The plan aims to facilitate the flow of traffic in combination with both measures for "hardware" and "software," that are in concert with the character of the local areas. The program focuses on the 23 wards, in particular 30 roads (sections) that are extremely crowded. The work includes building and lengthening right and left turn lanes, improving road facilities by changing lane markings, measures for freight, and the utilization of ITS (Intelligent Transport Systems) technology.

■ Parking Lot Operation ■

With progress in the construction of parking areas, the number of vehicles parking illegally for short periods on the street has declined from a peak of 200,000 (in 1993) to 58,000 (in 2010). However, the problem of short-term roadside parking has not been completely resolved. Under these circumstances, in order to help alleviate the problem of roadside parking, the Tokyo Metropolitan Government operates municipal parking areas in 6 locations (total 1,246 parking spaces), including the Yaesu and Showa Street underground parking areas. (A designated manager system has been introduced at all locations.)

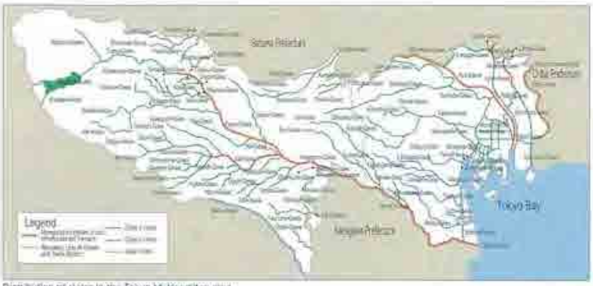
River Projects

River projects protect the lives and residences of the citizens of Tokyo from the danger of disasters stemming from floods (resulting from heavy rain) and storm surge such as flood damage or eroded soil. They develop attractive shoreline environments, promote utilization of the rivers, and create positive river and urban environments. Three types of basic river projects will be further promoted: flood damage countermeasures for small and medium-sized rivers, storm surge and earthquake countermeasures for rivers in lowland areas, and landslide countermeasures in the Tama region. In addition, we will also work to return the greenery and excitement to waterfronts, and develop rivers into appealing waterfront spaces that impress visitors.

River Management and Utilization

Due to their topological configuration, Tokyo's rivers generally have their source to the west and flow into Tokyo Bay. Among them, 92 are specified by the Minister of Land, Infrastructure and Transport as Class A rivers in the Tonegawa, Arakawa, Tamagawa, and Tsurumigawa river systems. Another 15 are specified by the governor of Tokyo as Class B rivers. In total, the number of rivers in Tokyo is 107, totaling around 858 km. Among these, the TMG manages around 105 rivers spanning 711 km, excluding the Arakawa and Tamagawa Rivers that are managed by the Ministry of Land, Infrastructure and Transport.

Of the rivers administered by the metropolitan government, 46 rivers in the 23 wards are managed by the wards in accordance with an ordinance governing TMG administration in special zones. In addition, the quasi-rivers specified and administered by the wards, cities, townships and villages in Tokyo number 25 and are approximately 50 km long in total.



Distribution of rivers in the Tokyo Metropolitan area

Building Mooring Facilities

Tokyo's rivers face a river management problem from boats and other craft that are moored in a disorderly fashion. To create order, mooring is now regulated by the Ordinance for Appropriate Mooring and Storage of Boats in Tokyo, which took effect in January 2003, addressing the problem of illegal mooring and establishing the construction of storage facilities.


Temporary mooring facility (Shinagawa River, Ota Ward)

Water Bus Operation and Constructing Disaster Prevention Pier

Emergency docks leading to evacuation shelters are being built so that the rivers can be used for purposes such as transporting materials in the event of an earthquake or other disaster. At normal times these docks are used as standard stops of waterbuses. The Etchujima and Akashicho disaster prevention pier are also made generally available to tour boats and other river vessels, and have become stopping points on new river boat tour routes.

The Bureau of Construction also utilizes three emergency transport boats as waterbuses during ordinary times. These operate as the "Tokyo Mizube Line" of the Tokyo Metropolitan Park Association so that more people can enjoy the city's waterfronts.


"Tokyo Mizube Line" waterbus and disaster prevention pier (Sumidagawa River in Akashicho, Chuo Ward)

Improving Small and Medium-Sized Rivers

Including rivers such as the Kandagawa River and Shakujiigawa River flowing through the 23 wards west of the Sumidagawa River, as well as the Karaborigawa River and Tsurumigawa Rivers in the Tama region, revetments capable of withstanding 50 mm of rain per hour are being built along 324 km of 46 rivers.

However, particularly urbanized areas require considerable time to improve. In these areas, we are constructing regulating reservoirs and diversion channels in order to prevent the threat of sudden flood damage and immediately increase flood damage safety measures as much as possible.

Constructing Revetments

To safely deal with overflowing flood water during heavy rains, rivers are being widened and dug down the riverbed. Paths through lush greenery border the rivers, and in areas with sufficient space the revetments are built at a gentle slope, allowing visitors to enjoy the river and creating an environment preserving the local fish, insects, and birds.


Revetment work (Shirakogawa River, Nerima Ward)


A river landscape designed to be enjoyed (Misawagawa River, Inagi City)


Improvement of Small and Medium-Sized Rivers

Constructing Regulating Reservoirs and Diversion Channels

Regulating reservoirs have been installed to store a volume of flood water when water levels rise in heavy rain, while diversion channels route flood water to a different location.

On some rivers such as the Kandagawa River, diversion channels are built to reroute the overflowing flood water to locations such as beneath adjacent roads.

The Kandagawa River Loop Road No. 7 Regulating Reservoir is designed to quickly increase the safety of the Kandagawa River mid-basin area, which frequently suffers damage. The reservoir, completed in March 2008, is a tunnel 4.5 km long and 12.5 m inner diameter beneath Loop Road No. 7. It is capable of storing 540,000 m³ of overflow from the Kandagawa, Zenpukujigawa and Myoshojigawa Rivers.

During the approach of Typhoon No. 18 in October, 2005, the reservoir was filled to the record mark of 505,000 m³, preventing a massive amount of potential flood damage.

Currently, underground regulating reservoirs for the Furukawa River and Shirakogawa River, the Saginomiya regulating reservoir for the Myoshojigawa River, and a diversion channel for the Yanagawa River are under construction.

◆ Emergency Measures to Protect Against Heavy Rain

By detaining water from two different watersheds – the Shirakogawa River and Shakujiigawa Rivers – in the Shirakogawa River underground regulating reservoir, it is possible to protect against local heavy rainfall in each watershed.

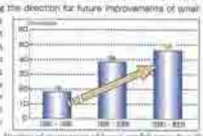
In addition, the Shakujiigawa River has been designated as a "Rivers Subject to Water Level Announcements", and in cooperation with local wards and cities this system helps in rapidly evacuating residents when necessary.


Image of water sources


Kandagawa River Loop Road No.7 Underground Regulating Reservoir (Suginami Ward)

Direction of Future Improvements

Due to the frequent occurrence in recent years of flooding as a result of rainfall exceeding the current design rainfall for requiring additional facilities of 50 mm per hour, a committee of academic experts and experienced professionals was formed in June 2011. In addition to studying the direction for future improvements of small and mid-size rivers from an expert perspective, this committee will also create reports concerning a new design rainfall for requiring additional facilities and other matters.


Number of occurrences of heavy rainfall exceeding 50 mm/h in the Tokyo Metropolitan Area

Improving Rivers at Low Elevation

In the eastern, low-lying parts of the city, considerable damage has been inflicted through the years by storm surges and floods. In response, the Bureau of Construction is taking measures against storm surges and conducting earthquake proofing. It is also furthering barrier-free areas for the disabled, improving the surrounding environment, and otherwise working to create appealing, nature-filled areas around the waterfront.

In addition, by means such as creating so-called "super levees", connecting multiple terraces, and landscaping on the banks of the Sumidagawa River and elsewhere, we are working to create exciting waterfront spaces that will be gathering places for many people.

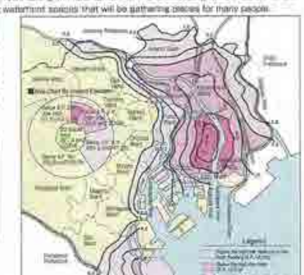
Installing Facilities for Protecting Against Storm Surge

Tide embankments to protect against storm surge and floodgates are being built primarily in the areas of low elevation east of the Sumidagawa River. They are designed to defend against tides like those produced by the Ise Bay Typhoon. Work has nearly been completed on major rivers including the Sumidagawa River, and the unprotected areas of Myokenjima Island.

Normal conditions **High tide**



Storm surge due to typhoon (Sumidagawa River, upstream of the Shin-Ohashi Bridge (left bank), Typhoon No. 15, September 2011)


Surface contour map of low-lying regions

Installation in the Koto Inner Rivers

Koto Triangle, an area of low land elevation surrounded by the Arakawa and Sumidagawa rivers. The rivers in the west side of the Koto triangle Area are being provided with earthquake-proof revetments, and riverside walkways are being built on east-side rivers where normal water levels are subsiding. These projects are being conducted to protect against water damage from the risk of collapsing revetments during major earthquakes.


Improvement to the Koto Inner River (Kyu Nakagawa River, Edogawa Ward)

Installing Super Levees and Gentle-Slope Levees

To increase safety in the event of major earthquake and reinvigorate the riverside environment, super levees and levees with gentle slopes are being constructed along major rivers such as the Sumidagawa River. Since the work requires broad tracts of land, it is being conducted hand-in-hand with urban development work in the areas behind the revetments, with terraces established first and opened to the public.


Cross-section of a Super Embankment (Sumidagawa River)

Earthquake-Proofing of River Structures

Using the river damage incurred from the Great Hanshin-Awaji Earthquake of January, 1995 as a point of reference, earthquake-proofing of levees, floodgates, and other facilities to protect below-sea-level areas was completed in 2006. Following the Great East Japan Earthquake which struck in March 2011, a technology verification committee comprised of academic experts and experienced professionals was established, and conducted a study concerning the future direction of improving the earthquake-proofing of facilities and other aspects of disaster readiness. Based on the study results, further earthquake-proofing of facilities and other necessary measures will be carried out in order to ensure the safety of eastern low-lying areas.


Earthquake-Proofed Levee (Nakagawa River, Edogawa Ward)


Installed Super Levee (Sumidagawa River, Arakawa Ward, Shirahige-nishi Area)

River Environmental Work

Building Riverside Environments

To remake the areas along the rivers into relaxing and pleasant spaces, we are working to create vibrant rivers that the people of the communities will be fond of. Examples include building walking trails utilizing maintenance paths and planting greenery along them, building areas of access to the waterfront using old river terraces areas, and revitalizing wetlands around regulating reservoirs.


Building Riverside Environments (Nakagawa River, Edogawa Ward)

Improving Water Volume and Quality

In response to problems concerned with water pollution and decreasing water levels the bureau is engaged in dredging of accumulated waste, building water purification facilities, raising water quality by combatting low-level dioxins, and ensuring sufficient quantities of water by drawing water from underground structures and other rivers.


Children Playing Around the River (Nogawa River, Mitaka City)

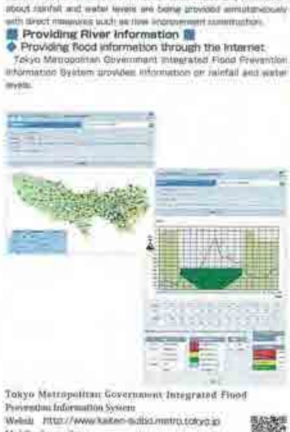
Improvement of Data Processing Methods

In order to protect the lives and residences of citizens from the dangers of water and landslide damage caused by heavy rain, floods, and high tides, data processing methods that allow the spread and clarification of information about rivers and information about rainfall and water levels are being provided simultaneously with direct measures such as flow improvement construction.

Providing River Information

◆ Providing flood information through the Internet

Tokyo Metropolitan Government Integrated Flood Prevention Information System provides information on rainfall and water levels.


Tokyo Metropolitan Government Integrated Flood Prevention Information System
Website http://www.kasen-suibo.metro.tokyo.jp
Mobile phone site
http://www.kasen-suibo.metro.tokyo.jp/k/

◆ Listing of regional flood predictions

Flood prediction information is listed so that local governments and citizens can prepare for the likelihood of floods.

http://www.kensetsu.metro.tokyo.jp/suigai_taisaku/index/menu02.htm

◆ Providing Flood Information

In cooperation with the Japan Meteorological Agency, flood warnings are provided for the Kandagawa River, Shibakawa River, Shinshibakawa River, Shibuyagawa River, Furukawa River, and Megurogawa River when there is the risk of a river overflowing its banks.

Spread and Clarification of River Information

A variety of measures to circulate and clarify information on rivers are being taken with the objective of promoting interest in rivers, and making citizens more aware of the dangers of floods, soil erosion, and water accidents.

Every year, July is promoted as River Appreciation Month, with a variety of activities held such as riverside walks, facility tours, river purification efforts, panels, photo contests, and symposiums.


Walking along a River ([illegible] River in Okutama Town)

Countermeasure for Sediment Disaster

Improvement in Sediment Disaster Control Facilities

In areas such as the Tama Region's mountain ranges and the Izu and Ogasawara Islands where risk of sediment disaster is present, Sabo dams, flow channels, grading crib works, and other physical structures serve to protect the areas from debris flow produced by rainfall, lava flow from volcanic eruption, landslide, and similar damage.

Construction of Sabo dam (type to prevent damage from debris flow (Hirasawa River, Hachioji City))

Construction of grading crib works to prevent landslide (Hinohara Village)

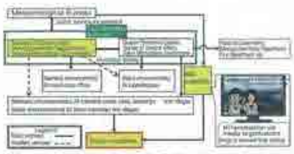
Designated Sediment Disaster Alert Areas

"Sediment Disaster Alert Area (special)" are designated in accordance with the Act on Sediment Disaster Countermeasures for Sediment Disaster Prone Areas in order to spread information, allow swift evacuation, and restrict development activity in areas where landslides pose a risk.

Regions designated as areas of Sediment Disaster Alert (as of April 1st, 2011)

Announcement of Sediment Disaster Warnings

Sediment disaster warnings have been jointly announced by the Tokyo Metropolitan Government and Meteorological Bureau in order to utilize the media to inform citizens when heavy rain warnings signal an increased risk of sediment disasters necessitating evacuation.



Information Transmission Routes for Sediment disaster Warnings

Improvement in Shoreline Preservation Facilities

In the 759 km of shoreline around the Tokyo area and its surrounding islands, the Bureau of Construction has installed 48 km of structures such as revetments and artificial reefs in order to protect shorelines at risk of deterioration due to the waves created by seasonal winds and typhoons.

Artificial reef (an underwater barrier) (Nagahama shoreline, Kouzushima)

Construction of gentle slope revetments (Habushiura Shoreline, Niijima)

Parks of Tokyo

Parks of Tokyo

The rich greenery, broad plazas, and open skies offered by the parks make them unique places of recreation that enhance the landscape.

Moreover, the foliage of the parks purifies the air, and the plazas offer refuge in times of disaster. The parks also play a part in protecting natural beauty.

Parks consist of city parks and other parks established by the Urban Park Act, as well as Natural Parks in accordance with the Natural Parks Act.

Parks of Tokyo

- ●City parks 7,609 locations, 5,565 hectares
  - Government managed parks (1 location, 165 hectares)
  - Municipal parks (80 locations, 1,937 hectares)
  - Local parks (7,528 locations, 3,463 hectares)
- ●Non-city parks 3,515 locations, 1,900 hectares
  - Locally established children's parks, etc.
  - National Parks
  - Sea parks established by the Tokyo Port Authority
  - Parks established on residential land or public corporations, etc.
  - Nature experience parks created by the Tokyo Metropolitan Government Bureau of Environment
- ●Natural parks
  - National Parks (3 locations, 69,436 hectares)
  - Quasi-national parks (1 location, 770 hectares)
  - Municipal Natural Parks (6 locations, 8,166 hectares)

※Current as of April 1st, 2011

The Condition of City Parks

As of April 1st, 2011, the total area of city parks and other parks comes to 7,313ha, or 5.70m² per citizen (excluding specially government-designated land).

In addition to parks such as Ueno Park and Inokashira Park, the Bureau of Construction supervises 80 locations across 1,978 hectares of land including cultural property gardens, zoos, and botanical gardens.

Creating Municipal Parks

Project Policy

Our policy is based on the greening plan established in "Revitalising Tokyo as a Beautiful City of Water and Greenery" - a plan which is a continuation of "The 10-Year Plan for Tokyo" that was part of "Tokyo 2020". The project which the Bureau of Construction has created to support this policy is the "Project for Creating a Water and Greenery Network". As part of this project, our new objective for the coming 10 years is to open 170 ha of municipal parks (of which 75 ha will be disaster prevention parks), and carry out complete, integrated upgrade and improvement of roads, rivers, and parks.

Beginning from fiscal 2012, and based on the "Action Program 2012" which is an action plan aimed at achieving the objectives in "Tokyo 2020", in addition to steadily expanding and improving city parks, we will also carry out other projects including strengthening the disaster readiness functions of the city parks which serve as disaster-readiness sites and evacuation sites, revitalizing the forest of culture at Ueno Park, and restoring cultural property gardens.

Status of Improvements

In fiscal 2011, the Tokyo Rinkai Disaster Prevention Park was fully opened to the public. This park is integrated with a park managed by the national government and will serve as a key disaster-readiness site for the broader region. The new Oto Park was also opened during this same year. We will continue with park expansion and improvements at locations including Tooen Park, Rokuen Park, and Sakuragaoka Park.

In addition, we are working to protect the lives and property of Tokyo residents in the event of a major earthquake by installing disaster toilets which can be used even when there is no water supply, solar guide lamps, and entrances for trucks carrying supplies at the city parks which have been designated as evacuation sites and centers for rescue and relief activities in regional disaster-readiness plans.

29th National Urban Greenery Fair - Tokyo

The Tokyo Metropolitan Government will hold the 29th National Urban Greenery Fair - Tokyo over 30 days from September 29 to October 28, 2012. This event is based on the theme of a "Tokyo of Greenery and Breezes" and will present garden exhibitions and a variety of events related to flowers and greenery.

The National Urban Greenery Fair has been held annually since 1983, and is intended to promote awareness of and broader knowledge related to urban greenery. This year marks the first time the event has been held in Tokyo in 28 years.

The six main venues will be Ueno Park, Inokashira Park, Hibiya Park, Hama-Rikyu Gardens, Umi-no-Mori (Sea Forest), and Showa Kinen Park. In addition, "green corridors" will be created along the roads and rivers that link the venues, and will incorporate satellite venues that are sponsored by individual municipalities. As the event is aimed at the whole of the Tokyo Metropolitan Area, it will generate green connections and lead to the wider use of urban greenery.

Locations of main venues

Preliminary event held one year in advance

第29回全国都市緑化フェアTOKYO

Greening of Roads

Greening of roads and thoroughfares performs many roles, including providing people with a relaxing atmosphere, enhancing the urban environment, creating attractive urban landscapes, contributing to safe and smooth traffic, and providing disaster-readiness functions which protect residents from fires and other dangers at time of disaster.

Of the 2,230 km (as of April 1, 2011) of roads administrated by the Tokyo Metropolitan Government, 1,230 km is planted with boulevard trees, while greenery on median strips and traffic islands total an area of approximately 324 ha.

Example of increasing the number of boulevard trees: Inokubo Road

Ginkgo outer gardens of Meiji Shrine

Japanese Horse Chestnut Tachikawa Akishima Route

Increasing the Numbers of Boulevard Trees

Since 2005, the Bureau has been conducting a project that creates and expands a "green road network", in which the number of trees planted along boulevards in the metropolis will be doubled to one million, making the link to "green hubs" such as city parks in order to create a beautiful Tokyo embraced by corridors of water and greenery. On existing roads, an "enriching boulevard trees" project is also carried out, with planting flowering and fruit-bearing trees in the spaces between tall trees in order to create roads with a delightful feel of the seasons.

The Bureau is planting and growing healthy trees, as well as managing and taking care of existing greenery, and is dedicated to improvement and management of a high standard that is appropriate to a city in full bloom.

In addition, large-diameter boulevard trees are systematically examined and replaced as necessary, aiming to reinforce the disaster-readiness functions of the boulevard trees.

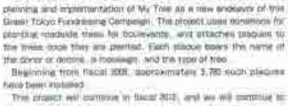
My Tree

As part of the Green Tokyo Movement for the creation and development of a Tokyo rich in greenery, the Green Tokyo Fundraising Campaign was established in fiscal 2007, and has continued to progress in its creation of a green Tokyo in cooperation with a large number of the city's residents and businesses.

Since 2008, the Bureau of Construction has been involved in the planning and implementation of My Tree as a new endeavor of the Green Tokyo Fundraising Campaign. The project uses donations for planting roadside trees for boulevards, and attaches plaques to the trees once they are planted. Each plaque bears the name of the donor or donors, a message, and the type of tree.

Beginning from fiscal 2008, approximately 3,780 such plaques have been installed.

This project will continue in fiscal 2012, and we will continue to plant and maintain boulevard trees in cooperation with the area residents and private businesses.



Examples of My Trees

Major Green Road Networks

Gardens

Tokyo Metropolitan Area city parks include nine gardens that have been designated as cultural assets by the national government or the Tokyo Metropolitan Government. They are valuable assets full of history and culture that has been passed down from the Edo Period, and each of them is a well-known garden that is a source of pride for Japan.

We are maintaining and caring for these gardens while ensuring that the necessary gardening skills are passed down to a new generation. In addition, a number of actions are being taken to raise the appeal of the gardens so that more and more people can enjoy them. They include opening them on New Year's Day, extending the hours of operation during the summer vacation season, providing nighttime lighting during the cherry blossom season and when the foliage changes color in the autumn, and holding a fall colors stamp rally.

At the Hama-Rikyu Gardens and Koishikawa Korakuen Gardens, which have been designated as special places of scenic beauty and special historic sites by the national government, we are working to restore the Daimyo Gardens which date from the Edo Period. At the Hama-Rikyu Gardens, we are working to restore sites including the group of teahouses which was destroyed by fire during the war, and other cultural assets, so as to recreate the culture of the Edo Period and restore the stately Daimyo Gardens for which the period is so famous. In 2010, we completed restoration of the Matsu-no-Ochaya teahouse and are continuing to work on restoration of the other teahouses.

In addition, visitors are provided services by information terminal (called Ubiquitous Communicator) which guides Garden's highlights and courses, using images and sounds in six languages.

At Koishikawa Korakuen Gardens, we have started a project that aims to restore all of the gardens for the first time since the initial post-war restoration, and we are currently working to restore "Daisensui", a garden pond which models Lake Biwa and creates central image of the gardens. Restoration of the stone arched Engetsu-kyo Bridge was completed in March 2010.

Engetsu-kyo Bridge, Koishikawa Korakuen Gardens (after restoration)

The Matsu-no-Ochaya teahouse, Hama-Rikyu Gardens

Fukagawa Akari Tanzaugi (illumination), Kiyosumi Gardens

Cemeteries

At present there are eight cemeteries operated by the Tokyo Metropolitan Government. The number of grave sites in use is approximately 280,000 with about 1.22 million people interred (as of April 2011). As city cemetery plots are highly sought-after with applications far outpacing available land, organizational improvement and area reduction of established cemeteries, as well as provision of consolidated cemeteries, is being carried out. Additionally, in keeping with the changing of the times and of common practice, the new-style plots that have become a central feature of other cemeteries are being made increasingly available.

The four cemeteries in the 23 ward area - Aoyama, Zoshigaya, Somei and Yanaka - have long histories, having all been opened in 1874. We are working on a revitalization project that involves relocating existing graves in order to construct new multi-level gravesites and open spaces, so that these ward cemeteries can be used as both cemeteries and park spaces by greater numbers of Tokyo residents. In advance of this project, leasing of gravesites was resumed at the Aoyama Cemetery in 2003 and at the Yanaka Cemetery in 2007.

At the four suburban cemeteries - Tama, Kodaira, Hachioji and Yahashira - effort is being made to create new types of gravesites and otherwise efficiently utilize space, while maintaining the scenic nature of cemeteries situated in parks.

Provision of New Cemeteries

In February of 2006, the Tokyo Metropolitan Parks Council addressed the issue of the provision and maintenance of new gravesites in municipal cemeteries. In regard to future handling of gravesites in city cemeteries, the council stated that in order to accommodate the demand for burial in the ground and a quiet return to nature after death, the remains of the deceased should be buried in wooded or forest gravesites, or in compact grave courtyards that, while small, provide peaceful and green surroundings. We are currently working to put this proposal into use.

These new types of gravesites efficiently utilize the space available for graves within the city, while providing lush greenery and landscapes, and helping to preserve the environment and create scenic city areas.

Kodaira shared plot structure

Yanaka multi-level gravesite facility

Image of forest gravesite (Proposal by Tokyo Metropolitan Parks Council)

Image of wooded gravesite (Proposal by Tokyo Metropolitan Parks Council)

Zoos and Aquariums

As exemplified by the Ueno Zoo, which became the nation's first zoo in 1882, the Tama Zoo, which was among the first in the world to create a safari-style facility; the Inokashira Park Zoo, which is home to the longest-lived elephant in Japan; and the Tokyo Sea Life Park, which started a boom in construction of large-size aquariums, Tokyo has led the nation's development of zoos and aquariums.

So that these facilities can continue to fulfill their roles in the future, in September 2011 the metropolitan government announced the "Metropolitan Zoo Master Plan" which indicates the future objectives of metropolitan zoos and aquariums and provides the direction for programs to achieve them. In the future, we will construct and improve zoos and aquariums based on this plan, as we create new, highly appealing zoos and aquariums.

Ueno Zoo

Ueno Zoo is a municipal zoo that also contributes to good international relationships as the flagship zoo of Japan. In 1972, a pair of Giant panda was sent from the Chinese government in commemoration of the normalization of diplomatic relations with China. These were the first pandas to be kept in captivity in Japan. Subsequently the zoo succeeded in raising two cubs, and over the past 35 years it raised a total of eight giant pandas.

However Giant panda exhibit at the Ueno Zoo came to an end with the death of the male LingLing in 2008. In July 2010, the Tokyo Metropolitan Government and the China Wildlife Conservation Association concluded an agreement for cooperation in giant panda protection and study, and in February 2011 a new pair of Giant pandas arrived at the Ueno Zoo. Their Japanese names RiRi (male) and ShinShin (female) were decided based on a public poll and the animals were first made available for public viewing on April 1, 2011.

In October 2011, the new facility "Polar Bear and Seal Oceans" was completed, allowing visitors to see real live polar bears, sea lions, and seals.


Polar bear


Giant panda

Tama Zoo

Tama Zoo is working to breed wild animals by making use of its lush natural environment, and has attracted worldwide attention for its success in breeding animals which require wide open spaces, such as orangutans, snow leopards, and cheetahs.

The Lion Bus of Lion Garden which opened in 1964 was among the first safari-type exhibits to be completed in the world, and remains highly popular today.

A wildlife conservation center was established at Tama Zoo in 2006. This facility helps the zoo achieve its conservation role not only by breeding endangered animals within the zoo grounds, but also by actively carrying out programs linked with animal habitats in nature. One example is its program for protective breeding of Japanese crested ibis in cooperation with the national government and related organizations. This program has been a large success and in 2008 the first ibis born at Tama Zoo took to the skies of Sado.

The "Asian Wetlands" exhibit that was completed in 2008 makes use of the lush natural environment and spacious site to present animals in their natural states, and includes a spacious area that allows Indian rhinoceroses to roam free, as well as a giant enclosed walk-in birdcage.

The "Asian Plains" exhibit, where visitors can see wolves, Przewalski's wild horses, and other animals which populate the grassy plains of Asia, is currently under construction with opening planned for 2012. This facility will also work to breed these endangered animals, and provide visitors with the opportunity to see animals living in families and herds up close.


Japanese crested ibis


Cheetahs

Tokyo Sea Life Park

Tokyo Sea Life Park opened in 1989. As one of the first large-size aquariums, it conducts exhibits, educational activities, and research that are at the top level of any aquarium in Japan.

The results from long-term tuna captivity, exhibits of the creatures that live in the vast seas of Tokyo from Tokyo Bay to Ogasawara, the great achievement of being the first in the world to successfully spawn Pacific bluefin tuna in captivity, breeding of the mudskippers whose number in Tokyo bay are diminishing, and other accomplishments are actively applied to educational activities.

In August 2011, with the cooperation of a private fishery company, an exhibit of the Ocellated icefish which lives in the Antarctic Ocean was opened, making it the first aquarium to successfully launch such an exhibit in the world.


Pacific bluefin tuna


Ocellated icefish

Inokashira Park Zoo

Located in the lush green environment of Inokashira Park in Musashino, Inokashira Park Zoo offers visitors a relaxed, comfortable atmosphere. It is a much loved zoo that is frequented by many repeat visitors, and which features as its symbol the Asian elephant named Hanako who this year turned 65 years old.

In addition to its captivity and breeding program to preserve the endangered Tsushima leopard cat, which it conducts in cooperation with the Tsushima region that is the cat's natural habitat, the zoo also conducts educational programs aimed at increasing awareness and understanding of the cat's habitat conditions and efforts to protect it. The zoo's aquarium presents exhibits of the living creatures that inhabit Japan's freshwater regions, and is working to breed and protect the Japanese rice fish, frogs, and other species that are seemingly common but in fact are facing extinction. The aquarium has had much success in programs to protect Japanese wildlife.

In October 2011, the zoo completed and opened the "Ikimono Hiroba" (wildlife encounter field) where visitors can observe and collect living creatures within the zoo.

As the zoo's other name Bunkaen (Culture Park) suggests, in addition to animals, the zoo also features botanical gardens, sculptures, and many other attractions that can be enjoyed by many different people.


Asian elephant "Hanako"


Tsushima leopard cat

Visit Zoo Campaign

The "Visit Zoo Campaign" was launched in 2010 in order to make the four municipal zoos and aquarium more appealing and exciting, and to attract a larger number of visitors. A campaign logo was created, and an active campaign was carried out to promote the attractions of the zoos and aquarium. Facility hours were extended, the number of operating days was increased, and other steps were taken to boost the number of visitors. From July through September 2011, the "Take the train to see them all! Zoo and Aquarium Stamp Rally" was conducted in collaboration with railway companies.

From December 2011 through March 2012, the "Limited-Time Winter Special Discount for the Municipal Zoos and Aquarium" campaign was conducted. This campaign offered a special 20% discount on entry fees during this period so that people would rediscover the appeal of the municipal zoos and aquarium in wintertime.

Botanical Gardens

The TMG is working creatively so that its botanical gardens can be enjoyed while absorbing knowledge of plant life and the relationship between plants and human life and culture.

Jindai Botanical Gardens

The Jindai Botanical Gardens in the City of Chofu, with its remnants of the forests of Musashino, features plum blossom gardens, cherry blossom gardens and a giant azalea field; a large greenhouse collecting exotic tropical plants; an exhibition of roses which won the Award of Garden Excellence from the World Federation of Rose Societies; as well as seasonal exhibits of chrysanthemums and violets, classical garden plants, Bonsai and other displays.

The Jindai Botanical Gardens celebrated the 50th anniversary of their opening in October 2011.

Yumenoshima Tropical Greenhouse Dome

The Yumenoshima Tropical Greenhouse Dome, uses residual heat from garbage disposal facilities to display scenes of tropical waterfronts and villages as well as vegetation from Tokyo's subtropical Ogasawara Islands.

Seasonal events such as nighttime tours and other events allow visitors to experience the real feel of nature.


Rose Garden, Jindai Botanical Gardens


Jindai Botanical Gardens 50th anniversary commemorative tree-planting


Glass Dome, Yumenoshima Tropical Greenhouse Dome

Civil Engineering Support and Training Center

The population and advanced urban functions of the city of Tokyo are highly concentrated, requiring that the roads, bridges, and other public facilities of the city be built, maintained, and administered at the highest level in terms of safety, the environment, cost, and other factors. To resolves challenges occurring at the ground level, the center utilizes its technology and knowledge to handle various operations including: (1) technical support for the various problems arising in this and other bureaus, (2) conducting research and development needed for technical support, and (3) accumulating and providing various types of technical information.

As we approach the period of mass retirement of the technical experts of the baby boom generation, the center is aiming to preserve, pass down, and further improve upon their technical abilities. As such, it is actively working to address this by implementing the Bureau of Construction technology master system to spread the expert technical skills of our members throughout the bureau.

Technical Support (Main Examples)

Technical support is carried out so as to contribute to projects not only within the Bureau of Construction but throughout the Tokyo Metropolitan Government as a whole by resolving the technical issues which are confronted at all stages of a project from works planning and design to execution and facilities maintenance and administration.

Sidewalk Slip-Resistance Testing

Some sidewalk pavement materials become slippery when wet, leading to pedestrian accidents caused by slipping on rainy days. We use testing devices to accurately measure the actual levels of slip resistance for pavement materials, helping to improve safety.

Technical Support to Work Audit Committees and Similar Bodies

We participate in the Work Audit Committees and similar bodies for construction projects such as the underground tunnel for the No. 2 Ring Road and the Shirakogawa River underground regulating reservoir, and provide technical advice for the various problems that are encountered during the construction.


Slip resistance level testing

Training of Technical Workers

As high numbers of technical workers continue to retire, continuation and improvement of technical skills among workers grows increasingly vital. For this reason, the center created a new initiative in 2008 designed to increase technical skills of workers.

Passing on Technical Skills

In fiscal 2008, the Bureau of Construction launched a Technology Master Program with the goal of passing on and improving technical skills. Professionals certified through this program act as mentors in problem-solving and training fields throughout the bureau, expanding the environment of on-the-job-training and contributing to the systematic continuation of technical skills and training of employees.

Operation of the Bureau of Construction Technology Master Program

Technical Training

The Civil Engineering Support and Training Center provides technical training to develop the skills needed for the works of the Bureau of Construction and to achieve practical technical improvement. A diverse menu of training courses, including training which uses full-scale structural models located within the Center, is used for systematic employee training so that they can acquire the skills needed by our in-house engineers.


Road traffic noise measurement course


Training course for team leaders

Research and Development Essential to Support (Main Examples)

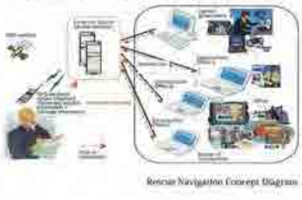
Systematic and continual research and development is carried out in cooperation by the various divisions of the Bureau of Construction, aiming to resolve the issues necessary in order for each division to achieve its policy goals. The advanced specialized knowledge and experience gained from the results of this research and development is used in technical support within the Bureau of Construction and also to other parts of the Tokyo Metropolitan Government.

Research and Development of Road Damage Information Gathering and Processing during Earthquakes

The Center is developing a rescue navigation system in conjunction with the Department of Roadwork, which in the event of an earthquake gathers information by sending and receiving signals through GPS-enabled phones and the internet, allowing for accurate and swift recovery.

Development of Pavement that Contributes to Environmental Conservation

Tokyo is beset by problems such as the heat island phenomenon generated as a result of crowding in urban areas, the noise produced from chronic traffic congestion, and the degradation of the roadside environment due to air pollution. As countermeasures to these problems, we are developing solutions such as solar heat-blocking pavement and low noise pavement.


Rescue Navigation Concept Diagram

Accumulating and Providing Technical Information (Main Examples)

Release of Liquefaction Potential Maps

The Tokyo Liquefaction Potential Maps were created using databases such as liquefaction studies which centered on the western lowland, and boring logs. Based on this information, maps were released showing the risk of liquefaction for all parts of the Tokyo Metropolitan Area.

We are planning to review these maps by the end of 2012, in consideration for information from the Great East Japan Earthquake, the results from new geological surveys, and other information, as well as input from experts in soil mechanics and other fields.


The Tokyo Liquefaction Potential Maps

Construction and Use of the Ground Information System

The Ground Information System is a database of the results from ground surveys conducted by construction companies and other organizations, and is widely used in areas such as construction, disaster readiness, and environmental administration.

Beginning from 2011, the boring map has been made available on the Bureau's homepage. Interest has been growing among city residents, particularly since the Great East Japan Earthquake, and this page was accessed more than 55,000 times during 2011.

* Boring map: Diagram which indicates underground soil, sand, clay, and other ground conditions in bar form.

Maintenance and Provision of Geodetic Surveying and Leveling Data

We maintain and manage data of 575 geodetic control points (class 1) and leveling data from the entire Tokyo Metropolitan Area, and provide it via the Center's homepage. This page was accessed more than 3,300 times during 2011.

In fiscal 2012, we are planning to conduct a new survey and collect new results based on information from the Great East Japan Earthquake.

Collaboration with the Japan Society of Civil Engineers, Universities, and other Organizations

By collaborating with the Japan Society of Civil Engineers, the Japanese Geotechnical Society, Tokyo Metropolitan University, and other organizations, the Center aims to further improve technical capabilities by sharing in the latest technical expertise of academic societies and universities, and to offer the specialized technical information which the Tokyo Metropolitan Government has acquired through its construction works.

Collaboration with the Japan Society of Civil Engineers

As a member of various committees of the Japan Society of Civil Engineers, the Center both acquires new and specialized expertise and also shares the technologies which it possesses. We also participate in the Civil Engineering Collection that is held on "Civil Engineering Day" and conduct PR for civil engineering technologies.

Collaboration with Tokyo Metropolitan University

We are working to strengthen both our own technical capabilities and also those of Tokyo Metropolitan University through means such as joint research concerning subjects such as rainfall characteristics of the small and mid-sized rivers, and participation by the university at presentations held by the Center.


Civil Engineering Collection for "Civil Engineering Day"

Land Acquisition for Projects

Land Acquisition for Projects

To effectively build road, river, and park infrastructure, it is necessary to acquire land in a planned, prioritized manner, with an eye on the future. The Tokyo Metropolitan Government is actively engaged in land acquisition for local roads in the 23 wards, and the Tama north-south roads and east-west roads connecting the 23 wards to Tama, all of which are critical for the road network. It is also acquiring land for rivers, parks and other facilities that are crucial and urgent from the viewpoint of improving the living environment and disaster readiness, while working to gain the understanding and cooperation of persons involved through reimbursement based on fair and open standards.

Flow of Land Acquisition

◆ 1. Project explanation meetings and surveying

An overview of the project plan is presented, including the steps in the project, surveying, the schedule for land acquisition and the like. Then the borders of the land are checked and surveying is conducted to check the location and land area involved.

◆ 2. Explanation of the land acquisition

The procedures for land acquisition, the nature of the reimbursement to be offered, provisions for restarting life elsewhere, etc. are explained to owners and lessees (hereinafter referred to as "rights holders") of land and buildings in the project area.

◆ 3. Land price appraisal and estimation of amount of reimbursement

A price appraisal made of the land to be acquired. For buildings, crops and the like, the structure, quantity, and the rights thereto are investigated, and the amount of reimbursement in the form of moving expenses and other amounts of compensation are calculated using the TMG's loss compensation standards.

◆ 4. Contract discussions

The land acquisition price and amount of reimbursement for other property is discussed, and monetary amounts are individually disclosed to the rights holders.

◆ 5. Entering into contracts and making payment

When the discussions are concluded, individual contracts are entered into with the rights holders, and payment of the land purchase cost and other reimbursement is made in accordance with the contracts. In cases where there are multiple rights holders for individual plots of land, contracts are as a rule entered into with them all at the same time.

◆ 6. Passing title to the land

The change in ownership of the newly obtained land is registered and recorded by the TMG. For buildings and the like, title is passed from the rights holders. The TMG confirms completion of the transfer, and ownership of the land is signed over.

Hachioji-Akiruno Highway ([illegible])

Outline of Reimbursement

Land Transaction Price

Land is acquired at normal prices, which are determined by referencing voluminous data, including the published land price in accordance with the Land Price Publishing Law, transaction prices of nearby properties, and the appraised price according a real estate appraiser. Prices are reviewed once each year.

If someone has a leasehold on land to be acquired, it is necessary for the lessor and the lessee to determine how the lease is to be allocated between them before a contract can be entered into.

Reimbursement for Building Relocation

If the land has a building or other structure on it, the owner moves to another site. When the land is acquired, reimbursement is made for the cost of relocating the structure and other costs as a "normally occurring loss".

The following are the reimbursement categories and a brief overview of them.

◆ 1. Building relocation reimbursement

If there is a building or similar structure on the land being acquired, reimbursement is made for the costs of moving it and related expenses.

◆ 2. Structure relocation reimbursement

If there is a gate, wall, garden stones or the like on the land being acquired, reimbursement is made for the costs required to move them and related expenses.

◆ 3. Reimbursement for trees and plants

If there are trees or plants on the land being acquired, reimbursement is made for the costs required to move them and related expenses.

◆ 4. Chattel relocation reimbursement

Reimbursement is made for the relocation of household effects and furniture, store merchandise, office equipment and the like.

◆ 5. Temporary residence reimbursement

If persons occupying a building are deemed to require a temporary residence in connection with the relocation of a building, rental costs are reimbursed.

◆ 6. Reimbursement for renters

If it is deemed that due to relocation of a building, a rental agreement with a landlord cannot be continued, reimbursement is made for new costs required to rent a similar building.

◆ 7. Business reimbursement

If it is necessary for a store, factory or other place of business to temporarily cease business in order to relocate, reimbursement is made commensurate with the loss of business, that is, loss of income during the time forced to be out of business, fixed costs, and for employees. Also, if it is deemed that the number of customers will decline after the business is reopened, reimbursement is made for those losses.

◆ 8. Rental income reimbursement

If rent for leasing a building to be relocated will not be received during the period of relocation, reimbursement is made in an amount equivalent to the rental income minus management expenses.

◆ 9. Miscellaneous relocation reimbursement

When a building or the like is relocated or vacated, reimbursement is made for the costs involved in the selection of where to relocate, as well as for procedures that must be taken according to law or ordinance.

Support for rebuilding of lives

A variety of assistance is provided to the rights holders to help them rebuild their lives, and careful negotiation is made with them. For example, alternative plots of land are offered, advice is provided by a financial planner, funds are loaned to assist with moving, and assistance in finding public housing such as TMG-operated housing is made.

When land acquisition through discussions is impossible

The general principle in land acquisition by the TMG is that it be accomplished through discussion. Yet in cases where discussion impossible due to disputes over land and buildings or the like, or when agreement cannot be reached concerning such issues as reimbursement amounts despite sufficient discussion, the TMG may obtain the land in accordance with procedures established by the Land Acquisition Law. In such cases it does so in consideration of the many people who have cooperated in the project and the status of the project.

Major Locations of Land Acquired for Projects

Road Projects

Area of land scheduled for acquisition in 2012: Approximately 147,000 m²

Roads are a crucial part of the urban foundation. They constitute the framework of the city, supporting the daily lives of the people and urban activity. In the process of land acquisition, full consideration is given to the urgency, importance, and benefits of a project.

(23 Wards)

Name of Road	Length	Project Location	Name of Road	Length	Project Location
Radial Road No. 5 ([illegible] Avenue)	1,300m	Suginami Ward	Loop Road No. 2	1,800m	Chuo Ward
Radial Road No. 7 (Mejiro Avenue)	2,000m	Nerima Ward	Loop Road No.3	2,100m	Shinjuku Ward, Koto Ward
Radial Road No. 25	1,700m	Shinjuku Ward	Loop Road No.4	1,900m	[illegible]
Loop Road No. 1 (Uchibori Avenue)	500m	Chiyoda Ward	Route 1 of Loop Road No.5 (Meiji Avenue)	4,500m	[illegible]

(Tama)

Name of Road	Length	Project Location
Chofu-Hoya Route (Musashi Sakai Avenue)	7,000m	Mitaka City, Musashino City, Nishi Tokyo City
[illegible]	3,900m	[illegible] City, Kokubunji City, Fuchu City
[illegible] Route (Shin-Takiyama Avenue)	2,600m	Hachioji City
Shin-Ome Avenue Route (Shin-Ome Avenue)	2,400m	[illegible]

Fuchu-Takiyama Kamakura Kaido route (Hon-machida, Machida City)

Chofu-Hoya route (Musashi Sakai Avenue), close to the Jindai Botanical Gardens intersection

In addition to these, land is being acquired as part of the Second Freeflowing Intersection Plan, in which 100 intersections will be upgraded over a 10 year period from fiscal 2005 to fiscal 2014 with the aim of resolving chronic traffic congestion.

River Projects

Area of land scheduled for acquisition in 2012: Approximately 10,000 m²

Name	Length	Project	Name	Length	Project
[illegible]	2,540m	[illegible] (Nerima Ward)	[illegible]	1,010m	[illegible]
[illegible]	900m	[illegible] (Nerima Ward)	[illegible]	630m	[illegible]

Park Projects

Area of land scheduled for acquisition in 2012: Approximately 120,000 m²

23 Wards	[illegible]
Tama	[illegible]

Departments of the Bureau of Construction

Director General of Construction Bureau — Deputy Director General of Construction Bureau — [illegible]

Department Name	Scope of Work	Address	Phone Number
General Affairs Department	Planning and organization of bureau matters, PR, council, budget, personnel, contracts, property administration, border verification technology	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 23rd and 25th Floors)	03-5320-5212 (General Affairs Section)
Land Department	Planning, organization, and leadership of land acquisition	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 22nd Floor)	03-5320-5252 (Management Section)
Road Administration Department	Maintenance of roads and bridges, planning and organization of traffic safety measures, administration of off-street parking facilities	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 24th Floors)	03-5320-5273 (Management Section)
Road Construction Department	Improvement of roads, city streets, and bridges, planning and organization of vertical train crossings	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 24nd Floor)	03-5320-5313 (Management Section)
3 Ring Roads Development Department	Planning, organization related to improvement of the 3 Ring Roads of the Tokyo Metropolitan Area	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 25th Floors)	03-5320-5176 (Management Section)
Parks Department	City parks, cemeteries, zoos, gardens, planning and organization of the citywide natural preservation, regulation of nature-rich and protected natural areas, etc.	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 23rd Floors)	03-5320-5363 (Management Section)
Rivers Department	River maintenance and improvement, flood protection, sandbagging, landslide and avalanche protection, shoreline preservation, planning and organization of waterproofing	2-8-1 Nishi-Shinjuku, Shinjuku-ku (Second Hon-Chosha 22nd Floors)	03-5320-5402 (Management Section)

Office Addresses and List of Contacts

Offices Names	Scope of Work	Jurisdictional District	Address	Phone Number
First Construction Office	Construction, maintenance, and management of roads and streets, bridges, and rivers.	Chiyoda, Chuo, Minato Wards	2-4, Akashi-cho, Chuo-ku	03-3542-0682 (General Affairs Section)
Second Construction Office		Shinagawa, Meguro, Ota, Setagaya, Shibuya Wards	c/o Shinagawa Sogo Chosha, 2-1-36, Hiromachi, Shinagawa-ku	03-3774-0313 (General Affairs Section)
Third Construction Office		Shinjuku, Nakano, Suginami Wards	c/o Nakano Sogo Chosha, 4-8-1, Nakano, Nakano-ku	03-3387-5132 (General Affairs Section)
Fourth Construction Office		Toshima, Itabashi, Nerima Wards	2-36-2, Minami-Otsuka, Toshima-ku	03-5978-1703 (General Affairs Section)
Fifth Construction Office		Sumida, Koto, Katsushika, Edogawa Wards	2-10-7, Kameido, Koto-ku	03-5875-1435 (General Affairs Section)
Sixth Construction Office		Bunkyo, Taito, Kita, Arakawa, Adachi Wards	2-10-10, Senju-higashi, Adachi-ku	03-3882-1152 (General Affairs Section)
Nishitama Construction Office		Ome, Fussa, Akiruno City, Mizuho, Hinode, Okutama Town, Hinohara Village	3-20-1, Higashi-ome, Ome-shi	0428-22-7210 (General Affairs Section)
Minamitama Tobu Construction Office		Machida, Tama, Inagi Cities	1-31-12, Nakamachi, Machida-shi	042-720-8622 (General Affairs Section)
Minamitama Seibu Construction Office		Hachioji, Hino Cities	c/o Hachioji Godo Chosha, 3-19-2, Myojin-cho, Hachioji-shi	042-643-2604 (General Affairs Section)
Kitatama Nanbu Construction Office		Musashino, Mitaka, Fuchu, Chofu, Koganei, Komae, Nishi-Tokyo Cities	1-27-1, Midori-cho, Fuchu-shi	042-330-1802 (General Affairs Section)
Kitatama Hokubu Construction Office		Tachikawa, Akishima, Kodaira, Higashi-Murayama, Kokubunji, Kunitachi, Higashi-Yamato, Kiyose, Higashi-Kurume, Musashi-Murayama Cities	2-15-19, Shibasaki-cho, Tachikawa-shi	042-540-9501 (General Affairs Section)
Civil Engineering Support and Training Centre	Testing, development, support and consultation of civil engineering technology, training of civil engineers and technical workers		1-9-15, Shinsuna, Koto-ku	03-5683-1512 (Technical Support Section)
East Parks Department	Development and maintenance of park, greenery park, memorial parks, preservation of historical areas and scenic areas. Centre of activities in conservation areas and scenic areas	All 23 Wards	7-47, Ueno-Koen, Taito-ku	03-3821-6141 (General Affairs Section)
West Parks Department		All of the Tama District	1-17-59, Gotenyama, Musashino-shi	0422-47-0218 (General Affairs Section)
Koto River Improvement Department	Improvement work, maintenance and administration of flood tide measures, Koto inner river improvement work, water gates, and drainage pumping station		2-10-7, Kameido, Koto-ku	03-5875-1528 (General Affairs Section)

Bureau Of Construction Overview 2012

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Cover Images (from left): Hibiya Park / Central Circular Shinagawa Route / Polar bear 'Sunida River and the Sky Tree

隅田川

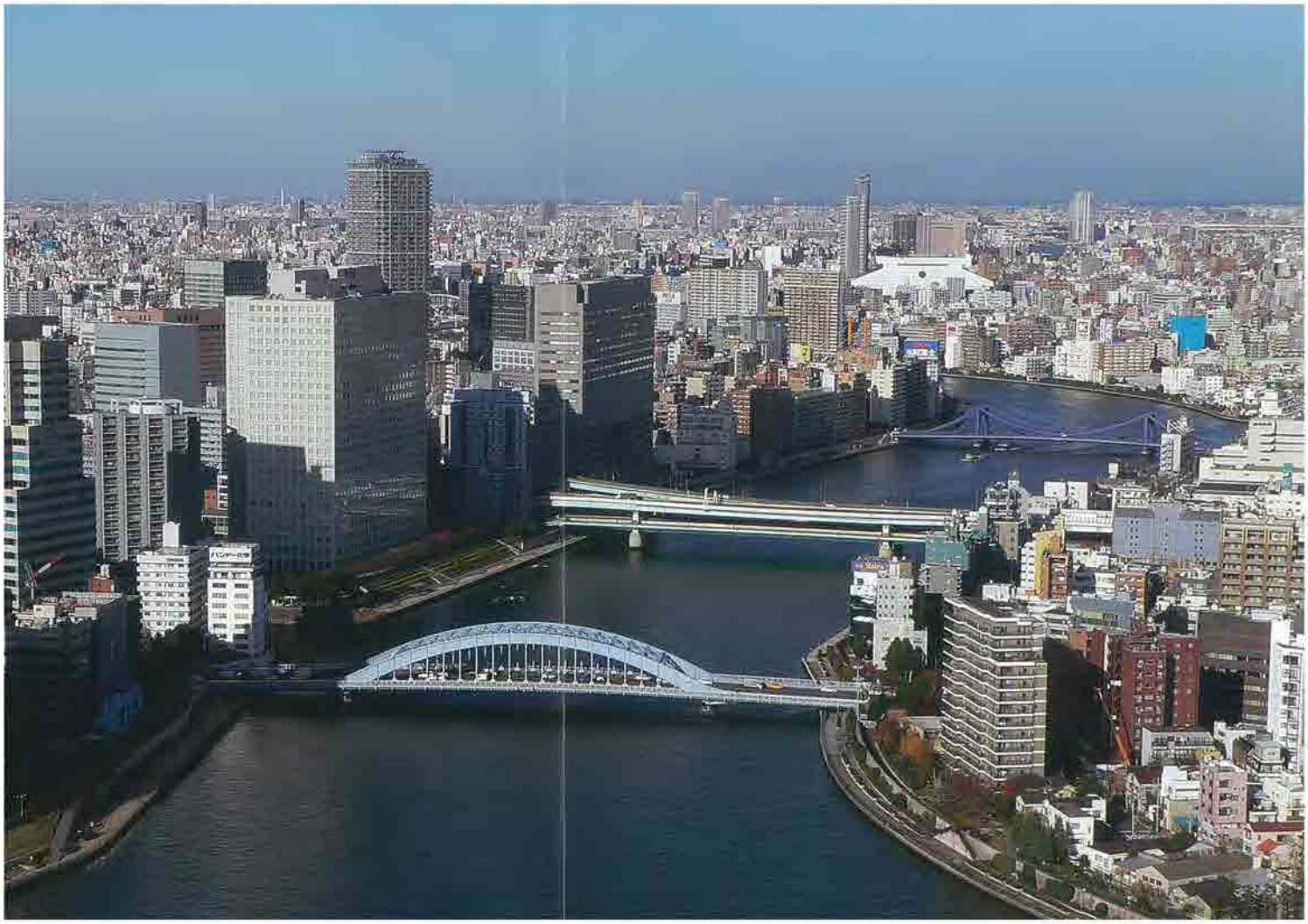
Sumida River

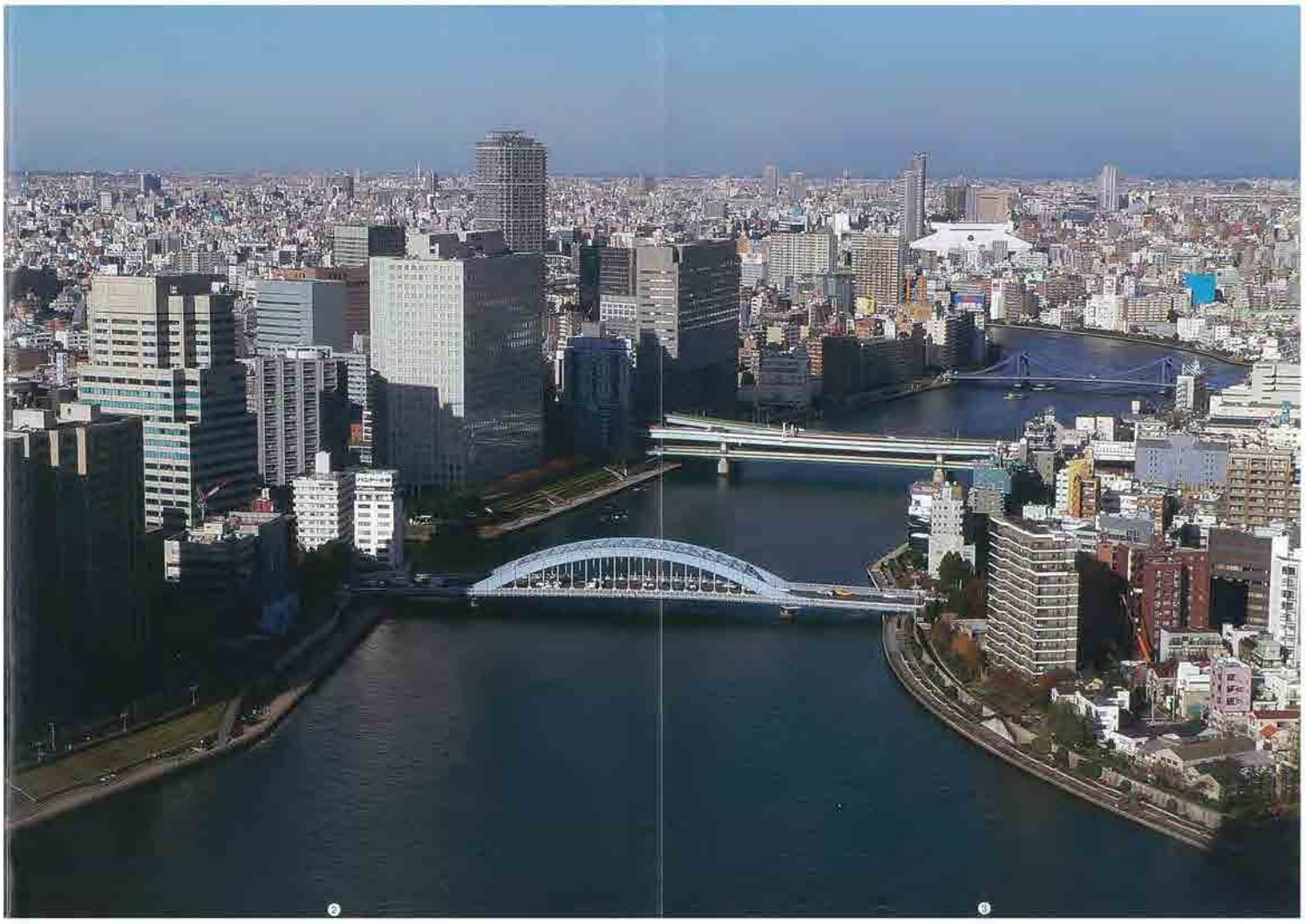
The Return of the Refreshing Riverside

For the public's understanding of super-levee improvement projects—

The water calls to the people,
The stream feeds the town,
The river is the mother.

Flowing from the sky, running down the hills and into the sea
What a blessing, what a bounty is the river!
For 5000 years, Egypt's history is woven together with the Nile
No civilization has ever prospered without a river
Since ages past, a river has flowed,
Through the fields of reed grass in the eastern Japan,
Time passed; it was called the Asakusa, and then the Ohkawa.
That river fed Edo, the largest city in the world, until
Today it reemerges, a new face on the great city of Tokyo.
The Sumida River,
No doubt, the mother river of Tokyo.






Shinjuku Night area


Sumida River Gate


Commencing the Upper Stream from Ohkawabata Area


Rainbow Bridge Illuminated at Night


Annual Grand Festival of Sumiyoshi Shrine


Firework festival


Sou-Kei Regatta (between Waseda and Keio Universities)

Taito-ku

Chuo-ku

Sumida River

Minato-ku

Sumida-ku


An audience of 5,000 at "Ninth Symphony" concert at Ryogoku National Sports Stadium (Kokugikan)


Ryogoku & Sumo

Koto-ku


Water-bus Sailing the Sumida River


Fukagawa Hachiman Festival

At 23.5km in length, the Sumida River flows through seven of Tokyo's wards: Kita-ku, Adachi-ku, Arakawa-ku, Taito-ku, Sumida-ku, Koto-ku, and Chuo-ku. The rich stream has been rooted in people's life and culture since long ago, like the mother of Tokyo.

Miyakodori! Alas, if the word is true,
I wish you to answer my question,
Is my beloved still alive in Miyako?

It is well known today that Ariwara no Narihira composed the poem included in Isehonogatari, a classic work, in the Heian Period (794-1185) when he crossed the Sumida River on a boat. The Noh song Sumida River also develops a story around the river.

The local culture along the Sumida River substantially emerged after Tokugawa Ieyasu began his government in Edo in 1590. The government began the urbanization of Edo, making a bridge called "Ryogokubashi," over the Sumida River, building embankments such as Nihon-zutsumi and Sumida-zutsumi along the river banks, and so on. In those days, the Sumida River was a place of leisure for ordinary people in Edo. In spring, they enjoyed the cherry blossoms. In summer, they cooled down there in the evenings. In autumn, they enjoyed viewing the moon in the evenings. In winter, they enjoyed the snow. In this way, people enjoyed the four seasons.
As a result, culture bloomed in the towns along the Sumida River, unique cultures and


Firework festival


Sou-Kei Regatta (between Waseda and Keio Universities)


Edo Boating dolls

埼玉県

Kita-ku

Taito-ku

Arakawa-ku

Adachi-ku


Dengakumai at Oji Shrine (Traditional Buddhist Dance)


Nomi-no-ichi

Sumida River

Sumida-ku


An audience of 5,000 at "Ninth Symphony" concert at Ryogoku National Sports Stadium (Kokugikan)


Cherry Blossom Festival at Sumida Park


Ryogoku & Sumo


Fukagawa Hachiman Festival

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As a result, culture bloomed in the towns along the Sumida River, unique cultures and

traditions that were made, developed, and loved by ordinary people. For example, when you talk about Kannon, then you're talking about Asakusa. When you talk about fireworks and sumo wrestling, the place is Ryogoku. And when you talk about festivals, it means the Sanja Festival or the Fukagawa Festival. Most of the Edo culture surviving today has its origin along the Sumida River. The river was, at different times, affectionately called the Asakusa River, Miyadogawa River, and Ohkawa River. Without the Sumida River, you cannot talk about today's Tokyo. And as long as the river flows in Tokyo, something new is always born.

As if cuddling up to the stream
Our life appears
The river is our life

There are temples. Markets are held
Portable shrines are paraded
Fireworks are shot off. Cherry blossoms flutter
Life in the downtown and the four seasons are reflected on the river surface
The Sumida River is where people come together
The river is living power. The river is living courage
The stream is our activity, our life itself
Today, along the riverside
Something new is born


Hokusai / Ohkawabashi
(from "Picture Book: Both Banks of the Sumida River")


Shower at Ohashi-Atake by Hiroshige
(from "100 Famous Views of Edo")


Around Mukojima Basil Fences

Sometimes, "Ohkawa River" mingles with people beautifully The river is the artist


Kyogoku Bridge by Hokusai
from "Picture Book: Both Banks of the Sumida River")

People coming and people going, people taking a rest
Through the four seasons,
a vast panorama of scenes takes form
The faces of the Sumida River,
through kaleidoscopic changes
Cannot help but move people's hearts
In every age, the stream tells the poem
The river is inspiration

The Sumida River, where Edo's popular culture flourished, has a close relation with a great Japanese artist known around the world. Katsushika Hokusai, a great Edo Period artist, vividly drew people coming and going over the river in his Picture Book: Both Banks of the Sumida River. Hokusai spent his whole life of 88 years living along the Sumida River. Ando Hiroshige, another great Edo-period artist comparable with Hokusai, also delighted in the beautiful scenes of the Sumida River. Hiroshige drew a variety of scenes of the Sumida River with a very impressive touch in his collection of works, 100 Famous Views of Edo, which had a great impact on van Gogh. Not only artists but also Tsuruya Nanboku, Santo Kyoden, and other literary figures as well as haiku poet Matsuo Basho loved and lived along the Sumida River. The stream enriched Japan's culture and formed a root of modern Tokyo and Japanese culture.


Around Mukojima (1918)


Ryogoku Fireworks by Hiroshige (from "48 Hilarious Views of Edo")


Around Chuo-Ohashi Bridge


Shinkawa-Hakozaki Area


Shinshige-Nishi Area

Now, carrying a new dream, The river flows toward the future. The river is a wonderland.


Asashi Area

The people must never forget the river.
The city must never be apart from the stream.
The waterfront is a joy, a shining world.
Adults and children both
Sing songs, dance, dream, and speak of their dreams
Our river has come back
Sumida River Renaissance——

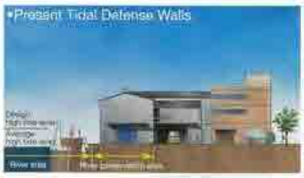

Odakeidosu Area

The Sumida River was loved by people through the Edo, Meiji, and Taisho Periods. However, the river had to change greatly with the times in the post-war era. As Tokyo grew during the period of high economic growth, water quality deteriorated. Concrete embankments built to protect riverside residents from the floods that were common in those days helped greatly with flood control—but at the same time, those embankments kept people further and further away from the river.

Today, time has passed, and society has become more stable. As people have begun to look for more comfort in life, they have begun to see the river as an valuable source. Reflecting the atmosphere of society, the Sou-Kei Regatta and the annual fireworks display in the Sumida River have been revived. The long-ago memories of the river have begun to come back to the people. The river has been called the life of the local community. People want to build a community where the Sumida River is accessible. The residents along the river want to transform the community into a water-rich environment. To this end, the Tokyo Metropolitan Government (TMG) is implementing a super-levee improvement project, building and improving the embankments and areas along the Sumida River to create a comfortable living environment.

Super-levee improvement projects are underway to restore the Sumida River into a refreshing waterfront area.

Structure of super levees and gentle-slope levees

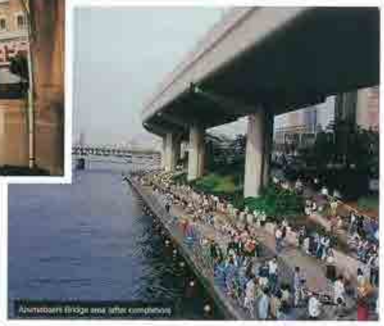



Okawabata area (after completion)


Okawabata area (before construction)

Since 1980, the Tokyo Metropolitan Government (TMG) has been implementing a project to revive the eastern part along with the Sumida River, creating a pleasant "waterfront city" making use of historical locations. To this end, starting in 1980, the conventional straight-walled concrete defense walls, or so-called "razor walls" on the Sumida River, have been gradually reworked into soil-filled, wide-surface, gentle-slope levees, greatly improving the waterfront environment. In 1985, the TMG furthermore started to acquire land for embankment more efficiently and to build super levees for greater flood control and earthquake-resistance. Improvements in these super levees have been integrated with urban area building redevelopment, park redevelopment, and improvement projects in the lowlands around the Sumida River. These projects have promoted more efficient use of the land. The TMG plans to turn conventional riverside defense walls into super levees as much as possible.


Azumabashi Bridge area (before the project)

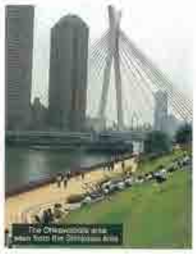

Azumabashi Bridge area (after completion)


Shinkawa-Hakozaki area (before the project)


Shinkawa-Hakozaki area (after completion)


Akashi area (before the project)


Akashi area (after completion)


The Okawabata area seen from the Shinkawa area

Building super levees now, so that flood and earthquake damage of the past are never repeated.

Past flood damage


Ojima area in Koto-ku flooded in Kanogawa Typhoon (September 1958)


Kinshi-cho in Sumida-ku flooded in Typhoon Kitty (August to September 1949)


Damage caused by Typhoon Kathleen (September 1947) Near Hirai Station on Sobu Line


Damage caused in the Great Kanto Earthquake (September 1923) Arakawa River (now called Sumida River) in front of Yasuda House, Yokoamicho, Honjo area (now called Yokoamicho, Sumida-ku)

In Tokyo's eastern lowland area, most of which is below sea level and where the population and property are extremely dense, flood damage was severe. Many people still vividly recall the past flood damage that typhoons and storms frequently brought. The Great Kanto Earthquake (1923) annihilated the urban areas in Tokyo.

The construction of the present tidal defense walls of the Sumida River began in 1957 and was completed in 1975, contributing greatly to flood control. The ongoing project that improves these defense walls into safer super levees is expected to mean greater control of damage from typhoons, storms, and large-scale earthquakes.

Record of major flood disasters

Year / Category	Aug. 1910	Sep. & Oct. 1917	Aug. & Sep. 1938	Sep. 1947	Sep. 1948	Aug. & Sep. 1949	Jul. 1958	Sep. 1958	Jun. 1966	Oct. 1979	Oct. 1981	Sep. 1982	Jul. & Aug. 1989	Sep. 1991	Aug. 1993	Aug. 1999	Sep. 2005
Disaster type	Storm (flood)	Storm (storm surge)	Storm (storm surge)	Typhoon Kathleen (flood)	Typhoon Ione (flood)	Typhoon Kitty (storm surge)	Typhoon No. 11 (storm surge)	Typhoon No. 22 Kanogawa Typhoon (flood)	Typhoon No. 4 (flood)	Typhoon No. 20	Typhoon No. 24 (flood)	Typhoon No. 18 (flood)	Local heavy rain (flood)	Typhoon No. 18 (flood)	Typhoon No. 11 (flood)	Local heavy rain (flood)	Local heavy rain (flood)
Barometric pressure (hPa)	993.3	952.7	978.8	992.5	971.3	985.9	986.4	974.7	981.9	[illegible]	966.6	963.0	—	980.2	979.1	—	—
Max. rainfall (mm per hour)	45.7	[illegible]	92.2	34.7	56.8	[illegible]	17.6	76.0	28.0	[illegible]	31.0	[illegible]	70.0	69.0	[illegible]	[illegible]	112.0
Total rainfall (mm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wind direction and max. velocity (m/s)	NW9.0	SSE[illegible]	S21.0	N15.0	SSW[illegible]	[illegible]	S22.4	NNW[illegible]	N15.5	S17.3	NNW14.4	S16.1	—	S19.6	NNW22.2	—	—
Tidal level (A.P. m)	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]	—	—
Area submerged (km²)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Houses flooded above floor level (houses)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Houses flooded below floor level (houses)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Casualties (people)	169	1,324	38	[illegible]	[illegible]	122	[illegible]	[illegible]	0	[illegible]	1	0	0	1	0	0	—

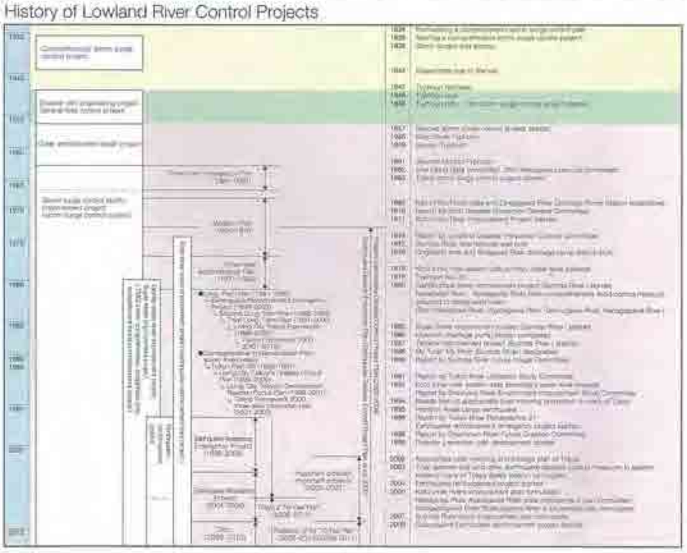
History of Sumida River Embankments

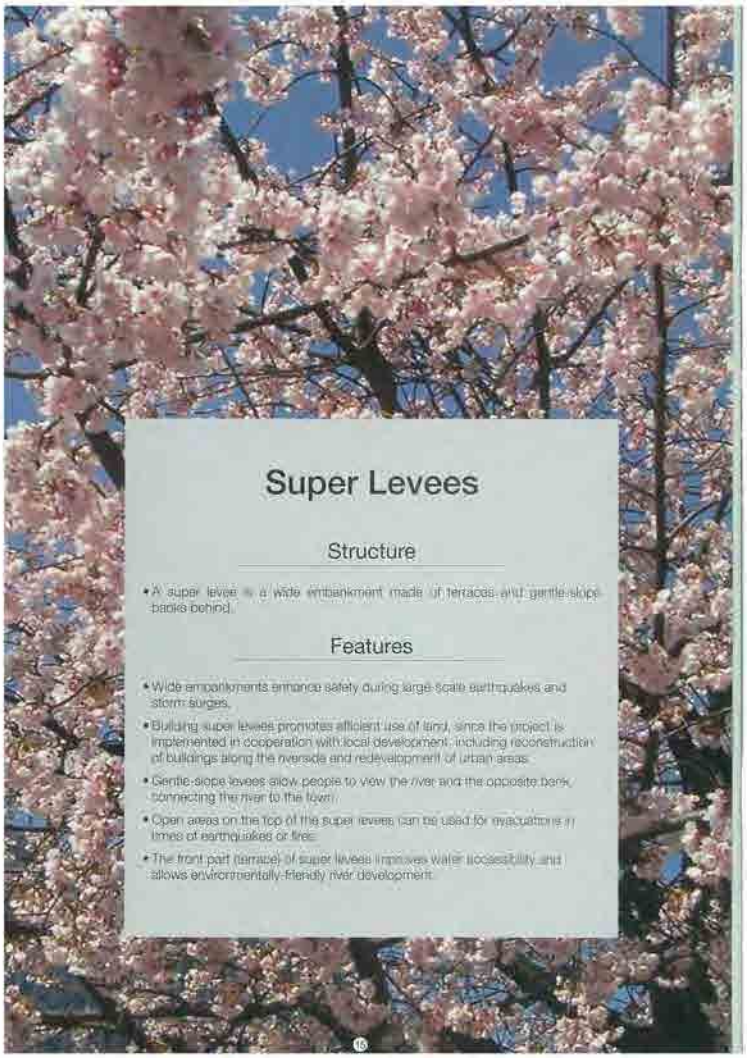

Around Mukojima (beginning of Meiji Period)


Present tidal defense wall


Around Mukojima (beginning of Taisho Period)

History of Lowland River Control Projects





Super Levees

Structure

- A super levee is a wide embankment made of terraces and gentle slope banks behind.

Features

- Wide embankments enhance safety during large-scale earthquakes and storm surges.
- Building super levees promotes efficient use of land, since the project is implemented in cooperation with local development, including reconstruction of buildings along the riverside and redevelopment of urban areas.
- Gentle-slope levees allow people to view the river and the opposite bank, connecting the river to the town.
- Open areas on the top of the super levees can be used for evacuations in times of earthquakes or fires.
- The front part (terrace) of super levees improves water accessibility and allows environmentally-friendly river development.

Home and the Sumida River Everlasting life flows from the stream ...

Like the Seine in Paris and the Potomac in Washington, many cities around the world have a beautiful river which people love and are proud of. The Sumida River was once pristine, with much interaction with people. Today, it is our responsibility to keep the river beautiful, and to pass it on to our future and our children. We want to transform the Sumida River into a water-rich, green river that we can be proud of around the world. As citizens of Tokyo, we want to revive the river as our home, and the origin of our life.

With these hopes in mind, the Tokyo Metropolitan Government is implementing the super levee project. We hope that this pamphlet will increase the public's understanding of this project's purpose, and encourage support from the people living along the Sumida River.

Map of areas where a super-levee construction projects are underway

○スーパー堤防整備事業対象河川

荒川水系　隅田川
利根川水系　中川
旧江戸川
新中川
綾瀬川

※概成地区とは計画延長に対して80%以上完成している地区

River Division, Bureau of Construction,
Tokyo Metropolitan Government

• For Information:
Contact the Planning Section, River Division, Bureau of Construction (22nd floor, 2nd Office Building), Tokyo Metropolitan Government
Tel: 5321-1111 (extension: 41-465)
Nishi-Shinjuku 2-8-1, Shinjuku-ku, Tokyo 163-8001

Bureau of Construction website: http://www.kensetsu.metro.tokyo.jp/

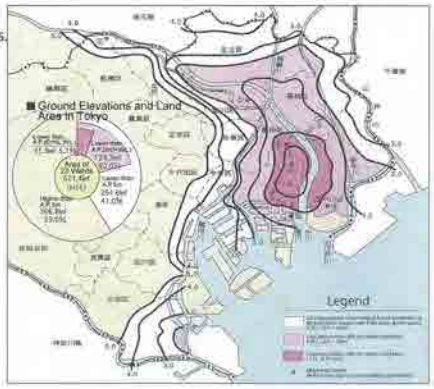
平成22年度登録第70号

Koto Flood Control Office of Tokyo Metropolitan Government Flood Gate Management Center

Protecting citizens of Tokyo from storm surges and tsunamis
24 hours a day, 365 days a year

What are Eastern Lowlands Areas?

The eastern lowlands such as Wards of Koto, Sumida, Katsushika, Arakawa and Ota are made of thick, soft sediment, called alluvial deposits, major rivers such as the Arakawa River and the Sumida river, as well as their tributaries and branches, run in all directions in the lowlands. For this reason, these Areas have often suffered from floods and storm surges. Furthermore, since the Meiji Period, industrial development has resulted in extensive groundwater abstraction, leading to ground subsidence. As a result, the lowlands have become extremely vulnerable to natural disasters such as storm surges, floods, and large-scale earthquakes.
Currently, about 3 million resistant live in this Area.



You can get information by e-mail about river water levels, watches and warnings

Total Flood Control Information System

information on rainfall and river water levels observed by Tokyo Metropolitan Government, watches and warnings are provided in real time

Flood Gates 'Opening/closing information' by Koto Flood Control Office

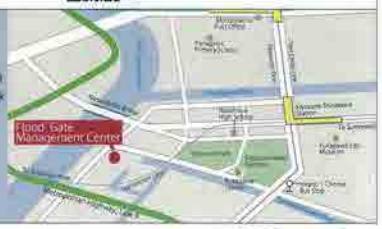
This service is distributing to mobile phones, etc. by e-mail the opening/closing information on 13 sluice gates administered by the Office, during emergencies, such as typhoons, storm surges and earthquakes as well as during periodic training.

* You need to register your e-mail address with 'Mogumogu', an e-mail magazine
* Information is free of charge and communication fee at your own expense

Koto Flood Control Office, Flood Gate Management Center

- Transportation
  Toei Oedo Line, Tokyo Metro Hanzomon Line Get off at Kiyosumi Shirakawa Station,10-minute walk
- Location
  1-2-37, Kiyosumi, Koto Ward
- For Inquiries
  Flood Gate Management Section

TEL.03-5620-2493



平成23年度 登録第2号

Role of Flood Gate Management Center

In order to protect lowland area of Tokyo from flood damage, Tokyo Metropolitan Government has built tidal defense walls in sea area and the Sumida River, which would withstand even Ise wan Typhoon class storm surges. Furthermore, flood gates have been set up at the entrances of tributaries/branch rivers in the inner lowlands. In case of storm surges or tsunamis, the sluice gates are closed, protecting the area in unison with the tidal defense walls.
Preparing for a rise of the water levels of rivers in the inner lowlands caused by rainfall while such flood gates are closed, drainage pump stations have been set up. When the water levels of the inner rivers rise, pumps at the stations are operated to drain water into the outside.

Around the clock, Flood Gate Management Center remotely monitors and controls 10 flood gates and 1 sluiceway under direct control, and remotely monitors 5 drainage pump stations under direct control/contract to wards and 3 sluice gates and 1 sluiceway under contract to wards.

■ Usage at each floor

5th floor (Meeting room)
4th floor (Office)
3rd floor (Monitoring room)
2nd floor (Electric room/Transmission facilities room/Private power generation facilities)
1st floor (Warehouse/water reception facility)

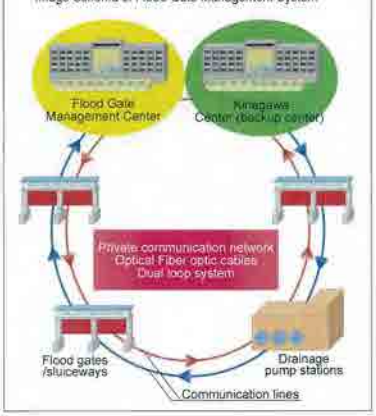
Outline of Flood Gate Management System

The entire monitoring and control facilities for the purpose of centralized monitoring of the sluice gates and drainage pump stations are called 'Flood Gate Management System'. After more than 20 years since the introduction of the former flood management system whose deterioration had progressed, facilities utilizing ICT (Information and Communication Technology) were introduced.

Characteristics

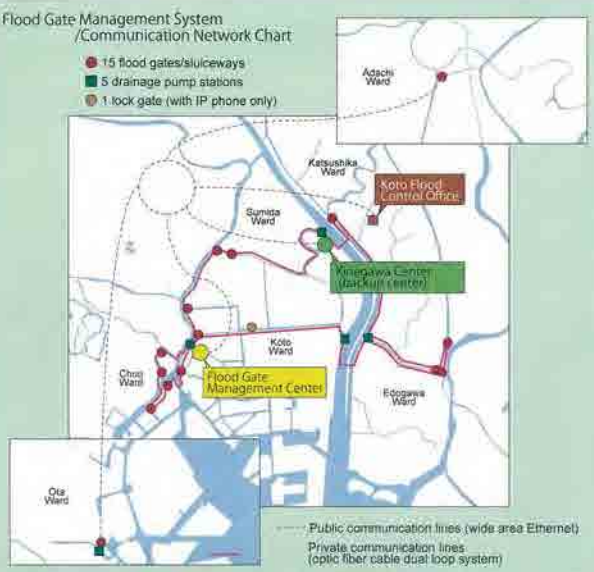
- Unified remote monitoring and control at Flood Gate Management Center realizes prompt operations.
- High reliability is realized by establishing Kinegawa Center (backup center) and installing dual loop optical fiber optic cables. In addition, the flood gates can be closed through wireless communications.
- Centralized monitoring and control realizes efficient management.

Image Schema of Flood Gate Management System



■ Flood Gate Management System /Communication Network Chart

- 15 flood gates/sluiceways
- 5 drainage pump stations
- 1 lock gate (with IP phone only)



Public communication lines (wide area Ethernet)
Private communication lines (optic fiber cable dual loop system)

① Second Manuscript of Narration 20110520.

①

'Flood gates/drainage pump stations protecting lowlands of Tokyo''

1 Eastern Lowland Areas of Tokyo Metropolis

Geographic map of Tokyo Metropolis

②

The geography of Tokyo runs from east to west, and can be roughly divided into three parts: the mountains area in the west, the low-relief plateau in central Tokyo, and the alluvial deposit in the eastern lowlands.

Ground level plan of the Lowland Areas
The location of the lowlands

③

Among them, the lowlands of Koto Ward, Sumida Ward, Edogawa Ward, Katsushika Ward, Arakawa Ward, and Ota Ward are called Eastern Lowlands Areas, where big rivers, such as the Arakawa River and the Sumida River as well as their tributaries and brunches, run in all directions in the lowlands.

Photos of water damage (2 photos or so from among 0301-0103/0303-0105/0303-0106/0304-0104 etc from Koto Inner Rivers Improvement Status a)

④

For this reason, these Area have often suffered from floods and storm surges. Furthermore, Meiji Period, industrial development has resulted in extensive groundwater abstraction, leading to ground subsidence. As a result, the lowlands have become extremely vulnerable to natural disasters such as storm surges, floods, and large-scale earthquakes.

round level plan of the Lowland Areas
Red-colored area

⑤

This red-colored area shows an area below the low water level of Tokyo Bay, which corresponds to 5% of the area of Tokyo's 23 Wards.

round level plan of the Lowland Areas
Red-colored area

⑥

The pink-colored area indicates an area below the high-tide level of Tokyo Bay, corresponding to 20% of the area of the 23 Wards. 1.45milllion residents live in this area

round level plan of the Lowland Areas
Light pink-colored area

⑦

The light pink-colored area is an area which will become submerged if Ise wan Typhoon class high waves strike. The area corresponds to 41% of the 23 Wards area where 3million residents.

Map of Storm Surge Defense Facilities Improvement Project
T:Tidal rivers

⑧

In order to protect lowland area of Tokyo from flood damage, tidal defense wall have been built to withstand Isewan Typhoon class high waves in coastal areas and tidal rivers affected by the ebb and flow of the tide, such as the Arakawa River and the Sumida River.

al Flood Gate, Shin-Onagigawa River Flood Gate e

⑨

In case of storm surge or tsunami occurrence, the Flood gates facing tidal water surface are closed, protecting the lowlands in unison with the tidal defense walls.

2 Origin of Koto Delta Area

Aerial view of Koto Triangle area

⑩

Among Eastern Lowland Areas, the area surrounded by the Sumida River and the Arakawa River is called Koto Triangle area, which has been considered especially vulnerable to flood damage.

Assumed topography in the Muromachi

⑪

In those days, Eastern Lowland Areas used to be wetlands corresponding to the estuaries of the Tone River , the Arakawa River and the like.

Major construction works in the early Edo Period (Fig. 3/ Ditto), Distribution of land reclaimed and waterway networks in the Edo Period (Fig. 4/Ditto) are to be used as reference, with gradual changes..

⑫

Since around the time when Ieyasu Tokugawa entered Edo, a project was launched to divert the Tone River and the Arakawa River, and the former estuaries and sandbars were reclaimed to be made into residential areas and new rice paddy fields.

After that, Onagigawa River or many other rivers, which remain even now, were made in order to transport goods into Edo.

These rivers had been used as the leading players in goods transport until a railway system appeared in the

Rivers in the east region (1897)

⑬

In the Meiji Period, utilizing the water transport, factories operated and managed by the government were built in this area, which developed as the center of modern industries.

As a result, the need for preventing repeated water damage was growing. Triggered by great floods in 1907 and 1910, Arakawa Floodway was newly constructed starting from Iwabuchi, Kita Ward.

The present
Koto Triangle area

⑭

This is the present-day Arakawa River. The construction was completed in 1930, when Koto Triangle area surrounded by the Sumida River and the Arakawa River came into being.

3. Ground subsidence and water damage in Koto Triangle area

Factories along the Rivers (2 photos or so from among 0301/0401/0501/1001 from Koto Inner Rivers: Past and Present (1) a)

⑮

In Koto Triangle area, as a lot of factories were built and underground water abstracted as industrial water after the Meiji Period, ground subsidence rapidly progressed.

Graph of accumulative fluctuations in ground subsidence

⑯

During the 30s of the Showa Period the Tokyo Metropolitan Government started to regulate extensive groundwater abstraction, further enhanced the regulation in the 40s of Showa and regulated extraction of water-dissolve natural gas. Consequently, the ground finally stopped subsiding in Showa 50s.

Well as evidence of the subsiding ground
T: Old well (1, Higashi-Shinkoiwa, Katsushika Ward)
T: Its top line of the well shows the ground height in 1938

⑰

However, in areas which experienced the severest ground subsiding during the period, the ground had subsided more than 4m, over 1m lower than the low water level of Tokyo Bay.

e.g. Arakawa Water Level Indicator in front of Edogawa Ward Office

⑱

As a result, Katsushika Ward, Edogawa Ward and Koto Triangle area had become vulnerable to storm surges and rise of the water levels of rivers and frequently suffered major flood damage.

4. Flood control measures

Higher revetments

⑲

11 internal rivers run through Koto Triangle area. These rivers had become dangerously vulnerable to large earthquakes, due to their repeated heightening to offset ground subsidence..

Therefore, since 1971, the Tokyo Metropolitan Government has undertaken flood control measures with superior quake resistance.

Map of Koto inner rivers (from ppt)

⑳

The Koto Triangle area has been roughly divided into two parts, the western lowlands with relatively higher ground and the eastern lowlands with especially lower ground.

Emphasize the inner rivers on the western lowlands

21

The Rivers in the western lowlands have been improved with the earthquake reinforcement-embankment method.

Emphasize the inner rivers on the eastern lowlands

22

The Old Nakagawa River, the Onagigawa River, the Kitajukken River and the Yokojukken River, those four Rivers flowing on the eastern side with lower ground height were decided to be improved with the water level-lowering measure by which the water level would be constantly kept lower than the ground height.

The inner rivers on the western side and Flood gates
T: Genmori River Flood Gate
T: Oshima River Flood Gate and Oshima River West Branch
T:Tatekawa Flood Gate

23

Directly connected with the Sumida River, the rivers in the western lowland are heavy with ship traffic and the flood gates are open at all times. For this reason, those rivers are affected by the ebb and flow of the tide

Improvement status of Oshima River West Branch

24

So, in fromt of conventional revetments, reinforced revetments which would withstand large scale quakes were constructed for the inner rivers in the western lowlands. In case of emergency, the flood gates facing the Sumida River will be closed so as to prevent flood damage in unison with the quake-resistant revetments.

The inner rivers on the eastern lowlands

25

Partly because the inner rivers on the eastern lowlands are light with ship traffic and also because the ground height is especially low in the area, water of the Sumida River is shut out to prevent its inflow at two locations, Kitajukken River Floodway and Ogibashi Lock Gate

Emphasize two drainage pump stations

26

At the Old Nakagawa River bordering the Arakawa River, Kinegawa Drainage Pump Station and Onagigawa Drainage Pump Station are set up, also separating the Old Nakagawa River from the Arakawa River.

Water level indication at Ogibashi Lock Gate
「: The low water level of spring tide of Tokyo Bay

27

In this way, the inner rivers on the eastern lowlands are closed at those four locations and the drainage pump stations further drain water, so that the water level of the rivers are kept 1m lower than the low water level of low tide of Tokyo Bay.
This is the water level-lowering measure.

Kitajukken River Floodway

28

Because the inner rivers on the eastern side are closed as such, Kitajukken River Floodway and Ogibashi Lock Gate take in water from the Sumida River to keep water quality.

Water intake pipe of Ogibashi Lock Gate
Kinegawa Drainage Pump Station

29

A Floodway refers to a Flood gate having a culvert chute that operates by allowing water, not ships to run under it.

Water of the Sumida River which Kitajukken River Floodway and Ogibashi Lock Gate have taken in are constantly drained by Kinegawa Drainage Pump Station into the Arakawa River, purifying the inner rivers on the eastern side.

5. Drainage Pump Station

Kinegawa Drainage Pump Station

30

A drainage pump station is a facility to prevent water damage; when heavy rain has elevated the water level of an inner river, such water will be drawn up with drainage pumps to be drained into Tokyo Bay, the Sumida River and the Arakawa River.

Kinegawa Drainage Pump Station, equipped with two electric pumps and three engine pumps, is capable of draining a total of 51 tons per second.

Electric pump

31

An electric pump, draining water of the inner rivers on the eastern side into the Arakawa River around the clock, plays the role of maintaining purified water quality and low water level

Engine pump

32

During typhoons and downpours, rainwater is drained from sewage pump stations into the inner rivers on the eastern side.
The role of the engine pumps is to drain this rainwater into the Arakawa River.

Onagigawa Drainage Pump Station

33

Onagigawa Drainage Pump Station, capable of draining 72 tons per second with 4 pumps, operates when rainwater whose volume exceeds the drainage capacity of Kinegawa Drainage Pump Station flows into the rivers.

Kiyosumi Drainage Pump Station

34

When the flood gates along with the Sumida River are closed to prevent high waves from typhoons or others, the inner rivers on the western side also becomes a closed water area.
When rain falls into this area, pumps on Kiyosumi Drainage Pump Station are activated to drain rainwater flowing in the inner rivers on the western lowlands into the Sumida River

6. Ogibashi Lock Gate

Ogibashi Lock Gate

35

Ogibashi Lock Gate was set up a little to the western side from the middle of Onagigawa River, in order to ensure the smooth navigation in-between rivers with different water levels in the eastern and western lowlands

Front gate

36

The area beyond the closed gate is Onagigawa River leading to the Sumida River and the one in front is Onagigawa River whose water level is kept low.

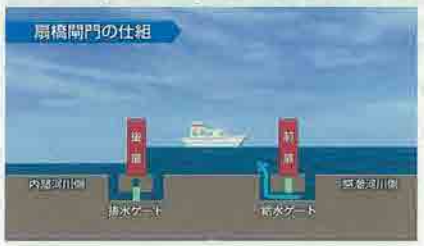
Water level difference

37

The water level difference can be as high as 3m or so at high water of Tokyo Bay

A ship entering the lock chamber
System of Ogibashi Lock Gate

38



A ship is let in a pool called lock chamber, which is 110 meters in full length and 11 meters in width. Then, the front and rear gates get closed and the water level inside the chamber is adjusted to the same level of the river in the direction of travel

A ship passing through the gate

39

After that, the lock gate in a forward direction gets opened to let the ship pass it through. Even on a small scale, the facilities are similar to those at the Panama Canal

Facilities managed by Koto Flood Control Offi

Kami-Hirai Flood Gate, Hanahata Flood Gate and Uchikawa Flood Gate

40

41

42

Besides Koto inner rivers, Koto Flood Control Office manages four Flood gates, such as Kami-Hirai Flood Gate in Katsushika Ward, Nihonbashi Flood Gate in Chuo Ward, Hanahata Flood Gate in AdachiWard and Uchikawa Flood Gate in Ota Ward.

Imai Flood Gate, Shinkawa-Higashi Flood Gate and Shinkawa Drainage Pump

43

44

45

Furthermore, the Office set up one Flood gate, one Floodway and one drainage pump station, such as Imai Flood Gate and Shinkawa's Shinkawa-Higashi Flood Gate in EdogawaWard in order to maintain water level 50cm lower than low water in Tokyo Bay, a similar control to the one for the Koto Triangle area's inner rivers on the eastern lowlands.

Layout of management facilities

46

he facilities managed by Koto Flood Control Office are: 13 Flood gates, 2 Floodways, 1 lock gate and 5 drainage pump stations, 21 facilities in total. Among them, facilities set up at rivers whose flows are complete within one ward are, in principle, contracted for their daily management to each relevant ward.

8. Flood Gate Management Center

Flood Gate Management Center

47

Flood Gate Management Center has introduced Flood Gate Management System as a tool for monitoring and controlling flood gates or others. Facilities monitored by this System are 20, excluding Ogibashi Lock Gate. Among them, facilities which the Center also controls are 10 flood gates and 1 floodway, excluding the facilities and drainage pump stations whose daily management is contracted to the wards.

Surveillance monitors

48

These facilities, connected to Flood Gate Management Center through optical fiber cables with dual loop installation, monitor the sites and operate the flood gates at respective facilities 24 hours a day, 365 days a year.

ıegawa Drainage Pump Station: Kinegawa Cer

49

In addition, the Center itself has a backup facility. Kinegawa Center with similar functions was established at Kinegawa Drainage Pump Station. When the system at Flood Gate Management Center is out of order, Kinegawa Center functions as its backup center.

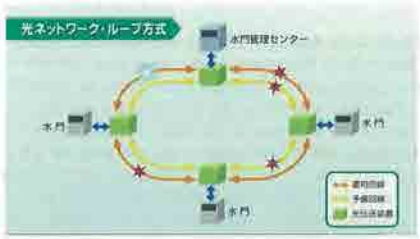
Network monitoring device

50

The optical network connecting between Flood Gate Management Center and each facility automatically switches to another route in case of any defect in line currently in use, so that data transmission capability may be secured.

Optical network loop system

51



In Flood Management System, such route switching is immediately conducted, so monitored images will not be interrupted. The Flood gates can be closed safely.

Wireless self weight descending device

52

Moreover, if communications through the Optical fiber network should become unavailable, all the flood gates can be closed via wireless operation. In the event that wireless solution is also unavailable, the Center staffs will rush to the site to close the sluice\flood gates.

Occurrence of the Great East Japan Earthquake on March 11. 2011

53

Responding to the Great East Japan Earthquake which occurred on March 11, 2011, all the flood gates were closed in order to prepare for tsunamis right after the quake occurrence.

Data on tsunamis

54

At that time, the Center observed tsunamis of up to 1.4 meters, which surpassed the expected height for the Great Tokai Earthquake, but no damage was incurred.

9. Epilogue

ıe Sumida River and Shin-Onagigawa flood Ga

55

Scene from Kami-Hirai flood Gate

Even with low ground height, no water damage will occur, unless water overflows from rivers.

56

flood Management Center, Ogibashi Lock Gate operation scene and Kinegawa

Even with low ground height, no water damage will occur, unless water overflows from rivers.

57

End credit

Koto Flood Control Office, in order to protect Eastern Lowland Areas of Tokyo, performs periodic operations and inspections at each facility for keeping their functions in perfect conditions and prepares for water damage around the clock, every day of the year.

58

Koto Flood Control Office of Tokyo Metropolitan Government

Japan's Earth Observation Satellites Applications for Thailand

December 2012

Dr. Shinichi Sobue
Planning Manager, EORC
Japan Aerospace Exploration Agency (JAXA)

J A X A P R O J E C T S

Contribution to the Earth Environment and Society

Greenhouse Gases Observing Satellite "IBUKI"

Land / Sea Observing Satellite "DAICHI"

Water Circulation Change Observing Satellite "GCOM-W"

Exploration of the Unknown

Asteroid Probe "HAYABUSA"

Venus Climate Orbiter "AKATSUKI"

Development of Launch Vehicles

H-IIB Launch Vehicle

JAXA

Aero-technology Research

Next Generation Supersonic Transport

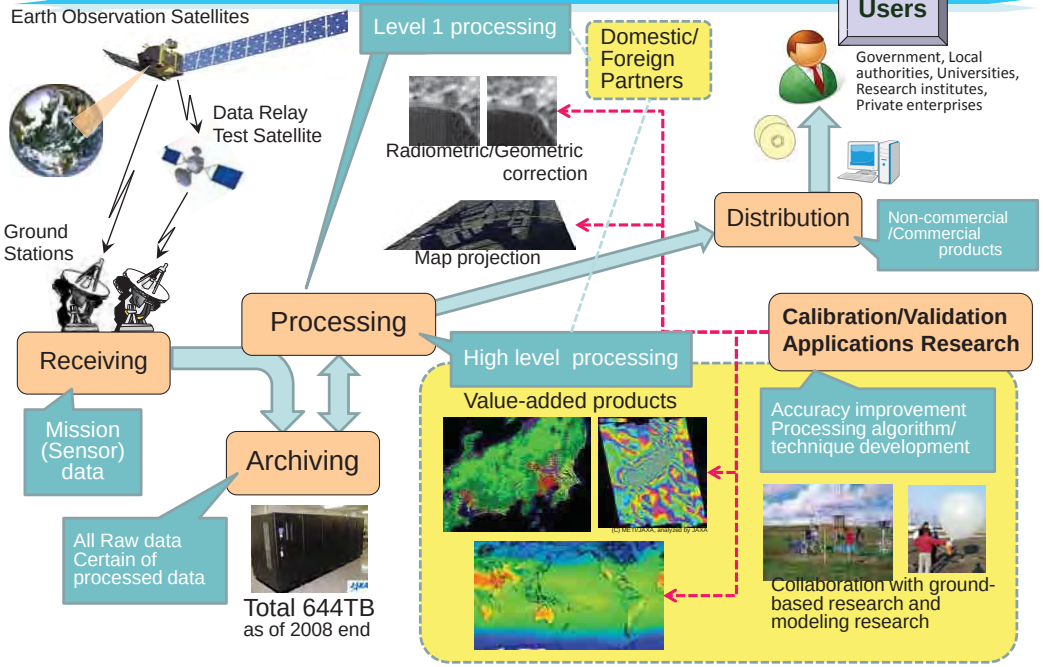
Expansion of Human Frontiers

Japanese Astronauts

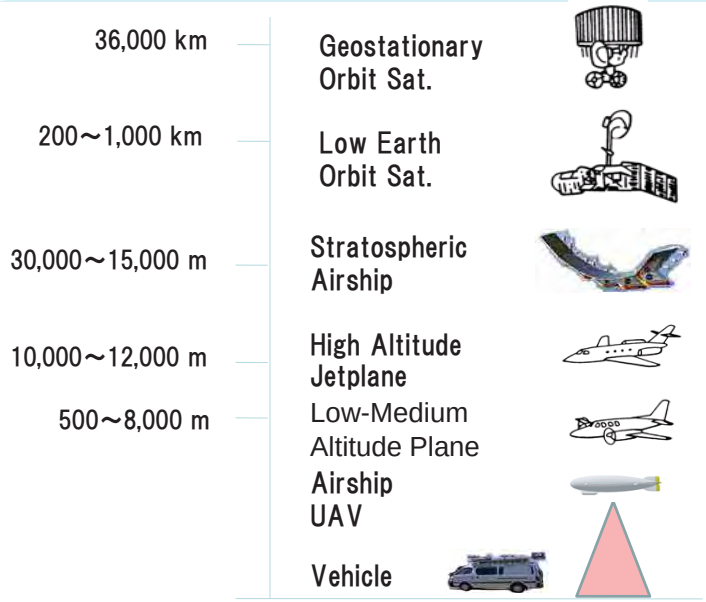
International Space Station (ISS)

JEM "KIBO" & Supply Cargo to ISS "HTV"

Activities of EORC

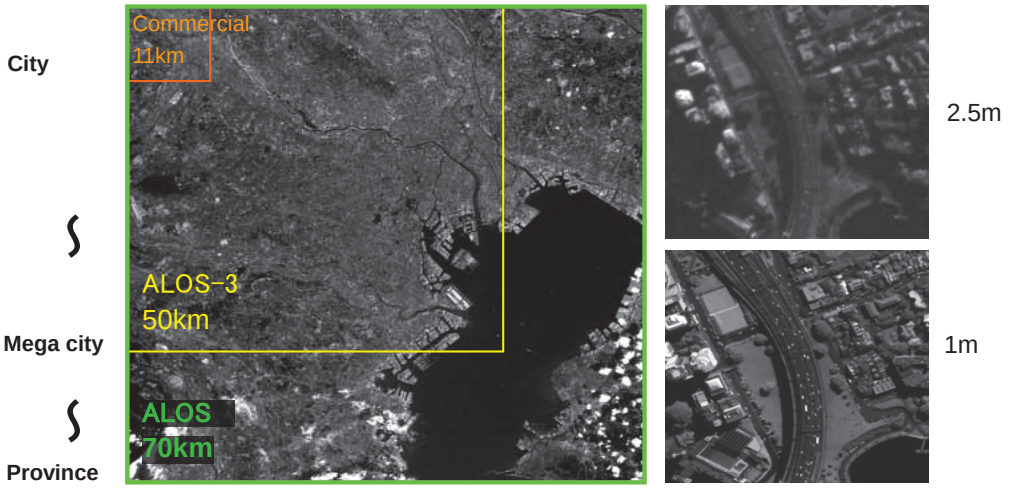


Altitude of EO Platforms



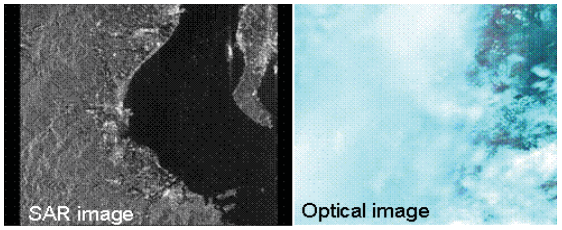
Comparison of Satellite Images

- Aerial Photograph: swathwidth 1~2km, spatial resolution 30cm
- US Commercial Satellite Ikonos: swathwidth 11km, spatial resolution 1m
- ALOS: swathwidth 70km, spatial resolution 2.5m (PAN), 10m (MS)
- ALOS has capability of wide field of view, high resolution mapping in 1/25,000



SAR observation for rainy / cloudy condition

■ SAR satellites provide earth surface information in all weather conditions, even in the rainy season in Thailand.



- A clear land surface image is obtained with SAR satellite observation under cloudy weather.

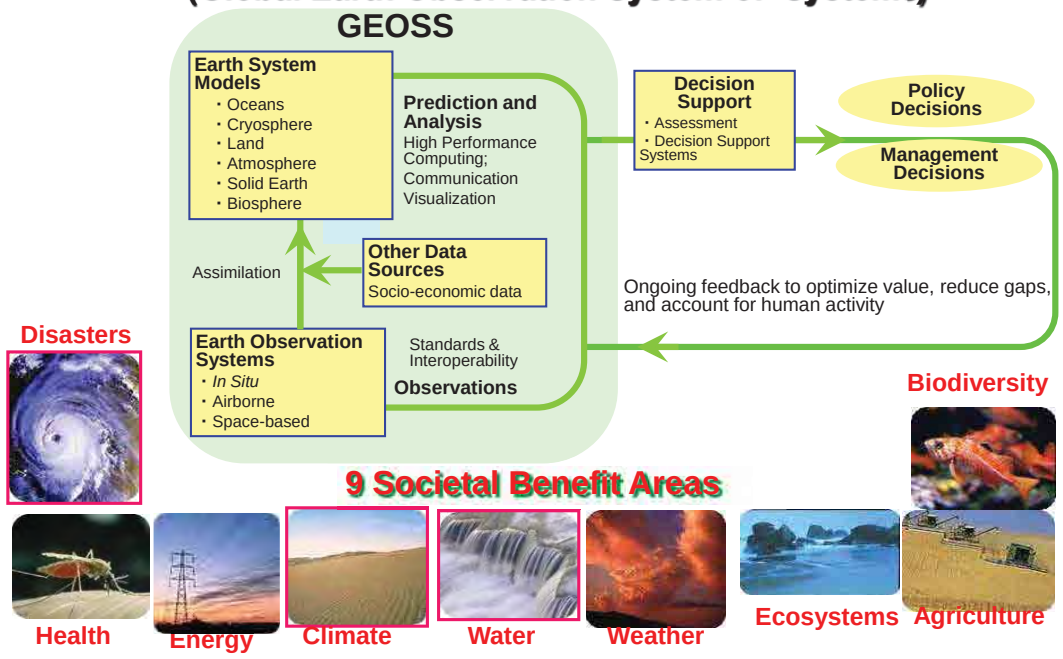
■ SAR satellites will make a remarkable contribution to address social and economic needs in Thailand,

especially in fields of:

- Rice crop monitoring,
- Disaster monitoring, including floods, earthquake, and tsunami,
- Costal monitoring.

GEOSS

(Global Earth Observation System of Systems)



History of Space Cooperation between Thailand and Japan

◆ Thailand and Japan has been cooperating in Space Development and Space Applications very closely and successfully for more than 25 years.

- The Agreement between the National Space Development Agency of Japan and the Geo-Informatics and Space Technology Development Agency of Thailand Concerning the Cooperation in the Field of Earth Observation and Satellite Application (Mar. 2001 -)
- Arrangement between Japan Aerospace Exploration Agency and Geo-Informatics and Space Technology Development Agency Concerning the Utilization of ALOS Archived Data for Scientific and Research Purposes (Oct. 2011 -)
- Implementation Plan Between Japan Aerospace Exploration Agency and Geo-Informatics and Space technology Development Agency concerning Personnel Exchange for the STAR Program (Feb. 2009 -)
- Memorandum of Agreement between the Japan Aerospace Exploration Agency and the Geo-Informatics and Space Technology Development Agency on the Utilization on WINDS User Terminal for WINDS Experimentand Reference Carrier Operation (Dec. 2011 -)

MOS-1 Receiving Station at Lad Krabang (1986-)

HRH Princess Sirindhorn's visit to Earth Observation Center (EOC) of NASDA (at present JAXA) (1993). Grow up of the dogwood "Hanamizuki" tree HRH Princess planted

Common issues solved by satellite applications

Thailand and Japan have common issues which can be solved by satellite applications.

(1) Rice crop monitoring
(2) Flood prediction
(3) Coastal monitoring
(4) Subsidence
(5) Disaster Monitoring

GISTDA and JAXA have been jointly working to solve common issues by satellite applications through holding GISTDA-JAXA workshops with Thai stakeholders including RID, OAE, etc.

Monitoring Crop Yield

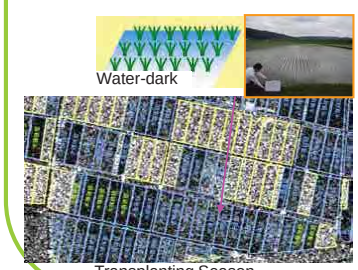
Combination of Satellite imageries of SAR, etc. enables country-wide estimation/forecast of Crop Yield

Rice Crop

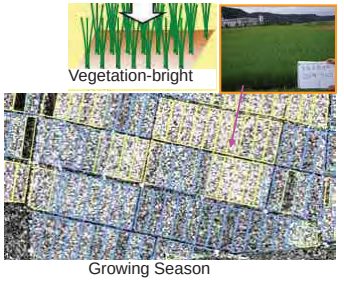
-Identifying the cultivated area size and estimating the rice crop yield.

-Operating "The Thai Rice Crop Yield System" using SAR and GIS data.

Irrigated paddy field with SAR



Transplanting Season



Growing Season

Paddy Field Classification Result

Rice crop monitoring

Rice crop growing stage classification using SAR

❖ Each Sample Area was classified into crop growth stages based on the visual interpretation of photos.

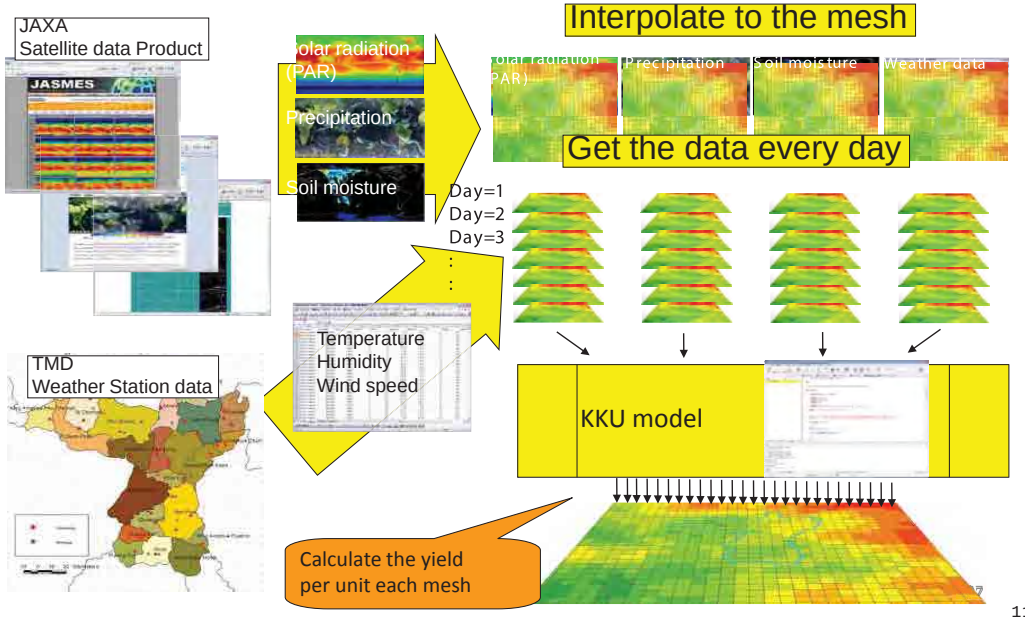
Planting

Vegetated

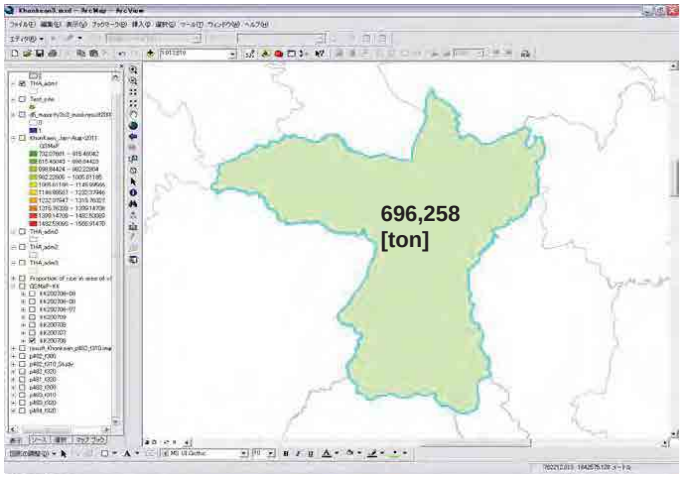
Harvesting

New airborne L-band SAR (Pi-SAR-L2) detected rice crop growing stage with polarmetric obsevation . Pi-SAR-L2 has three meter spatial resolution. ALOS-2 will install a L-band SAR with same resolution as Pi-SAR-L2 and much wider swath than Pi-SAR-L2.

Yield per unit information estimation with model



Procedure of rice crop yield estimation by acreage and yield per unit



Acreage

*

Yield per unit

Yield

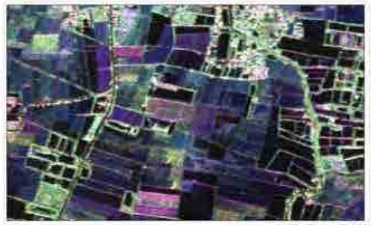
Flood damage assessment

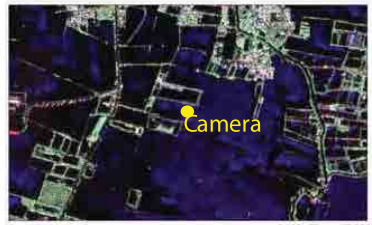
Suphanburi observation by Pi-SAR-L during 2011 Thai flood with 3m resolution

27 September 2011

8 November 2011

Pi-SAR-L
HH:HV:VV = R:G:B

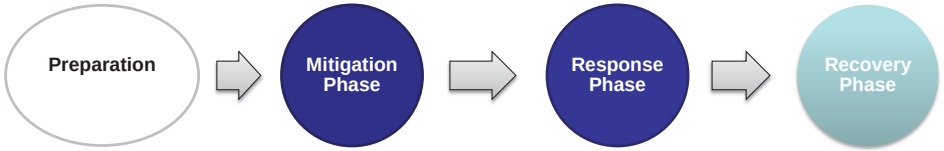




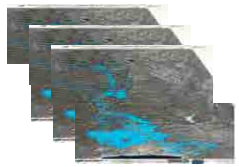
Field Router
(automatic data collection system)

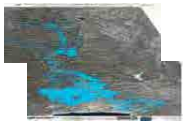
[Courtesy Prof. Mizoguchi, U.Tokyo]

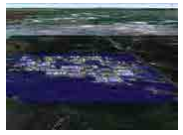
Space Technology in Flood Management

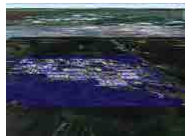


Risk Assessment	Urban and Regional Planning	Flood Area Detection Flood Forecast Evacuation	Reconstruction Compensation
• Historical inundated area database • Topographic data • Rain and weather information • River GIS		• Flood area detection • Water volume estimation	• Damaged area • Water-level decrease





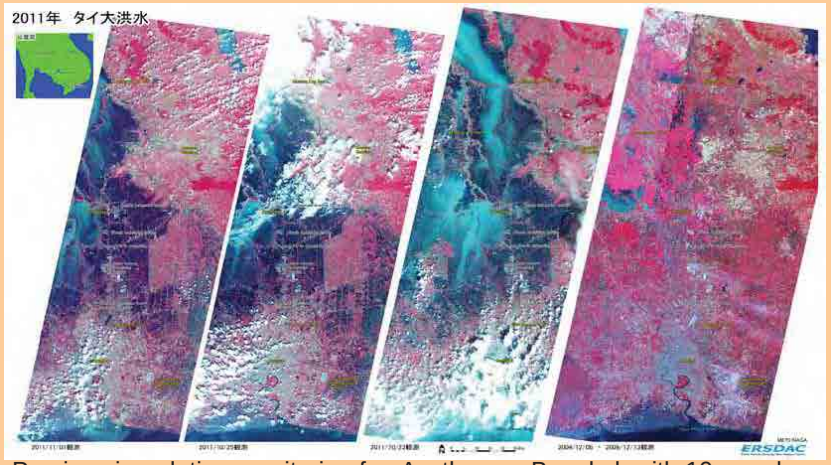




How should flooding be monitored?

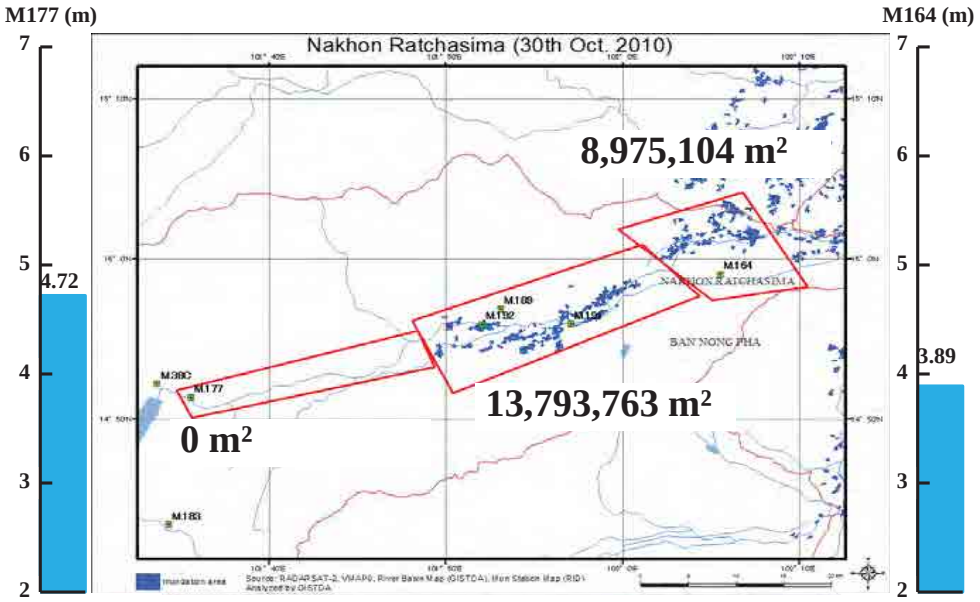
- Combination of optical and radar sensors helps - (ASTER, SAR and Pi-SAR-L)

ASTER/TERRA by METI/ERSDAC

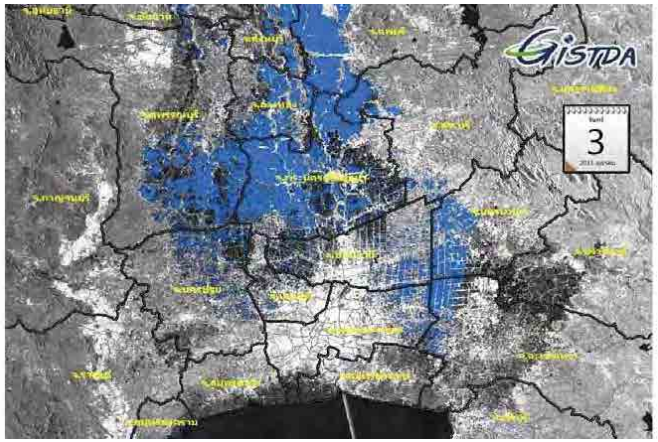


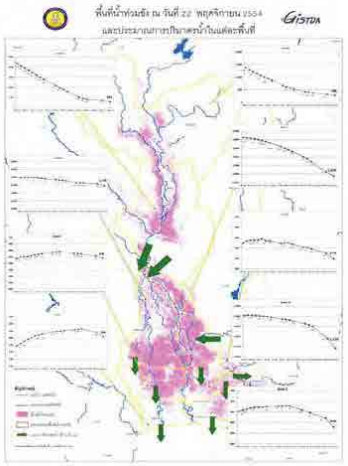
Precious inundation monitoring for Ayuthaya – Bangkok with 10m and hand them to provide GISTDA

衛星データアーカイブ、地形情報、モデルなどとの統合利用による氾濫進展把握からシナリオ予測へ



Flood Area Mapping by SAR Data in Response Phase - Thailand Flood Monitoring in 2011 -





- RADARSAT data analyzed by GISTDA (Geo-Informatics and Space Technology Development Agency)
- Monitoring over the Bangkok metropolitan area（100x100km）every few days
- Provision of time-series inundation maps

Flood Monitoring by RADAR

RADAR is all-weather sensor and useful for identifying flooded area.

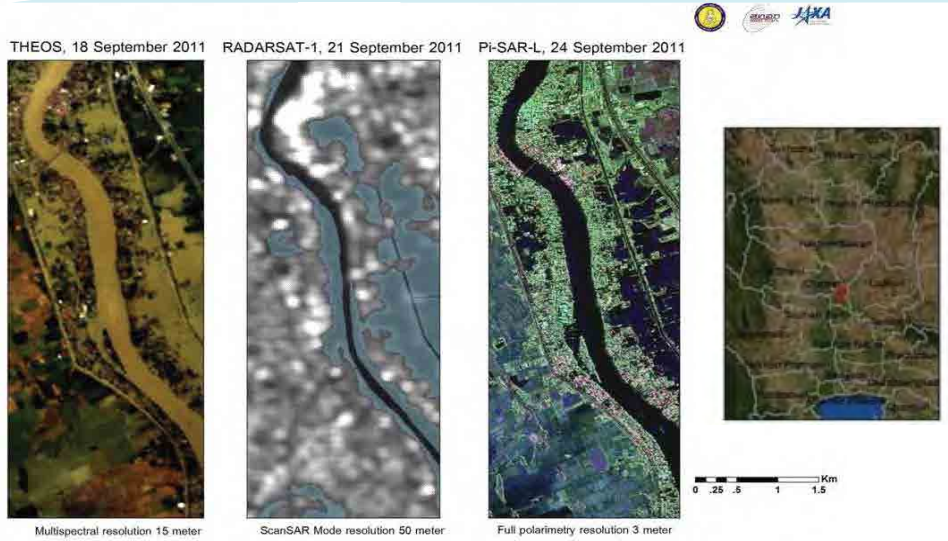
Pi-SAR-L2

- Almost completed
- Same spatial resolution with ALOS2/PALSAR-2
- Observation results will be utilized for ALOS-2 data analysis.

ALOS2/PALSAR-2

- launched in 2013
- Improved sensor compared with ALOS PALSAR
- Wider swath compared with Pi-SAR-L2

2. Flood monitoring



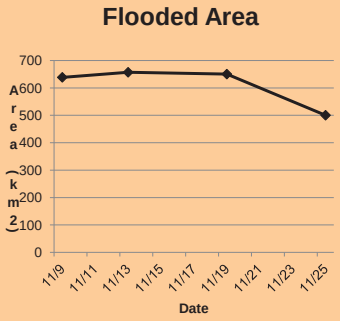
Airborne L-band SAR (Pi-SAR) detected flooded area with dark color (black and blue) in Nakhon Sawan province in September 24, 2011.

Pi-SAR has three meter spatial resolution. ALOS-2 will install a L-band SAR with same resolution as Pi-SAR and much wider swath than Pi-SAR.

Calculating Total Flood Area

- High resolution sensor helps estimating expansion/recession of floods -

Pi-SAR-L by JAXA



Precious inundation area change monitoring for downtown Bangkok with 3m all weather active radar (Pi-SAR-L) and hand them to GISTDA

Provision of Timely Information on Flood Area
（When, Where and How much?）

Hi-tech Industrial estate 2011/11/05

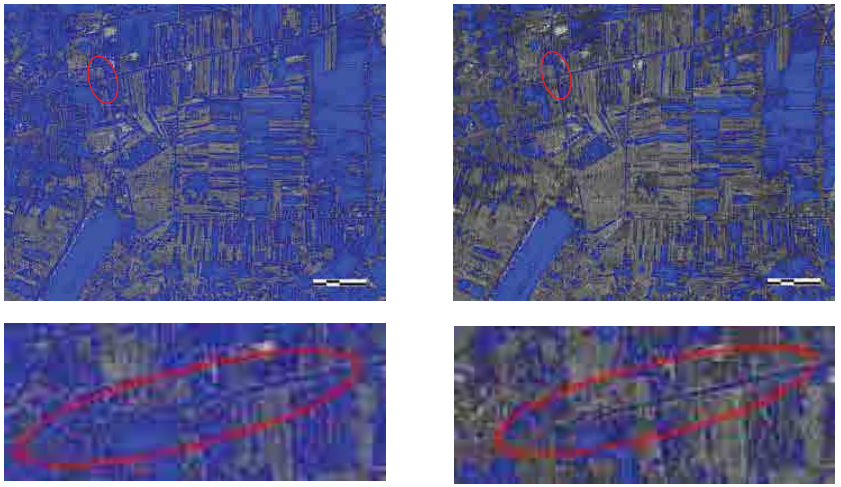
Provision of Timely Information on Flood Area
（When, Where and How much?）

Hi-tech Industrial estate 2011/11/27

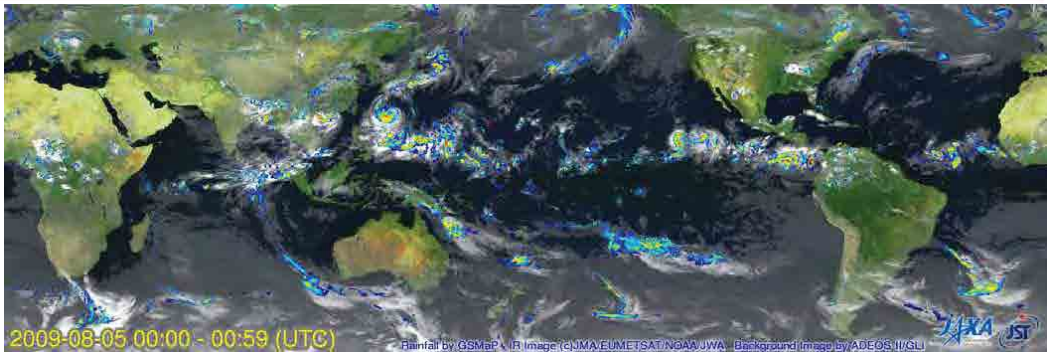
航空機レーダによる冠水の面積と地形データとの組み合わせによる水量の変化把握

Space Application in Recovery Phase

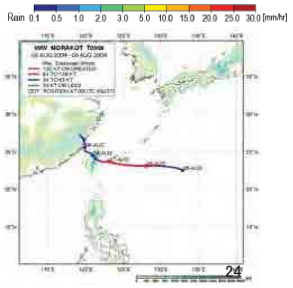
被災後の現地の情報が得にくい、水が引いた直後の構造物の変化状況を提供
→ どこまで水が引いているかという状況とともに、復興のための計画立案作り、被害補償などに貢献



Satellite-based Global Rainfall Map in Near Real Time



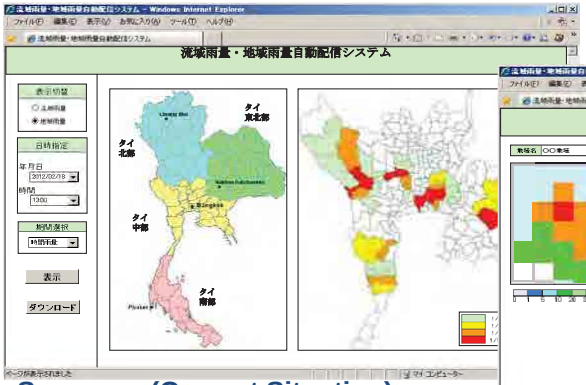
Typhoon MORAKOT (09W): Aug. 5 – 10, 2009 (Big impact in Chinese Taipei)



- **Global rainfall map** merging **TRMM**, **AMSR-E** and other satellite information
- Available **4-hour after observation**, **hourly update**
- 0.1-degree latitude/longitude grid

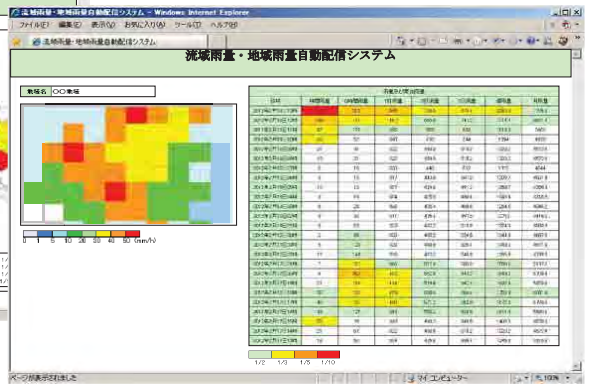
http://sharaku.eorc.jaxa.jp/GSMaP/

Administrative Boundary Precipitation Info.



Summary (Current Situation)

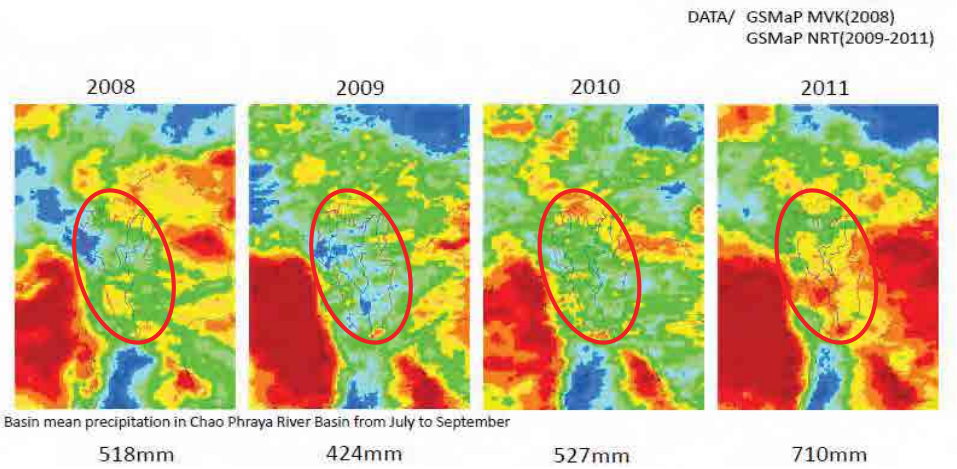
Details (Historical Situation)



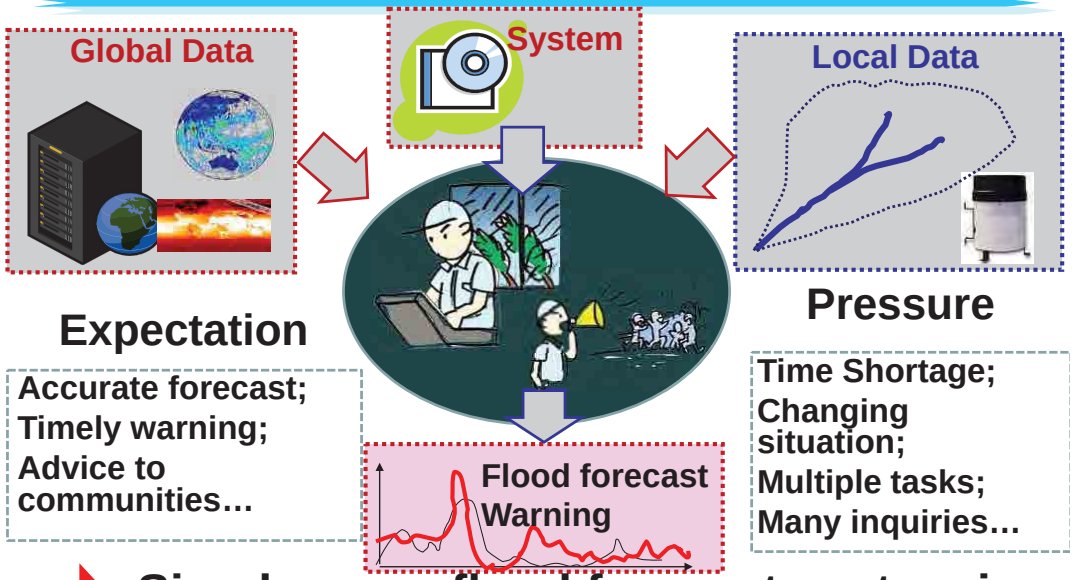
- Every Tambon are maintained.
- Accumulated (1H, 6H, 1-3D, 1W, 1M) precipitation rate and statistics can be browse on the WEB.
- Data (Precipitation & Statistics, gird basis and Shp. Files) is downloadable.

Knowing difference between last year and this year to avoid mistakes

- Comparing basin-wide rainfall is the key -

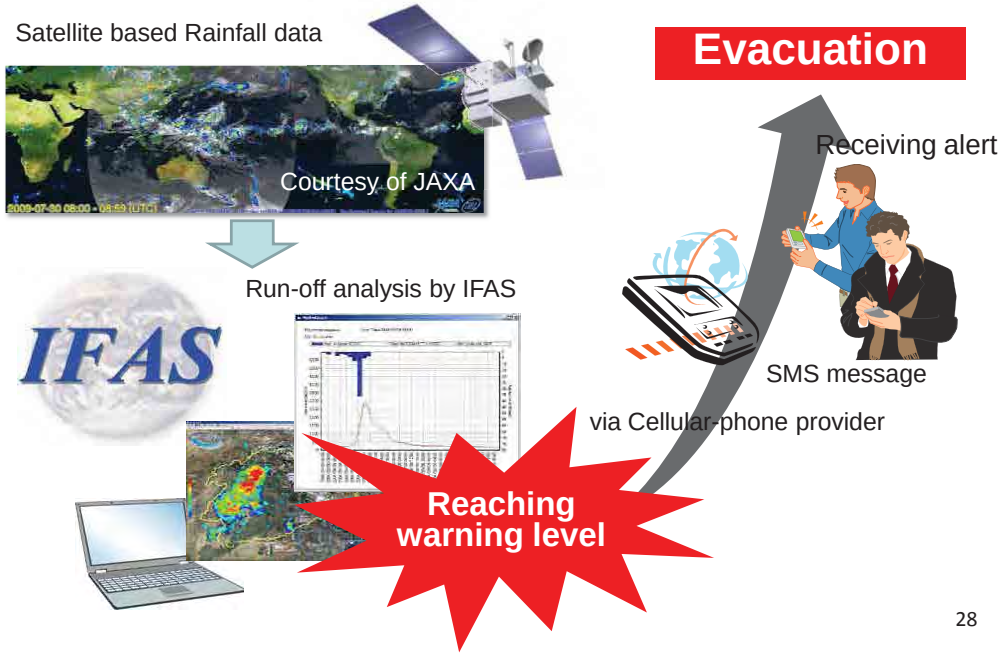


What happens to flood managers in emergency

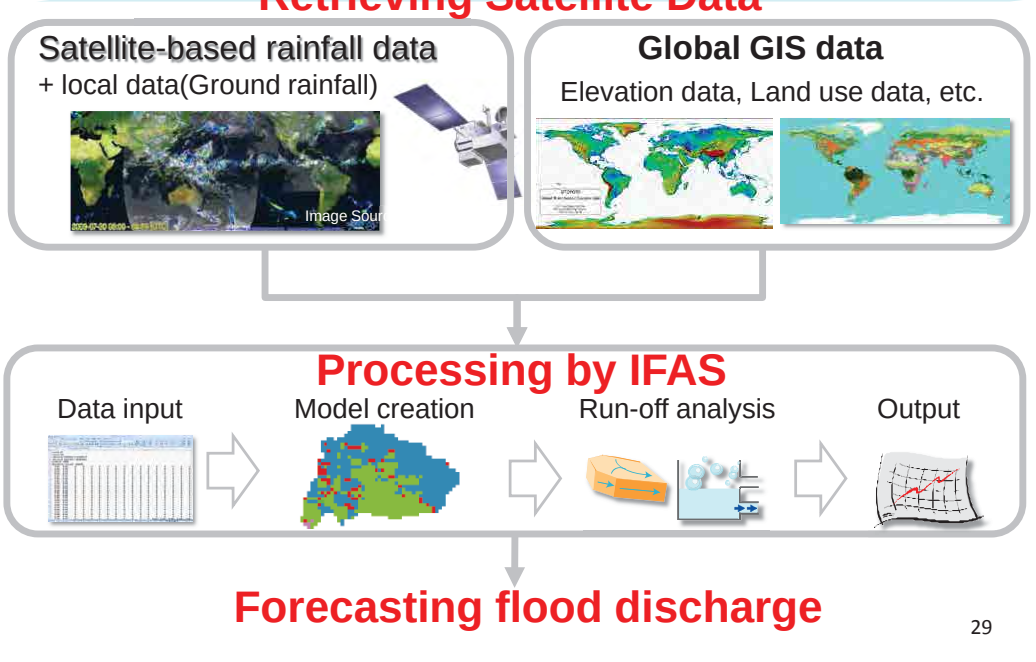


Simple, easy flood forecast system is needed

Integrated Flood Analysis System (IFAS)



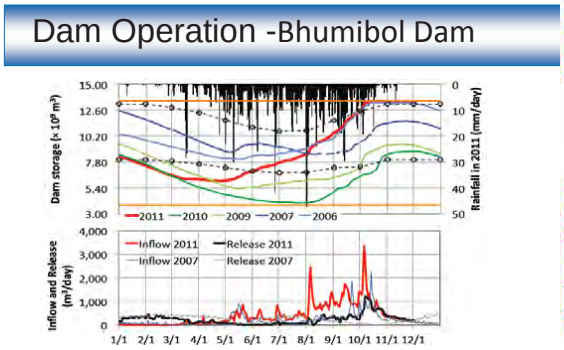
How IFAS works…

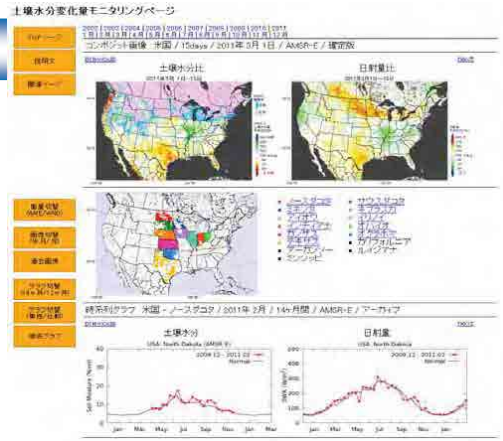


Operating dams wisely

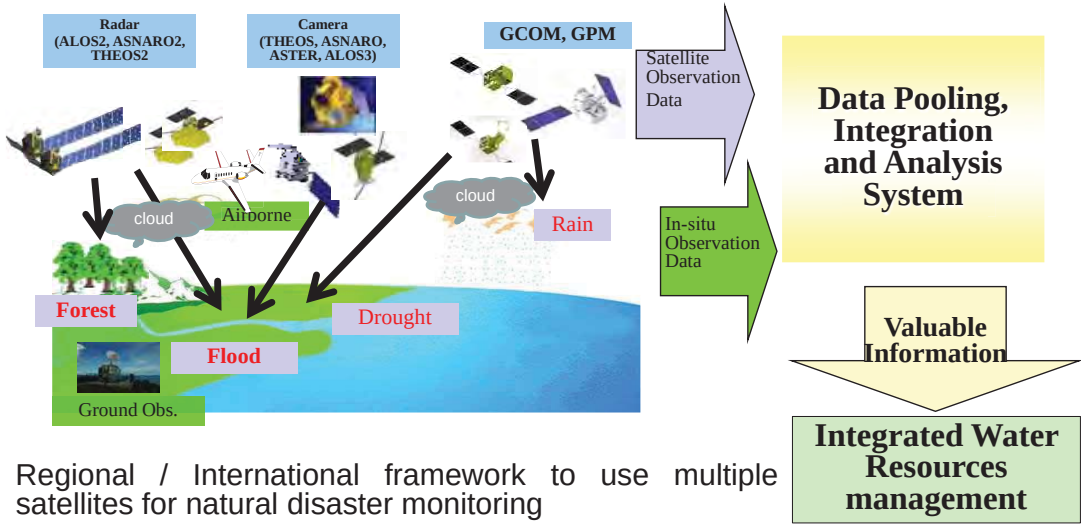
Beware, drought and flood are both sides of the same coin

- **Lowering reservoir water level too much is risky**
- **Operate dams using satellite-based weather forecast and wetness of land**





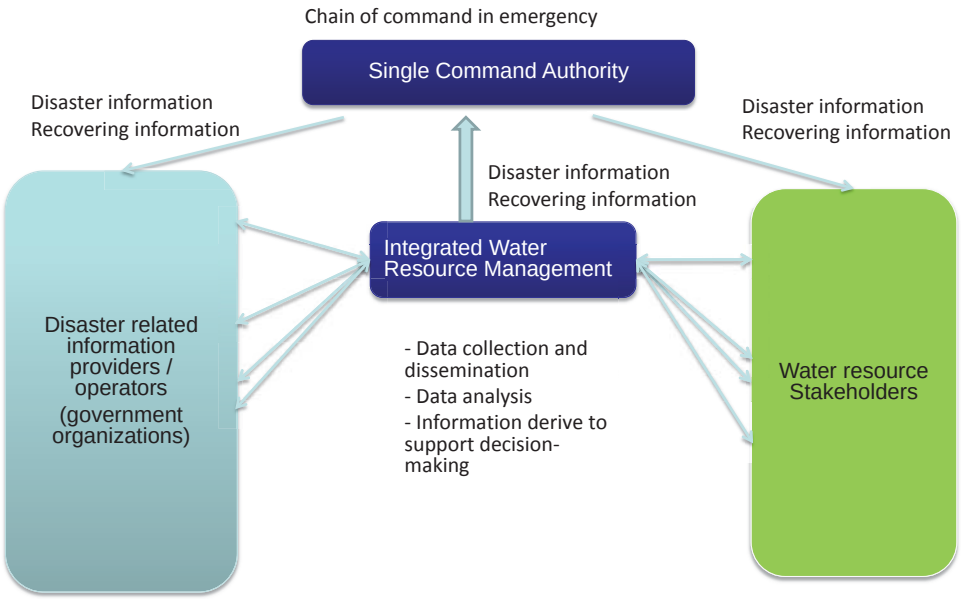
Constellation of Satellites to help IWRM



Regional / International framework to use multiple satellites for natural disaster monitoring

- APRSAF 'Sentinel Asia / International Disaster charter
- ASEAN 'Disaster Management Network for the ASEAN region' initiative proposed by Japan

An idea of IWRM in Thailand

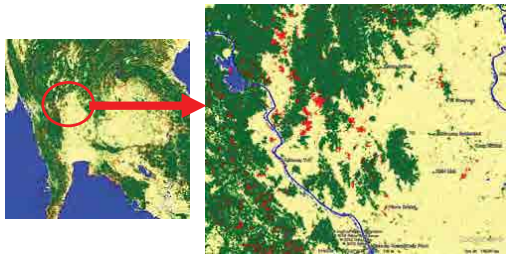


Forest Conservation

Forest Conservation

-Monitoring deforestation by SAR

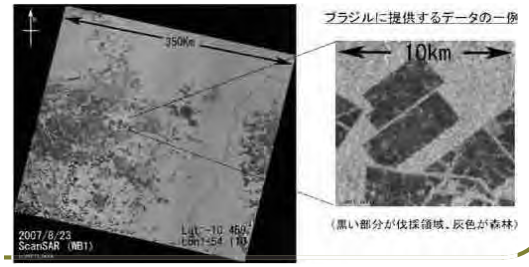
-About 1,200 km² deforestation in northern part of Thailand (upstream of Chao Phraya river basin) is monitored since 2007.



Monitoring illegal logging (A case in Brazil)

Detecting illegal logging of forest in Brazil / Amazon

-Forest data at 100m resolution is distributed every 10 days



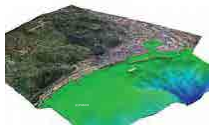
Monitoring Land

Coastal Erosion

-Detecting coastline changes over years with SAR and optical data.

-Monitoring coastal accretion and erosion of Thailand.

-Operating “The Thai Coastal Change Monitoring System” with satellite imageries.

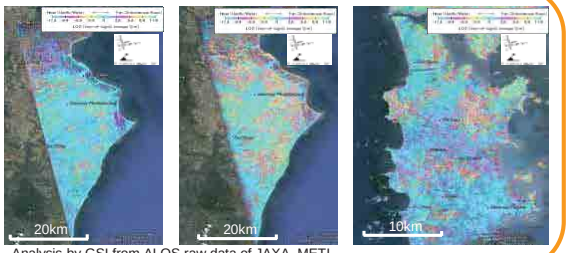


←Retreating of coastline (the erosion process) in the Gulf and Phuket of Thailand detected by SAR

Subsidence

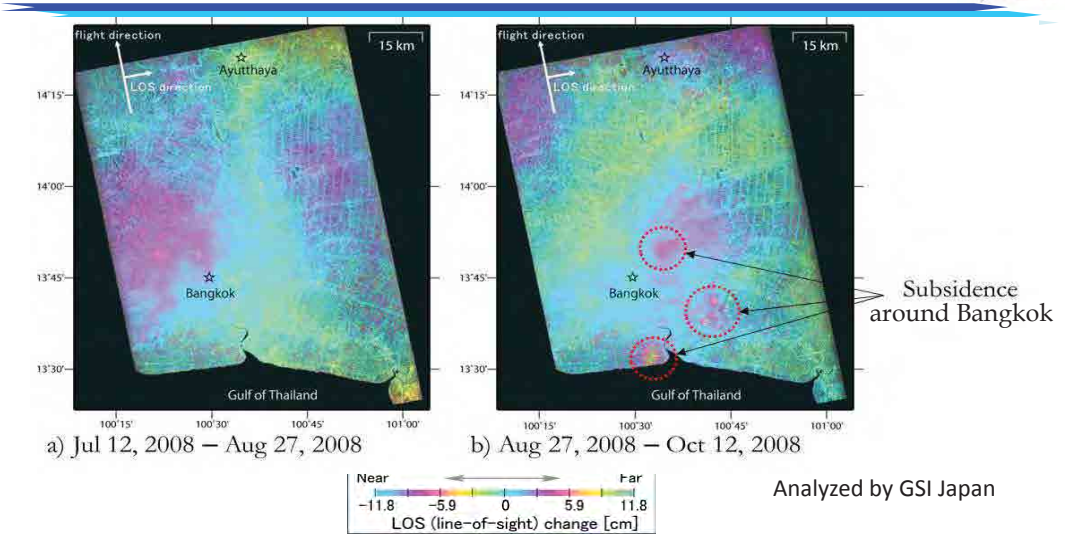
-Monitoring the subsidence by InSAR method.

-The study shows slight land change (subsidence) in Bangkok, Gulf of Thailand area and Phuket.



Analysis by GSI from ALOS raw data of JAXA, METI

Subsidence



Analyzed by GSI Japan

About 5.9 – 8.3 cm subsidence is detected in coast neighborhood and the suburbs of Bangkok within a few months (August – October, 2008) by using ALOS PALSAR data.

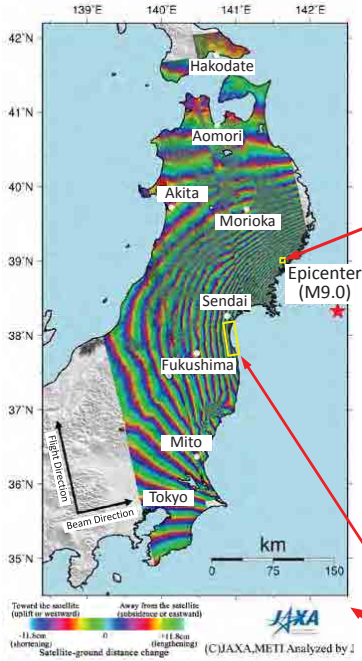
THEOS data Utilization of Flood area by Tsunami caused by the Great East Japan Earthquake

A comparison between images before and three days after the Earthquake

Before the Earthquake taken by "DAICHI" (ALOS) on Dec. 4 2008

3 days after the Earthquake taken by THEOS on Mar 14. 2011

ALOS data utilization for disaster monitoring in the Great East Japan Earthquake (March 11, 2011)



Bird's-eye view over Rikuzen-Takada CIty

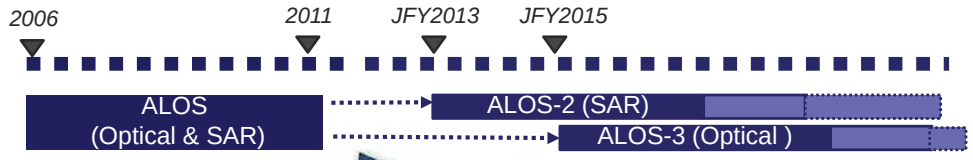
Made from AVNIR-2 using digital elevation model derived by PRISM

Water-covered area by Tsunami

PALSAR interferogram indicating crustal deformation (Mar. 20, 2011)

ALOS Series

- Wide-swath and high-resolution data of ALOS series will contribute to public safety, land management, assurance of food/resource/energy, solution of global environment issues
- Promoting public-private partnership, since its data has commercial value



ALOS (Optical & SAR) (2006～2011)

- Wide-swath (Max 490km), High-resolution (1-3m)
- L-band SAR (PALSAR-2)

ALOS-2 (SAR) (Launch: JFY2013)

- Panchromatic imager with wide-swath (50km) and high-resolution (0.8m)
- obtain global 3D geospatial information

ALOS-3 (Optical) (Launch: JFY2016)

JAXA's Mid-Term Plan

Target	Sensors	JFY 2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Disaster/ Resource	SAR	PALSAR								ALOS-2 (SAR)					
	Optical	ALOS PRISM, AVNIR2 (Optical)										ALOS-3 (Optical)			
Climate Change/ Water Cycle	Precipitation Radar	TRMM/PR								GPM/DPR					
	Microwave Radiometer	Aqua/AMSR-E						GCOM-W/ AMSR2							
Global Warming	Optical Sensor										GCOM-C/ SGLI				
	Cloud Radar											EarthCARE/CPR			
	Spectrometer				GOSAT								GOSAT-2		
Communi -cation	Mobile Communication	ETS-VIII												Next-generation	
	Wideband Internetworking	WINDS													
	Data Relay	DRTS											DRTS Follow-on		
Navigation	Quasi-zenith								QZSS						

Operation Development Research

Flood Risk Management

International Center for Water Hazard and Risk Management (ICHARM)

Shigenobu Tanaka and Takahiro Sayama

Outline

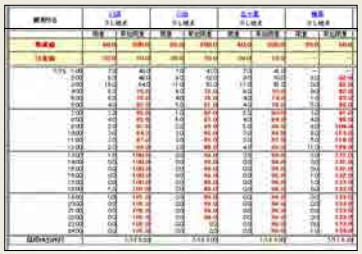
- Introduction of ICHARM
- Japanese Flood Forecasting and Evacuation
- RRI Model for the Chao Phraya River Basin
- Possibility of Rainfall-Runoff-Inundation Forecasting
- Simulation of 2011 Thai Floods
- Long-term Simulation and Climate Change Impact

Flood forecasting by MLIT local office

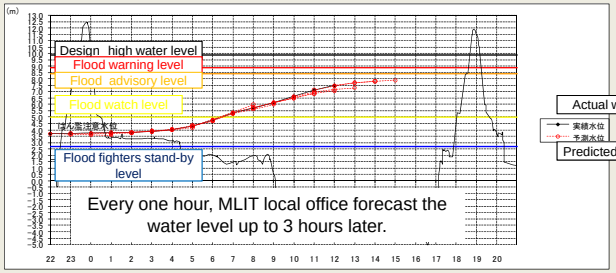
Observation of precipitation data

Sent to MLIT local office by telemetry system

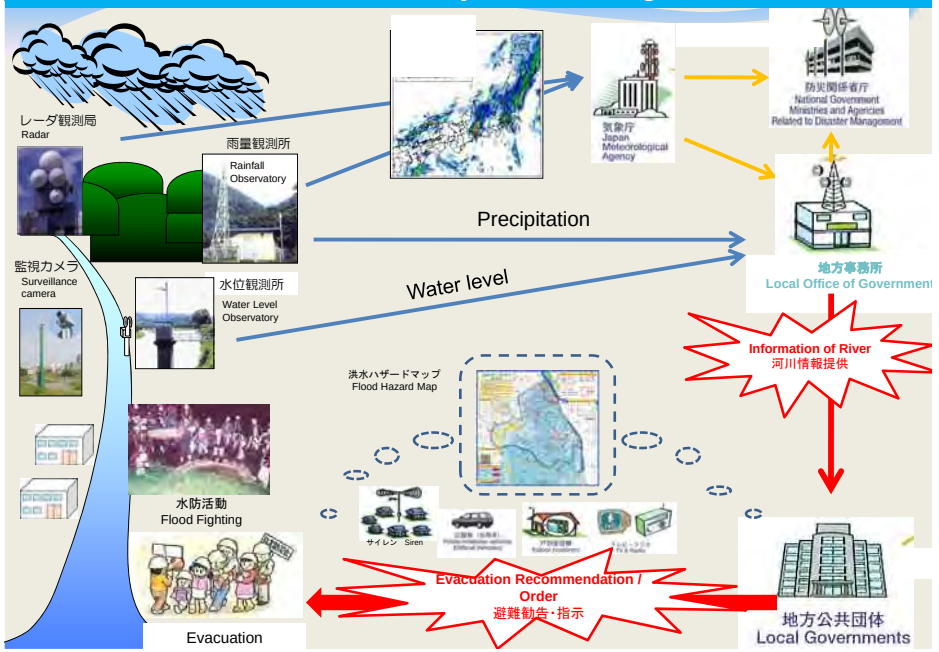
Collection of precipitation data as well as that in upper river basin area



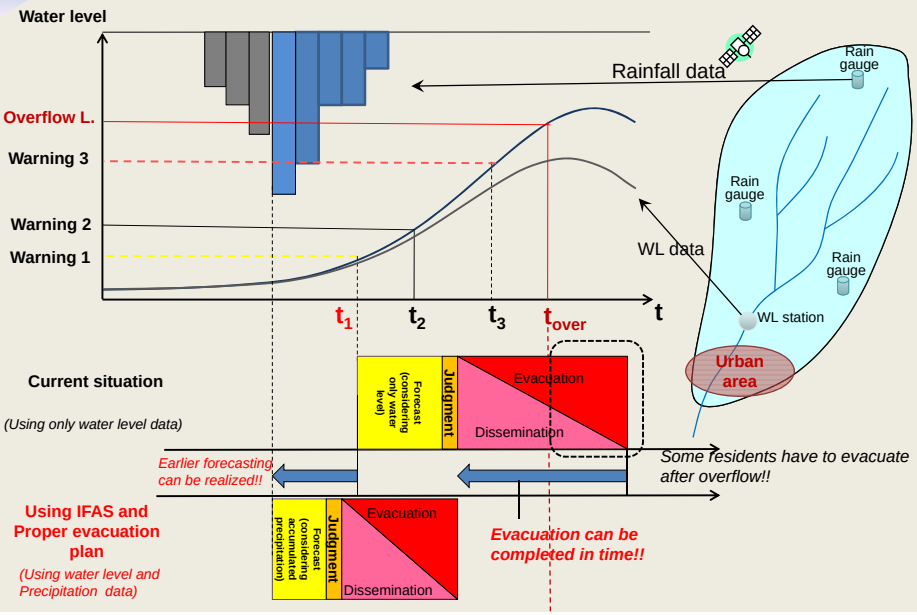
MLIT local office calculates and forecasts the water level



Communication system during flood



Concept of Early Warning (General case)



Acts related flood countermeasures

Flood-fighting Act (1949, 2005)

Focuses on flood-fighting activities at the local level in reaction to flood events.
Municipalities that include potential flood areas are required by revised law to prepare and disseminate flood hazard maps on the basis of maps of flood-prone areas created by the MLIT and the prefectures.

River Act (1964, 1997)

This is at the core of flood control legislation.
This law is to reorganize the role of the river administrations and to change the conventional section-by-section river management into a more integrated approach. It was then amended in 1997 to take into account economic and social changes, to emphasize the need for sound river environments, and to incorporate the opinions of local residents through river improvement planning systems. the River Law is for specifically on flood prevention structural measures. This law is in charge by MLIT.

Disaster Countermeasures Basic Act (1961)

To protect life of the people is mandated by municipalities (City, Town and Villege). The nation and prefectures are in the position to support them. Ministerial departments and prefectures are responsible for elaborating their own disaster management plans, provided these are in line with the Basic Disaster Management Plan. Likewise, municipalities develop their plans in line with their corresponding prefecture's plan

Reference: OECD REVIEWS OF RISK MANAGEMENT POLICIES Japan 2009

Content of Local disaster management plan (Hanyu City)

Part 1: General Provisions, Etc.
Chapter 1: Overview of Hanyu City Regional Disaster Prevention Plan
Chapter 2: Organizations Related to Disaster Prevention
Part 2: Earthquake Disaster Response
Chapter 1: Earthquake Disaster Prevention
Chapter 2: Emergency Earthquake Disaster Response Plan
Chapter 3: Earthquake Disaster Restoration and Recovery Response Plan
Chapter 4: Response Measures Plan to Accompany Tokai Earthquake Warning Declaration
Part 3: Wind and Flood Damage Response
Chapter 1: Disaster Prevention Plan
Section 1: Flood Damage Prevention Plan
Section 2: Plan Regarding Establishment of Disaster Communications Network
Section 3: Plan Regarding Establishment and Inspection of Facilities and Equipment Pertaining to Disasters
Section 4: Plan Regarding Drills
Section 5: Disaster Prevention Plan
Section 6: Disaster Prevention Education Plan
Section 7: Plan Regarding Emlightenment of Disaster Prevention Knowledge
Section 8: Disaster Prevention Activities Outpost Plan
Section 9: Evacuation Plan
Section 10: Stockpiling of Supplies, Equipment and Materials
Section 11: Establishing Medical Treatment Network, Etc.
Section 12: Hydrological Data Acquisition Plan
Section 13: Matters Regarding Disaster Prevention Measures for Schools, Hospitals, Factories, Offices, Commercial Facilities, Etc.
Section 14: Disaster-Preventive Urban Development Plan
Section 15: Matters Regarding Disaster Prevention Measures for Cultural Assets
Section 16: Establishment Plan Network for Ensuring Safety of Necessary Relief Parties in Time of Disaster
Section 17: Large-Scale Disaster Prevention Plan

Content of Local disaster management plan (Hanyu City) cont'd

Chapter 2: Emergency Disaster Response Plan
Section 1: Mobilization Plan
Section 2: Emergency Activities Plan
Section 3: Disaster Information Communications Plan
Section 4: Disaster Public Relations Plan
Section 5: Evacuation Plan
Section 6: Applicable Plan under Disaster Relief Act
Section 7: Food Supply Plan
Section 8: Supply Plan for Clothing, Daily Essentials and Other Supplies
Section 9: Water Supply Plan
Section 10: Emergency Medical Treatment and Midwifery Care Plan
Section 11: Plan for Placement of Emergency Provisional Housing and Emergency Repairs for Disaster-Affected Residences
Section 12: Epidemic Prevention Plan
Section 13: Animal Protection in Times of Disaster
Section 14: Sanitation Plan
Section 15: Plan for Searching and Rescuing Disaster Victims and Storing and Burying Remains
Section 16: Obstruction Removal Plan
Section 17: Transport Plan
Section 18: Labor Supply Plan
Section 19: Emergency Response Plan for Transportation
Section 20: Emergency Disaster Response Plan for Public and Transportation Facilities
Section 21: Response Plan for Educational and Cultural Assets
Section 22: Accepting Support
Section 23: Fire Prevention Plan
Section 24: Self-Defense Force Dispatch Request Plan
Section 25: Flood Fighting Plan
Section 26: Emergency Disaster Response Plan for Electrical Facilities
Section 27: Emergency Disaster Response Plan for Telecommunications Equipment
Section 28: Mutual Support and Cooperation Plan
Section 29: Ensuring Safety of People in Need of Aid during Disaster
Chapter 3: Disaster Restoration Plan

Example of evacuation advice (order) system in Japan

In case of Hanyu City, Saitama prefecture

	Situation when Issuing advices or orders	Requested Actions to Residents
Advice on preparing evacuation (evacuation advice to those who need assistance)	• There is a need to start evacuation for those who need more time for evacuation, such as people needing assistance in emergency situations.	• Those who need assistance in emergency situation should start evacuation to designated evacuation places (members who will assist those people should also start assisting) • Other people should start preparations for evacuation, such as contacting families, preparing disaster kits.
Evacuation Advice	• There is a need to start evacuation for ordinary people and when possibility of human damage is clearly expected.	• Those who can make ordinary evacuation actions should start evacuation to designated evacuation places
Evacuation Order	• Expectation of human damage is apparently very high, due to the fact such as (1) predictive phenomena were observed, (2) Situations is different lining besides river banks, etc. • Human damage already reported	• Those who are making evacuation must finish evacuation immediately. • People who have not yet evacuated must immediately take evacuation actions, when there is no time, must at least take any actions to protect their own lives.

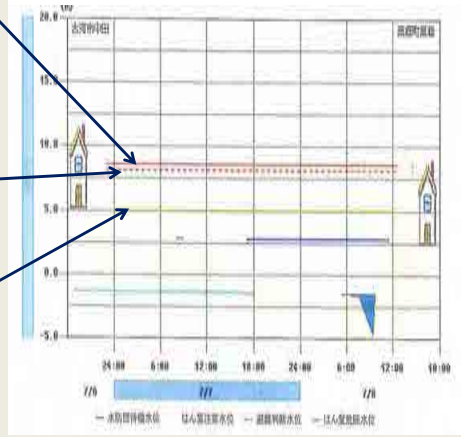
Location of Hanyu city and Kurihashi water level station of Tone River

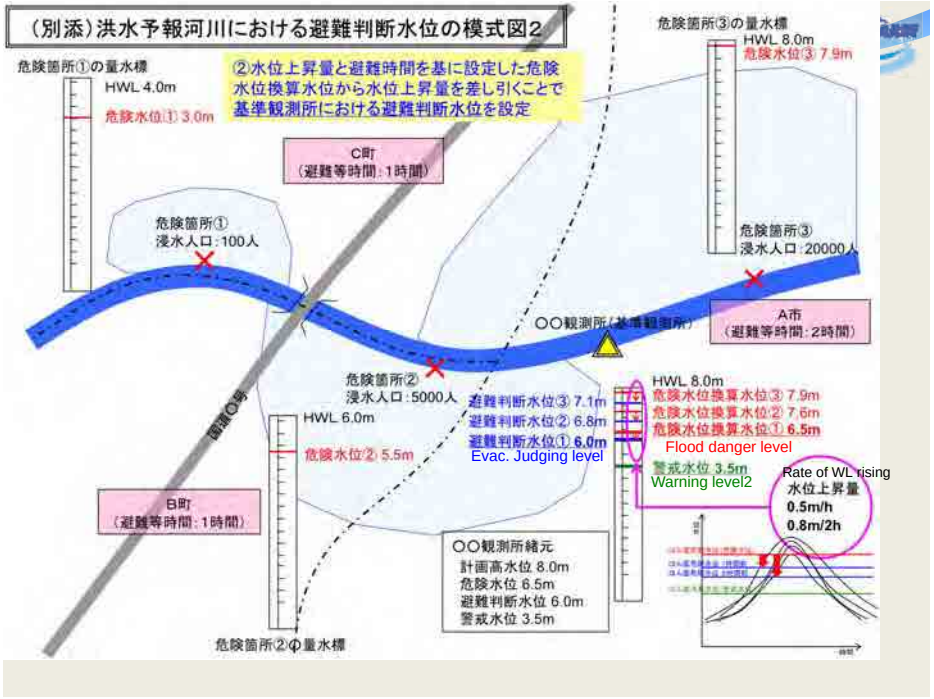
Criteria of issuance of evacuation advice (order) Based on nearby WL station

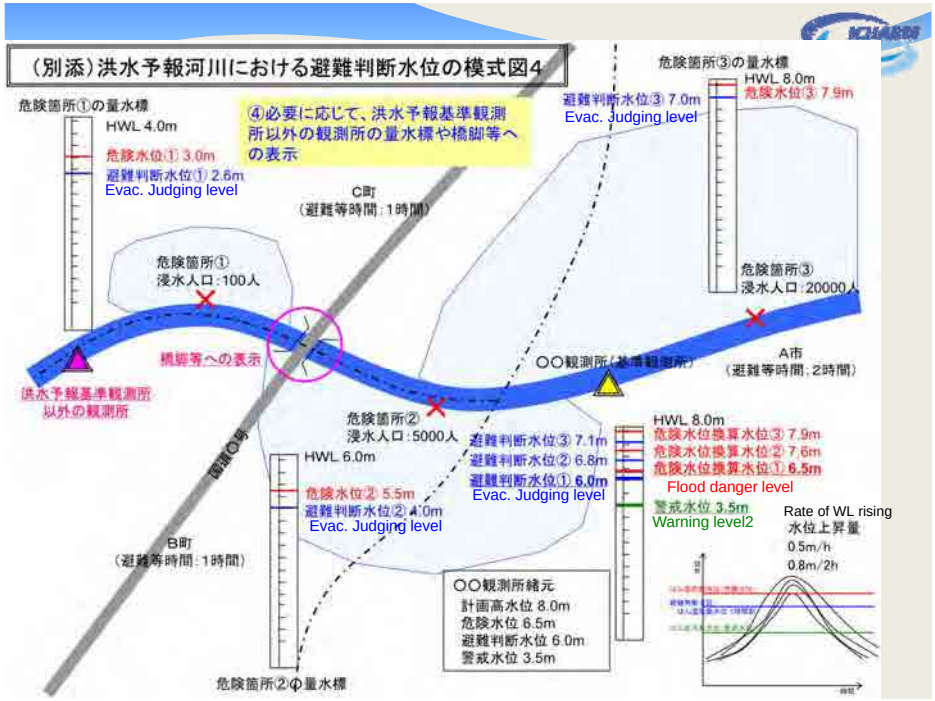
(In case of Hanyu City, Saitama prefecture)

Evacuation Order	Dyke breach was reported * Water Level has reached 8.5m and still expected to rise
Evacuation Recommendation	* Unusual phenomenon reported on flood management facilities (which could cause leakage, dyke breach, etc.) * Water Level has reached 8.0m and still expected to rise
Advice on preparing evacuation (evacuation advice to those who need assistance)	*Water Level has reached 5.0m and still expected to rise

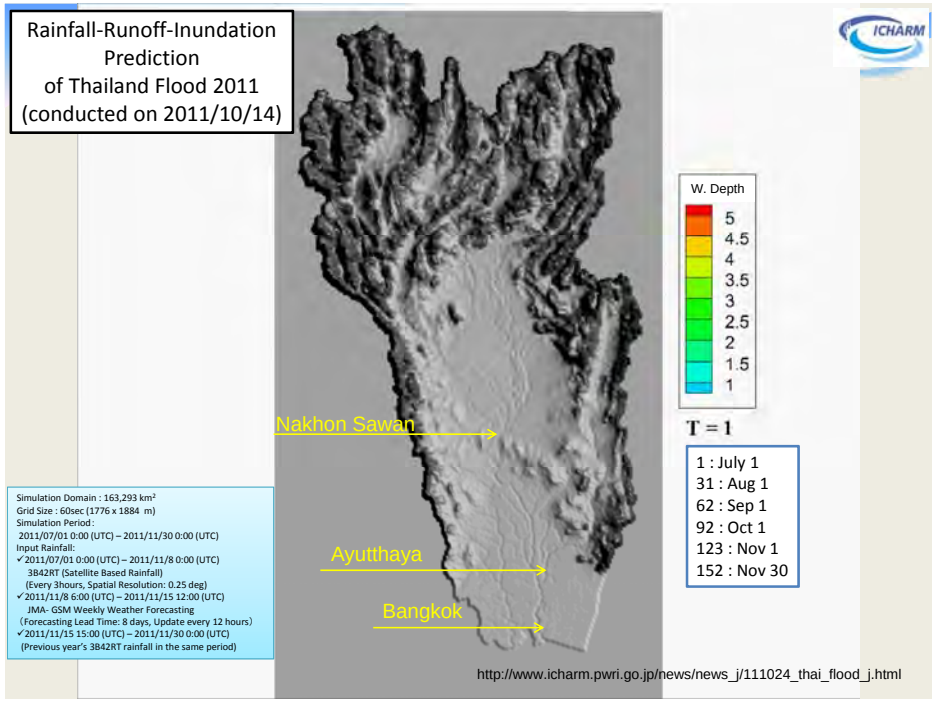
基準値	Stand-by WL for Flood Fighting Group	Flood Caution WL	Evacuation Advice WL	Flood Danger WL
	2.7m	5.0m	8.0m	8.5m





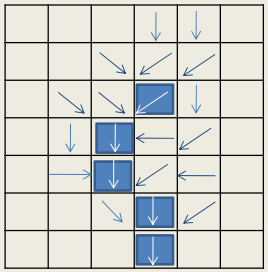


Rainfall-Runoff-Inundation Prediction of Thailand Flood 2011



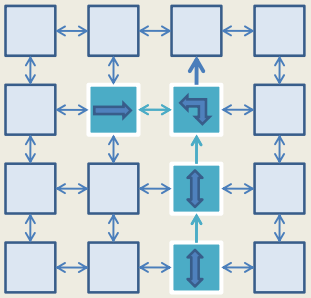
Distributed R-R Model

Flow directions are fixed based on topography

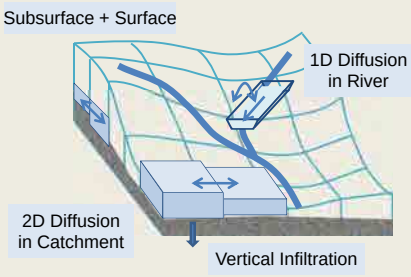


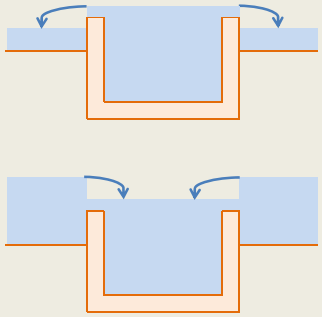
RRI Model

Flow directions change based on water levels



Rainfall-Runoff-Inundation (RRI) Model





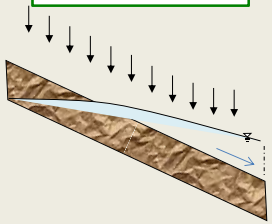
- Diffusion Wave Approximations
  - 1D in River
  - 2D in Catchment
- Subsurface flow
  - Vertical Infiltration with Green-Ampt
  - Saturated Subsurface + Surface Flow

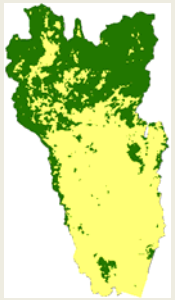
- Rectangular river cross sections
  - Width, Depths, Levee heights can be assigned for each river grid-cells
- Over-topping and step-down formulae are used to compute the interactions between water in river and on slope
- Water depth and discharge boundary conditions can be wet at any grid-cell

Subsurface flow and infiltration in RRI

Saturation Excess

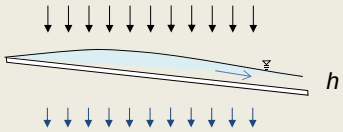
Subsurface + Surface





Infiltration Excess

Vertical Infiltration



Infiltration : Green Ampt Model

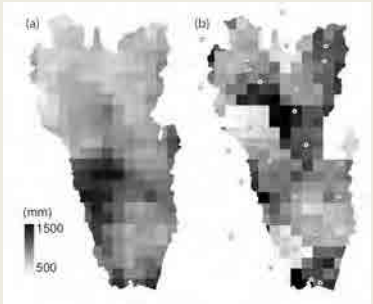
Forecasting (Lv1) and Post Simulation (Lv2)

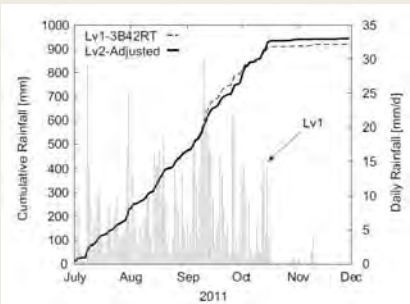
YES

- Ground Gauged Rainfall
- Evapotranspiration (4 mm/d)
- Dam
- Tidal Effects
- Parameter Calibration
- Detail Reflection of Cross-Section

Parameter	Lv. 1 (Forecast)	Lv. 2 (Post-Simulation)
River : n ($m^{-1/3}s$)	0.03	0.03
Slope : n ($m^{-1/3}s$)	0.3	0.35
Soil Type for Green Ampt Model	Silty Clay Loam (Limit: 400 mm)	Clay (Limit: 400 mm)

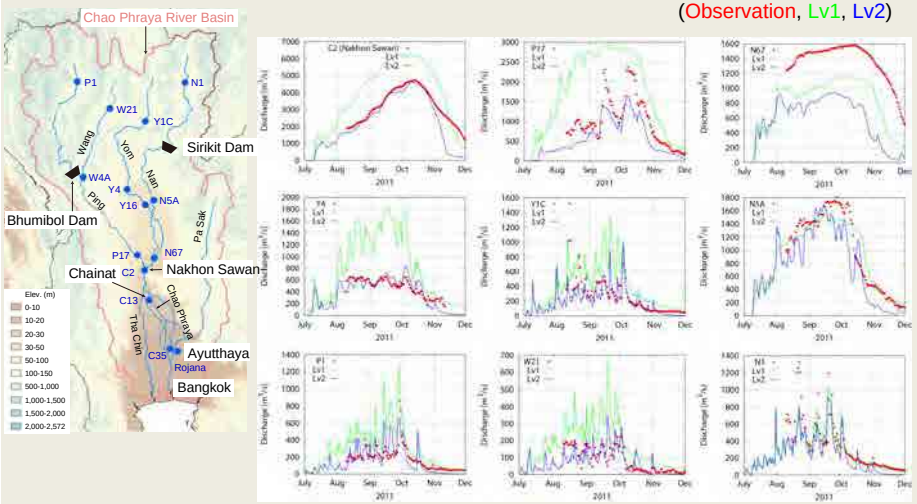
Lv1 (3B42RT) Lv2 (Adjusted)





River Discharges

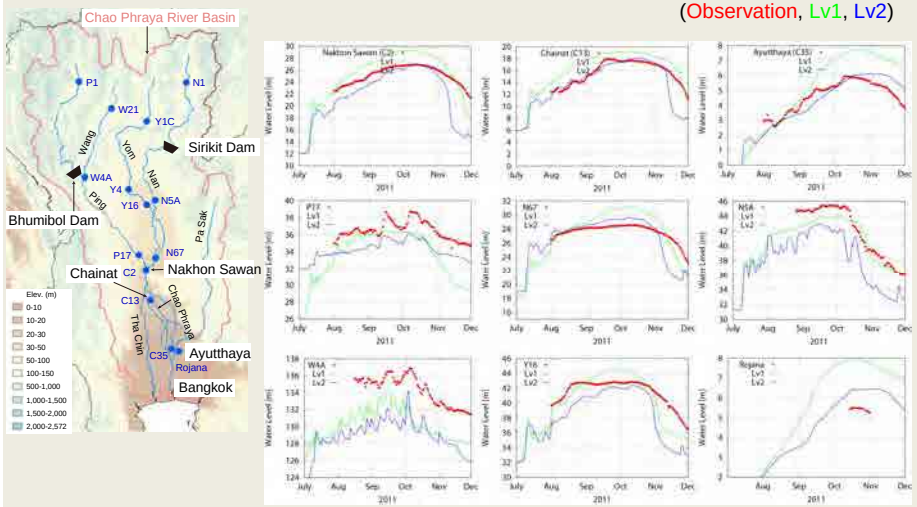
(Observation, Lv1, Lv2)



Forecasting Mode (Lv1) and Post Flood Simulation Mode (Lv2)

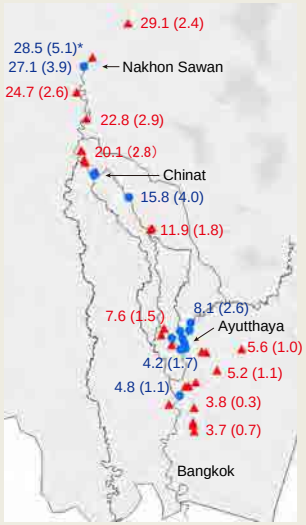
River Water Levels

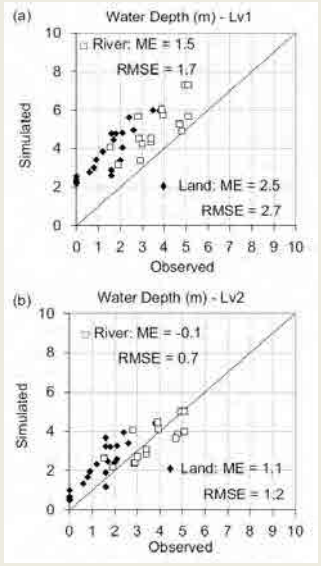
(Observation, Lv1, Lv2)



Forecasting Mode (Lv1) and Post Flood Simulation Mode (Lv2)

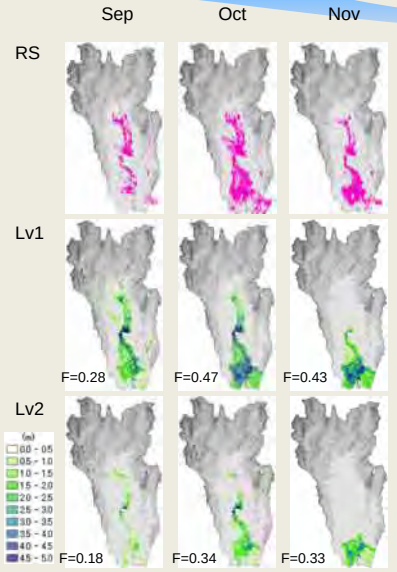
Peak water levels





Red: Land, Blue: River Peak water level
(Reduced water level by the end of November)

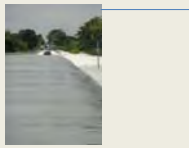
Inundation extents

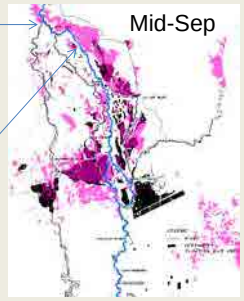


F: $\frac{IA_{obs} \cap IA_{sim}}{IA_{obs} \cup IA_{sim}}$

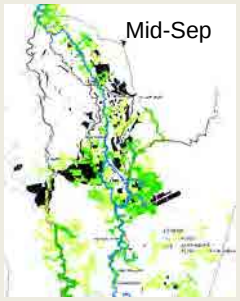
- Lv2 slightly under-estimates inundation extents
- Water levels in river and on floodplain become independent, becomes difficult to simulate

Inundated Area and Past Floating Rice Field





UNOSAT



RRI Model (Lv2)

Possibility of Rainfall-Runoff-Inundation Forecasting

Assessment of Countermeasures

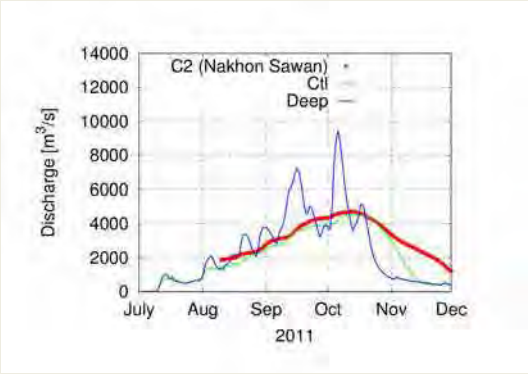
What would happen…

1. if there was no flood inundation?
2. if there was dyke along the main rivers?
3. if the dams had more storage capacities?
4. if there were floodways?

Simulation Cases

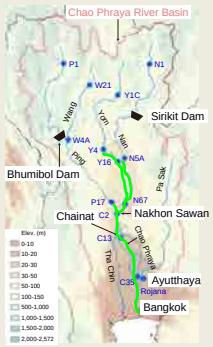
Ctl (Control)	*Deep*	*Dyke 5m*	*Dyke 20m*	*Dam Opt*	*Floodways*
2011 Simulation Outflow boundary cond. at B. and S. dams	Deepen rivers by 20 m to avoid inundation	Build 5m dyke along rivers (Below P17, Y4, N5A)	20 m (others are the same as Dyke 5m)	Outflow boundary at B. and S. dams with constant disc. considering more initial capacity	Floodways proposed by Thai Gov.

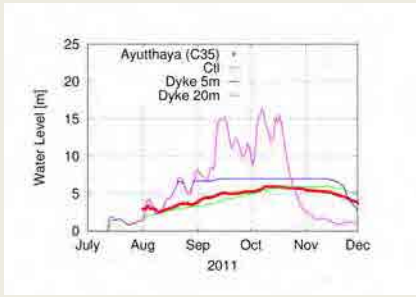
What if there was no flood inundation?



- ✓ At Nakhon Sawan, peak discharge could increase up to 9,500 m^3/s from 4,500 m^3/s
- ✓ At Bangkok, up to 10,500 m^3/s from 3,200 m^3/s

What if there was dyke along rivers?

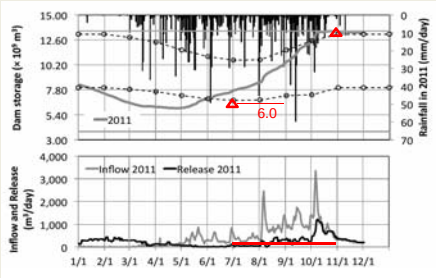




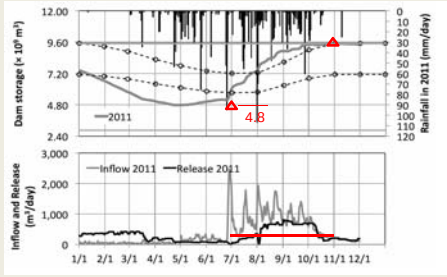
- ✓ With 5 m dyke, overtopping flood happened even in the beginning of September
- ✓ More than 10 m dyke is necessary to flow the 2011 flood water without overtopping (which is unrealistic option in the current Chao Phraya system)

What if the dams with more capacity?

Bhumibol Dam



Sirikit Dam

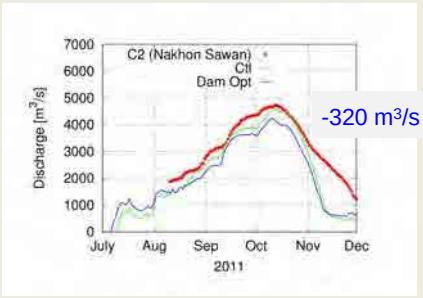


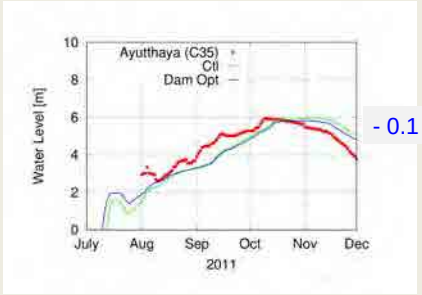
(Background figures from Komori et al. 2012)

Discharge boundary conditions at B. and S. dams

Control	: Release 2011
Dam Opt	: B. 181.5 m^3/s, S. 383.3 m^3/s constant

What if the dams with more capacity?



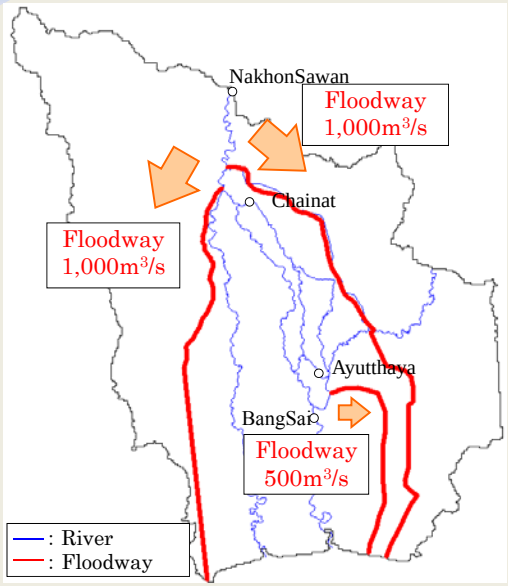


✓ Inundation vol. : - 2.4 bill m^3 (Control: 19.4 bill m^3)

Flood control by changing the dams' operation policy may mitigate the flooding; however, need to realize its limitation. It cannot solve everything

Floodway Plan

JICA M/P Project

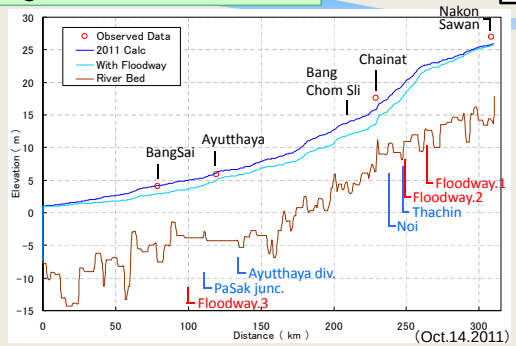


The simulation setting follows the proposal by the Thai Gov.

* Diverted water directly pours into the sea without inundation.

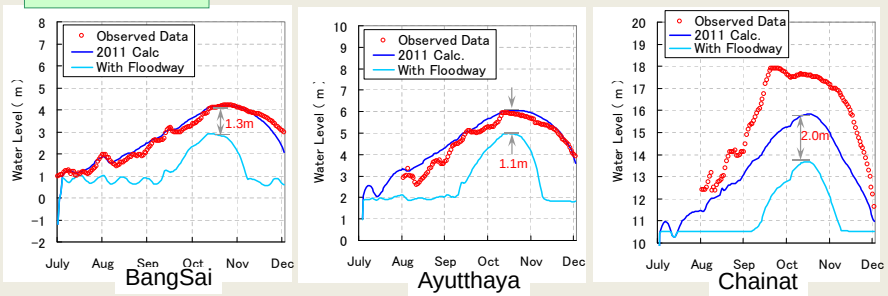
Longitudinal Water Level

JICA M/P Project



(Oct.14.2011)

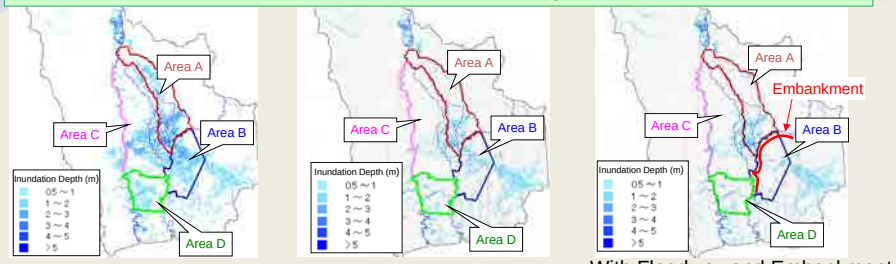
Water Level



Inundation volume in each zone

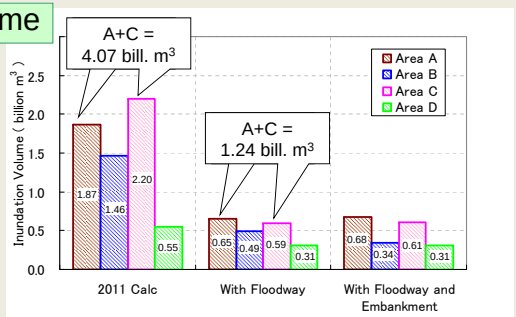
JICA M/P Project

Peak Inundation Depth



2011 Calc. | With Floodway | With Floodway and Embankment

Inundation Volume



Summary

1. Emergency response-type Rainfall-Runoff-Inundation (RRI) predictions
   - ○ Maximum flooding extent
   - ○ “Flooding may remain in the downstream area by the end of November”
   - × Overestimation of inundation water levels by about two meters ← ET
   - △ Inundation extent during small flooding (impact by artificial structures)

2. An example of RRI simulation to understand the Chao Phraya River system
   - River discharge of 2011 flood potentially increase up to 10,000 m^3/s
   - Increasing river flow capacity is not a good idea
   - (More than 10m dyke will be needed…)
   - Additional effect of flood control by dam reservoirs is limited
   - (-10 cm of inundated water level in Ayutthaya)
   - Proposed floodways have considerable effects around Ayutthaya

3. On the assessment of climate change impact
   - High sensitivity of flood inundation volumes to six month rainfall

Outline of FRICS

FRICS

December 19, 2012

FRICS

- Foundation of River & basin Integrated Communications
- FRICS is a non-profit private organization, but
- Endowment was made by all 47 prefectures and 10 large cities of Japan, and
- FRICS has been, is , and shall be a highly public body in charge of prevention and/or mitigation of water-related disasters.

Mission

- The Foundation aims at:
- Collecting, processing and disseminating information on rivers and basins, and thereby
- Reducing flood and other water-related damages and contributing to better and reasonable use of rivers.

History

- 1976 First Radar Rain gauge on Mt. Akagi (in the Tone River basin near Tokyo)
- 1982 Disaster caused by torrential rain in Nagasaki (1000 km from Tokyo): Request to disclose information gathered by (then) Ministry of Construction
- 1985 Establishment of the Foundation
- 1986 Commencement of information provision: Subscription fee was charged to information receivers (mainly municipalities).
- 2006 Operation of the Integrated River Information System started for Municipalities under the contract with the Government: Free of charge.

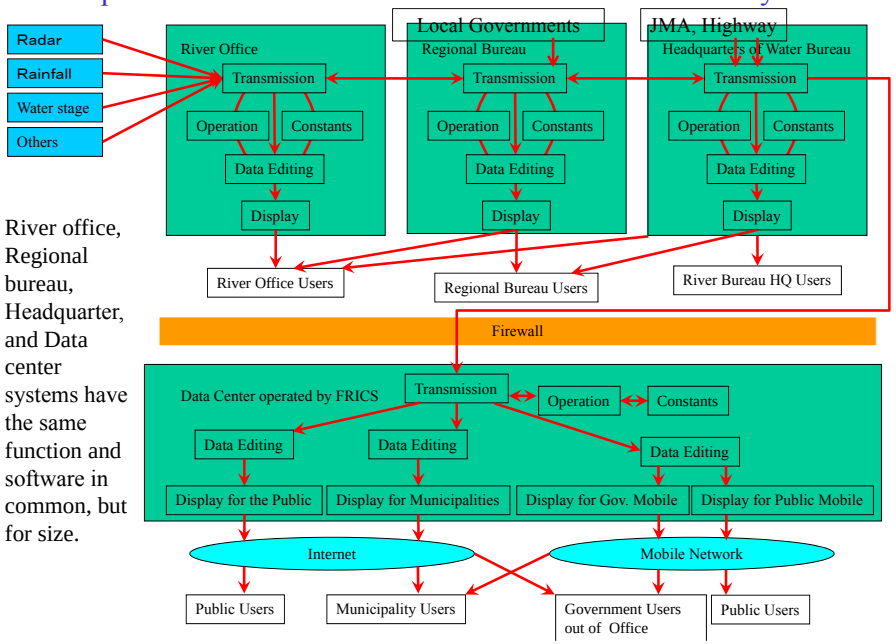
Organization

- President
- Board of Directors(15)
- 11 Divisions and 4 Sub-divisions
- 9 Branch offices corresponding to Regional Development Bureaus of MLITT
- 98 Persons (59 at HQ, 39 at Branches)

FRICS has:

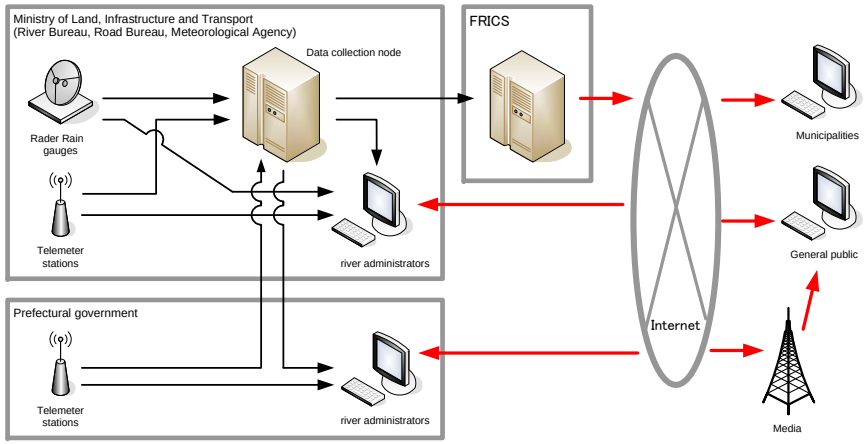
- Integrated MLITT's 26 Radar Rain gauges along with online calibration;
- Developed the Integrated River Information System. More than 17,000 stations have been incorporated into a single system;
- Established a data verification scheme based on the Hydrology and Water Quality Database to enable accurate and prompt publication;
- Compiled the "Guideline for Flood Hazard Mapping";
- Initiated a Roll-playing Type Training Scheme for decision-makers to cope with Crises, and practiced more than 190 times until fiscal 2008 at all levels of the Central and Local Governments;
- Set up the "National Land with Water Information" Center, a clearing house of information vital for river/basin planning and management; and
- Developed flood forecasting systems for dams operation and flood fighting based on distributed- parameter runoff model, etc.
- Most of above achievements have been made through contracts with the Government Organizations based on proposals from FRICS.

Conceptual Architecture of the Unified River Information System



River office, Regional bureau, Headquarter, and Data center systems have the same function and software in common, but for size.

Data Flow



← Information sharing through Internet

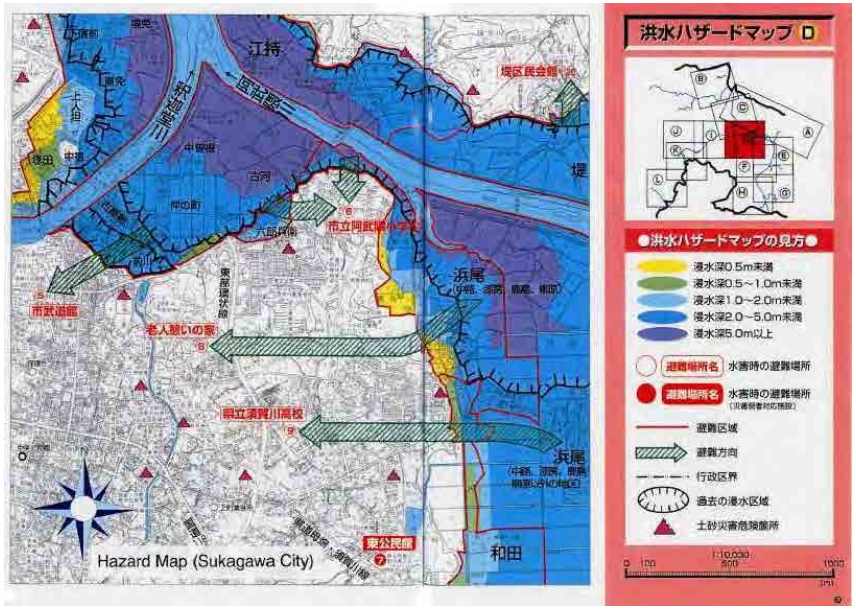
Site of the National Land with Water Information

Clearing house of databases, and Common help desk

Hydrological and Water Quality Database

Independent Systems for Management and Data Retrieval

Compilation of a Hazard Map (Sukagawa City)



Thank you.

- Please also visit our Website:
- http://www.river.or.jp/outline/index.html
- and send comments to:
- frics@river.or.jp , or
- nakao@river.or.jp

English