2018臺北國際水環境高峰論壇暨產業展

Smart Flood Management of Taipei City under Climate Change



Contents

1. Characteristics of Taipei

1.Characteristics of Taipei

- Location : North Taiwan
- Population : 2.7 million
- Area : 272 km2
  - 55% mountains
  - 45% plains

Palace Museum

Keelung River

Taipei 101

Low-lying areas

Tamsui River

Jingmei River

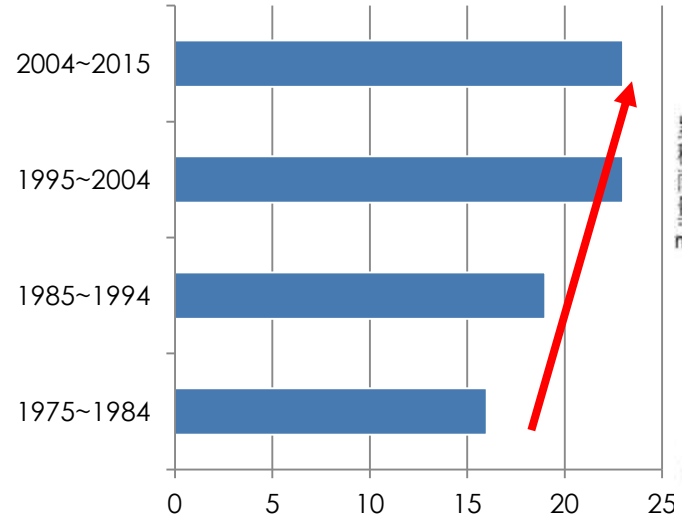
Xindian River

Taiwan

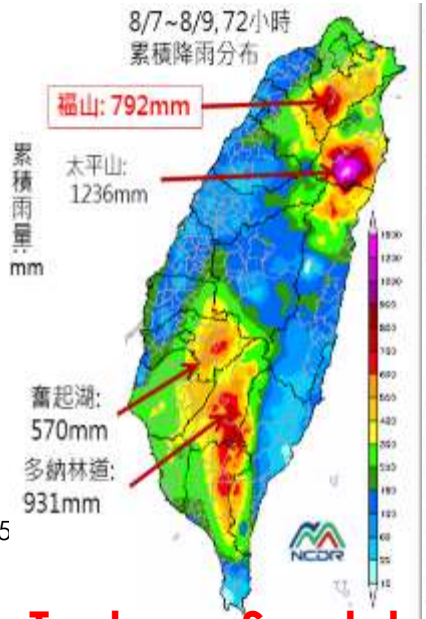
1.Characteristics of Taipei

Multiple typhoon routes

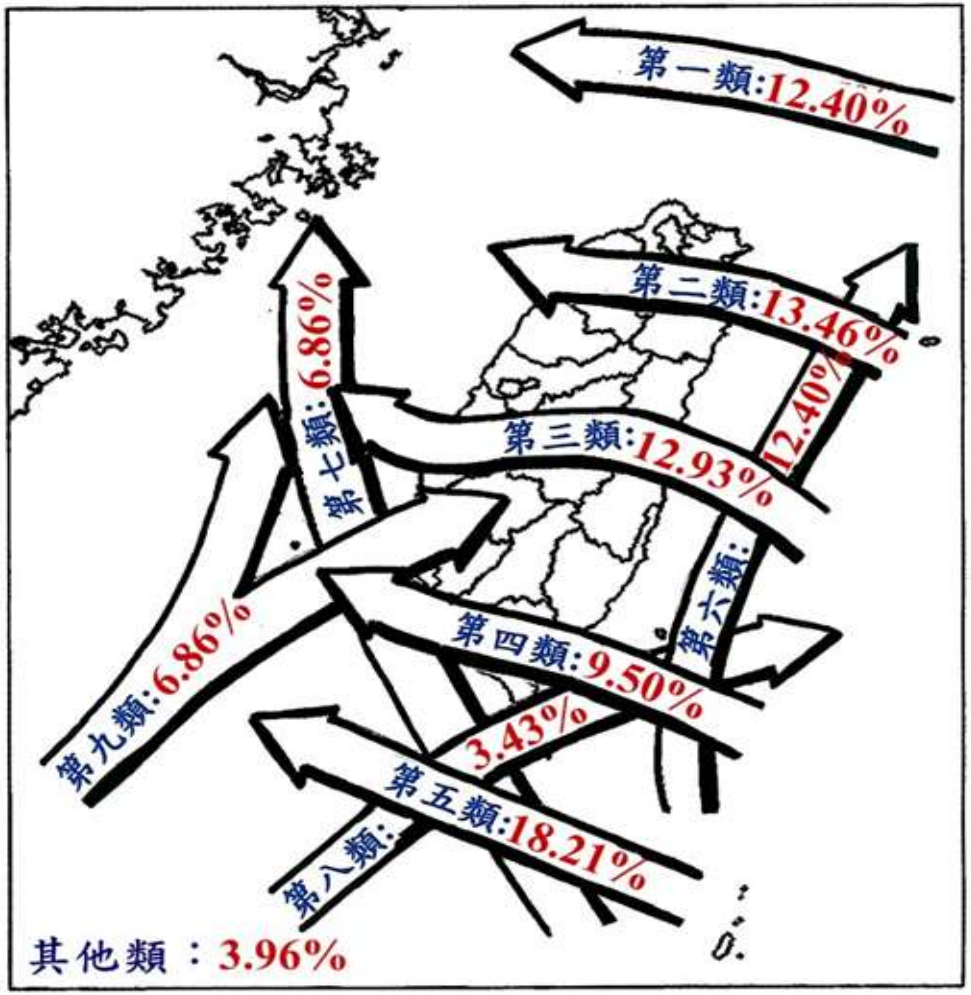
- **Average annual rainfall：**
  - **2,900 mm/yr. on the plains**
  - **4,500 mm/yr. in the mountains**
- **Avg. 5.2 typhoons/yr. hit in the past 10 years.**
- **Uneven rainfall**



Strong typhoon intrusion times



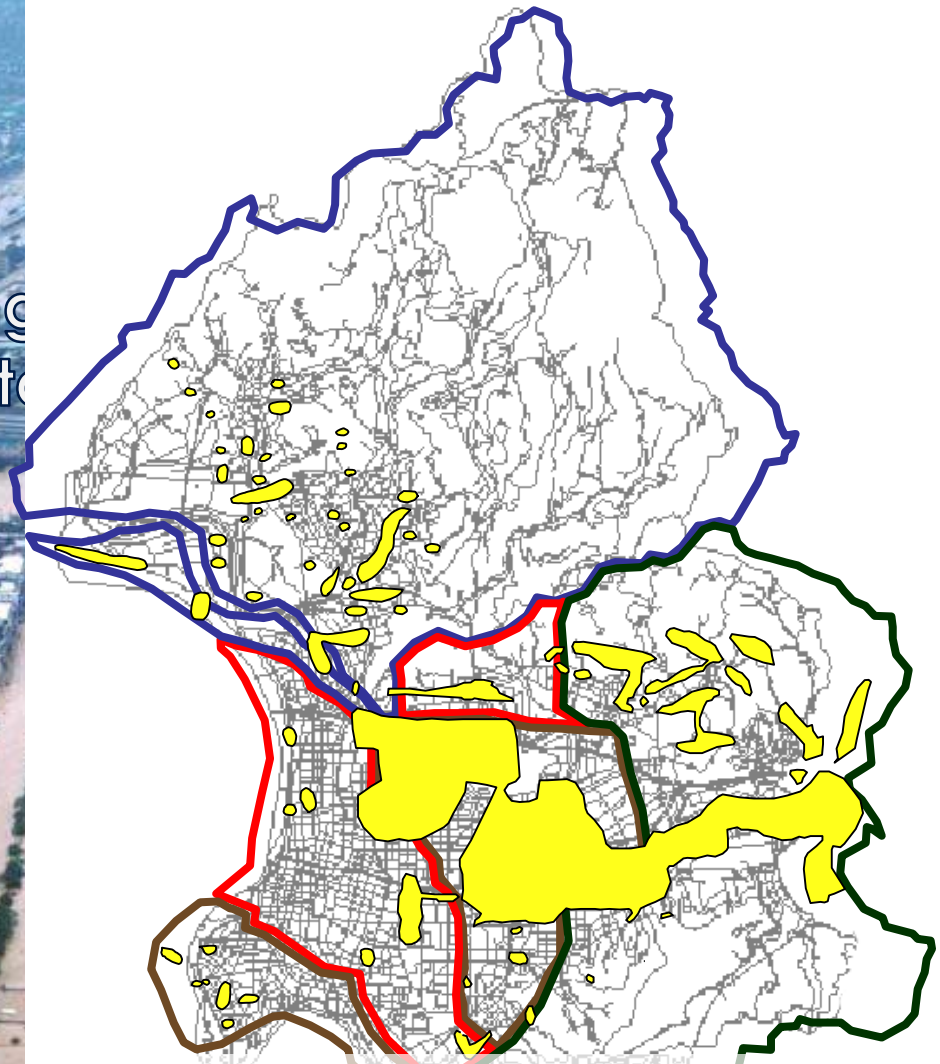
Typhoon Soudelor



Strong Typhoon Disaster 2001. 9.17, Typhoon Nari

Depth 0.5m~1.0m

Flooding in MRT



- max rainfall : 148.5mm/hr.
- Flood area : 43km^2

Strong Typhoon Disaster

2015. 6.14, Storm

Facing the challenges of extreme events and huge amounts of recovery costs

2. Flood Control Infrastructure in Taipei

2.Flood Control Infrastructure in Taipei

Flooding Prevention Scheme

"Taipei Metropolitan Flooding Prevention Scheme"

- **Issued in 1973,**
- **Comprised 3 principal pillars: Embankments, Drainage systems and Pumping station**

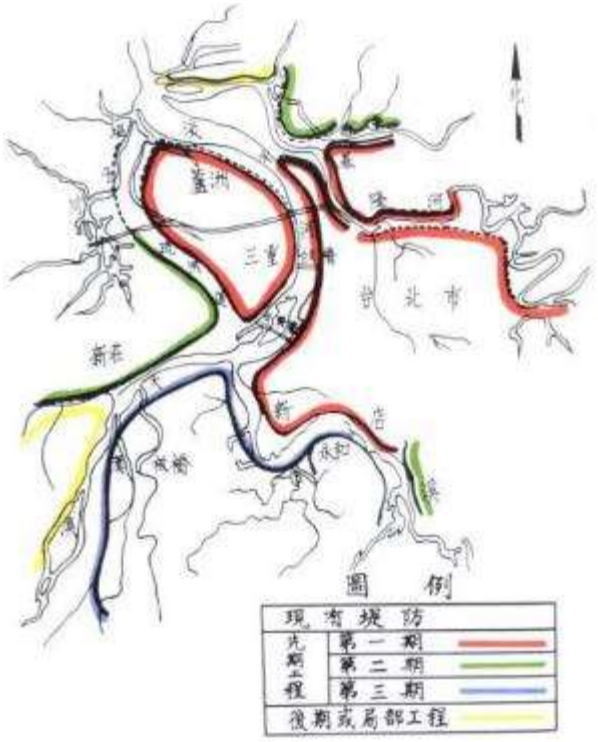
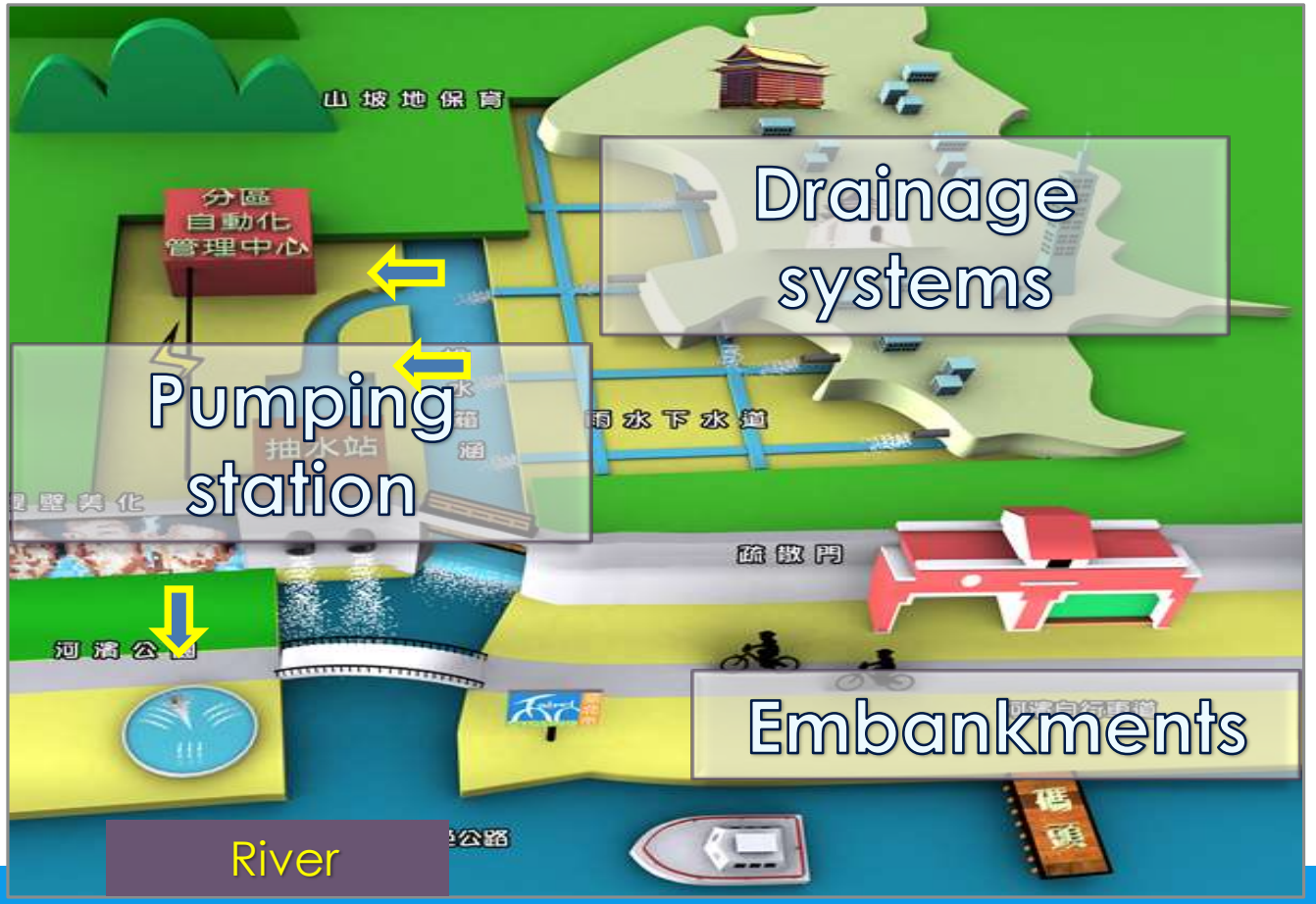
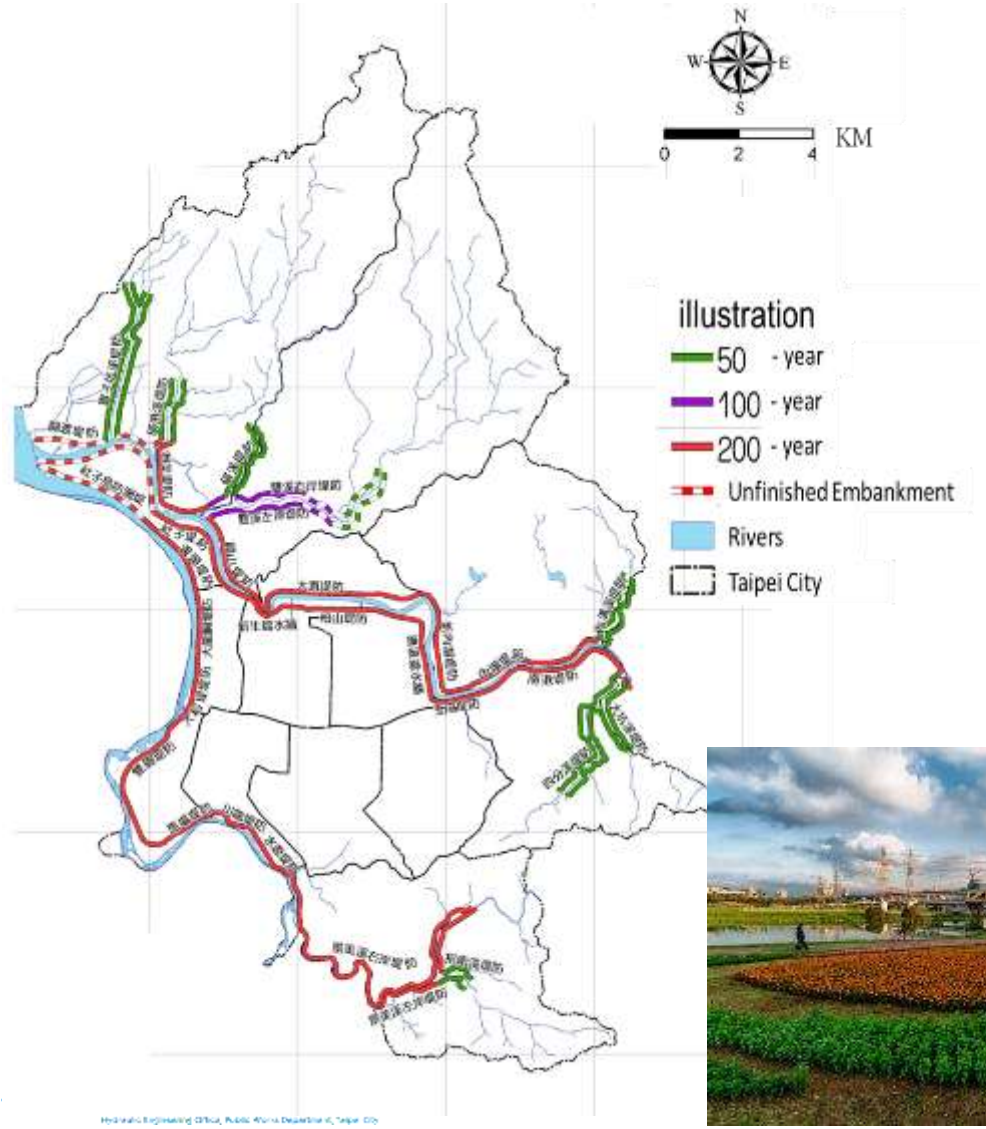


圖 1 台北地區防洪計畫(建議方案)實施程序



2.Flood Control Infrastructure in Taipei
Embankments



1. **Design Criteria (return period)**
   - Major river: **200 years**
   - Secondary river: 100 years
   - Tributary river: 50 years

2. **Achievement**
   - Scheduled length: 131 km
   - Completed length: 109 km
   - Completion proportion: **83.2%**

2.Flood Control Infrastructure in Taipei

Embankments

2.Flood Control Infrastructure in Taipei

Storm Drainage

1. Design Criteria (return period)

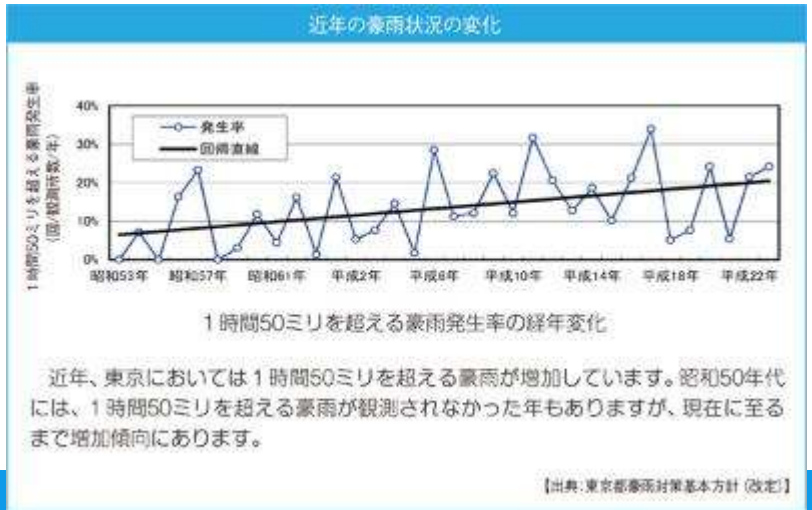
- Sewerage system: 5 years storm
- Designed Rainfall: **78.8 mm/hr.**

2. Achievement

- Scheduled length: 540 km
- Completed length: 522.2 km
- Completion proportion: **96.7%**

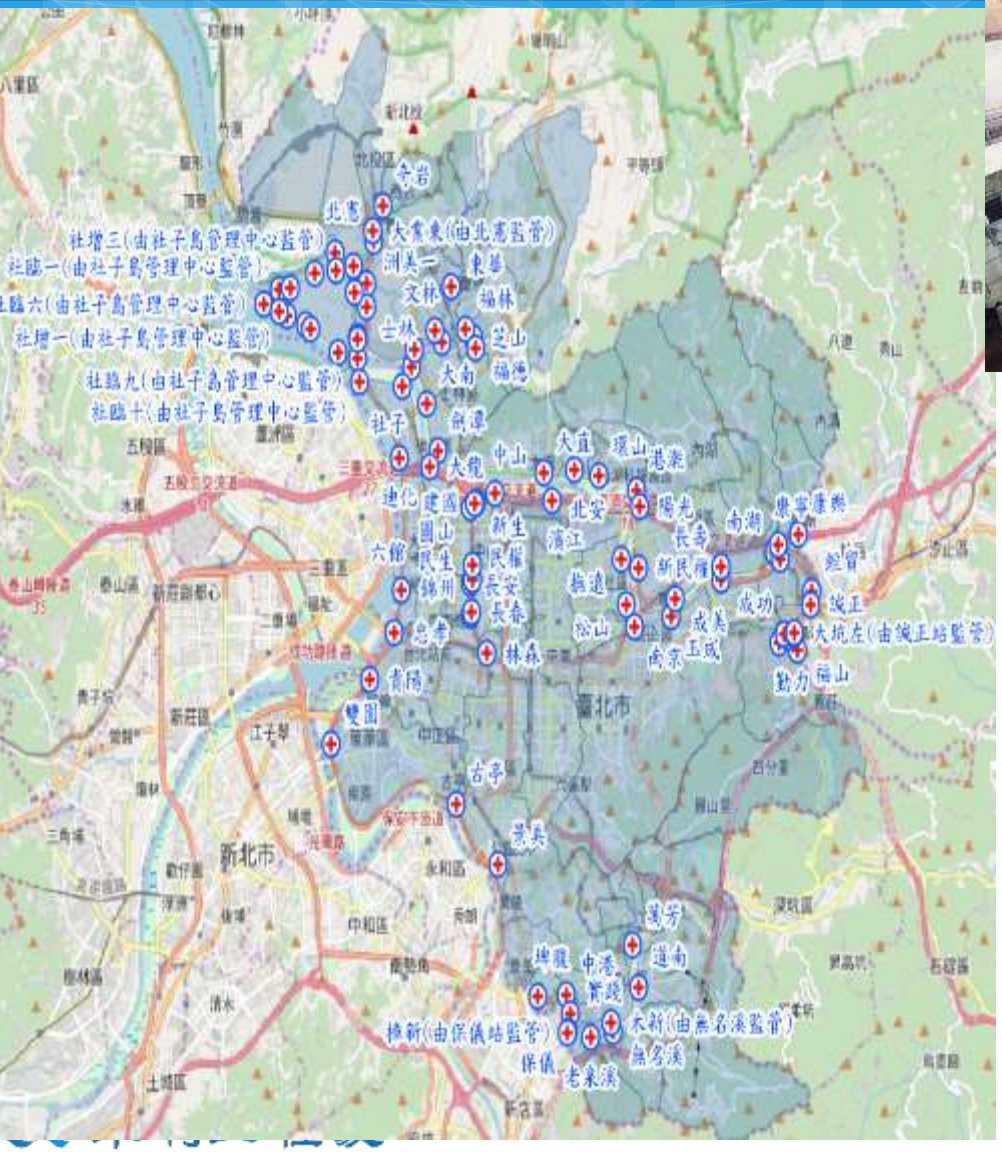
✓ **Designed Rainfall in Tokyo: 50 mm/hr, ➡ 75mm/hr**

大田区上池台の浸水状況（平成25年7月23日）



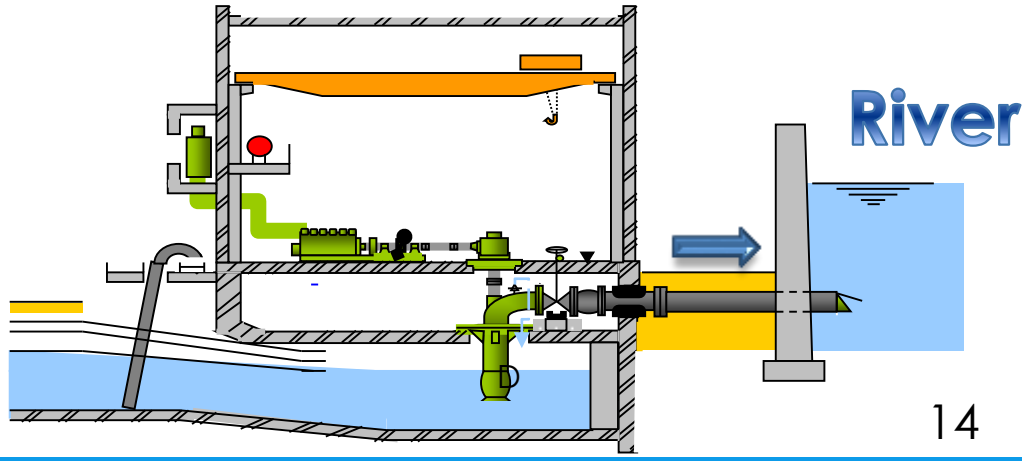
2.Flood Control Infrastructure in Taipei

Pumping station



Pumping station

- Number of pumping stations : 87
- Total discharge capacity : **2,195 cms**



3. Smart Flood Management

3. Smart Flood Management

Sponge City

Increasing Flood-Resisting Capacity

Smart governance

Smart City

Smart Flood Management

3. Smart Flood Management

4 parts

Scheduled maintenance

Riverside Patrol APP

- Riverside Park deletion report
- Electronic patrol point

Sewer Patrol APP

- Manhole and structure inspection
- Attached cable inspection

Pumping Station Patrol APP

- Daily equipment inspection
- Routine test report

Embankment Patrol APP

Monitoring

- Rainfall station
- Gauging station

- Storm drainage system monitoring
- River water level monitoring
- Water gate monitoring

GSN VPN INTERNET

- **Water Information Integration Platform**
- **Taipei Water Information App**

Controlling

Pumping Station Automatic controlling System

Land Lock and Water Gate Monitoring controlling System

Forecasting

Urban Flooding Potential Forecasting

River level Forecasting

Taipei city disaster prevention APP

Disaster prevention personnel

Public

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3. Smart Flood Management

Riverside Inspection

Scheduled maintenance

Monitoring

Controlling

Forecasting

Inspection → Report → Supervision → Repair → Re-check → Finish

Inspection groups start inspection

Defects found and uploaded to app

Collect the cases and assign to management station to execute

Improve the defects

Inspection groups recheck

3. Smart Flood Management

Sewer Inspection

Scheduled maintenance

Monitoring

Controlling

Forecasting

Inspection	Report	Supervision	Repair	Re-check	Finish
Outsourcing Inspection groups start inspection	Defects found and uploaded to app	Staffs check the cables falling off	Improve the defects	Inspection groups recheck	

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3. Smart Flood Management

Pumping Station Inspection

Scheduled maintenance

Monitoring

Controlling

Forecasting

Inspection	Report	Supervision	Repair	Re-check	Finish
Outsourcing Inspection groups start inspection	Defects found and uploaded to app	Staffs check when the equipment falls	Improve the defects	Inspection groups recheck	

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3. Smart Flood Management

Flood Control Infrastructure Inspection

Implement 3-stage flood control infrastructure inspection in non-flood-period (from December to next April) each year.

Recheck

(From Apr 1st till the end of the month)

Typhoon sea warning

Storm above certain level

Taipei city Earthquake intensity above 4

Unscheduled Inspection

Second Stage Check

(From Feb 1st till the end of the month)

First Stage Check

(From Dec 1st till next 15th Jan)

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3. Smart Flood Management

Advantages of Scheduled maintenance

Scheduled maintenance

Monitoring

Controlling

Forecasting

Electronic process Easy to control

Paperless carbon reduction

Simple access higher efficient

Convenient data management and analyze

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3. Smart Flood Management

CCTV & Monitoring

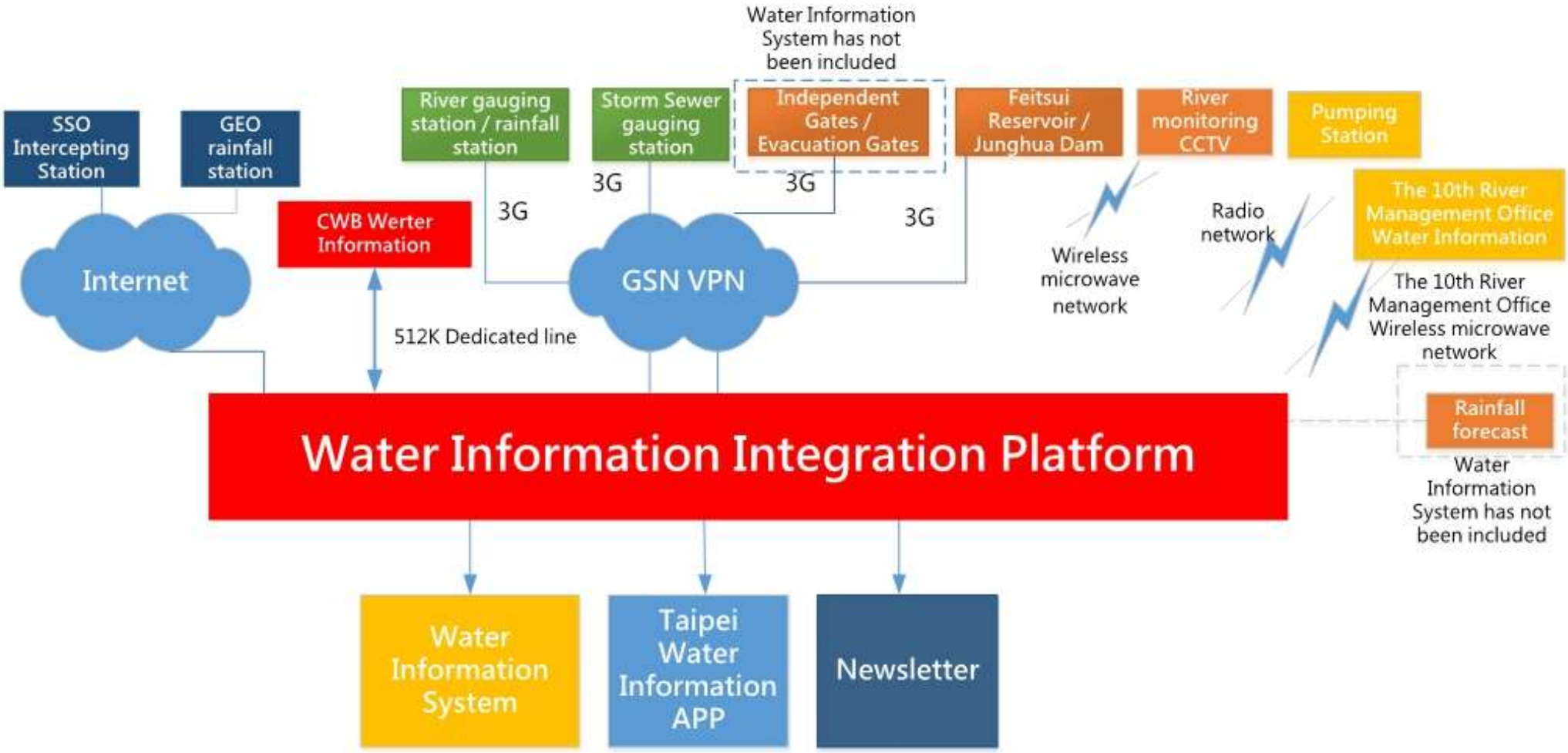
Scheduled maintenance | **Monitoring** | Controlling | Forecasting

- 25 spots of river water level monitoring
- 156 spots of storm drainage system water level monitoring
- 59 spots of CCTV river monitoring

3. Smart Flood Management

Integration platform

Scheduled maintenance | **Monitoring** | Controlling | Forecasting



3. Smart Flood Management

Mobile app

Scheduled maintenance | **Monitoring** | Controlling | Forecasting

- rainfall
- river water level
- storm drainage System
- pumping stations
- radar maps
- videos and warning information **into the mobile app to keep track of water information.**

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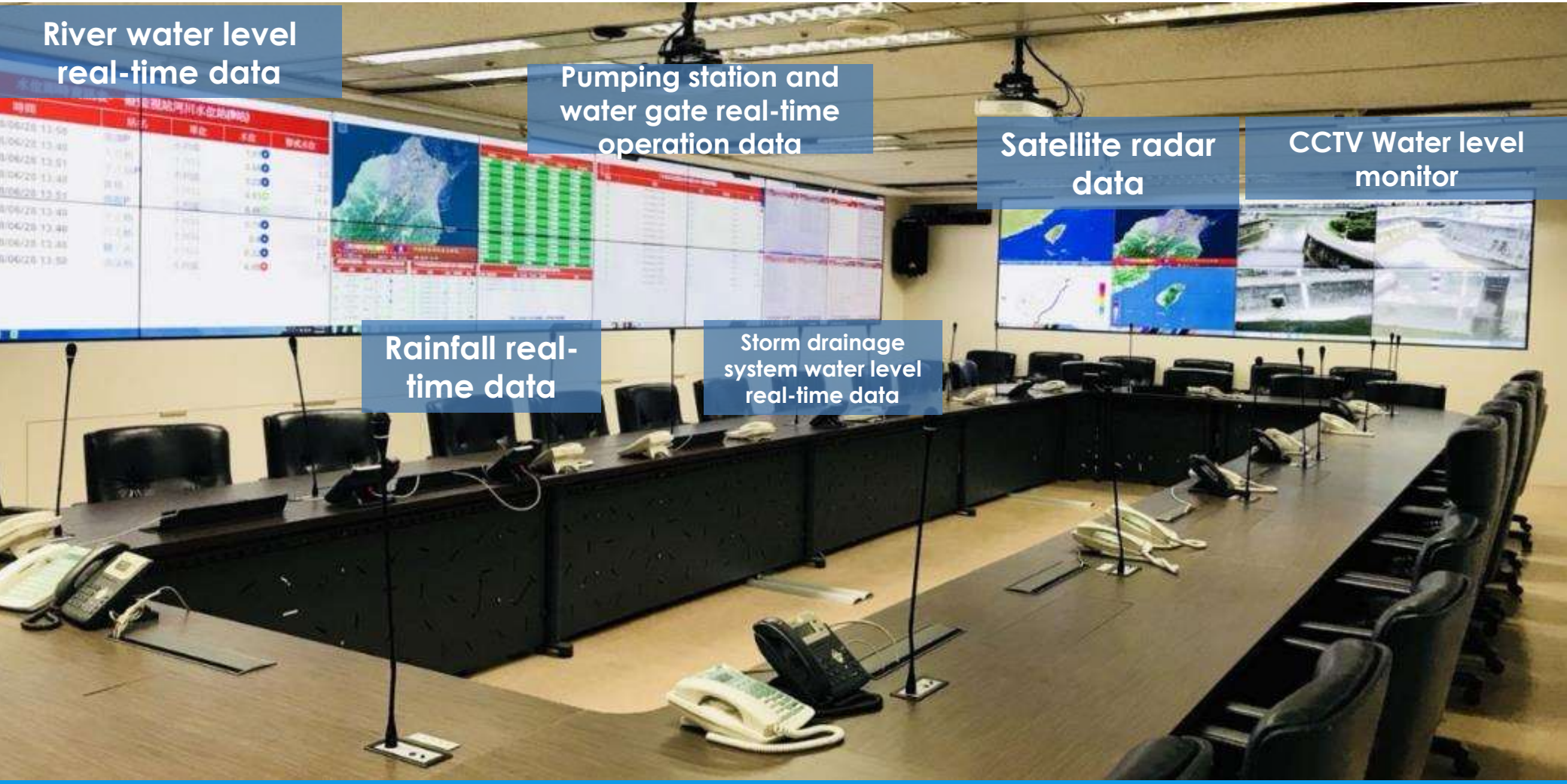
3. Smart Flood Management

Typhoon Emergency Center

Scheduled maintenance | **Monitoring** | Controlling | Forecasting



3. Smart Flood Management

Pumping Station Automatic control System

Scheduled maintenance | Monitoring | **Controlling** | Forecasting

Automatic Control System

Pumping station Control &Monitoring system — **Automatic Operation**

internet

District Management Center — **Remote Control**

internet

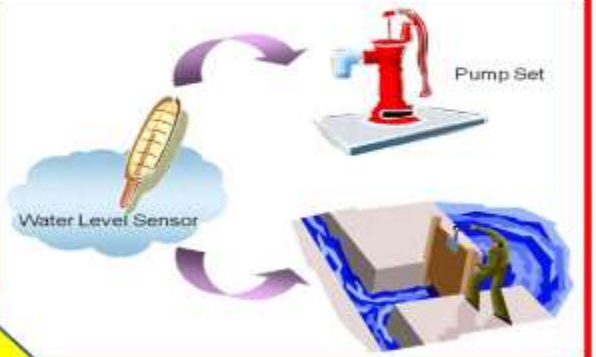
General Management Center/Flood control headquarters — **Remote monitoring**

效益:

1.Enhancement of flood safety
2.Improvement of maintenance quality

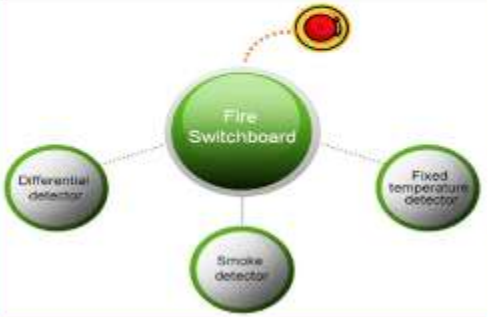
Automatic Operation:

Base on inner water level to start pumping machine



Fire Alarm:

Set up the different detector for alarm which provide prior notification of accidents



Remote Control:

The District Management Center control pumping machine and receive information through internet

Burglar Proof Security:

Set up infrared sensor and camera to ensure safety

3. Smart Flood Management

Pumping Station Automatic control System

Scheduled maintenance | Monitoring | **Controlling** | Forecasting

FLOW CHART

Command Center — Monitored

- The First Management Center — Monitored
- The Second Management Center — Monitored

Remote Surveillanc

Division 1 — control	Division 2 — control	Division 3 — control	Division 4 (Under Construction) — control	Division 5 (Under Construction) — control	Division 6 (Under Construction) — control	**Remotely controlled**
10 stations	15 stations	11 stations	22 stations	12 stations	17 stations	**Automatic operation**

3. Smart Flood Management

Pumping Station Automatic control System

Scheduled maintenance | Monitoring | **Controlling** | Forecasting

Traditional operation is highly relied on trained staffs on duty 24 hours

Automatic control System:
Optimized operation, fewer human force needed

Computer

Programmable Logic Controller

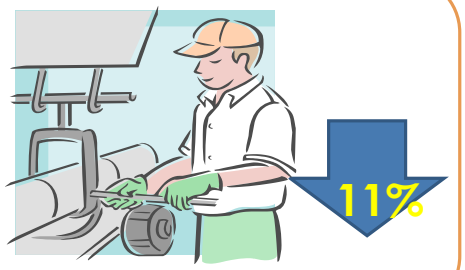
Command center ⟺ Divisions ⟺ Stations

Computer &PLC

3. Smart Flood Management

Advantages of Automatic control System

Scheduled maintenance | Monitoring | **Controlling** | Forecasting



- **Save 11% human force needed**
  - Some smaller pumping stations can be totally operated by the system without staff watching.
- **Optimized operation procedure**
  - Optimized operation can be precisely used to operate the pumps according to the oscillatory water level, and reduce flooding risk more effectively.
- **Enhance maintenance quality**
  - The system can monitor the water level of the pumping system and gave feed back or warning when any unusual condition occurred. It's quite helpful for unexpected malfunction situation and enhance maintenance quality.

3. Smart Flood Management

Forecasting System

Scheduled maintenance | Monitoring | Controlling | **Forecasting**

Flood Simulation

- Simulate the potential disaster of rainstorm flooding
- Simulate the range of river overflowing

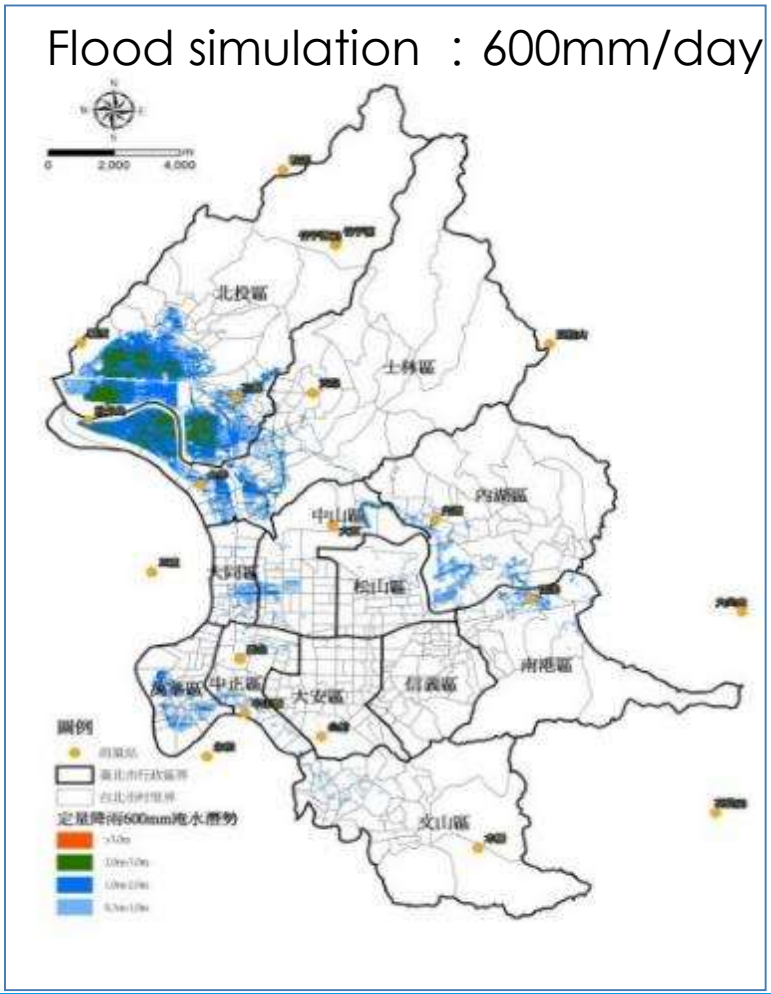
Flood hazard preservation program

Forecasting

- Inundation potential forecasting
- Immediate flood level forecasting

Send immediate notification and warning notification

Flood simulation ：600mm/day



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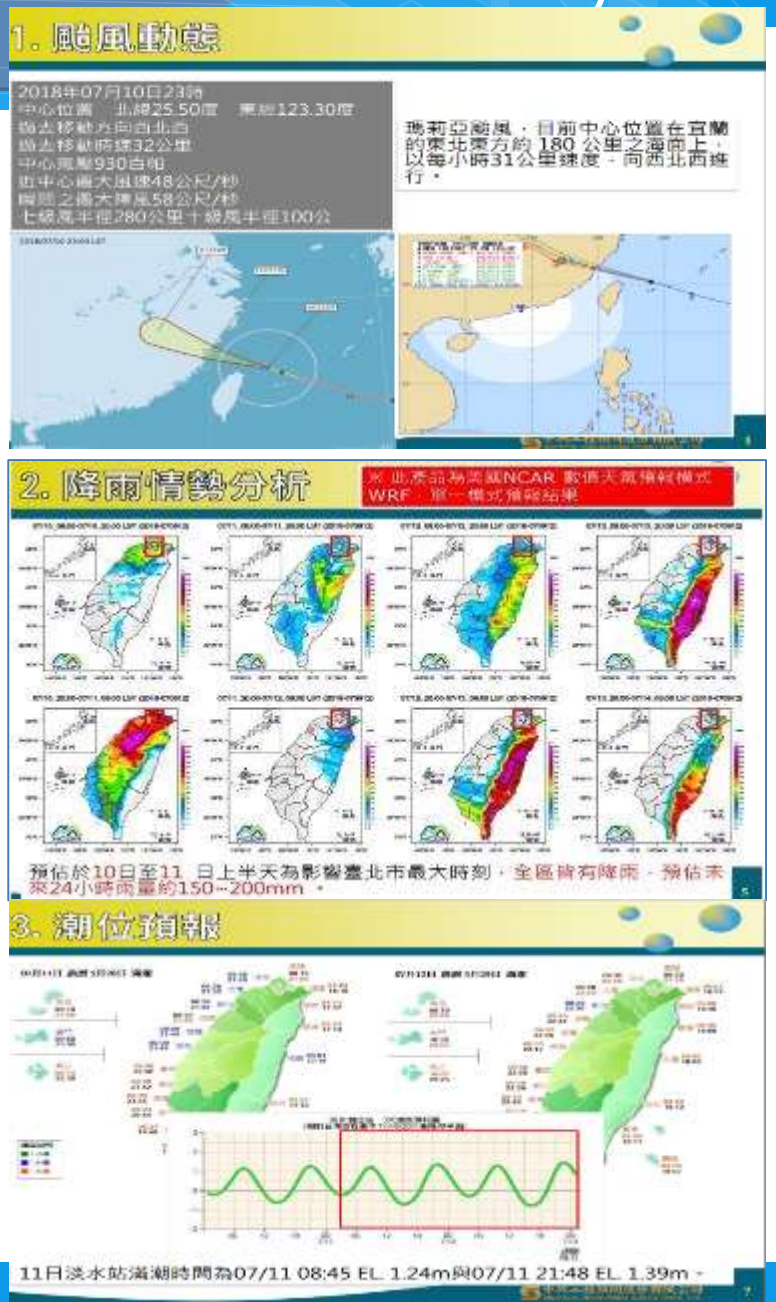
3. Smart Flood Management

Rapid Correct Precise

Disaster Prevention and Rescue System

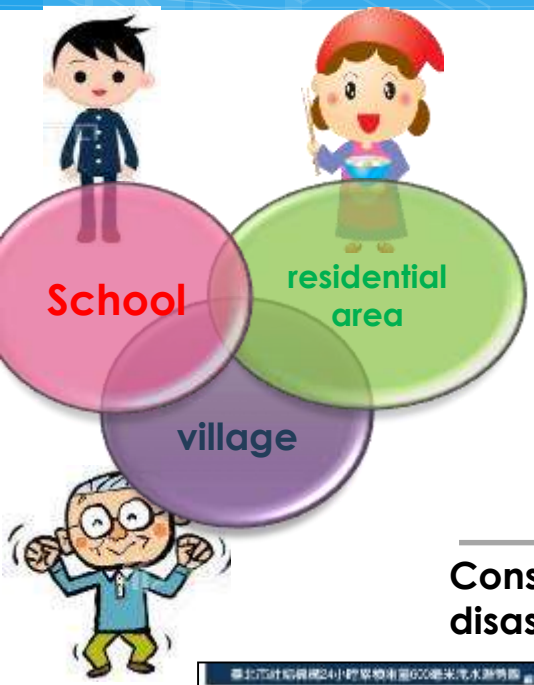
- Analysis of heavy rain, flood and typhoon dynamics
- Automatic sending message of rainfall and water level
- Historical ponding area
- Handling the disastrous situation and range
- Automatic control and monitoring system of rainwater pumping stations

Rescue System



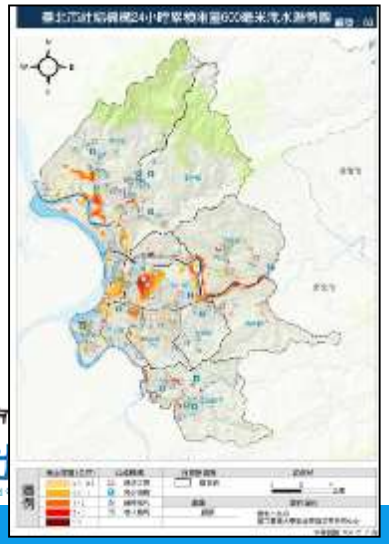
3. Smart Flood Management

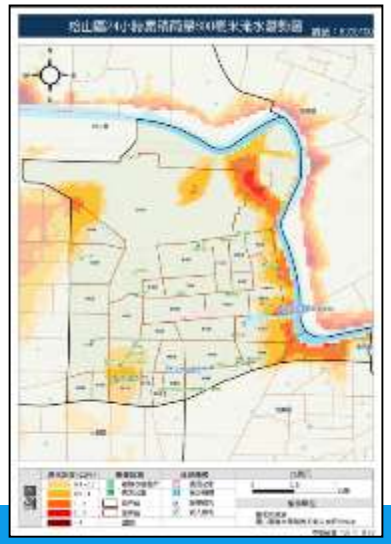
Before the Disaster



Organization

Construct the adequate disaster prevention system





Information Disclosure

Receive disaster potential information

Disaster prevention drill

Promote the response ability of rescuers

3. Smart Flood Management

Information Disclosure and Response

During the disaster

Information Inquiry

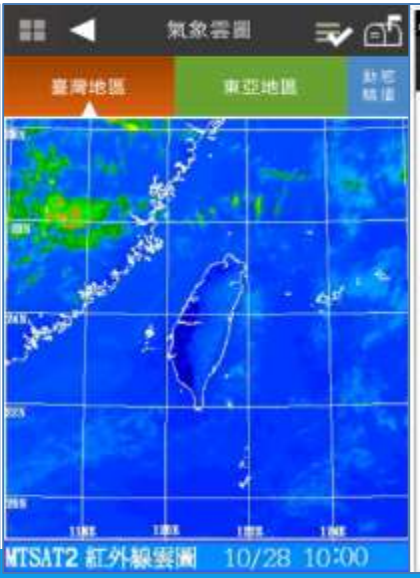
Public inquiry for resident

Alerting and Warning

Push notification of the up-to-date disaster prevention information

Feedback mechanism

Mobile Survey APP



4. Conclusion

4.Conclusion

- Facing the challenge of the climate change , the strategy is "Disaster prevention is more important than Rescuing, Keeping the disaster away is better than preventing it. "
- The Taipei City Government has actively promoted Smart City and strengthened Smart Flood Management. Now using the information technology, government can prevent disaster efficiently.
- The Taipei City Government will continue to improve the monitoring quality and ensure the accuracy of flooding information. With the Smart Flood Management, we could make the disaster prevention and rescue more efficiently, accurately and safely during the typhoon and strom in the future.

Thanks for Listening!