Yokohama's Revised Flood Hazard Map — More resiliency for intensifying rainfalls

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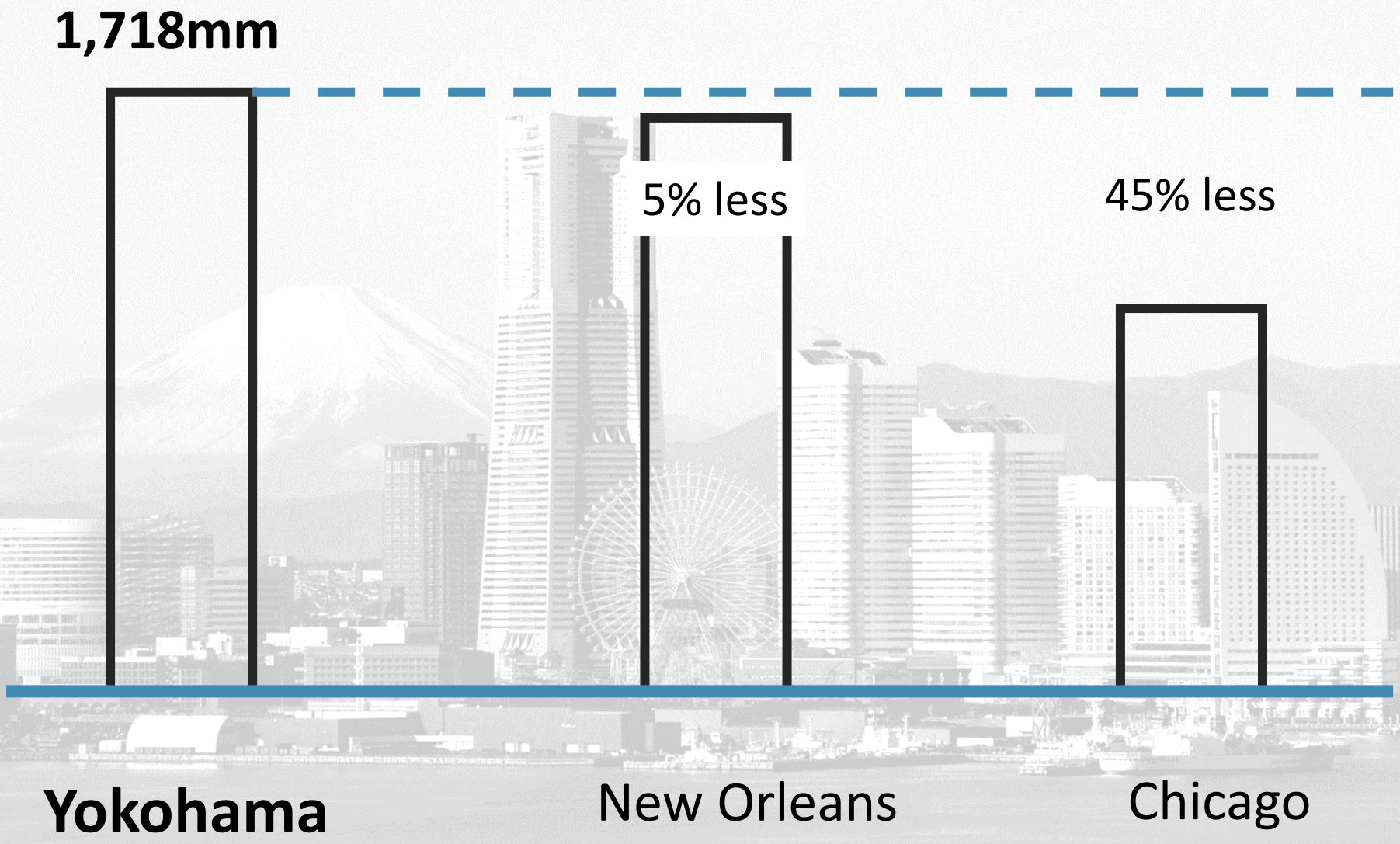
Today's Presentation

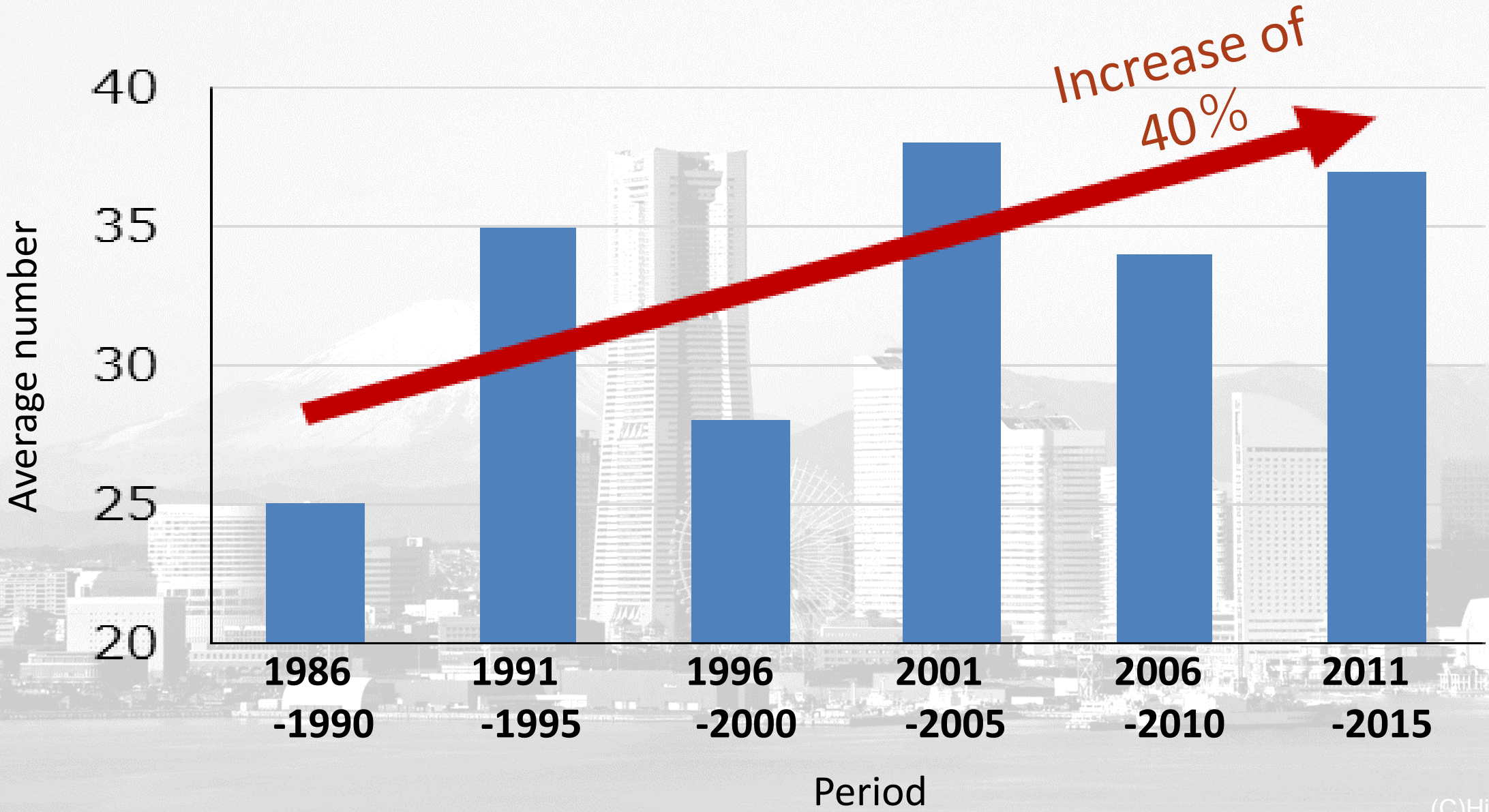
1. Introduction
2. Yokohama's Flood Control Measures
3. Flood Map Policy
4. Conditions of Numerical Simulations
5. Improved Communication to Citizens
6. Conclusion

Introduction of Yokohama

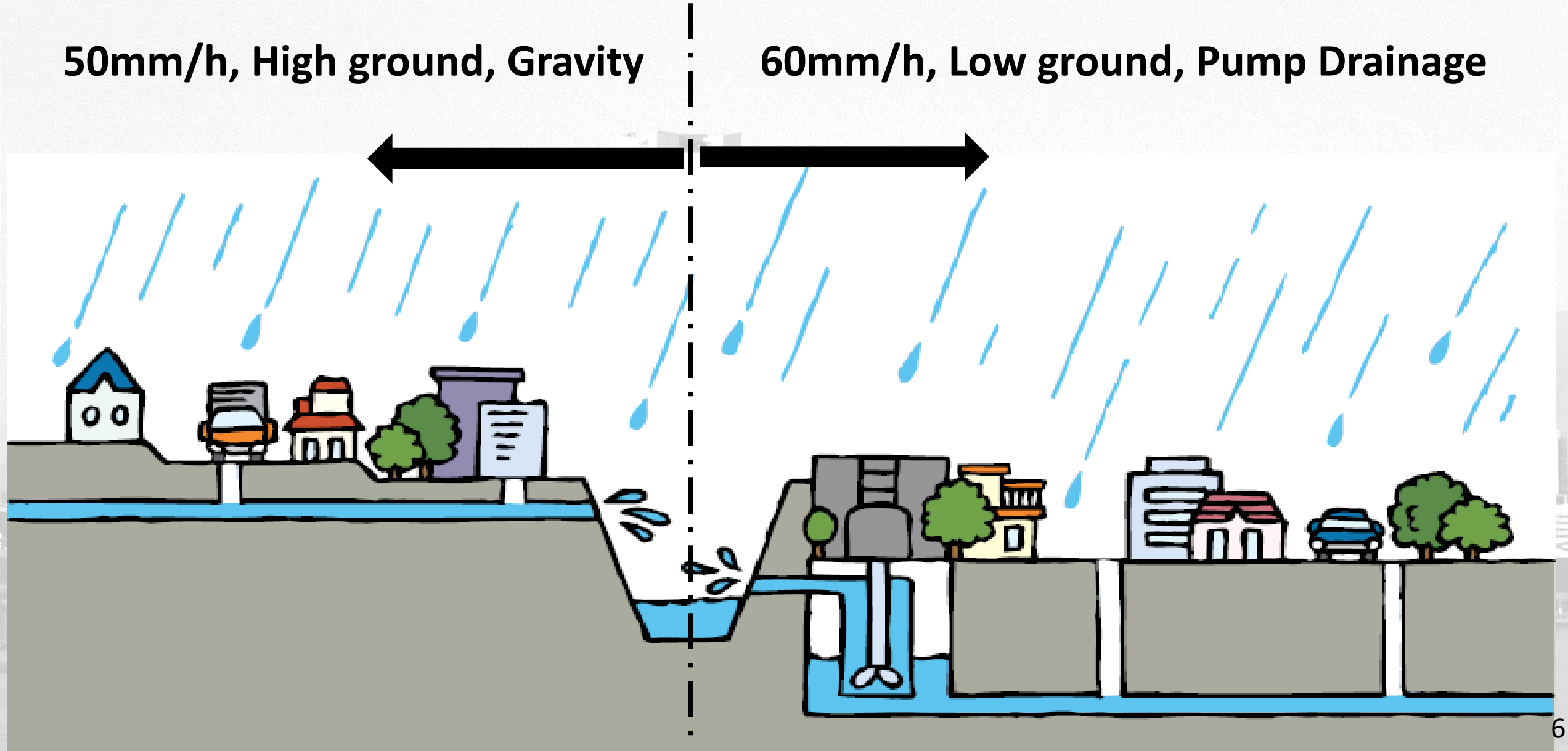
Introduction, Annual Rainfall



Increase in the average number of heavy rainfall events

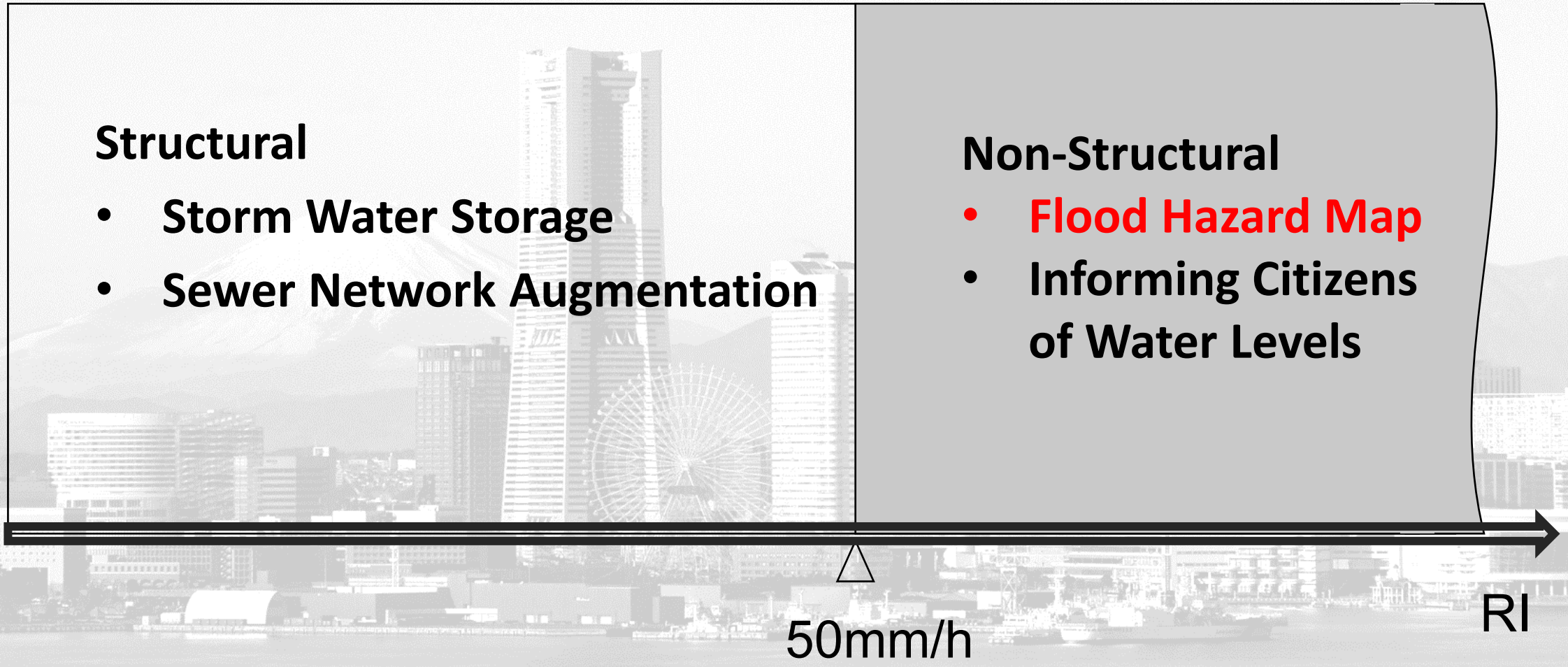


Flood Control Measures: Targets & Structural Solutions



Non-Structural Solutions

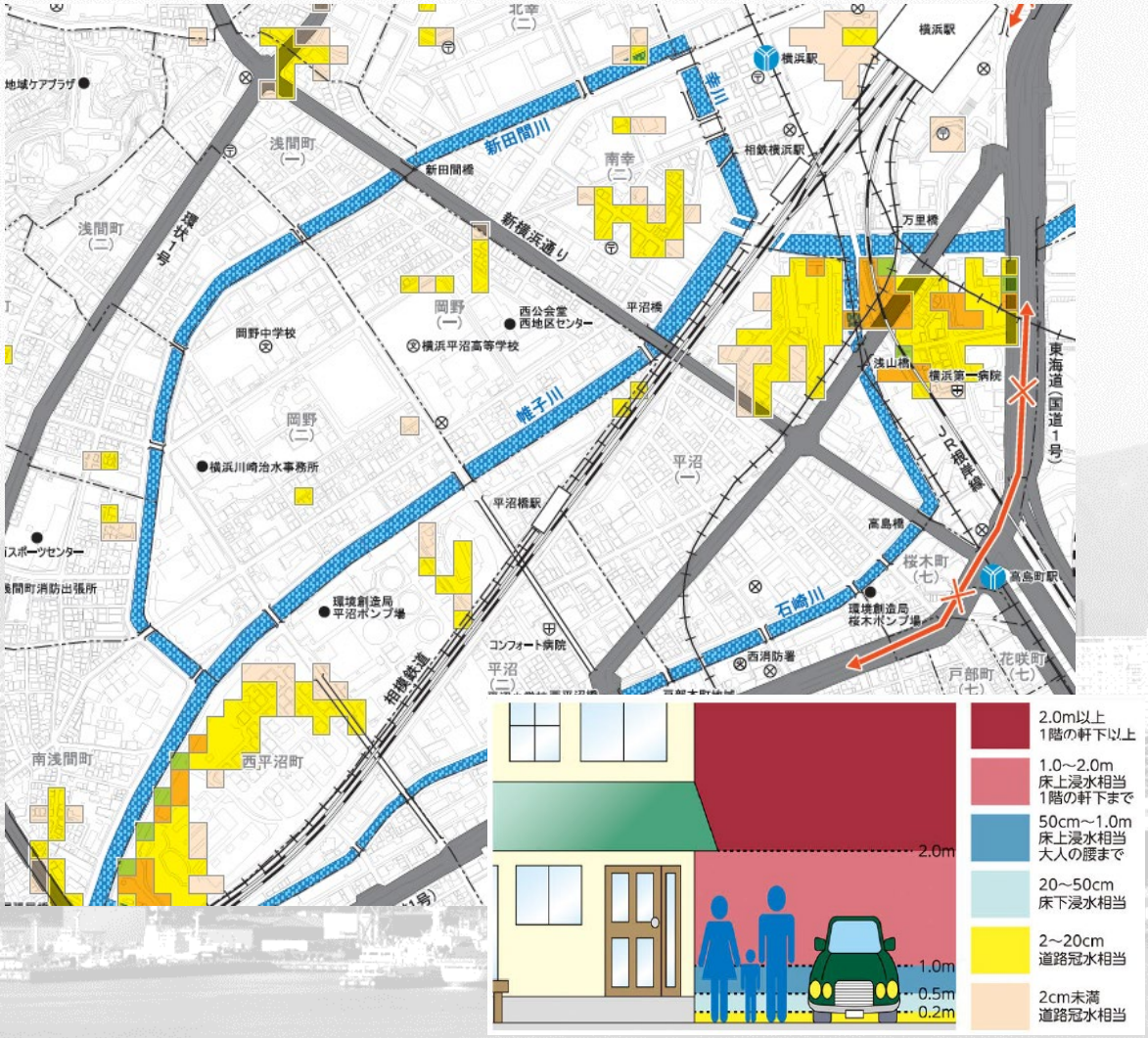
Ex. Gravity Drainage



What are Flood Hazard Maps?

・Area and depth of flooding expected when rainfall exceeds the capacity of drainage facilities is shown

・Helps residents save themselves and others



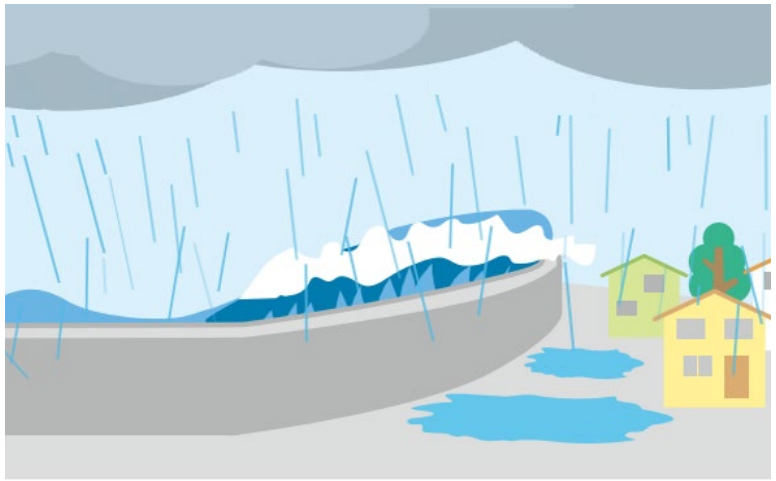
What are Flood Hazard Maps?

- Japan's Flood Prevention Law distinguishes flood causes.

Lack of Sewer Capacity

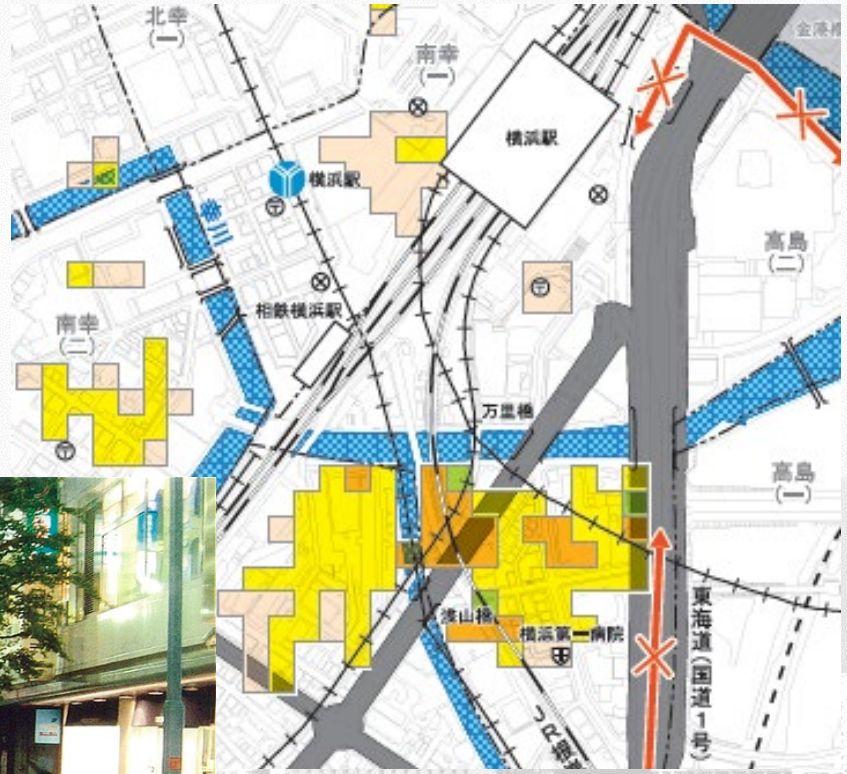
Breach of Flood Barrier

Storm surge



Flood Hazard Map 2014

Rainfall Intensity:
76.5mm/h, Maximum
Recorded in Yokohama,
2004



Need for Updating

- **Record rainfall of 100mm/h observed**
- **Revision of flood control law, 2015**
- **Progress in Sewerage Projects**

Start updating hazard maps in 2019

Flooding Simulation for Yokohama

Model	Software
Pipe Model	MIKE URBAN 2019 (Release 2019 update 1)
Ground Surface Inundation Analysis Model	MIKE 21 FLOW MODEL (Release 2019 update 1)
1D and 2D data creation and editing	MIKE ZERO 2019 (Release 2019 update 1)

・Pipe model also includes model of river to which the water is to be discharged

Rainfall Intensity in Revised Hazard Maps

・Assumed maximum rainfall according to the Flood Prevention Law: 153mm/h

・Observed in Chiba, about 100km away from Yokohama.

Input conditions for simulation

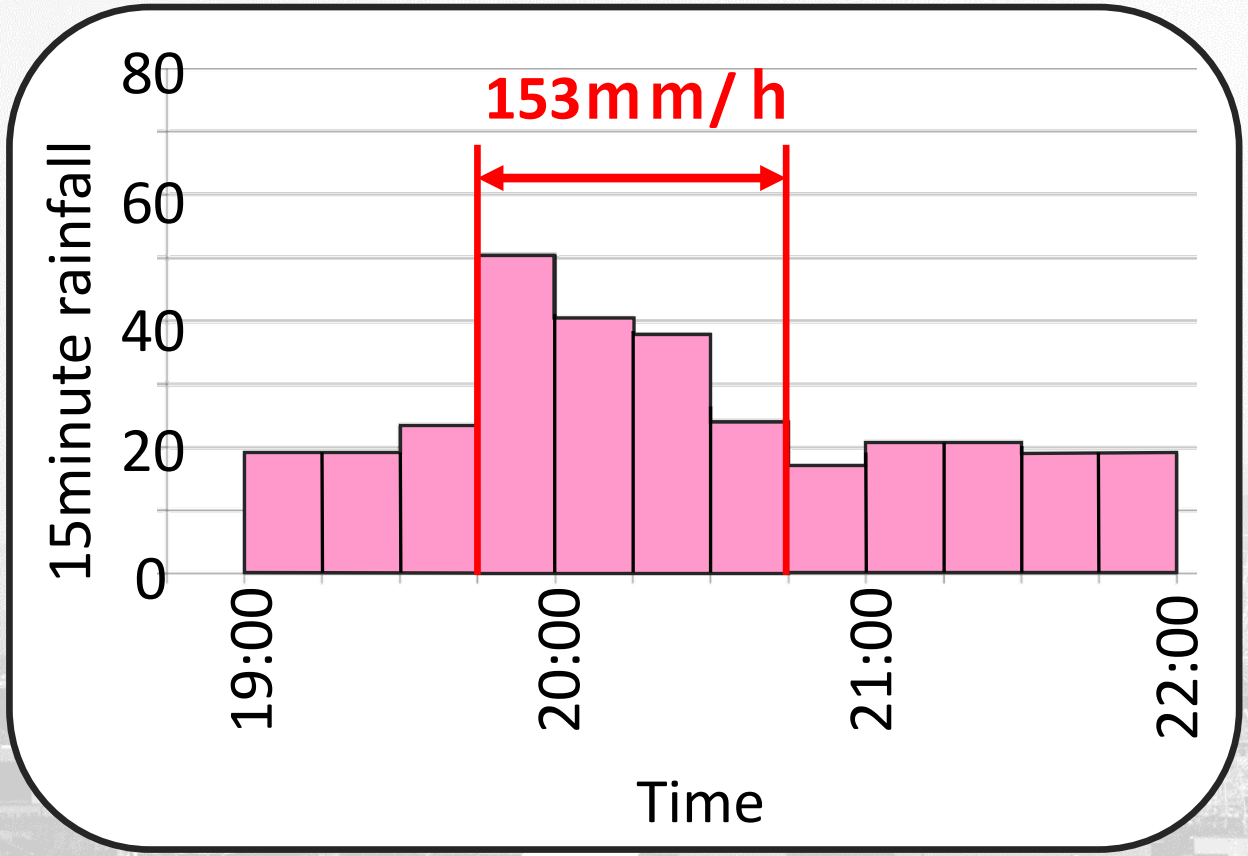
1. Hyetograph

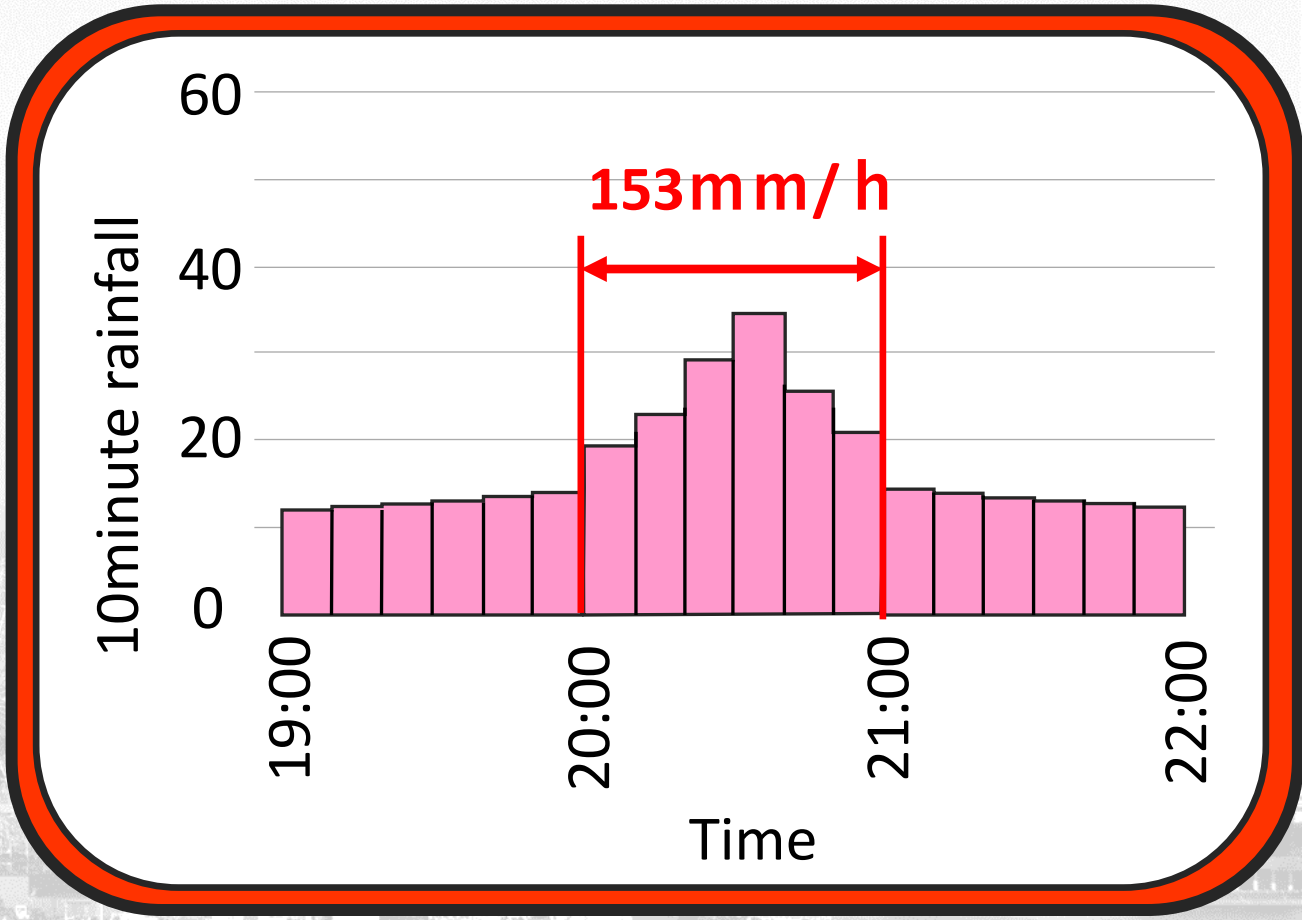
2. River level

Simulate with multiple scenarios and compare visually to choose one

Hyetograph for 153mm/h

Actually Observed vs Centered Peak





Possibility of Change

Commonly Used

River Water Levels, Boundary Condition

Realistic Scenario of Flooding

Unsteady RWLs

- Overflows once RWLs exceed floodwall
- Overflows ignored

Steady RWLs

- Current floodwall height
- Planned high WL

Riverside Areas for MS Analysis

8 Simulation Scenarios

RFs: 2 Hyetographs

- Actually Observed
- Central Peak

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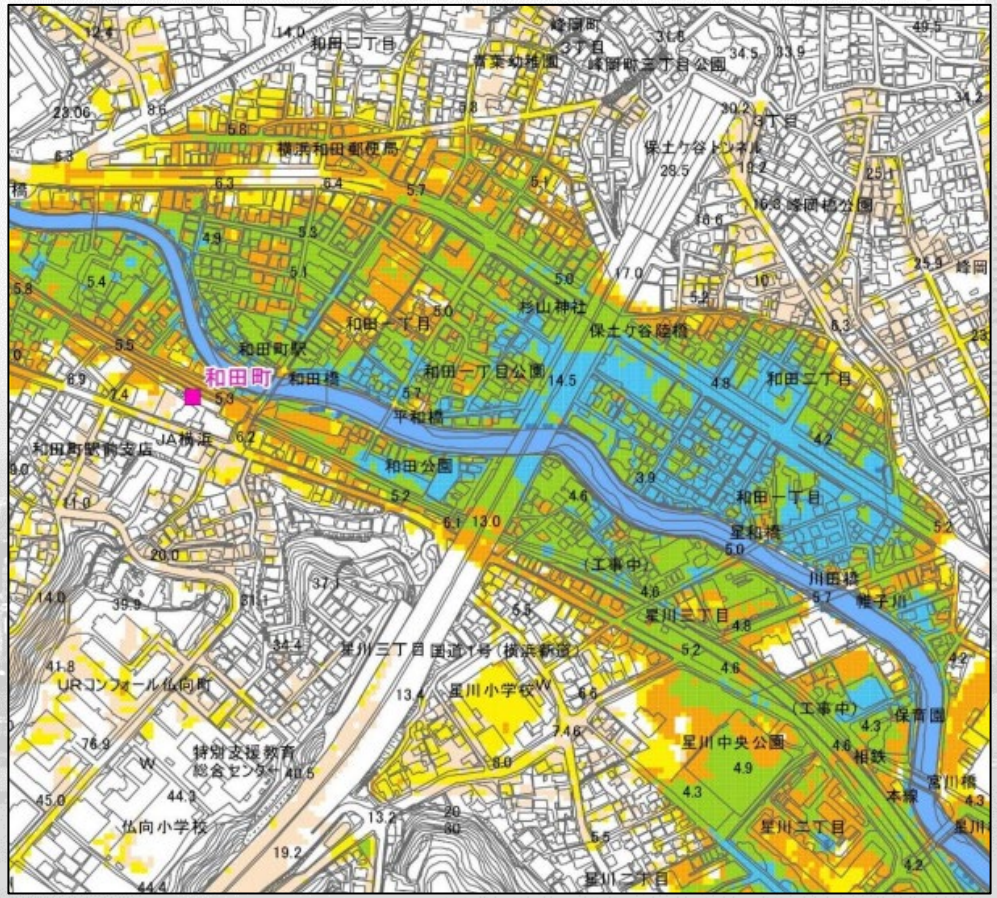
River WLs: 4 scenarios

- Unsteady with Overflows
- Unsteady without Overflows
- Steady as Planned HWLs, No OFs
- Steady as Current Floodwall H., No OFs

Simulations Results with 2 Hyetographs

Actual



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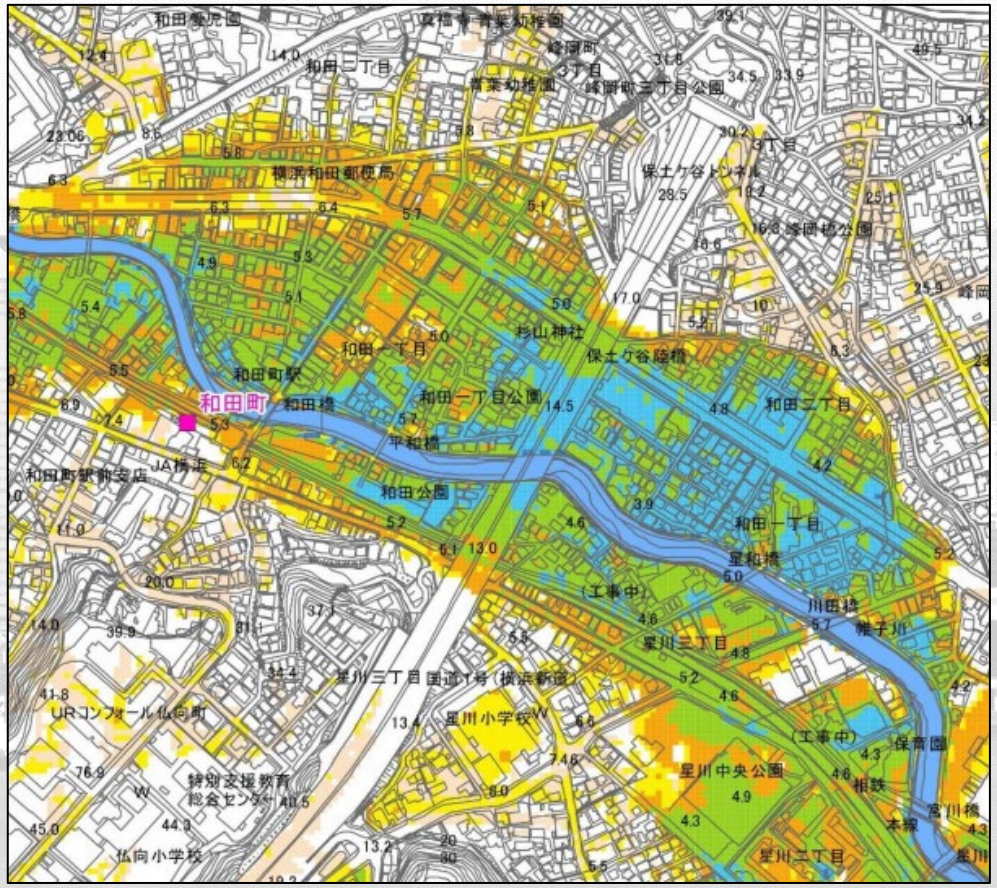
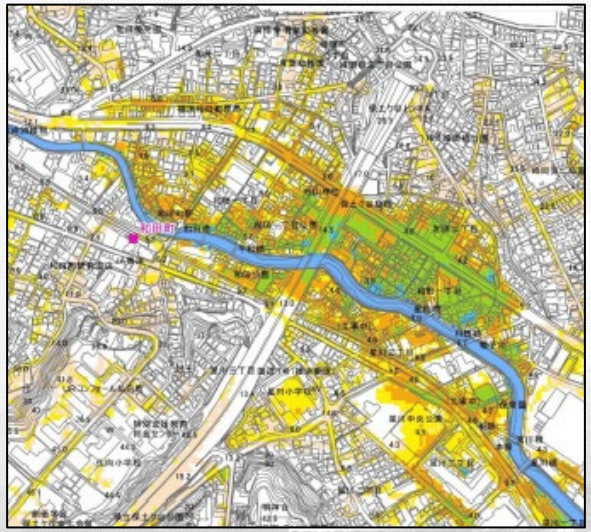
Central Peak

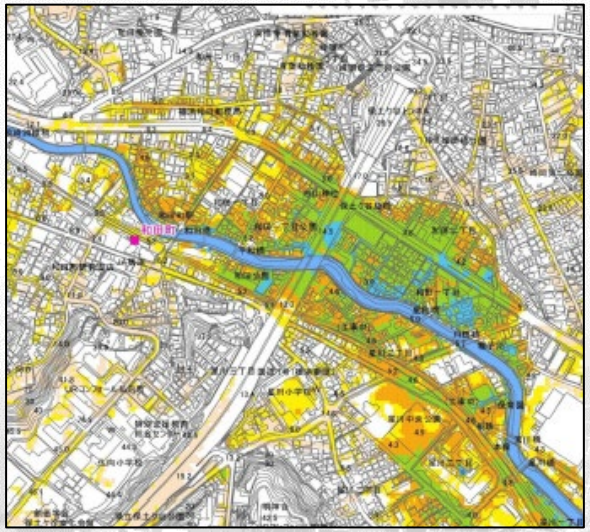


Flood Severities under 4 RWL Scenarios

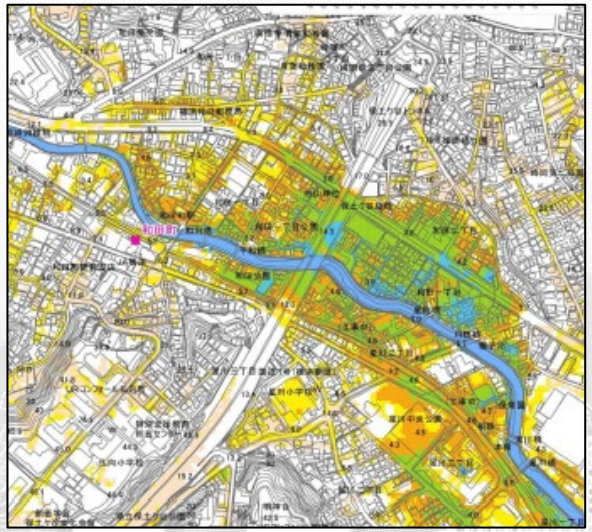
Steady;
Planned HWL
No overflows



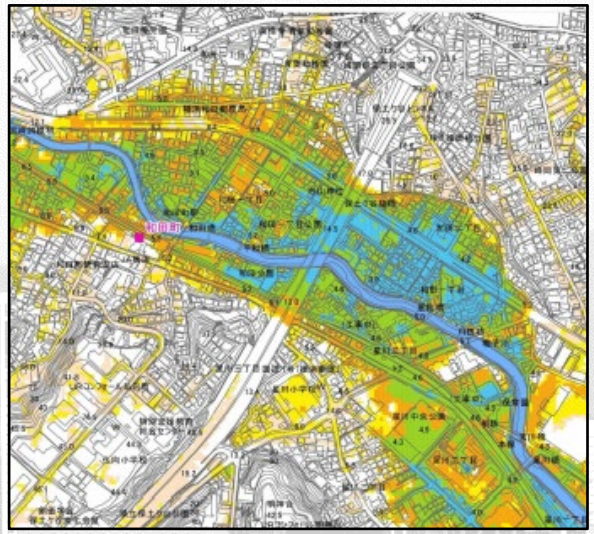
Unsteady;
No Overflows



Steady;
Current Floodwall Height
No overflows



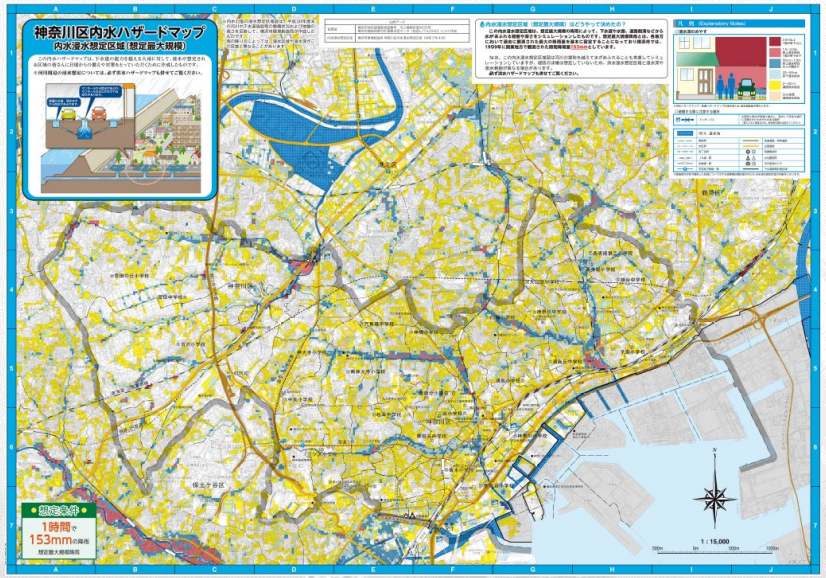
Unsteady;
Overflows



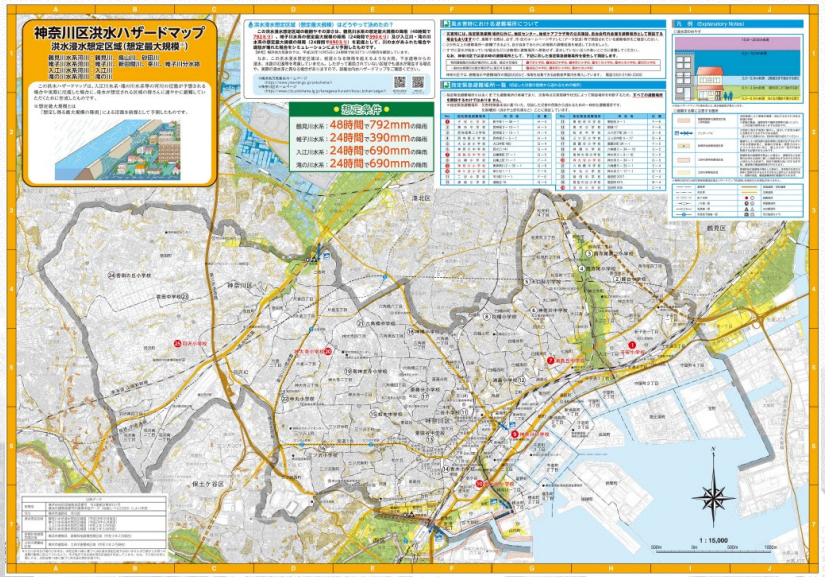
low **high**

Severity

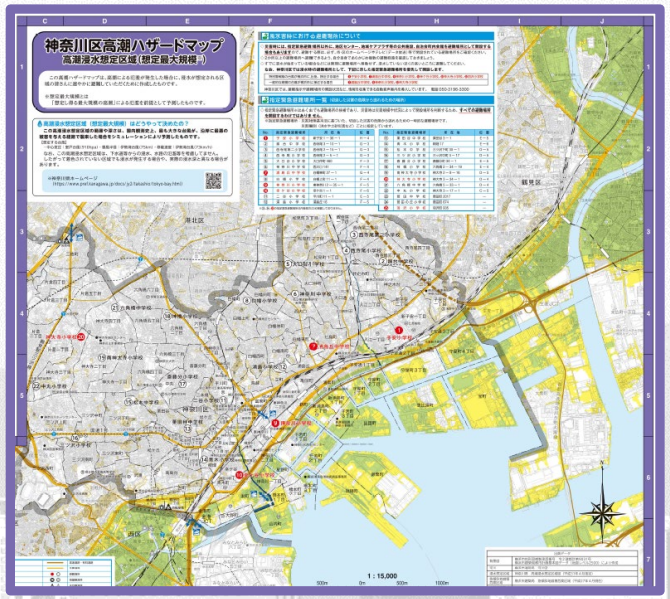
Improved Communication to Residents, Packaged Publication of 3 Maps



Flood Hazard Map



River Flood Map



Coastal Flood Map

Distributed to approximately 1.78 million people throughout the city, helping to raise citizens' awareness of disaster prevention

Conclusion

I hope that the efforts to raise awareness of disaster prevention through the City of Yokohama’s hazard maps introduced in this presentation will be of help to those who are working on flood countermeasures.

OPEN
YOKOHAMA

Thank you for your attention