
ICLEI
Local Governments
for Sustainability
WORLD
WATER
COUNCIL
WEBINAR SERIES
CitiesWithWater
TOO MUCH

WEBINAR SERIES CitiesWithWater TOO MUCH

Facilitator

Ms. Yoonjin Kim

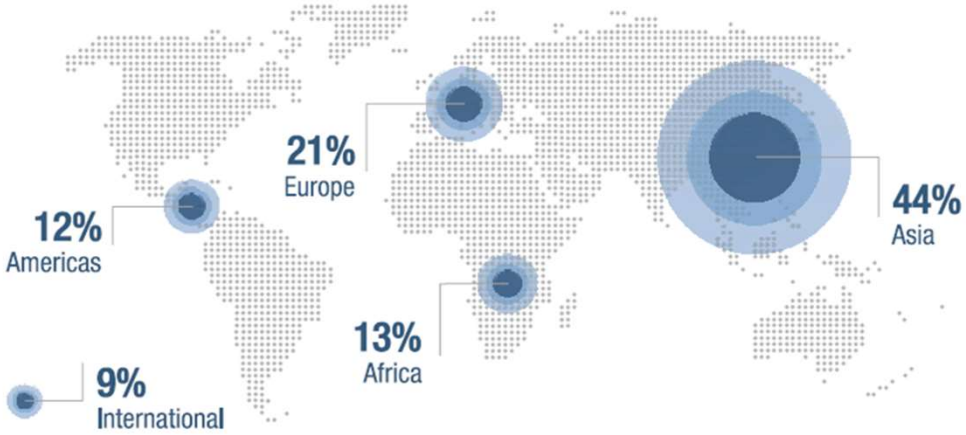
Director, Strategy and Development

WORLD WATER COUNCIL

Together we make water a political priority for all.

WORLD WATER COUNCIL

250+ members accross 50+ countries



An International Multi-Stakeholders Platform Organization

Created in 1996 to :

- **Promote political action, advocacy and hydrodiplomacy**
- **Bring together every stakeholders to enhance new innovative solutions to protect water**
- **Organize every three years the World Water Forum,** gathering more than 20 000 persons

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Local Governments for Sustainability

ICLEI'S REACH

ICLEI – Local Governments for Sustainability is a global network.

We have put 'urban' firmly on the sustainability agenda, working with and effectively advocating for local and subnational governments in the global arena for

30+ years

Working with

2500+

local & regional governments

Active in

125+

countries

WEBINAR SERIES CitiesWithWater

ICLEI & WWC Series of webinars 2025

>> highlight the experience of cities in developing urban water resilience

Webinar 1, **Too Little**: 26 March

Webinar 2, **Too Much**: 18 June

Webinar 3, **Too Dirty**: 10 or 17 September

Webinar 4, **International Partnerships**: November

ICLEI & WWC International Photography Competition

>> showcase and celebrate innovative local actions

Submit 1 photo in one or more of the following categories:
Too little water / Too much water / Too dirty water

Submission deadline: **30 June 2025**

Webinar 1 reflections

Mr Anton Earle

Global Coordinator: Water Systems

ICLEI

Webinar 1 - “TOO LITTLE”

Challenges:

- Climate change has increased the severity and frequency of droughts
- Rapid urban growth has led to over-abstraction
- Waste is a problem with non-revenue water over 30% globally

Call to action:

- Preserve sourcewater through catchment conservation
- Develop non-conventional sources
- Reclaim wastewater
- Treat water fit for use purpose
- Communication & stakeholder engagement

ICLEI & WWC International Photography Competition

A dedicated prize of **€1,000** per category and for the best **youth** entrant (18-29 years), courtesy of our generous sponsors:

Government of the Netherlands

Water as Leverage For Resilient Cities

ARUP

WORLD WATER COUNCIL

SURVEY :

In one word, what does your city most need to turn flood risk (or 'too much water') into resilience?

https://www.menti.com/al2svb2zn7m1

Join at menti.com with the code: 6213 9862

SURVEY :

When your city faces heavy rain or flood events; rank the factors in importance needed to protect people and assets?

https://www.menti.com/al2svb2zn7m1

Join at menti.com with the code: 6213 9862

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Speaker

City of Kumamoto

JAPAN

Mr. Kazufumi Onishi

Mayor of Kumamoto City

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WORLD WATER COUNCIL

Sustainable Groundwater Preservation and Measures for Flooding in Kumamoto City

- Water Cycle in Kumamoto
- Effective Groundwater Preservation Efforts Using Scientific Techniques
- Water-Related Disaster (Flood) Risk Reduction
- Conclusion

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Water Cycle in Kumamoto

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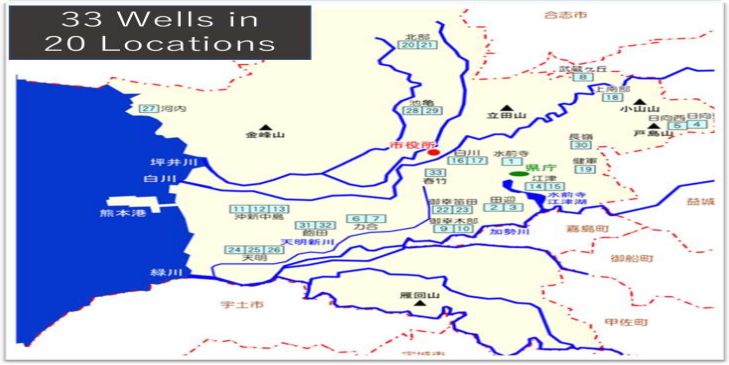
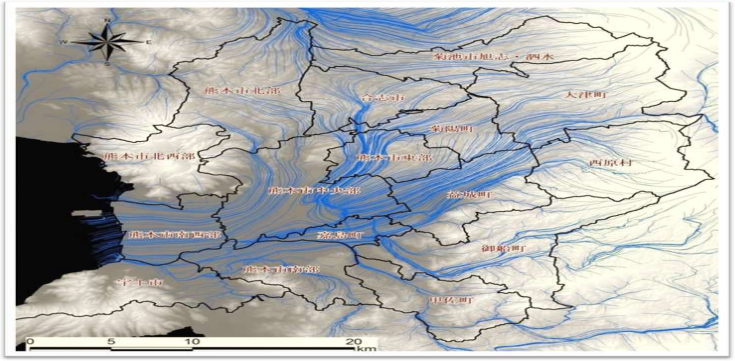
Kumamoto Groundwater Observation Wells



Visualizing Our Groundwater



Groundwater Recharge Forests

Field Flooding Between Crop Rotation

Effective Groundwater Preservation Efforts Using Scientific Techniques

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Kumamoto for SDGs

Water-Related Disaster Risk Reduction

River Basin Disaster Resilience and Sustainability by All

Comprehensive and multi-level water-related disaster prevention

Prevent Floods & Reduce Hazards

e.g. Channel modification, stormwater storage facilities, forest conservation, paddy field water storage

Reduce Exposure to Disaster

e.g. Promotion of redevelopment of decrepit buildings in the city center

Increase Disaster Resilience

e.g. Create hazard maps and raise citizen awareness of water-related disasters

▲Modified Section of the Shirakawa River

Water-Related Disaster (Flood) Risk Reduction

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Kumamoto for SDGs

Strengthen Flood Evacuation Plan

Never underestimate future disasters and conduct training courses to protect lives

■**Training city workers for disaster response during the pandemic**

Training on how to respond to various unexpected situations during disaster response while being cautious of the spread of COVID-19.

■**Training citizens for flood evacuation using VR (Virtual Reality)**

Collaboration with ICHARM-PWRI

Water-Related Disaster (Flood) Risk Reduction

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Hosting the 4th Asia-Pacific Water Summit

4th Asia-Pacific Water Summit
Kumamoto Japan 2022

Conclusion

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Speaker

City of Lusaka

ZAMBIA

Ms. Bwalya Funga

Senior Community Development Officer, Community Engagement Coordinator and Resource Mobilization Chairperson

Lusaka Water Security Initiative

LuWSi
Lusaka Water Security Initiative

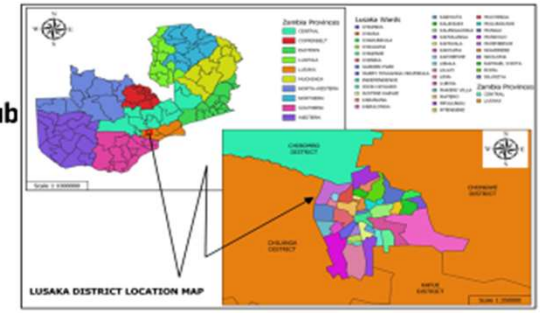
INTRODUCTION OF LUSAKA

BACKGROUND

Lusaka is the capital and largest city of Zambia, a district capital and economic hub

LOCATION

southern African .



ADMINISTRATION

The City is delineated in 7 constituencies and 38 Wards. The city has a population density of 5272.9km²

Population

About 3.5 million
70% living in
informal settlements

CHALLENGES

- Urbanization
- Urban flooding

Lusaka: Epicentre of cholera in Zambia & sub-region

2017/2018 Cholera:
92% cases & 86% deaths nationally were in Lusaka (Sinyange et al., 2018

LUSAKA'S CURRENT CHALLENGES

- **Informality** -70% of the population living informal settlements with little access to basic services such as water and sanitation, good housing , proper road network
- **Inadequate access to Water and sanitation-** only 60% of the population is connected to water and 40% subscribe to waste management systems , this poses a threat on water security
- **Climate change effects such as urban flooding and droughts .**

Flooding -The city experiences disease urban because of 60% of the population is not connected to water , they depend on either shallow wells or boreholes

Inadequate waste management systems - Only 40% of the population subtribe to the solid waste management system and most residents in peri urban areas indiscriminately dispose waste contributing to the clogging of the drainage system

WHAT IMPACTS DOES CITY SUFFER BECAUSE OF FLOODING?

Diseases!

Lusaka: Epicentre of cholera in Zambia & sub-region

2017/2018 Cholera:

92% cases & 86% deaths nationally were in Lusaka (Sinyange et al., 2018)

500,000 additional **formal sector jobs** planned may not be realised

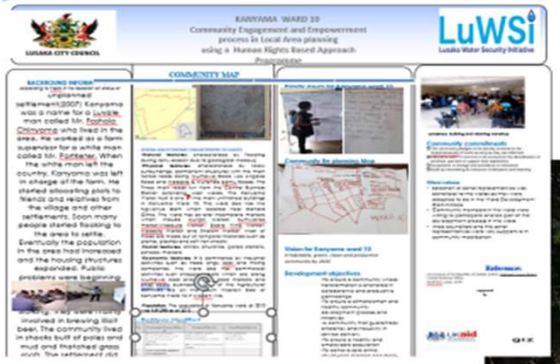
1.3% of annual GDP lost due to **poor sanitation** alone (CDC, 2015)

Poor investment Climate

Huge impact on Economy

WHAT IS LUSAKA DOING TO ADDRESS URBAN FLOODING

DEVELOPING LAPS reflecting WASHE



WHAT LUSAKA CITY COUNCIL IS DOING TO ADDRESS URBAN FLOODING

COMMUNITY AND STAKEHOLDERS SENSITISATION

CASH FOR WORK- COMMUNITIES UNCLOG THE BLOOCKED DRIANGES

PARTNESHIPS

LCC IS CURRENTLY IMPLEMENTING CITYGAP FLOOD RISK MANAGEMENT PROJEC

TREE PLANNTING

PROTECTIO N OF RECHARGE AREAS

CURRENT INTERVENTIONS TO ADDRESS FLOODING

- Development of LAPS reflecting water security
- DRR 4 AFRICA WITH ICLEI – focusing on Disaster preparedness
- Youth climate change project – with Bloomberg
- City GAP fund project
- Facilitate local area planning that focuses on climate action
- Community led projects derived from the CDP
- Fund that focus on climate action such as protection of recharge areas ,
- tree planting
- Facilitate and strengthen disaster preparedness and response (early warning systems).
- Support sustainable settlements such as urban gardening that is climate resilient

Dear Fabrizio,

Thank you for your message.

Using the Zoom platform, we are only able to generate an attendance report of all participants (on an excel file), which I have already shared with Anton.

According to this report, we can confirm that you did attend the webinar.

However, unfortunately, we are not in a position to issue a formal certificate of participation.

I hope this message is of some help.

Thank you for your understanding.

Best regards,

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WORLD WATER COUNCIL

Speaker

City of Ningbo
CHINA

Mr. Wenwu Yan

– ***Professor-Level Senior Engineer*** *in Water Conservancy*

– ***Vice-Chairman***, ***China*** *Water Conservancy and Hydropower Investigation and Design Association*

– ***President***, ***Ningbo*** *Water Conservancy & Hydropower Planning and Design Institute*

NIB Ningbo

NDWP

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CONTENT

1 City profile

2 Challenges

3 Practical solutions


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City profile
Ningbo-Zhoushan Port
with the largest cargo throughput in the world
Key node city for port & shipping cooperation
along the Belt and Road
9816 km²
10 million people
¥1.8 trillion GDP
National Pilot City for
Sponge City Development
&
Smart Water Conservancy

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City profile

Terrain
Surrounded by mountains on three sides and facing the sea on the fourth

River system
Mainstems of three rivers traverse the city before discharging eastward into the sea

Rainfall condition
Prone to typhoons and rainstorms during flood season

Four-fold threat:

Typhoon + Rainstorm + High tide + Flash flood

WEBINAR SERIES CitiesWithWater TOO MUCH

CONTENT

1 City profile

2 Challenges

3 Practical solutions

Challenges

2.1 Great threats of flood and tide

- Extreme weather is increasing, with **record rainfall and tidal levels** during typhoons.
- Over **60%** mountainous terrain enables **flash floods** to reach downtown in **under half a day**.
- Due to **backwater effect of high tides**, flood discharge through three major rivers is hindered, exposing the city to heightened flood risks.

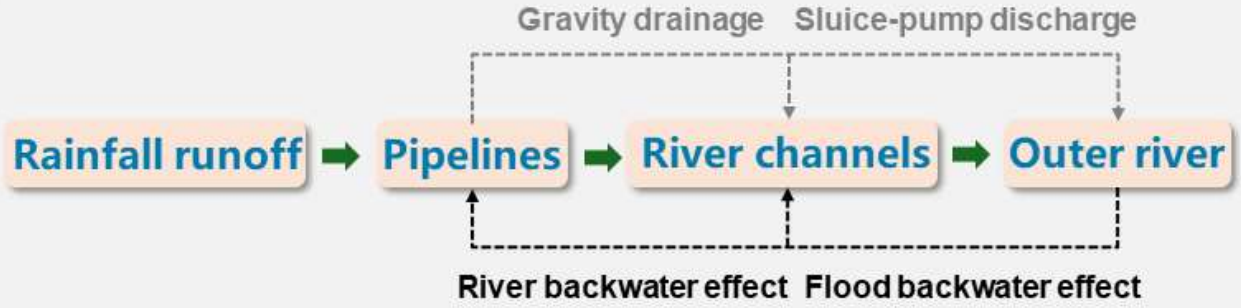

Storm tide


The main river


Reservoir flood storage

2.2 Serious urban waterlogging problem

- With low-lying terrain and a dense river network, the city employs a three-tier drainage system: pipelines → river channels → outer river.
- Flood backwater from outer rivers impedes drainage in both channels and pipelines, leading to severe urban waterlogging.



WEBINAR SERIES CitiesWithWater TOO MUCH

CONTENT

1 City profile

2 Challenges

3 **Practical solutions**

Practical solutions

Water management history of Ningbo

Ningbo's millennium-long hydraulic evolution embodies its unique water management wisdom guided by the concept of nature-human integration.

- Among the world's earliest urban hydrological monitoring and regulation systems
- Unified tidal gate control via "平"-inscribed steles
- Dynamic city-wide water level regulation

Water Level Stele (825)

- One of China's four great ancient hydraulic projects
- Adopts "fish-mouth" flow-splitting technology for self-regulating tidal control
- Continues to serve core functions today

Tashan Weir (833)

- Interconnects Dongqian Lake with the Three Rivers system
- Functions as a drought-flood regulator

Dongqian Lake (1047)

- Achieved artificial regulation of Yong River tides
- Permanently ended Yaojiang's millennium-long saltwater intrusion history

Yaojiang Floodgate (1959)

Practical solutions

Modern flood control system of Ningbo

Overall idea

Watershed coordination, holistic governance, and tech-enabled solutions

- **A modern flood control and disaster reduction system**

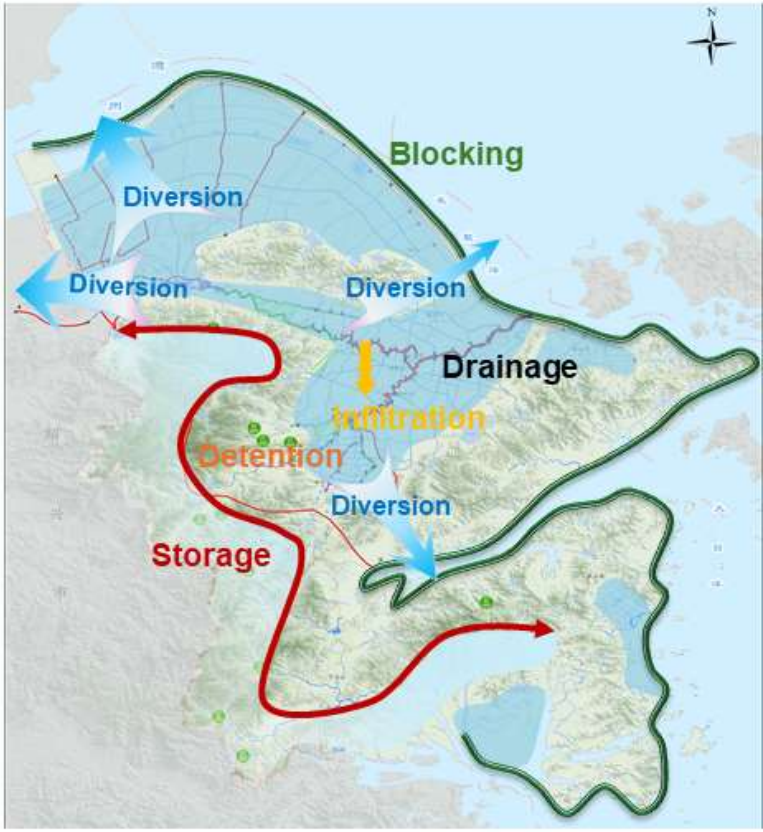
Green, high-standard, multi-dimensional, resilient, proactive and efficient

Blocking **Storage**

Diversion **Detention**

Drainage **Intelligence**

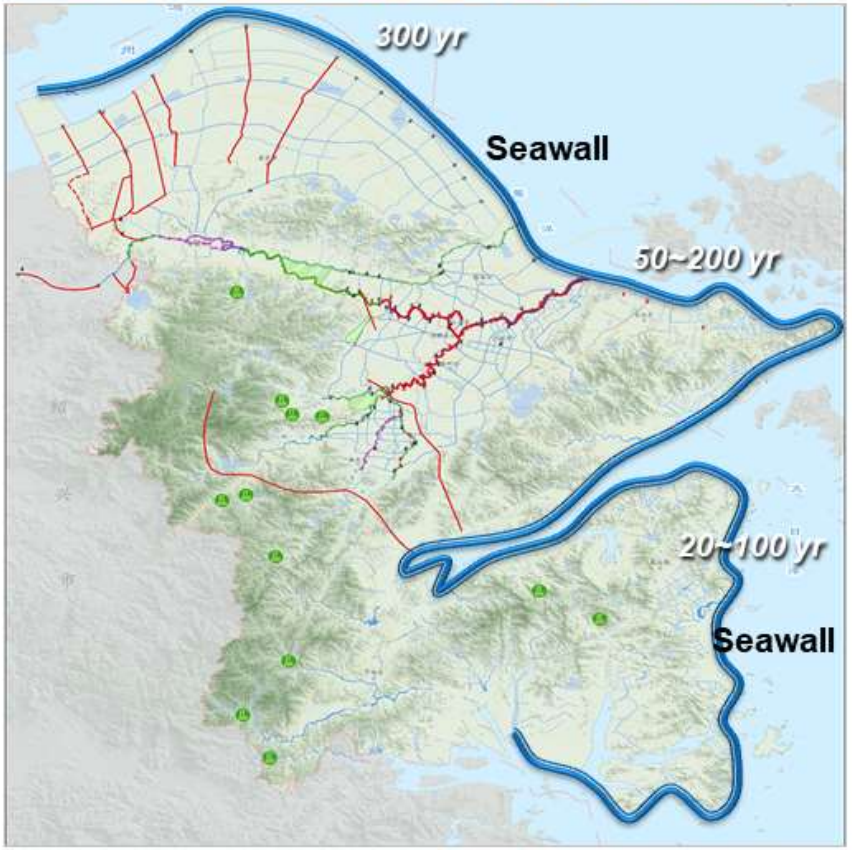
Infiltration



Practical solutions

Blocking——Constructing High-standard multifunctional coastal tidal defense enclosure

- Upgrade or reinforce coastal seawalls (545 km).
- Integrate ecological, cultural, and transportation functions.



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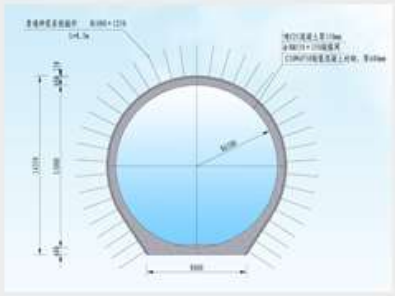
Practical solutions

Diversion——Overall planning for flood outlets to overcome geographic drainage barriers

Rapid waterway via staged relay pumping along main rivers

Deep tunnel diversion to prevent urban flooding

Tunnel section: D=10~16m



Cijiang Q=100m³/s

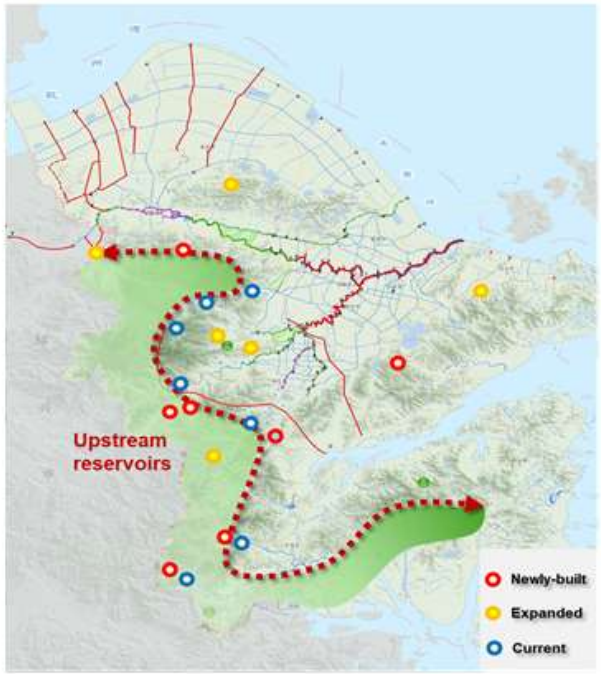
Huazi Q=150m³/s

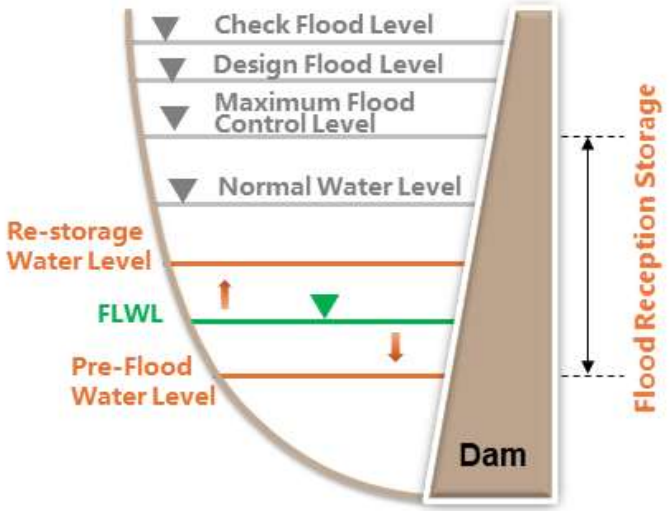
Xiepu Q=250m³/s

Practical solutions

Storage —— Maximizing reservoir regulation functions to enhance flood source control

① Expand reservoir storage capacity » ② Enhance pre-release capability » ③ Dynamic control Flood-Limited Water Level for flood-utilization balance





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Practical solutions

Detention —— Proactive flood detention: from passive defense to active management

Flood detention zones

Tiered Protection——Introduce overflow sections designed for above-standard floods, ensuring the safety of key protected areas.

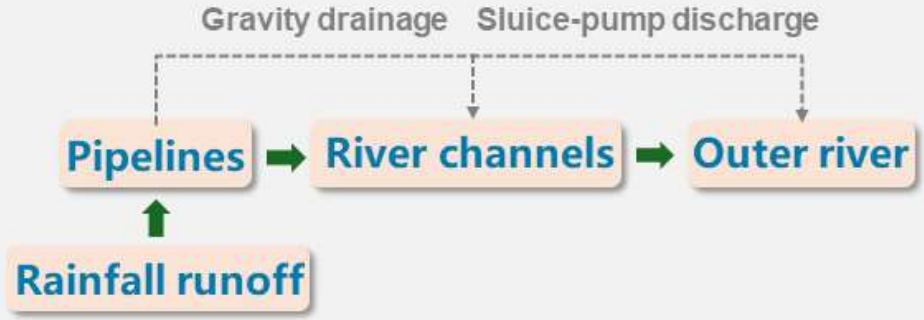
Detention and Storage Zones——Designate rotational agricultural areas as flood detention zones to reduce peak flows and relieve pressure on the main river, enhancing the capacity to cope with extreme floods.

Practical solutions

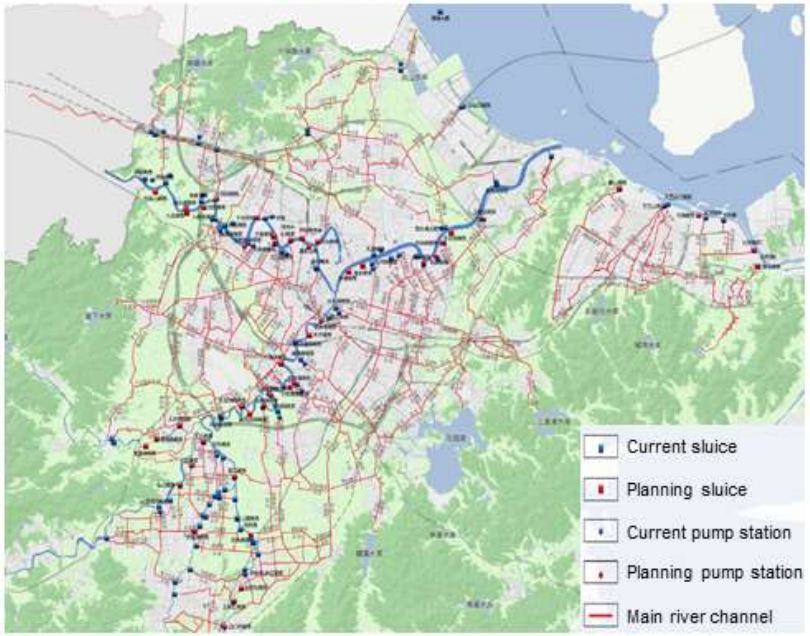
Drainage —— Coordinating rainfall runoff drainage and waterlogging management

➢ Establish an integrated, full-chain waterlogging management system, **pipelines → river channels → outer river**, to ensure:

- **Smooth drainage under pipe-design-standard rainfall**
- **No waterlogging under waterlogging-control-standard rainfall**
- **Effective response to extreme rainfall beyond design capacity**



Urban Waterlogging Prevention & Control



Practical solutions

Infiltration —— Building sponge city to promote source reduction

By promoting natural retention, infiltration, and purification, the city reduces waterlogging, lowers runoff pollution, and enhances urban ecology, aligning with the "low-carbon and ecological" urban development philosophy.

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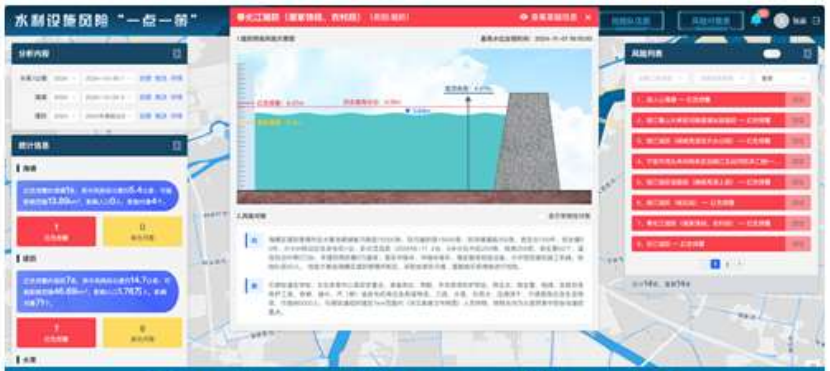
Practical solutions

Intelligence——Smart water conservancy empowering modern watershed flood risk management

Integrated air-space-ground monitoring network

Digital twin technology for water conservancy

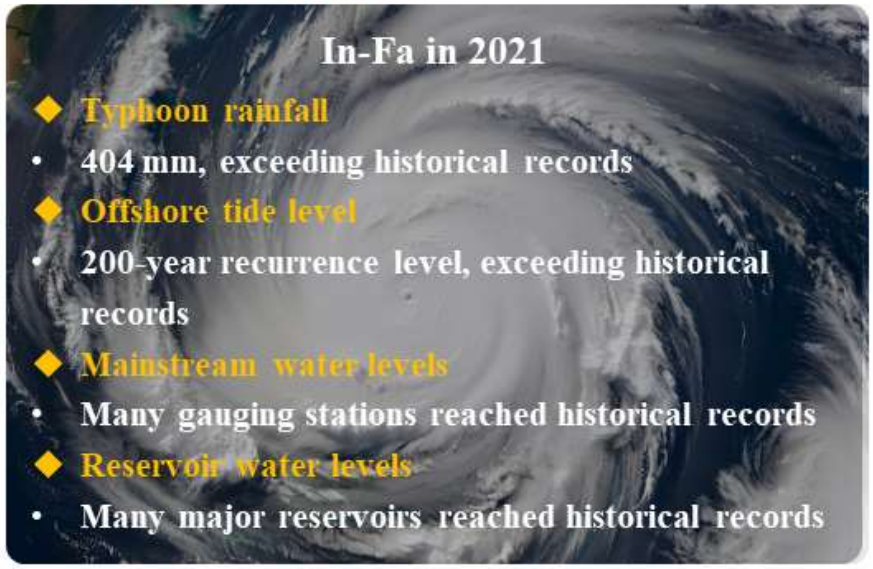


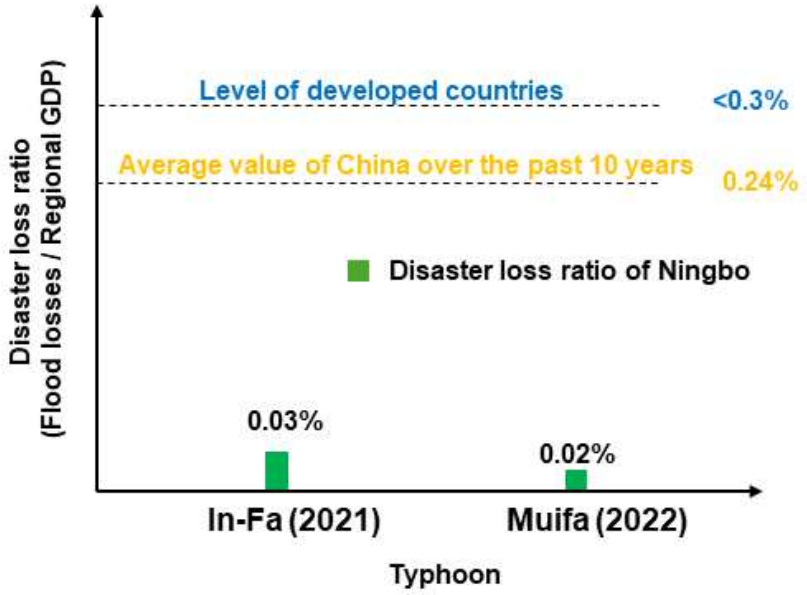
Targeted multi-source risk control

AI model for water conservancy

Achievements in flood and waterlogging management

Ningbo successfully withstood extreme typhoons such as **In-Fa (2021) and Muifa (2022)**, achieving **zero casualties** and **no major infrastructure damage**. Economic losses accounted for only **0.02 % ~ 0.03 %** of the city' s GDP.





ΔΗΜΟΣ ΛΑΡΙΣΑΙΩΝ
MUNICIPALITY OF LARISSA

ICLEI
Local Governments for Sustainability

WORLD WATER COUNCIL

Flood phenomenon “DANIEL” – the experience of Larissa

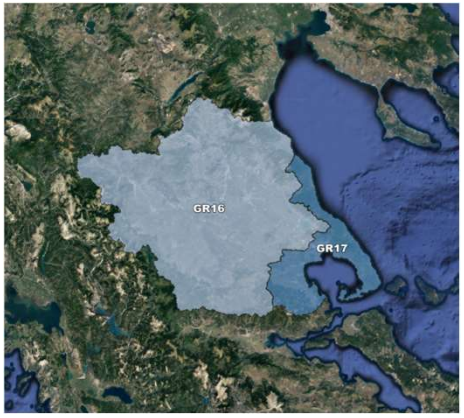
18 June 2025

Maria Nikolaidou
Municipality of Larissa
Department of Planning

Michail Tsiaras
Municipality of Larissa
Department of Civil Protection

Water Unit of Thessaly - EL08

- Total area: 13,140 km²
- Population (2021 census): 687,527 inhabitants.
- 1 main river (Pinios), 4 main tributaries (Karampalis, Kalentzis, Sofaditis, Enipeas), mountain streams
- Climate
- Average annual temperature: 16 to 17°C.
- Annual thermometric range: over 22°C.
- **Average annual surface precipitation estimated at: 678 mm.**



MUNICIPALITY OF LARISSA

- Area: 335.12 km2
- Population (2021 census): 164.095 inhabitants (in reality 200.000)
- Apart from the city of Larissa the Municipality includes 9 Municipal & Local communities which are rural areas

Climate:

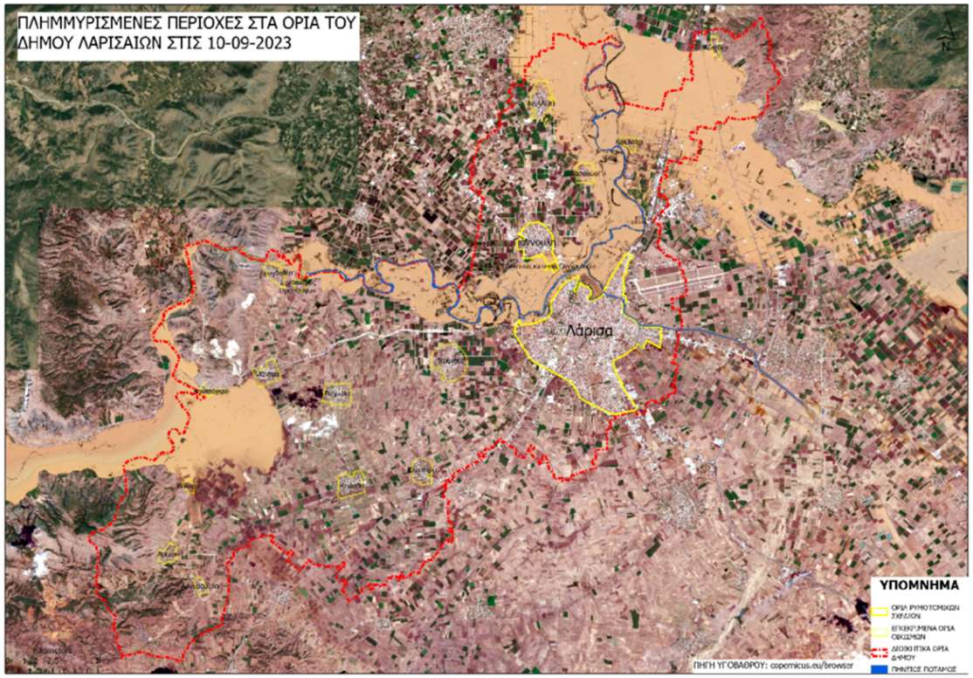
- Continental climate
- Average annual temperature: 15.7°C degrees (lowest recorded temperature -21.6°C, highest 45.4 °C)
- **Average annual rainfall: 425 mm**

FLOOD PHENOMENON “DANIEL”

- Duration: 3/9/2023 – 12/9/2023
- **Maximum precipitation: 750mm (8b tn of water)**
- Area flooded: 700.000 acres
- 90% agricultural land
- 17 dead
- Estimated damages: over 2b€

- Villages underwater, over 60 collapsed houses
- Damages in business / industries
- Displacement of population
- Loss of farm animals (over 200.000 dead animals)
- Destroyed equipment (vehicles, tractors, farm equipment)
- Pollution (soil, water) from gasoline, petrol, engine oils, pesticides, fertilizers
- Public health hazard
- Total loss of crops in flooded areas
- Destruction of infrastructure (roads, bridges, levies, irrigation canals, etc)
- Landslides in mountain areas (Pelion)
- Disruption of natural areas (Lake Karla, river Pinios, Golf of Pagasitikos, coastal areas of Larissa, Aegean Sea)
- Large volume of mud, sediments, rocks, tree trunks/branches, vehicles, heavy objects, etc

FLOOD PHENOMENON “DANIEL” - MUNICIPALITY OF LARISSA



- **4 & 5/9/2023: Maximum precipitation: 305mm**
- Flooding incidents in the southeast area (Gousbasaniotis), small and localized in the rest of the city

- 6/9/2025: Incoming flood waters from western Thessaly through Pinios
- Flooding in the water retention areas in the north of the city, backflood incidents in neighborhoods in the north and northeast areas (adjacent to the retention area)
- Flood relief to the northeast area towards the Pinios Delta and Lake Karla

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FLOOD PHENOMENON “DANIEL” - MUNICIPALITY OF LARISSA

- The retention area of Pinios (outward branch) was planned for water level of 6,5m – water reached 11,5m without overflowing to the city (south)

- On the north side, the social housing that was build on the verge of the retention area was flooded and ground floors were compromised
- The road connecting the area with Larissa was overflowed and traffic was prohibited

FLOOD PHENOMENON “DANIEL” - MUNICIPALITY OF LARISSA

The Municipality of Larissa, as a civil protection body, tried to deal with the phenomenon with all the means at its disposal (materials, machinery and human resources) mobilizing and launching actions aimed primarily at **protecting the lives and property of citizens**, as well as at **managing the consequences** caused by the phenomenon.

Memorandum of actions is provided for in the **General Plan for Responding to Emergency Needs and Immediate/Short-Term Management of the Consequences of the Flood Phenomena Manifestation** of the Municipality of Larissa, with the code name **"DARDANOS 2“**

- Stage 1 – Increased Readiness
- Stage 2: Risk Management after Flood Phenomena
- Stage 3 – Immediate/Short Term Management of the Consequences

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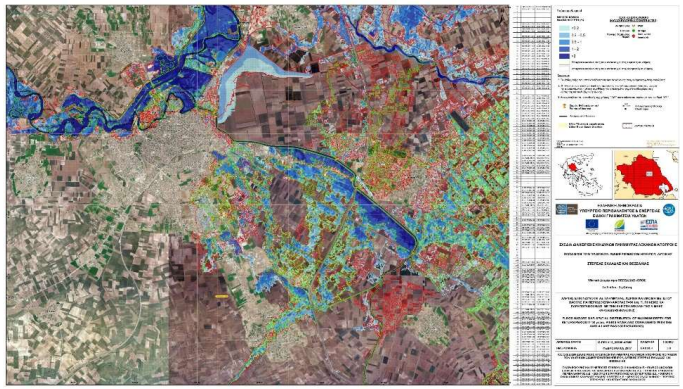
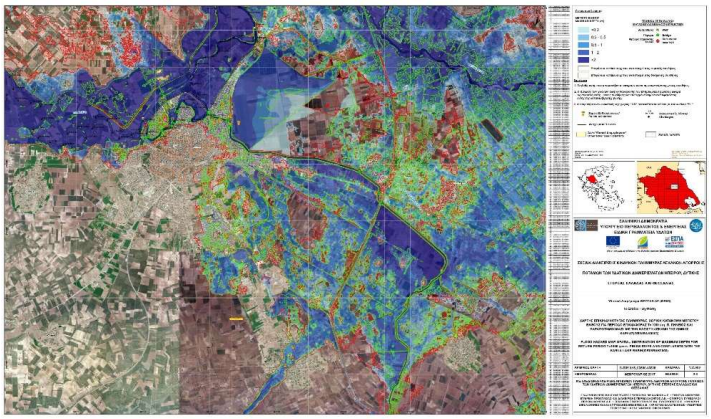
Flood risk management plans (2018)

T=50 years

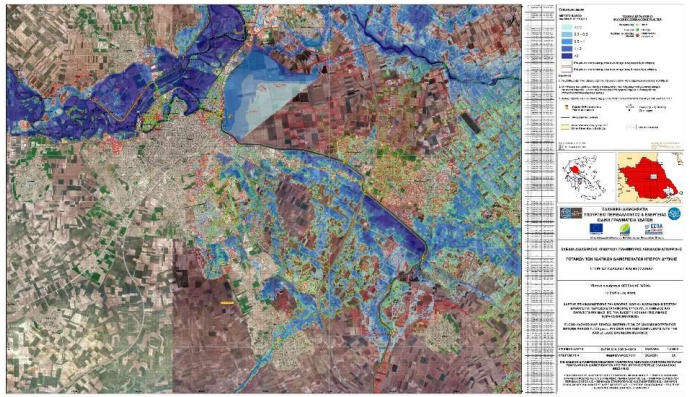


T=1000 years



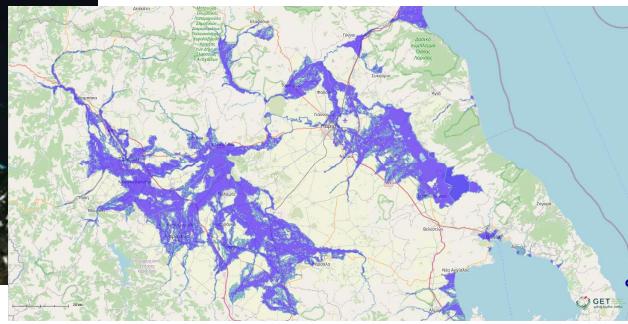
for a return period T=1,000 years, the rainfall would reach approximately 6-8 billion tons (the corresponding maps have been designed with a scenario that predicts approximately 6 billion tons) – **actual event 8 billion tons**

T=100 years



Revision (2024)

T=1000 years

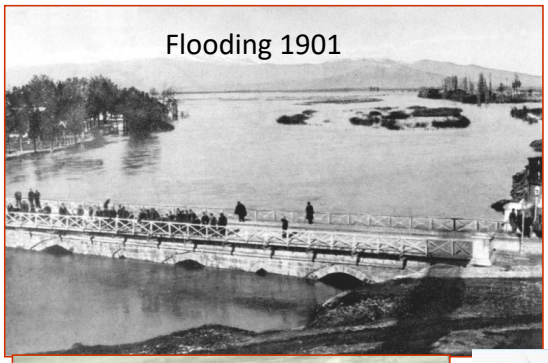


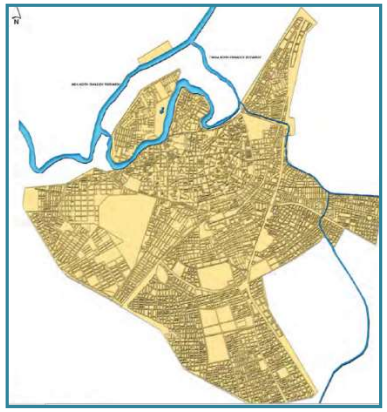
CHALLENGES

- Gradual development of the phenomenon allowed for the situation to be more operationally manageable but the force and the impact of the flood in a long and linear front in many cases stretched the available resources thin
- The level of water in Pinios (inner and outer branch) was a constant concern both because of the influx from the west and the degree of relief to the east – Larissa was in the middle, trying to also deal with local problems, respond to emergency calls, take precautions for water rise as well as take action for infrastructure failures (e.g., power outages, support of health institutions, damages to municipal buildings and infrastructure, etc)
- Flood protection doesn't rely on a single project, but requires a multitude of individual flood protection projects, which operate as a whole to cover the water basin area.
- Planning and implementation of flood prevention infrastructure requires long-term timelines, very high cost, and exceeds the level of authority of municipalities.
- In the interim period until the completion of all projects concerning a water basin area, flood protection level to a large extent, is closer to the previous than to the next level, in terms of the protection offered
- The fragmentation of responsibilities and multitude of bodies in charge of the implementation of flood protection planning is a structural weakness of Greek flood protection planning, as the bodies have different capacities and levels of effectiveness
- Although Larissa has been working for the protection of its geographical area, the lack of flood prevention structures in the Region in an integrated way creates vulnerabilities for the city

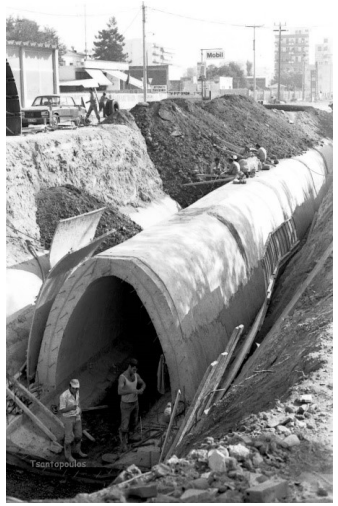
PREVIOUS PROJECTS

- Larissa had been dealing with major floods due to its position on the banks of Pinios, with human lives and livestock lost, and land and infrastructure damages





- 1930s: creation of the outer branch of the river Pinios
- 1980s – today: sewage and stormwater separation network, telemetry, water level sensors, water control gates in the inner branch



SUGGESTIONS – LESSONS LEARNED

A flood that occurs once every 1,000 years, such as DANIEL, the magnitude of which was underestimated, changes the hydrological data of the country and requires a comprehensive review of flood planning, which need to take into account that:

- Climate models must be improved, in order to obtain a safer - as far as possible - prediction of the frequency of major flood phenomena in the coming decades. At the same time, we must (in parallel with the completion of the update of hazard maps) move from static flood maps to dynamic flood forecasting and monitoring models, with priority given to areas that are most vulnerable to flood
- Whatever level of flood protection is decided (e.g. floods with a reference period of X years, based on new climate data), it must be ensured that it covers the intended areas, works effectively and is implemented within the framework of a strict plan (timetables, quality of execution and holistic treatment of flood phenomena)
- The concept of resilience should be introduced into planning, as a priority, and supported with very significant resources. The concept of resilience needs to be taken into consideration during the time period needed to increase the level of flood protection as well as to manage phenomena that may be greater than the flood planning.
- The absolute priority in planning should be to protect human life. However, the concept of resilience includes consideration of critical infrastructures (also of productive infrastructures and private sector activities), which may need to have a much higher level of resilience than the level of flood resilience. This means that these infrastructures should withstand floods of e.g. 1,000 years, even if the general level of flood planning is lower.
- VERY IMPORTANT: creating and sustaining networks of cooperation and trust with all organizations involved results in better coordination and response in time of crisis – this is even more crucial when it relates to local communities, civil society and volunteers that will offer their time, their resources and support systems

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