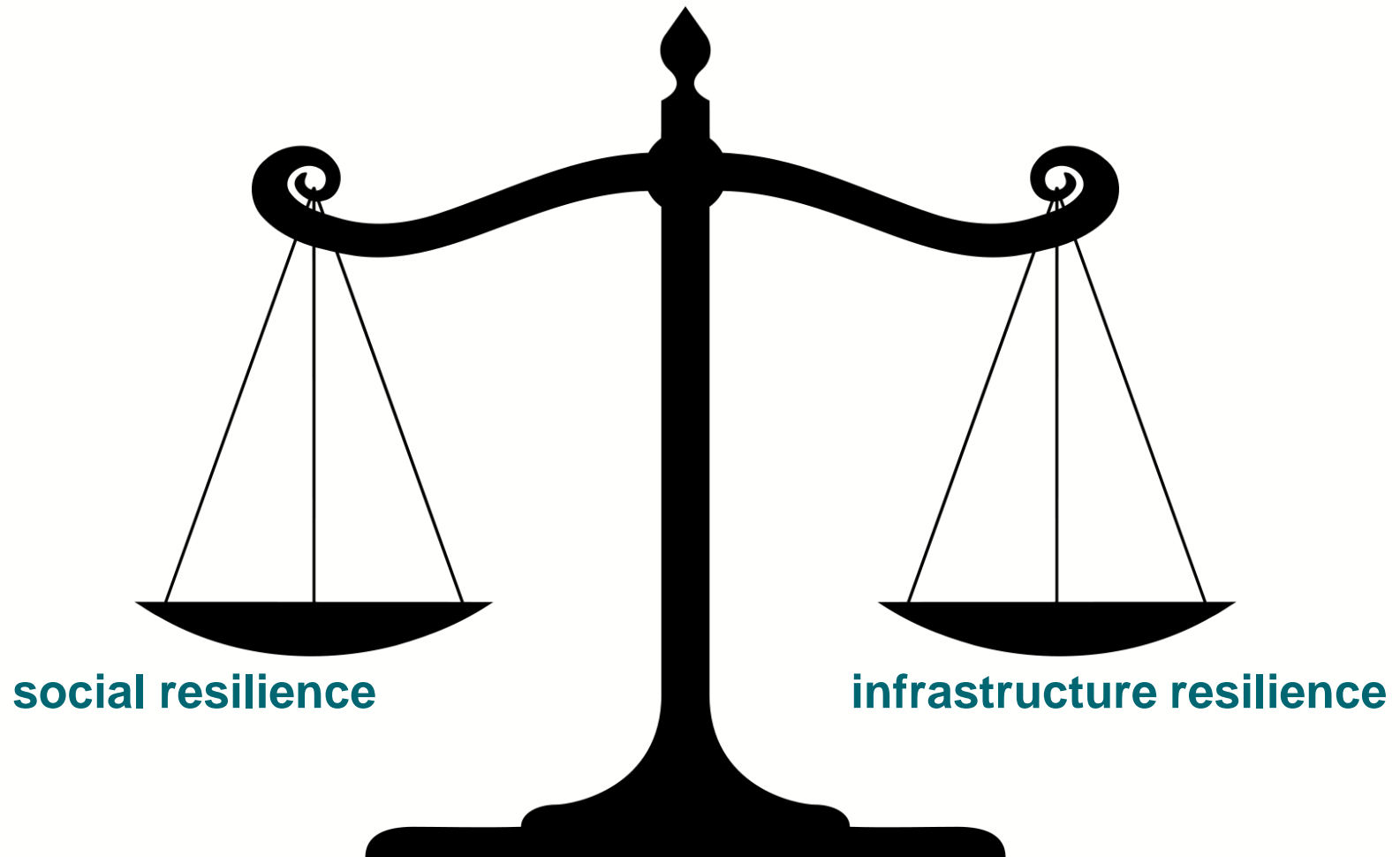


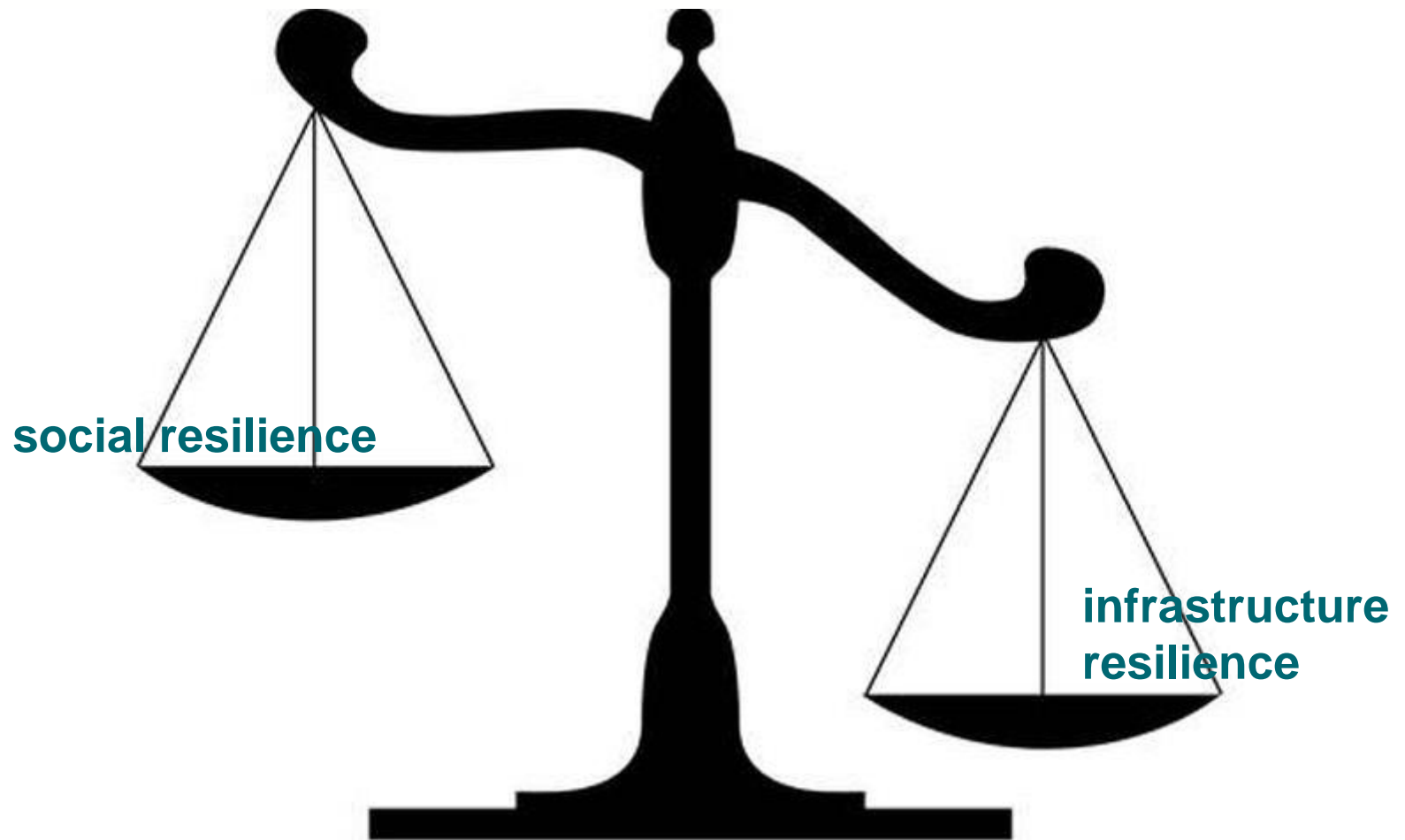
Building Watershed Resilience and Community Collaboration under Climate Change

Building water security resilience in urban environment

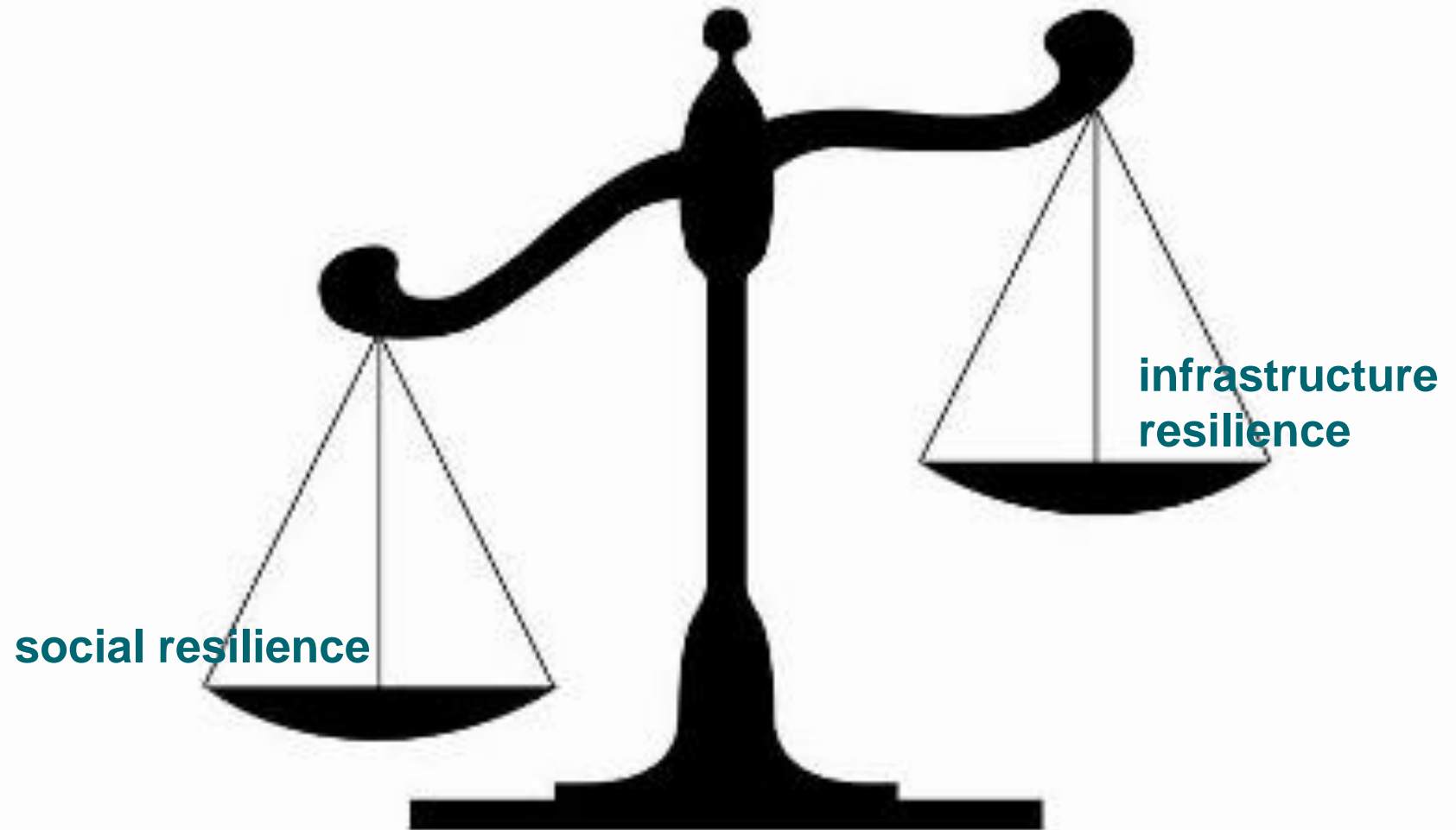
Balancing social and infrastructure resilience



Developed World



Developing World

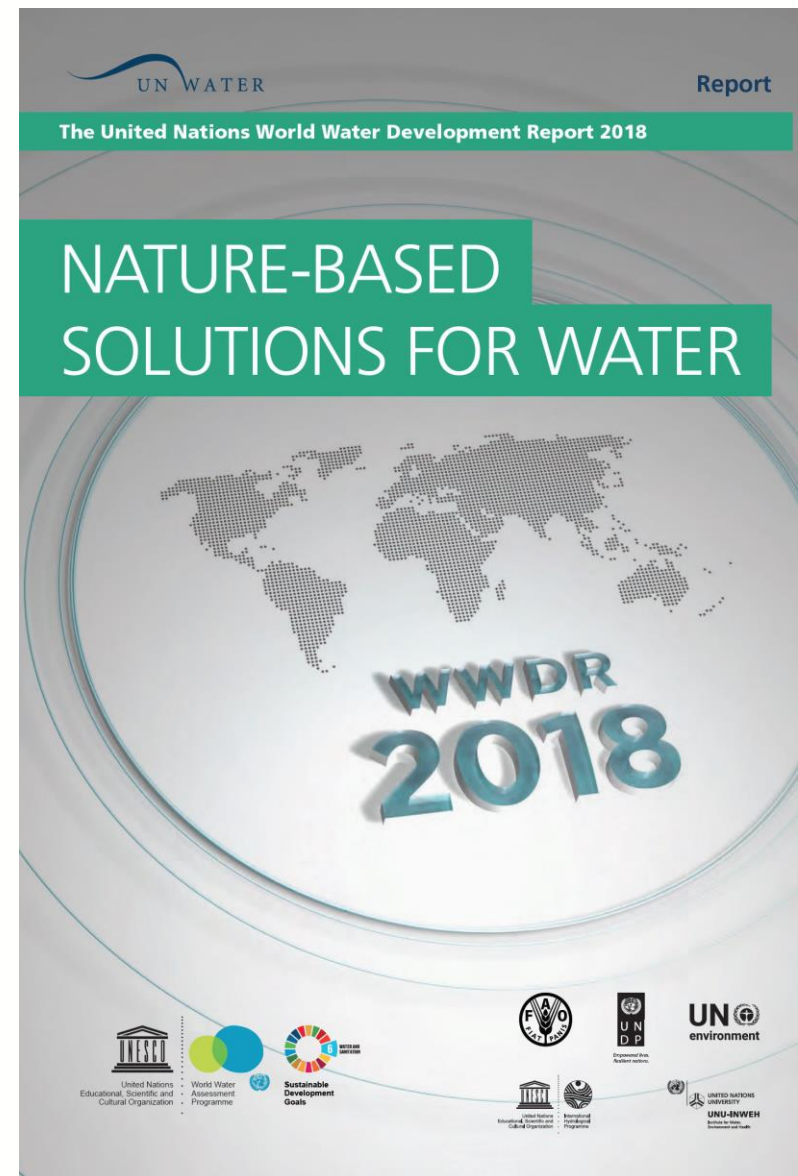


Nature-based Solutions for Water

“For too long, the world has turned first to human-built, or “grey”, infrastructure to improve water management.....

*Three years into the 2030 Agenda for Sustainable Development, **it is time for us to re-examine nature-based solutions (NBS) to help achieve water management objectives”***

Gilbert Hougbo, Chair of UN-Water



Nature-based Solutions for Water

*“The current situation, with ageing, inappropriate or insufficient grey infrastructure worldwide, creates opportunities for NBS as innovative solutions that embed **perspectives of ecosystem services, enhanced resilience and livelihood considerations in water planning and management**”*

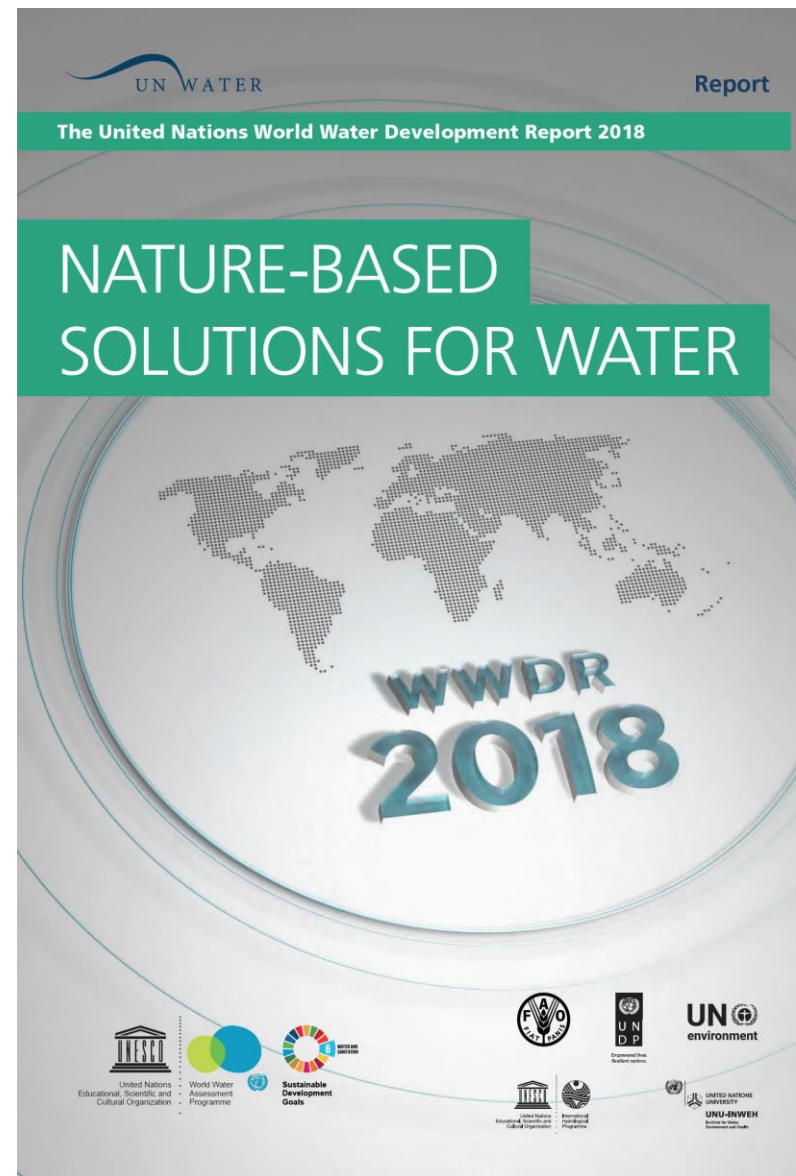
extract from Executive Summary



Nature-based Solutions for Water

*“NBS for addressing water availability in urban settlements are also of great importance, given that the majority of the world’s population is now living in cities. **Urban green infrastructure, including green buildings, is an emerging phenomenon that is establishing new benchmarks and technical standards that embrace many NBS**”*

extract from Executive Summary

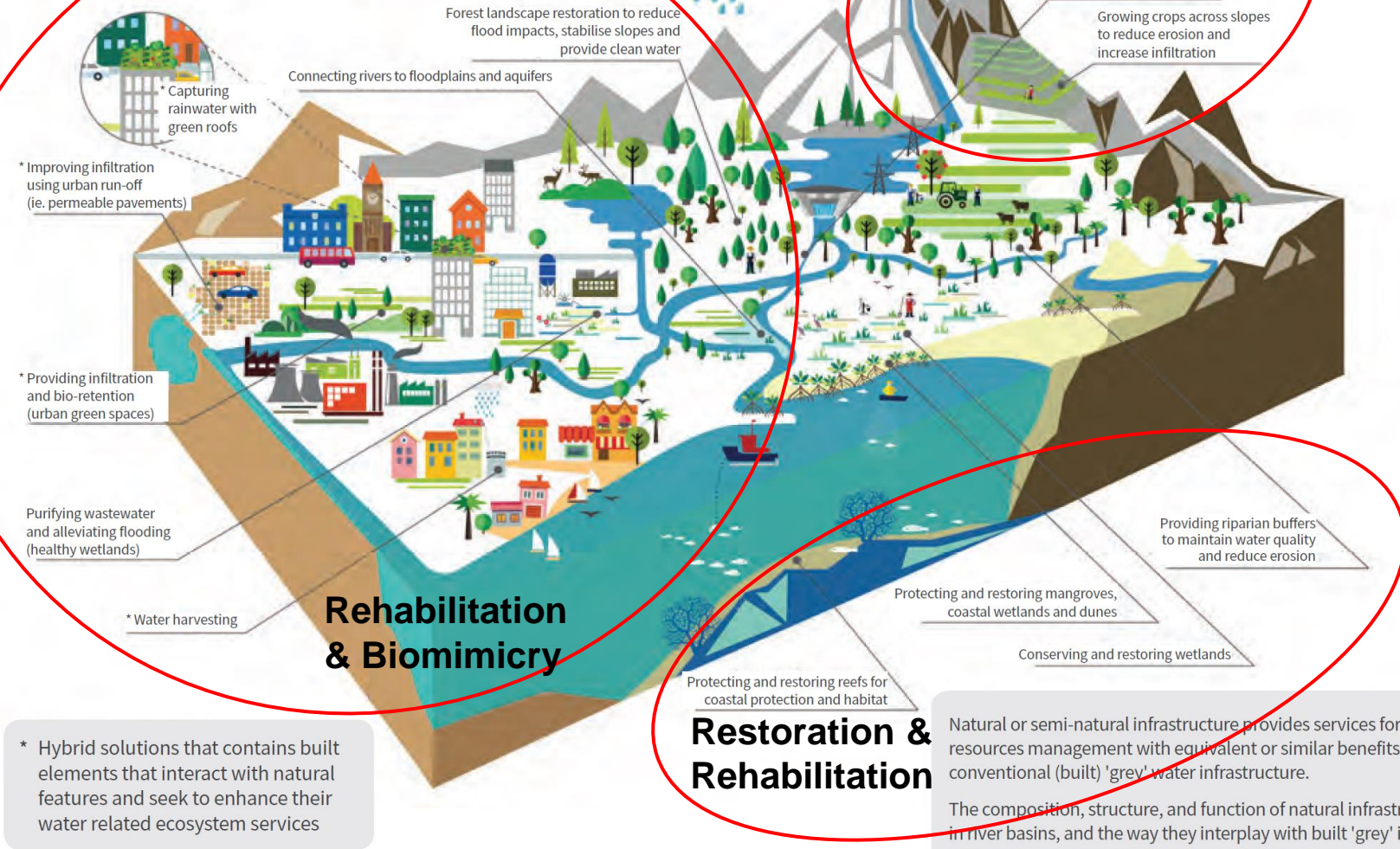


Nature Conservation, Restoration, Ecosystem Services, Rehabilitation and Biomimicry

Conservation & Restoration

Rehabilitation & Biomimicry

Restoration & Rehabilitation



* Hybrid solutions that contains built elements that interact with natural features and seek to enhance their water related ecosystem services

Natural or semi-natural infrastructure provides services for water resources management with equivalent or similar benefits to conventional (built) 'grey' water infrastructure.

The composition, structure, and function of natural infrastructure assets in river basins, and the way they interplay with built 'grey' infrastructure will determine the primary services and co-benefits produced.

Further information can be found in UNEP-DHI/IUCN/TNC (2014).

Embedding ecosystem services into cities and towns

Biomimicry

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies.



Hallam Wetland Experiments



2.25 hectare Catchment Area. Rainfall runoff collected from roads and roofs to be purified before release into waterways and infiltration into watertable.

7m Length Pond Storage
(30% of RAINwater module)

Inlet Stormwater Storage I.SARI.
Reduces water velocity of inflowing water for larger sediment particles to settle and sink.

18m Long Macrophyte Wetland Zone (2% of catchment Zone)
(70% of RAINwater module)
Length to width ratio >3:1 and <10:1

Aquatic Plants reduce Flow velocity to <0.2m/ sec.
Filtration of pollutants, heavy metals, organic chemicals and oils.
80% reduction of Suspended Solids, 45% reduction of Phosphorus, 45% reduction of Nitrogen

Kills bacteria and algal blooms uptake dissolved nutrients.

3m
Deep Marsh:
40-60cm
depth

3m
Marsh:
20-40cm
depth

3m
Shallow Marsh:
20cm depth

3m
Marsh:
20-40cm
depth

3m
Deep Marsh:
40-60cm
depth

3m
Open Water
'UV' Zone
150cm depth

2.5m wide RAINwater module; Wetland and Pond area width for streetscapes and naturestrip's.

40cm Overflow outlet depth to maintain permanent Wetland storage level.

Grate Covering Wetland Zones

Pollutant Loading Vegetation

Stormwater Outlet



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Facility for Advancing Water Biofiltration, Monash University

Cities Providing Ecosystem

Services: meaning the built environment functions to supplement and support the function of the natural environment



- ❑ water quality improvement
- ❑ management of stormwater, greywater/blackwater as resources
- ❑ buffering aquatic ecosystems from the effects of catchment urbanisation and climate change
- ❑ flood mitigation – Infiltration; Detention; Harvesting & safe passage of flood water

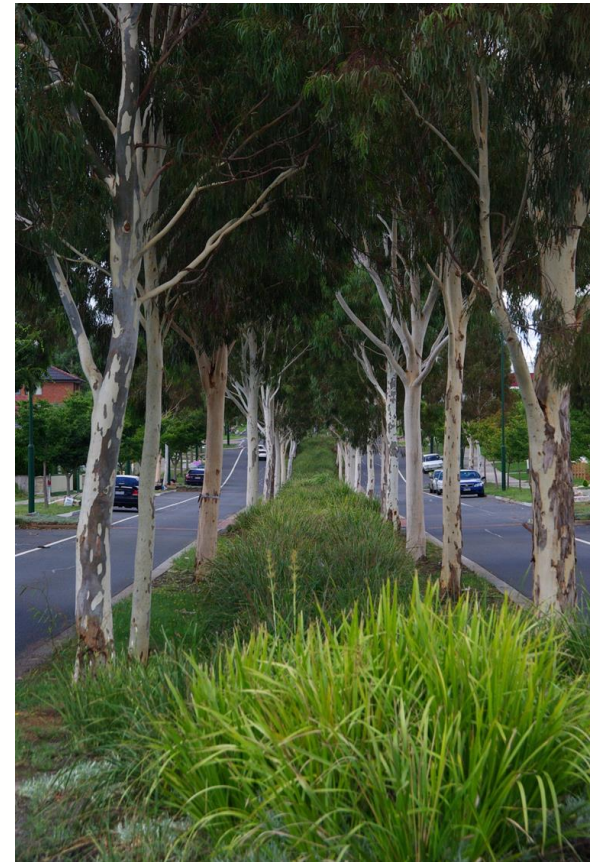


Cities Providing Ecosystem

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- ❑ flood mitigation – Infiltration; Detention; Harvesting & safe passage of flood water
- ❑ influencing urban micro-climates
- ❑ enhancing urban ecology and biodiversity



IOT enabled future water utility

Sponge City/Water Sensitive City



Green infrastructure

Green infrastructure – planning and design

Grey infrastructure

Ultimately operated by AI
(Artificial Intelligence)

Weather forecast

WQ infrastructure | Flood infrastructure | WW infrastructure | WS infrastructure

Smart infrastructure

Monitoring device
-local and regional



NB-IOT



NB-IOT



NB-IOT



NB-IOT



NB-IOT

Cloud and IOT Platform

Sponge City Brain

Modelling-Analytics-Accounting
Software Application

Management/Operation Interface

Public Interface



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Kunshan Sponge City Brain (IoT) Platform

Intranet - Water Tech x Sponge City Brain: Ki x thredds netcdf - Go x Aggregating netCDF x New Tab

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昆山海绵大脑

CRC for Water Sensitive Cities

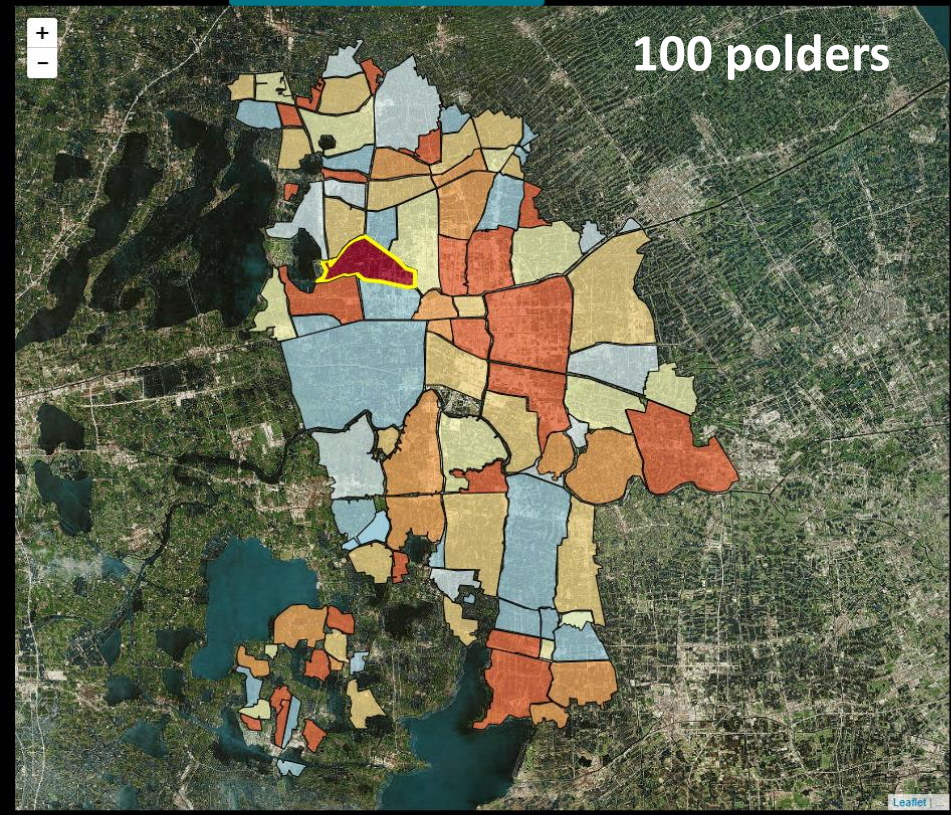
- 城市运营
- 城市规划
- 城市建设

Polder Water Quality Real Time monitoring and prediction

Browser tabs: Intranet - Water Tech, Sponge City Brain: K, thredds netcdf - Goc, Aggregating netCDF, New Tab

Address bar: www.flowmatters.com.au/fa2398912312ba123cee312/#/kunshan?_locale=zh_cn&_page=1

Navigation menu: 运营状态总览 (selected), 圩区状态总览, 雨洪管理, 水质管理, 监测, 数据管理



仪表盘状态

Dashboard implemented

详细信息

水位 (m)

	4 天前	3 天前	2 天前	1 天前	Now	1 天内	2 天内	3 天内	4 天内	5 天内
友谊站	Red	Orange	Yellow	Light Blue	Light Blue	Dark Red	Red	Yellow	Light Blue	Light Blue
周家埭站	Red	Red	Red	Red	Red	Dark Red	Dark Red	Yellow	Light Blue	Light Blue
南窑站	Orange	Orange	Yellow	Light Blue	Light Blue	Dark Red	Red	Yellow	Light Blue	Light Blue
顾家河站	Orange	Orange	Yellow	Light Blue	Light Blue	Dark Red	Orange	Yellow	Light Blue	Light Blue

水质等级

	4 天前	3 天前	2 天前	1 天前	Now	1 天内	2 天内	3 天内	4 天内	5 天内
水质观测点7	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
水质观测点2	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
水质观测点3	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
鼎泾河花园路北	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue

Windows taskbar: Start button, taskbar icons (File Explorer, Mail, Edge, etc.), system tray (8:33 PM, 16/04/2018)

IOT-enabled polder recirculation operation

主页

运营总览

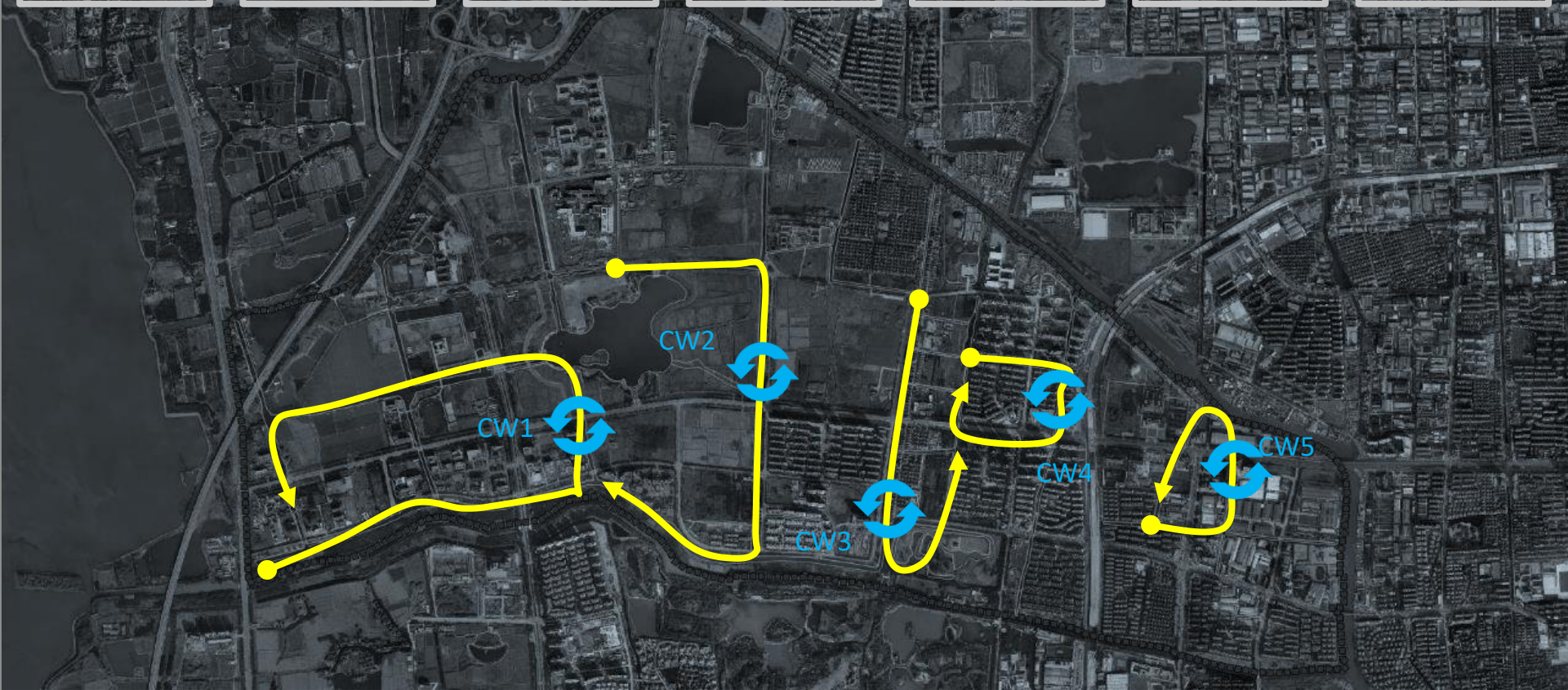
圩区总览

雨洪管理

水质管理

监测

数据管理



CRC for
Water Sensitive Cities

IOT-enabled polder recirculation operation based WQ prediction

主页

运营总览

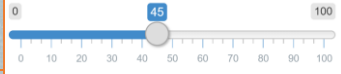
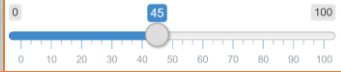
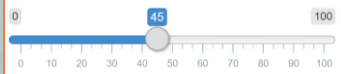
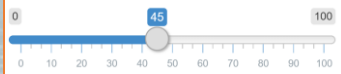
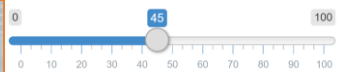
圩区总览

雨洪管理

水质管理

监测

数据管理

循环泵	额定最大流量 (L/s)	流量控制 (%)	开启时间	运行时长 (min)
CW1	100		2018-04-06 11:00	600
CW2	300		2018-04-06 11:00	300
CW3	80		2018-04-06 11:00	100
CW4	250		2018-04-06 11:00	250
CW5	180		2018-04-06 11:00	300

Simulation

Real Time Monitoring of Water Levels in Waterway

主页

运营总览

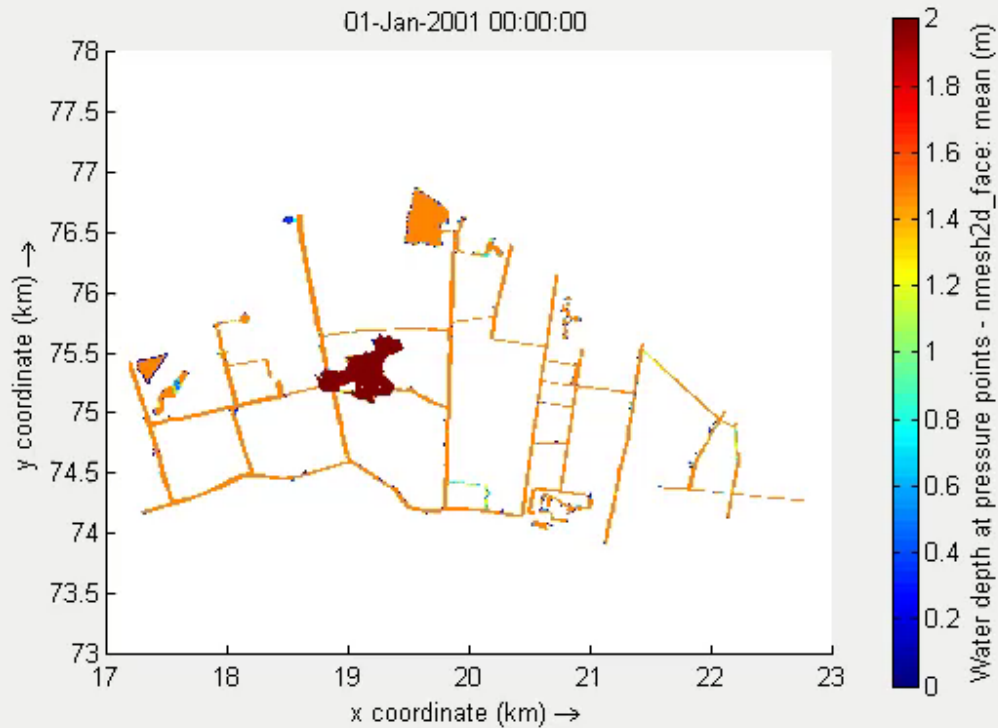
圩区总览

雨洪管理

水质管理

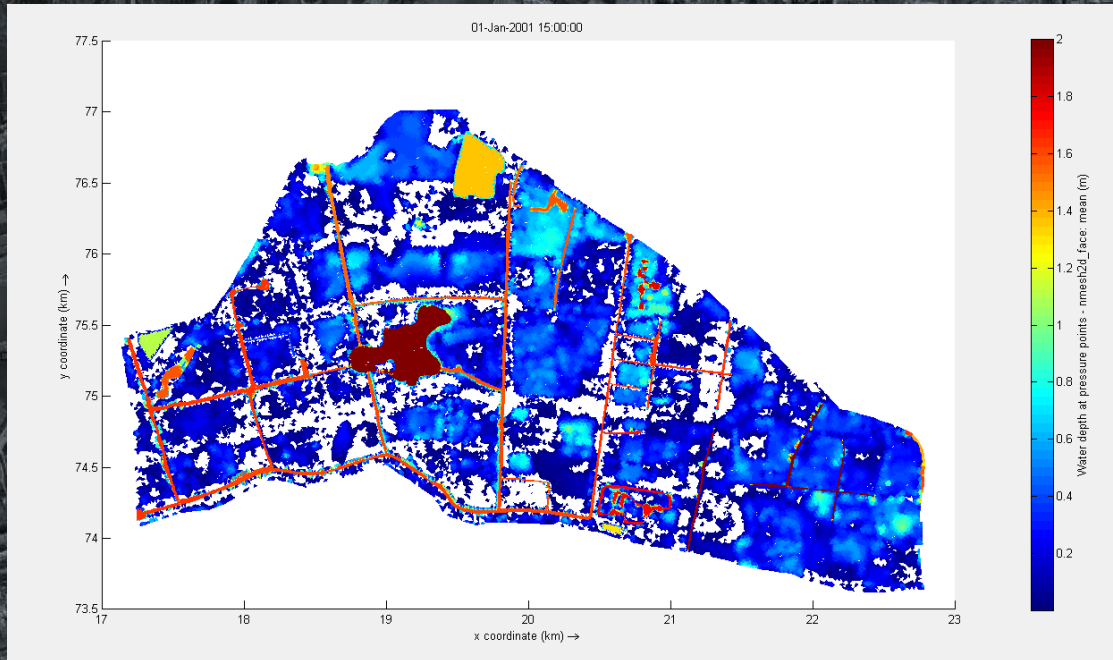
监测

数据管理



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Real Time Prediction of Flood Inundation Depth



IOT-enabled Polder Flood Pumps Operation and Water Level at Critical Point

