Multi-level Governance for Climate Change Adaptation in Delta Urban Regions

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Urban Management Tools for Climate Change

IHS, Erasmus University Rotterdam, 13 June 2018

Outline

Background

Some key concepts

The Randstad: Rotterdam and The Hague

Pearl River Delta:

a. Hong Kong
b. Guangzhou and Shenzhen

Conclusions

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1. Background

- A problem that is both **global and local** in nature (‘glocal’) → need responses at **multiple administrative levels** (Gupta, 2007)

- A **particularly complex problem** → need **integrated policy** action (water, planning, housing, health, disaster management, research, etc.)

- Cities are **perpetrators** of climate change but also their main **victims** too and part of the **solution**

- **Delta urban regions** particularly **vulnerable to climate change:**
  - Tension between the **natural environment** and intensive **urbanisation** – urbanisation increases vulnerability
  - **Rising sea levels** particularly dangerous for **low-lying areas**
  - Prone to river **flooding**
  - Damage of infrastructure and other physical assets from extreme weather events → costly and harmful for the **economic activity**, which tends to be concentrated in deltas
  - Threat to the **dense population** living in deltas
  - **Public health** implications of higher average temperatures
  - Stress on **water resources**, etc.

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Obstacles to implementation of urban climate change policies:

- **Institutional blockage** - clashes of interests and priorities across the departments of sub-national authorities
- **Mismatch of priorities** across the levels of governments
- **Insufficient capacity** and expertise
- **Lack of appropriate funding** to reach national targets
- **Lack of devolved authority**, appropriate responsibility and/or financial autonomy
- **Difficult co-ordination between municipalities** within metropolitan and functional areas

(Gupta, 2007; Corfee-Morlot et al., 2009, Betsill and Bulkeley, 2007)

1. How does climate change affect the cities in which you live and work? Which population groups are the most affected?

2. Does the city recognise the problem? Does it take adaptation measures? If yes, are they framed as climate adaptation or something else?

2. Conceptual framework

- **Multi-level governance (MLG)** as a conceptual framework – recognising interdependencies and across scales (e.g. Hooghe and Marks, 2001; Hooghe et al. 2010)

  - **Vertical dimension** – to implement national climate adaptation strategies, the governments need to cooperate with regional and local governments as agents of change, while cities' actions are 'nested' in legal and institution frameworks at higher scales

  - **Horizontal dimension** – international networks and inter-jurisdictional cooperation on climate change adaptation to exchange knowledge, pool resources and and address cross-boundary issues (Corfee-Morlot et al., 2009; Bulkeley and Betsill, 2005)

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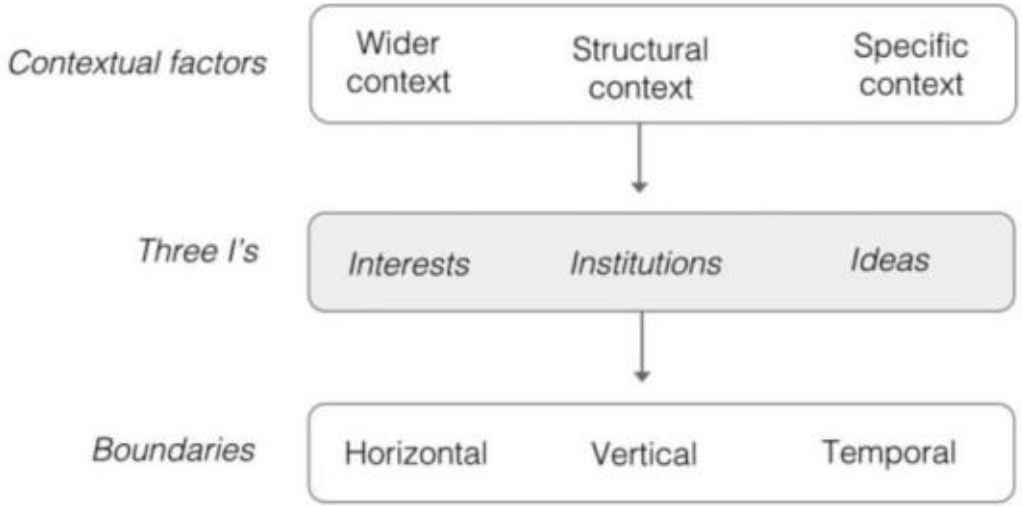
Spanning boundaries to enact urban climate change adaptation policy

- Horizontal
- Vertical
- Temporal



Spanning **horizontal** boundaries

- Boundaries between policy sectors
- Administrative boundaries - inter-municipal cooperation
- Boundaries between societal groups
- Problems:
  - What strategies for spanning boundaries? Who can play the ‘spanner’ role?
  - How to cooperate informally to overcome the legal and institutional barriers?
  - How to trigger governance learning to work across silos?
  - Context-dependent cultural barriers - challenge for policy mobility

Spanning **vertical** boundaries

- Levels of government: city, region, state, EU
- Geographical scales: neighbourhood, urban, metropolitan, regional, delta, river basin
- Problem:
  - Multi-level governance gaps: political, fiscal, policy, objectives…
  - Context-dependent obstacles for coordination and cooperation

Spanning **vertical** boundaries

- Levels of government: city, region, state, EU
- Geographical scales: neighbourhood, urban, metropolitan, regional, delta, river basin
- Problem:
  - Multi-level governance gaps: political, fiscal, policy, objectives…
  - Local innovations - how to upscale, mainstream, coordinate?
  - Context-dependent obstacles for coordination and cooperation

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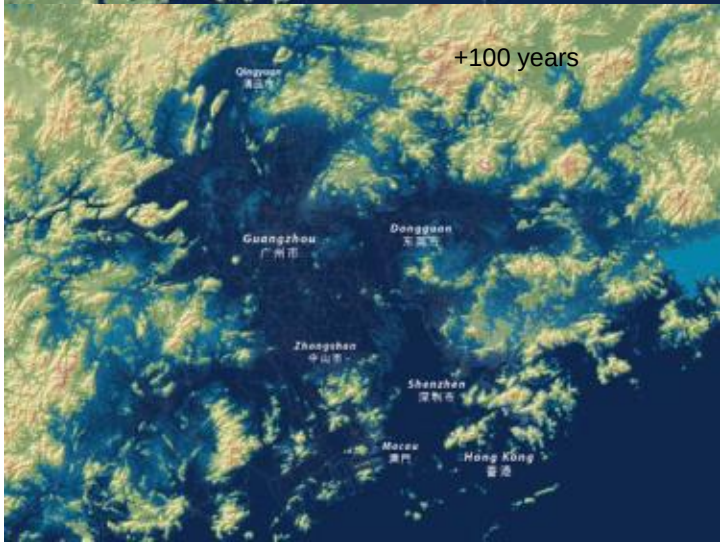
Spanning **temporal** boundaries

- Short-term VS long-term
- Problems:
  - Culture and time perspective
  - Electoral cycle and the pursuit of quick fixes
  - Awareness among citizens, investors - do you know what you are getting into when choosing to invest here?
  - Planning goals - Growth? Liveability? Resilience?
  - Bureaucratic rigidity, path dependence VS the need for adaptive planning



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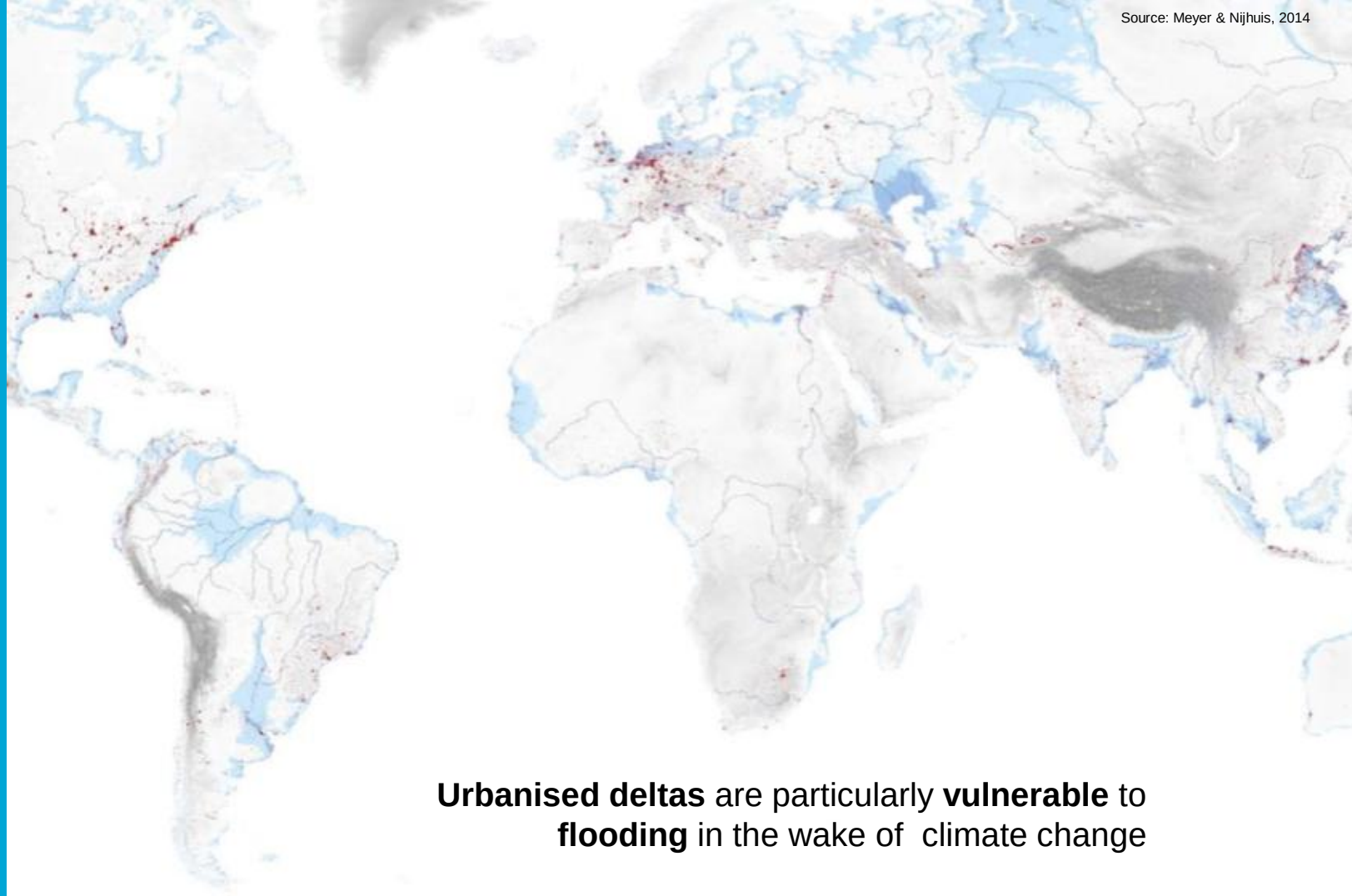
Puzzle:

How do the **contextual factors,** from the wider political culture to the structure of the territorial governance systems, **shape** the patterns of **governance of adaptation** policies in urban regions?

What are the **barriers for boundary spanning** that urban adaptation policies require and how these barriers emerge?



Source: Meyer & Nijhuis, 2014

Urbanised deltas are particularly **vulnerable** to **flooding** in the wake of climate change

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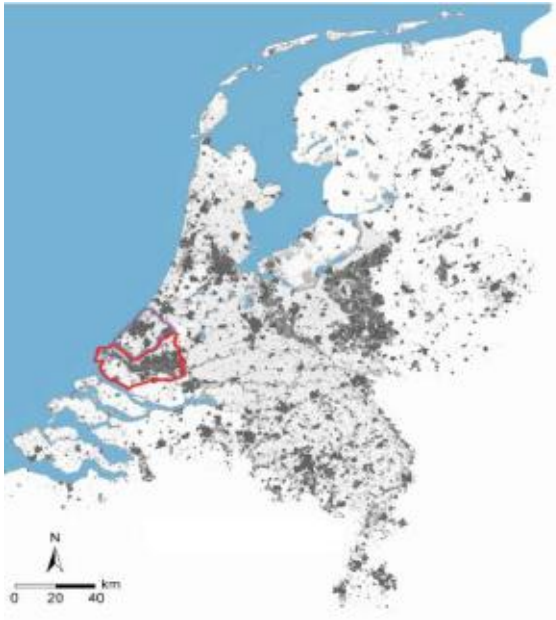
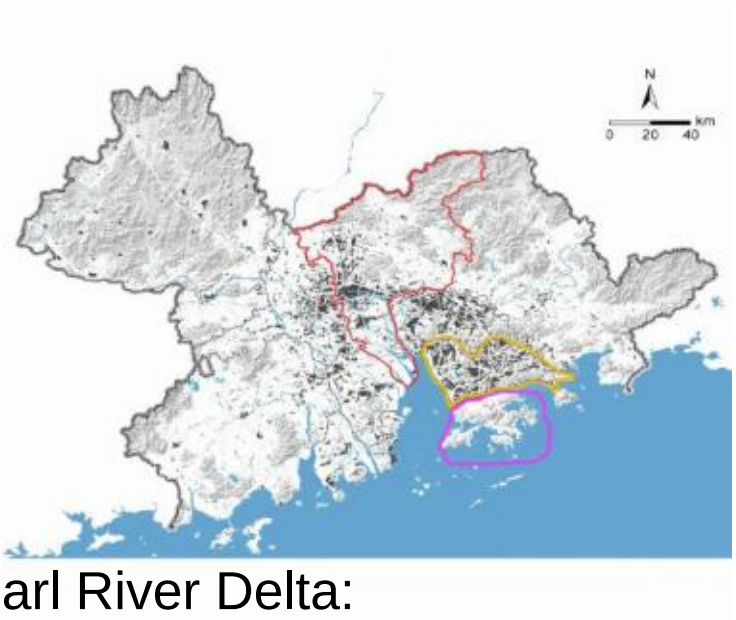
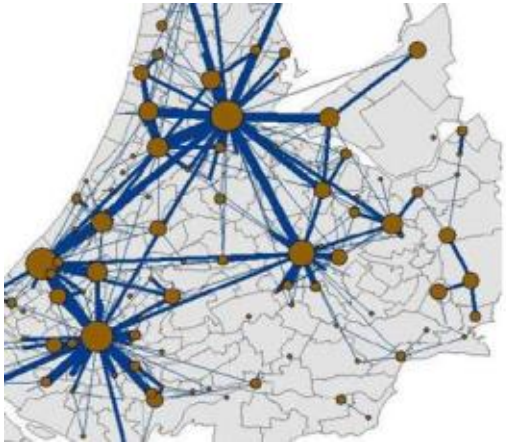
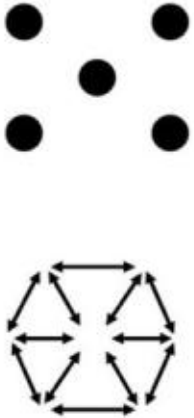
Randstad (South Wing):
Rotterdam and The Hague

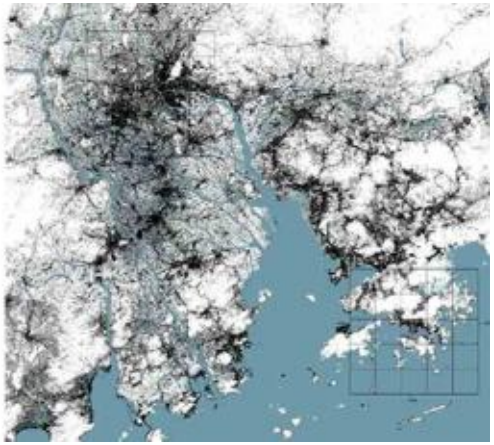


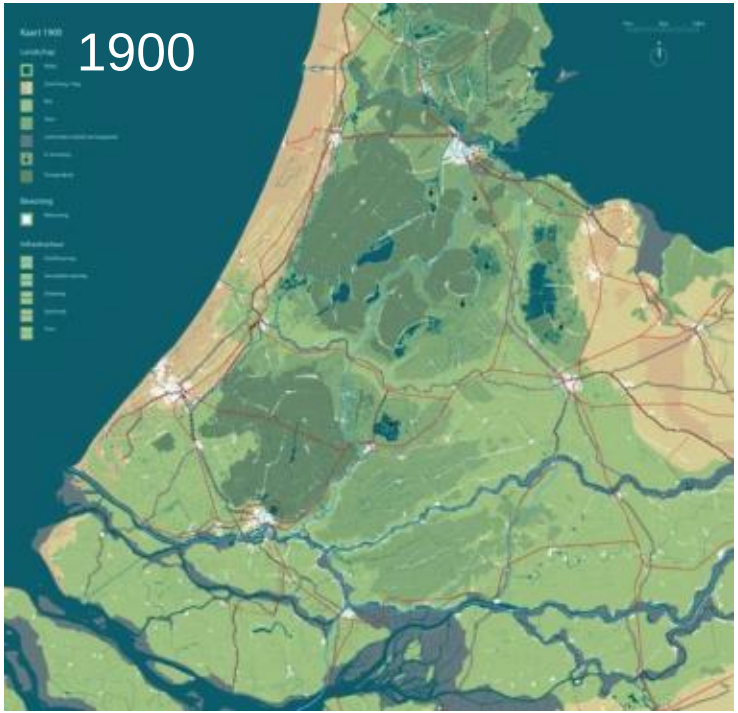


Pearl River Delta:
Hong Kong, Shenzhen, Guangzhou








1900


2000

1979

2009

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Photos: Marcin Dąbrowski

Rotterdam

The Hague

Photo: Christopher A. Dominic

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Risky parking in unembanked areas

Photo: Marcin Dąbrowski

Flooding in the unembanked areas of Dordrecht, 5 Jan 2012

Photo: Robin Utrecht / AFP – Getty Images


Maas spilling over in Noordereiland, Rotterdam
Photo: www.nufoto.nl

Flooding in Shenzhen (2014), Hong Kong (2009), Guangzhou (2010)

Source: Reuters

Photo: TVB

Source: CCTV

Photo: Eddie Tse

Photo: IC / China Daily

Guangzhou, 10 May 2016

Photos: China Daily

Rank	Country	Urban Agglomeration	Exposed Population Current	Exposed Population Future
1	INDIA	Kolkata (Calcutta)	1,929,000	14,014,000
2	INDIA	Mumbai (Bombay)	2,787,000	11,418,000
3	BANGLADESH	Dhaka	844,000	11,135,000
4	CHINA	Guangzhou	2,718,000	10,333,000
5	VIETNAM	Ho Chi Minh City	1,931,000	9,216,000
6	CHINA	Shanghai	2,353,000	5,451,000
7	THAILAND	Bangkok	907,000	5,138,000
8	MYANMAR	Rangoon	510,000	4,965,000
9	USA	Miami	2,003,000	4,795,000
10	VIETNAM	Hai Phòng	794,000	4,711,000
11	EGYPT	Alexandria	1,330,000	4,375,000
12	CHINA	Tianjin	956,000	3,790,000
13	BANGLADESH	Khulna	441,000	3,641,000
14	CHINA	Ningbo	299,000	3,305,000
15	NIGERIA	Lagos	357,000	3,229,000
16	CÔTE D'IVOIRE	Abidjan	519,000	3,110,000
17	USA	New York-Newark	1,540,000	2,931,000
18	BANGLADESH	Chittagong	255,000	2,866,000
19	JAPAN	Tokyo	1,110,000	2,521,000
20	INDONESIA	Jakarta	513,000	2,248,000

Table 1: Top 20 cities ranked in terms of population exposed to coastal flooding in the 2070s (including both climate change and socioeconomic change) and showing present-day exposure (Source: Nicholls et al (2007), OECD, Paris)

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Rank	Country	Urban Agglomeration	Exposed Assets Current ($Billion)	Exposed Assets Future ($Billion)
1	USA	Miami	416.29	3,513.04
2	CHINA	Guangzhou	84.17	3,357.72
3	USA	New York-Newark	320.20	2,147.35
4	INDIA	Kolkata (Calcutta)	31.99	1,961.44
5	CHINA	Shanghai	72.86	1,771.17
6	INDIA	Mumbai	46.20	1,598.05
7	CHINA	Tianjin	29.62	1,231.48
8	JAPAN	Tokyo	174.29	1,207.07
9	CHINA,	Hong Kong	35.94	1,163.89
10	THAILAND	Bangkok	38.72	1,117.54
11	CHINA	Ningbo	9.26	1,073.93
12	USA	New Orleans	233.69	1,013.45
13	JAPAN	Osaka-Kobe	215.62	968.96
14	NETHERLANDS	Amsterdam	128.33	843.70
15	NETHERLANDS	Rotterdam	114.89	825.68
16	VIETNAM	Ho Chi Minh City	26.86	652.82
17	JAPAN	Nagoya	109.22	623.42
18	CHINA	Qingdao	2.72	601.59
19	USA	Virginia Beach	84.64	581.69
20	EGYPT	Alexandria	28.46	563.28

Table 2: Top 20 cities ranked in terms of assets exposed to coastal flooding in the 2070s (including both climate change and socioeconomic change) and showing present-day exposure (Source: Nicholls et al (2007), OECD, Paris)

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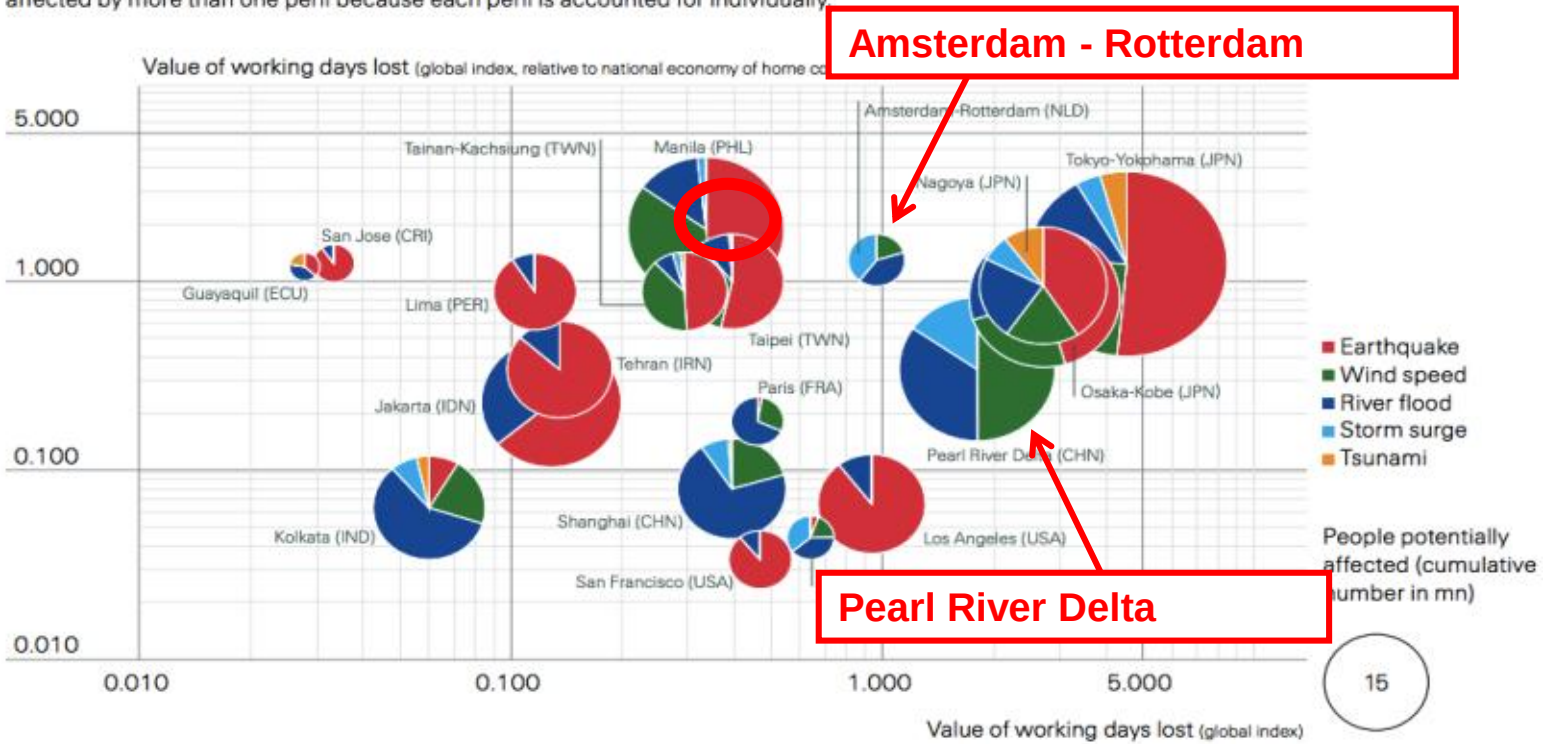
Figure 8: Impact of all perils by metropolitan area – Top 10
The chart includes the aggregate number of people potentially affected by all relevant perils (bubble size) and global rankings by the value of working days lost, in absolute terms (x-axis) and in relation to the country's national economy (y-axis). Residents are counted multiple times when affected by more than one peril because each peril is accounted for individually.



Source: Swiss Re, 2014

Table 1 | City ranking by risk (AAL) and relative risk (AAL in percentage of GDP) for 2005.

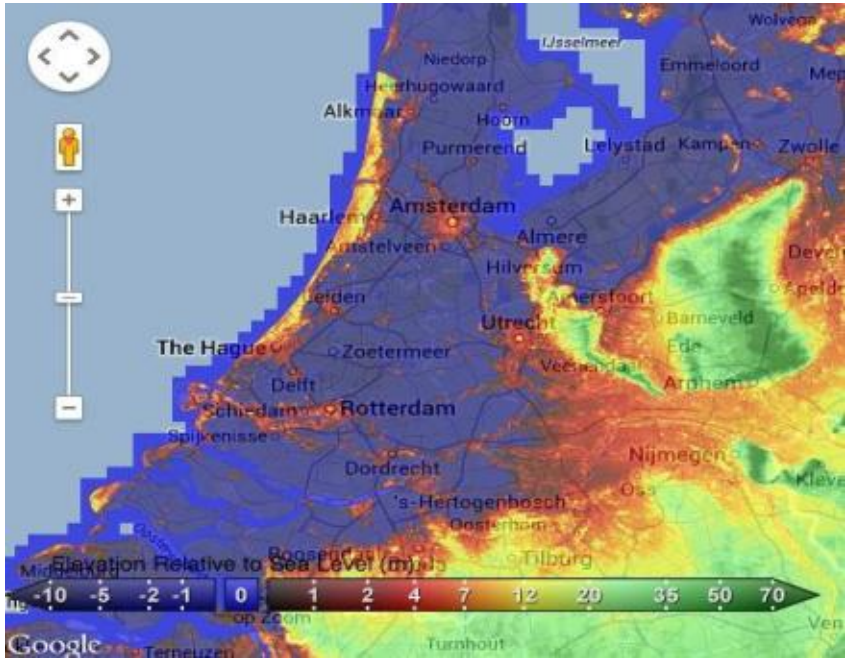
Ranking by AAL (US$ million)					Ranking by relative AAL (percentage of city GDP)				
	Urban agglomeration	100 year exposure	AAL, with protection (US$ million)	AAL, with protection (percentage of GDP)		Urban agglomeration	100 year exposure	AAL, with protection (US$ million)	AAL, with protection (percentage of GDP)
1	Guangzhou	38,508	687	1.32%	1	Guangzhou	38,508	687	1.32%
2	Miami	366,421	672	0.30%	2	New Orleans	143,963	507	1.21%
3	New York—Newark	236,530	628	0.08%	3	Guayaquil	3,687	98	0.95%
4	New Orleans	143,963	507	1.21%	4	Ho Chi Minh City	18,708	104	0.74%
5	Mumbai	23,188	284	0.47%	5	Abidjan	1,786	38	0.72%
6	Nagoya	77,988	260	0.26%	6	Zhanjiang	2,780	46	0.50%
7	Tampa—St. Petersburg	49,593	244	0.26%	7	Mumbai	23,188	284	0.47%
8	Boston	55,445	237	0.13%	8	Khulna	2,073	13	0.43%
9	Shenzen	11,338	169	0.38%	9	Palembang	1,161	27	0.39%
10	Osaka—Kobe	149,935	120	0.03%	10	Shenzen	11,338	169	0.38%
11	Vancouver	33,456	107	0.14%	11	Hai Phòng	6,348	19	0.37%
12	Tianjin	11,408	104	0.24%	12	N'ampo	507	6	0.31%
13	Ho Chi Minh City	18,708	104	0.74%	13	Miami	366,421	672	0.30%
14	Kolkata	14,769	99	0.21%	14	Kochi	855	14	0.29%
15	Guayaquil	3,687	98	0.95%	15	Tampa—St. Petersburg	49,593	244	0.26%
16	Philadelphia	22,132	89	0.04%	16	Nagoya	77,988	260	0.26%
17	Virginia Beach	61,507	89	0.15%	17	Surat	3,288	30	0.25%
18	Fukuoka—Kitakyushu	39,096	82	0.09%	18	Tianjin	11,408	104	0.24%
19	Baltimore	14,042	76	0.08%	19	Grande_Vitória	6,738	32	0.23%
20	Jakarta	4,256	73	0.14%	20	Xiamen	4,486	33	0.22%

A comparison with a ranking by exposure is proposed in the Supplementary Information.

Source: Hallegate et al. 2013

3. The Randstad: Rotterdam and The Hague

Areas exposed to flooding as a result of the rising sea level



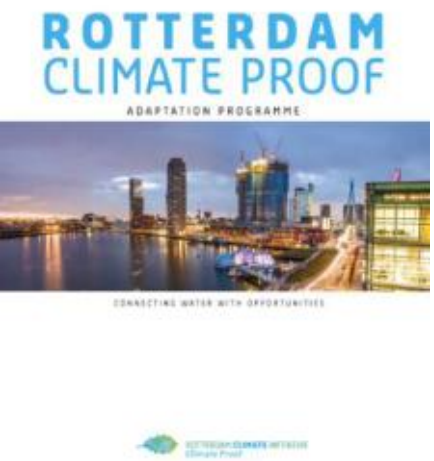
Source: Sea Level Rise Explorer


Werk aan de delta


Samen werken aan een veilig en mooi rivierengebied
Rijk en regio doen het samen
Ruimte voor regionale ontwikkeling

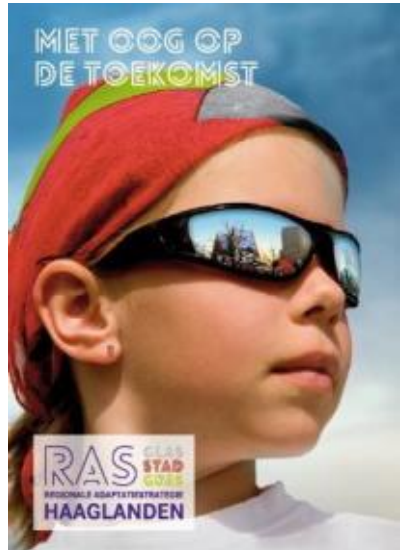

Kennis voor Klimaat
2008 - 2014
Verantwoording & resultaten


Bouwstenen
Adaptatiestrategieën
Regio Rotterdam


ROTTERDAM
CLIMATE PROOF
ADAPTATION PROGRAMME
CONNECTING WATER WITH OPPORTUNITIES


Rotterdam
Climate Change Adaptation Strategy


WATERPLAN
WORKING ON WATER FOR AN ATTRACTIVE CITY
Rotterdam


MET OOG OP DE TOEKOMST
RAS
STAD GOES
REGIONALE ADAPTATIESTRATEGIE
HAAGLANDEN

Climate change programmes and strategies

- **National:**
  - Delta Programme:
    - Objective: update and adapt the national flood protection and fresh water supply policies in the context of climate change
    - Delta Fund - 1 billion EUR per year for implementation
  - Knowledge for Climate – a research programme
  - Room for the river – investment in measures to create more space for the water to mitigate flood risk

- **Regional/local:**
  - Rotterdam Climate Proof - adaptation (and mitigation) programme to improve the climate resilience by 2035, while enhancing the city's spatial quality and promote economic development
  - Stadsregio Rotterdam adaptation strategy – regional programme of Rotterdam + 5 municipalities
  - Haaglanden Waterproof – regional programme coordianted by the Haaglanden city-region

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1953 flood in Zeeland

Photo: Wikimedia Commons


↑ N 10 km
Delta Works
North Sea
1
2
3
4
5
6
7
8
9
10
11
12
Rotterdam
Biesbosch
the Netherlands
Belgium
Westerschelde
Source: Wikimedia Commons

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Oosterschelde, Zeeland

Photo: rws.nl

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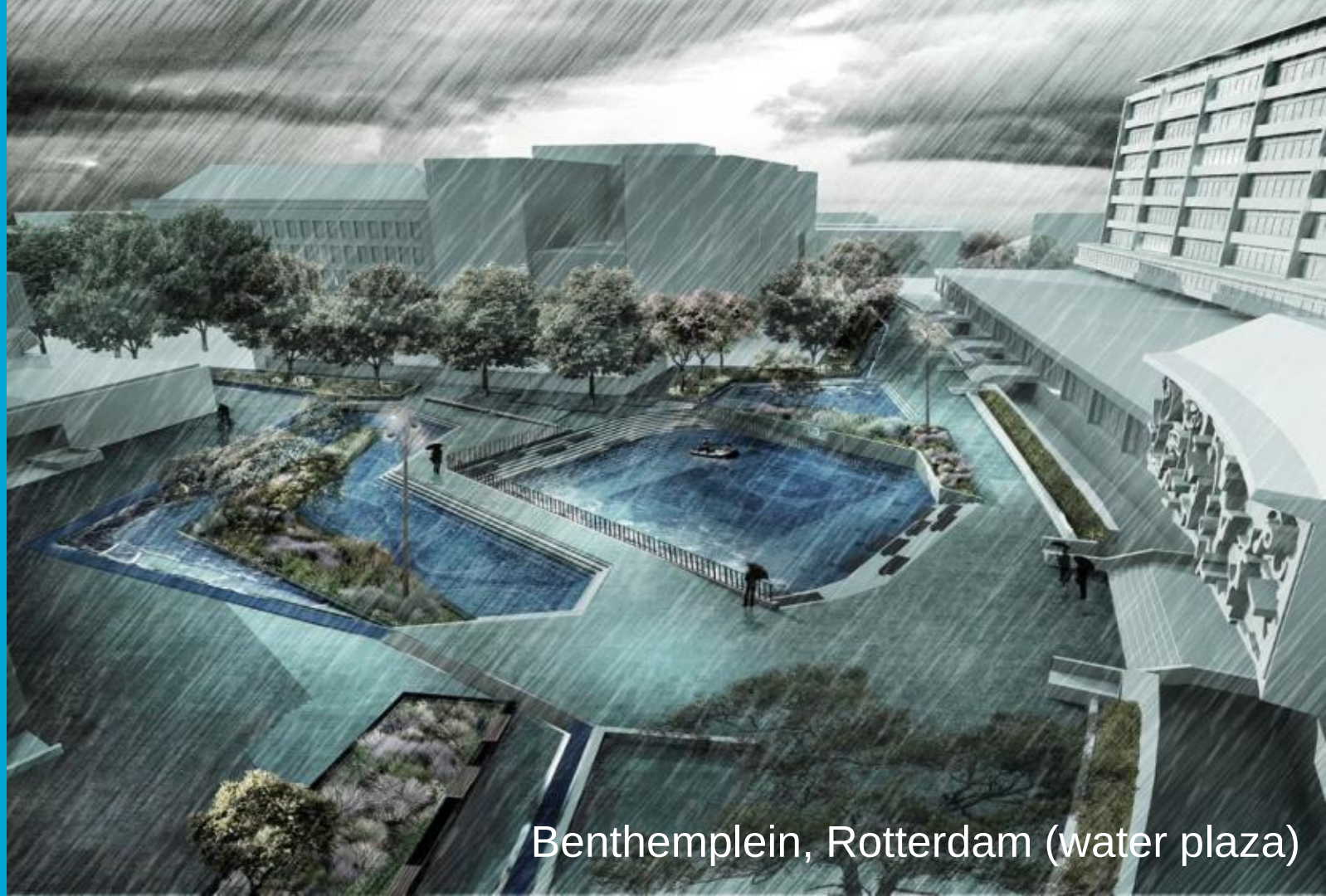
Maeslant storm surge barrier protecting Rotterdam

Photo: Marcin Dąbrowski

Maeslant storm surge barrier protecting Rotterdam

Photo: waterschappen.nl



Benthemplein, Rotterdam (water plaza)

Benthemplein, Rotterdam (water plaza)

Photo: Marcin Dabrowski

Benthemplein, Rotterdam (water plaza)

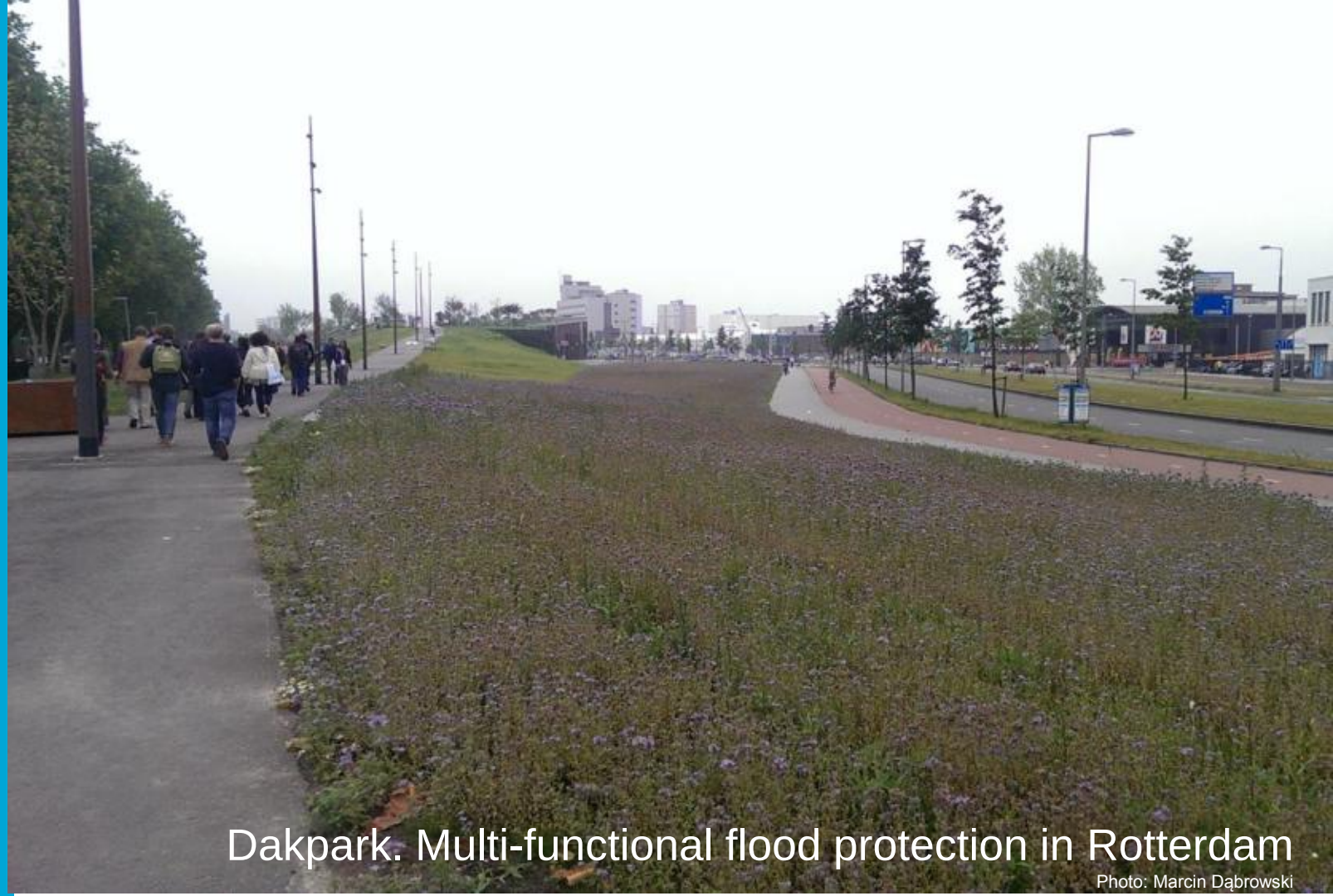
Photo: Marcin Dabrowski

Water plaza in Rotterdam

Photo: Marcin Dąbrowski

Floating pavillons in Rotterdam

Photo: Marcin Dąbrowski



Dakpark. Multi-functional flood protection in Rotterdam

Photo: Marcin Dąbrowski

Green roof in Rotterdam

Photo: Millieu Centrum Rotterdam

Urban garden, Feijenoord, Rotterdam

Photo: Marcin Dabrowski

Multi-functional dike in Scheveningen

Photo: www.nrc.nl

Boskalis dredging ship building the Sand Engine in The Hague.

Photo: www.dezandmotor.nl

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Sand Engine in July 2011

Photo: www.dezandmotor.nl

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Sand Engine in Sept 2014

Photo: www.dezandmotor.nl

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Actors

State	Non state	Knowledge	Beyond NL
Municipalites – the key actors	Maritime business (dredging,hydraulic engineering)	Universities	EU– guidelines, funding
Port authorities	Energy companies	Research institutions	Belgian Flanders
City-regions –coordinating strategies of municipalities	Environmental NGOs	Cross-sectoral think tanks	
A myriad of deliberative and cooperative bodies, multi- and single-purpose; e.g. Monitoring Committees for the Delta Programme	Housing associations (semi-public)		
Waterboards – an additional layer of sub-national governement for managing flood protection infrastructure			
Safety regions – disaster management			
Provinces – planning and coord.			
Rijkswaterstaat - national water authority			
Ministry of Infr. and Env.			

Institutions

- The **resourceful municipalities** (e.g. Rotterdam) and **city-regions** (Haaglanden) are the **key actors,** but **smaller municipalities** lack capacity and funding (austerity and ‘shrinking state’)
- **Polder model can prevent effective decision-making** – need to consult everyone and ensure broad consensus – joint decision trap?
- **General complexity** of governance arrangements rendering cooperation laborious and time consuming
- **Mismatch between the boundaries** of sub-national bodies - provinces, waterboards, safety regions, regions for the purpose of adaptation policy (Delta programme)

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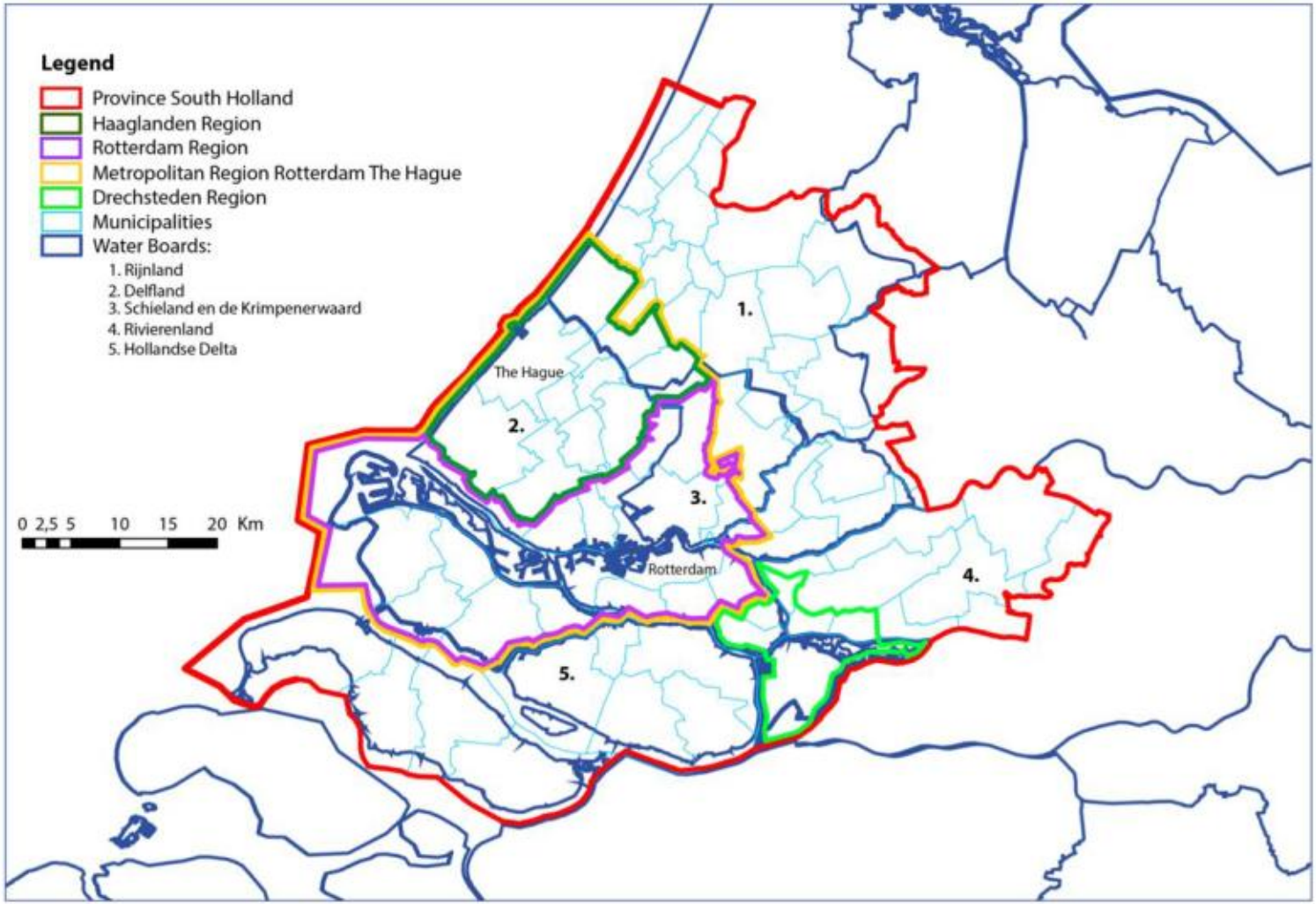
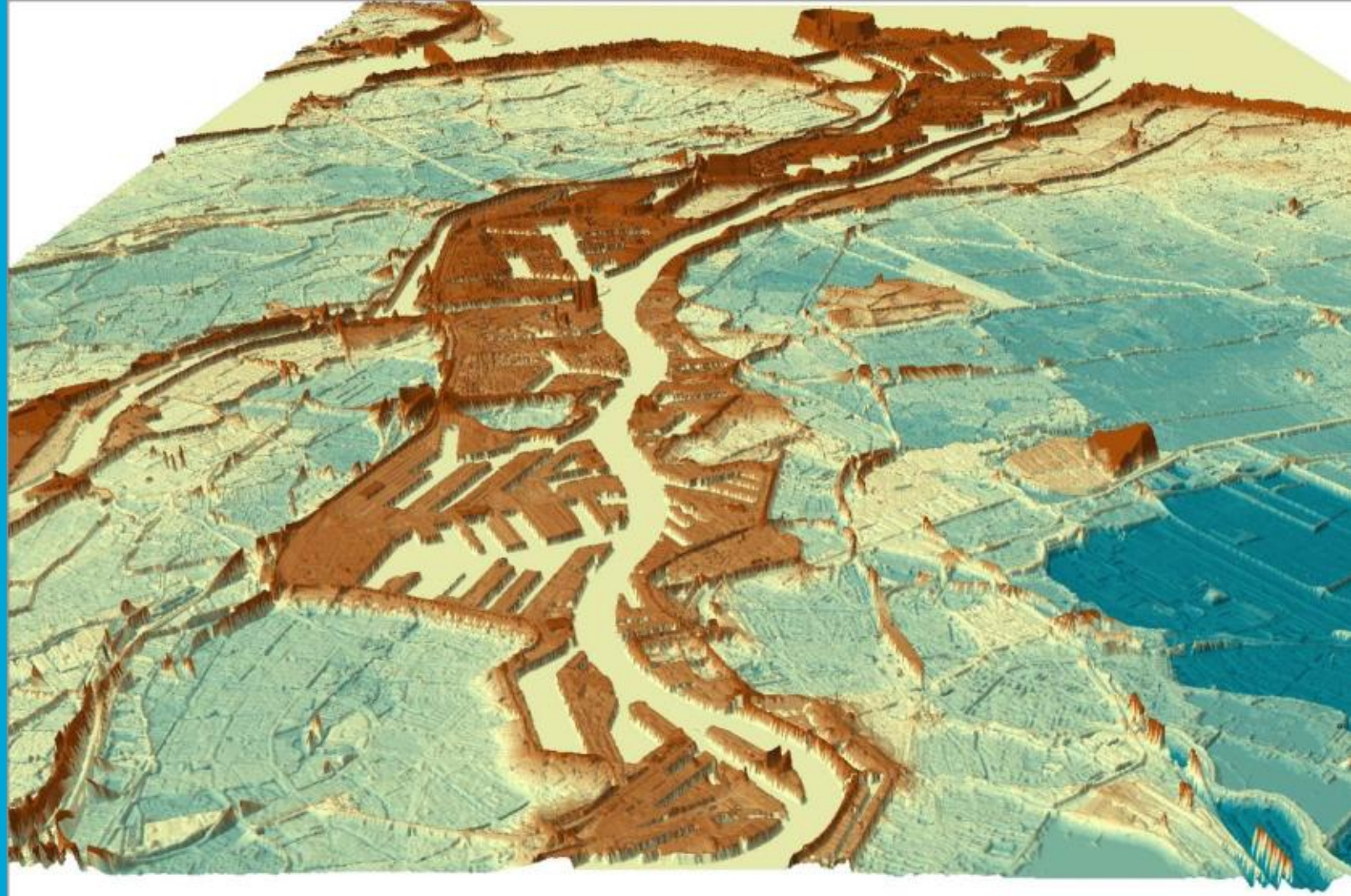

Legend
Province South Holland
Haaglanden Region
Rotterdam Region
Metropolitan Region Rotterdam The Hague
Drechsteden Region
Municipalities
Water Boards:
1. Rijnland
2. Delfland
3. Schieland en de Krimpenerwaard
4. Rivierenland
5. Hollandse Delta
0 2,5 5 10 15 20 Km
The Hague
Rotterdam
1.
2.
3.
4.
5.

Institutions

- **Smaller municipalities** lack resources (austerity, ‘shrinking state’)
- **Complexity of governance** arrangements → **laborious** coordination
- **Administrative system is in flux** → uncertainty and policy in flux
- **Fragmented responsibility** for flood risk:
  - Coastal flooding – national government
  - River flooding - regional water boards
  - Pluvial flooding – municipalities and landowners
- **Blurred accountability** for **unembanked areas** – legal grey zone



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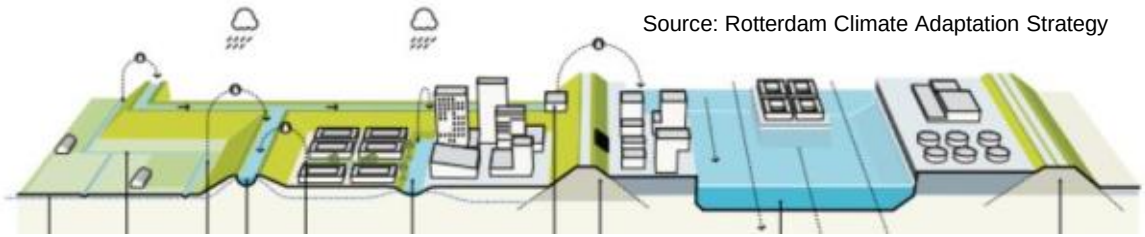
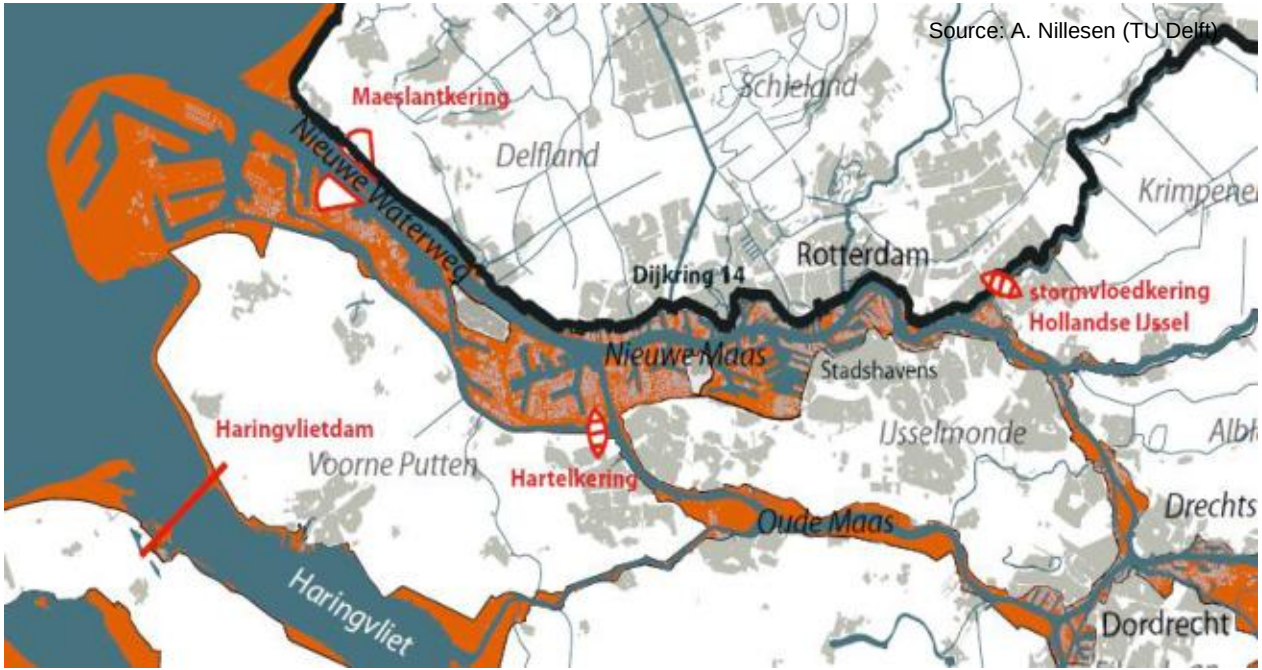


Source: Rotterdam Climate Adaptation Strategy



Source: A. Nillesen (TU Delft)

Unembanked areas (orange) in the Rotterdam region, 2014


Unembanked area, Feijenoord, Rotterdam
Photo: Marcin Dabrowski

Unembanked area, Noordereiland, Rotterdam

Photo: Marcin Dabrowski

Ideas

- Difficult cooperation between **municipalities** and **water boards** due to **different approaches and ways of doing things**

- **Paradox**: too much **trust** in the long established flood protection system **limits awareness** of the threat and **undermines public support** for adaptation policies

- The **‘green-blue’** solutions are **not deemed effective** by water boards but can play an important **role in building awareness**

Interests

- **Who pays** for infrastructure to protect unembanked areas and urban adaptation projects?
- **Who takes responsibility** for floods?
- **Disincentives for long-term** perspective:
  - Distant risk that is largely **ignored by the public**
  - Local leaders operate according to a **four year electoral cycle** and are under pressure to cater to **other societal interests**
- Climate adaptation as a **place branding** strategy – how effective are the measures taken? What is behind the positively loaded discourse?

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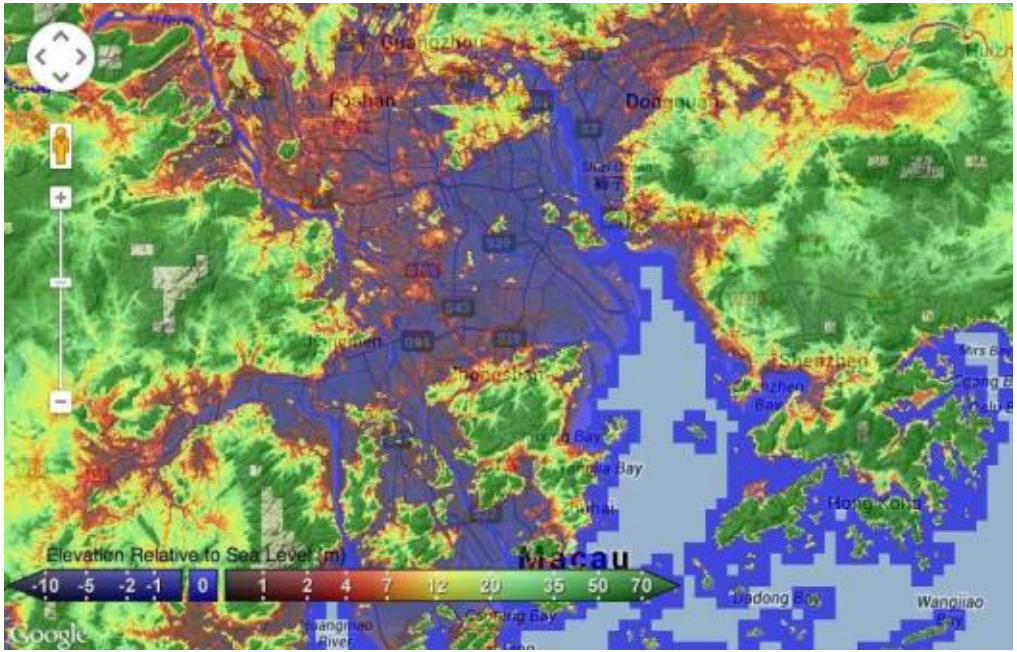
1. What are the main challenges encountered in adapting to climate change in your cities? What boundaries need spanning?

2. What is needed to overcome them?

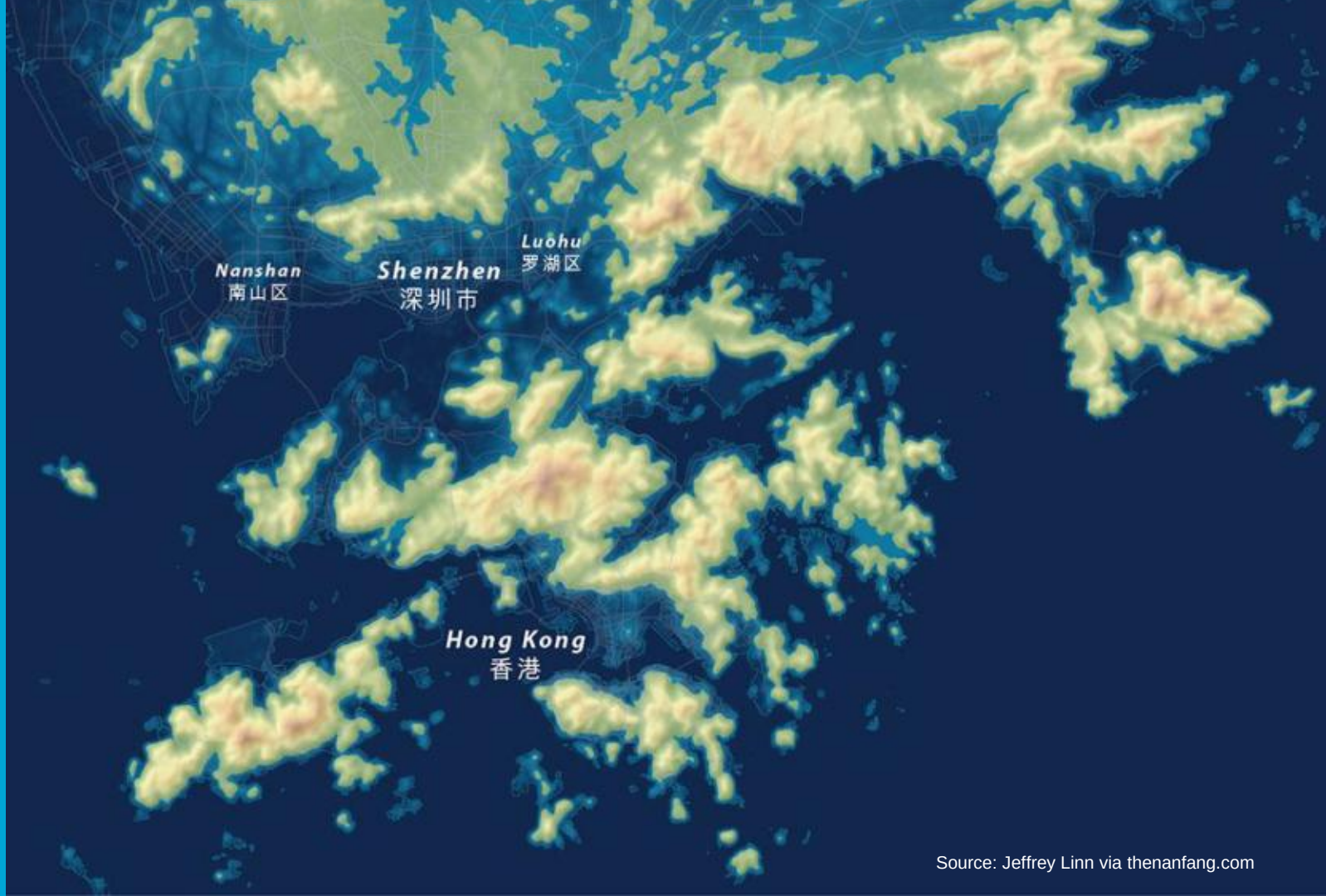
3. Examples of good practice from your cities?

4. Pearl River Delta: Hong Kong

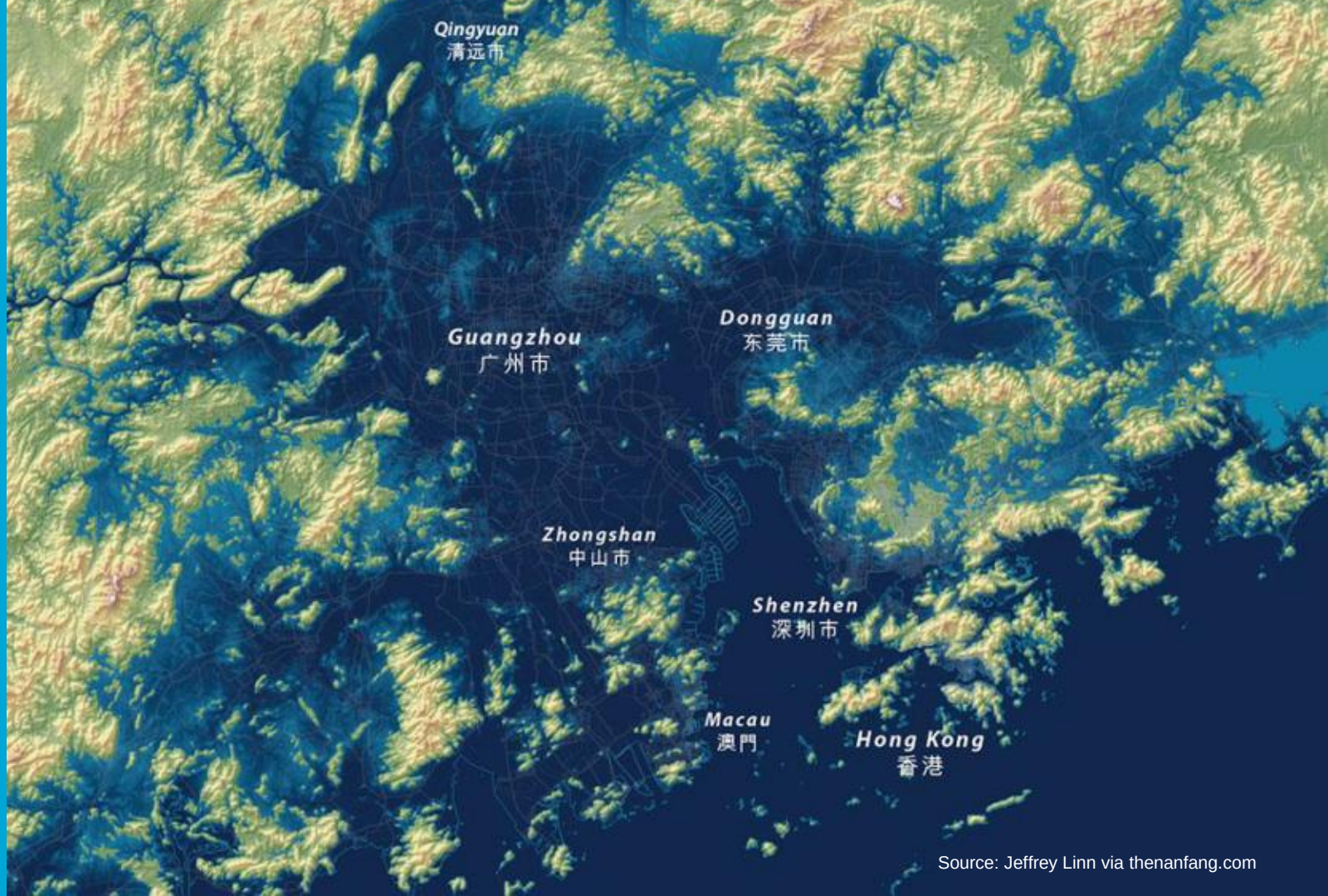
Areas exposed to flooding as a result of the rising sea level



Source: Sea Level Rise Explorer



Source: Jeffrey Linn via thenanfang.com



Source: Jeffrey Linn via thenanfang.com

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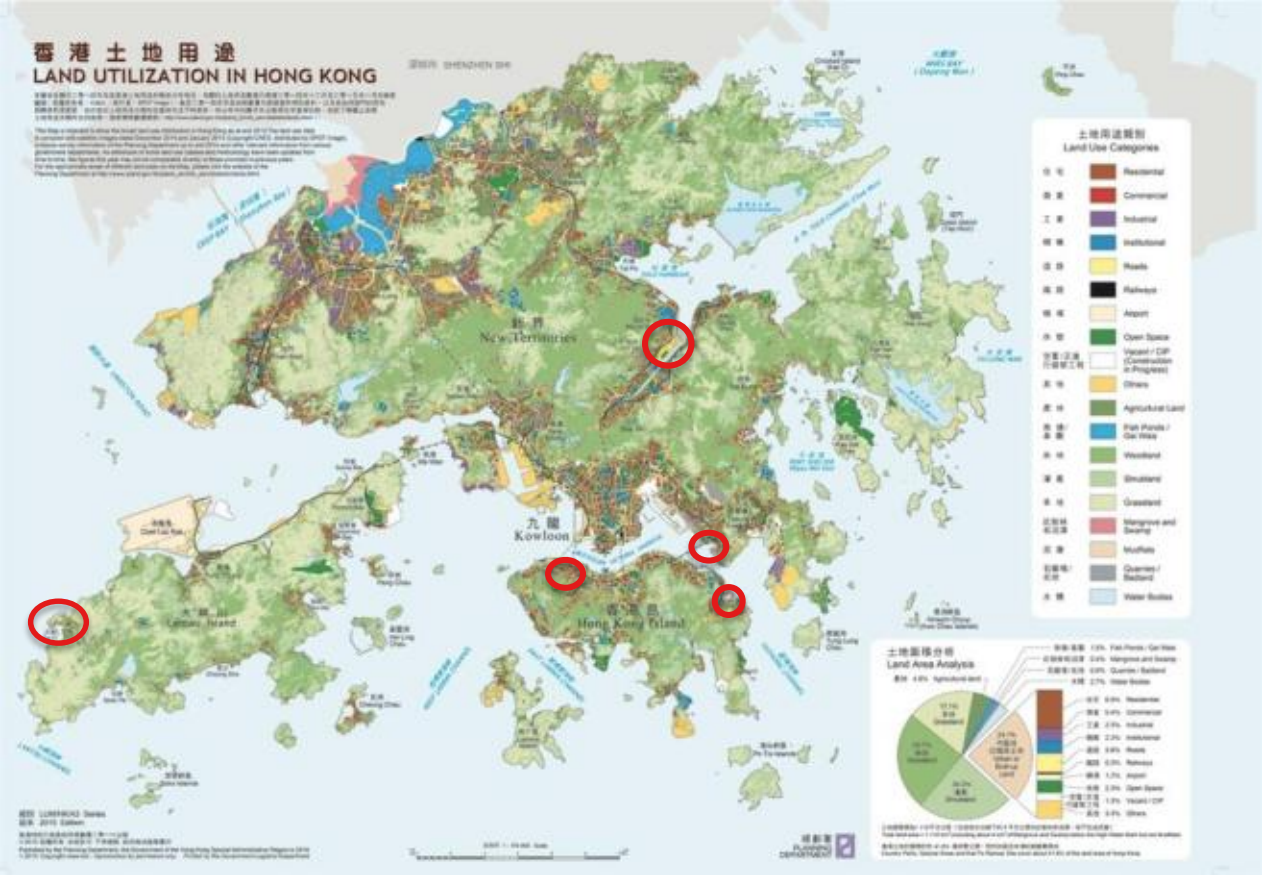
Hong Kong

Typhoon Hato – 23 August 2017

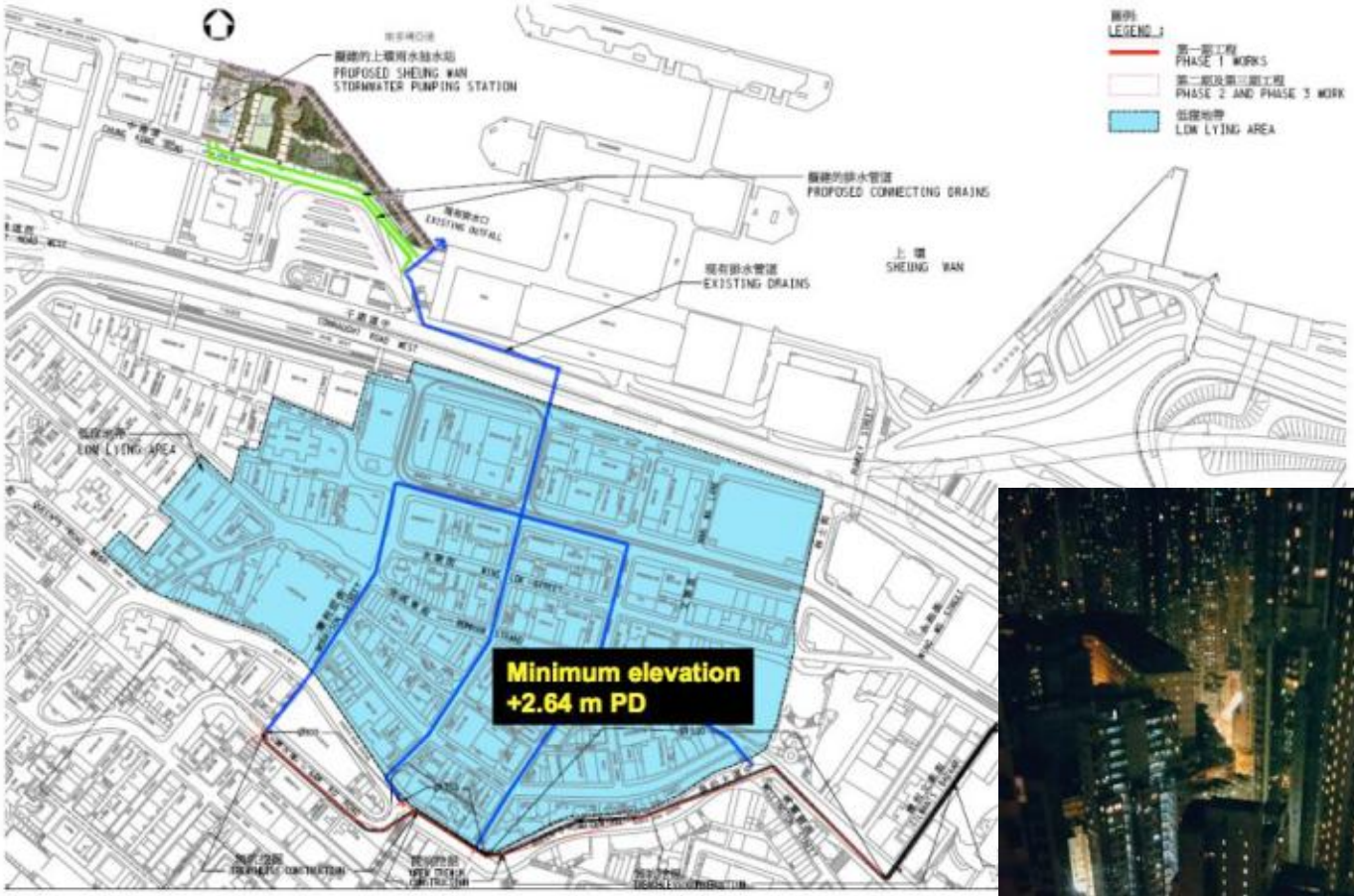
Photo: businessinsider.com

Storm surge at Lei Yu Mun – Kowloon East

Source: The Standard



Sources: Faith Chan, HKO, Planning Department


LEGEND
PHASE 1 WORKS
PHASE 2 AND PHASE 3 WORK
LOW LYING AREA
PROPOSED SHEUNG WAN
STORMWATER PUMPING STATION
PROPOSED CONNECTING DRAINS
EXISTING OUTFALL
EXISTING DRAINS
SHEUNG WAN
LOW LYING AREA
Minimum elevation
+2.64 m PD

ed

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RECLAMATION & DEVELOPMENT
IN HONG KONG
1977 - 1984
NEW TERRITORIES
KOWLOON
HONG KONG ISLAND
Lantau Island
DEEP BAY
MIRS BAY
TSUEN WAN
YUEN LONG
TUEN MUN
TAI PO
SAI KUNG
RECLAMATION
1968 - 1976
up to 1887
1888 - 1924
1925 - 1945
1946 - 1967

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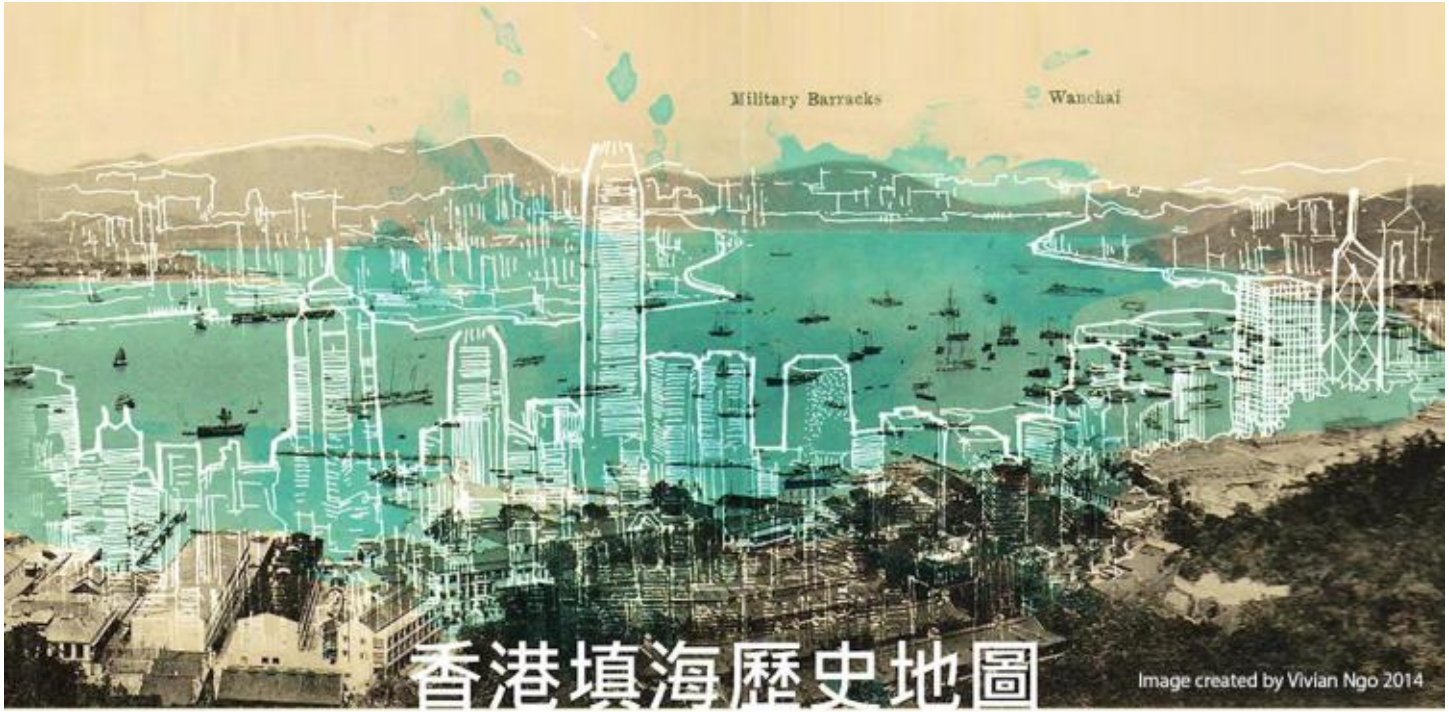
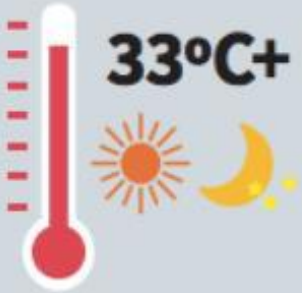

Military Barracks
Wanchai
香港填海歷史地圖
Image created by Vivian Ngo 2014


荔枝角 Lai Chi Kok
深水埗，長沙灣 Sham Shui Po, Cheung Sha Wan
九龍灣 Kowloon Bay
土瓜灣 To Kwa Wan
油麻地 Yau Ma Tei
尖沙咀 Tsim Sha Tsui
官塘 Kwun Tong
北角 North Point
上環 Sheung Wan
中環 Central
西環 Western District
鰂魚涌 Quarry Bay
銅鑼灣 Causeway Bay
筲箕灣 Shau Kei Wan
灣仔 Wanchai
柴灣 Chai Wan
Land Reclamation Time Slider
1842 - 2010
南區 Southern District
COASTLINE
- DIGITIZED FROM HISTORIC MAPS
ORIGINAL COASTLINE
YEAR RECLAMED
- DIGITIZED FROM HISTORIC MAPS
1840-1849
1850-1859
1860-1869
1880-1889
1890-1899
1900-1909
1910-1919
1920-1929
1930-1939
1940-1949
1950-1959
1960-1969
1970-1979
1980-1989
1990-1999
2000-2009
2010-PRESENT

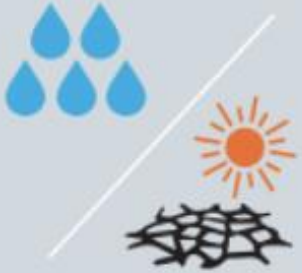
Hato flooding and reclaimed land



More very hot days and hot nights

Fewer rain days but average rainfall intensity will increase

More extreme rainfall events



More extremely wet years but risk of extremely dry years will remain

Global sea level rise will lead to coastal changes all over the world, including Hong Kong

Threat of storm surges associated with tropical cyclones will rise

Source: Hong Kong Environment Bureau, Hong Kong Observatory

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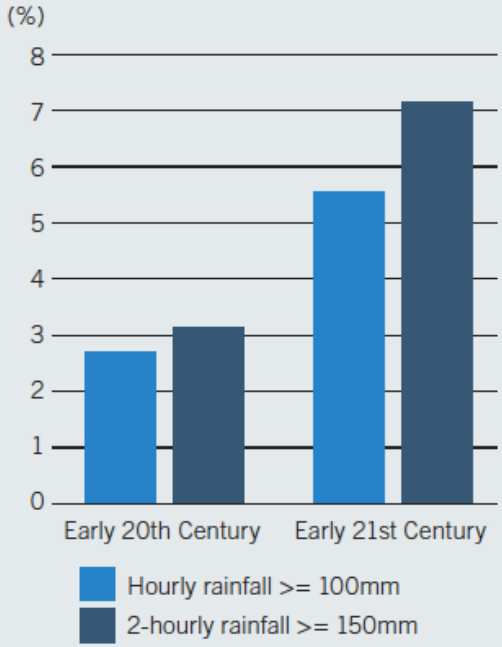
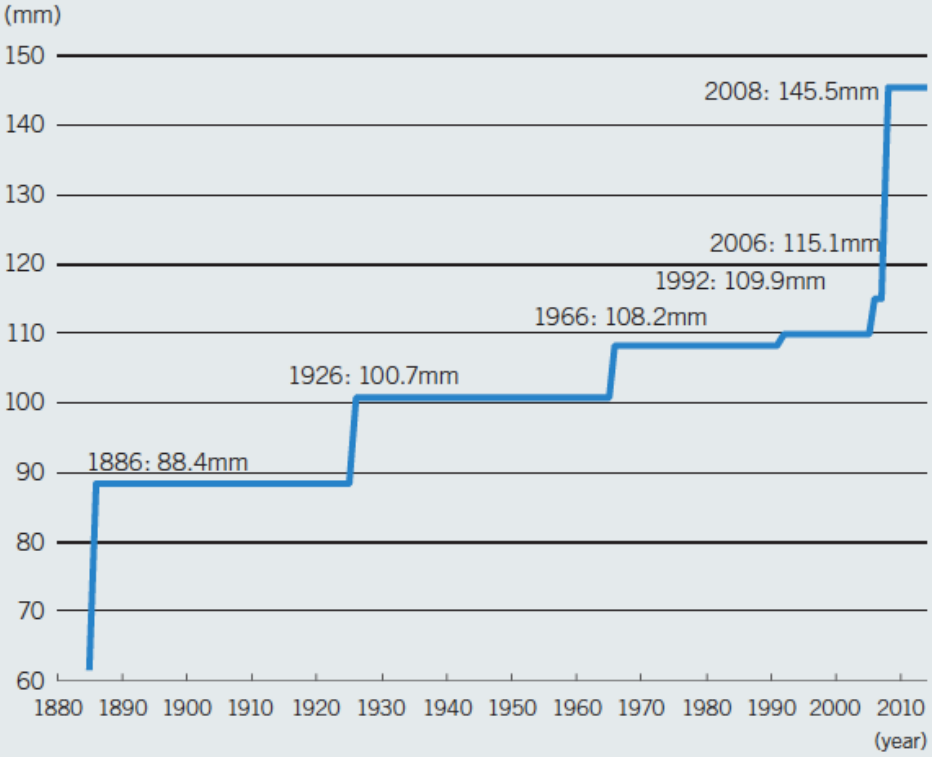
Probability of annual extreme rainfall events



Hourly rainfall records at the Hong Kong Observatory Headquarters (1885 - 2014)

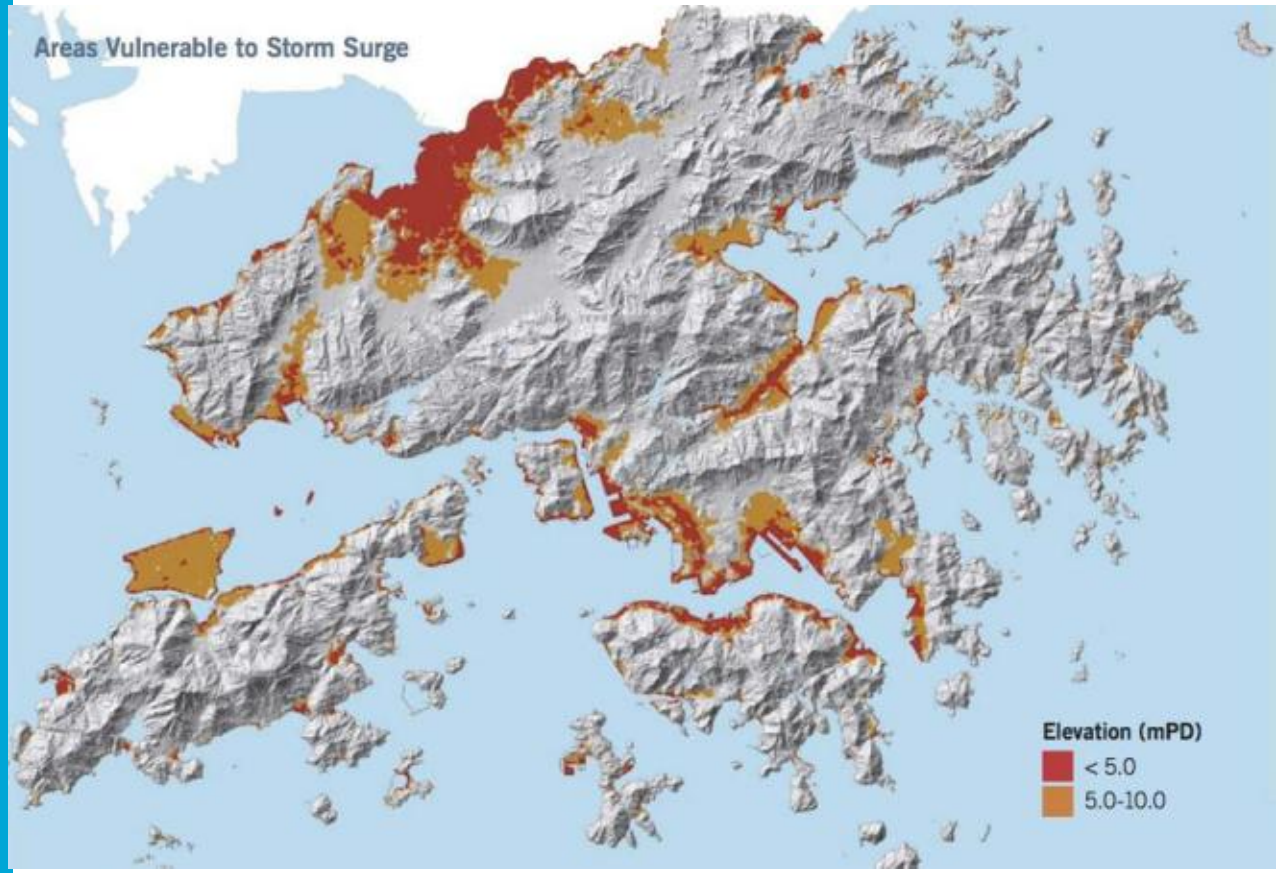


Source: Hong Kong Environment Bureau, Hong Kong Observatory

Return period (year)	Extreme sea level above Chart Datum (m)				Historical Typhoons bringing significant storm surges to Hong Kong (Maximum sea level above Chart Datum at Victoria Harbou)
	Current	Sea level rise reaching 0.26m in 2021-2040	Sea level rise reaching 0.53m in 2046-2065	Sea level rise reaching 1.07m in 2081-2100	
1	2.7	3.0	3.2	3.8	T. Hagupit in 2008 (3.53m)
2	2.9	3.2	3.4	4.0	
5	3.1	3.4	3.6	4.2	T. Wanda in 1962 (3.96m)
10	3.3	3.6	3.8	4.4	Typhoon in 1937 (4.05m)
20	3.4	3.7	3.9	4.5	
50	3.5	3.8	4.0	4.6	

Projected changes in return values of extreme sea level events in 2021-2040, 2046-2065 and 2081-2100 under the high GHG concentration scenario

Source: Hong Kong Environment Bureau, Hong Kong Observatory



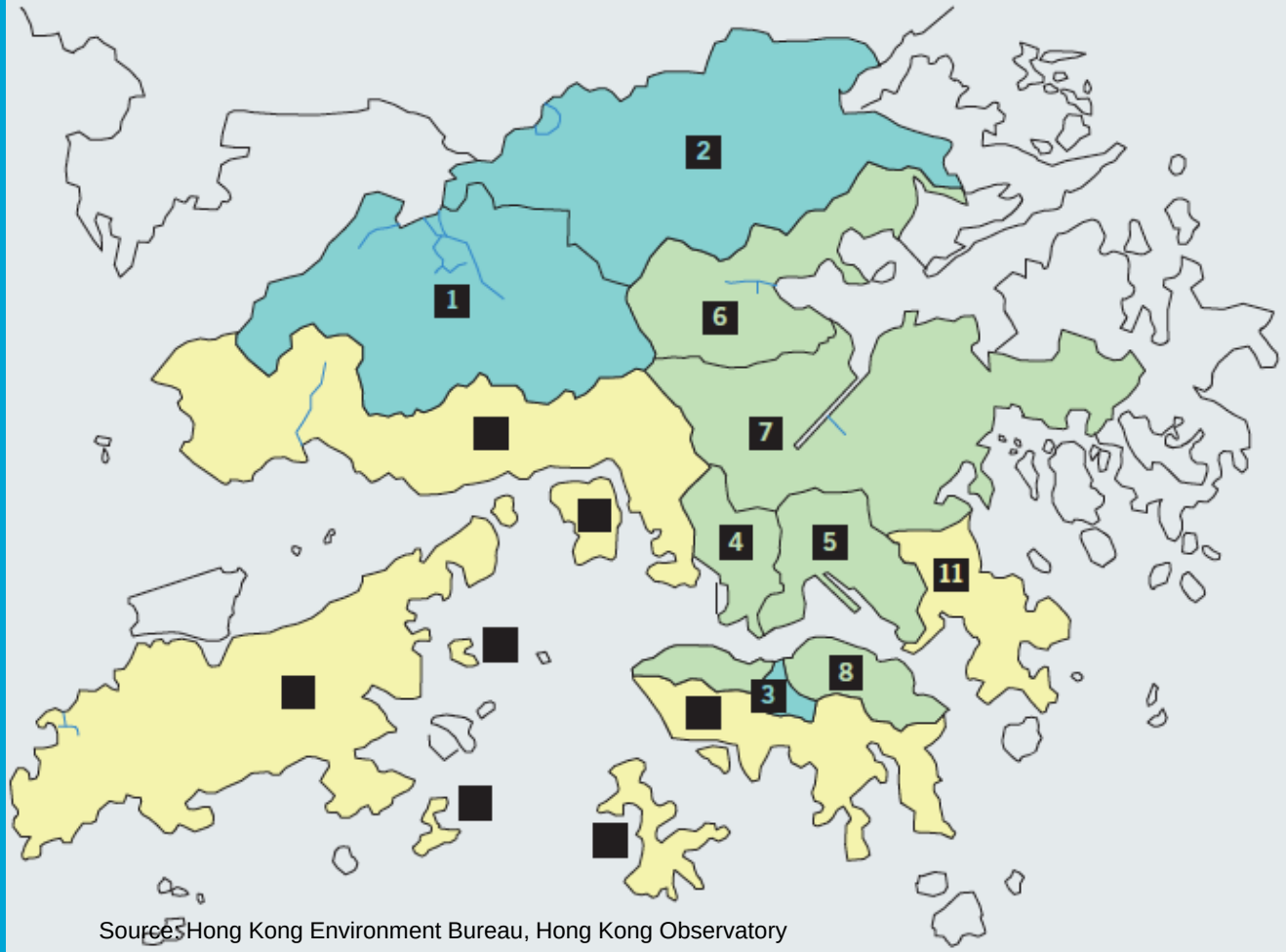
Source: Hong Kong Climate Change Report 2015

Climate change programmes and strategies

- Hong Kong Observatory (2010) Sea-level rise and storm surge - impacts of climate change on Hong Kong → very clear and precise data on climate change threats, that is hardly taken up by the government
- Environment Protection Department (2010) A Study of Climate Change in Hong Kong - Feasibility Study (focus on mitigation)
- However, recognition of the climate change impacts by the government and ongoing efforts across various government departments to update standards and procedures in the wake of the raising sea level and more frequent extreme weather (e.g. for drainage, coastal infrastructure, land reclamation)
- Hong Kong Climate Change Report 2015 – mititgation and adaptation actions outlined, but still falls short of being an integrated strategy
- Hong Kong's Climate Change Action Plan 2030+ - progress but still no substance for spatial planning
- More and more examples of adaptation measures, which however remain 'accidental' and are not part of integrated strategies

Drainage Master Plan Review Studies

(On-going, since 2008)



Source: Hong Kong Environment Bureau, Hong Kong Observatory

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Constructed wetland at Yuen Long Bypass Floodway

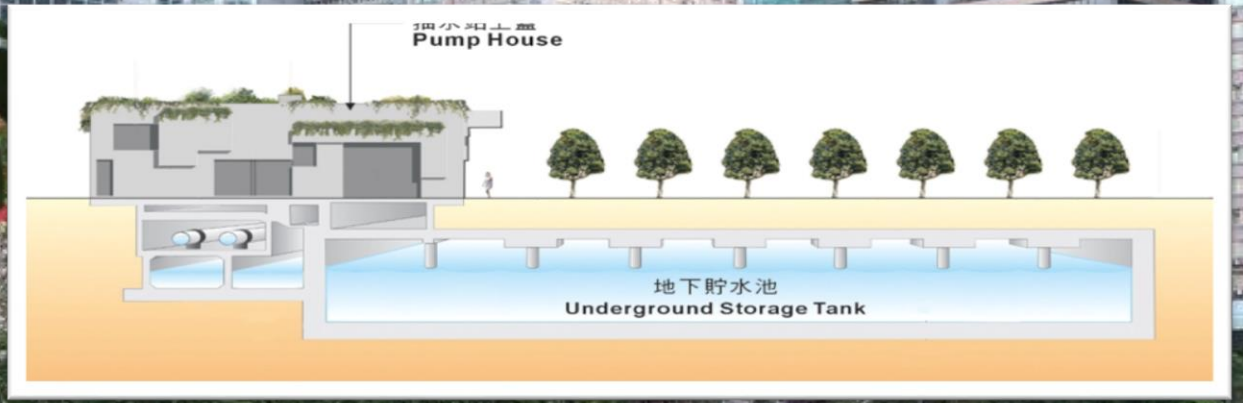
Anderson Road Quarry Development, photomontage image of proposed flood lake which will serve not only as a recreational amenity but also as a rainwater harvesting facility

Kai Tak River revitalisation (photomontage)

Source: HK Climate Action Plan 2030

Demountable flood barrier in Tai O Village

Photo: Landezine.com



Multi-functional Sheung Wan underground storage tank and pumping station

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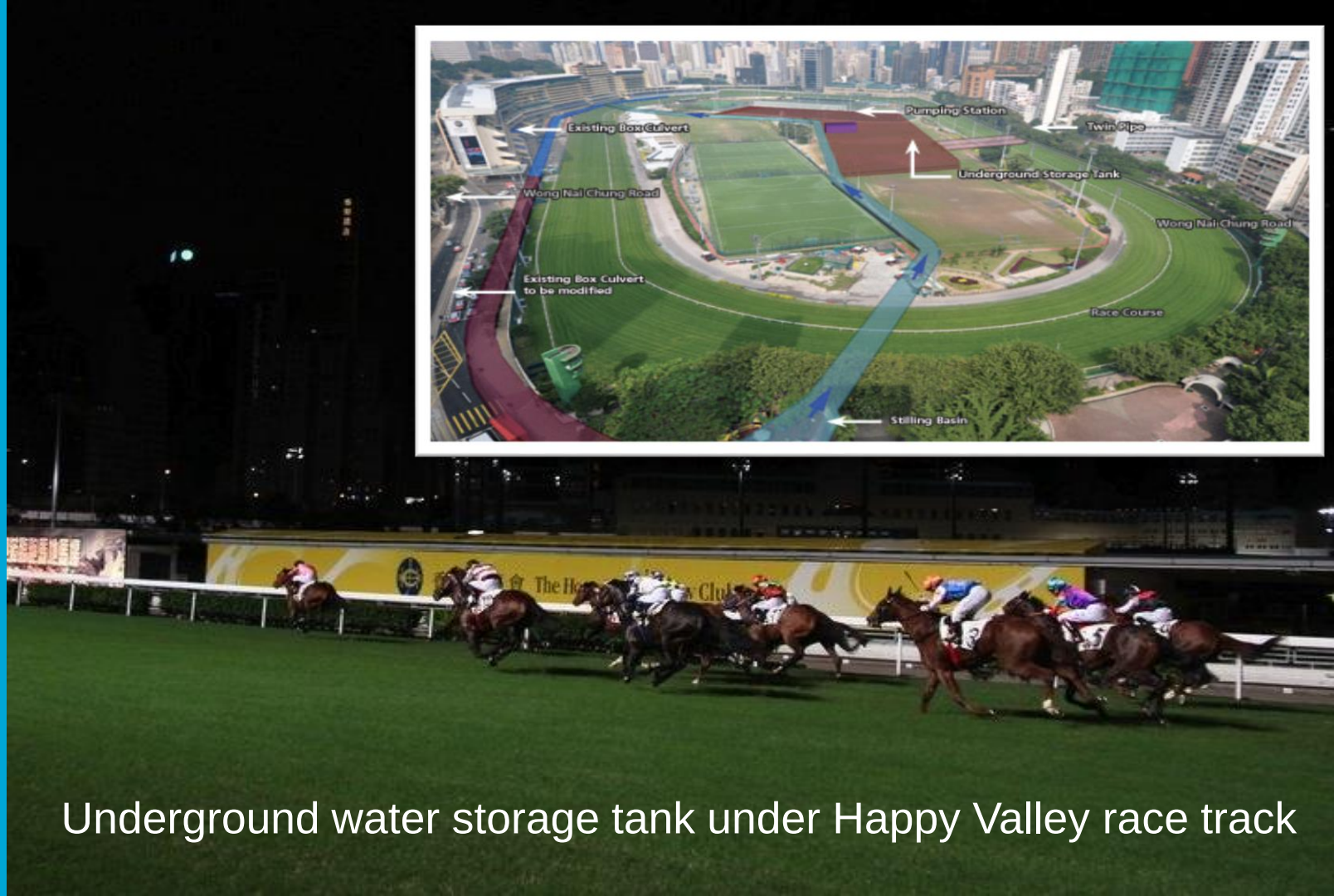


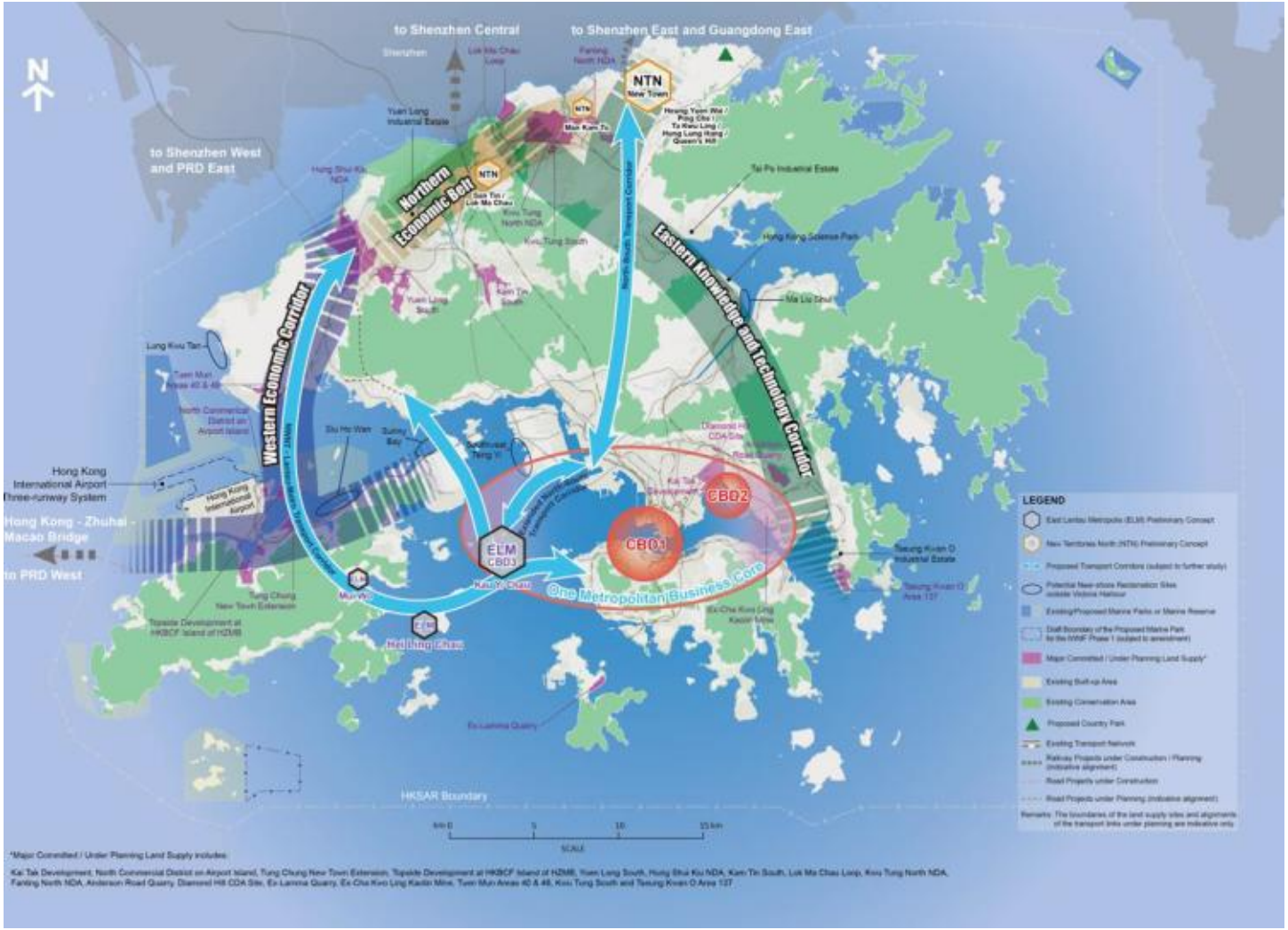
Underground water storage tank under Happy Valley race track

Actors

State	Non state	Knowledge	Beyond HK
Hong Kong Government departments of Environmental Protection, Drainage Services, Civil Engineering and Development, Water Resources	Transportation and utilities businesses	Universities and research institutions provide knowledge on climate change impacts and are involved in adaptation studies	Hong Kong/Guangdong Joint Liaison Group on Combating Climate Change
	Environmental NGOs (e.g. WWF)		C40 Cities (focus on mitigation)
	Business associations		

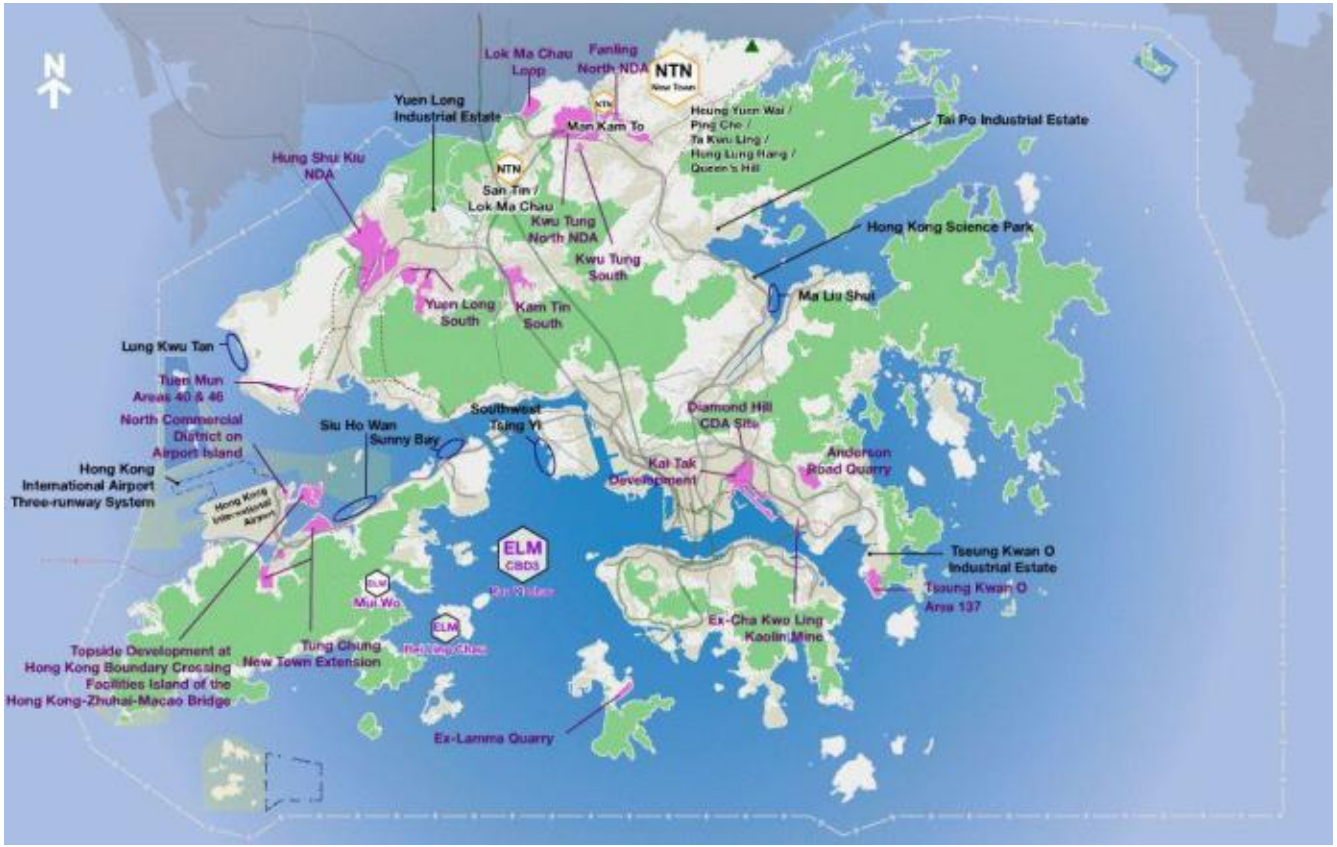
Institutions

- Small and '**insular**' government – not dealing with higher or lower scales of government
- Wealth of engineering and scientific **expertise**, availability of data on climate change impacts
- **Silo-mentality** deeply embedded in the efficient but reactive and stiff post-colonial administration – no coordination on climate change adaptation, only routine operational interactions
- **Blurred accountability** for tackling coastal flooding – Drainage Services Department deals with flood risk generally, but coastal flooding is beyond its jurisdiction, while the Civil Engineering and Development Department deals with coastal infrastructure but not storm surges
- **Planning Department** focused on zoning and permits rather than on strategic planning – sidelined from discussions on adaptation – expansion onto reclaimed land continues



*Major Committed / Under Planning Land Supply includes:

Kai Tak Development, North Commercial District on Airport Island, Tung Chung New Town Extension, Topside Development at HKBCF Island of HZMB, Yuen Long South, Hung Shui Kiu NDA, Kam Tin South, Lok Ma Chau Loop, Kwu Tung North NDA, Fanling North NDA, Anderson Road Quarry, Diamond Hill CDA Site, Ex-Lamma Quarry, Ex-Cha Kwo Ling Kaolin Mine, Tuen Mun Areas 40 & 46, Kwu Tung South and Tseung Kwan O Area 137


N
Lok Ma Chau Loop
Fanling North NDA
NTN
New Town
Yuen Long Industrial Estate
Heung Yuen Wai / Ping Che / Ta Kwu Ling / Hung Lung Hang / Queen's Hill
Tai Po Industrial Estate
Hung Shui Kiu NDA
Mon Kam To
NTN
San Tin / Lok Ma Chau
Kwu Tung North NDA
Kwu Tung South
Hong Kong Science Park
Yuen Long South
Kam Tin South
Ma Liu Shui
Lung Kwu Tan
Tuen Mun Areas 40 & 46
North Commercial District on Airport Island
Siu Ho Wan
Sunny Bay
Southwest Tung Yi
Diamond Hill CDA Site
Hong Kong International Airport Three-runway System
Kai Tak Development
Anderson Road Quarry
ELM
CBDs
Tseung Kwan O Industrial Estate
Tseung Kwan O Area 137
Mui Wo
Ex-Cha Kwo Ling Kaolin Mine
Topside Development at Hong Kong Boundary Crossing Facilities Island of the Hong Kong-Zhuhai-Macao Bridge
Tung Chung New Town Extension
Ex-Lamma Quarry


Tung Chung
New Town Extension
Hong Kong International
Airport Three-Runway
System
North Commercial
District on Airport Island
Topside Development at
Hong Kong Boundary
Crossing Facilities Island
Siu Ho Wan
Development
Sunny Bay
Hong Kong Disneyland
Resort Further
Development
ELM – Strategic Growth Area

Ideas

- **Low (but growing) awareness** of the climate change impacts
- However**, short term thinking is the norm** – legacy of colonial rule and the focus on making money
- **Engineering-focused** management in government departments tends to favour **short term techno-fixes**
- Perception of **typhoons and the related flooding as something normal** and inevitable, hence focus on draining the excess water and warning systems rather than on preventing storm surges and extreme weather
- **NGOs are influential** in setting the tone of the debate on climate change – conferences, consultations, ex-NGO under-secretary of the state in the Environmental Bureau

- No real cross-border cooperation on this issue due to **ressentiment towards Mainlanders**
- **Complacency** stemming from excessive trust in the drainage and slope control infrastructure massively developed recently
- **Occupy Movement and the constitutional crisis** – low legitimacy of the government further hinders long-term thinking and grand visions – focus on daily business


9·28我唔走
我要真普選
#UMBRELLA MOVEMENT
風雨中抱緊自由
自信可改變未來
公民抗命
假普選歧視基層
真普選人人平等

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Interests

- **Business-orientated government** avoids imposing policies that would generate costs for businesses

- **Some particularly vulnerable businesses lead the way** (MTR, energy companies) in climate adaptation measures to protect their assets and reduce risks

5. Pearl River Delta: Guangzhou and Shenzhen

Source: www.epd.gov.hk

Source: Yuting Tai, TU Delft

Nansha, Guangzhou

Source: architectus.com.au

Climate change programmes and strategies

- Recognition of the need to take adaptation measures at the national level, trickling down to the provincial, level, but no local response :
  - **National Plan for Coping With Climate Change 2011-2020** – focus on mitigation, but urban adaptation measures mentioned
  - **Provincial Climate Change Adaptation Strategy**, 2010 – document not taken up by the municipalities
  - **Sponge City Programme**, since 2014 – national programme for making cities more ‘water proof’ and prevent waterlogging, Low Impact Development ideas, climate change not mentioned, confusion onlcoal implementation
  - **Guangzhou Water White Paper 2013** – climate change not mentioned
  - However, at the local level, **some water management and urban development projects would tick the box of urban climate change adaptation**, but are not labeled as such

Combining urban redevelopment with flood protection on the South bank of the Pearl River in Liwan district, GZ

Photo: Marcin Dąbrowski

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Reopened canals combine heritage protection, with enhancing spatial quality and resilience to surface flooding in Liwan district, GZ

Photo: Marcin Dąbrowski

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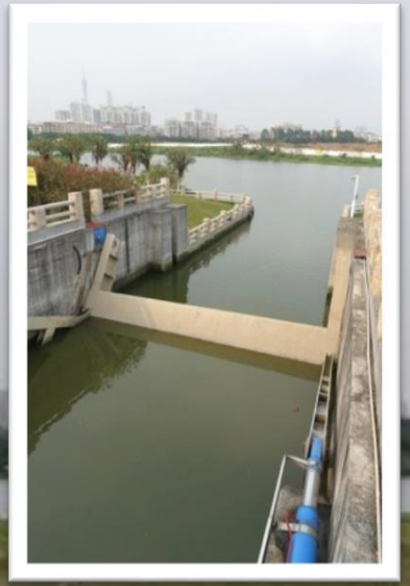
Haizhu lake – a (flawed) hydrological project with a key role in the future development of Guangzhou's city centre (extension of the 'Axis')
Google ear



Haizhu lake – a (flawed) hydrological project with a key role in the future development of Guangzhou's city centre (extension of the 'Axis')

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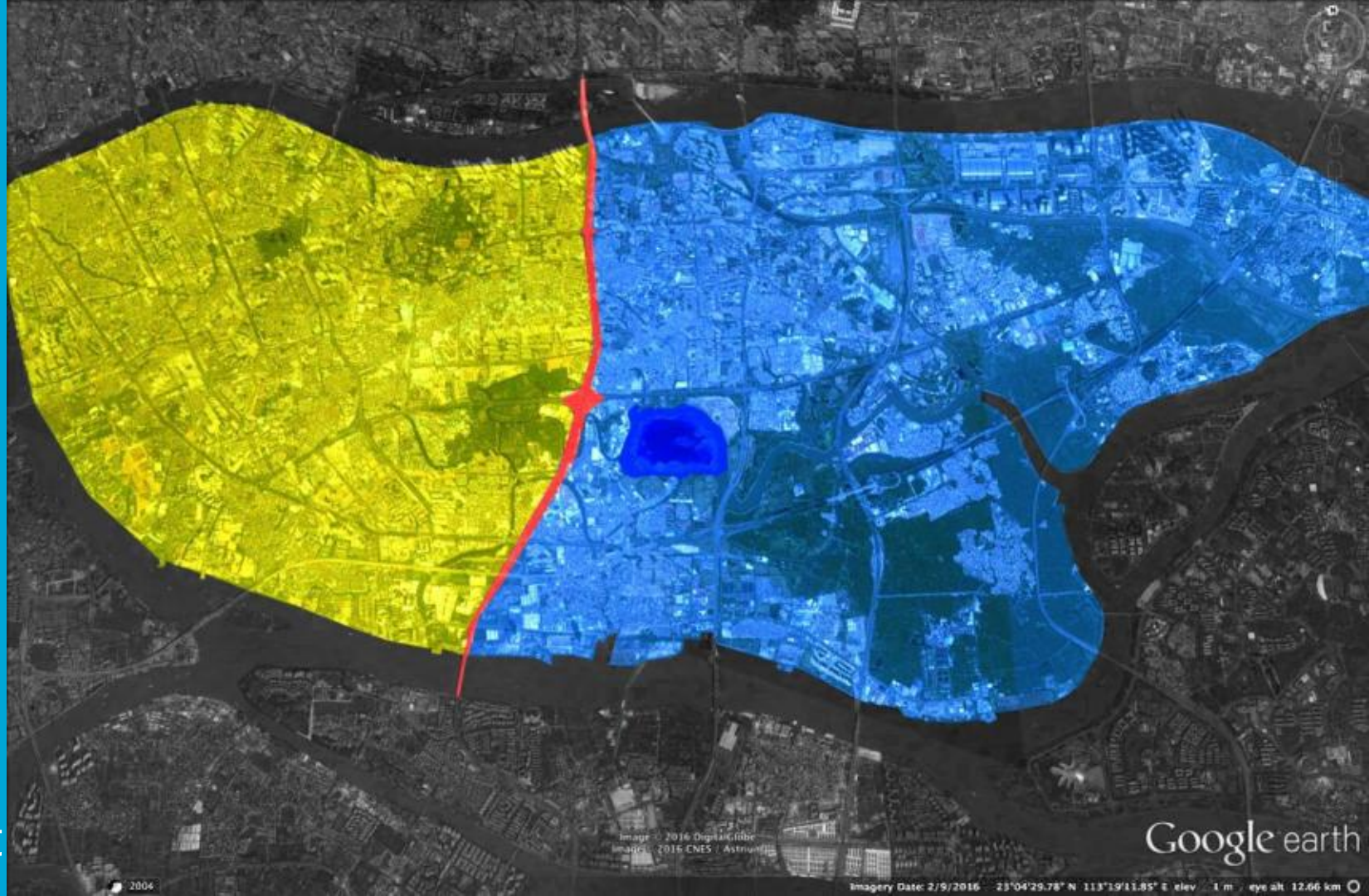
Image © 2016 DigitalGlobe
Image © 2016 CNES / Astrium
2004
Imagery Date: 2/9/2016 23°04'29.78" N 113°19'11.85" E elev 1 m eye alt 12.66 km
Google earth

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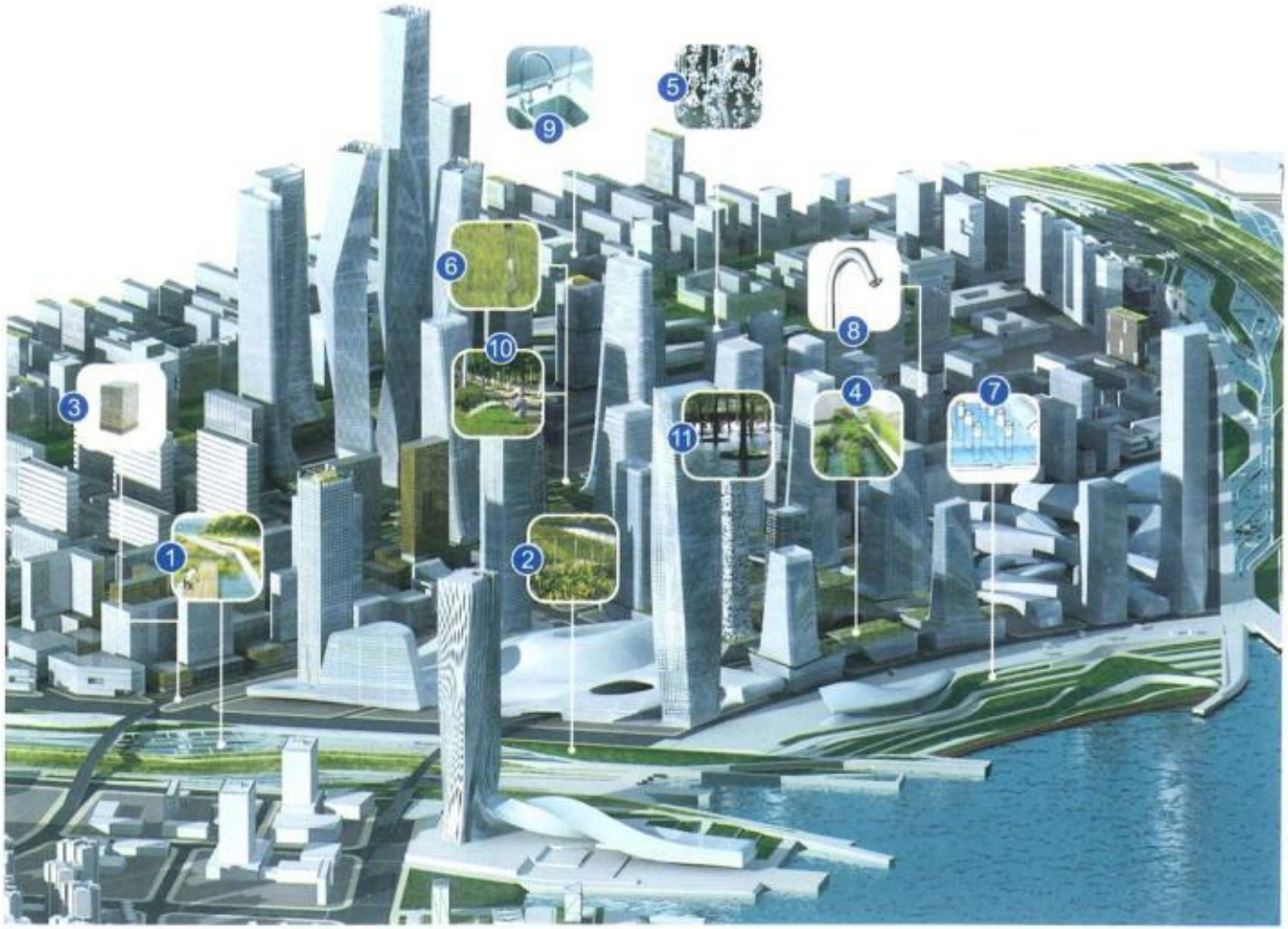
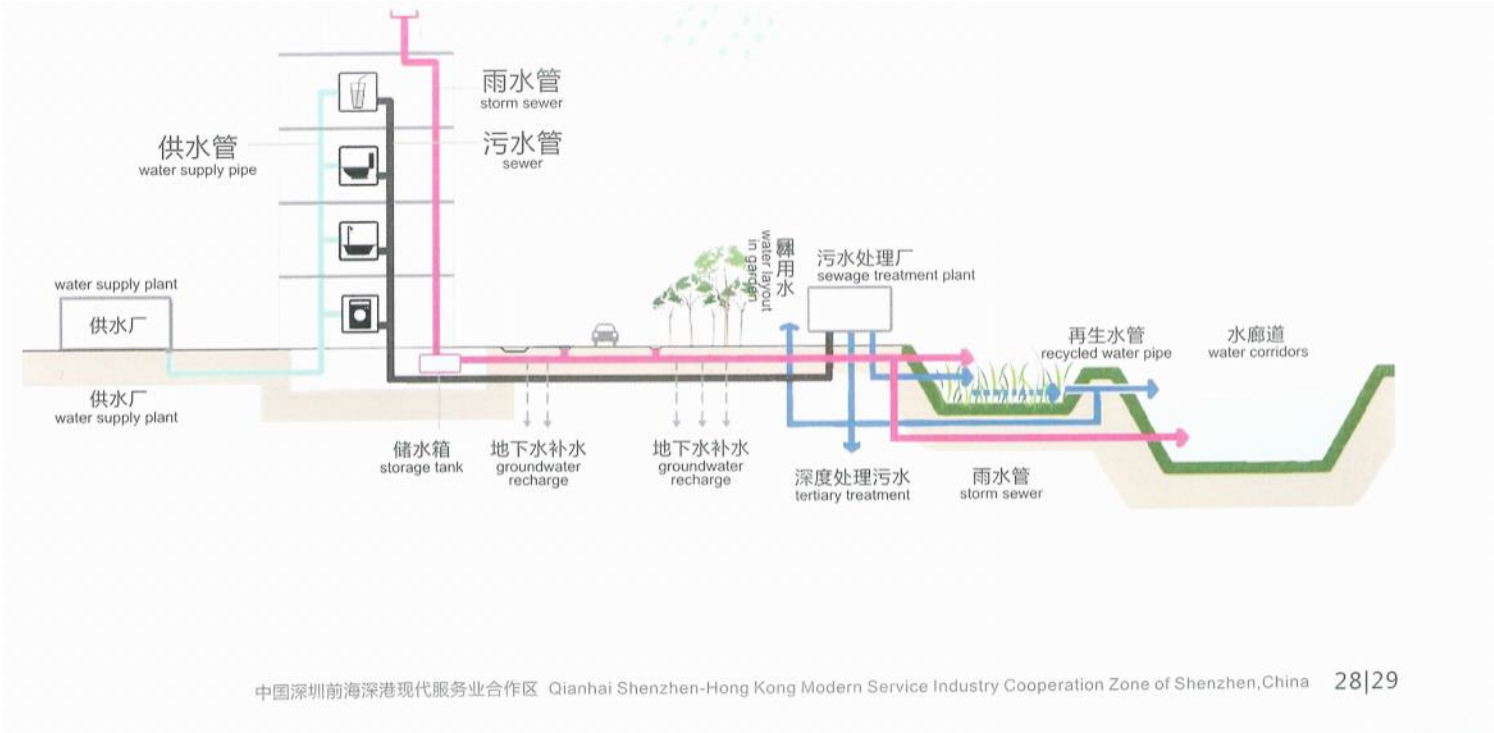
Tianhe Wetland Park.
Pilot ‘Sponge City’ project
in Guangzhou

Qianhai New Town,
Shenzhen, build on reclaimed land with blue-green infrastructure to store water and mitigate storm surges

Sources: Google Maps, Qianhai Authority


1 水廊道 Water corridor
2 生态湿地 Wet land
3 透水性地面 Permeable pavements
4 绿色屋顶 Green roofs
5 雨水收集 Rainwater harvesting
6 雨水花园 Rain garden
7 雨洪调节池 Detention tank
8 节水装置 Low flow fixtures
9 分质供水 Dualwater supply
10 中水回用 Grey water reuse
11 城市水景 Water landscape


雨水管
storm sewer
供水管
water supply pipe
污水管
sewer
water supply plant
供水厂
供水厂
water supply plant
储水箱
storage tank
地下水补水
groundwater recharge
地下水补水
groundwater recharge
中水
water layout in garden
污水处理厂
sewage treatment plant
深度处理污水
tertiary treatment
雨水管
storm sewer
再生水管
recycled water pipe
水廊道
water corridors
中国深圳前海深港现代服务业合作区 Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone of Shenzhen,China
28|29

Actors

State	Non state	Knowledge	Beyond CN
Municipalites and their sectoral departments reflecting the higher scale administrative hierarchy – no activity in climate change adaptation	NA	Universities and research institutions involvement limited to design of new districts	Hong Kong/Guangdong Joint Liaison Group on Combating Climate Change
Inter-municipal cooperation arrangements – no activity in climate change adaptation			C40 Cities (Shenzhen – low-carbon city focus)
Guangdong Province – climate change adapatation strategy (window-dressing)			
Pearl River Water Resources Commission - no activity in climate change adaptation			
Ministries of Land & Resources, Water Resources, Housing & Urban-rural Development, Environmental Protection – piece meal measures to address the national strategy			
National Development and Reform Commission – key actor defining the national climate change policy			
National Response Leading Group on Climate Change (headed by Chinese Premier)			

Institutions

- **Hierarchical system with a Chinese specificity** – replication of departments across the scales and (in theory) a policy transmission belt from central to local, but in practice local level has large degree of autonomy and the central government little means of enforcing implementation

- In theory different municipal bureaus coordinate actions to ensure flood safety, in practice **complete silo-mentality and lack of coordination**, not only lack of dialogue but also examples of counterproductive actions (transport bureau vs water resources bureau in the case of Haizhu lake)

- No continuity of urban policies – **Mayors 'parachuted'** from elsewhere to be later promoted to the provincial or national level

Ideas

- **Living with water is in the local DNA**, however, the ancestral knowledge in with water management has been lost
- **Short-term thinking** is the norm – legacy of the rapid economic transformation; built environment not made to last
- As in HK, **typhoons and the related flooding seen as normal and inevitable** → focus on draining the excess water and warning systems rather than on preventing calamities from happening
- **No awareness of climate change impacts** – only academic hydraulic engineering experts seem to grasp it, but have hardly any influence on policy. Consequently, the **cities expand extremely fast into areas that are extremely vulnerable to coastal flooding ignoring the risks** – e.g. Nansha New Area in Guangzhou or Qianhai in Shenzhen

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Ideas

- **No knowledge or dismissal of international studies** on climate change impacts among the decision-makers
- **‘Accidental’ climate adaptation measures** that are not framed as climate change adaptation and not based on assessment of future risks – the objective is to create a beautiful urban landscape (‘every Mayor wants a lake in his district’)
- **Sponge City** programme introduces the concept of Low Impact Development (Shenzhen mainly, but ideas spill over across the region)
- **No real cross-border cooperation** on this issue due to resentment towards HK – vague exchange of knowledge

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Interests

- **Urbanisation at break-neck speed and at all cost → flood risk management is not a priority** (developing real estate is) and lags behind, resulting in very low level of flood protection:
  - About 77% is protected with 1-in-20 years (or below) and many core city areas (e.g. in Tianhe, Liwan, Baiwan, Haizhu) are currently only equipped with less than 1-in-10 years or 1-in-1 year protection measures

- No local response to the national climate change policy – focus on urban expansion and development, **environmental concerns are secondary, not to mention climate change adaptation**

- **Peculiarity of the assessment of local officials** – focus on GDP growth as the main indicator of performance and no interest of the leaders to do anything else (eying promotion to Beijing), unless better water management becomes a national priority in a particular area (see Sponge City policy)

Interests

- **Interest in boosting the value of real estate** dictate the use of multi-functional flood-protections and Low Impact Development solutions rather than environmental or climate adaptation concerns
- **Impressing high level visitors** by pleasant water landscape features
- **Extremely difficult collaboration between the cities** prevents any cooperation on issues other than transportation
- Focus on economic growth and **limited availability of rural land that can be converted in to urban justifies the expansion of the cities onto reclaimed land** (see Nansha, Qianhai new areas)

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Conclusions

- **Urbanisation patterns and climate change vulnerability are closely connected**, if not readily recognised by decision-makers
- **Context matters:** political culture, local politics, (changes in) the governance setting and vertical and horizontal institutional linkages, are crucial for determining how cities and urban regions can address adaptation by spanning across various boundaries
- **Cross-jurisdictional and cross-sectoral governance difficulties** hamper boundary spanning needed for adaptation
- **Three I's** enhance the understanding of **which barriers** hinder boundary spanning for adaptation and **why** they emerge
- **Solutions** to at least some of them can be found, paradoxically, not at the local or even city-region scale, but at the **national** level

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- A closer look reveals essentially **similar flood protection / urban development projects** implemented in the different cities, however, their aims, framing and extent vary greatly

- **Implications for practice:**
  - Climate risks awareness-building to build support for investment in adaptation
  - Framing climate adaptation measures as an opportunity to improve spatial quality and attractiveness of the city – but who benefits?
  - Improving vertical and horizontal coordination
  - A degree of pragmatism – work around institutional limitations with the existing strengths and opportunities

Some further reflections

- Climate adaptation as a city branding strategy for Rotterdam – **What is behind the discourse?** What is the actual effectiveness of the measures implemented in the city?

- Importing multi-functional flood protection solutions and international best practice in water management and Low Impact Development to Shenzhen and Guangzhou, without any consideration for climate change impacts, but rather to make the new districts more attractive and maximise profits on real estate sales – **a case of policy transfer in which imported solutions serve a completely different purpose as intended**

- **Who benefits** from adaptation measures, who loses out, what are the possible negative effects (risk of **maladaptation**)?

- **Embracing the past?** Scope for learning from past solutions to co-exist with water

Thank you.

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