Asia Water Forum 2022
8–11 August 2022 • Online

Focus Area: Water as a sustainable resource

Session: Nature-based solutions and integrated perspectives

Schedule: [11 August 2022 (Thu), 9:00 a.m. - 10:30 a.m. (GMT+08)]

Merging Blue-Green Infrastructure with Urban Design – a water master-planning approach in four quadrants

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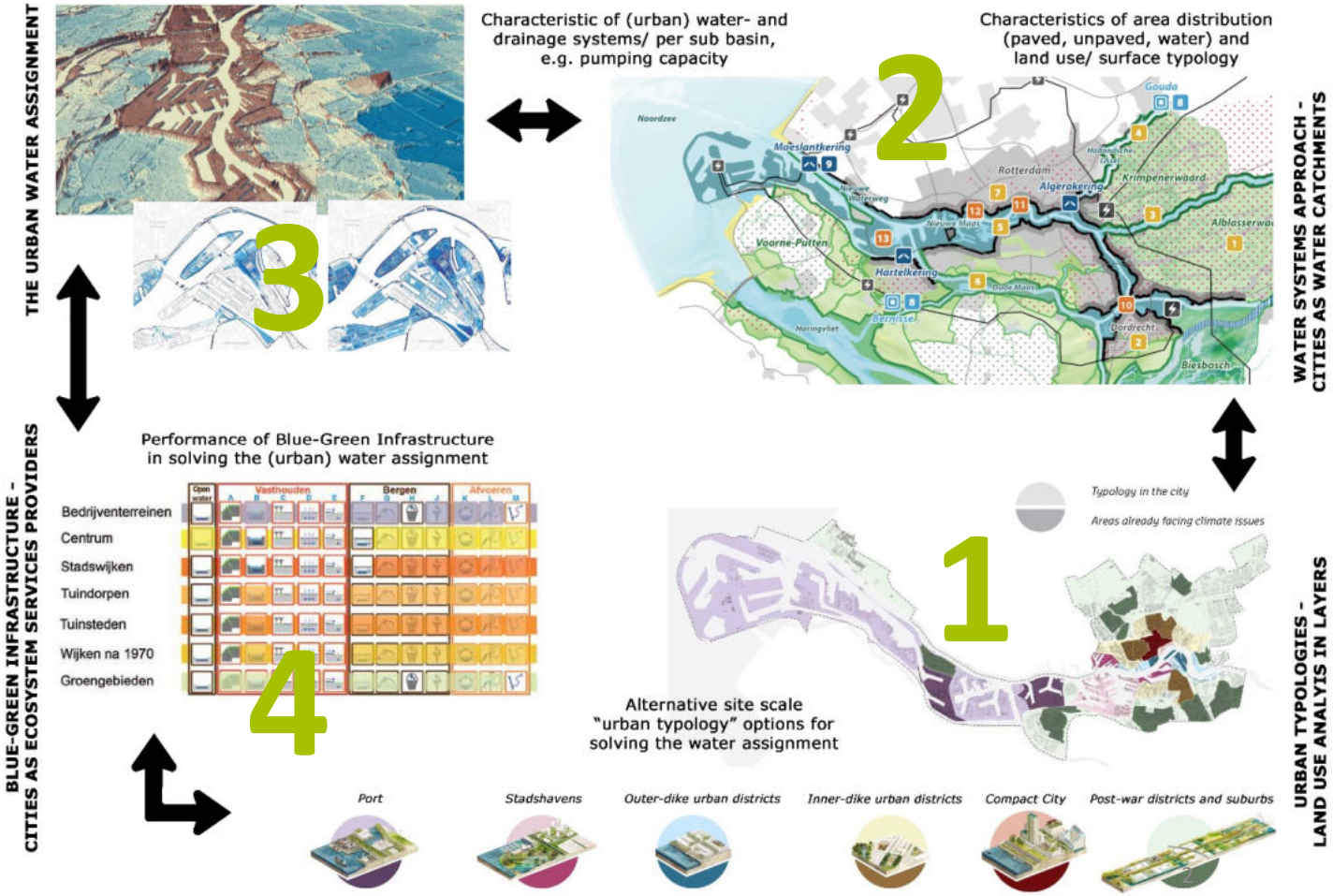
Royal HaskoningDHV

ADB

Water master-planning approach in 4 quadrants for merging BGI with urban design

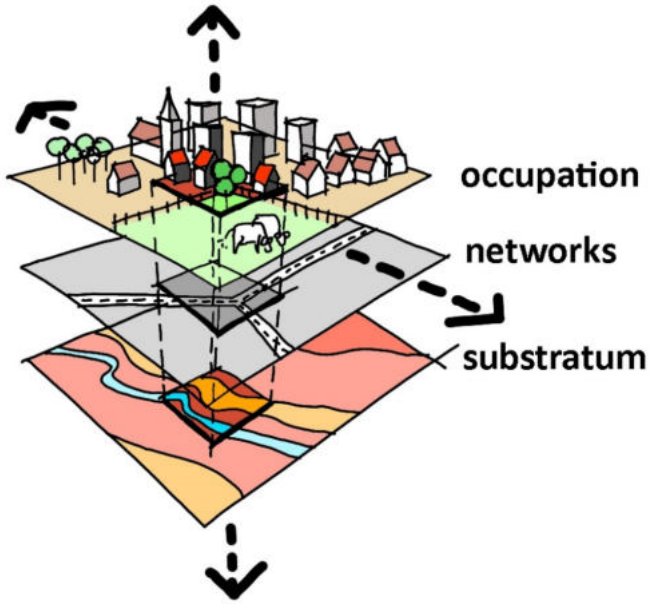
1. Urban analysis in layers – city (use) typologies
2. Water systems approach – cities as water catchments
3. The water assignment
4. Blue-Green Infrastructure – cities providing ecosystem services

(source: Dolman, 2021)



Q1. Urban analysis in layers — city (use) typologies

- Layers approach to spatial planning and design.

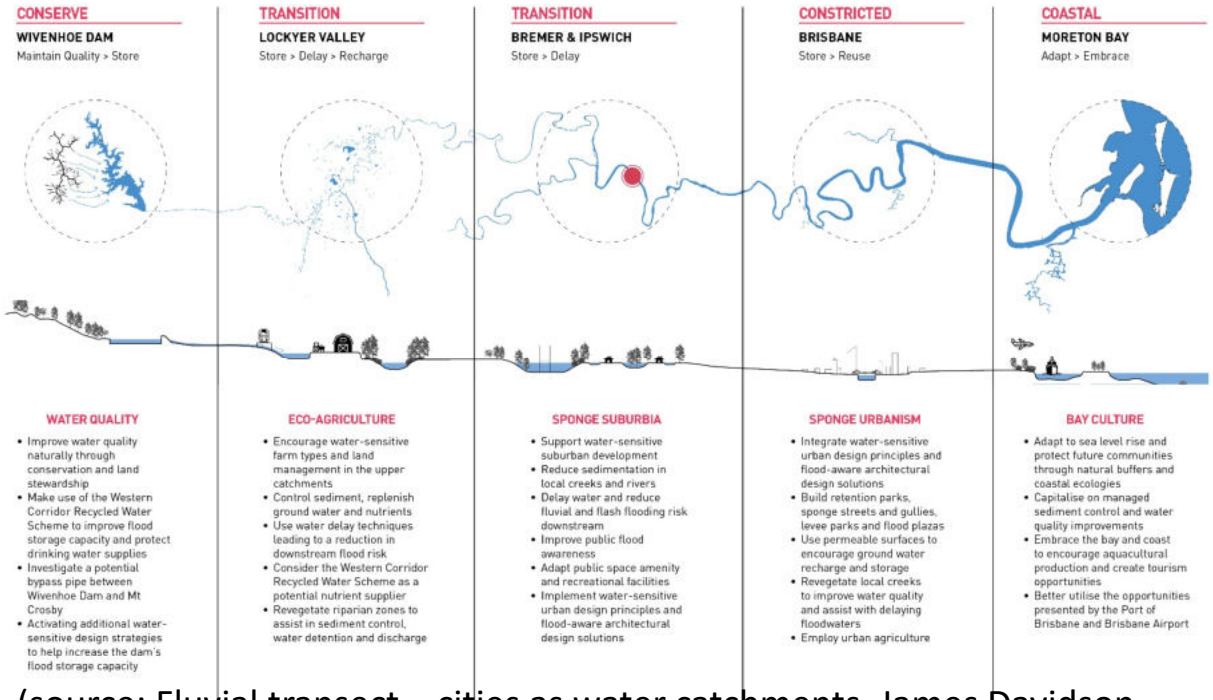


(source: Dauvellier/MIRUP and www.ruimtexmilieu.nl)

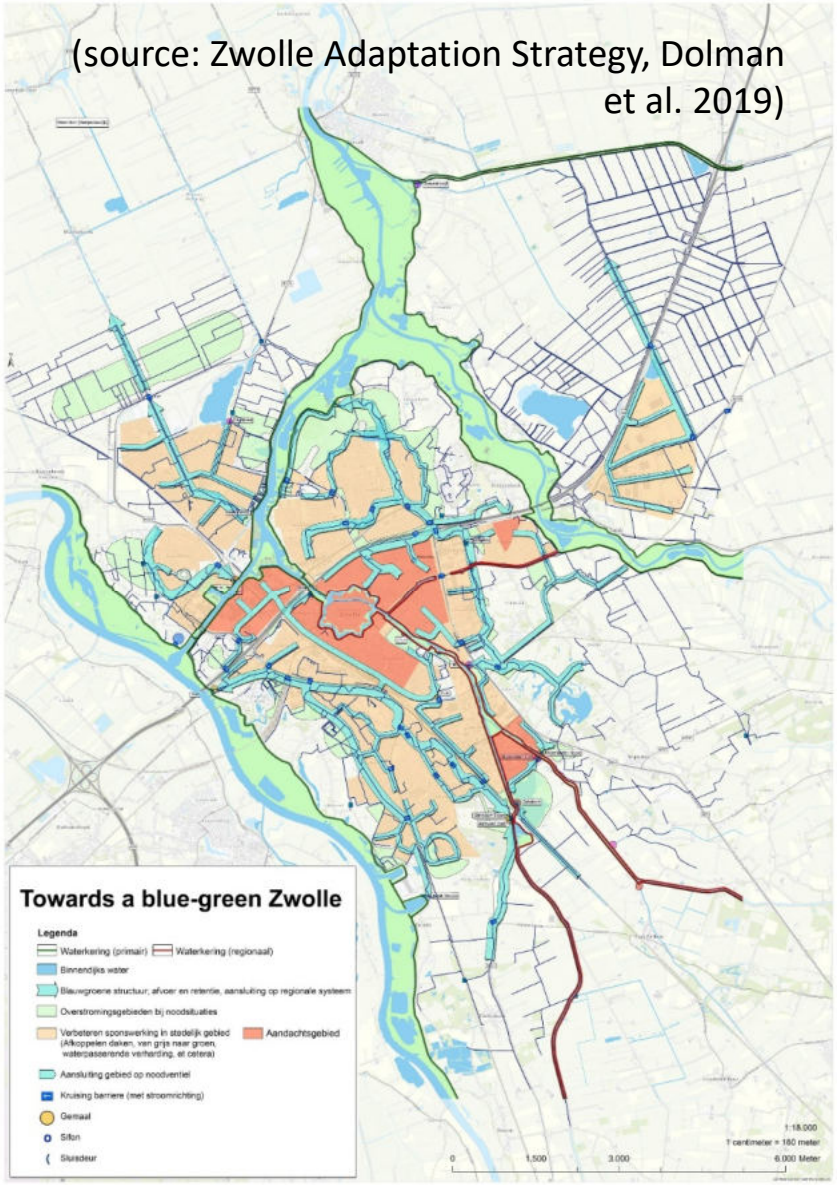
(source: Greater New Orleans Urban Water Plan, Waggonner et al., 2014)

Q2. Water system approach

- Cities as water catchments



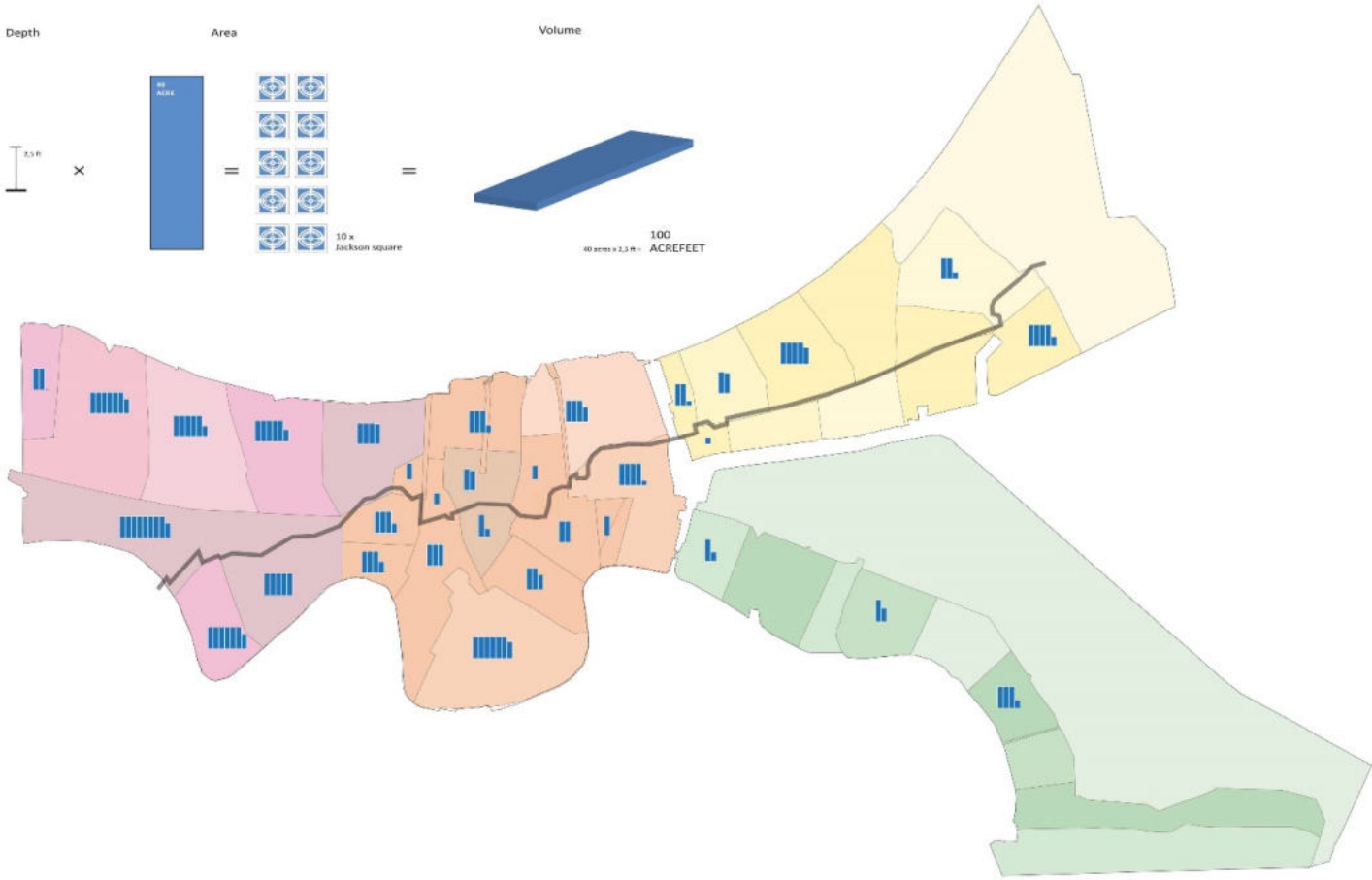
(source: Fluvial transect – cities as water catchments, James Davidson Architect, 2017)



(source: Zwolle Adaptation Strategy, Dolman et al. 2019)

Q3. The (urban) water assignment

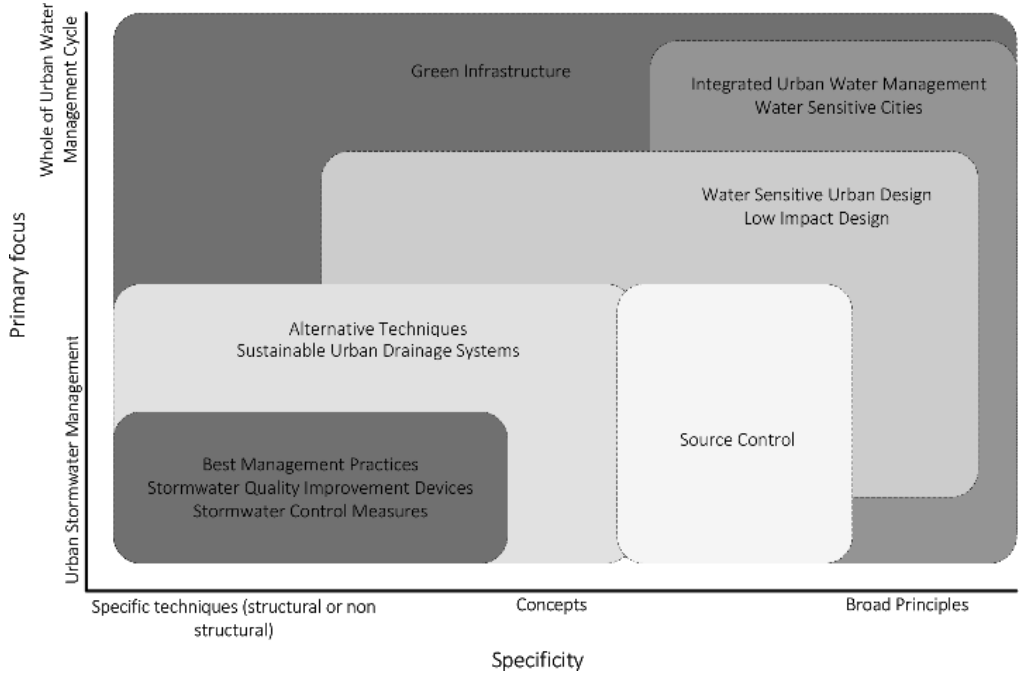
- Urban water assignment (required water storage) per sub-basin or neighbourhood



(source: Greater New Orleans Urban Water Plan, Waggonner et al. 2014)

Q4. Blue-green infrastructure

- Cities providing ecosystem services



(source: Different terms for broader more sustainable approaches in urban water management (Šakić Trogrlić et al., 2015, adopted from Fletcher et al., 2014)

(source: Greater New Orleans Urban Water Plan, Waggonner et al., 2014)

Stormwater Best Management Practices Assumptions

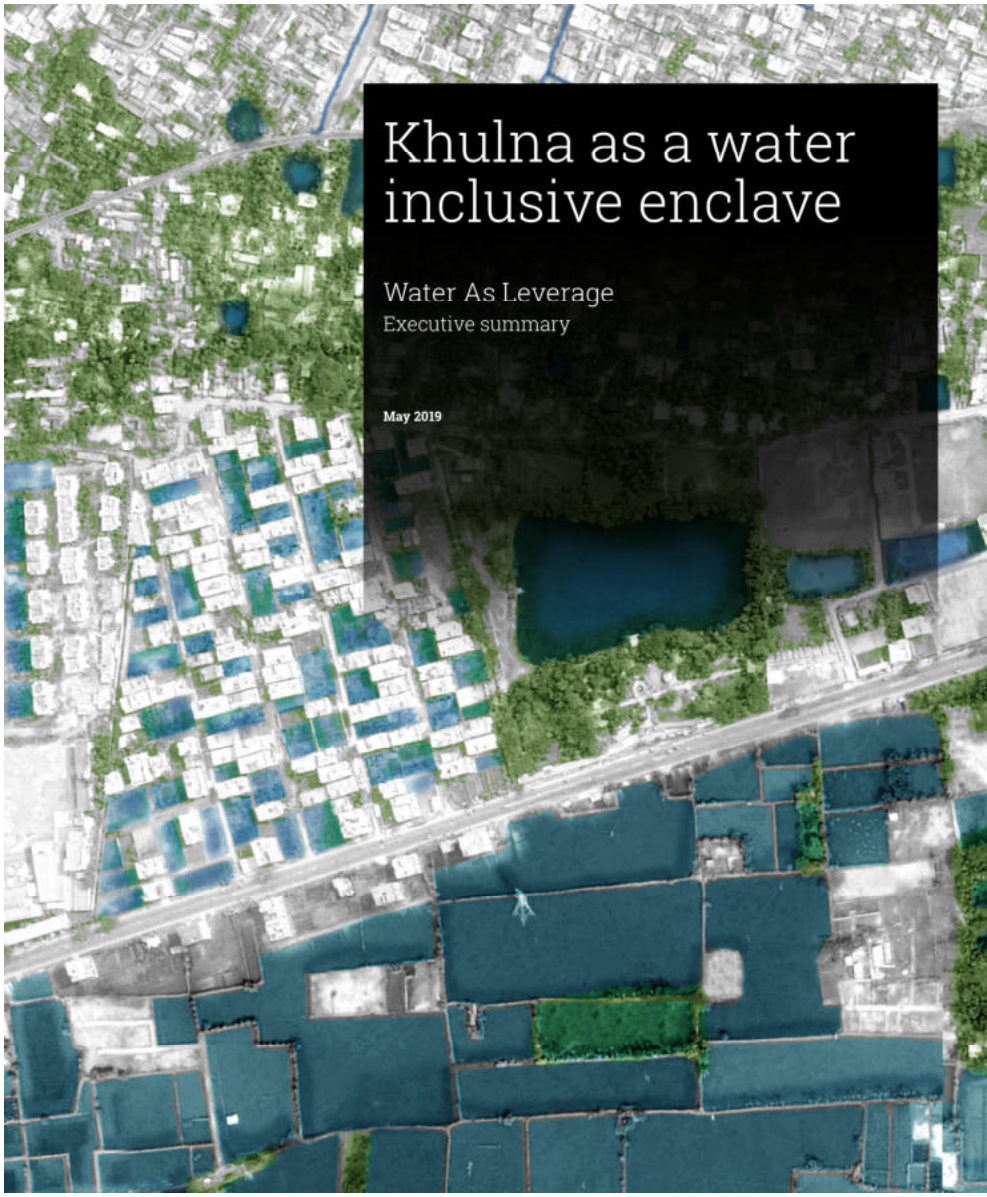
Typology			Bio Cells	Bio Swales	Street tree wells	Neutral Ground Detention Trees	Pervious Paving	Pervious Curbing (Catch Basin Diversion)	Good Neighbor Policy (1.5" residential lot detention)	Stormwater Structural Planters	Subsurface Structural Detention	Impervious Surface Reduction	Constructed Wetlands	Green Roofs	Retention Ponds	Stormwater Harvesting (Irrigation)	Turf Conversion	Reforestation	Bored wells/infiltration galleries	Canal Easement Enhancements
Surburban Residential	Private	Residential Lots							■											
	Right of Way	2 Lane Residential	■		■															
Urban Residential	Private	Residential Lots							■											
	Right of Way	2 Lane Res NG Trees			■			■												
		Interstate								■										
		1 Way Residential			■															
		Off Ramps											■							
		2 Way Residential			■															
		2 Way NG (Small)			■															
Multi Family	Private	Multi Family														■				
	Right of Way	2/3 Lane			■															
		Access	■								■									
		Canal																■		■
Open Space - Managed	Private																			
	Right of Way																			
Open Space - Unmanaged	Private																			
	Right of Way																			
Commercial/Lite Industrial	Private	Commercial		■								■	■					■	■	
	Right of Way	2/3 Lane NG Trees			■							■					■			
Industrial	Private																			
	Right of Way																			
Campus	Private													■	■	■		■		
	Right of Way					■	■						■		■					
Vacant	Private																			
	Right of Way																			
Urban Dense	Private																			
	Right of Way																			

Case of Khulna, Bangladesh

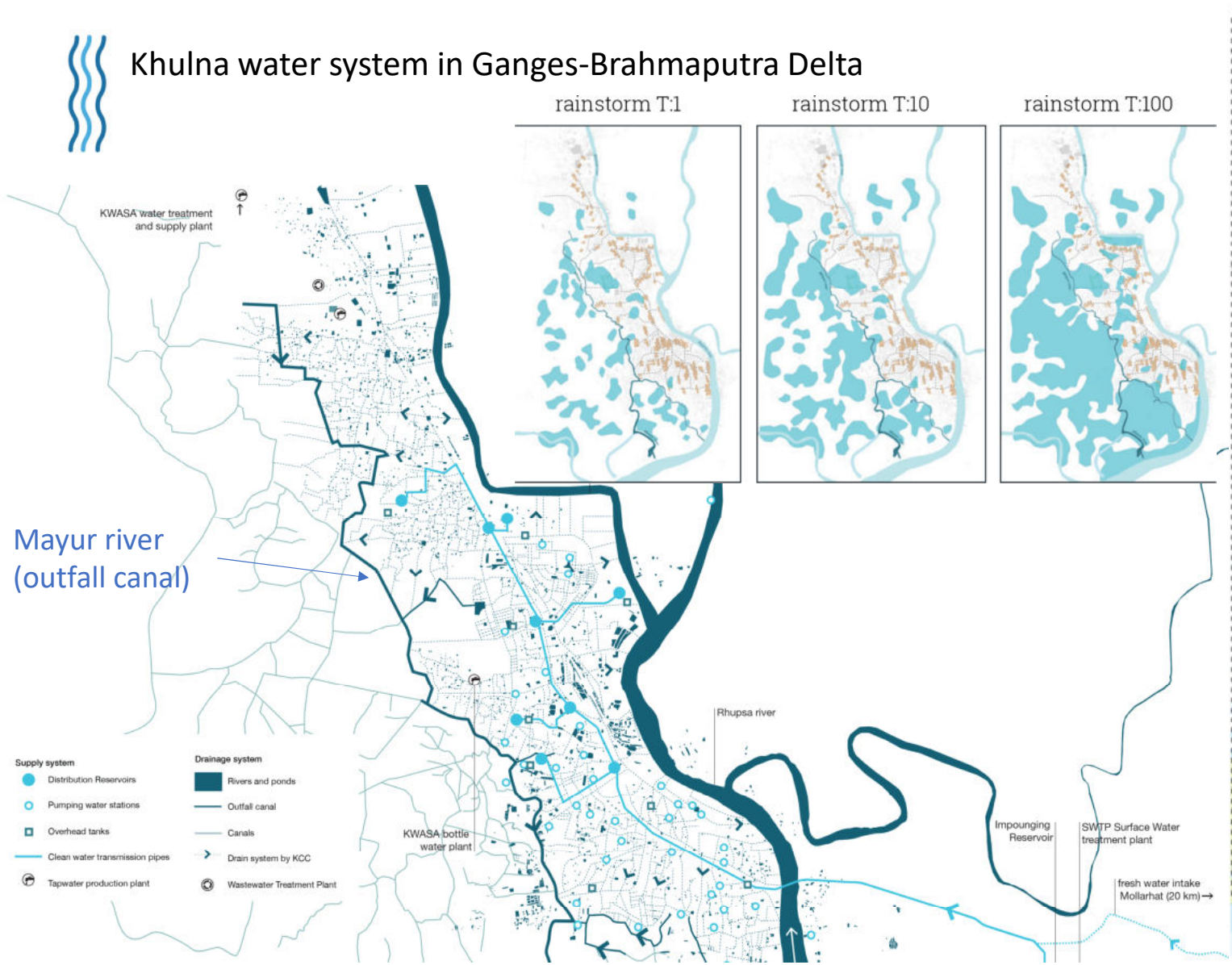
- Water as Leverage for Resilient Cities Asia (2018-2019)
  - Collaborating with the cities of Chennai (India), Khulna (Bangladesh) and Semarang (Indonesia);
  - ***To tackle urban water-related challenges in an innovative and inclusive way.***

- Two teams with technically sound strategies:
  1. Team 1: "**Khulna as a Water Inclusive City**" – CDR International, Defacto Urbanism, Nelen en Schuurmans, DevConsultant, Khulna University, Royal HaskoningDHV, Wageningen University and Research;
  2. Team 2: "Creating inclusive and natural water synergies in Khulna urban region" - Euroconsult Mott MacDonald B.V., Khulna University of Engineering & Technology, Urban and Regional Planning (KUET-URP).

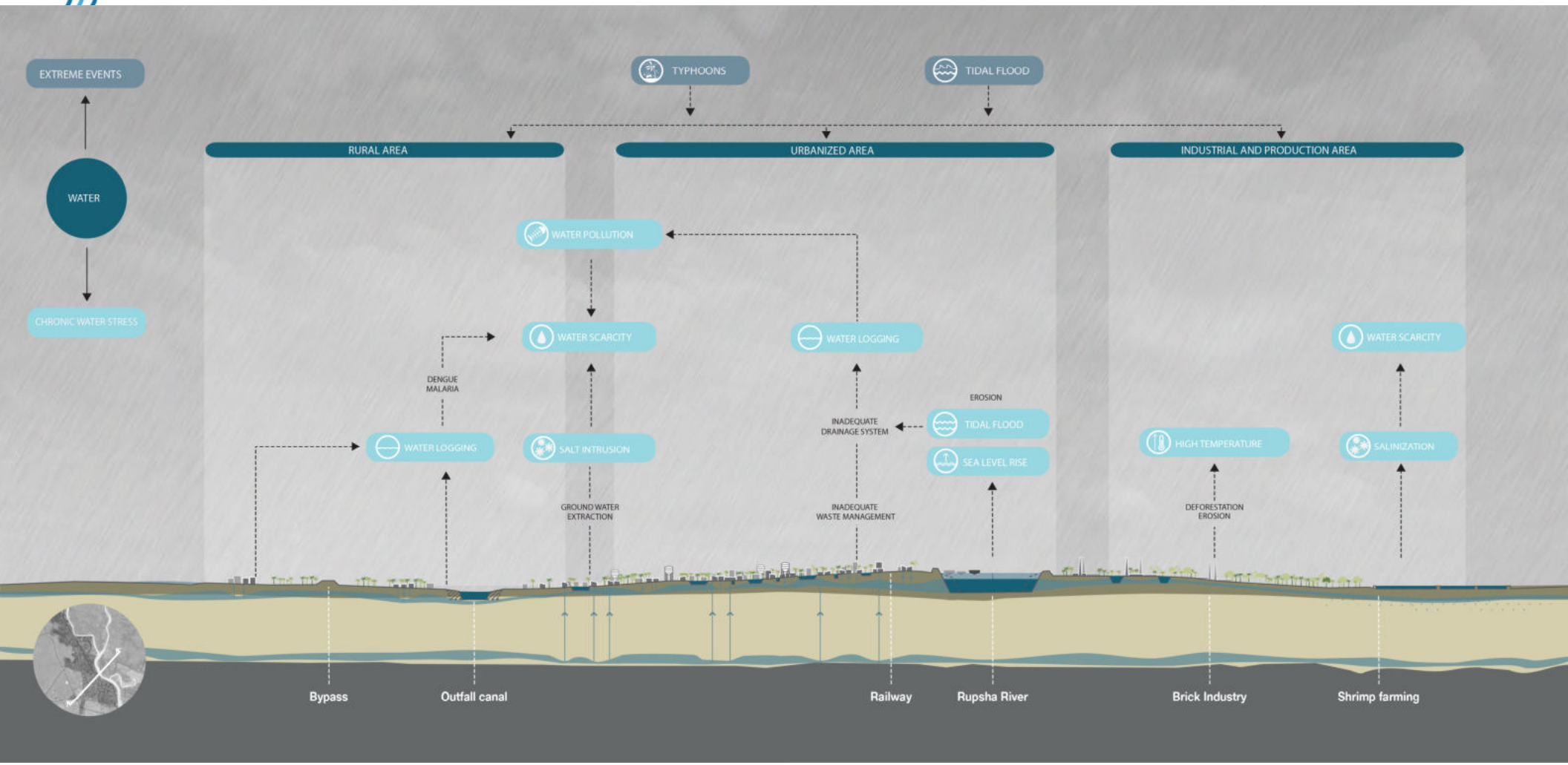
(Source: Defacto Urbanism | RHDHV, 2019)



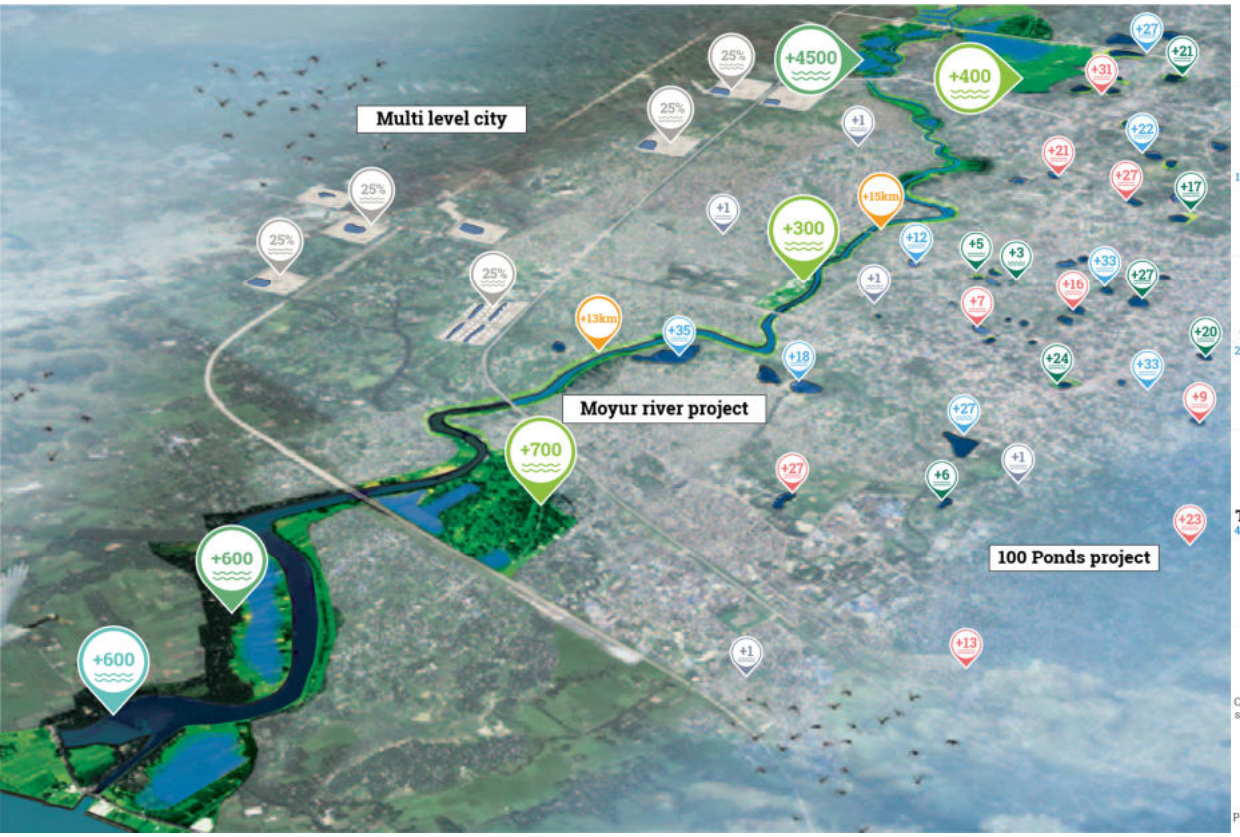
Khulna water system in Ganges-Brahmaputra Delta

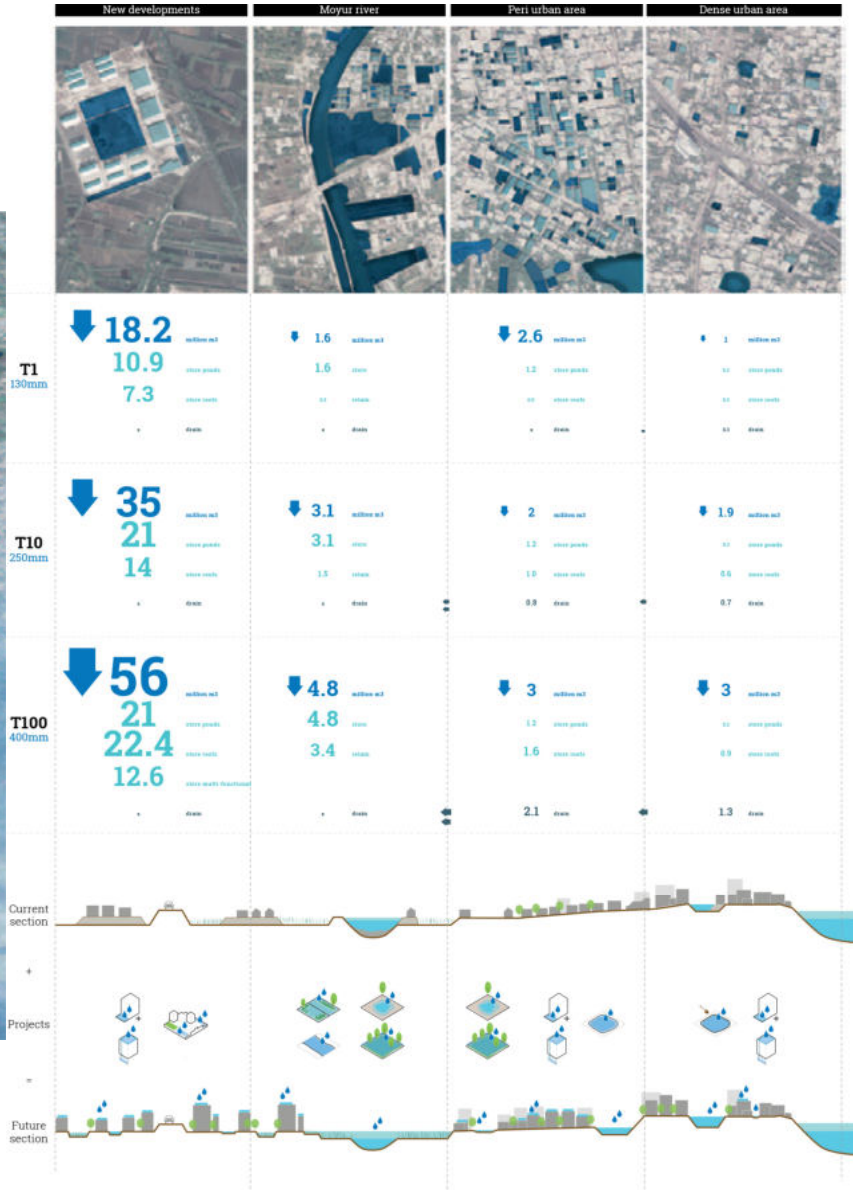


Water issues in city of Khulna (Bangladesh)



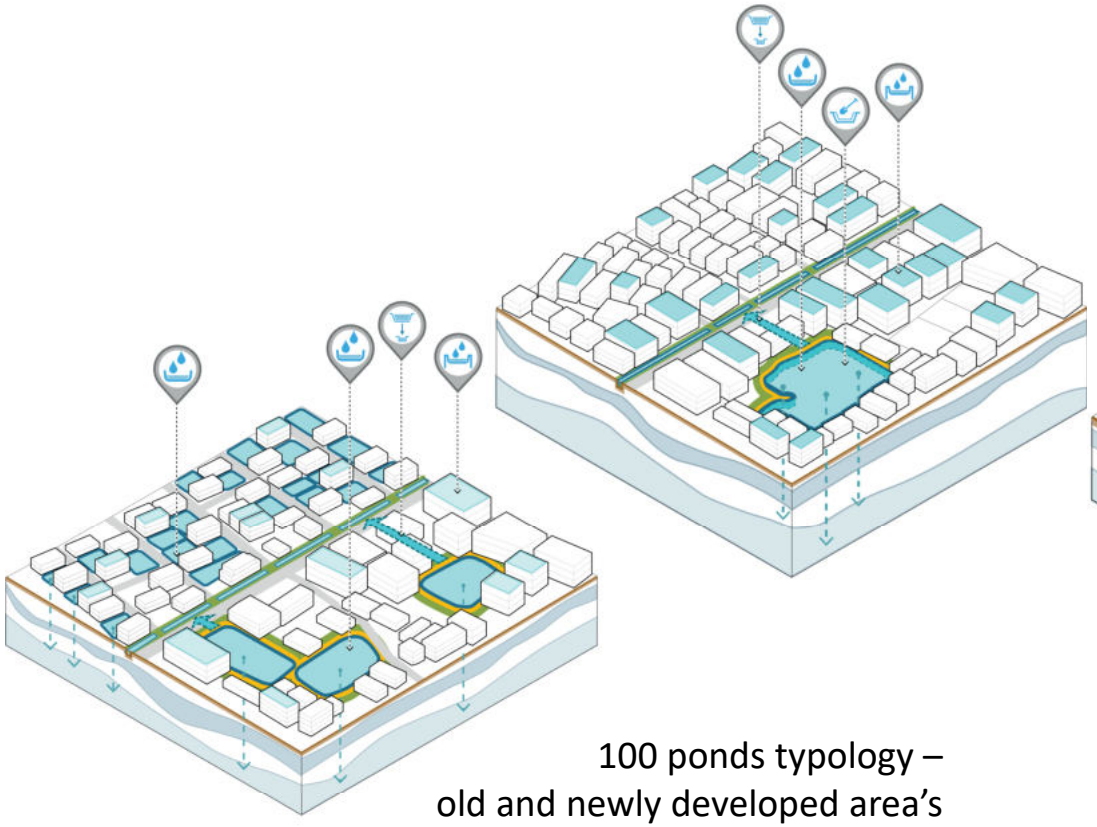
Khulna as a Water Inclusive City – using blue-green infrastructure to solve water assignment





Aerial image of principles for water storage within the Khulna city and diagram showing water storage principles that can be applied in different city parts

Two propositions for Water as Leverage for Khulna



100 ponds typology –
old and newly developed area's

Actions	Effect	Leverage
Protect ponds Connect ponds to khals Deepen ponds		
Blue roof (store rain water)		

Moyur river – typology

Actions	Effect	Leverage
Protect Moyur river Moyur as water storage Connect khals to Moyur		
Blue roof (store rain water)		