

The logo for MORPHUM environmental. The word "MORPHUM" is in a bold, white, sans-serif font. The letter "O" is replaced by a circular graphic with a blue-to-green gradient. Below "MORPHUM", the word "environmental" is written in a smaller, lowercase, green, sans-serif font.

MORPHUM
environmental

Water Sensitive Cities
IPWEA NZ Think Piece 3rd November 2022



Drivers

What might our future look like ?

- Increased urban population density
- Prolonged dry periods
- High intensity downpours (not just floods)
- Increased ambient temperatures
- Rising sea levels



What are the risks

- Diminished Mauri
- Increased contaminant loads to waterways
- Instream scour and slumping
- Thermal stress
- Loss of indigenous/Taonga species
- Community disconnection with waterways/nature
- Increased human mortality and heat stress
- Increased energy demands (cooling)
- Fragile food systems
- Etc etc etc



Our future communities will need to be balanced.....

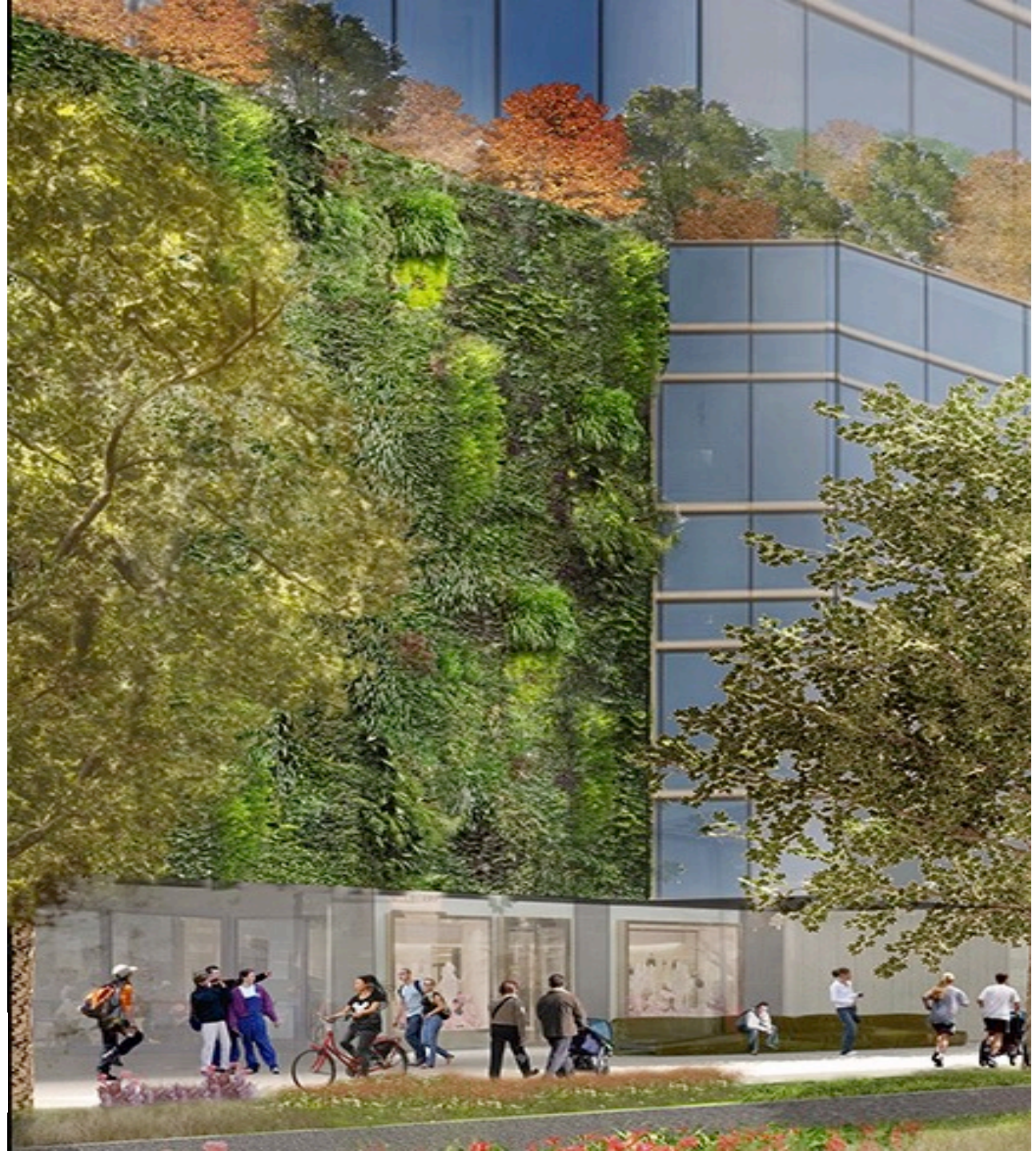
- Te Tiriti o Waitangi and Kaitiakitanga
- Diversity, Equity and Inclusion
- Growth – NPS Urban Development
- Environment – NPS Freshwater Management, NPS Indigenous Biodiversity
- Water reforms
- RMA Reforms
- Climate change mitigation
- Climate change adaptation
- Community Health & Wellbeing
- Financial constraints



Water Sensitive Cities

About the CRC for Water Sensitive Cities

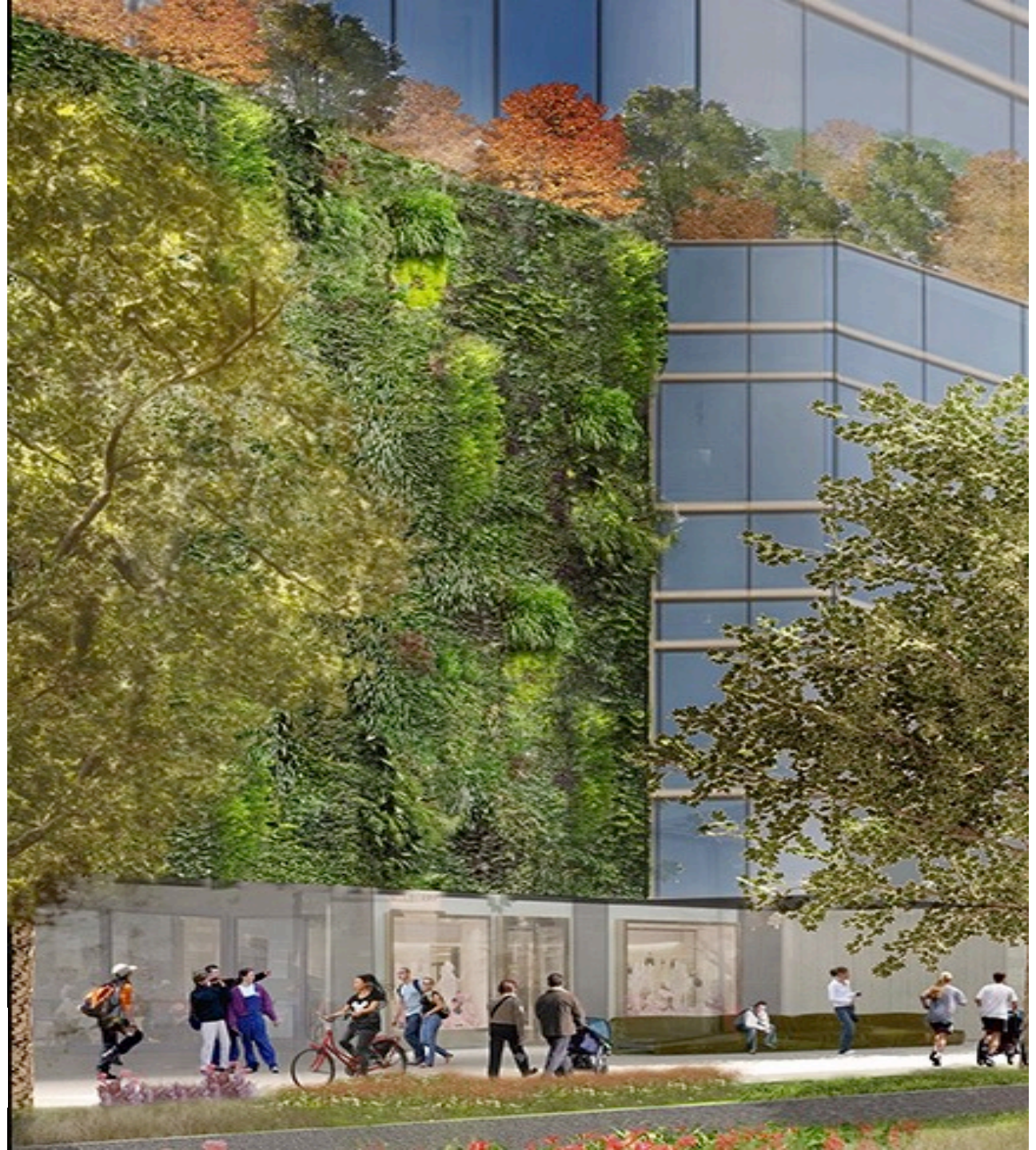
- Commonwealth funded, national research program
- 2012-2021 Now transitioned to the WSC Institute at Monash University
- Vision is to create water sensitive cities across Australia (and overseas).
- Water sensitive cities are more sustainable, liveable, resilient and productive through smarter water management.
- Mission is to Research, Synthesise and Influence
- 80+ partner organisations



Why do we need water sensitive cities?

To meet three challenges that critically affect cities and towns:

- population growth and changes in lifestyle and values
- climate change and climatic variability
- challenging economic conditions.





Pillars of water sensitive practice

- Cities as water supply catchments
- Cities providing ecosystem services
- Cities comprising water sensitive communities



Research partners



+ 8 other Australian and international researcher providers

2012-2016

4 research programs, 34 projects, 64 PhD



Society

Economics
Legal
Behavior change
Social science



Water Sensitive Urbanism

Urban heat
Flood resilience
Urban planning
Statutory planning
Ecology



Future Technologies

WSUD
Waste water
Resource recovery
Smart systems
Managing decentralised systems



Adoption Pathways

Architecture
Capacity building and education
Case studies
Modelling tools

2016-2021

6 integrated projects combining 'best of' '12-16 research



IRP1
How water sensitive is your city?

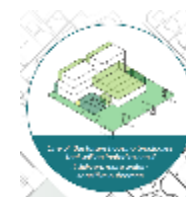
INFFEWS Value Tool: Guideline (Version 1)

Supporting Planning and Governance for Water Sensitive Cities

IRP 2
What is the \$ value of water sensitive cities?



IRP 3
Harmonising urban planning and water planning



IRP 4
Higher performing infill designs



IRP 5
Techniques for developing in high groundwater areas



Tools and Products:
Quantify the heat and other benefits of water sensitive cities





Vision and strategy

Water Sensitive Cities Index

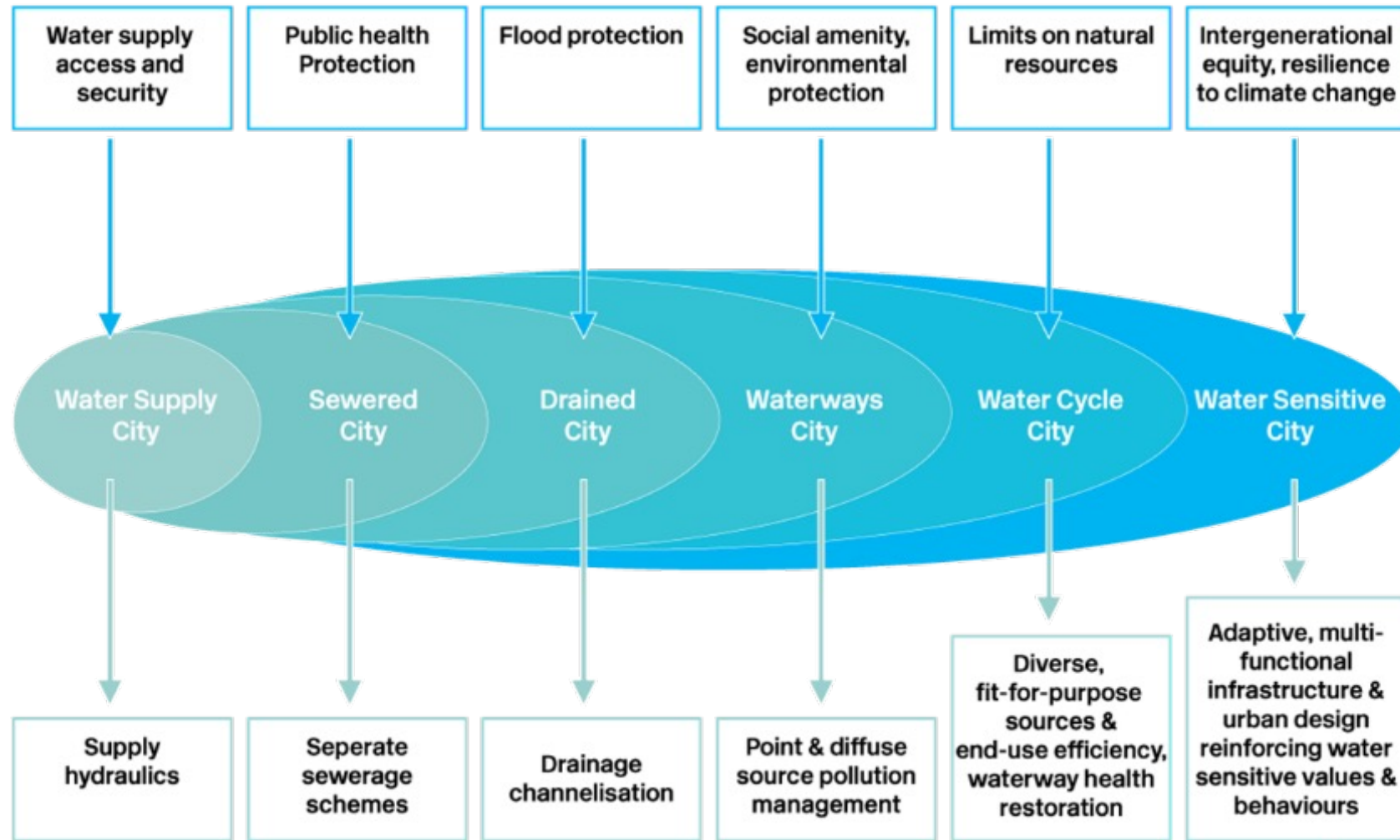
Transition Dynamics Framework



An aerial photograph of a beach. The top right corner shows the ocean with white-capped waves breaking onto the shore. The beach is a wide expanse of light-colored sand, showing some tracks and a few small figures of people. On the left side, a paved area contains a white SUV and a dark car. The text 'WSC Benchmarking' is overlaid in the center of the image.

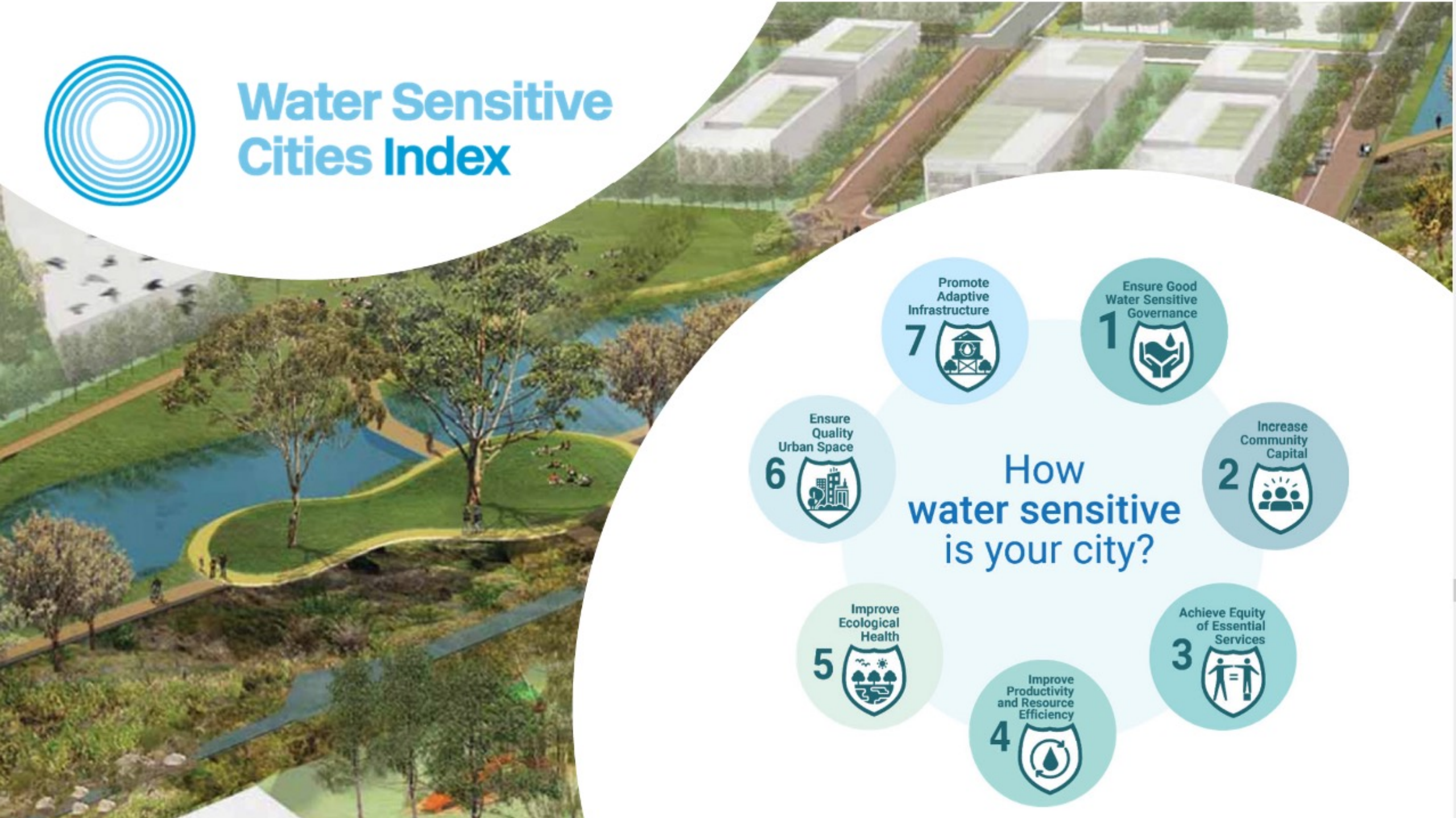
WSC Benchmarking

Cumulative Socio-Political Drivers





Water Sensitive Cities Index





Auckland Water Strategy

Auckland Council's strategy to protect and enhance te mauri o te wai, the life-sustaining capacity of water.

2022 – 2050

aucklandcouncil.govt.nz

Water Strategy Strategic Framework

Our Vision	Te mauri o te wai, the life-sustaining capacity of Auckland's water, is protected and enhanced	
Our Treaty Context	The Council and mana whenua must take a partnership approach to the protection, management and enhancement of water	
Our Over-arching Challenges	<ol style="list-style-type: none"> 1. Protecting and enhancing the health of waterbodies and their ecosystems 2. Delivering 3-waters services at the right time, in the right place, at the right scale, as the city grows 3. Having enough water for people now and in the future 4. Reducing exposure to water-related natural hazard risk over time. 5. Affordability for Aucklanders 6. Improving how the council works with its treaty partners 7. Improving how the council organises itself 	
Our Cross-cutting Themes	<p>Equity and Affordability: Equitable access to essential services and affordable investment</p> <p>Climate Change: Mitigating and adapting to the impacts of climate change</p>	
Our Strategic Shifts	<p>1 Te Tiriti Partnership The council and mana whenua working together in agreed ways on agreed things</p> <p>3 Sustainable Allocation and Equitable Access Prioritising mana whenua water, to sustain the environment and people in the long term</p> <p>5 Water Security Creating water abundance and security for a growing population through efficient use and diverse sources</p> <p>7 Restoring and Enhancing Water Ecosystems Taking catchment-based approaches to the health of water ecosystems</p>	<p>2 Empowered Aucklanders The council working with Aucklanders for better water outcomes</p> <p>4 Regenerative Water Infrastructure Ensuring Auckland's water infrastructure is regenerative, resilient, low carbon, and increases the mauri of water. It should be seen and understood by Aucklanders</p> <p>6 Integrated Land Use and Water Planning Integrating land use and water planning at a regional, catchment and site scale</p> <p>8 Pooling Knowledge Fostering a shared understanding enabling better decisions for our water future</p>
Our Implementation	Co-ordination, Capacity and Capability across the Council Group	

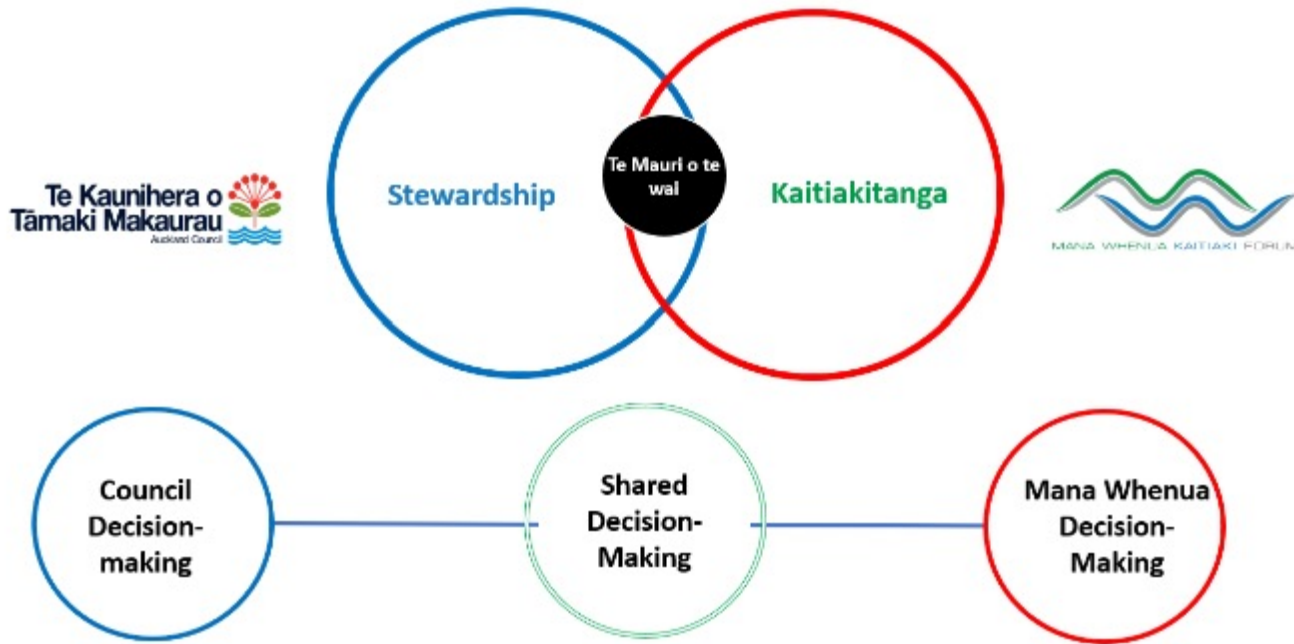


- 4% ● **Water Sensitive City**
- 56% ● **Water Cycle City**
- 91% ● **Waterway City**
- 67% ● **Drained City**
- 100% ● **Sewered City**
- 100% ● **Water Supply City**



Tuituia (bindings) between the Mātauranga Māori Benchmarking and Water Sensitive Cities Frameworks

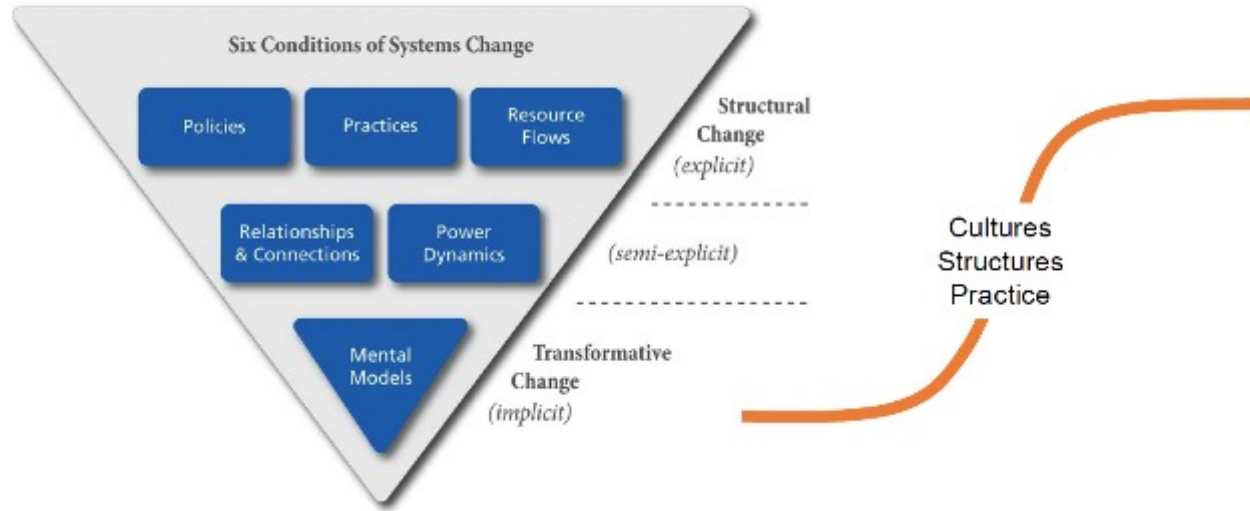
Mana Whakahaere	Governance and decision making
Turangawaewae	Integrated land use planning and quality urban spaces
Whanaungatanga	Community capital Sustainable use and equitable access
Taonga Tuku Iho	Adaptive, resilient infrastructure
Te Ao Tūroa	Productivity and resource efficiency Ecological health and restorative action



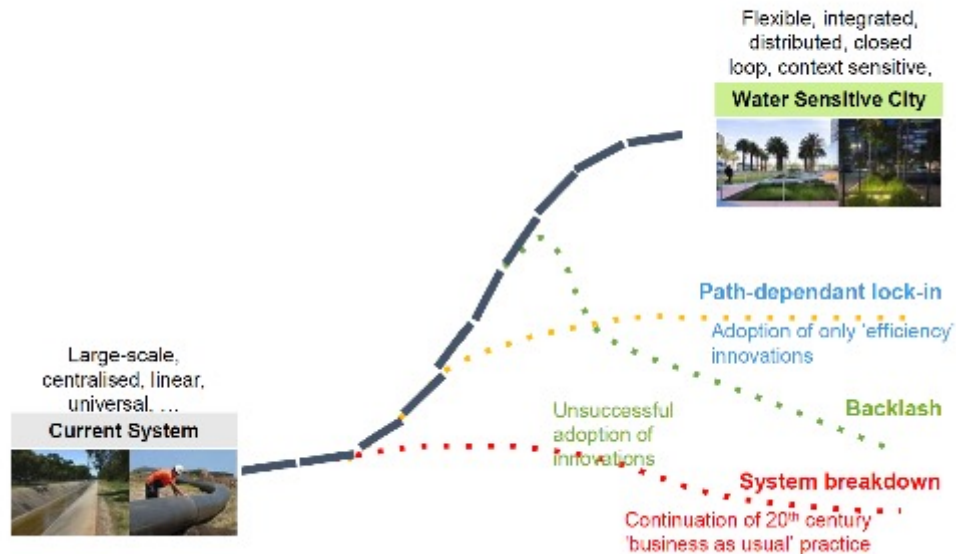
An aerial photograph of a wetland landscape. A central, narrow water channel runs vertically through the middle of the frame. The surrounding area is covered in dense, green vegetation, likely mangroves or marsh plants. The vegetation appears to be in various stages of growth or transition, with some areas showing more uniform green and others showing more fragmented or sparse growth. The overall scene suggests a dynamic wetland environment.

WSC Transition Dynamics

Theories of system change

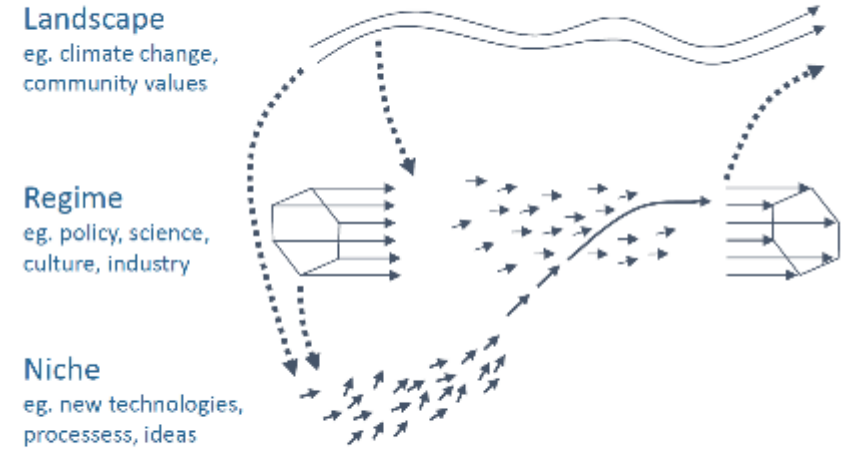


Transitioning to water sensitive cities



Van de Brugge and Rotmans (2007) Futures

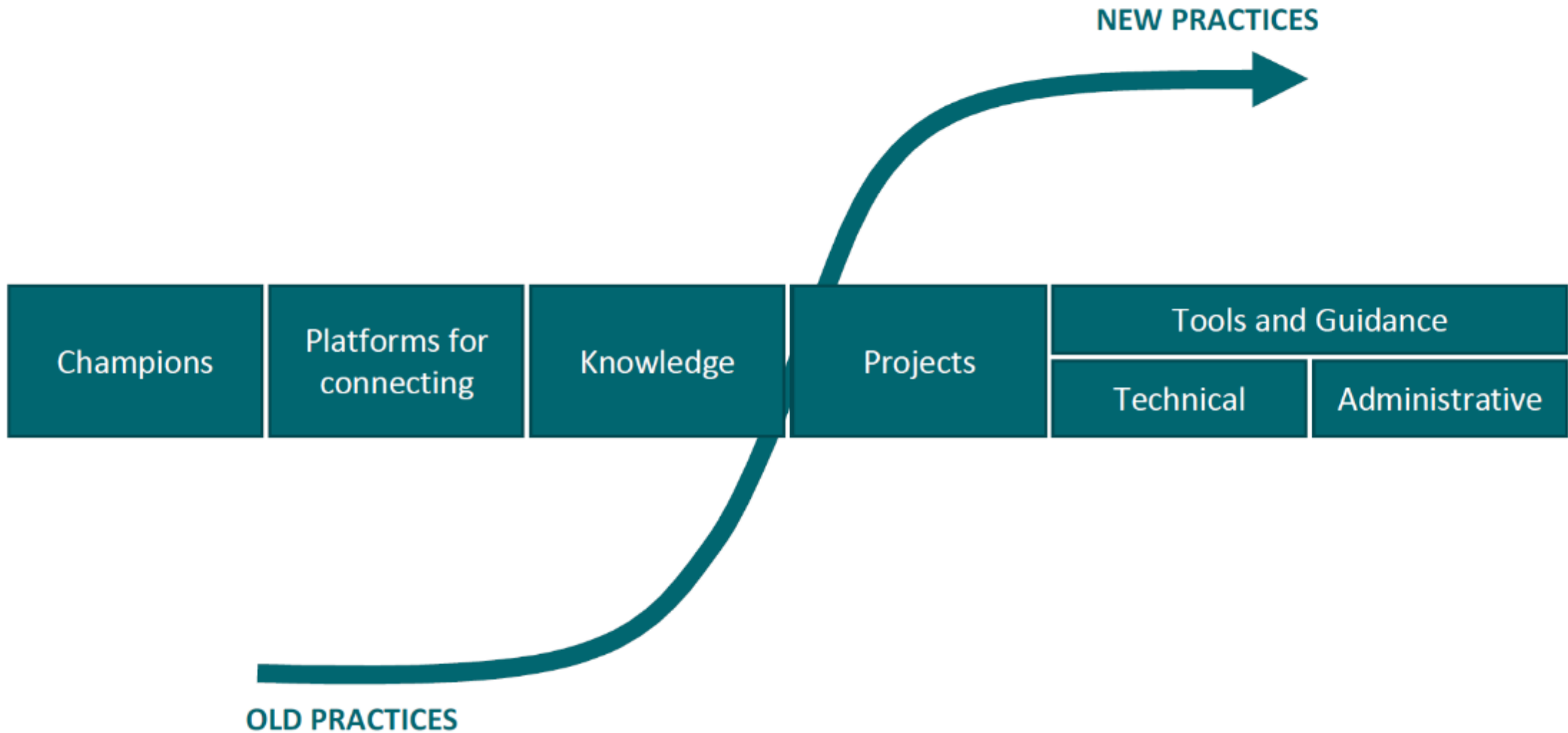
Basics of Transition Theory



Geels (2004)

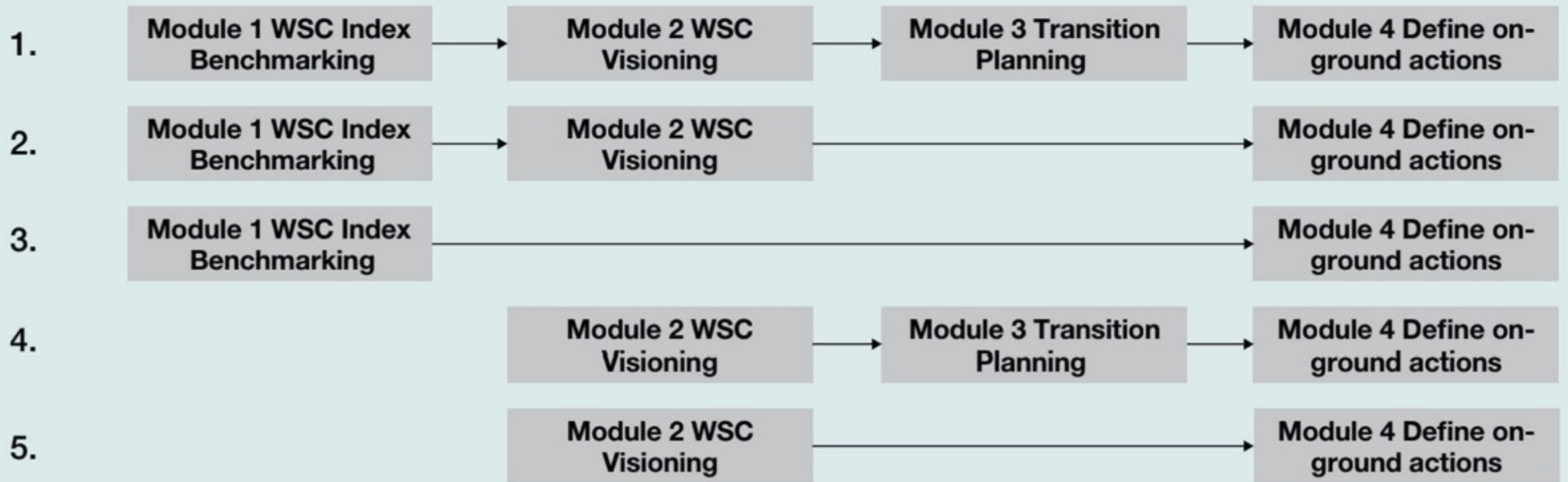
Multi-Level Perspective





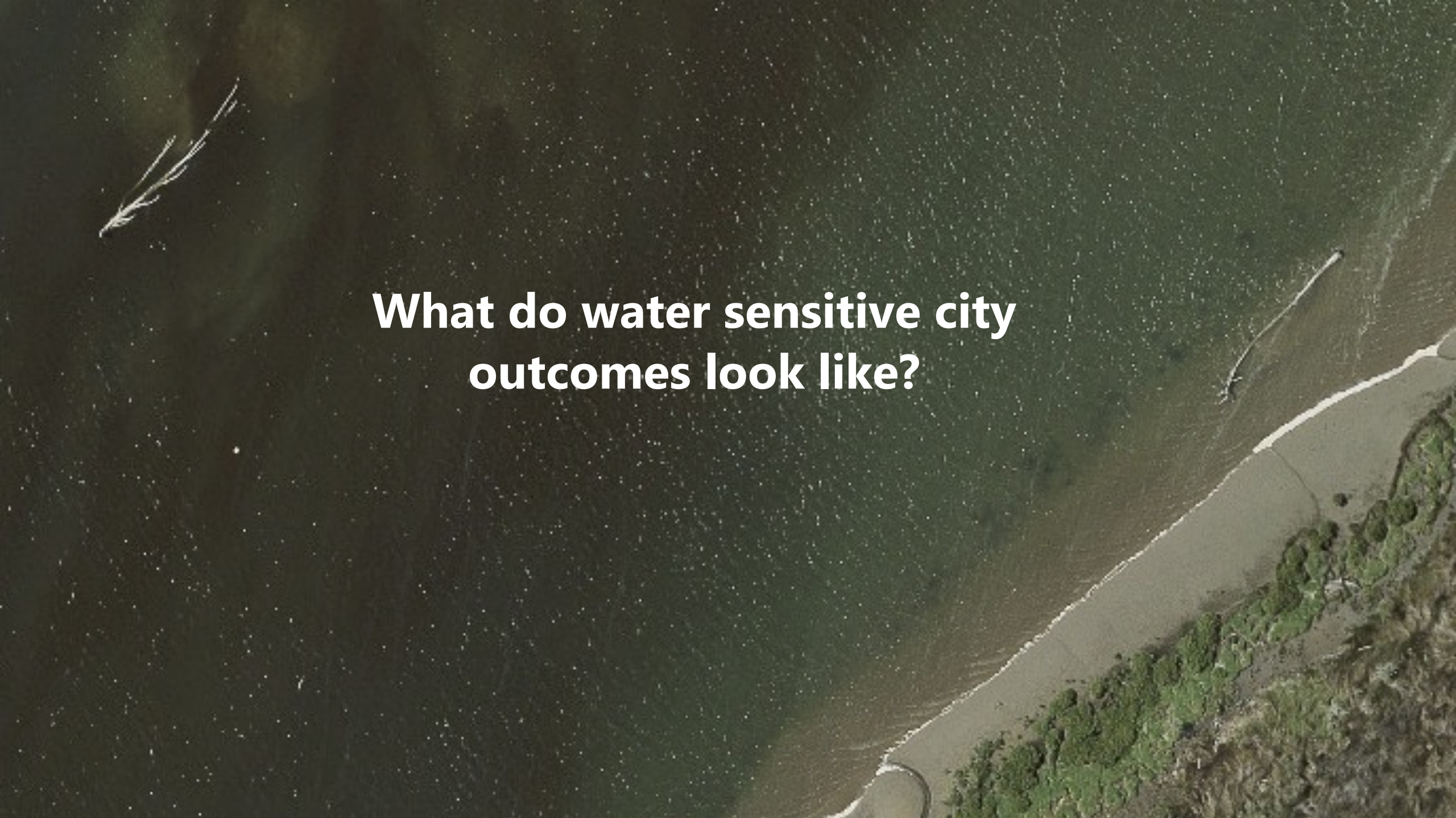
Transition phase	Champions	Platforms for connecting	Knowledge	Projects	Tools and Guidance	
					Technical	Administrative
1. Issue emergence	Issue activists		Issue highlighted	Issue examined		
2. Issue definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	Data and evidence collected	
3. Shared understanding & issue agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance	Administrative instruments explored
4. Knowledge dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and design tools	Early policy & performance standards
5. Policy and practice diffusion	Government agency champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Guidance for implementation & cross-sector	Refined policy & standards, early regulation
6. Embedding new practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive standardised guidance	Comprehensive policy and regulation



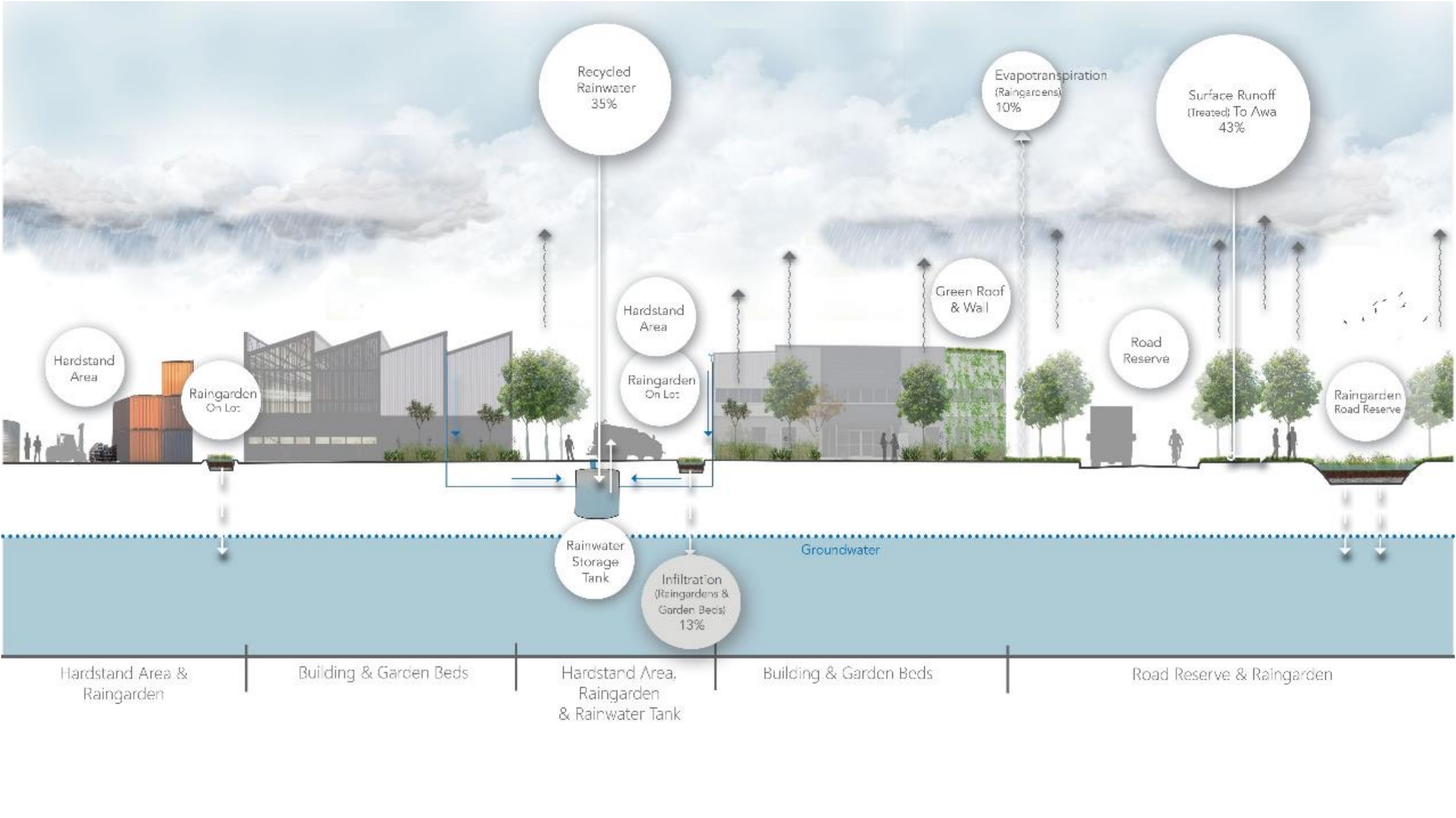


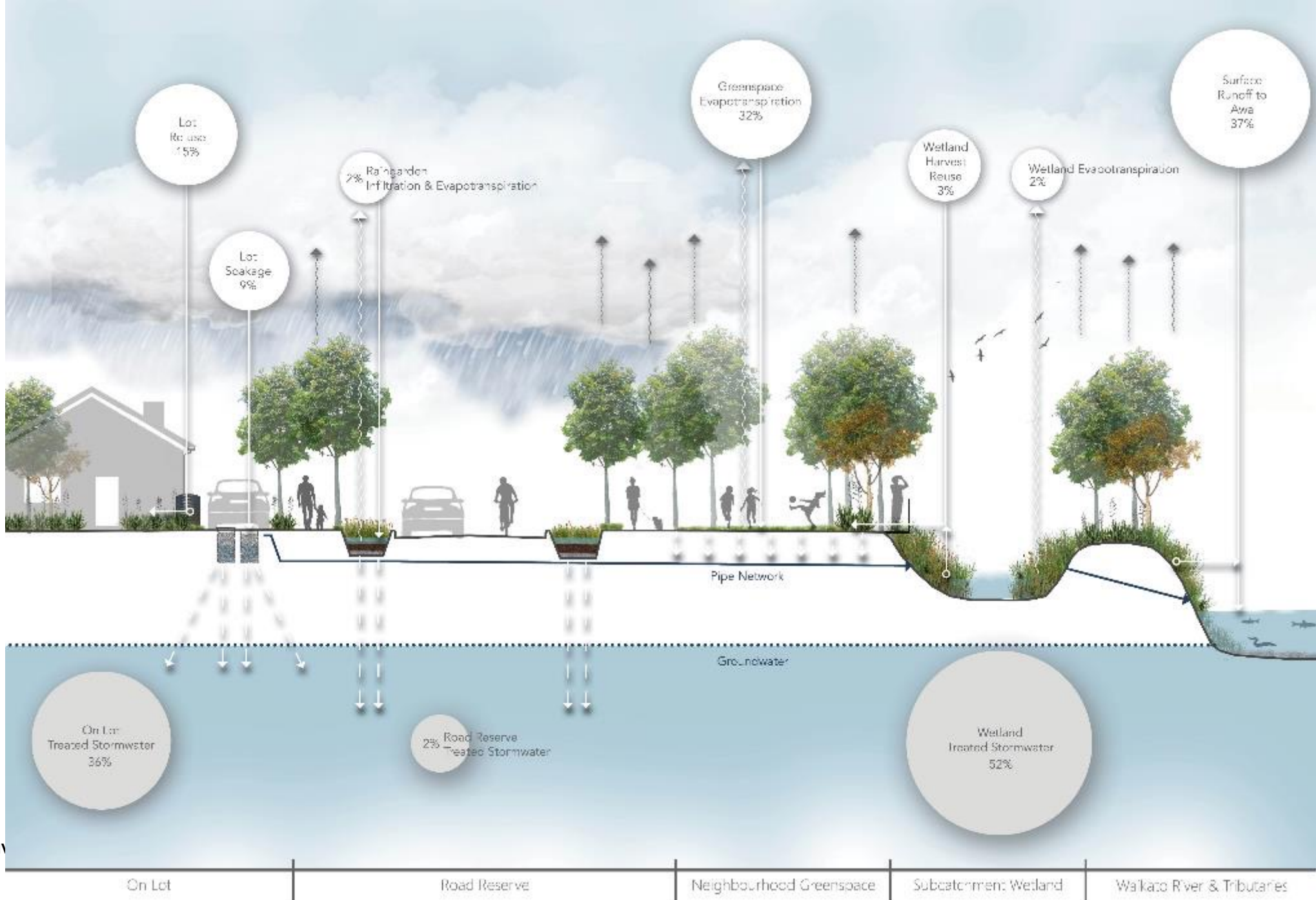
1. Full transition planning process – workshops and analysis
2. Benchmarking and visioning workshop – development of action plan by consultant
3. Benchmarking workshop – development of action plan by consultant
4. Visioning workshop – TDF analysis
5. Visioning workshop – development of action plan



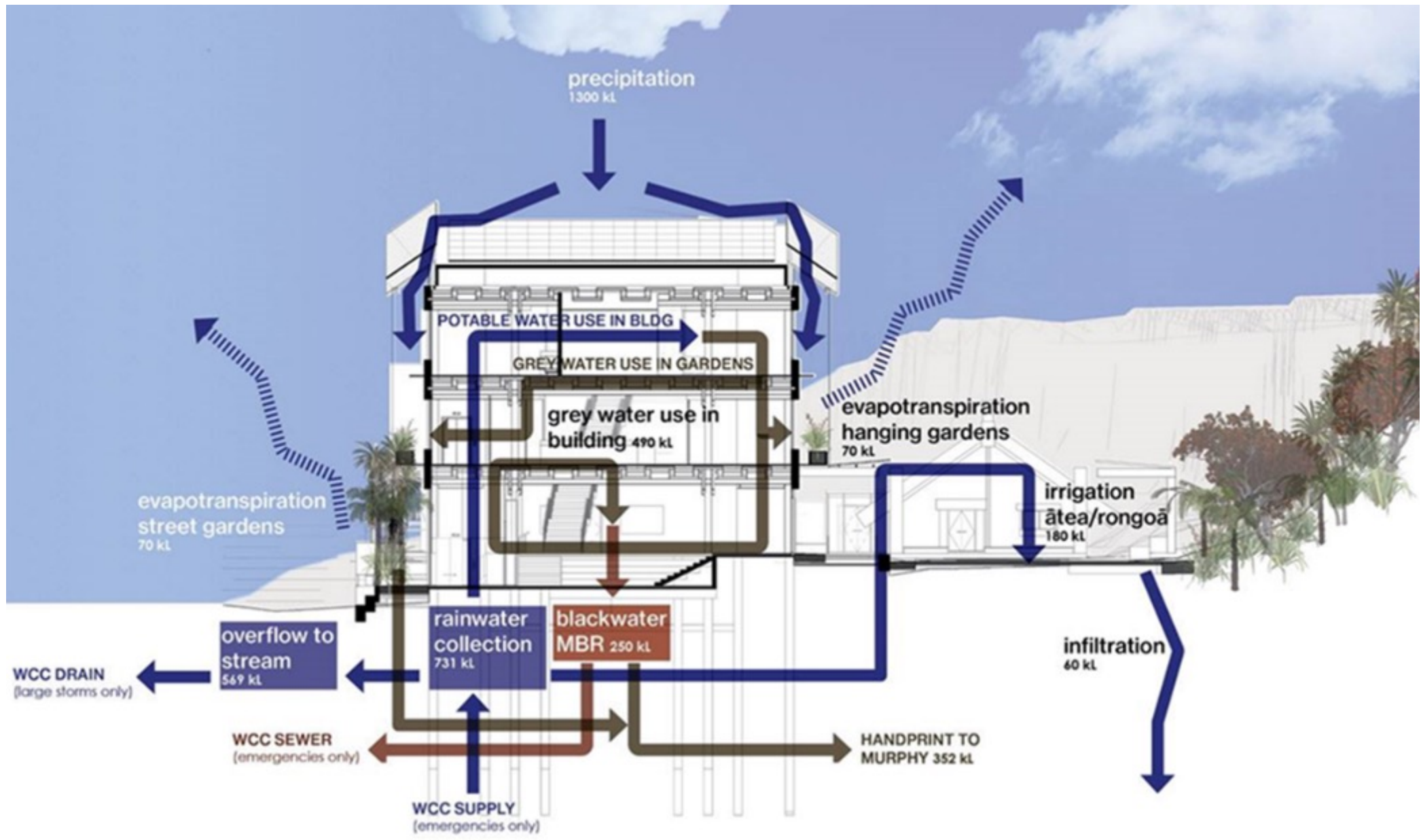
An aerial photograph of a coastline. The top half of the image shows dark, rippling water. A thin, light-colored line marks the edge of a sandy beach. Below the beach is a dense, green forested area. The text "What do water sensitive city outcomes look like?" is overlaid in white, bold font in the center of the image.

**What do water sensitive city
outcomes look like?**



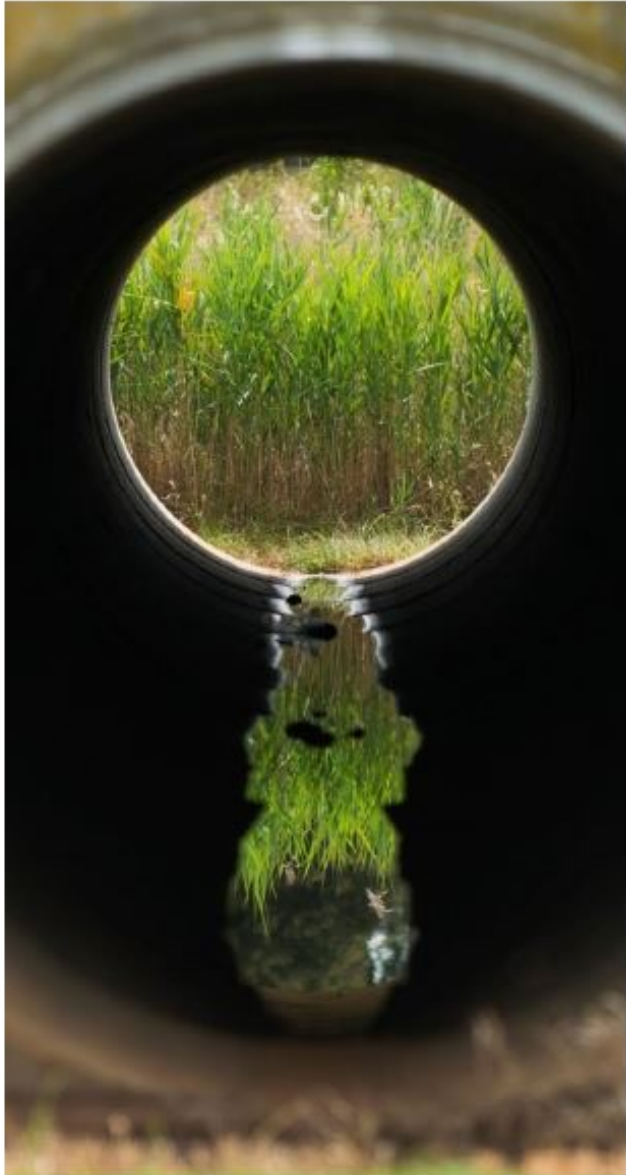






Aquarevo – Fully integrated three waters in Greenfield





70% reduction
in potable
supply

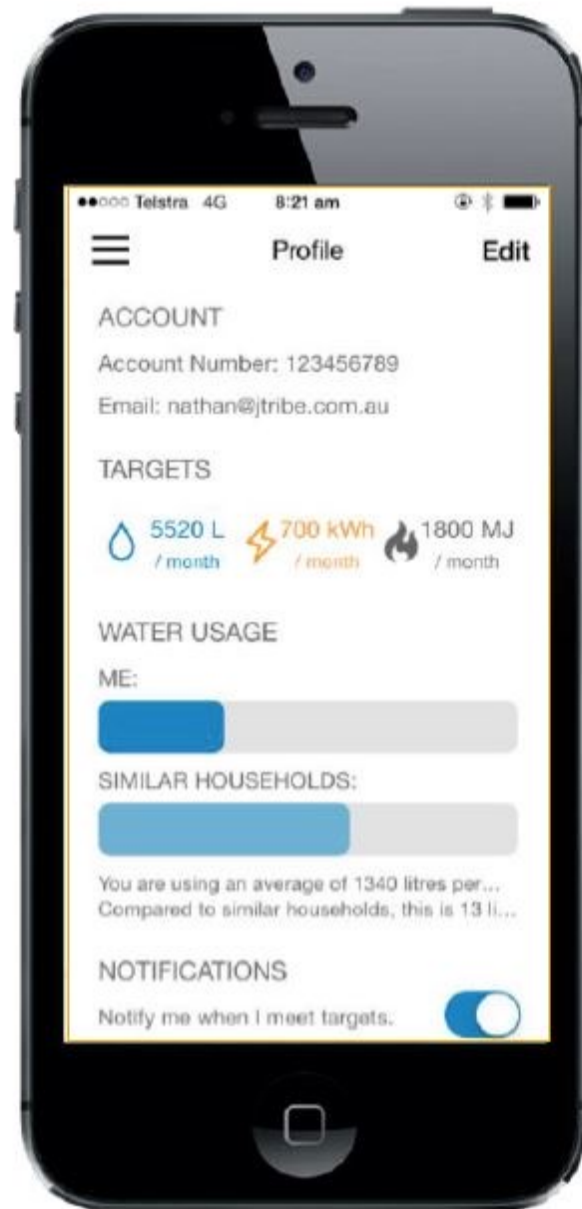
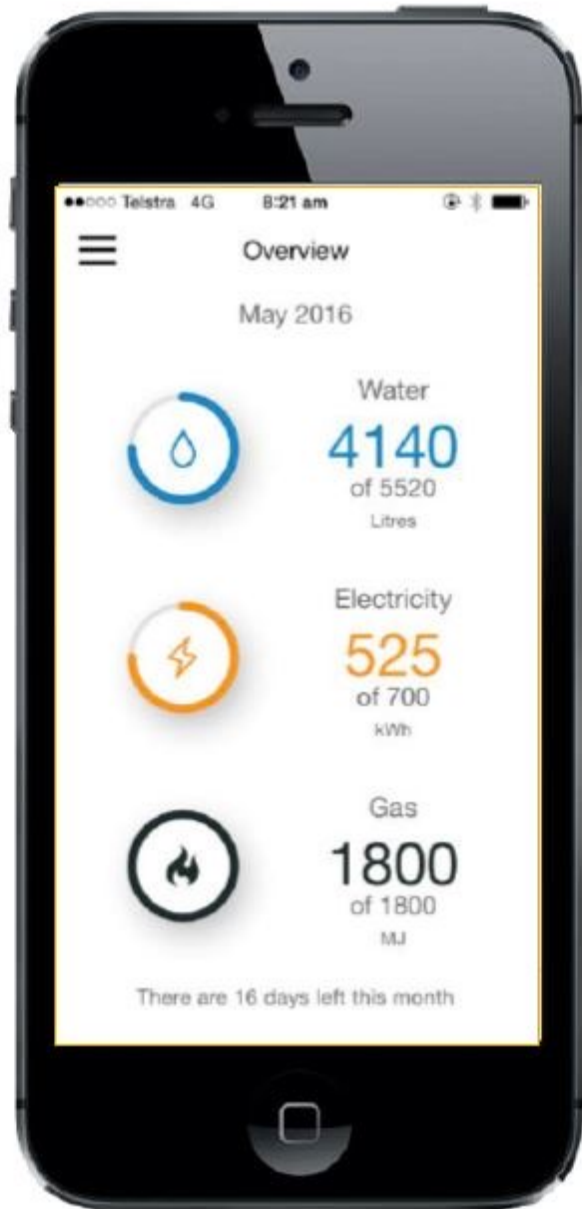
75% reduction
in wastewater
discharged
offsite

55% reduction
in mean annual
stormwater
discharge to
waterways

26% reduction
to peak runoff
events

35% reduction
in stormwater
nutrient loads
beyond best
practice

Additional
55 ML/year of
water infiltrated
to enhance soil
moisture and
support urban
forest





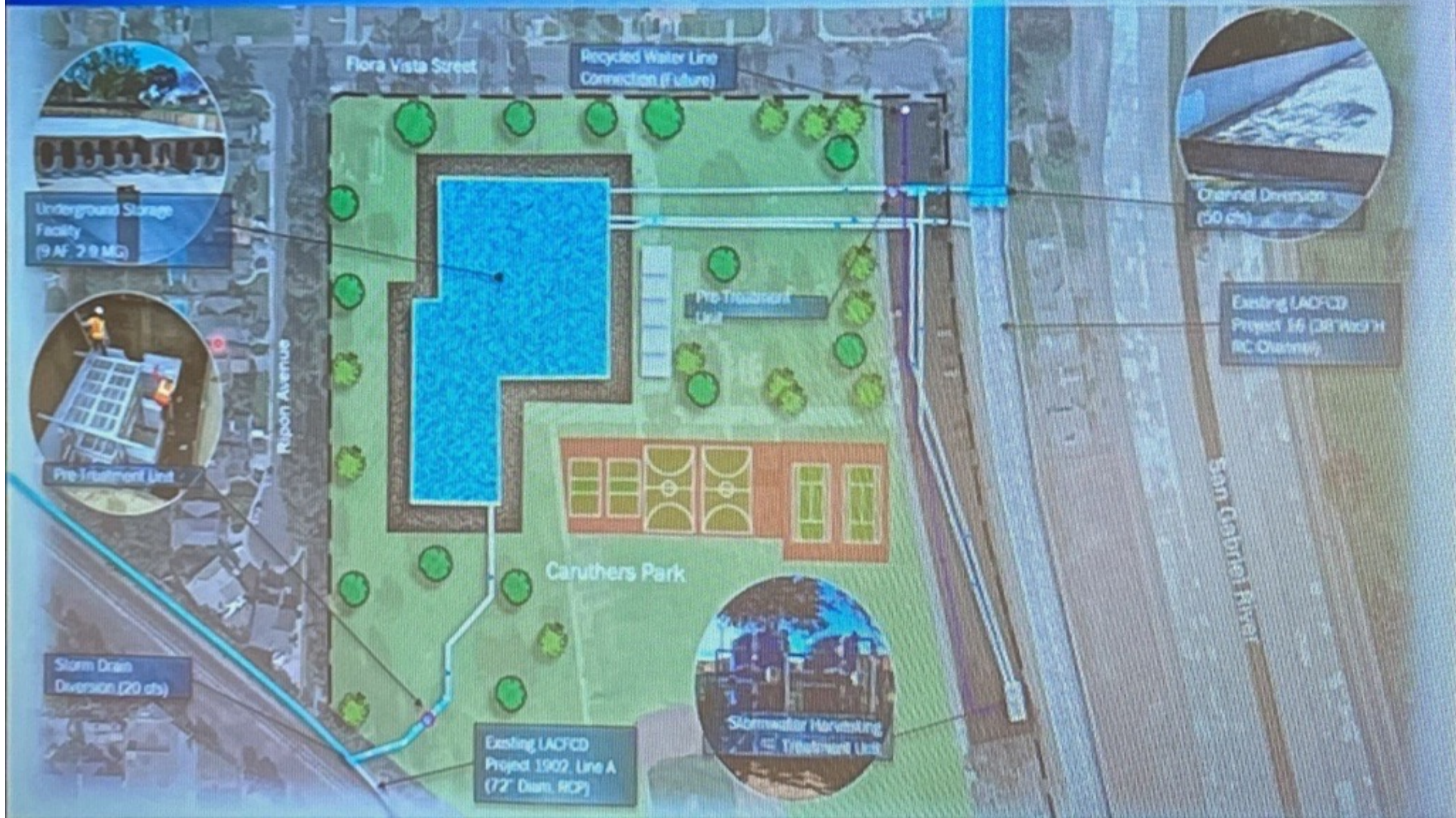
Caruthers Park Multi-Watershed Stormwater Capture Project

- Total Drainage area is 3,136 acres
- Bellflower consists of 1,276 acres: 138 acres from Los Cerritos Channel and 1,138 acres from Lower San Gabriel River
- Downey consist of 1,860 acres
- Total Storage Volume: 9.1 AF
- Construction funded by Caltrans Cooperative Implementation
- O&M funding from LA County's Safe, Clean Water Program

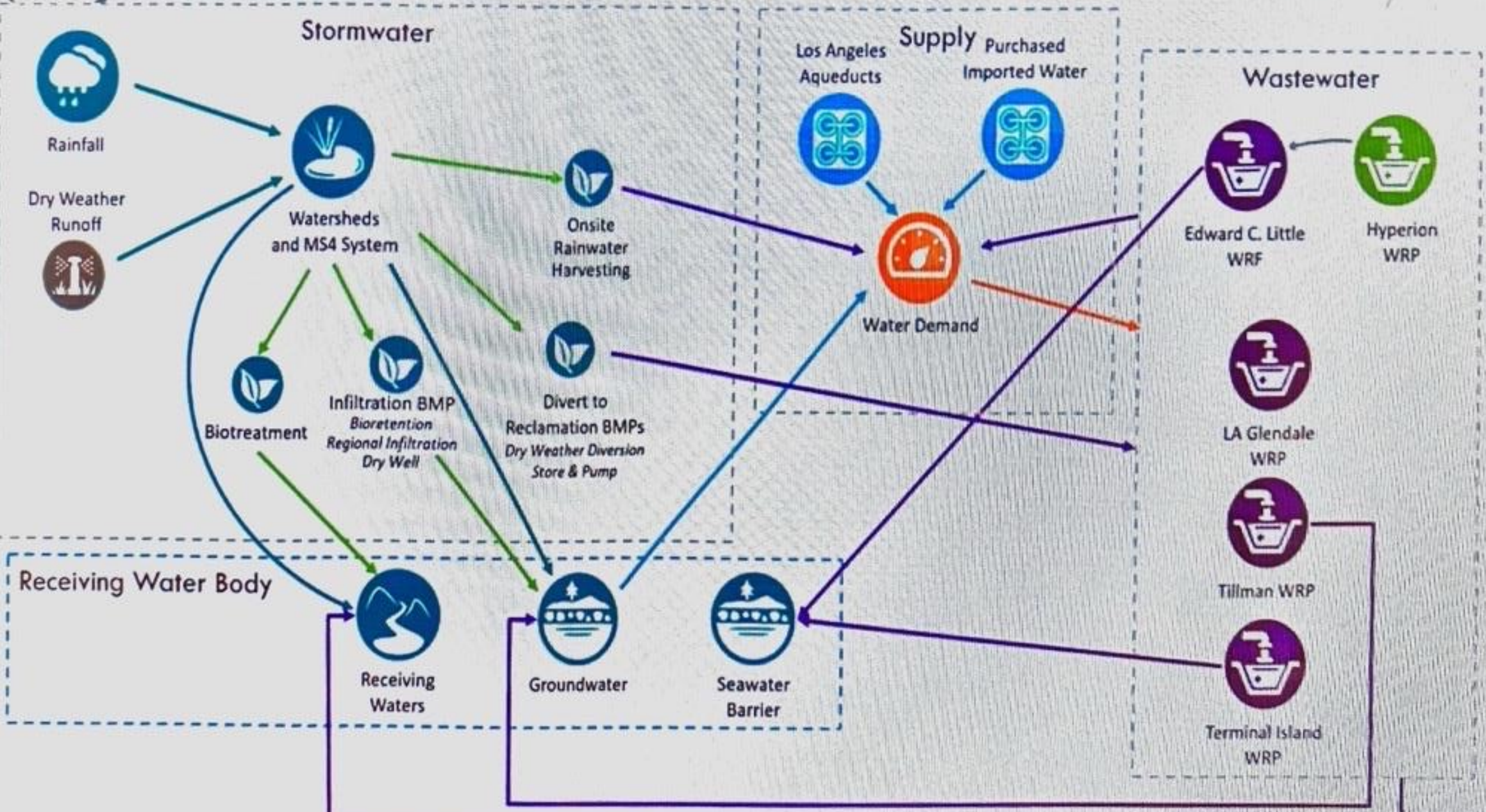
12km²

11,000m³

Bellflower Caruthers Park Stormwater Capture Project



LA WATER INTEGRATION TOOL (WIT) SCHEMATIC



LA Water Integration Tool (WIT) Example results (Zimmer 2022)

Parameter	Base WMMS Case SW Capture and Bio.	Store and Pump to treatment Scenario	Blended
Total Spent over 30 years (millions)	\$6,364	\$1,342	\$2,735
Total Stormwater Control (drainage acres managed)	7,700	7,700	8,000
Implemented Capture (AF)	374	374	372
Total Annual Supply Generated(AF/yr)	0	1,959	1,094
Total Reduction in MWD Cost over 30 years (millions)	\$0	\$93	\$52
Greenhouse Gas Reduction from Baseline (Tons CO ₂)	-2,351	202	-561
Heat Island Reduction from Baseline (deg F)	-1.97e-3	0	-5.64e-4
Change in LA River Flows for Typical Dry Conditions (cfs)	0	0	0





Strategic Shift 3

Sustainable Allocation and Equitable Access

Prioritising mauri when using water, to sustain the environment and people in the long term_____

Strategic Shift 4

Regenerative Water Infrastructure

Ensuring Auckland's water infrastructure is regenerative, resilient, low carbon, and increases the mauri of water. It should be seen and understood by Aucklanders_____

Strategic Shift 6

Integrated Land Use and Water Planning

Integrating land use and water planning at a regional, catchment and site scale

Strategic Shift 5

Water Security

Creating water abundance and security for a growing population through efficient use and diverse sources_____





THANK YOU.