Sustainable urban water management and water sensitive cities

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LIVEABLE CITIES

+ Regional planning  + Urban planning  + City liveability  + Water-sensitive urban design

URBAN WATER CYCLE MANAGEMENT

+ Water harvesting  + Surface water storage  + Stormwater collection
+ Flood mitigation  + Catchment management  + Waterway health

TRADITIONAL WATER AND WASTEWATER SERVICE PROVISION AND MANAGEMENT

+ Bulk water supply  + Water manufacturing  + Water treatment
+ Water distribution  + Retail services  + Wastewater collection
+ Wastewater treatment  + Wastewater recycling  + Effluent discharge

Multiple drivers, Multiple criteria & Multiple scenarios

- Carrying Capacity – ecological footprint and the planetary boundaries
- Coping Capacity – to adapt, withstand and recover from climatic extremes
- Comfort Capacity – systems supporting the many characteristics that influence people to live in a place
The Water Sensitive City requires the transformation of urban water systems from a focus on water supply and wastewater disposal (the ‘taps and toilets’ water utilities) to more complex, flexible systems that:

- integrate various sources of water;
- operate through a combination of centralised and decentralised systems;
- deliver a wider range of services to communities (e.g. ecosystem services, urban heat mitigation); and
- integrate into urban design.
Cities as Water Supply Catchments: meaning access to water through a diversity of sources at a diversity of supply scales;

Cities Providing Ecosystem Services: meaning the built environment functions to supplement and support the function of the natural environment; and

Cities Comprising Water Sensitive Communities: meaning socio-political capital for sustainability exists and citizens’ decision-making and behaviour are water sensitive.

Our cities are water supply catchments.

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As stormwater runoff is generated across distributed areas, distributed green infrastructure presents the best opportunity for delivering multiple benefit outcomes while managing stormwater impacts.


www.watersensitivecities.org.au
There are growing qualitative and quantitative evidence that green infrastructure deliver a net positive economic benefits to urban communities.


www.watersensitivecities.org.au
Ecological Landscapes

Green Infrastructure for:

- **water quality improvement** – to protect and enhance ecological values of aquatic environments
- **transforming cities into water supply catchments** – to build water supply resilience through diversity of sources
- **drainage and flood mitigation** – a network of green and blue corridors for flood conveyance and fostering biodiversity in urban environments
- **buffering aquatic ecosystems** – from the effects of catchment urbanisation and climate change
- **Influencing urban micro climates** – promoting climate responsive design in urban environments
Effective Drainage & Flood Mitigation

- Future cities would incorporate into its urban planning and design of appropriate land uses in accordance to the three-tiered approach of retreat, adapt and defend against future flood vulnerability.

- A water sensitive city would establish a network of blue and green open spaces and corridors to serve as an integral element of the city’s drainage infrastructure and floodway for flood conveyance during rare (low probability) storm occurrences.
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Influence of shade from trees and buildings on Physiological Equivalent Temperature (PET) in Bourke (BK) and Gipps Street, Melbourne, 24-25 February 2012. (Coutts et al., 2013)
Trees and water bodies (lakes and wetlands) have a significant cooling effect during the day. This cooling is apparent, independent of other influential factors.


www.watersensitivecities.org.au
For each 10% increase in tree cover, there is a reduction in land surface temperature of between 0.5°C and 1°C.


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The Dubbo Case Study
The thermal signature of Dubbo changed during the 12-year period of observation:

- as the drought wore on, and irrigation use was restricted, the daytime thermal signature of Dubbo lessened and merged into the rural background
- as the drought broke, both rural and urban landscapes were naturally well watered, the city showed up as an area of relative daytime warmth, because of the warmer city surfaces associated with urban infrastructure

The provision of water to the green infrastructure in this urban landscape is having a remarkable cooling effect on land surface temperatures.

Mitigating urban heat

- **Climate responsive designs** will have a positive effect on human health. Urban heat mitigating design responses should place particular emphasis on the strategic implementation of WSUD technologies and green infrastructure.

- Green infrastructure supported by such **design principles of keeping water in the landscapes and promoting lush and well-irrigated vegetation** can provide microclimate benefits by reducing excess urban heating (through shading, and cooling by evapotranspiration) and limit human exposure to extreme heat.
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Thank You