



ATSE

SUBMISSION TO THE

Senate Environment and Communications References Committee Inquiry into Stormwater Resource in Australia

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Australian Academy of Technological Sciences and Engineering

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The Australian Academy of Technological Sciences and Engineering (ATSE)¹ welcomes the opportunity to provide input to the Australian Senate Inquiry into Stormwater.

Stormwater is a valuable potential resource for Australian towns and cities that is currently drastically underutilised. Better stormwater management would reduce pollution and erosion of urban waterways, while providing a significant alternative water source for a range of productive applications. Existing technologies are capable of providing these services, but urban water governance frameworks need to be updated to enable wider deployment of these distributed systems.

Better management of urban stormwater is essential. Poor management of stormwater leads to costs on society, the economy and the environment, through:

- **Flooding.** The damage that uncontrolled stormwater can cause to urban infrastructure during large storm events is well documented for Australian cities. Due to the aging of drainage infrastructure, rapid increases in urban population and the densification of cities, ongoing investment will be needed to ensure that our drainage systems deliver the expected level of service.
- **Degradation of waterways and bays by uncontrolled stormwater runoff.** The copious amount of impervious areas in cities results in excessive flows into waterways, causing erosion and pollution. Indeed, the elevated flows and volumes, due to the change in natural hydrology, are the key causes of urban stream degradation. Stormwater can also carry large amounts of heavy metals and nutrients, which can increase the risk of algal blooms. An important US EPA study has shown that stormwater is the number one pollution source of coastal waters in the USA². There are indications that Australia has the same problems; e.g. stormwater nitrogen loads into Port Philip Bay in Melbourne, Morton Bay in Brisbane, and the Swan River Estuary in Perth are regarded to be the key pollution source for these valuable receiving waters. Stormwater is also a key source of pathogens in some iconic recreational waters in our cities; e.g. the Yarra and Swan River estuaries, as well as urban beaches in Melbourne and Sydney.

The full potential of urban stormwater is still to be realised.

- **Urban stormwater is a large potential source of water, generated close to where it is needed.** For example, the volume of stormwater discharged from houses annually in Melbourne is similar to the entire household water demand of the city, and this is even greater in Brisbane, exceeding demand by around 50 per cent, as illustrated in Figure 1. Stormwater generally requires less treatment than other wastewater sources, such as sewage or industrial waste, depending on their intended use. Its harvesting, via a range of passive treatment and distribution methods based on natural processes, has considerably lower energy requirements than many other water treatment and supply solutions. Stormwater harvesting can protect and enhance the health of urban streams

¹ ATSE advocates for a future in which technological sciences, engineering and innovation contribute significantly to Australia's social, economic and environmental wellbeing. The Academy is empowered in its mission by some 800 Fellows drawn from industry, academia, research institutes and government, who represent the brightest and the best in technological sciences and engineering in Australia. The Academy provides robust, independent and trusted evidence-based advice on technological issues of national importance. ATSE fosters national and international collaboration and encourages technology transfer for economic, social and environmental benefit.

²Burton, G. A., & Pitt, R. E. (2002). *Stormwater effects handbook - A toolbox for watershed managers, scientists, and engineers*: CRC Press.



by restoring flows and water quality to approximately pre-development levels; stormwater is the only water source whose use will benefit the environment, rather than degrade it. Most importantly, acceptance of stormwater harvesting by Australian communities is also significantly greater than it is for wastewater reuse. It is therefore unsurprising that over 100 stormwater harvesting systems were built during the Millennium drought in Victoria, largely without participation from the water industry. Adelaide has had a far more organised approach, investing widely in stormwater harvesting infrastructure.

Technological solutions to manage stormwater and provide community, economic and environmental benefits are ready to be deployed.

- ***Vegetated stormwater treatment systems, known as Water Sensitive Urban Design (WSUD) technologies (wetlands, rain gardens, swales, bio-retentions, etc.) provide multiple benefits to our cities (Figure 2).*** Apart from reducing nuisance flooding, managing pollution, and increasing water security, they also:
 - ***Improve the urban micro-climate***, reducing thermal stress and therefore aiding public health. By maintaining water in the landscape, WSUD systems reduce local temperatures during heat extremes.
 - ***Increase ‘green-blue cover’ in urban areas, directly improving social amenity of cities.*** Green stormwater infrastructure can be scaled for any urban setting. Large stormwater wetlands, ponds and lakes increase the amenity of suburban parks, while rain gardens, green roofs, and green walls can make a substantial impact on increasing the liveability of commercial areas and densely populated inner city areas; wellbeing of urban dwellers is linked to the level and quality of green space, so the impact of distributed stormwater management vegetated systems cannot be neglected.
 - ***Increase the value of nearby properties and entire developments.*** A recent study on property prices of 4,437 home sales in Sydney, concluded that stormwater rain gardens increased property values by approximately 6% for houses within 50 metres of a rain garden (\$54,000), and by approximately \$1.5 million in the aggregate for all single family houses within 100 m of a typical intersection with rain gardens³. The return on investment, in the case of these small stormwater management measures, is indisputable since their capital costs are in the order of \$15-50k.

³ Polyakov, M., Iftekhar, S., Zhang, F., and Fogarty, J. (2015). ‘The amenity value of water sensitive urban infrastructures: A case study on rain gardens.’ *59th Annual Conference of the Australian Agricultural & Resource Economics Society*, Rotorua, NZ, 10-13 February 2015.

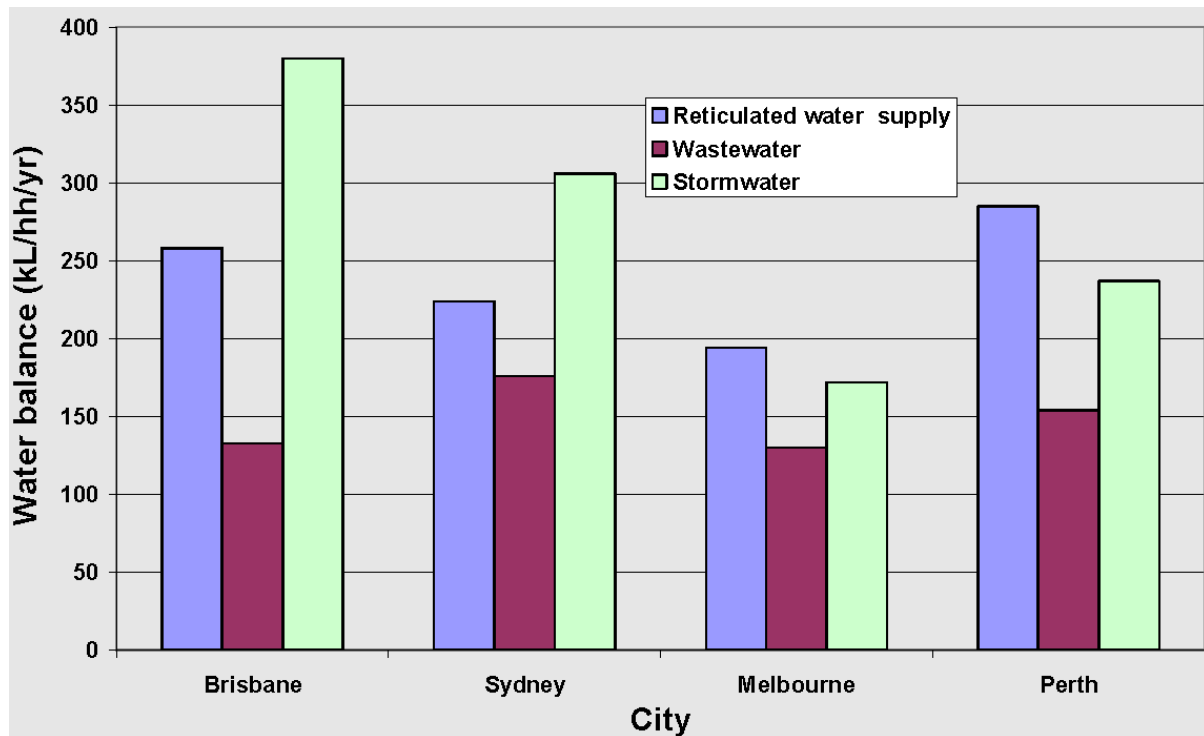


Figure 1: Capital city average household water balance – reticulated water consumed and waste and storm water discharged in kilolitres per household per year⁴.

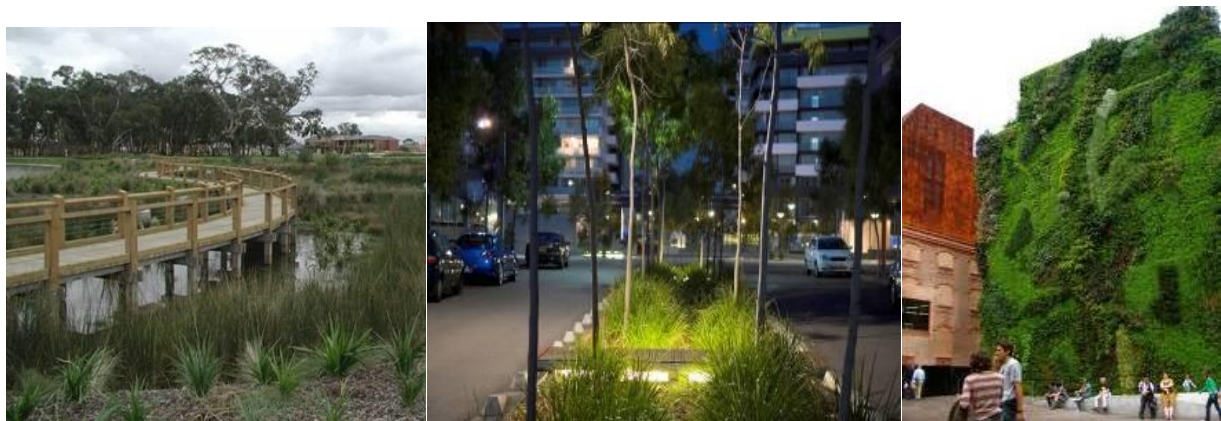


Figure 2: Green stormwater infrastructure provides pollution protection, minimises flooding nuisance, provides micro-climate benefits and increases amenity and property values.

Pictured: wetland – Lynbrook Estate, Melbourne; rain garden biofilter – Victoria Park Sydney; green wall by Patrick Blanc – Europe.

⁴ PMSEIC (Prime Minister's Science Engineering and Innovation Council) Working Group (2007), *Water for Our Cities: building resilience in a climate of uncertainty*, a report of PMSEIC Working group.



A way forward

Australia has made major advances in stormwater management in the past decades. For example, our stormwater technologies have been exported to some of the most advanced water management regions in the world, including Israel and Singapore. However, to stay at the global forefront of stormwater management, and ensure that we keep providing responsible levels of flood and pollution protection for our growing cities, while taking full advantage of stormwater's untapped potential, ATSE proposes the following actions:

Functional

1. Australia needs to further develop its vegetated stormwater harvesting technologies, as they currently lag far behind other water treatment technologies. There should also be a strong commitment to maintaining these green, de-centralised systems, as well as investigation of potential potable use of stormwater through further treatment such as reverse osmosis.
2. The nation needs to secure ongoing investments to implement stormwater water sensitive urban design technologies. This will ensure that we can delay augmentation of existing drainage infrastructure, making considerable savings. Whenever possible, renewal of ageing infrastructure should be undertaken in line with water sensitive urban design principles.
3. Australia needs to develop robust economic evaluation models that can assess the total community costs and benefits of complex stormwater systems. The present models are too narrow in scope and cannot assess the true value of investments made into green stormwater systems that provide high amenity value to our cities while delivering on basic water services.

Policy-related

4. Australia needs more sophisticated governance frameworks for managing multi-functional stormwater assets to transition its cities to more liveable places. For example, the key issues we face in the implementation of green systems pertain to the prevalence of an outdated paradigm of centralised water assets in our water sector. Stormwater systems are decentralised in nature. As such, they are notably different from single-function water systems for which the current governance models have been primarily developed.
5. The nation needs to link stormwater management strongly to urban planning processes to maximise the wider benefits of green stormwater infrastructure and technologies to Australian communities. Currently water infrastructure plans are not strongly linked with urban planning processes, thus leading to 'lost opportunities' in the development of Australian cities – including the potential for broader rooftop capture and use.

Stormwater management should form part of a forward-looking strategic reform agenda, building on the lessons learnt through past national water reform, and stormwater research should be part of any national strategy for water science and research – as identified in ATSE's 2014 position statement *National Water Management: new reform challenges*.



Further reading:

- ATSE (2014). *National Water Management: new reform challenges*, Australian Academy of Technological Sciences and Engineering, available at <http://www.atse.org.au/atse/content/publications/policy/national-water-management.aspx>
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- Hatt B.E., Fletcher T.D., Walsh C.J., Taylor S.L. (2004). 'The influence of urban density and drainage infrastructure on the concentrations and loads of pollutants in small streams', *Environmental Management* 34(1): 112-124.
- Endreny T. (2008) 'Naturalizing urban watershed hydrology to mitigate urban heat-island effects', *Hydrological Processes* 22: 461–463.
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