CRC for Water Sensitive Cities

Fact Sheet: Why choose stormwater biofiltration?

Today's cities, and cities of the future, face mounting challenges from increasing population, housing density and climatic variability. Without careful planning, these changes greatly reduce the liveability of the urban area. The built environment in its traditional form exacerbates hot temperatures, severely restricts green spaces and distorts the hydrological cycle (Figure 1).

However, the potential of Water Sensitive Urban Design (WSUD) to help alleviate these problems is increasingly being recognised and quantified. Biofiltration of stormwater runoff is amongst a suite of WSUD tools. Biofilters provide improvements in water quality, downstream hydrology, biodiversity, microclimate, aesthetics, urban greenery, human health and an alternative water supply (Table 1). The costs of WSUD should be compared against the costs of implementing traditional stormwater management, which is accompanied by waterway degradation, flood control, water pollution, asset maintenance, upkeep of civic garden beds, loss of revenue to businesses dependent upon healthy aquatic environments, and loss of amenity to the community. Not all of these aspects can be readily quantified, but evidence of the economic benefits of biofiltration, or more broadly, WSUD, includes:

- The **amenity value of streetscape raingardens** in Sydney is realised in residential house prices, **increasing property values by around 6% ($54,000 AUD) for houses within 50 m and 4% ($36,000 AUD) up to 100 m away** (Polyakov et al., 2015).
- **A business case analysis of WSUD technology found the benefits do surpass the costs.** Even on a standalone basis, the value of nitrogen reduction was predicted to exceed the project lifecycle cost; increased prope rty values were estimated at approximately 90% of the capital costs of WSUD; and the saved cost of waterway restoration works equate to approximately 70% of the project life cycle cost (Water by Design, 2010).
- From a waterway protection and restoration perspective, **WSUD technologies cost less to implement than the economic cost of traditional stormwater drainage** (i.e. taking into consideration the avoided costs of restoration works etc.; Vietz et al., 2014).
- A **reduction in nitrogen load** in stormwater runoff is currently **valued at $6,645/kg N in Victoria**, valued on the basis of past stormwater treatment works (Melbourne Water website, 2015)

Figure 1. Traditional urban design with impervious surfaces brings challenges for water management, climate control, human wellbeing and waterway health

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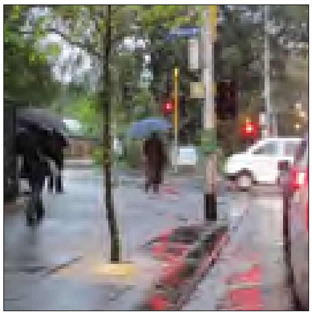
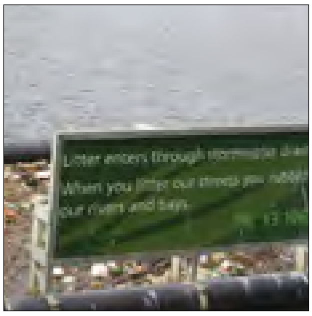
Table 1. The multiple and wide-ranging benefits of stormwater biofilters

Outcome delivered by biofilter	Resulting benefits
Improvement in quality of stormwater runoff	Improved water quality in local creeks, rivers, bays or lakes downstream. The improved health of riparian and aquatic environments: • Supports greater diversity and numbers of flora and fauna • Provides enhanced amenity for the local community & visitors • Improves community engagement and satisfaction with the local environment, • Increases the potential for use and enjoyment, which in turn delivers health benefits • Increases local property values • Reduces the need for expenditure on maintenance, management and works to restore degraded waterways and waterbodies • Increases commercial opportunities for fishing, tourism, sport and other activities associated with downstream waterbodies
Pollutant collection	The concentration of pollutants at a central point allows: • Capture before pollutants are distributed widely throughout receiving environment • Appropriate management, including potential reuse or safe disposal
Conversion of some pollutants into inert or stabilised forms	This transformation provides: • Permanent removal from the system (e.g. N into N_2 gas (denitrification), organic compounds into CO_2 and H_2O)
Reduction in runoff volume and peak flow	Alteration of the hydrological regime towards pre-development conditions delivers: • Reduced erosion and scouring in downstream creeks and streams • Flow regime that better supports healthy macrophyte and aquatic invertebrate communities, and diverse and healthy in-stream and riparian vegetation • Reduces the need to maintain or construct traditional stormwater drainage (e.g. piped underground networks) • Helps to mitigate localised flooding risk
Adds to neighbourhood aesthetics	Improves the landscape and attractiveness of streetscapes, parking lots, median strips and other public or private spaces, which generates: • Increased local property values • Community satisfaction and sense of pride
Provides a green space, cooling and enhanced amenity in the urban environment	In the urban environment green spaces provide: • Microclimate benefits with significant cooling of the urban environment from evapotranspiration and shading – this reduces energy demand and benefits human health significantly • Improvements to human health with increased mental wellbeing, exercise areas and socialising areas – providing a place 'people want to spend time in' • Public amenity as cities move towards higher density, with limited or no backyard environments • Avoids the landscaping cost otherwise required for a garden bed or lawn occupying the space





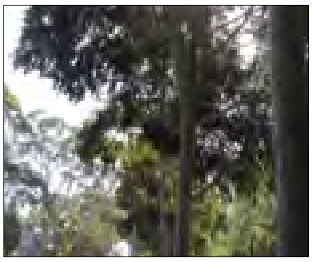


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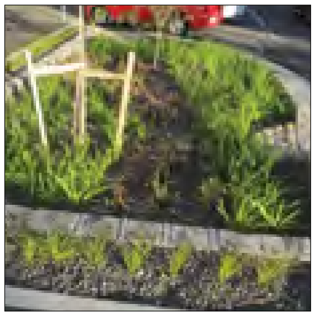
Table 1. Continued

Outcome delivered by biofilter	Resulting benefits
Visible water management	The treatment of stormwater above ground, where it is visible and available to provide additional benefits, creates: • Community engagement and education • Allows stormwater to be embraced as a valuable resource and part of the urban environment • Potential for unique and functional landscaped elements – a possible 'selling point' or increased brand for the development
Habitat and biodiversity	Provision of habitat for flora and some fauna generates: • Greater diversity and distribution of local indigenous plant species • Habitat for insects and birds in the urban environment
Supplies alternative and local water source (stormwater harvesting schemes)	In the case of stormwater harvesting projects, the recycled water supply allows: • A viable alternative water supply • Greener public spaces - supports larger irrigated areas and green spaces throughout the summer • Reduced demand for potable water • Reduced demand for water pumping across long distances • Increased security of supply • Increases amenity for use (e.g. sports field) - delivering social and human health benefits
Passive and localised water treatment technology	Small-scale, distributed treatment of stormwater: • Has low energy requirements and no operational costs • Does not require large pipe collection/distribution networks • Reduces need to invest in large centralised and heavily engineered infrastructure for water treatment plant • Reduces the need for irrigated garden beds and landscaping, instead providing 'self-irrigation'
Provides shelter and screening	As a landscape element biofilters can be applied to provide: • Shelter from wind • Shading from the sun • A screen to improve the visual aesthetics (e.g. to conceal structures considered ugly) or provide a visual barrier



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