CRCWSC
Research
Synthesis

Discussion Paper
CRC for Water Sensitive Cities

ENHANCING THE ECONOMIC EVALUATION OF WSUD

CRC for
Water Sensitive Cities

Australian Government
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Enhancing the economic evaluation of WSUD

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Disclaimer

Key messages

1. Research shows that communities in Australian cities value the multiple benefits that water sensitive urban design (WSUD) can provide. This is demonstrated by positive and consistent willingness-to-pay for these additional benefits. These benefits align with South Australia's WSUD policy and principles (Fig 1).

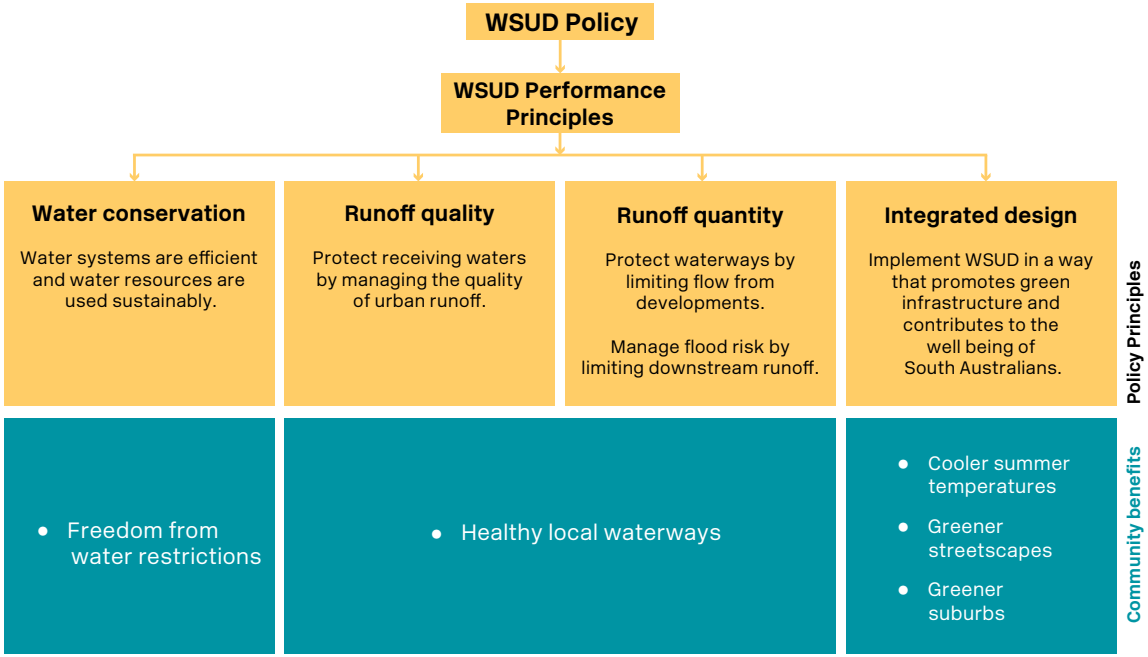


Figure 1. Community benefits delivered by the WSUD policy

2. State agencies should deliver these outcomes through their infrastructure projects where it is cost-effective to do so. Indeed, projects that deliver multiple outcomes will deliver better community and political return-on-investment and these benefits should be incorporated into the cost effectiveness analysis and accompanying economic evaluation.

3. Cost-effectiveness should be determined by the value provided (return-on-investment), acknowledging that co-investments by multiple stakeholders and benefices may be justifiable.

4. Communities have indicated their willingness-to-pay or monetary value to assign to specific outcomes. These outcomes can be summarised as:

    - Freedom from water restrictions
    - Reducing local peak summer temperatures
    - Protecting healthy waterways
    - Greening streets and suburbs.

5. State agencies can use these monetary values as a guide to identify how much additional investment is justified to deliver these outcomes or the contribution that should be sought from the beneficiaries of such initiatives. Projects that deliver the outcomes for less than the monetised values nominated by community should be prioritised as 'good investments'.

6. The design of WSUD elements should maximise value for that context and community. This can be done using a framework for the evaluation of benefits and an understanding of local demographics.

Background

Purpose

A research synthesis workshop on South Australia's Monetised Benefits of WSUD tool (draft) was held on 19 May 2016. This document represents the compilation and refinement of the ideas developed during the workshop.

The workshop considered the outcomes communities want from urban water management and the value individuals put on these benefits.

It also considered how this research could be applied in rapid assessments of infrastructure projects. Fundamental to this is a robust understanding and assessment of the benefits, the valuation of these benefits and the limitations of these approaches.

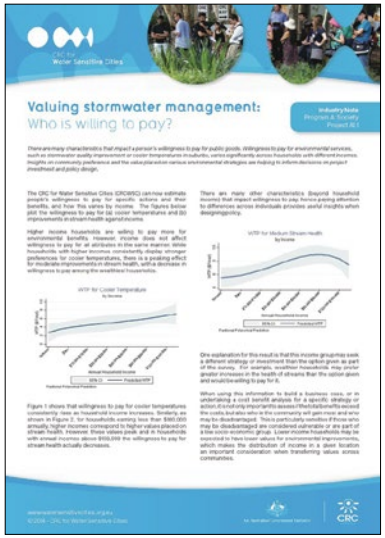
This research synthesis project focuses on the South Australian context where tools are needed to support the adoption of WSUD in state managed infrastructure projects. This is an action from the South Australian Government's WSUD policy (DEWNR, 2013). The project focuses specifically on the development of the Monetised Benefits of WSUD tool (draft) to ensure it includes evidence-based default values for key WSUD outcomes.

The intention of this report is to ensure that the rapid assessment of benefits in the tool is robust, evidence-based and effective. This report is presented in three sections:

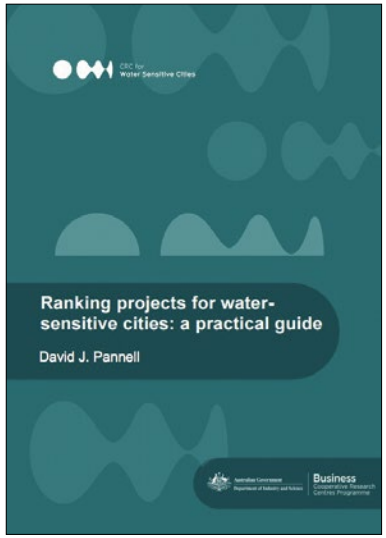
1. the over-arching economic evaluation framework
2. the benefits of WSUD, and economic valuation of these benefits
3. using these valuations in decision making.

Building an evidence-based approach to economic evaluation

This report can be read in conjunction with other CRCWSC publications that provide advice on economic evaluation and business cases.

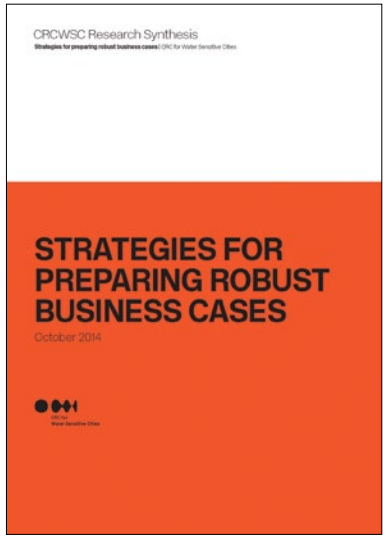


Fact Sheets, journal articles and industry publications highlight the economic valuation of the benefits of a water sensitive city. These should be read in conjunction with other CRCWSC publications that demonstrate how communities understand water and how this influences their preferences.



This CRCWSC publication provides a guideline for assessing projects. It includes principles for ranking projects, common mistakes to avoid and formulas to use to rank projects.

This guideline can be used for any type of water related project.



This Research Synthesis report provides strategies to build support for a business case from decision makers.

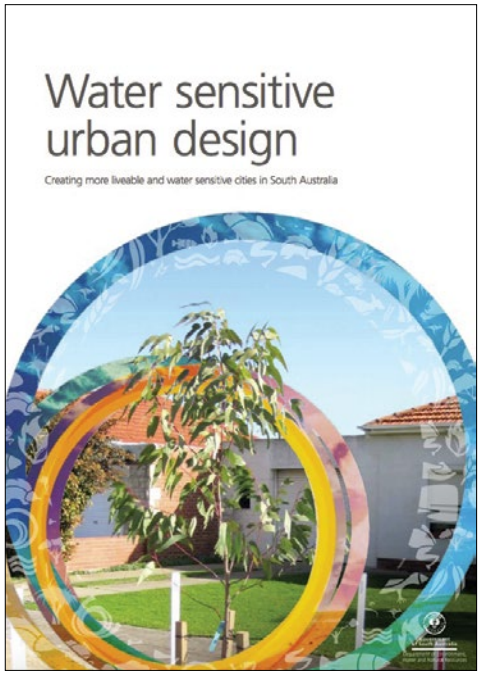
It demonstrates that having a well-documented business case is not enough. It is also important to advocate to decision makers.

These publications can be found at www.watersesnsitivecities.org.au

Context

South Australia's WSUD policy

South Australia's WSUD policy was released in 2013 (DEWNR, 2013). It recognises the role of WSUD in delivering more liveable cities, helping Adelaide adapt to a changing climate and in creating healthy communities. It aims to mainstream WSUD in South Australia's built environment.



WSUD policy and objectives

↓

WSUD principles

↓

Targets

↓

Monetised Benefits Tool

↓

Projects incorporating WSUD in their design

Figure 2. WSUD policy aims to increase the uptake of WSUD in state managed projects

Drivers – why is a WSUD policy needed?

The policy explains that WSUD is a response to a number of drivers in South Australia:

- waterways are being damaged by urban runoff
- reduced storage of rainfall runoff is drying urban catchments
- reliance on water imported from outside the city is increasing.

The policy aims to increase the adoption of WSUD by establishing objectives, principles and targets for water conservation, runoff quality and quantity and integrated design to guide this change. A suite of 14 actions are included to implement the policy.

Improving the economic evaluation of WSUD

A key action in the policy is to:

> *Establish a framework (including appropriate cost benefit analysis techniques) to adopt the State-wide WSUD performance principles in future State-managed infrastructure projects*[1]*, where appropriate.*

This will:

- ESTABLISH clear and consistent objectives for WSUD appropriate to South Australia.
- INFLUENCE the design of new urban developments and infrastructure by strengthening links between project development and water management.
- ENABLE the State Government to show leadership in its own projects to build industry capacity to implement WSUD.

A further, implied objective is to increase the community benefits that Government delivers through its investment.

[1] *State infrastructure projects include road construction, new residential development and other building projects. The State may plan and fund part or all of these projects, with a designated agency or third party accountable for overall delivery.*

The Monetised Benefits Tool (draft)

A spreadsheet based tool is being developed that enables a simple calculation of the economic value of WSUD.

The tool provides guidance on the outcomes WSUD should deliver and how projects should be assessed. These outcomes reflect the performance targets in the WSUD policy.

The tool assesses the economic, social and environmental benefits of WSUD that are not easily incorporated in cost-benefit analysis.

Research Synthesis workshop focus

The Research Synthesis workshop discussed opportunities to ensure the Monetised Beliefs Tool (specifically) and economic evaluation (generally):

- represents the economic framework needed to transition to water sensitive cities. It should consider city scale opportunities and outcomes, include outcomes across the whole water cycle and evaluate the full range of costs and benefits rather than those related only to core, regulated services.
- is evidence based and supported by CRCWSC bio-physical, social and economic research.
- supports an integrated approach to urban planning and water cycle management.

Frameworks for evaluating economic benefits

The assessment of economic value must be underpinned by a framework for identifying the benefits of a WSUD project. Defining this framework ensures the evaluation process is transparent and consistent between options and projects. This will build stakeholder support for the tool and subsequent business cases.

An important principle is to include the full range of economic benefits within the decision making process.

Economic benefits

Economic assessment identifies the net benefits to the community of an action. It differs from financial analysis which considers the financial feasibility of a project based on its cash flows.

Traditionally the economic assessment of drainage and water projects has valued drainage in terms of the damage costs associated with flooding and water as an undifferentiated commodity.

However, the recent context of droughts and the aspiration for more liveable cities has improved governments' understanding of the broader range of costs and benefits of water cycle management. For example, decentralised nature-based solutions for stormwater harvesting delivers economic value beyond the benefit of an alternative source of water (i.e. water as a commodity) and include economic benefits associated with flood management, increased biodiversity, quality open spaces and enhancement of urban microclimate.

Tools, including economic valuations of specific benefits, are required to select the options which provide the best community outcomes. This is part of the shift in economic assessment from a focus on the lowest cost options to those that provide the best value.

Evaluating an investment always begins with an understanding of the 'return' that is required. This holds for WSUD projects: governments need to define what outcomes they want from WSUD projects followed by how much they are prepared to spend to get these benefits.

A framework for identifying these benefits

A clearly defined economic framework provides a way to describe costs and benefits and to understand how value is assessed for each project. A framework begins with the question to be solved. The question presented by the WSUD policy is: how do we create more liveable and water sensitive cities in South Australia?

A framework to deliver this can include:

- Different types of costs and benefits (including non-market values).
- Benefits that are locally specific as well as those that benefit the broader city.

1. Broadening the range of costs and benefits

The Total Economic Value framework (Marsden Jacobs, 2013) articulates the contribution of 'use' and 'non-use' values to the net community benefit of a project. Within this framework, benefits are compared against the costs of an option to identify the net value.

The Total Economic Value framework includes:

1. **Direct costs**: The present value of all upfront and ongoing expenditure required to construct and operate the WSUD elements.
2. **Indirect delivery costs**: Other service delivery costs required to modify or add to road, regional drainage or other assets and the marginal administration costs required to support the WSUD.
3. **Use value benefits**: The value that will be gained by the organisation installing the WSUD. An example may be the value of water for irrigation if the scheme includes stormwater harvesting, or the reduced building energy costs if WSUD is associated with building design.
4. **Avoided costs** – Local and downstream– the present value of avoided capital and operating costs associated with water supply, drainage and waterway management services.
5. **Community willingness-to-pay (non-use)**: Research has indicated that the broader community is willing to pay for the benefits of WSUD. To avoid double counting, the community willingness-to-pay must exclude the direct benefits included elsewhere in this framework.
6. **Other environmental / community benefits**: 'Uncosted' but still relevant benefits that should be incorporated into decision making.

Examples of the costs are shown in Figure 3.

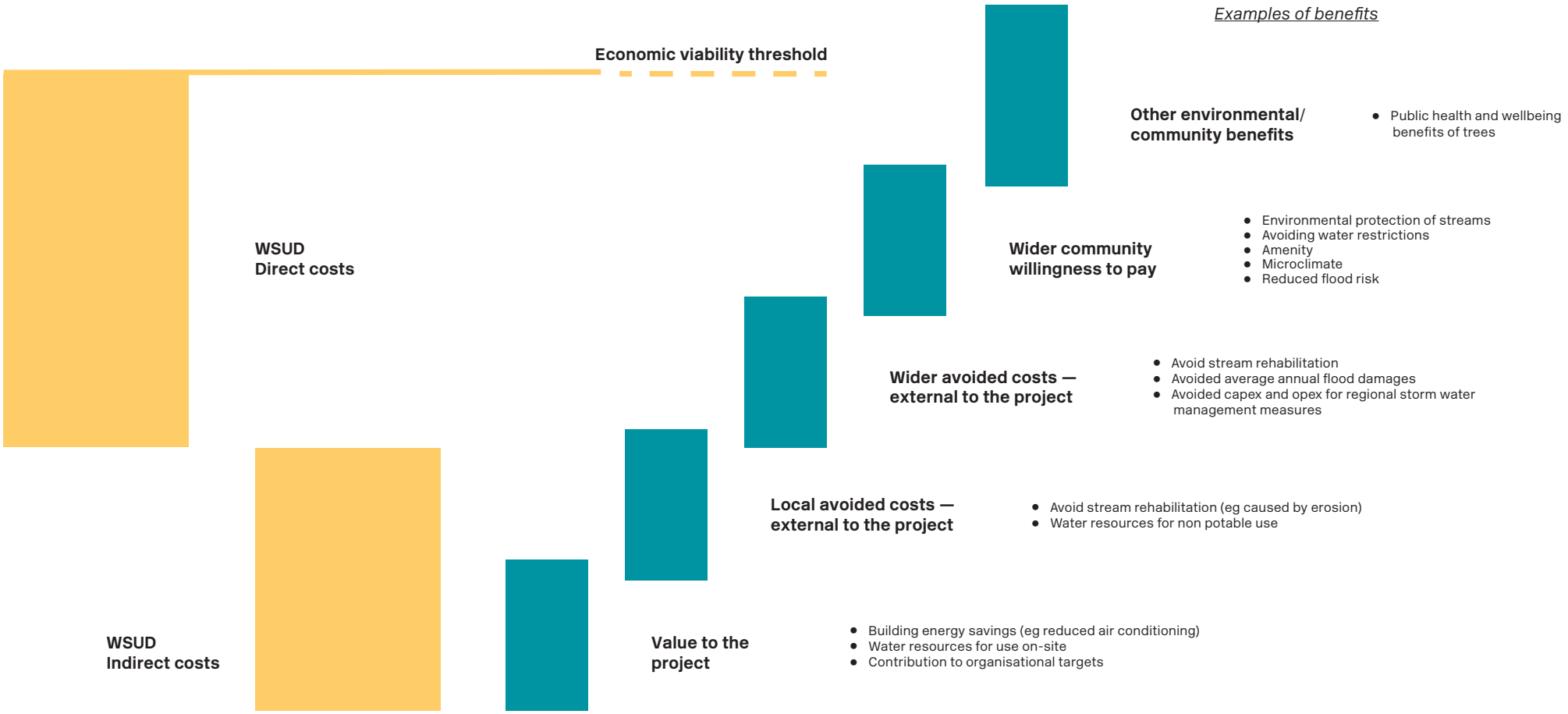
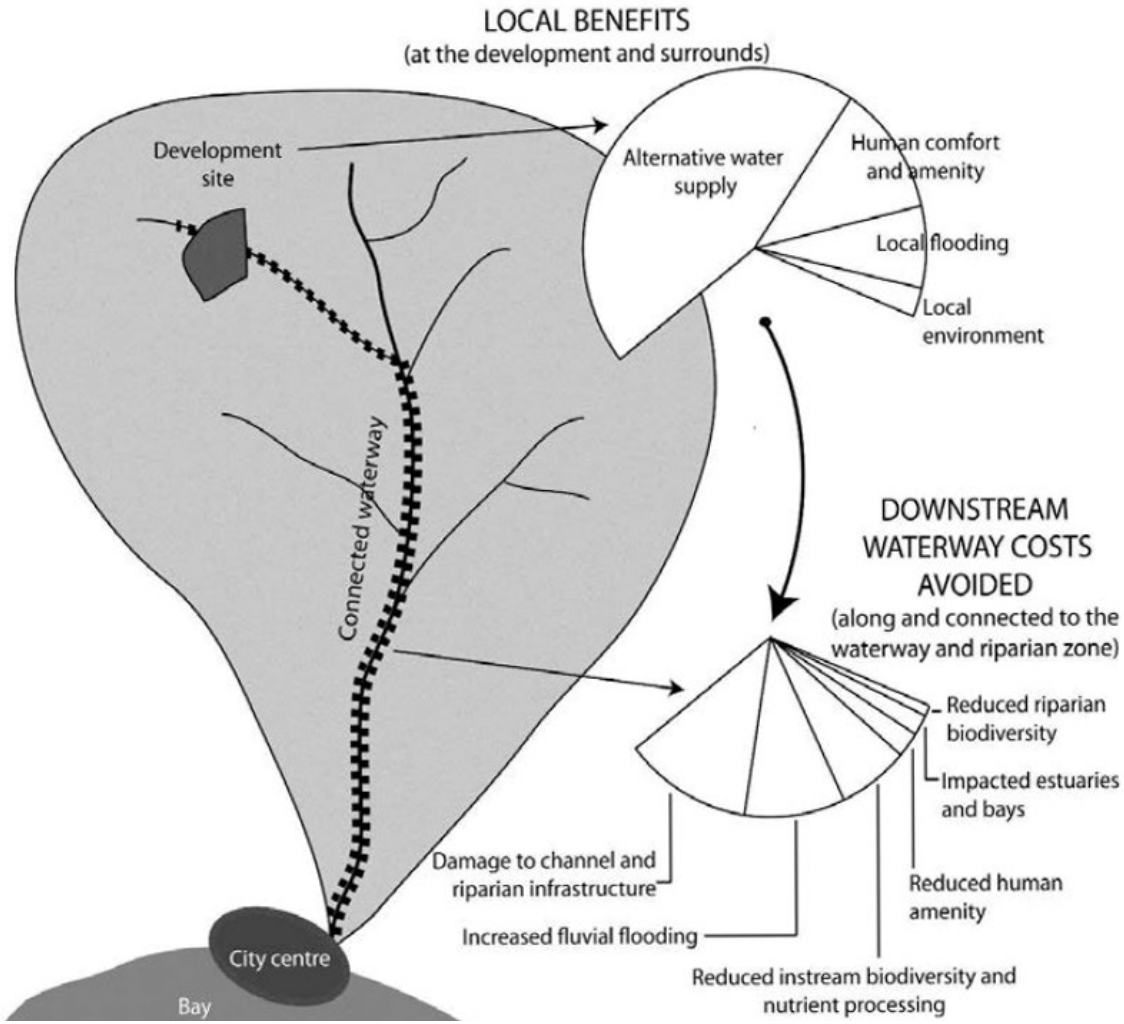


Figure 3. Total Economic Value framework showing costs, benefits and examples[2] (adapted from Marsden Jacobs, 2013).

[2] Note that the size of bars does not reflect the size of costs/benefits in this example



2. Considering the range of scales

It is also important to recognise the potential impact of city wide implementation of distributed water cycle approaches such as WSUD. This is often described as the deferral or avoidance of upgrades to regional water, drainage and sewerage networks if growth in demands for these services can be met locally. The impact of large scale uptake of rainwater tanks on a city's water supply is an often quoted example.

This distinction between local and regional benefits is further explained in Figure 4. These benefits will include a mix of willingness-to-pay and avoided costs.

Figure 4. Benefits and avoided costs of alternatives to conventional urban drainage at two scales. (Source: Vietz et al., 2014)

The economic benefits of WSUD

The CRCWSC has identified the economic value of several attributes of WSUD (Fig. 5)

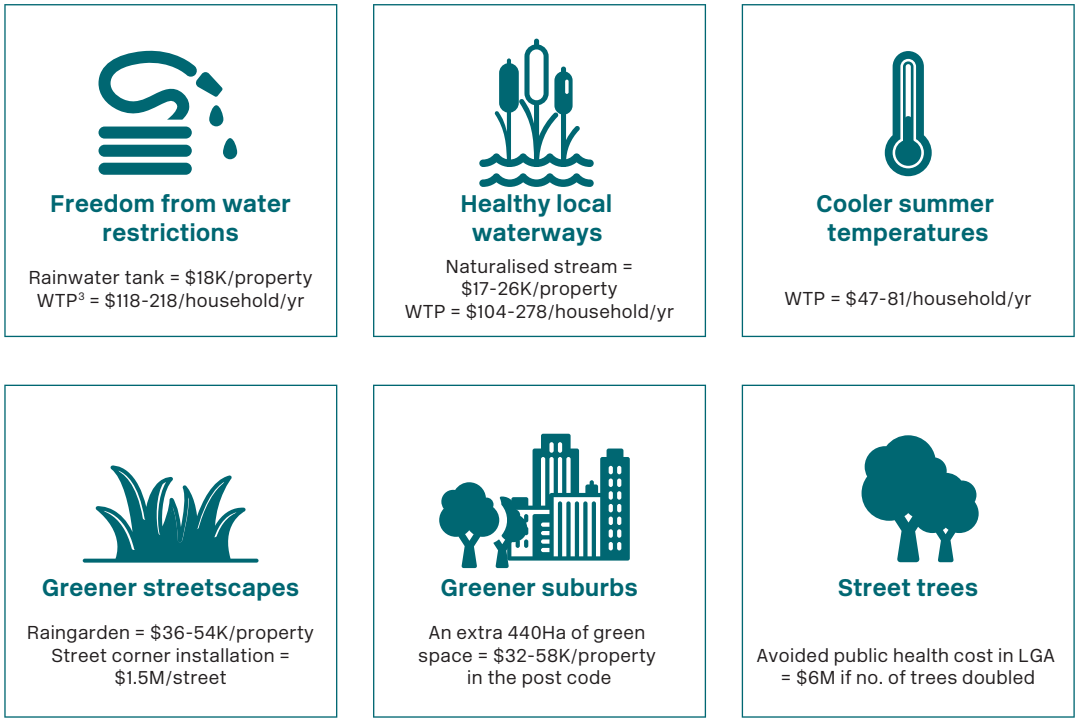


Figure 5. Summary of benefits and valuations from CRCWSC research

Valuing non-market benefits

Valuation is the process of assigning a dollar value to a benefit so it can be included in financial decision making. Values can the determined in two main ways:

- Stated preference, in which individuals are asked how much they would hypothetically pay to 'purchase' the benefit, typically through an increase in rates.
- Revealed preference, in which an inference of the value is made by assessing the difference people actually pay for goods that vary only in the extent to which the benefit is present. For example, how much extra do people pay for a house with a rainwater tank, compared to an otherwise identical house without one?

[3] *Willingness to pay.*

1. Freedom from water restrictions

An individual's history influences their values. In most Australian cities, residents have experienced prolonged drought and associated water restrictions. The impacts of this include foregone economic opportunity (ie businesses affected by water restrictions) as well as loss of amenity and other lifestyle benefits. Avoiding these impacts has an economic value.

One way of avoiding water restrictions is to incorporate stormwater harvesting into the design of WSUD projects. The scale of stormwater harvesting will vary from rainwater collection on individual properties to schemes that harvest and treat water from large urban catchments.

In each case, the harvested water provides an additional water source for property owners, councils and communities that can be used to improve water security.

The value of access to alternative or additional water supplies can often be more than the traditional cost of supply as it provides a way to overcome the 'costs' of water restrictions imposed during drought when the beneficial uses of gardens, green spaces and sporting ovals are lost.

Research summary

Valuing environmental services associated with local stormwater management: Stated preference experiments in Melbourne and Sydney. There is significant economic support for projects that eliminate exposure to water restrictions (A$218 per household per year in Melbourne and A$118 per household per year in Sydney).

Reference: Brent et al (2016).

The capitalized value of rainwater tanks in property prices: Revealed preference (hedonic pricing) study in Perth. This study finds that there is a premium of up to AU$18,000 built into the sale prices of houses with rainwater tanks installed. The premium is likely to be greater than the costs of installation, even allowing for the cost of time that home owners must devote to research, purchase and installation.

Reference: Zhang et al (2015).

Table 1: Monetised benefit

Project outcomes	Equivalent annual payment[4]	Equivalent once-off payment
For every extra house that is free from water restrictions …	$118-$218/household/year (Brent et al., 2016)	$18,000 per property (Zhang et al., 2015)

[4] The annual and one-off payments are based on separate research and may not be equivalent in monetary value.

2. Improving the condition of local waterways

Communities value nature in cities and generally support environmental protection. Research shows that individuals generally identify themselves as being 'environmentally sustainable' citizens and this is reflected in a willingness-to-pay for stormwater management actions that protect waterways.

Our research shows that this benefit has two elements:

- Enhancing environmental condition, such as water quality conditions, to enable ecological protection or higher order human uses such as swimming.
- Restoration of urban drains into 'living streams' which transform local landscapes by introducing more natural channel form and vegetation.

Community perspectives

How the community understands WSUD affects the value individuals put on its benefits, and research shows that community understanding is generally poor.

Many people have not heard of WSUD. However once the concepts and technology are explained, support increases as people appreciate the idea of living in a green city and near clean water.

Community research also shows that individuals differ in the way they engage with water and WSUD. Typically, less affluent communities derive the greatest value from the introduction of WSUD to their neighbourhoods, but will have less ability (willingness) to pay.

This suggests that social equity should be a factor in project evaluation, with consideration given to emphasising the benefits of WSUD in lower socio-economic areas.

Table 2: Monetised benefit

Project outcomes	Equivalent annual payment	Equivalent once-off payment
For every house that is within 200m of a naturalised waterway …		$17,000-$26,000 per property (Polyakov et al., 2015; Polyakov et al., 2016)
For every house in a catchment that has ecologically healthy waterways …	$104 – $278/household/year (Brent et al., 2016)	

Research summary

Valuing environmental services associated with stormwater management: Stated preference experiments in Melbourne and Sydney. There is significant economic support for projects that maximally improve stream health (A$278 per household per year and A$104 per household per year).

Reference: Brent et al (2016).

The value of restoring urban drains to living streams: Revealed preference (hedonic pricing) study in Perth. After the natural wetland ecosystem has established, the median home within 200m of the restoration site increased in value by $17,000 to $26,000 above the trend increase in house values in the area, or 4.4% once the restored area became fully established. When we compare benefits to costs we find that, with real discount rates of 5%, 7%, and 9%, project benefit–cost ratios are 2.6, 2.5, and 2.2, respectively. In other words, the benefits were more than double the costs.

References: Polyakov et al (2015) and Polyakov et al (2016).

3. Cooling suburbs in summer

Microclimate benefits are associated with green neighbourhoods and streets but have a value in their own right. The benefits include improvements in human thermal comfort as well as more direct health benefits if heat related morbidity and mortality can be avoided. Householders may also benefit from energy savings if air conditioning use is reduced (depending on WSUD design).

The value of these benefits is supported by a willingness-to-pay for cooler summer temperatures and avoided health care costs.

Research summary

Valuing environmental services associated with local stormwater management: Stated preference experiments in Melbourne and Sydney. There is significant economic support for projects that reduce peak summer temperatures (A$81 per household per year and A$47 per household per year).

Reference: Brent et al (2016).

Table 3: Monetised benefit

Project outcomes	Equivalent annual payment	Equivalent once-off payment
For every extra house in an area where peak summer temperatures are reduced by 2°C is orphaned	$47-$81/household/year (Brent et al., 2016)	

4. Greening streets and suburbs

Individuals prefer to live in verdant streets and neighbourhoods. This preference is supported by social and economic research and is expressed as a willingness-to-pay to live near green infrastructure. The value is mostly clearly reflected in house prices, with market values of houses in proximity to 'green infrastructure' bringing higher sales prices[5].

Importantly these benefits can be delivered at a range of scales, with even the introduction of individual street trees and raingardens providing measurable value. These benefits are described in Figure 6.

Another perspective of this research insight is the potential for 'value capture' models to fund the creation of green and blue corridors in urban environments. Value capture acknowledges the multiple benefits of public infrastructure investments and applies a 'beneficiary pays' approach to fund these works. Under this model local beneficiaries make a co-investment (eg through a levy on development) equivalent to part of the predicted increased value (eg higher sales price of development properties in the vicinity of the works).

Green infrastructure – with and without WSUD

The role of WSUD is an important variable in the value of green infrastructure. For instance, Thom found that doubling the coverage of street trees in the City of Monash (VIC) provided a 72 % increase in economic benefit, valued at $ 9.285 million. In comparison, a 50 % loss in tree cover resulted in an equal (50 %) loss in economic benefits, valued at $ 6.496 million. Where trees suffered poor health, an estimated 10 % reduction in economic value was estimated. This is supported by Coutts et al. (2014) who show that the addition of water to grass and WSUD that have high soil moisture reduces surface temperatures and lowers air temperatures. This highlights the importance of maintaining healthy green infrastructure and soil moisture, with WSUD elements playing a role by providing passive irrigation.

Figure 6. The social, economic and environmental benefits of street trees (Source: Adapted from Thom, 2015).

[5] *Property values are a surrogate indicator of willingness to pay to live in green neighbourhoods not an objective of 'greening' suburbs.*

Table 4: Monetised benefit

Project outcomes	Equivalent annual payment	Equivalent once-off payment
For every extra house that is … within 50m of a raingarden … within 100 m of a raingarden		$36,000 per property $54,000 per property (Polyakov et al 2015)
For every house in a postcode that gains green infrastructure equivalent to a 1 std dev change in Enhanced Vegetation Index[6] …		$32,000 – 58,000 per property (Rosetti, 2013)
For every postcode in which the number of street trees is doubled…		$6M per postcode (Thom, 2015)
For every postcode in which the condition of existing of street trees declines to 'poor health' …		10% reduction in economic value of street trees (Thom, 2015)

Research summary

Valuing Australia's green infrastructure: Revealed preference (hedonic pricing) study across Australia. A one standard deviation increase in the Enhanced Vegetation Index (EVI) leads to an increase in housing prices of 8.62% to 15.57% (depending on the statistical method used). For an average house this translates to an increase of AU$32,139 and AU$57,991. These increases represent benefits to the community because they indicate how much more people are willing to pay, at the margin, for houses with green infrastructure in place.

Reference: Rosetti, J. (2013).

Valuing street trees: This study quantified the ecosystem services of street trees including air pollution, carbon, stormwater management and heat mitigation during an extreme heat event. The economic value of these benefits was determined by relating units of environmental ecosystem services to associated marginal economic values. The current tree population in a local government area was valued at $12.85 million for a year that included an extreme heat event. A 100 % expansion in current tree cover provided a 72 % increase in economic benefit, valued at $ 9.285 million. In comparison, a 50 % loss in tree cover resulted in an equal (50 %) loss in economic benefits, valued at $ 6.496 million. Where trees suffered poor health, an estimated 10 % reduction in economic value was estimated.

Reference: Thom (2015)

[6] In the study postcode, 1 standard deviation of enhanced vegetation index was equivalent to an additional 440 Ha of green infrastructure.

5. Saving infrastructure and maintenance costs

Decentralised water management approaches such as WSUD can avoid or defer to the costs of augmenting city-scale water supply, waste water treatment or drainage systems.

This can occur if local scale options can be used close to the source/demand to provide water supplies, treat water or manage flooding. This reduces costs to councils and water authorities, for instance if:

- The location is undergoing intensification and existing water/sewerage/drainage/waterways need to be upgraded to service the increased population.
- The location is on the metropolitan fringe and centralised water/sewer or drainage transfer networks need to be extended to service the new community.
- The increase in population is a driver to increase the capacity of centralised water supply or sewerage treatment infrastructure.
- Improved management of part of a network such as the upper reaches of a catchment can reduce the need for regional drainage, water quality or stream stabilisation assets (and associated maintenance).

These costs can be significant. The capital expenses associated with regional infrastructure often require large upfront investments. Costs include:

- Head works and transfer network costs for water supply systems (eg if stormwater harvesting substitutes a demand that would otherwise be met by centralised systems).
- Treatment systems and transfer networks of sewerage (eg if WSUD can reduce stormwater infiltration to sewage networks).
- Drainage networks and waterways including treatment and flood mitigation assets.

Research summary

In Melbourne, CRCWSC partners including Melbourne Water, City West Water, South East Water, Yarra Valley Water and the Department of Environment Land Water and Planning have developed shadow costs for each water cycle service based on the long run marginal costs. This study identified specific areas of Melbourne in which decentralised options could be financially viable.

The monetised regional value of local options will differ between cities and so a replication of this project in Adelaide is recommended instead of specific default monetary values.

Reference: DELWP (2015)

Using these valuations in decision making

1. Tailor the valuations to the project

These valuations can be used in cost benefit analysis to evaluate projects. Several additional factors should be considered to ensure a robust result.

The values are presented in this report as a range to reflect differences in:

- Heterogeneity in the community: Willingness to pay varies between individuals and communities. Factors such as risk aversion and income will influence willingness to pay.
- Valuation methodology: stated and revealed valuation approaches can give different dollar values, in part because the time period of payment can be different. The direction of the value and the relative priorities between benefits are important trends to look for.

Nonetheless, at a community level the CRCWSC's research has not found any significant difference in willingness to pay between different Australian cities. Users can be confident the valuations are transferable between Australian cities.

When applying results to specific projects, consider the influence of local context and demographics on the valuations. Use tools such as ABS data on demographics or the CRCWSC's heat vulnerability mapping[7] to determine the relevance and importance of a benefit in a given location. This information may help justify the use of the upper or lower end of the default valuation range.

2. Don't ignore benefits that don't have monetary valuations

Some benefits can only be assessed qualitatively. The Total Economic Valuation framework recognises these remain important for decision making. Including them in economic assessment tools acknowledges their relevance and provides a placeholder that can be updated as new valuation research is completed. If needed, the scoring of these qualitative benefits can be reported separately. This is commonly done when performing multi-criteria assessments.

3. Valuing the marginal benefits

The results in this report represent the value of an additional (marginal) benefit. This is illustrated in Thom's (2015) study which valued the effect of doubling or halving the number of street trees from current levels.

It is important to isolate the extra benefits that WSUD will provide rather than valuing the total benefit of the project. This can be achieved by describing the base case and specifying the changes that WSUD will deliver. These differences are the benefits to input into the valuation tool.

Further information on this issue is provided in Appendix 1.

[7] http://www.mappingvulnerabilityindex.com/

4. Misinterpreting hedonic valuations

Hedonic valuation is a methodology that determines the value of WSUD by considering changes in house prices. However, any increase in house prices is a proxy for the benefit communities receive from WSUD (such as better amenity), not the benefit itself.

Moreover, treating an 'increase in property values/council rates' as a benefit of WSUD should be avoided because:

- The price premium is based on scarcity. As WSUD becomes mainstream, the scarcity value disappears (but importantly the underlying benefit remains).
- Council revenue is determined at a municipal scale and recovered through rates apportioned to individual rate payers based on property valuations. This shows that changes in the value of some properties will affect the distribution of rates but not the total revenue for council.

5. Avoiding over-estimation

A common mistake is to ignore uncertainty in the benefits. The valuations assume the benefits are fully delivered. In practice this is often not the case, however this uncertainty can be easily incorporated into the assessment. Assigning a probability to the valuation is easily achieved by non-experts, and avoids over-estimation of the benefits.

Pannell (2015) provides a detailed methodology to consider factors such as regulatory or technical risks that may affect the probability of a benefit being fully realised.

Ashely et al (2016) suggest using a scenario assessment. This considers the likelihood of the benefits being achieved in multiple future scenarios. It is recommended that scenarios be few in number and be pre-defined to facilitate consistency.

6. Consider costs when ranking projects (benefit cost ratio)

Pannell (2015) recommends using a benefit cost ratio to rank projects, highlighting the influence of this on project ranking. To illustrate, consider the three hypothetical projects shown in Table 5, with benefits (B) and costs (C). Because the budget is limited, the first project chosen is the one with the highest benefits per unit cost (the highest BCR) = project 1. But if projects are ranked according to B – C, the top ranked project is project 2, while ranking according to B (ignoring costs) selects project 3. Clearly, the choice of metric determines the value the community ultimately receives.

Table 5: Benefits and costs of hypothetical projects, and their ranking using various criteria.

Project	B	C	BCR	B – C	Rank (BCR)	Rank (B –C)	Rank (B)
1	5	1	5	4	1	2	3
2	7	2	3.5	5	2	1	2
3	8	7	1.1	1	3	3	1

Conclusion

This report considers the need to enhance the economic evaluation of WSUD to reflect advances in science and practice. This will ensure projects with the potential to influence city-wide and community-wide outcomes are evaluated accordingly. It also means that a business case presenting these arguments is duly considered because a framework exists within which to make such a decision.

The challenge lies in transforming current practice. Even though the water industry understands that WSUD is critical for the protection of aquatic ecosystems and provides a wider range of benefits than traditional drainage infrastructure, the assessment of project options continues to disadvantage WSUD approaches. Given this, it is appropriate to ask "why isn't current economic evaluation incorporating these benefits?" Indeed, not including these benefits is the same as saying they have a value of $0 – an outcome that is contradicted by research.

The reason is not a lack of commitment to WSUD; WSUD is well supported by policy and community alike. But its adoption in practice continues to be influenced by the outcomes of economic evaluations that focus on the direct implementation costs of WSUD.

This presents an issue if our cities are to become more liveable, sustainable and water sensitive. Aside from the need to develop more cost effective WSUD technologies, there is a disconnect between our vision for cities and the way we prioritise investments in these urban areas.

This report presents evidence to support a broadening of economic assessments. In doing so, it acknowledges the problem does not lie with benefit-cost methods themselves, as these are robust and well understood. Similarly, the imperative to use limited resources efficiently is respected. The gap lies in the treatment of opportunities beyond basic and immediate drainage services and the difficultly of assigning values to these benefits.

However, research shows that WSUD provides a range of benefits including:

- water security
- healthy streams
- cooler summer temperatures
- greener suburbs.

It also shows that communities want these outcomes, albeit not “at any cost”.

Based on this research, the research synthesis workshop highlighted opportunities to develop tools that re-frame the problem to “how can WSUD help to transform cities?”, and makes recommendations in three areas:

1. Establishing a broader framework for identifying costs and benefits. In some cases this may preference options that are not financially cheapest however this enables a discussion on value for money, transforming the evaluation from ‘least-cost to service’ to ‘return on investment’.

2. Inclusion of a number of specific benefits that are supported by evidence that shows:

    a. Alignment with community aspirations and preferences for their neighbourhoods.
    b. Willingness-to-pay, often supported by multiple studies and methodologies.
    c. Monetary valuations that can be included in benefit-cost calculations.

3. Tactics to apply these valuations in economic assessments to ensure the results are reliable. Particular caution is given to the need to distinguish the additional outcomes of a WSUD option from those that are already provided by the base case.

Beyond these recommendations the next step lies in identifying who the beneficiaries of projects are and developing mechanisms so they can co-invest in their delivery.

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Appendix 1 – With versus without assessment

(adapted from Pannell, 2015)

The benefit of a project is the change in values generated as a result of the project. In other words, it is a difference: the difference between the values with the project and without the project. The values could be generated by income, by recreation, by health or whatever, and the question is, how much do they change as a result of the project?

So, to estimate the benefits of a project, you need two pieces of information: the values with the project and the values without the project. Usually, when we are evaluating a project, the project has not yet been implemented. In that case, both of the required pieces of information have to be predicted. You can't observe them, because they are in the future.

Note that comparing values "with versus without" the project is not the same as comparing values "before versus after" the project. The reason is that conditions may not be static in the absence of the project. For example, it may be that an environmental asset would degrade in the absence of the project, but its condition would be improved by the project (relative to its current condition). Assuming we go with that simplified approach (focusing on benefits at year 25), the relevant measure of project benefits for ranking projects is (2) minus (3).

This is illustrated in Figure 1.

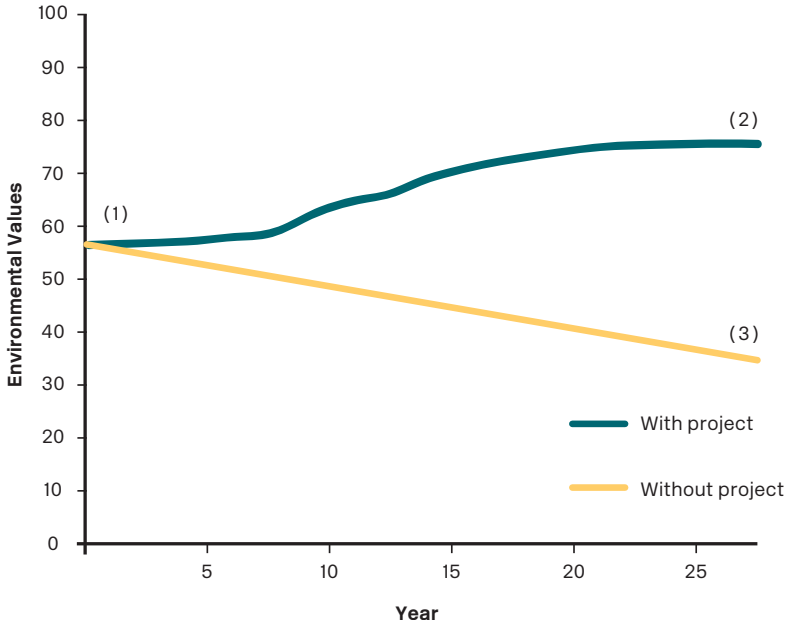

Figure 1. Environmental values with versus without project

About the CRCWSC

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) was established in July 2012 to help change the way we design, build and manage our cities and towns by valuing the contribution water makes to economic development and growth, our quality of life, and the ecosystems of which cities are a part.

The CRCWSC is an Australian research centre that brings together many disciplines, world-renowned subject matter experts, and industry thought leaders who want to revolutionise urban water management in Australia and overseas.

Research synthesis

Research synthesis is key to successful research application and adoption.

A facilitated design process, Research Synthesis brings together the CRCWSC's many research areas and disciplines with government and private industry partners to develop practical "ideas" for addressing specific industry-based challenges.

Research synthesis is a highly effective tool for exploring collaboration and innovation. The open-minded environment of a research synthesis design workshop is founded on science, and no individual organisation leads or owns the conversation. This supports an un-biased dialogue that enables the discovery of new and creative ideas.

CRCWSC Research Synthesis

Discussion Paper
CRC for Water Sensitive Cities

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