CRC for
Water Sensitive Cities

Stakeholder Needs Assessment Report

IRP2 - Comprehensive Economic Evaluation Framework (2017 – 2019)

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Stakeholder Needs Assessment Report
Comprehensive economic evaluation framework (IRP2)
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1 Introduction

The Integrated Research Project 2: Comprehensive Economic Evaluation Framework (IRP2) is working on developing an economic evaluation framework to identify and quantify economic, environmental and community values of investments in water sensitive practices and systems. The ultimate output of the project would be an accepted and well-aligned evaluation framework that users will apply to business case development and decision making at multiple levels in public and private sector organisations. The specific deliverables of the project are the followings:

- A Benefit Transfer tool and guideline
- A Benefit-Cost Analysis tool, framework and guideline
- Advice on financial regulation framework for selected cases
- Economic evaluation of Urban Heat Island (UHI) mitigation scenarios
- Generate primary information for specific case studies

These outputs are being developed in collaboration with our industry partners and other stakeholders. Since the beginning of the project we have carried out a number of engagement and need assessment activities, such as interviews, group discussions, meetings, workshops and conference sessions (see Appendix A). Some findings from these activities have already been presented in other reports, such as Stakeholder Engagement Strategy, Milestone Report on BCA tools and detail project plan for WP6. Here, we provide a synthesis of our current understanding of the industry needs of various elements of the main deliverables of the project.

2 Stakeholder engagement

Active stakeholder engagement is a key requirement of the Integrated Research Projects of the CRCWSC. To facilitate the engagement process we have developed a comprehensive Stakeholder Engagement Strategy in thorough consultations with our industry partners. A summary of needs identified during the process has been presented below.

2.1 Method of consultation

Development of the stakeholder engagement strategy provided significant insights into the end user needs required from IRP2. The aim of the engagement strategy is to increase the likelihood that key stakeholders, especially end users such as local government and water utilities, will want to use the tools, framework, information and lessons generated from the Project. This will be achieved by designing an approach that involves end users with the development, testing and use of different tools and the framework.

The engagement strategy was developed in a collaborative manner with input from the project team, project steering committee, members of the Regional Advisory Panels (RAP), and CRCWSC executive and staff. Key meetings and interviews were conducted over the period February to June 2017 and were guided by a semi-structured interview process. Please see the Stakeholder Engagement Strategy for details of the consultation activities.

2.2 Needs identified

Stakeholder needs were identified in relation to two main categories as follows:

2.2.1 How do end users want to be engaged?

- Collaboration - End users favour a collaborative approach to the way that each work package is developed. This is important so that the research team gains an understanding of the practical issues that need to be considered along with relevant theory;
- Regular feedback - There is a preference for regular communication of small amounts of information rather than large amounts of material infrequently;
- Direct engagement - Workshop processes combined with one-on-one meetings provide an effective method of engagement and information sharing. Involving key stakeholders in a meaningful way, such as in case study workshops, will also increase the likelihood that they will assist with adoption of the tools once the project is completed;
- Digital media - It is important that information can be easily accessed from the web page and that this information is updated regularly. Other forms of digital media highlighted were e-newsletters, emails and webinars;
- Early access - There is a strong demand from end users who want to have access to early beta versions of the framework and tools to test in case studies;
- Make use of local networks - There is a diverse array of networks across Australia with differences in how they operate from state to state. End users want the project team to work with relevant capacity building organisations, programs and industry associations to determine the most relevant networks to share information through;
- Working with developers - End users would like active engagement with developers by preparing a developers engagement strategy and seeking their input with some of the WP5 case studies.

2.2.2 Desirable features of outcomes and outputs from IRP2

- Common, agreed framework - There is a desire to rationalise existing frameworks to develop a common approach and agreed set of principles that are applicable under a range of conditions and at multiple scales e.g. city through to suburb and street. A common framework could be used to underpin a "lite" business case process;
- Environmental externalities - Any proposed framework should consider environmental externalities that sit outside standard market based cost-benefit assessments;
- Liveable cities - While supporting economic valuation for water sensitive cities is an important driver, the broader context for the work needs to be to contribute to "liveable" and "resilient" cities;
- Planning context - A barrier to the effectiveness of any tools or a framework is the existing planning context and framework. The outputs of the project should be developed noting this broader context, with potential policy changes recommended that would be required for effective use of the framework;
- Case studies - Case studies should aim to demonstrate how general principles can be applied in more detail. There should be additional opportunities for input to the case studies to refine them further;
- Suite of tools - In addition to a broad framework, there should be a suite of tool(s) that can be applied to projects where more detailed assessment is required;
- Investment ready - A project investment framework is required that provides information on how to finance a project as well as conduct a cost-benefit analysis;
- Broadly applicable - Any framework or tool needs to be useful to a broad range of end users, from regulators and state agencies to local government and developers;
- Flexibility of use - It is important that the tool is easy to use and able to be used by non-experts i.e. non-economists. While some organizations may have in-house economic experts their time might be considerably constrained.
- Continued support - The tool generated at the end of the project requires ongoing support and maintenance if it is to be of use for the industry and become an industry benchmark.

2.3 Strategies to address the needs

We have developed a comprehensive Stakeholder Engagement Strategy which provides a detailed plan on how we will engage with the industry. The needs identified on various elements of the tools and framework will be given due consideration when preparing / developing them.

3 Benefit transfer tools

A benefit transfer tool would allow the end users to synthesise existing estimates on non-market values from various sources and apply them to their own situation or context. Development of this tool was identified as a high priority during the project development phase. In this section, we report the process and some outcomes from the consultation process.

3.1 Method of consultation

There were two parts in the information collection process on benefit transfer tools; a) collect existing benefit transfer tools, and b) review these and conduct interviews and meetings with practitioners and experts.

3.1.1 Overview of existing benefit transfer tools

The following tools and databases were examined:

1. NYC Green Infrastructure Co–Benefits Calculator
2. SET- Social and Environment Tool by MJA
3. CIRIA BeST: BENEFITS OF SuDS TOOL
4. Ecological Accounting Protocol – A Tool to Calculate the Opportunity Cost of Drainage Infrastructure
5. Catchment Investment Analysis Tool (CIAT)
6. USGS Benefit Transfer toolkit
7. CRC for Bushfire and Natural Hazards value tool database
8. Threatened Species Database
9. EVRI
10. SET- Social and Environment Tool by Water Corporation
11. Envalue

A summary of our assessment of these tools have been presented in Appendix B.

We have started the consultation process with the industry end users and experts. At the time of the drafting this report, we have interviewed four industry representatives, Ursula Kretzer, Department of Water and Environmental Regulation (WA), Mellissa Bradley, Water Sensitive SA (SA), Kym Whiteoak, RMCG (VIC) and Sadeq Zaman, Inner West Council (NSW). In addition, two high profile academics and experts on non-market valuation were also consulted; Professor Vic Adamowicz (Vice Dean of the Faculty of Agricultural, Life and Environmental Sciences, Resource Economics and Environmental Sociology at the University of Alberta) and Associate Professor Michael Burton (UWA School of Agriculture and Resource Economics, University of Western Australia). Prof. Adamowicz was one of the main advisors of the EVRI database.

The discussions with industry partners and experts were based on following issues:

- Potential end users of non-market values
- Situations where non-market values are used
- Experience with benefit transfer tools, advantages, disadvantages or problems
- Main themes and non-market values in the water sector
- Useful design features and functionalities
- Recommendation of experts who are interested or have used non-market values and benefit transfer tools

A summary of the discussion are presented in the following sub-sections.

3.2 Needs identified

3.2.1 Need for BT tool of non-market values

Every interviewee identified that there is clear need for non-market values in developing their business cases related to investments in water sensitive systems and practices. Some of them use values quantitatively to rank projects or make decisions to invest in proposed project(s). In certain instances, non-market benefits are incorporated in a qualitative manner. Use of expert opinion (including multi-criteria analysis i.e. asking stakeholders to rank projects) is a common approach. However, having estimates of non-market values would make their business cases stronger. According to some interviewees, it is often harder to estimate non-market values for small-scale projects as it is relatively difficult to establish a causal relationship between the project and environmental and/or social changes.

3.2.2 Potential end users of BT tool of non-market values

Three categories of end users were identified:

1. Large organizations, such as Water Corporation and Department of Water and Environmental Regulation, often have in-house economic experts. However, for more complex analyses they often engage consultants.
2. Local governments, who use non-market values in their business cases by either accessing people in-house with the capacity to understand BCA tools (may be engineers/scientists) or hiring consultants to carry out the benefit-cost analysis work.
3. Consultants, who use non-market valuation estimates (wherever available) in their work.

3.2.3 Identified themes and values of interest

A wide range of themes were identified which could be potentially incorporated in the benefit transfer tool / database.

- Liveability, social amenity (and disamenity) values, cultural, social cohesion, passive recreation, reduced travel cost
- Amenity of public open space, urban street trees
- Human Health and green infrastructure
- Heat and thermal stress, local and global impacts
- Catchment water quality improvements in drains/urban living streams, water pollution abatement
- Access to alternative water
- Biodiversity and habitat conservation as well as carbon and environmental offsets
- Affordable housing vs potential benefit to developers
- Recreational fishing

3.2.4 Tools that stakeholders use or are familiar with

1. SET – This has been used by the Water Supply and Planning Division, Department of Water and Environmental Regulation.
2. CIRIA BeST tool - Water Sensitive SA organized a workshop and trialled the CIRIA BeST tool. Below are some comments about their experience:
    - Less than a day training which was not enough to grasp everything about the tool

- Comprehensive
- Variables in the tool are clearly defined
- Explanation of the values on how to apply are provided
- Have pre-populated values for each aspect of the benefit
- It has flexibility to add own values if available
- It has a feature to compare among projects/scenarios
- The training has provided learning experience to understand what sort of values/ information required

Existing tools used by the Water Corporation to evaluate the impacts of various projects include the Social Environmental Tool (SET), and the Sustainability Wheel. The Cost of Carbon Abatement Tool developed by Sydney Water is another tool which has been used in a limited capacity by the Water Corporation and other utilities around Australia and which has also had limited application in the Water Corporation. Another MCA tool used in the area of natural resource management and other sectors is WEB-HIPRE. This is web-based tool which utilises the Analytical Hierarchy Process (AHP) to evaluate and rank choices and would be a useful tool to consider for MCA and project evaluation and prioritisation. It is understood that there are spatial 'plug-ons' which also utilise the AHP process.

3.2.5 Recommended features of IRP2 BT tool / database:

- Good explanation of data, however, the tool should be robust and not dumbed down
- Reasonable interpretation of values/check values quantified in meaningful way (Clear description of what is trying to measure in each study)
- Report marginal changes
- Report appropriateness of values for different context, e.g., scale of the project, types of values, etc.
- Assessment of the quality of the original studies included in the database
- Some attributes can overlap- should avoid double counting
- Provide link to the original paper / source for more details and cross-checking by the users
- Some control features to keep built-in values unchanged
- Given the data gaps- may need to include estimates from international studies. It should have the flexibility to add practitioners' own values
- Good guidance on how to use values. Full-day training courses could be organized.
- Should not be very specialized. The tool should be accessible to a range of users. Use of MS-Excel might be convenient for users.
- Users should need to undertake their own risk assessment when using these values

3.3 Strategies to address the needs

The following strategies will be adopted to address these needs:

- Consult different types of stakeholders (such as experts from large water utilities, consultants in the water sector and officers from local government and some industrial partners including property developers to understand broad range of users and their needs).
- Further review of existing tools
- Develop and update the database of non-market values (start with Australian studies and then move into studies from developed countries)
- Refer to recent papers that provide guidelines to assess primary non-market valuation studies available.

    - Contemporary Guidance for Stated Preference Method (Johnston et al., 2017)1
    - Contingent Valuation: A Practical Alternative when Prices Aren't Available (Carson, 2012)2
- Consult experts and refer papers on adjusting values for benefit transfer and relevant issues
    - Scaling values
    - Adjusting values with response rate and protest responses
    - Issues related to baseline and counterfactual
    - Use of meta functions
    - Distance decay
- Map data availability with needs of the industry
- Identify data gaps
- Consult stakeholders and academics to discuss ways to find data from Australia
- Develop a prototype and get feedback from the stakeholders

[1] JOHNSTON, R. J., BOYLE, K. J., ADAMOWICZ, W., BENNETT, J., BROUWER, R., CAMERON, T. A., HANEMANN, W. M., HANLEY, N., RYAN, M., SCARPA, R., TOURANGEAU, R. & VOSSLER, C. A. 2017. Contemporary Guidance for Stated Preference Studies. Journal of the Association of Environmental and Resource Economists, 4, 319-405.
[2] CARSON, R. T. 2012. Contingent Valuation: A Practical Alternative When Prices Aren't Available. Journal of Economic Perspectives, 26, 27-42.

4 Benefit: Cost Analysis Tools

A Benefit: Cost Analysis Tool designed for the specific context of water-sensitive cities was identified as a priority in the consultation process that led to the establishment of IRP2. Here we report on consultation during IRP2 to help us understand the needs and constraints in more detail.

4.1 Method of consultation

1. Collation of information about available tools for BCA or related purposes. This was based on our existing knowledge of available tools, advice from a range of stakeholders who were aware of particular tools, including advice received in one-to-one interviews, responses to a call for input that was publicised throughout the CRCWSC, and a web search.
2. Examination of each of the relevant tools. Where possible, a copy of each tool was obtained and run on microcomputer. The main characteristics and key strengths and weaknesses were captured for each tool. Some tools identified were more relevant to the Benefit-Transfer Tool and were passed on to that sub-project. Please see the milestone report on the BCA tools for details of each existing BCA tool.
3. One-to-one interviews with a wide range of stakeholders. Notes were made during each interview, but the material presented here is a synthesis across all the interviews (plus the other information sources).
4. Discussions with tool developers and economists, drawing on experience with developing and applying BCA tools and conducting general BCA studies, to derive lessons for our project. These discussions were held opportunistically in the course of other projects or meetings with people we know have been involved in conducting BCAs or developing tools for the water or environment sectors.

4.2 Needs identified

Based on all the information collected, the interviews and discussions, and examination of existing tools, a set of high-level lessons and implications were identified for this project.

- Every organisation consulted recognised the important role of economic analysis, including BCA, in building business cases to convince decision makers about the merits of water-sensitive practices.
- Some organisations make extensive use of BCAs. These are all larger organisations – water utilities, government agencies, and large councils like Brisbane City Council. There is a trend that they tend to use Multi-Criteria Analysis instead of BCA when the benefits get harder to measure3 (more social and environmental benefits). The intention in IRP2 is to use BCA even in these cases, using the Benefit-Transfer tool to provide values.
- Most of the BCAs that are conducted for these organisations are commissioned from outside consultants. In a minority of organisations, some BCAs are conducted using internal expertise, but even in most of these organisations they sometimes commission BCAs from external consultants.
- Smaller organisations, particularly local governments, generally lack economics expertise, and they tend to make much less use of BCA in their existing processes (relative to the larger organisations). The need for support with economics is greatest for these organisations. Some of the larger organisations also lack internal economics expertise. For the organisations with low internal economics expertise (both small and large), even relying on external consultants for their economics information can be problematic, as some level of economics expertise is needed to commission appropriate BCAs and interpret their results.

[3] For example, the Water Corporation has identified three possible levels of usage which are required of a tool or suite of tools, as follows: 1) a basic multi-criteria assessment (MCA) type tool which enables both subjective and objective input; 2) a ‘lite’ version of a cost benefit assessment tool which is able to be used by ‘non-experts’; and 3) a full cost-benefit assessment tool which can be used by experts.

- The level of expertise to successfully undertake a high-quality BCA is high. Experienced economists highlighted that there are risks in making a user-friendly BCA tool available to non-expert users. Even with the best designed and most user-friendly tool, experience shows that users need active support during the conduct of a BCA if the quality of the resulting analysis is to be assured. One tool, INFFER, built facilities into the tool itself to facilitate review of assumptions (a system with the capacity for reviewers to comment on assumptions, project developers to reply explaining their changes, and reviewers to provide an overall stamp of approval on the process and the assumptions made).
- There are various existing BCA tools that could be relevant to water-sensitive projects, as well as related tools, guidelines and protocols, and there are some training materials.
- The existing BCA tools vary widely in their user-friendliness, structure, comprehensiveness and level of support. Most tend to be focused on a relatively narrow context, such as projects for catchments, urban trees, urban drainage or water recycling, each of which has a dedicated BCA tool, from somewhere in the world.
- There is no existing BCA tool that is usable across a broad range of investment types (i.e. all of the above project types and more) and is specifically designed for projects with a focus on water-sensitive outcomes. CIRIA BeST is designed to deal with a wide-ranging set of benefits that are relevant to water-sensitive cities projects, but it does not provide a full BCA. INFFER is broadly relevant and is the most user-friendly of the tools, but it is not specifically designed for water-sensitive cities projects. There are good ideas to be obtained from the various tools.
- There was incomplete information available about the levels of usage of the various tools, but overall it seems clear that most existing tools are used much less than hoped or expected. For example, the Catchment Management Investment Standard (and its spreadsheet tool Catchment Investment Analysis Tool, CIAT) were commissioned by the Water Services Association of Australia, but it has had limited usage since.
- Some experienced economists do not support the idea of producing a standardised BCA tool. They prefer to develop a custom BCA spreadsheet for each analysis they do. They highlight the high level of heterogeneity between cases and feel that any tool needs to be adapted to suit particular circumstances for each analysis (or a standardised tool needs to be sufficiently flexible). For them, developing a custom spreadsheet for each analysis is not difficult and allows them the highest level of flexibility. They are also reticent about allowing non-expert users to conduct BCAs without sufficient support.
- On the other hand, there was support from some economists for a tool that could become a standard for the water sector, particularly if it was seen to be endorsed by the CRCWSC and perhaps departments of Treasury. A standardised tool has the advantage of reducing the risk of error (which is always present in a custom-developed spreadsheet), being relatively accessible to non-expert users (even if they don't end up using the tool themselves) and supporting better standardisation of the approach used for BCA in the sector. The experience of INFFER shows that there can be value in developing a standardised tool even if it is not used by non-expert users. A comment made about the routine use of consultants was that people inside the organisation don't necessarily learn much from the arms' length process. An additional feature of INFFER that has helped ensure its continuing use is the well-designed participatory and elicitation approach that it includes.
- Any new BCA tool produced would need to be flexible. It needs to be able to capture a wide range of benefit types.
- Strong support emerged for a different type of BCA tool – a BCA support tool that would help an organisation in planning and preparing for a BCA. It was felt that it would be of benefit to all organisations, and that there is no existing tool of this type, whereas a traditional BCA quantitative tool would only benefit a minority of organisations and is competing with a number of existing tools or with the option of a custom-developed BCA spreadsheet. It was felt by some that this could actually be a higher priority than development of a new BCA quantitative tool per se.

4.3 Strategies to address the needs

Based on consultations and observations of the various existing tools, the IRP2 team collated the following ideas for the BCA tool. The BCA Support Tool is a separate item that is also being explored with the aim of developing it as well, if time and resources permit.

Given the wide range of benefit types that can be generated by water-sensitive projects, and the huge range of contexts around Australia where these projects will be implemented, it seems unrealistic to expect to create a system where the quantitative estimates of all the benefits are built into the tool. This has been attempted in the CIRIA BeST tool, specifically for drainage-related projects in the UK, and even there the information requirements were enormous.

The strategy we will use in this project is to have two different tools: one related to BCA and one to assist people to estimate the more difficult-to-quantify benefits (the Benefit-Transfer Tool). This section focuses on the BCA aspect. However, the Benefit-Transfer Tool will need to generate values in a form that are usable within the BCA tool. For the development of a BCA tool, it is important to be able to represent benefits that are structured in different ways.

4.3.1 Possible benefit structures for inclusion in the tool

- Benefit per person (on average) for a particular population (e.g. heat, health, amenity, biodiversity/ecology, recreation, tourism)
- Benefit per unit of action or area (e.g. biodiversity/ecology)
- Benefit per unit of abatement (e.g., CO_2 emissions, air pollution, water pollution)
- A total or aggregate benefit per year (e.g. development, other economic benefit, groundwater recharge, rainwater harvest, tourism, carbon storage)
- Delay or reduction in a cost (e.g. water treatment plant construction or upgrade)
- Improved condition of an environmental or community asset, expressed as a benefit for the asset as a whole (e.g. biodiversity/ecology, water quality)
- Reduced probability of a risky event that could occur with a specified probability in any year (e.g. flood, treatment plant failure)
- Custom benefits, specified year by year

We will set up the tool to capture benefits under any or all of these structures. Each of these imply a different way of calculating the benefits, and will require different parameters depending on which structure is used (e.g. the number of people affected, the number of units of pollution abatement, the number of years by which a cost is deferred).

It is important to capture that each project is likely to generate multiple benefits. The benefits may be of different structures (from the above bullet list) or there may be multiple benefits within the same structure (e.g. various benefits measured as a benefit per person).

Some of the benefits may be downstream or off-site from the location where the project actions are undertaken (e.g. effects of reduced water pollution on a downstream water body).

Some benefits may be able to be represented by more than one of the above structures. For example, the benefits of reducing water pollution might be measured per person, or per unit of pollutant, or as the aggregate impact on a downstream water body. The user would be able to choose the structure that works best for a particular analysis. This may depend in part on the way that the information about the benefits has been estimated.

The timing of benefits is important. We will specify a year to commence transition (i.e. benefits start to grow from zero), a year when transition is complete (benefits reach their maximum), a year when the maximum benefit finishes, and a year when the benefit fades out to zero. We could allow the user to specify the same time profile for each of the benefits, or to customise the profile for each benefit.

Some projects rely on behaviour change. Without sufficient behaviour change, the benefits are not fully realised. Most tools do not include this explicitly, but there is value in the INFFER approach of making assumptions about behaviour change explicit. This uses a simple but effective approach of defining a variable representing how much behaviour change the project is expected to generate, as a proportion of the level of change that would be needed to fully deliver the target level of benefits, and scaling the benefits accordingly. As with issues of timing, we could allow the user to specify the same behaviour change parameter for each of the benefits, or to customise the parameter for each benefit.

We will allow users to capture several types of project risk. These represent the probability of the project failing to deliver its intended benefits for various reasons:

1. Technical risk: the probability that the project will fail to deliver outcomes for technical reasons. Management actions are implemented but they don't work because something breaks, or newly planted vegetation dies, or there was a miscalculation when designing the actions, or there is some sort of natural event that makes the actions ineffective.
2. Social/political risk: the probability that social or political factors will prevent project success. For example, a project might rely on another government agency to enforce existing environmental regulations, but that agency is not prepared to enforce them because of the likelihood of a political controversy. Or there might be community protest, or perhaps even legal action, to stop the project.
3. Financial risk: the probability that essential funding from partner organisations, or long-term funding for maintenance of benefits, will not be forthcoming. Many projects require ongoing funding for physical maintenance, or for continuing education or enforcement, without which the benefits would be lost. Sometimes the decision to provide ongoing funding is made independently of the decision to fund an initial project, so it is risky from the perspective of the funders of the initial project.
4. Management risk: if different projects will be managed by different organisations, then there are likely to be differences in the risk of failure related to management. These risks might include poor governance arrangements, poor relationships with partners, poor capacity of staff in the organisation, poor specification of milestones and timelines, or poor project leadership.

Some of these risks relate to all-or-nothing outcomes (e.g. there either is successful legal action against the project or there isn't), while others relate to continuous variables (e.g. maintenance funding might be deficient but not zero, resulting in some reduced level of ongoing benefits).

Representing risks for continuous variables is possible, but it requires fairly detailed information. Given that we are making educated guesses when we specify these risks, going to that level of detail is probably not warranted. We plan to approximate each of the risks as the probability of a binary (all-or-nothing) variable turning out badly. We also plan to treat the different project risks as independent, not correlated. They are sufficiently different in nature for this to be reasonable.

The above risks all relate to the probability of a project failing to deliver its intended benefits. Another type of risk is one that creates an additional cost, unrelated to the intended benefits of the project. For example, a project to decentralise water supplies might result in a risk of adverse health impacts amongst water consumers. This could either be represented quantitatively, or if that is too difficult, captured qualitatively and reported to decision makers.

The breakdown of costs will be structured based on the CIAT tool (part of the Catchment Management Investment Standard). As well as the initial project costs, CIAT allows users to specify maintenance/operating costs as a % of capex, or as a fixed annual amount. It also allows for contingency costs.

A system for recording data sources for each number used.

Users will be allowed to specify different stakeholder groups (whole community, industry, a particular business) and to allocate a share of costs and benefits to each. This would allow us to show a BCA from the perspective of each stakeholder group. While this would provide additional information, it would also increase the complexity of the tool. We will investigate ways to switch this facility off to keep the tool simple.

A system will be provided for the various project options to be compared (similar in spirit to part of CIRIA BEST). The numbers assumed for each project could be compared and checked for consistency, and the overall results (in terms of Benefit: Cost Ratio or Net Present Value) could be compared.

People will register to access the tool, providing email, name and organisation. Having done that, the tool would be free to access.

Ensure Treasury (and other relevant regulatory agencies) are satisfied that the tool meets requirements.

5 Financial regulation framework

The main deliverable for this milestone is at the end of the IRP2 project. The steps outlined therefore reflect the very early stages of development of the project. That this work package has been progressed as much as it has to date is related to the timing of a pricing decision that has been brought down in Western Australia, and the opportunity to provide input into that process.

5.1 Method of consultation

There have been two initial stages of consultation. The first stage has been to informally contact Economic Regulation Authority to discuss issues. There were several discussions with ERA in Western Australia, and there are additional meetings planned. To date these meetings have focused on discussing conceptual issues of pricing theory, and aspects that are difficult to resolve. The next step in the discussion process is to discuss the pricing principles that have been developed in the working paper (work-in-progress) 'Equitable and efficient systems of water utility charges in the face of a changing water supply mix'. These pricing principles have material implications for how economic evaluations of WSUD type technologies proceed.

The second element of the initial discussion phase was present to the Water Services Association of Australia (WSAA) to seek feedback on the key issues relevant to members. A presentation and discussion session took place on 13 September 2017.

5.1.1 Topics discussed with the WSAA

- Non-market benefits and costs
    - Perceptions, issues, existing experiences
    - What evidence is acceptable, internally, and to regulators
    - Benefit transfer tool v Primary data collection
- Differences between beneficiaries and where costs fall
    - Ownership of assets, time horizon issues
    - Is pollution reduction seen as different to local amenity benefits
    - How is the regulated asset base treated
- Basis for regulators rejecting WSUD type proposals
    - Decision rules
- Role and responsibilities of different actors:
    - developers, local government, and utilities views
- General pricing issues
    - Tariff structures for wastewater and water supply
    - Role of risk mitigation (portfolio optimization)
- Diversity of different internal financial models across utilities, developers and regulators
    - How much is common and how much is idiosyncratic
    - Where do decentralized systems perform better overall
- Relative importance of different discipline groups
    - What is the business tradition?
- Relative importance or wastewater v water supply v drainage
    - Where should the focus be?

The presentation was to the asset management, resilience and creation group. A second presentation to the regulatory managers group is hoped for later in the year. The intent is to then come back to the Adaptive Planning and Integrated Water Management Network to consolidate findings. The Water Services Association of Australia have identified the Adaptive Planning and Integrated Water Management group as the people who tend to

undertake broader economic evaluation of projects in addition to influencing policies associated with WSUD type investment.

5.2 Needs identified

A number of potential issues were raised during the presentation and discussion session. Some aspects, such as the type of evidence required and specific examples of projects require follow up. This follow up to document specific matters will be co-ordinated through Karen Campisano, Manager, Research and Innovation, Water Services Association of Australia. The target is to have a clear overall picture of needs by the end of the year. This timeline is consistent with the overall work package timeline.

5.3 Strategies to address the needs

Following the session with the WSAA, and follow up meetings a report will be prepared for the Steering Committee outlining strategies.

6 Economic assessment of heat island mitigation benefits

The need to quantify the economic benefit of heat mitigation from irrigated green infrastructure (IGI)/WSUD has been long recognised and has been a basis for informal discussion between researchers and industry partners since the earliest days of the CRCWSC. This is because the cooling associated with elements of IGI/WSUD is clear and the deleterious effects of heat, for example on human health, productivity and urban infrastructure are also clear and quantifiable. There is currently no way to use UHI mitigation in any policy position or business case for greening cities and integrated water management policy changes. Therefore, linking the two clearly makes a powerful argument for implementation of IRI/WSUD. A case study approach using a Melbourne location was deemed the best way to proceed with Work Package 6 (WP6).

6.1 Method of consultation

The experimental parameters of WP6 (modelling/scenario approaches) were clearly established during the IRP2 proposal writing stage and industry stakeholders had input to that area at that time.

Decisions were made about the context under which economic benefits of cooling should be evaluated:

- Extreme heat events.
- Typical summertime conditions.

Decisions were made about the scenarios of development that would be evaluated:

- No WSUD or Integrated Water Management (IWM).
- Current regulatory settings for WSUD/ IWM.
- Proposed changes for WSUD/ IWM.
- Targeted UHI mitigation scenario to achieve a desired cooling (e.g. 2 degrees on extreme heat days).

During the lifetime of WP6 two key periods of consultation have been identified;

1. Discussion with local stakeholders (coordinated by Melbourne Water) about the case study and its location.
2. Discussion with the wider group of industry partners about the most effective way of providing/workshopping the key outputs of WP6 to all industry partners.

6.2 Needs identified

In relation to the WP6 case study, there was a clear need identified, with the help of the local stakeholder group, with regards to a greenfield development area in outer Melbourne where;

- The environmental conditions are suitable for demonstrating the benefits of IGI/WSUD.
- There is already a strong motivation at local and state government level for IGI/WSUD development.
- The project team has sufficient existing information to allow efficient implementation of the scenario modelling approach.

The local stakeholder group were excited by the opportunity to identify an appropriate case study, but were very concerned about raising expectations locally about the scale of IGI/WSUD implementation that could not be met. Discussions between the project team and the local stakeholder group took place in Melbourne in March/April 2017, and an agreement was reached about the case study location. To allay concerns about raising expectations, the case study location has been de-identified, and will remain so in all future outputs of WP6, subject to a decision by the stakeholder group.

The other key needs towards the end of WP6 are:

- to provide robust evidence that can be used to support implementation of IGI/WSUD at the local government level supported by committed state government.
- to provide training on the spreadsheet tool that will allow quantification of economic benefits.

6.3 Strategies to address the needs

The strategies listed below will be used to disseminate key outputs from WP6. These strategies will be coordinated with the wider IRP2 project team.

1. A brief overall WP6 project report will be made available that will provide information on the heat mitigation benefits of IGI/WSUD under the different climate and implementation scenarios, the literature survey on economic benefit of urban cooling, and the spreadsheet tool developed out of WP6 work.
2. The material in the report will be the basis for several articles submitted for formal publication in appropriate journals as well as for presentation at a range of national and international conferences (e.g. in areas of climate adaptation, economics, etc.). CRCWSC industry conferences will be especially targeted.
3. A user guide be included in the spreadsheet tool to aid industry partners in implementing the spreadsheet tool developed as part of this project.
4. Subject to appropriate funding, WP6 project members will develop material sufficient for a one-day workshop that will be taken on a 'roadshow' to Perth, Adelaide, Melbourne, Sydney and Brisbane during 2018.

7 Conclusion

In summary, the information presented in this report provides the current understanding of the desirable features of various IRP2 tools and frameworks. However, we are working continuously with our Project Steering Committee and industry partners to develop outputs so that they are relevant, reliable and robust.

Appendix A: List of key events organized or attended by IRP2 project team members for industry need assessment

Sessions

1. Session on IRP2-WP4 in a meeting with WSAA's Asset Management, Resilience and Creation group, 13th September, 2017
2. A session on "Economic Valuation of Water Sensitive Cities", CRCWSC Conference, 18-20th of July, 2017, Perth
3. A session on "Designing liveable cities through heat mitigation", CRCWSC Conference, 18-20th July, 2017, Perth
4. Session on IRP2 in the WSAA's Adaptive Planning & IWM Network event, 4th of May, 2017, Brisbane
5. A session on "What are the key issues and how do we overcome them", Symposium on Green Infrastructure, 4th April, 2017, Perth
6. Mini-Symposium on Urban Water Economics, 61st Annual Conference of the Australian Agricultural and Resource Economics Society in Brisbane, 7-10 February 2017, Brisbane

Interviews

1. A series of interviews and meetings to develop the Stakeholder Engagement Strategy
2. A series of interviews and meetings on the BCA tool and framework
3. A series of interviews and meetings on the Benefit Transfer tool and framework

Briefings

1. Briefing to Water Corporation, 21 August, 2017, Perth

Meetings

2. Annual Face to Face IRP2 Project Steering Committee meeting, 17th of July, 2017, Perth
3. Stakeholder Meeting on WP6, 17 March 2017, Melbourne

Workshops

1. CRCWSC Research Synthesis workshop "Ideas for Subiaco Resource Precinct", 24-25th of May, 2017, Perth
2. IRP2 scoping workshop on "Residential development with WSUD", 24 March, 2017, Perth
3. IRP2 scoping workshop on "Greening the Pipeline", 17 March, 2017, Melbourne
4. CRCWSC workshop on building a business case for water sensitive projects, 21 February, 2017, Perth

Appendix B: A summary assessment of different tools and databases relevant for developing a benefit transfer tool

A brief summary of different features of the tools and databases are presented below.

Tool	Coverage	Useful features	Comment
NYC Green Infrastructure Co–Benefits Calculator : Compares green infrastructure projects in the New Yolk City (Developed by NYC Department of Environmental Protection)	Co-benefits covered: • Carbon Sequestration • Urban Heat Island Mitigation • Reduced Energy Demand • Improved Air Quality • Improved Ecosystem Services • Improved quality of life • Increased Property Values • Reduced Treatment Needs • Green Jobs Source studies are from UK	• Organized interface • Provides a brief tutorial • Each project type is described with small explanation and a picture • Inbuilt data to covert each project aspect to money terms (Eg., reduced air pollution, cost of construction)	• No flexibility in adding more projects (Only compare 8 types of specific green infrastructure projects) • Specific to NYC • Data (used for calculation) sources are not given
SET- Social and Environment tool (Developed by Marsden Jacob Associates for Melbourne Water) : Evaluate waterways projects	• 21 non-market values related waterways • All values are from 12 Australian studies	• Database in Excel • Links to data sources are provided • Sensitivity analysis	• Instructions on how to use the tool is not available

CIRIA BeST: Benefits of SUDs tool:
For practitioners to evaluate benefits for drainage proposals
	• Value library -built into the tool- studies from UK
	• Most of them are institutional reports
	• Values are organized based on ecosystem services
	  ○ Provisioning
	  ○ Regulating
	  ○ Cultural
	  ○ Supporting
	Main values covered
	○ Sustainable Drainage Systems
	○ Amenity
	○ Biodiversity and ecology
		• Screening questions and initial qualitative assessment
		• objectives, supporters and funding organizations are asked as inputs
		• Comprehensive
		• Option to provide Baseline
		• Potential stakeholders/organizations to discuss the impacts
			• Cost calculations were not available so far
			• Data requirement to develop this kind of tool is very high
			• Still in the development process

	○ Building temperature ○ Carbon reduction and sequestration ○ Flooding ○ Groundwater recharge ○ Health ○ Pumping wastewater ○ Rainwater harvesting Recreation ○ Treating wastewater quality	• Transparent • Potential areas of double counting is checked • Feature to compare more than one project • Flexibility to change values • Sensitivity analysis • Results are summarised and can be presented in graphs	
USGS Benefit Transfer toolkit (Colorado State University) (with the support of Dr. John Loomis at Colorado State University and Dr. Randy Rosenberger at Oregon State University.	• Non market valuation databases • 2900 value estimates from 1980's from different countries • Values covered ○ Recreation ○ Total economic value ○ Threatened Species ○ Water quality	• Online database • Reference to each data source is provided • Provide simple tools to estimate values using both unit transfers and meta-regression functions used • Provide a brief description about benefit transfer methods • Examples of benefit transfers • Map to show spatial location of recreational studies	• All studies in the database come from the USA
CRC Value tool for Natural Hazards (Developed by CEEP, SAGE, UWA)	• Non-market values extracted from studies around the world • Health, Environmental and Social values related to natural hazards	• Database of non-market values in Excel • Guidelines on benefit transfer • References of source studies and links are provided	• No tool to adjust non market values
NESP Database of Threatened Species Developed by CEEP, SAGE, UWA)	• Non-market values extracted from studies around the world • Total economic value of species conservation	• Database of non-market values of protecting species in Excel • Guidelines on benefit transfer • References are provided	• No tool to adjust non market values
EVRI Database (Environmental Valuation Reference Inventory)	• 4000 total number of records • 1034 records on water as of July 2009 • Other areas covered are land, plant, animal and air • Free access to Australia, Canada, France, Mexico, New Zealand, United Kingdom and United States.	• Online database of valuation studies • Canadian-run resource facilitates the worldwide development and promotion of environmental valuation using the	• Does not evaluate the quality of the original studies

		benefits transfer approach • Abstract, study reference and some key information is given for each record	
SET- Social Environmental tool Developed by Water Corporation	• Various aspects including land clearing, water sources, water treatment, water efficiency, waste water treatment and disposal	• Provide money values adjusted for 2013 • Both benefit and costs are covered • Scaling factors are provided • Source references are provided	• Limited description about the tool • There has been low application rate of the SET (~1 project per year) • It has specific focus on infrastructure projects • It requires time and specific skills, data and knowledge to use
Envalue Developed by Depart. Of Environment, climate change and water, New South Wales Govt. (released in 1995)	• Air and water quality, urban and non-urban amenity values, noise and radiation, land quality , values of natural areas and risk of fatality • Studies are from1980-2002 • Relevant methodological and conceptual studies are also provided	• An online database • Provides key information for each record • Each study was assessed through a checklist	• No records available from 2002

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