

WATER SENSITIVE URBAN DESIGN

BARRIERS AND OPPORTUNITIES IN DARWIN

DISCUSSION PAPER

FINAL

Prepared for the Northern Territory Department of Planning and Infrastructure

GPO Box 2520

Darwin NT 0801



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Author(s):	Richard McManus
Approved by:	David Knights
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1 INTRODUCTION

Urban development in the Darwin Region is occurring without appropriate management of its impact on the urban water cycle and the health of the region's waterways.

Water Sensitive Urban Design (WSUD) seeks to address the deficiencies in traditional water management practice. Effective implementation of WSUD occurs through a strong policy and planning framework which acts as the basis for on the ground works. This Discussion Paper reviews the current barriers to WSUD implementation throughout Australia and through a series of interviews identify the barrier to WSUD implementation in Darwin. This paper identified the key needs of the stakeholders so as to achieve better outcomes for the region's waterways.

In order to manage the impacts to Darwin Harbour, particularly from new development and re-development areas, the Territory has identified that the implementation of WSUD on all new development zones is critical. To assist in the adoption of WSUD, the Department of Planning and Infrastructure (DPI) in conjunction with Department of Natural Resources, Environment and the Arts (NRETA) have secured a grant from the commonwealth Coastal Catchments Initiative (CCI) program to develop a **WSUD Strategy for Darwin Harbour**. The Strategy is to create an enabling environment to ensure commitment to urban water cycle and stormwater management through the development of a WSUD framework linking policy to locally relevant technical design guidelines, manuals and industry tools. Development of the Strategy represents a substantial project as defined by the Workplan provided in Table 1 below.

This discussion paper has been developed as part of Task 9 (Stage 3) of the WSUD Strategy for Darwin Harbour Workplan (Table 1). The task seeks to identify potential barriers to the uptake of WSUD in the NT and develop strategies to address the outlined barriers. This work draws upon the Darwin Harbour Regional Plan of Management and WSUD projects elsewhere in Australia.

Table 1: WSUD Strategy for Darwin Harbour - Workplan

STAGE	TASK #	Activity
1	1	Refine workplan
	2	Establish project working group.
2	3	Develop WSUD Strategies for case studies in suitable format for communication and identify case studies for sub-catchment scale application of WSUD treatment train. <ul style="list-style-type: none"> • <u>WSUD Showcase</u> - Bellamack residential sub-division conceptual WSUD Strategy is complete • Design development of Bellamack WSUD Strategy is about to commence (see Task below)
	4	Identify potential WSUD objectives for Darwin <ul style="list-style-type: none"> • <u>Stakeholder workshop</u> held on 14th and 15th June 2007 • WSUD Objectives for Darwin – Discussion Paper (EDAW, Oct 2007)
	5	Critical Analysis of WSUD/Stormwater Treatment Options for Darwin <ul style="list-style-type: none"> • <u>Stakeholder workshop</u> held on 14th and 15th June 2007 • Water Sensitive Urban Design Stormwater Treatment Options For Darwin - Discussion Paper (EDAW, Oct 2007)
3	6	Prepare a stakeholder communication and consultation strategy (including establish website, fact sheets, presentations). <i>About to commence in collaboration with WQPP</i>
	7	Prepare and communicate a definition of WSUD within Darwin <i>About to commence in collaboration with WQPP</i>
	8	Review and report on policy, programme, technical and decision-support systems for WSUD in Australia (including any barriers to uptake of WSUD and respective jurisdictional responses). <i>About to commence in collaboration with WQPP</i>
	9	Identify potential barriers to uptake of WSUD in the NT. Develop strategy to address barriers. <i>Much of this work is complete as part of the Darwin Harbour Regional Plan of Management and WSUD projects elsewhere in Australia. This is to be summarised in a discussion paper. If the Working Group identify the need to further define the barriers a stakeholder workshop and interview process will be undertaken.</i>

STAGE	TASK #	Activity
4	10	Develop WSUD Strategies for case studies in suitable format for communication and identify case studies for sub-catchment scale application of WSUD treatment train. <i>WSUD Showcase – Complete design development of the Bellamack WSUD Strategy</i> <i>Identify and scope work associated with “retrofit” WSUD case study</i>
	11	Prepare detailed workplan for development of NT WSUD policy, objectives, design manual, performance standards and decision-support tools.
5	12	Prepare draft NT WSUD policy and objectives for Darwin including understanding existing legislation, workshops etc.
	13	Assess application of WSUD objectives and management practice options across a range of development situations and/or catchment-scale treatment-train & confirm set of objectives.
	14	Undertake consultation of draft WSUD policy and WSUD objectives to stakeholders and barriers to WSUD.
6	15	Define requirements of WSUD Guidelines and Tools (workshop to define design needs in detail and assess whether exiting guidelines satisfy this need)
	16	Document Draft WSUD Guidelines and Tools in including High Level and Conceptual Design Guideline, Technical Design Guideline and Design Tools (MUSIC Guidelines, Deemed to Comply Solutions, Standard Drawings etc.)
	17	Prepare Draft WSUD decision support tools for Darwin Harbour, consistent with WQPP, linking policy, objectives and guidelines
7	18	Undertake stakeholder consultation of WSUD Policy, WSUD design manual and performance standards, and decision support Tools and seek approval.
	19	Finalise WSUD design manual, decision support tools and performance standards
8	20	Seek NT Government approval for WSUD Policy, WSUD design manual and performance standards and decision support tools.
	21	Develop and publish stormwater management plans for key subcatchment in Darwin to illustrate application of WSUD Policy/Framework, design manual and decision support tools.
9	22	Develop an implementation strategy for incorporating policies and provisions for WSUD within NT planning policies, strategic plans and development approval processes as well as local government instruments
	23	Ongoing communication and website management
	24	Capacity Building and Training including government, local authorities, developers and industry practitioners
10	25	Incorporate policies and provisions for WSD into NT government planning policies, strategic plans and development approval processes, as well as relevant local government instruments. Implement agreed strategy to address barriers to uptake of WSD.

1.1 Outline of Discussion Paper

This paper identifies the barriers to WSUD implementation in Darwin. These barriers were identified through 10 interviews with nineteen stakeholders. By way of benchmarking the barriers to WSUD implementation in Darwin were compared to those in other parts of Australia. The paper presents a desktop review of the barriers to implementation of WSUD throughout Australia. The paper draws on assessment of barriers undertaken for three other CCI projects, namely, Lower NSW North Coast, South East Queensland and Botany Bay (southern Sydney), as well as a review of the body of literature on WSUD barriers and related research.

The research undertaken to date has shown that a series of institutional, community and technical barriers are evident, many of them paralleled in each of the jurisdictions investigated. Therefore the existing research from around Australia forms a useful starting point for understanding potential barriers to WSUD implementation in the Darwin Region and points to potential opportunities for overcoming common barriers. This paper identifies the barriers to WSUD adoption in Darwin in the following sections:

- Section 2 – summarises the key findings of relevant research on barriers to WSUD adoption undertaken for other CCI projects.
- Section 3 – outlines the methodology by which the stakeholder interviews were undertaken.
- Section 4 – outlines the summary of the stakeholder interviews in the form of a Strengths, Weaknesses, Opportunities and Threat analysis.
- Section 5 – discusses and summaries the breadth of issues that have been identified that act as barriers to and influence the adoption of WSUD in Australia and Darwin offering comparisons. A series of recommendations are presented as a framework to WSUD adoption in Darwin.
- Section 6 – presents a series of conclusions on the research and recommendations for capacity assessment of the barriers (and needs) into WSUD in Darwin.

2 BARRIERS TO THE IMPLEMENTATION OF WSUD OUTSIDE DARWIN

An assessment of the barriers to the implementation of WSUD has been undertaken for three National Coastal Catchment Initiative Projects, namely;

1. *Water sensitive urban design: Barriers to Adoption and Opportunities in SEQ* (Water by Design 2005);
2. *Assessment of barriers to uptake of water sensitive design / development in Australia, NSW and the Lower North Coast* (Walkerden 2007);
3. *Barriers and Opportunities to WSUD Adoption for the Botany Bay CCI*, (McManus and Morison 2008)

Each of these reports undertook a series of organisational capacity assessments through interviews and workshops with key stakeholders. The findings of these reports show similar trends with the following main barriers identified:

- *Policy and Planning barriers:*
 - A policy paradox – whilst the state government controls the planning regulations and instruments, there is a lack of policy leadership evidenced by no formal policy, limited guidelines, regulations and administrative procedures.
 - Lack of consistency between local governments on the policy provisions and application of WSUD.
 - Poor administrative integration between agencies and councils, as well as between departments within local councils, to implement WSUD.
 - Limited councillor and senior staff commitment to WSUD.
- *Technical and knowledge barriers:*
 - Cost concerns for building, maintaining and replacing WSUD-related infrastructure by private industry and government that are couched within the 'affordable housing' viewpoint.
 - Lack of awareness by stakeholders and the community about the benefits and practicalities of water sensitive urban design, and lack of suitable training programs and access to relevant information.
 - Lack of consumer demand for water sensitive design developments, and lack of appropriate marketing about their costs, benefits and rewards.
 - Limited quantification of the benefits of WSUD in terms of initial costs and maintenance.
 - Little regional and local data on water quality parameters for MUSIC and other modelling tools to design WSUD systems.

To place these projects into the broader research that has been undertaken on organisational capacity and barriers to the implementation of WSUD, a literature review has been undertaken of broader capacity assessments within Australia. The specific barriers and opportunities facing organisations implementing WSUD in two of these projects is included in the following sections.

2.1 Barriers to Sustainable Urban Water Management In Australia

A significant body of research on capacity issues surrounding Sustainable Urban Water Management (SUWM) has been undertaken by the National Urban Water Governance Program at Monash University (including Brown and Farrelly 2007a, 2007b, 200c, 2007d, Brown, Farrelly and Keath 2007, Brown and Clarke 2007, Brown 2006, Brown 2004). This work has been complemented by other work on CCI projects as outlined above, as well as work by McManus and Brown

A central tenant of this capacity building work has been in identifying the barriers that relate to the officer implementing WSUD and their relationship within the organisation, with other organisations, and the rules established by state or territory legislation and incentives.

A review of local government capacity to implement the SUWM aspects of the Victorian State Environmental Planning Policy (Waters of Victoria)¹, (McManus and Brown 2005) concluded that 'a significant majority of the ... councils [interviewed] appear to be in the developmental phases of sustainable water management and struggle with key issues such as attracting and/or maintaining skilled staff, lack of internal political will and resources, and confusion over roles and responsibilities'. Table 7 summarises the results of a series of six half-day group interviews involving 4-5 officers from 18 councils of varying locations and sizes across Victoria, reported by McManus and Brown (2005).

Table 2: Identified capacity issues for councils implementing the SEPP (adapted from McManus & Brown, 2005)

Sphere of institutional capacity	Capacity issues identified by councils
Human resources	<ul style="list-style-type: none"> • Low level of knowledge and understanding of range and specifics of council obligations across organisation and amongst councillors. • Environmental health and planning sections of councils appear to be most familiar with their obligations. • When a council has a 'direct connection with a receiving water body of significance to the community', there is a 'collective consciousness' aimed at protecting receiving waters that informs local priorities. • A significant 'de-skilling' of council engineering and planning capabilities in the late 1980s and early 1990s and the increasing environmental agenda has led to a current skills shortfall. This may worsen over the next 10 years with up to 70% of engineers and technical staff reaching retirement.
Intra-organisational capacity	<ul style="list-style-type: none"> • Sustainable water management is one of a large number of competing responsibilities for councils • A small number of councils possess strong stakeholder relationships, good internal skills, resources, political will and are highly successful with water-related state grants. • A significant majority of the remaining councils are in the developmental phases of sustainable water management, struggling to attract and/or maintain skilled staff, with nil or negligible political will and resources, and confusion over roles and responsibilities. • Specific impediments include a lack of reliable and long-term funding, limited staff resources, 'short-term thinking' of state government funding programs, limitations with managing the increasing and competing directions of state agencies and the maintenance burden not realised and resourced by program funding bodies. • Reinforcing the lack of political will, many councils and their executive did not think the obligations were core business and some referred to it as a state government responsibility.

¹ The State Environmental Planning Policy (Waters of Victoria) is a statewide policy developed by the Victorian Environment Protection Authority (EPA) to address the growing community concerns of ecological damage to catchments and receiving waters across the state. The SEPP provides policy guidance to state agencies, mainly the EPA, and local government to control diffuse and point-source water pollution. The SEPP cites the Stormwater Best Practice Environment Guidelines, published by the Victorian Stormwater Committee (CSIRO 1999), which, accordingly, establish WSUD as best practice for urban runoff management.

Sphere of institutional capacity	Capacity issues identified by councils
Inter-organisational capacity	<ul style="list-style-type: none"> • There is perceived no ‘common and long term framework’ for all the different agencies, departments, and organisations that play a role in the water cycle. • Specifically, the roles of the state agencies responsible for environmental and catchment management are unclear to councils with regard to sustainable water management. • Catchment Management Authorities do not have the capacity to assist local councils in clarifying inter-organisational roles and responsibilities. This restricts councils from effectively managing their ‘obligations and risks’. • There is a fundamental lack of understanding by state government officers of the role, operational context and needs of local government and often the intergovernmental cultural relations are poor.
External institutional rules and incentives	<ul style="list-style-type: none"> • The state stormwater management program (VSAP) and particularly the capacity building program (Clearwater) had been important in raising the profile of sustainable stormwater management for many senior executives and elected officials across local government. This was evidenced in the skill development and political advocacy effected by the program. • However, the inertia of change appears to be slowing with the transfer to a new broader water management program overseen by the DSE. Councils are unconvinced of the new program’s objectives and its deviation from stormwater management interventions. • Many council officers feel unappreciated by state government for their achievements sustainable urban stormwater management. Since the programs have changed, their concern broadens to maintaining political support from councillors that have been encouraged and persuaded over the last few years to prioritise stormwater management.

This work has been further developed and summarized by Brown and Farrelly (2007e). Table 3 shows twelve common barriers which relate to either the capacity of the people or organizations trying to implement sustainable urban water management. What is significant about this work is that it shows that the majority of barriers are not related to the individual but the framework within which the individual trying to implement SUWM operates, ie capacity issues relate to either within or between organizations and the rules and incentives established by state or territory governments.

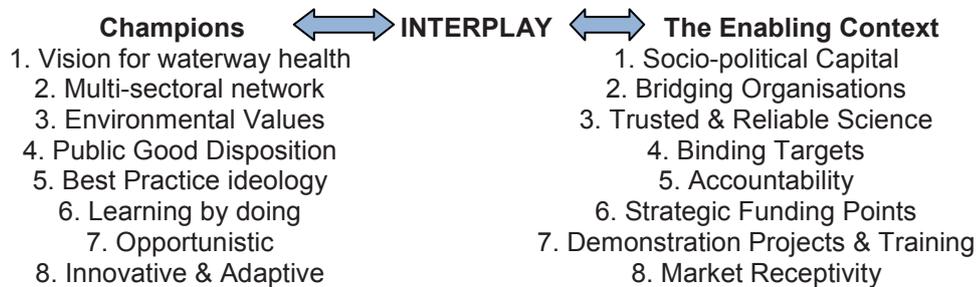
Overcoming that barriers and the implementation of successful SUWM identified within Tables 2 and 3, has been related to two philosophies. Firstly the identification of a stormwater “champion” within an enabling context (Table 4). Secondly a framework within which to assess the progression of Councils through SUWM (Marrickville Council 2007).

Table 4 has been based on research by Brown and Farrelly (2007b) in Melbourne, and highlights that for a successful person of “champion” to succeed there need to be an enabling framework within which that person operates. The establishment of state legislation, funding schemes, training, and bridging organisations (<http://www.clearwater.asn.au/>), can assist that person and indeed an organization / council attain greater traction with SUWM.

Table 3: Institutional barriers typology (Brown and Farrelly 2007e)

Barriers	Human Resources	Intra-organisational capacity	Inter-organisational capacity	External rules and incentives
Uncoordinated institutional framework				
Limited community engagement				
Limits of regulation				
Insufficient resources				
Unclear roles and responsibilities				
Poor organisational commitment				
Lack of knowledge				
Poor communication				
No long-term vision strategy				
Technocratic path dependencies				
Little monitoring and evaluation				
Lack of political and public will				

Table 4: Institutional barriers typology (Brown and Farrelly 2007e)



As an organisation moves along the trajectory of SUWM, it has been identified that there are a series of phases in which the organisation transitions as shown in Table 5 (Marrickville Council 2007). At the outset if an organisation is aware of stormwater and has undertaken a one-off project then it can be seen at the beginning of the stormwater development,. Along the trajectory an organization becomes more integrated in its approach through the organization, responds to and engages with others outside the organization and has dedicated policies and internal structures to foster sustainable water management. Importantly there is a strong knowledge and awareness of elements of WSUD supported by the identification of support services to address knowledge gaps.

Table 5: Organisational phases of development (Marrickville Council 2007)

Phase	Commitment	Skills	Relationships
Project Phase	one off project	Individual	Limited
	compliance with regulation		
	limited support		
	not related to core business		
Outside Phase	Small internal budget and low priority	Individual technical officer	Building relationships with external organisations
	'Sectionist' - competition and advocacy for attention		Poor inter-departmental relations
Growth Phase	Environment gaining organisational profile	Individual technical officer	Extended stakeholder consultation
	Advocacy of risk and reputation exposure for not addressing environmental issues	Dedicated internal staff e.g. coordinator sustainable water	
	Increasing internal resources		
Insider Phase	Key champion(s) play a networking and knowledge role across departments	Good knowledge and skills with SUWM across Council	relationships with research institutions and community
	Moving from reputational to an environmental leadership		Strengthening departmental relations
Integrated Phase	Sustainability integrated across departmental areas and built into performance assessments	Community governance and	Very strong relationships with extended stakeholder networks
	Dedicated corporate policy, interdepartmental committees	Concerns with innovations being constrained by 'antiquated' state policies	

In order to assess the performance of an organisation implement and sustain SUWM three studies have developed capacity assessment frameworks (Brown 2006 (See appendix A), van de Meene and Brown 2007 and McManus 2006). These projects seek to measure an organization against a series of capacity attributes, relating to the SUWM barriers identified in research outlined in this section. An important component of this work is determining the measure of an organization and benchmark of what an ideal capacity attribute maybe. For example assessing the policy and objectives of an organization should seek to ensure the objectives are appropriate for the receiving waters and reflect best practice. This policy should also be integrated into all developments as required and be assessed by those that are able to critically assess deficiencies therein.

Table 6: Capacity attributes for SUWM (after van de Meene and Brown 2007 and McManus 2006)

External Rules & Incentives	<ul style="list-style-type: none"> - There is senior government commitment (political leadership) to SUWM involving vision, appropriate legislation and policies, financial and technical support - There are established and effective community participation mechanisms - Legislation is holistic and provides a supportive framework for SUWM - Clear roles and responsibilities are defined for all organisations - Regulations and policy tools encourage SUWM
Inter-organisational	<ul style="list-style-type: none"> - Mechanisms for effective coordination and cooperation between vertical and horizontal organisations exist - Mechanisms for clear and effective communication are in operation - Urban water related information is shared and communicated between vertical and horizontal organisations - Research partnerships with local universities are developed
Intra-organisational	<ul style="list-style-type: none"> - Organisation employs staff, or has access to staff, to undertake technical activities or that understand and can use technical information - Organisation provides training to all staff - Organisation has policies and procedures to attract, develop and retain staff - Organisation has adequate scientific and technical knowledge - Assessment of SUWM projects is undertaken by people with appropriate knowledge and skills in SUWM - Organisation encourages innovation
Organisational	<ul style="list-style-type: none"> - There exists strong policy framework for SUWM including clear vision, principles, objectives and targets - There is clear senior executive support for SUWM - Funding stream for SUWM exists - Operation and maintenance is well acknowledged and addressed in all projects
Human Resources	<ul style="list-style-type: none"> - Staff have skills and knowledge to undertake tasks and can understand and make use of relevant information - Staff have appropriate qualifications to undertake tasks - Staff can think laterally and exhibit innovation - Staff demonstrate leadership - Staff are aware of available opportunities

Such a framework as outlined in Table 6 can be used within this project to determine capacity deficiencies within organizations trying to implement SUWM, and thereby addressing capacity needs that are identified. Figure 1 outlines a capacity assessment framework for Darwin, which shows the linkages between the capacity attributes identified in Table 6.

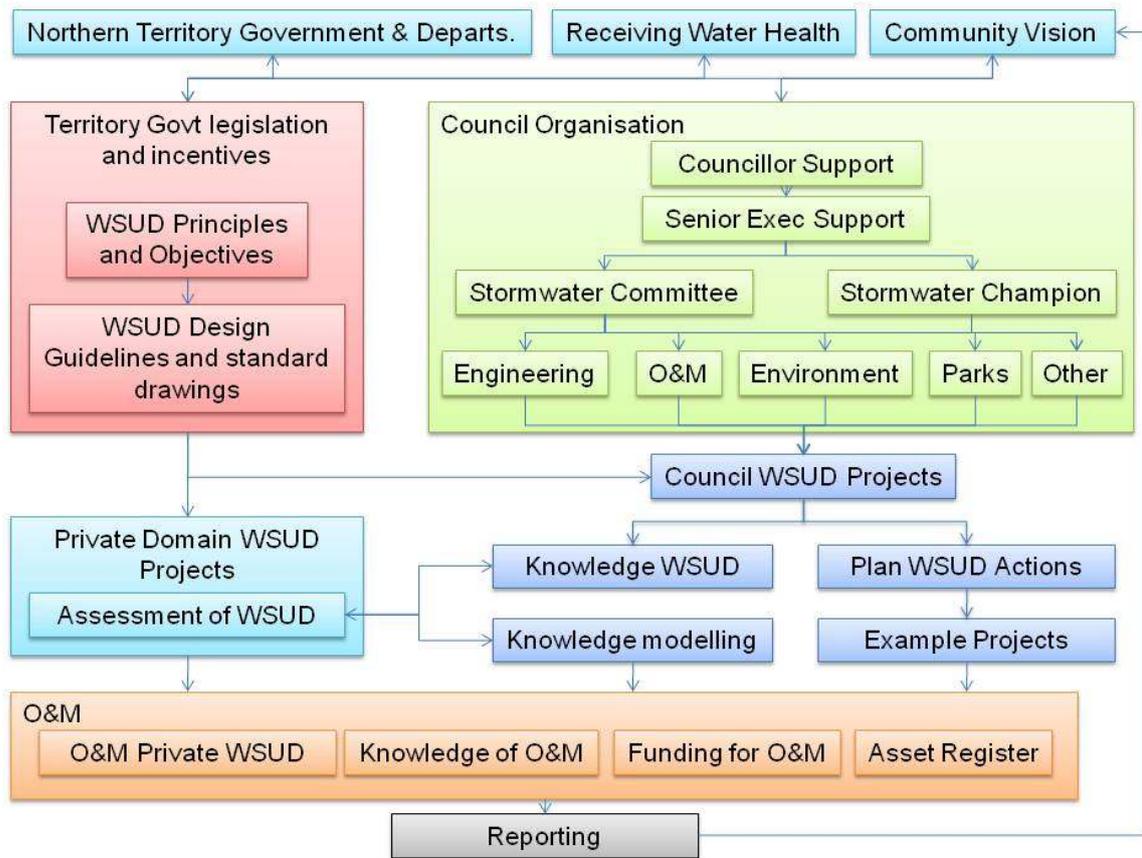


Figure 1: Capacity assessment framework for Darwin.

3 INTERVIEWS TO DETERMINE WSUD CAPACITY IN DARWIN

A series of ten interviews were held in Darwin with nineteen people representing a range of organisations working within water related fields in Darwin. Interviewees are outlined in Table 3.

Table 3: Stakeholder Interviews.

Interview	Company	People	Time	Location
1	Health	Peter Whelan	Wed 5/3 9.00am	Bld 19, Royal Dwn Hospital
		Allan Warchot	Wed 5/3 9.00am	Bld 19, Royal Dwn Hospital
2	PCC	Luccio Cercarelli	Wed 5/3 11.00am	8th flr Cavenagh House
3	Larrakia	Greg Constantine	Wed 5/3 2.00pm	3/41 Sadgroves Cres Winnellie
4	DPI	Chris Humphries	Wed 5/3 4.00pm	8th flr Cavenagh House
		Steve Popple	Wed 5/3 4.00pm	8th flr Cavenagh House
5	DPI	Jennifer Harlock	Thur 6/3 8.00am	5th floor Energy House
6	PowerWater	John Pudney	Thu 6/3 10.00am	Ben Hammond
		Ella Patterson	Thu 6/3 10.00am	Ben Hammond
		Skefos Tsoukalis	Thu 6/3 10.00am	Ben Hammond
		Trevor	Thu 6/3 10.00am	Ben Hammond
		John	Thu 6/3 10.00am	Ben Hammond
7	Consultant	Adrian	Thu 6/3 12.00pm	8th flr Cavenagh House
	Consultant	Bronwyn	Thu 6/3 12.00pm	8th flr Cavenagh House
8	DCC	Angelika Hesse	Thur 6/3 2.00pm	DCC, Customer Service
9	NRETA	Chris Wicks	Fri 7/3 8.30am	Goyder 2
		George Maly	Fri 7/3 8.30am	Goyder 2
10	SKM	Brendan Flood	Fri 7/3 10.30am	33 McLachlan St Darwin
		Peter Saunders	Fri 7/3 10.30am	34 McLachlan St Darwin

3.1 Interview Questions

All of the interviews followed a similar structured approach, with a standardised series of questions asked. Beyond the standard questions, a series of other questions were asked based on the role of the interviewees' organisation. The standard series of questions included:

- Background and role in the organisation of the interviewee?
- What are the main water issues / hot spots in Darwin?
- What water issues do you come across in your every day activities?
- What could your organisation do to manage water more effectively? What could you do in your role to manage water more effectively?
- What guidance and/or support does your organisation need to successfully implement sustainable water management?
- Who are the key relationships that you have in relation to water management? Who else should we speak to?

Insights from the responses are presented in the following sections.

4 BARRIERS TO THE IMPLEMENTATION OF WSUD IN DARWIN

In reviewing the barriers and drivers to the adoption and implementation of WSUD in Darwin, a SWOT analysis framework was based on its pragmatism and ease in deciphering. Such a framework was used to identify barriers to WSUD implementation in the Botany Bay Coastal Catchments Initiative Project and allows a ready comparison of WSUD barriers and constraints between regions. As defined in the Botany Bay Project, the SWOTs can be identified as:

- **Strengths:** attributes of the organisations that are helpful to achieving the objective.
- **Weaknesses:** attributes of the organisations that are harmful to achieving the objective.
- **Opportunities:** *external* conditions that are helpful to achieving the objective.
- **Threats:** *external* conditions that are harmful to achieving the objective.

In our review, we have composited the outcomes of the stakeholder interviews into each of the four attributes. This allows for common themes in each of the ten interviews to be identified and groups while also allowing confidentiality among the interviewees, given some of the responses were candid and potentially controversial.

There were a number of distinct strengths, weaknesses, opportunities, and threats associated with advancing WSUD in Darwin which upon assessment were unique to this region.

4.1 Strengths

Within the Darwin region there is a general support for environmental initiatives with a recent community survey by Darwin City Council showing that the environment is the second most important issue to local residents. This is supported by the initiatives of both Palmerston and Darwin Councils joining the ICLEI campaign to reduce greenhouse gas emissions. Darwin Council has developed a comprehensive Environmental Management plan with specific water initiatives including a 20 year sustainability program, a gross pollutant trap masterplan and the implementation of water quality and conservation plans. Palmerston Council recently switched from mains water to bore water for the irrigation of its open space areas and is seeking to develop a plan to address stormwater management from its developed areas. This work is complemented by the identification of Bellamack as a demonstration site whereby a suite of sustainability issues such as stormwater treatment and a third pipe for wastewater / bore water will be implemented. While this project is being led by DPI there is strong support from Palmerston Council as well as the broader development industry.

At a Territory level, the Sustainability Unit within DPI is implementing a 10% reduction in greenhouse gas production by 2010 in all government buildings. The mandate for this unit has broadened from energy to a wider sustainability brief including water management. It is envisaged that water conservation initiatives will be rolled out in the future once water conservation targets are established and resources have been identified. In Alice Springs NT Power and Water has introduced a series of potable mains water demand management initiatives to better manage water resources in the town.

These initiatives show that there is an growing appreciation at the community and local and territory government level to address sustainability issues. This desire can be seen as a strength and harnessed to seek to implement WSUD and sustainable water management practices in the Darwin Region.

4.2 Weaknesses

While there are a series of identified strengths leading to potential WSUD adoption, some of the initiatives outlined in section 4.1 are driven and supported by cost savings. Specifically, there are

obvious cost savings to Palmerston Council and the Territory Government to switch open space irrigation from mains water to bore water and reduce energy consumption in buildings, respectively. As these organisations travel along the sustainability implementation paradigm, cost savings will not be readily evident, with further initiatives being either cost neutral or having a payback period of several years. Commitment needs to be secured to put in place these initiatives in the absence of other drivers.

All of the interviews identified that there is no perceived driver or “trigger for WSUD in Darwin”. Tidal flushing of Darwin Harbour coupled with the small population and small development footprint mean that there are no clear issues of water pollution within the Harbour. This compares to Brisbane and Melbourne and to a lesser extent Sydney, where receiving water quality issues are a fundamental driver for policy and action. While this remains true, there is a growing understanding of the impacts of development which are impacting on Darwin Harbour and are the basis of this project and its parent the Darwin Harbour Protection Program funded by the Coastal Catchments Initiative.

Major stormwater issues within Darwin are related to mosquito, flooding and sediment and erosion control. Mosquito control and addressing of flooding issues has led to a culture of piping and draining stormwater as quickly as possible from the urban areas to discharge stormwater to mangroves where there is adequate tidal flushing. Erosion control from development sites has been acknowledged by many interviewees as a key issue for the environment within Darwin. While there are regulations in place there is limited or no enforcement by agencies and builders are seen to “get away with what they want”.

Most interviewees identified “an apathy” of residents and organisations within Darwin to change their current water consumption practices based on the apparent abundance of water that falls within the summer months, and the subsequent large irrigation consumption in the winter months to “maintain a green tropical garden”. This is compounded by lack of leadership from Territory and local Government whereby public open space areas are set up on routine timers and irrigate during the wet season.

This apathy of the community is further fostered by the inaction of government departments to establish targets for potable mains water demand reduction. While such a step is seen as “too hard” or “not necessary”, NT Power and Water has identified a suite of demand reduction initiatives including pressure reduction, advertising campaigns, tariff reform, and water restrictions. However while pressure reduction has been implemented there is no comprehensive plan for demand management. Further it is apparent that there is a need to interrogate household consumption data in detail so as to develop a benchmark for water consumption, from which demand management initiatives will be derived.

This fundamental lack of knowledge of natural resource issues and planning is currently translated into stakeholders questioning potable water consumption figures, acknowledging that there is only three years of water supply available, general uncertainties as to the adequacies of water supplies and ground water extraction, over extraction of bore water in certain areas of Darwin and limited knowledge on the impact on and potential contamination of aquifers, as well as limited knowledge on the health of Darwin Harbour and the surrounding environment and ecology. While related to the “lack of a trigger for WSUD” as identified above, the deficit of baseline NRM information makes it difficult for organisations to make a case for improved water management or WSUD.

The lack of drivers and gaps in natural resource data has meant that stormwater and sustainable water management have not been developed and there is a low appreciation and no adoption of WSUD. When asked about the knowledge and skill gaps and needs for WSUD, stakeholders identified the following needs and requirements;

- The need for information on the cost and practices of operation and maintenance of WSUD elements. This includes knowledge and the economic benefits of such elements. Further any WSUD elements should be designed with ease of maintenance considered.
- Need for any such elements not to impact on the affordability of housing in Darwin. While it was acknowledged that there is a demand for low cost housing in Darwin as elsewhere in

Australia, it was also acknowledged that there are benefits in design and improved valuations of properties as a result of WSUD.

- Mosquito borne diseases are a significant issue in the wet/dry tropics, especially compared to temperate regions, where mosquitoes are predominantly a nuisance value. Any WSUD elements need to address mosquito and public health issues.
- Industry requires significant up-skilling from inception, design to construction as there is limited application of WSUD in Darwin.
- The wet/dry tropics are significantly different to temperate regions where the majority of existing stormwater treatment systems have been designed and constructed
- The majority of the research on performance of stormwater treatment systems has been conducted on systems in temperate region. Data on the performance of modified treatment systems for the wet/dry tropics is extremely limited. Design parameters from temperate regions are being adopted but their validity for Darwin needs to be verified.
- Plant selection for these systems needs to take into consideration climate conditions of Darwin.
- There is limited regulation of stormwater / sediment erosion controls at present which will need to be reversed.

4.3 Opportunities

It is noted that there have been a series of successful natural resource initiatives to rectify problems in the Darwin region. More specifically the mosquito eradication program of the 1970 and 80s saw major initiatives facilitating the draining of swamp areas, prohibiting development in certain areas including within one mile of the high water mark and infrastructure to quickly convey stormwater flows from developed areas to receiving waters. More recently a need to control excessive land clearing has led to strong guidelines and controls to manage a natural resource issue, as well as over extraction of bore water is now leading to controls on development.

These examples show that there has been successful implementation of natural resource issues within Darwin based on specific although reactive needs. Current natural resource management programs such as the water allocation program, the Darwin Harbour Protection Program and sewer and potable water planning may lead to a greater understanding of the state of water resources within the Darwin Region and the identification of drivers for action.

Within this framework the Australian Government's National Water Initiative is seeking to roll out water reform within major water users, which may include an external driver for pricing reform and two-tier pricing in Darwin.

As identified in Section 4.1 there is a shift in awareness and desire to undertake sustainability initiatives. Building on the opportunities and strengths, there is a broader acknowledgement for the need for sustainability programs within the planning scheme, which is being actively pursued by DPI. This is evident in the Bellamack development as well as identifying WSUD as a design philosophy such as CPTED and healthy by design.

4.4 Threats

While most organisations identified that there was some communication between staff and organisations, it was clear that there is a lack of integrated planning between organisations coupled with an apparent demarcation between issues. At the organisation level it was perceived that there was "no communication" over major strategic planning issues, and while one organisation may have certain ideas over natural resource issues this is not support or even known about by other

organisations. Such a lack of integrated planning has resulted in the perception of policy by stealth and a lack of trust between organisations.

The planning framework within Darwin is currently not well suited to WSUD and stormwater management. At present a WSUD guideline would be situated under Territory Planning Scheme, however, stormwater infrastructure, including approvals and ownership, is the responsibility of local government. It was noted in several interviews that stormwater infrastructure has previously been approved and built by a developer, but not to council specifications. Council then does not take ownership of the infrastructure and its maintenance falls to DPI. Any WSUD policy and its implementation therefore will need to have support at all levels of government to ensure consistency of application and to ensure the willingness of local government to take over responsibility for stormwater infrastructure associated with WSUD.

There is a general scepticism of ideas from the "south", and many perceive that practices from outside the region are not appropriate for Darwin. Darwin's rainfall, climate and small population make people think that these practices are not appropriate to the region. However it is worth noting that Darwin has recently created a new EPA division within the territory government's environmental department, NRETA. It is also worthy of noting that WSUD practices are now being implemented in relatively similar wet/dry tropics such as Townsville and Cairns, Singapore, as well as in new developments in small regional towns such as Narromine where there is a population of 3,000 people and an arid rainfall of less than 500mm/yr.

A final key threat to the implementation of WSUD is resourcing any initiatives. It was repeated that there are only limited resources in government and many competing needs for funds and attention. This is coupled with the current cost of water which at 74c/L, makes Darwin the cheapest potable mains water of any State / Territory capital in Australia, and hinders attempts to reduce the consumption of water.

5 DISCUSSION

As shown in the work undertaken for the Botany Bay CCI Project and the other literature presented in Section 3, a series of common barriers can be identified for organisations in their implementation of WSUD. However, an organisations and/or regions approach WSUD is a response to a range of internal and external factors, and it may be that one, or a combination of many factors influence barriers to WSUD adoption. This project has shown that there is a clear difference between the barriers to WSUD adoption between the “South” and the Darwin Region.

In south-eastern Australia there has been a prolonged awareness of the environmental degradation of receiving waters as a result of urban development and its associated activities. This has led to sustained community programs in the 1980s to cease sewer outfalls on beaches in Sydney, and more recently to protect the health of both Port Phillip Bay and Sydney Harbour. Within these States environmental legislation was enacted in the early 1970s and an Environment Protection Authority (or similar) has been in operation since the early 1990s. These drivers at a local level have influenced programs throughout the state at the state and local level and fostered funding programs and regulatory drivers for improved stormwater management. Drought has acted as a further enabler for action on water conservation. Through these problems WSUD has evolved as a response whereby potable mains water, wastewater, groundwater and stormwater are managed to optimise the synergies between these water streams.

As a result the south-eastern Australia has a relatively mature WSUD industry, whereby WSUD is becoming accepted across other professions and the elements of WSUD interms of potable water conservation, rainwater tanks, stormwater treatment and reuse are commonly used by the broader community. WSUD practitioners are supported by funding mechanisms, regulation and a history of support from research institutions. Despite this apparent maturity of the industry there are a range of barriers to WSUD adoption in south-eastern Australia including:

- A lack of policy leadership from State Government evidenced by a lack of formal policy, limited guidelines, regulations and administrative procedures.
- Lack of consistency between local governments on the policy provisions and application of WSUD.
- Poor administrative integration between agencies and councils, as well as between departments within local councils, to implement WSUD.
- Limited councillor and senior staff commitment to WSUD.
- Cost concerns for building, maintaining and replacing WSUD-related infrastructure by private industry and government that are couched within the ‘affordable housing’ viewpoint.
- Lack of awareness by stakeholders and the community about the benefits and practicalities of water sensitive urban design, and lack of suitable training programs and access to relevant information.
- Lack of consumer demand for water sensitive design developments, and lack of appropriate marketing about their costs, benefits and rewards.
- Limited quantification of the benefits of WSUD in terms of initial costs and maintenance.
- Little regional and local data on water quality parameters for MUSIC and other modelling tools to design WSUD systems.

Within the Darwin region, sustainability in water management is in its very infancy, and these barriers are either apparent or not entirely relevant. It is noted that at a Territory and local government as well as a community level there is a growing ground swell of environmental attitudes and activities. Furthermore with potential future industrial and resource development in the region is likely to result in significant increases in population in a relatively short time frames, which will impose significant restrictions on water and natural resources. However, with a small population, a well flushed harbour and an apparent abundance of rain, there has been no apparent need to manage water resources in a more sustainable way, and therefore there has been no push for WSUD. Further given the seasonal extremes of rainfall the design of stormwater treatment

technologies developed in south-eastern Australia at first glance do not seem appropriate to Darwin and will need to be adapted to accommodate rainfall patterns of the region.

Whereas in south-eastern Australia WSUD has evolved, been defined and practised over a period of more than ten years, there is a need to define what WSUD is and what it means for Darwin. This comes at two levels, firstly there is a need to ensure that objectives and direction of this project are appropriate for the knowledge skills of the people in Darwin and address the specific water management issues that are evident in Darwin, namely, sediment and erosion control, extreme rainfall / climate, pollution in Darwin Harbour, and potable water demands.

Secondly there is a perception that WSUD is not appropriate and will not work in for Darwin due to the extreme wet season rainfall and prolonged dry season dry spell. This perception suggests that there are limits on the application of a range of WSUD elements such as rainwater tanks (they will be empty within a month of the wet season ending), wetlands that will dry out and vegetation die, and that there is no pollution issue. Given the relative infancy of water management in the region there is a need to test these assumptions.

With the range of water management studies and policies presently being developed in Darwin including the water allocation program, the Darwin Harbour Protection Program and sewer and potable water planning, WSUD may well be an appropriate framework within which to develop these initiatives. To facilitate WSUD in Darwin and to address the barriers identified in this report a framework for WSUD implementation has been developed and is described in the following section.

5.1 Framework for the Darwin Harbour WSUD Strategy

A conceptual framework for WSUD in the Darwin Harbour Catchment has been developed to address WSUD in both new and existing developments, as well as providing an overall framework for WSUD (Figure 2). The framework illustrates how the overarching WSUD strategy encompasses both existing development and new developments and how these tasks relate various stages.

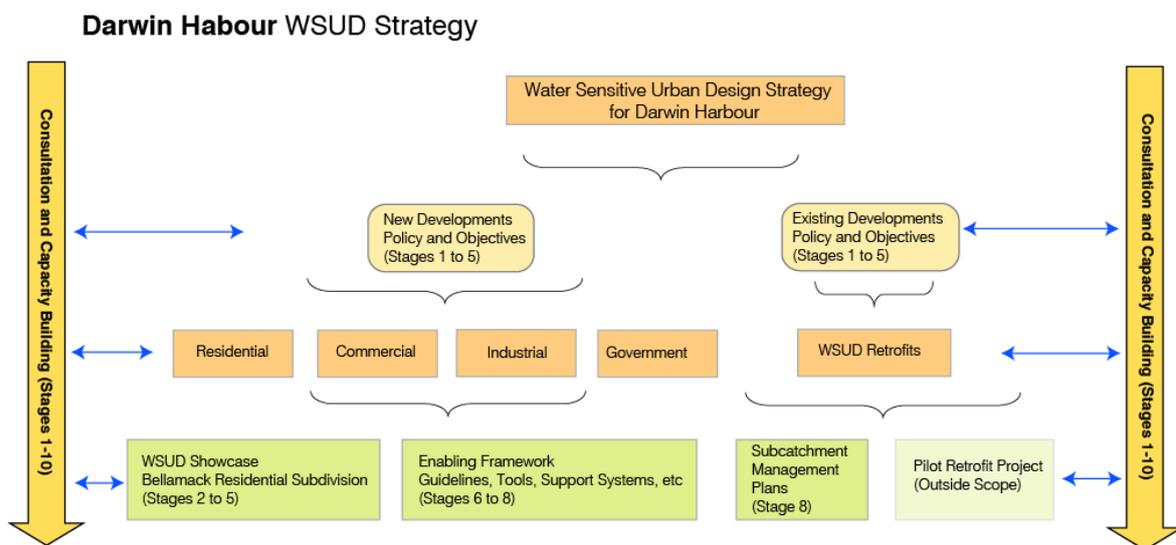


Figure 2 Broad Framework

The major goal of the WSUD Strategy for Darwin Harbour is the adoption of WSUD in all new development in the region. The three key overall phases of implementing the WSUD Strategy for new developments are:

- setting and adopting WSUD Objectives

- development of an enabling framework
- industry and whole of government communication and capacity building

These phases are discussed in more detail in the following sections.

5.1.1 Setting and Adopting WSUD Objectives

Setting WSUD objectives for new development and the adoption of these objectives into policy and legislation. Currently Interim Objectives have been developed in the early stages of this project. The next stage of this project will seek stakeholder agreement on these interim objectives and determine the most appropriate way of adopting these interim objectives into policy and legislation in the local context. Tasks that will be required to implement the WSUD objectives include:

1. Further development of technical and economic feasibility of waterway objectives
2. Further development of an appropriate water conservation target and the technical and economic feasibility. This task involves an analysis of current water consumption data, the potential of demand management measures to reduce water consumption and the feasibility of non-potable water supplies such as rainwater tanks, aquifer storage and reuse and wastewater reuse.
3. Further development of the water quality targets and their application to various developments including industrial developments, high density urban residential developments and various government developments.
4. Whole of Government engagement strategy to support adoption of WSUD objectives
5. Analysis of existing legislation and policies in relation to its current support and potential modification to incorporate WSUD objectives
6. Incorporation of WSUD objectives into existing legislation and policy

This phase of the project broadly encompasses Stages 1 to 5 outlined in Table 1.

5.1.2 Enabling Framework

Development of a broad enabling framework including, guidelines and tools to assist new development implement the WSUD principles and meet the objectives developed in section 5.1.1. This phase of the project broadly encompasses Stages 6 to 8 outlined in Table 1.

5.1.3 Communication and Capacity Building

Communication and capacity building is the principal component of the final phase of the project. Capacity building, consultation and communication is integrated throughout the project there is a significant increase in capacity building in the latter phase to ensure widespread adoption of the WSUD strategy.

A series of formalised workshops and training sessions are proposed to disseminate information to a broader audience. This includes

- The training of local Council and Territory government staff.
- Industry training for practitioners of WSUD, primarily those responsible for the implementation of WSUD which includes government engineers and ecologists, consultants and Utility companies.
- Information sessions for the development industry.

- General information sessions open to the broader community.

The training will form an important element of the dissemination and roll-out of the implementation guidelines and tools. A training program will be developed to ensure knowledge transfer and application of the WSUD objectives, guidelines and tools. The training workshops will be interactive with participants, involving problem based learning, through training modules, whereby the implementation strategies suggested can be trialled by staff.

The training modules will be developed through consultation with government and involve appropriate groups based on the type of activities and skill levels. These different groupings will involve different types of training and are likely to include:

- General public (information)
- Senior managers and developers (information),
- Planning and assessment officers (assessment and compliance processes),
- Operation and maintenance staff (ensuring efficient maintenance), and
- Stormwater / engineering managers and designers (design and application of WSUD and water recycling, harvesting technologies).

For more information on the communication and stakeholder engagement strategy see the WSUD Communication and Consultation Strategy developed for the program. This phase of the project broadly encompasses Stages 9 to 10 outlined in Table 1.

5.2 Next Steps

The identification of barriers to WSUD implementation as identified in this report involved ten interviews with nineteen stakeholders. The outcomes of this and other related projects (Table 1) has shown that WSUD is in its infancy in the Darwin region with no readily identifiable WSUD elements on the ground and limited understanding of the application of WSUD.

The next steps of the project will build on the findings of this report and work with the organisations to determine the most appropriate way to ensure the implementation of WSUD in the Darwin region. This workplan will deliver on the workplan identified in Table 1 and included work with:

- Darwin and Palmerston Councils –
 - Determine the current knowledge, skills and needs around water management within each of the organisations so as to tailor the Draft WSUD Guidelines and Tools (High Level and Conceptual Design Guideline, Technical Design Guideline and Design Tools)
 - Work through the organisational structure and policy framework to determine how the WSUD guidelines can be best drafted so as to facilitate WSUD in the NT Planning Scheme through the Darwin City Council Development and Subdivision Guidelines (DCCDSG) 2005 and City of Palmerston Subdivisional Guidelines (CPSG) 2007 or as an additional appendix.
 - Identify Council requirements for design and operation and maintenance to ensure that WSUD elements and infrastructure are designed and implemented as needed to ensure long-term maintenance.
 - Identify potential Council capital works project which can include WSUD elements to act as demonstration projects for WSUD in Darwin.

- NREETA –
 - work with NREETA to determine the relationship between the ecosystem response model currently being developed and the WSUD Program, and ensure that each program builds off each other.
- Dept of Health
 - Ensure that WSUD elements do not exacerbate any health concerns including mosquitoes.
- Department of Planning and Infrastructure
 - Work with DPI to determine the best way to embed WSUD into the NT Planning Act (Section 51) and Planning Scheme (Part 2 (Section 4.1 and Section 4.2)), Part 5 (Section 11.1), and Part 1 (Section 2.8 and Schedule 3).
 - Identify the needs for developers of subdivisions when implementing WSUD.
- Consultants and Developers
 - determine the current knowledge, skills and needs around water management within each of the consultants so as to tailor the WSUD Guidelines and Tools (High Level and Conceptual Design Guideline, Technical Design Guideline and Design Tools)
- Other organisations - Undertake consultation of draft WSUD policy and WSUD objectives to stakeholders and barriers to WSUD.

Interviews and working with these organisations will lead to a greater understanding of the needs of WSUD in Darwin as well as enabling a tailoring of the deliverables from this project, as identified in Table 1.

6 CONCLUSIONS

Barriers to WSUD adoption throughout Australia have been presented in this report as a literature review of the previous CCI projects as well as recent investigations in Sydney and Melbourne. The common conclusion of these investigations shows that barriers to WSUD implementation are the result of a series of factors and focusing efforts in one area does not necessarily overcome in other areas (Brown *et al.* 2006, McManus and Morison 2008). A holistic approach is needed whereby WSUD barriers are identified across an organisation or organisation which can both identify barriers as well as determining appropriate policies and programs are developed, that will address those barriers.

To determine the barriers to WSUD implementation in Darwin a series of ten interviews were held in Darwin with nineteen people representing a range of organisations working within water related fields in Darwin. The interviews asked a series of questions focusing on the main water issues in the region as well as the activities of the stakeholders and the guidance and/or support does the organisation need to successfully implement sustainable water management.

It was found that there is a clear differences between the barriers to WSUD adoption between Darwin and other areas in south-eastern Australia where there has been a prolonged awareness of the environmental degradation of receiving waters as a result of urban development and its associated activities. Furthermore in the eastern states the last 10 years have seen drought conditions, which have focussed attention on water resources for urban communities. In south-eastern Australia there is relatively mature WSUD industry, whereby WSUD is becoming accepted across other professions and the elements of WSUD in terms of potable water conservation, rainwater tanks, stormwater treatment and reuse are commonly used by the broader community.

Within the Darwin Region, sustainability in water management is in its very infancy, and the barriers identified in south-eastern Australia are either apparent or not entirely relevant. It is noted that at a Territory and local government as well as a community level there is a growing ground swell of environmental attitudes and activities. However, with a small population, a well flushed harbour and an apparent abundance of rain, there has been no apparent need to manage water resources in a more sustainable way, and therefore there has been no push for WSUD. Further given the seasonal extremes of rainfall the design of stormwater treatment technologies developed in south-eastern Australia at first glance do not seem appropriate to Darwin and will need to be adapted to accommodate rainfall patterns of the region.

A framework for WSUD implementation has been developed through this project to establish WSUD in the Darwin Region. It is proposed that as part of this project that some of the common issues raised in questioning the appropriateness of WSUD in the dry tropics are addressed. The framework seeks to develop guidelines for all development types in Darwin. However it is suggested that initially the strategy focus on testing the appropriateness of WSUD in Darwin, addressing the concerns of stakeholders identified in this paper and looking at demonstration projects whereby WSUD can be trialled and refined.

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Appendix A BARRIERS TO THE IMPLEMENTATION OF WSUD THROUGHOUT AUSTRALIA

To inform this project a literature review was undertaken of prior projects and studies which have identified aspects of institutional capacity development related to urban water management. These studies / projects are presented in chronological order and include:

- ARQ² Chapter 5 “Institutional Capacity” (Brown *et al.* 2006)
- Barriers and Opportunities to WSUD Adoption for the Botany Bay CCI (EDAW and Monash University 2008)

These projects are briefly summarised in the following sections.

A.1 Institutional Capacity – ARQ Chapter 5

The Australian Runoff Quality (ARQ) has been developed by the Institution of Engineers, to provide an overview of current best practice in the management of urban stormwater in Australia (IE Aust 2006). Chapter 5 of the document entitled “Institutional Capacity” provides managers with guidance on improving an organisation’s capacity for implementation of sustainable urban water management (Brown *et al.* 2006).

The document offers a holistic assessment of the key factors which influence the capacity of local government to implement sustainable water management. These key factors relate to themes which have been raised in the above sections and include knowledge building, professional development, organisational strengthening, directive reforms and facilitative reforms, as outlined in Table 2. It is noted that focusing efforts in one area such as teaching officers new skills does not necessarily overcome obstacles in intra- and inter organisational issues, nor does it develop and sustain the capacity of an organisation to undertake WSUD (Brown *et al.* 2006). Rather, a holistic approach is needed whereby WSUD is addressed across the organisation.

The capacity building themes identified below represent a continuum of implementation of sustainable water management from individual officers through to capacity building and reform of both local and state governments. As suggested within the ARQ, Table 2 represents a potential checklist/guide for initiating a collective diagnostic of the quality of current institutional capacity for WSUD (Brown *et al.* 2006).

Table 2 Summary of capacity building themes and interventions (Brown *et al.* 2006).

Capacity Building Theme	Capacity Building interventions
Knowledge building	<ul style="list-style-type: none"> • Knowledge of performance and cost of water management measures • Knowledge of social acceptance / expectations with respect to urban water management practices and designs • Knowledge of natural resources in the region • Knowledge of water governance issues and research • Knowledge / skills of professions dealing with water in the region • Knowledge of technical assessment tools to support water management decisions • An ongoing, coordinated R&D program
Professional development	<ul style="list-style-type: none"> • Technical knowledge and skill development • People Skill development

² Australian Runoff Quality: A guide to Water Sensitive Urban Design

Organisational strengthening	<ul style="list-style-type: none"> • Political and managerial commitment • Reform of legislation, organisational structures and key processes to clarify responsibilities and efficiently deliver WSUD • Cultural management • Fostering champions / leaders • Improvements in inter-agency structures, networks and collaboration
Directive reforms	<ul style="list-style-type: none"> • Establish clear policy statement, regulations and standards • Using design objectives and technical guidelines • Adopting enforcement strategies
Facilitative reforms	<ul style="list-style-type: none"> • Mobilising community and political support • Creation of adequate funding mechanisms, financial resources and incentive structures • Using market based instruments • Providing organisational incentives • Using cross-stakeholder networks and stakeholder participation • Improving the way information is managed and shared • Ensuring accountability for peoples actions • Auditing and reporting performance • Providing conflict resolution resources to stakeholders

A.2 Barriers and Opportunities to WSUD Adoption for the Botany Bay CCI

An assessment was undertaken of the barriers and opportunities to WSUD adoption for the councils of the Botany Bay Catchment (EDAW and Monash University 2008). The project included group interviews of six councils, representing 70% of the catchment area, which were supplemented by extensive interviews undertaken separately with three other councils in the catchment. The interviews assessed the constraints and opportunities for councils through a SWOT framework, which identified the following variables:

- *Strengths* – Ongoing stormwater quality improvement works (such as gross pollutant traps), officer interest and enthusiasm, WSUD ‘entrepreneurs’ in a number of councils, stormwater management service charge (where established), adaptation of WSUD to policy windows (e.g. ‘drought-proofing’ and climate change agenda), pragmatism of WSUD
- *Weaknesses* – low executive commitment and leadership, low councillor awareness, limited capacity of planning staff, limited construction and O&M staff capacity, policy deficits (no relevant, universal planning instruments), fear of failure (flooding, amenity, cost), saturated workloads of WSUD protagonists
- *Opportunities* – WSUD developments (e.g. Landcom sites), ongoing implementation of WSUD in Sydney Region capacity-building program, comprehensive WSUD projects funded under the Urban Sustainability Program, standard Local Environmental Plan (LEP) template, Building and Sustainability Index (BASIX) as a policy platform for WSUD
- *Threats* – insufficient maintenance and asset management research, cost-benefit disincentives (price of water), limited inter-local knowledge transfer, uncertainty of state government leadership, community ignorance of WSUD, engineering skills shortage, and weak water management provisions in LEP template

The threats and opportunities found through this research are similar to other institutional capacity assessments of councils in both Sydney and Melbourne. What is evident is that whilst common threats can be identified for the councils throughout the catchment, each council’s approach to WSUD is a response shaped by a range of internal and external factors. Consequently, whilst there are strategies to address skill and knowledge issues common to most councils, there is a requirement for a specific assessment of current threats and opportunities on a council by council basis so as to tailor appropriate solutions for each local government area.

The following strategies were ranked by the stakeholders in order of preference and we strongly recommend each is pursued by the BBCCI and other programs:

- Development of a WSUD DCP and supporting provisions/guidelines for Councils to facilitate the consistent implementation of WSUD in new developments throughout the catchment
- Defining consistent WSUD Principles for insertion into each council's LEP template
- Securing Councillor awareness and commitment to WSUD. This could include Councillor awareness-raising through existing forums (e.g. floodplain management conferences)
- Securing executive awareness and commitment to WSUD with targeted programs
- Disseminating tangible data on the operation and maintenance of WSUD elements. This would be prepared in consultation with council staff to ensure consistency with current council O&M practices
- Disseminating tangible data on cost-benefits of WSUD. This would be prepared in to consultation with council staff to ensure consistency with council accounting practices
- Endorsement of an independent capacity self-assessment tool by the BBCCI and WSUD in the Sydney Region Programs to determine the specific WSUD needs of each council. The results of this assessment could be addressed through council programs under the Stormwater Management Service Charge