Using Effective Policy Frameworks to Drive Water Sensitive Urban Design

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Abstract

Experience shows that in order to achieve effective, wide-spread, on-the-ground application of water sensitive urban design (WSUD), a sound policy framework is vital.

In the context of this paper, the term 'policy framework' refers to a clearly defined and widely endorsed set of WSUD-related objectives which are given effect through instruments such as mandatory town planning controls supported by a suite of measures such as technical standards and guidelines, modelling tools and on-going capacity building programs. These policy frameworks can be developed for a range of scales, but it is often in local government where they can be the most influential.

This paper argues that when developing an effective policy framework, it is necessary to first gain a sound understanding of the management environment in which the framework is to be delivered. Elements of this environment include relevant political drivers, the legislative context, strategic planning initiatives, land use planning and development approval processes, supporting scientific knowledge and technical 'tools', existing organisational cultures and available human resources.

In addition, the setting of realistic, achievable, and measurable objectives or targets is also extremely beneficial and is suggested as being the one of the primary drivers for the wide-spread implementation of WSUD. Such objectives are particularly useful when linked to mandatory town planning controls.

Once developed, policy frameworks promoting WSUD need to be supported by a substantial and long-term capacity building program that meets the needs of all key stakeholders.

Finally, the paper argues that without a comprehensive mechanism to evaluate the performance of the policy framework in promoting WSUD, continual improvement in the paradigm shift towards WSUD will be impeded.

1. INTRODUCTION

1.1. Purpose of this paper

The purpose of this paper is to:

- emphasise the importance of a sound policy and managerial framework to drive the implementation of water sensitive urban design (WSUD) that includes mandatory town planning controls as its centrepiece;
- highlight those elements of a sound policy and managerial framework that are seen as essential ingredients for success;
- suggest that major improvements could be made to the design and maintenance of many of the policy frameworks currently in place in Australia, with relatively little effort; and

- summarise and briefly analyse four (4) case studies of policy frameworks that promote WSUD in Australia primarily through their town planning controls.

1.2. Background

In this paper, the term 'policy framework' refers to a clearly defined and widely endorsed set of WSUD-related objectives which are given effect through instruments such as mandatory town planning controls. While this paper will focus on town planning controls as the primary policy instrument to promote WSUD, it must clearly be stated that these controls can be ineffective unless they are supported by:

- high-level policy that is endorsed by relevant politicians;
- a comprehensive suite of technical guidelines and standards;
- local science;
- modelling tools;
- on-going training and other forms of capacity building for key stakeholders;
- suitable resources to use the planning controls (e.g. in development assessment areas);
- monitoring and evaluation mechanisms to identify opportunities for improvement; and
- regular maintenance of controls.

To some extent, this paper says the obvious – that policy frameworks that include mandatory planning controls (e.g. a codes in a city's town planning scheme) are vital to the widespread adoption of WSUD in developing areas. What is not obvious however, is why:

- widespread adoption of WSUD in newly developing areas around Australia is still the 'exception' rather than the 'rule', despite many agencies introducing policies and planning controls that promote WSUD;
- relatively little effort goes into the design of most WSUD-related policy frameworks and town planning controls compared to say the design of large structural measures for stormwater quality improvement;
- little attention is often payed to the maintenance of these policy frameworks and town planning controls; and
- very few attempts are made to monitor and evaluate the effectiveness of these vital controls.

This paper is a reaction to these concerns. It seeks to provide a 'wake-up call' to many agencies who have an unparalleled opportunity to substantially improve the extent to which WSUD is adopted in their region, by redesigning their town planning controls as well as the surrounding policy and managerial framework.

The term 'planning controls' is used in this paper to primarily refer to regulatory instruments that apply when a new development is proposed and approved by a planning authority. For the majority of Australia, planning controls operated by local government authorities are the primary instruments for promoting WSUD in new development. These controls may be in the form of codes, planning scheme policies or development control plans, depending on the locality.

Such controls are vital, as in theory, they should specify precisely the philosophy, objectives, performance criteria and acceptable solutions that need to be met for a development to be approved. In theory, a development should not be approved unless it meets the objective of the planning control. In theory, the implementation of an excellent planning control (when supported by a suitable policy and managerial framework) should provide a regulatory 'switch' that ensures water sensitive developments become the 'rule' rather than the 'exception'.

The importance of planning controls was highlighted by the Cooperative Research Centre (CRC) for Catchment Hydrology who broadly evaluated the potential effectiveness of 'non-structural measures' to improve urban stormwater quality through the use of a literature review and a survey of 36 urban stormwater managers from Australia, New Zealand and the United States of America (see Taylor and Wong, 2002a, 2002b and 2002c). This research indicated that the 'non-structural measure' having the most potential value was 'town planning controls' that involve:

- the implementation of WSUD policy in town planning schemes;

- requiring stormwater quality (and other aspects of WSUD) to be addressed in development proposals; and
- applying WSUD–related development approval/permit conditions.

2. ESSENTIAL INGREDIENTS

This section summarises what we believe are the essential ingredients to a sound policy and managerial framework for the promotion of WSUD. It is suggested that *all ingredients* are needed for widespread promotion of WSUD via new development.

Firstly, the design of suitable planning controls must be done with a sound *understanding of the* 'management environment' within which the controls have to operate. Aspects of the management environment that need to be carefully considered include existing high-level policy, current political drivers, the legislative context, relevant strategic planning initiatives, existing land use planning and development approval processes, supporting scientific knowledge and technical 'tools' (e.g. standards, guidelines, models, web-based calculators, etc.), existing organisational cultures and available human resources and capabilities.

For example, consider a local government authority that has a development assessment area that is under-resourced and has no prospects of an increase in human resources in the foreseeable future. Designers of new town planning controls to promote WSUD in this management environment may need to:

- develop very simple controls that create only a minimal increase in work for development assessment officers, even though it is acknowledged that the controls could be more scientifically based, elegant and comprehensive;
- examine options for private certification, where a suitably qualified and independent third party undertakes the development assessment process on behalf of council; and/or
- focus capacity building efforts on those staff who are most likely to review the WSUD elements of new developments, as well as ensure that developers, their consultants and others involved in the development industry are also considered in the delivery of capacity building initiatives.

Secondly, we believe that the planning controls must have *measurable objectives/targets* that need to be met with respect to stormwater quality, stormwater quantity and water conservation (as a minimum) if these controls are to be a fundamental driver in ensuring WSUD measures are used in new developments. Examples include 'best practice' load reduction targets, median concentration based targets, mains water reduction targets, targets relating to the 'equivalent percentage treated area' (this term is explained in Section 3.2), and targets relating to the percentage of directly connected impervious area on a development.[1]

Ideally these objectives should be based on credible, local science. For example, load reduction targets for stormwater pollutants should draw on the results of local scientific studies investigating sustainable pollutant loads for receiving waters.

Planning controls that provide 'loose' *qualitative* descriptions of what is required with respect to WSUD have proven to be largely ineffective in the context of development assessment, where stakeholders may have greatly differing views on what is a 'water sensitive' outcome.

Similarly, if good, quantitative water-related objectives have been set using credible science, but have not been included or referred to in a mandatory town planning framework, their ability to influence WSUD implementation is usually limited.

Thirdly, the planning controls (e.g. codes in a town planning scheme) need to be supported by detailed standards, technical guidelines and models. Typically, town planning instruments refer to technical documents to provide guidance on *how to comply* with the objective of the planning instrument. Applicants who faithfully use the guidelines or standards should be deemed to comply with the

[1] *See the introduction to the Australian Run-off Quality Guidelines (IEAust, 2003) for more information on objectives that can be used to drive WSUD.*

planning instrument. However, innovative designers should always be provided with the freedom to present unusual ways of meeting the intent of the planning control. Importantly, such innovators should not be penalised in terms of incurring delays in the development assessment process. Indeed, forward-thinking planning authorities that encourage innovation should *reward* innovative applicants, perhaps by fast-tracking in their development assessment if they can demonstrate the potential for valuable knowledge to be generated through the project. Unfortunately, this is usually contrary to the cautious approach taken by most approval agencies.

Detailed technical guidelines that are developed to support water sensitive planning controls must not contradict well-known and established technical guidelines. If there is inconsistency, chances are that the traditional, 'water insensitive' solution will be implemented.

Fourthly, a comprehensive and long-term capacity building program is needed to support the planning control. Identifying and fostering champions for WSUD within an organisation's development assessment area is also strongly recommended.

Of primary importance in delivering a capacity building program is to ensure that the program is *maintained* so that training initiatives continue to be delivered throughout the life of the planning framework. Usually, capacity building (if it is done at all) is undertaken when a planning control is first introduced, but it is only on rare occasions that this is continued. Given the amount of staff attrition that occurs in all areas of the development industry and the rapid evolution of WSUD, it is essential that capacity building programs continue to be delivered such that persons new to the planning frameworks have the opportunity gain the necessary knowledge and understanding needed to continue implementation.

High-level awareness raising exercises for senior management and politicians within the organisation that uses the planning controls are also recommended to ensure development assessment staff at the 'coal face' feel appreciated and supported when they are operating as advocates for WSUD.

To ensure that capacity building has the desired effect, impediments to progress also need to be removed. For example, if staff promotion and/or salary increases in a development assessment area are linked with productivity in terms of the rate that developments are approved, staff are less likely to be a strong advocate for WSUD when dealing with developers.

Finally, an auditing mechanism needs to be established to monitor and evaluate the effectiveness of the policy framework and planning controls to deliver WSUD. A research project to do this has recently been designed and initiated by the CRC for Catchment Hydrology at Moreland City Council in Melbourne. Over several years, a series of audits and pollutant export modelling exercises will be used to measure the effect of new town planning controls on the style of new development and to estimate the approximate reduction in stormwater pollutant loads in newly developed areas. Such evaluations require substantial commitment, as it may take several years for a new town planning control to produce on-the-ground results due to the time it takes to draft controls, have them approved (e.g. by a State government authority), apply the controls in a development assessment context, and then build the development.

In addition to monitoring on-the-ground outcomes, those charged with the design and implementation of the policy and managerial framework should be vigilant of opportunities for to improve the design of all of its elements. At the simplest level this may involve adjusting the measurable targets within planning controls. For example, recent work by the CRC for Freshwater Ecology and the CRC for Catchment Hydrology has highlighted the importance of the degree to which impervious areas in a catchment are *directly connected* to waterways (e.g. through traditional drainage infrastructure) as an indicator of waterway health (see Walsh, 2001; and Walsh *et al.,* 2003). New policy frameworks may wish to incorporate this knowledge into the numerical objectives of a water sensitive planning instrument to cap the percentage of directly connected impervious area on a new development, thereby promoting WSUD features (e.g. infiltration systems, vegetated swales, etc.).

3. FOUR AUSTRALIAN CASE STUDIES

This section briefly summarises four (4) relatively new Australian policy frameworks that promote WSUD primarily via strong town planning controls. The purpose of this section is to provide an insight into the nature of these frameworks and how they work. This section also highlights how different these frameworks can be.

3.1. NSW BASIX System

Summary of how the system works:

BASIX stands for 'building sustainability index' which is a web-based planning tool that has been designed to help people assess the likely performance of proposed *residential* developments against simple sustainability indicators. The tool is supported by a policy framework which includes State legislation and technical guidelines.

BASIX will be phased in across New South Wales from 1 July 2004 in four stages:

1. July 2004 - new residential allotment developments in Sydney.
2. October 2004 - all residential developments in Sydney.
3. July 2005 - all residential developments in NSW.
4. October 2005 - residential alterations and additions in NSW.

BASIX is mandatory for two indices namely water and energy, and is related to other indices on energy, landscaping, and stormwater. The mandatory targets for BASIX include a 40% reduction in potable mains water and producing 25% less greenhouse emissions compared to NSW homes of the same type with traditional designs.

The BASIX system will be a mandatory component of the development approval process in New South Wales under the *Environmental Planning and Assessment Act 1979*. The *Environmental Planning and Assessment Amendment (Building Sustainability Index (BASIX)) Regulations 2004* and the *State Environmental Planning Policy 75 - Building Sustainability Index (BASIX)* have been developed as the necessary planning instruments.

To meet the 40% reduction target for water conservation, a typical residential development may choose to implement shower heads and tap fittings with a 3A rating, dual flush toilets, and a rainwater tank (or connect to an appropriate recycled water supply for outdoor water use and toilet flushing and/or laundry).

Development assessment authorities across New South Wales will need to ensure these mandatory planning controls are supported by an adequate policy and management framework which includes up-to-date technical guidelines, on-going training, human resources for development assessment, systems for maintenance, etc.

For more information on BASIX, see www.basix.nsw.gov.au and/or Department of Infrastructure, Planning and Natural Resources (2004).

Perceived strengths:

The BASIX system is simple, web-based, mandatory and will eventually be implemented State-wide. It also includes quantitative targets for water management, albeit just for water conservation at this stage. Once established however, the system will also provide the opportunity to progressively add sustainability indicators to the planning framework. Importantly, the system provides consistency across residential developments replacing varying requirements of different Councils' Development Control Plans (DCPs) on issues such as rainwater tanks and demand management targets.

The BASIX system also currently includes nine (9) 'practice notes' to help people understand and comply with the new requirements, as well as a user-friendly website.

Perceived weaknesses:

Currently the scope of the system is quite narrow. It is currently only designed to apply to *residential* development and in terms of water management, only sets targets for water conservation.

Because the system has been developed by the State government for accreditation by Councils, there is a risk that the planning controls will be implemented without strong supporting technical and managerial framework in some local governments.

The adoption of a State-wide process also takes away potential for local skills and innovation to be developed within Councils.

Opportunities for further improvement/development:

This system is new and represents a significant step forward in the management of water conservation during the residential development approval process. It is hoped that with time, the system will be well-maintained, evaluated and progressively strengthened to address other aspects of the water cycle (e.g. the amount of directly connected impervious area on the development).

3.2. Victorian Association of Bayside Municipalities (ABM) System

Summary of how the system works:

The Association of Bayside Municipalities (ABM) in Melbourne has developed model planning scheme provisions for stormwater quality management by local government authorities. These provisions include:

- Planning controls that operate via 'municipal strategic statements' in local government authorities and introduce a new concept called the 'Equivalent Percentage Treated Area (EPTA)'. The EPTA is the percentage of the site for which stormwater is treated using WSUD techniques.
- A practice note on how to calculate the EPTA for a given development.

The EPTA is a relatively simple mechanism that allows the transfer of 'best practice', State-wide water quality performance objectives in Victoria (e.g. load reduction targets for nutrients) to the site level within a municipal planning framework, without the need for pollutant export modelling to be undertaken for every application.

The model planning controls needs to be tailored for each local government area before they can be applied. This tailoring includes:

- determining what type of development the planning controls apply to; and
- defining minimum EPTAs that must be achieved *on-site* (these are dependent on the location, type of development and size of development, and are determined through site investigations and detailed case studies involving modelling).

The project has also *proposed* that in some circumstances stormwater 'treatment units' may be purchased off-site to ensure all approved developments reach the goal of '100% EPTA' when on-site and off-site stormwater treatment are jointly considered. Safeguards have also been proposed to protect sensitive waterways between a new development and Port Phillip Bay (i.e. to ensure that trading offsets within the Port Phillip Bay catchment does not jeopardize the health of *local* creeks, rivers and wetlands with significant environmental values).

The proposed scheme requires developers to submit details on the development's EPTA to Council with their planning permit application. These details demonstrate how the proposed development meets the requirements of the planning controls with respect to the EPTA.

For more details on the ABM 'Clean Stormwater' project, see Walsh *et al.* (2004), Environment and Land Management & Ecological Engineering (2001) and/or the information exchange section of www.clearwater.asn.au.

Perceived strengths:

This model is a leader in Australia in terms of its ability to apply numerical objectives within the context of assessing small to large development applications. The EPTA concept has considerably simplified the process of demonstrating that numerical, stormwater pollutant load reduction objectives have been met for a given development.

Another advantage of the EPTA concept is that is a measurement unit that allows controlled trading to occur of stormwater 'treatment units' within the Port Phillip Bay catchment. When a developer has the option of treating some stormwater on-site and purchasing treatment offsets off-site to meet a combined treatment standard of '100% EPTA', in theory, market forces will ensure that the most cost-effective treatment options are funded first.

Perceived weaknesses:

Despite the elegance of the ABM model and the quality of the products, the system may be perceived to be too complex and/or resource intensive to effectively operate by some local government development assessment officers and applicants, particularly in relation to *small* developments. This may generate the need for third party certification, an 'in-house certifier' position to be created in Council, and/or adjustment to the definition of those developments to which the planning controls apply.

The ABM model applies established Statewide stormwater-related objectives to the site level. These numerical, Statewide objectives are currently based on what 'best practice' stormwater management could achieve in the mid to late 1990s via 'end-of-pipe' measures. Ideally, the Statewide objectives would be updated to reflect local science (i.e. objectives that relate to the ecological needs of Port Phillip Bay), or what 'best practice' can *currently* deliver in terms of stormwater pollutant load reductions. This is not a reflection on the ABM project, but rather the broader planning framework in Victoria.

Opportunities for further improvement/development:

This system is new and not yet operational (as of May 2004). A monitoring and evaluation program has been implemented at one of the local government authorities where the framework is being used to develop new planning controls (i.e. Moreland City Council in Melbourne). With time, high-quality monitoring data should be available at Moreland relating to the on-the-ground results produced by this innovative planning control.

Another opportunity for the development of the ABM project is that the model planning provisions, EPTA concept and supporting technical guidelines be used on a *Statewide basis* by planning authorities in Victoria (like the BASIX system in New South Wales).

3.3. NSW Planning Guidance on Water Sensitive Urban Design

Summary of how the system works:
The New South Wales Department of Environment and Conservation (formerly NSW EPA) is finalising a series of guidelines under their 'Managing Urban Stormwater' initiative (see www.epa.nsw.gov.au/stormwater/usp/docs.htm). One of these documents focuses on how to promote WSUD within the NSW planning system. It is called the 'Managing Urban Stormwater - Urban Design' document and is due for release in late 2004.

The document provides a comprehensive overview of drivers for WSUD in NSW, how WSUD can be incorporated at various stages in the land development process, and detailed guidance on how to exploit WSUD opportunities at the subdivision and allotment scale.

The intent is for the document to be an intermediate guidance document that provides local government and the development industry with the necessary information to plan and assess WSUD developments. It builds on the guideline called 'Water Sensitive Planning Guide for the Sydney Region' (Upper Parramatta River Catchment Trust *et al.,* 2003) which provides Sydney Councils with guidance on how to promote WSUD at both the 'plan making' and 'development assessment' stages of the land development planning process.

The Managing Urban Stormwater - Urban Design document contains chapters that give a detailed overview of how WSUD can be implemented at a range of scales, including at the allotment and subdivision scales for new developments and redeveloping areas. Within the document, two detailed case studies are provided - one for a greenfield site and one for an existing urban site. These are used to demonstrate what is necessary to incorporate WSUD into these styles of development.

As part of the introduction of the 'Managing Urban Stormwater' guidance documents, a comprehensive training program is proposed to be conducted in various centres across New South Wales.

Perceived strengths:

It is intended that this document will fill the gap between high-level, theoretical documents such as Australian Runoff Quality (IEAust, 2003) and detailed design specification type-guidelines for various best management practices (e.g. the NSW 'Managing Urban Stormwater: Treatment Techniques' document [NSW EPA, 1997] that is currently being updated). This will assist both local government agencies and development consultants by providing the guidance necessary on *how to* incorporate WSUD in the design of new developments across New South Wales using the planning system.

Also included within the document is guidance on typical development control plan requirements which will assist local government agencies in the inclusion of WSUD within town planning controls.

The document is part of a broader set of guidelines that include aspects such as detailed design guidance of WSUD measures, and how to evaluate the life-cycle costs associated with the implementation of WSUD practices.

Perceived weaknesses:

Perhaps the key weakness with the *implementation* of this planning document will be that the *detailed design* of WSUD measures is still not adequately addressed for some practices. In the majority of cases, this may be due to guidelines not being able to address all of the site-specific constraints that need to be considered when undertaking the design.

It must also be realised that this is only one element of the overall planning framework and is only a guideline. To promote WSUD, the document (with associated guidelines and capacity building activities) must lead to the implementation of local planning controls such as development control plans/local plans and appropriate development assessment conditions. It will also be complemented by the mandatory 'BASIX' system in New South Wales that promotes water conservation on residential development (see previous case study).

Opportunities for further improvement/development:

Other guideline documents are also being developed to support this document (e.g. technical WSUD design guidelines). In addition, continual improvement of the planning elements will be needed. Managerial and funding arrangements may also need to be examined to ensure that *ongoing and maintained* Statewide capacity building activities are undertaken to support these guidance documents.

3.4. Brisbane City Council's Planning Controls and Policy Framework

Although only a local authority, Brisbane City Council has jurisdiction over a large area and is the largest Local Authority in Australia. The main advantage of this size is the ability for the one authority to plan and manage across the whole water cycle whilst also regulating water supply and distribution. In essence Brisbane has a better chance than many other Local Authorities to apply water planning consistency through vertical integration.

Queensland's governance system promotes greater planning and management by Local Authorities with an absence of formal regional planning bodies directly influencing policy development at a local level. Integrated planning is promoted through the *Integrated Planning Act 1997* which is administered by Local Authorities. Town Planning Schemes are the main vehicles used to regulate development.

Currently, Brisbane City Council's town planning scheme (the *City Plan 2000*), includes provisions for WSUD which are administered through the Stormwater Code. The code includes the following provisions

1. A definition of WSUD.
2. Requirement for developments to consider WSUD as solutions to stormwater management.
3. Requirement for developments to develop Site-Based Stormwater Management Plans to manage stormwater quantity and quality.
4. Water quality objectives (administered through a supporting Planning Scheme Policy) which describe the numerical performance targets that large developments must demonstrate that they will achieve.

Summary of how the system works:

Certain types of developments are required to comply with the requirements of the Stormwater Code. To meet the requirements of this code, developers must submit Site-Based Stormwater Management Plans (SBSMPs). WSUD is promoted in the code as a design solution. Thresholds are used to define small and large developments. Small developments must identify current 'best practice' for stormwater quality management and incorporate these elements into the design. Large-scale developments must demonstrate that they meet relevant numerical water quality objectives, which is typically done by pollutant export modelling. Currently, relevant water quality objectives are concentration based (i.e. rather than load based, or a combination thereof).

In the event that a development approval is issued, the relevant SBSMP is referenced in the legally enforceable conditions of development to enable implementation to occur as planned.

Brisbane City Council's planning controls are supported by many technical guidelines (see Chandler *et al.,* 2000). Significant effort was also made to explain how the new planning controls work and to train stakeholders in the skills they need to comply with the controls around the time they were first implemented.

For more details on the Brisbane City Council system, see Chandler *et al.* (2000) and Abal and Taylor (2003).

Perceived strengths:

The key strengths of this system are:

- WSUD is enforceable through planning legislation, defendable through the Queensland Planning and Environment Court.
- Brisbane has had in place these WSUD provisions since 2000 and have thus gained a certain amount of public awareness.
- The provisions are linked to regional water quality objectives developed through the successful South East Queensland Regional Water Quality Management Strategy (2001), a joint Federal, State and Local Government initiative.
- Pollutant export modelling is only required for large developments.

Perceived weaknesses:

Detailed design solutions for implementing WSUD are currently only well-established for large-scale developments in greenfield areas and specifically only being utilised to improve stormwater quality. 'Large-scale developments' include residential subdivisions, commercial and industrial buildings above certain thresholds. Although this is certainly helping to achieve a more sustainable Brisbane, missed opportunities are a major concern especially considering the decreasing availability of greenfield land in Brisbane. More focus is required on promoting and regulating WSUD for other developments such as individual houses and 'in-fill developments' within existing residential suburbs.

The current provisions have limited 'teeth' in terms of regulating WSUD beyond just stormwater management. The definition contained within City Plan currently limits its focus on stormwater solutions. Council is however currently looking to review the WSUD provisions to ensure they apply to the whole water cycle.

Opportunities for further improvement/development:

Possible options to improve Brisbane's existing WSUD provisions include the following:

- Investigate opportunities to expand the powers under the City Plan and associated documents to regulate requirements for more than just stormwater management (i.e. to include whole water cycle).
- Expand the existing performance targets for Site-Based Stormwater Management Plans to include water conservation targets and fix existing 'loop holes' in the use of water quality objectives.
- Further support the development industry by developing a new technical manual that is consistent with current national WSUD initiatives and the latest available knowledge.

4. CONCLUDING REMARKS

There is increasing recognition that high-quality, well-designed, town planning controls are essential to promote water sensitive urban design. This paper supports that view and has highlighted some Australian case studies where strong town planning controls are being used to address elements of WSUD, albeit in significantly different ways.

Mandatory town planning controls with quantitative targets for water management are however just one ingredient of effective policy and managerial frameworks that deliver widespread WSUD in developing areas. Other ingredients include clear high-level policy statements, comprehensive and consistent technical guidelines and standards, user-friendly models, ongoing and maintained capacity building programs, monitoring and evaluation programs, adequate human resources (especially in development assessment areas), and mechanisms to ensure the whole framework is regularly maintained and refined. Without all of these ingredients in place, on-the-ground results are likely to be modest.

Agencies in charge of designing, operating and maintaining policy and managerial frameworks for the delivery of WSUD are encouraged to review the ingredients listed above, ensure that they are all in place, and be committed to continually improving them by drawing on local experience, innovative models that are used elsewhere, and relevant up-to-date research findings.

When all ingredients are in place to promote WSUD in developing areas, town planning controls can become *highly effective* measures, rapidly creating assets across a region that will work for decades to minimise the development's impact on the water cycle.

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