



**water** *by* **design**  
Creating water sensitive communities in SEQ

# Water sensitive urban design

Barriers to Adoption and Opportunities in SEQ



## Introduction

**Greater cooperation is needed between all levels of government and the private land development industry to lessen the impact of urbanisation on water resources in south-east Queensland according to a social survey of professionals in government and industry.**

The report '*Water Sensitive Urban Design: Research into Barriers to Adoption, Opportunities and Stakeholder Needs in South-East Queensland*' identifies a range of social, institutional, financial and technical barriers preventing the wide-spread adoption of water sensitive development in the region. The report will be used as the basis to develop strategies that will reduce the irreversible impacts of urban development and improve stormwater drainage, reduce water consumption, conserve natural drainage systems, and improve water quality in creeks, rivers, wetlands and Moreton Bay.

The study, commissioned by the Moreton Bay Waterways and Catchments Partnership and undertaken by Brisbane consultants Colmar Brunton in 2004, involved interviewing a number of private industry and government water professionals to determine their current level of awareness and knowledge of water sensitive urban design practices.

It compiled opinions about perceived levels of adoption and identified various barriers that may prevent organisations in implementing effective water sensitive urban design policies and practices. The study also identified stakeholder needs that are critical for behaviour change and recommended strategies to overcome social, economic and institutional barriers.

This document summarises the report's findings. It describes how professionals currently view water sensitive urban design, the perceived barriers to adoption as outlined by participants in the survey, suggestions of ways to overcome those barriers, and a summary of conclusions and recommendations outlined in the report.

## Water Sensitive Urban Design

Water sensitive urban design (WSUD) is an approach to urban planning that aims to minimise the hydrological impacts of urban development to the environment. Also known as 'low impact development', it aims to mitigate development impacts on the natural water cycle.

Water sensitive urban design is about managing water on an urban development in a holistic manner. It seeks to integrate the management of stormwater, groundwater, wastewater and water supply.

Five key principles for water management are to:

- Protect natural systems, such as downstream waterways and wetlands.
- Protect water quality of surface and ground waters by treating and reusing stormwater and greywater.
- Reduce runoff and peak flows, such as providing opportunities to detain water or re-use stormwater in surrounding areas.
- Add value to the social and ecological aspects of development while minimising construction and maintenance costs.

## Research Methodology

The study involved a social survey of 14 in-depth interviews and 3 discussion groups with private industry and government water professionals. In all, there were 36 survey participants who were selected by the Moreton Bay Waterways and Catchments Partnership because of their interest and experience in water sensitive urban design concepts and principles. The report is a reflection of their perceptions, attitudes and opinions. It will be used to develop and implement a Strategy for Water Sensitive Urban Design in South-East Queensland.

The participants comprised a range of professions including engineers, environmental and town planners, landscape architects, asset managers, builders, developers and ecologists, representing local government and private industry. Many survey participants, while supporting the principles of sustainable water use, found it difficult to access relevant information and obtain technical expertise. They also identified a variety of institutional barriers between federal, state and local government agencies, and between developers and some professional associations.

## Summary of Research Findings

The top four barrier areas identified were:

- Lack of broad policy direction, regulations and guidelines by State Government and local councils, and lack of detail in the approval and administrative process.
- Costs for building, maintaining and replacing WSUD related infrastructure by government and private industry.
- 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.

The group also suggested a number of strategies to increase the level of low impact development and water conservation measures in the region. These included a range of reduced water consumption, groundwater structures and water treatment measures. They also included new town planning controls and financial incentives that reduce consumer demand for water. Some participants suggested greater use of well known water conservation measures in homes, such as installing rainwater tanks and water efficient appliances.

When asked about what initiatives they believe their organisation should be doing, the response by the group was mixed. Several indicated that they were doing all they could given their current knowledge and resources. Others indicated they would like to incorporate more water sensitive design elements into more projects. A number of constraints were identified. Their reasons ranged from lack of regulatory guidelines, lack of policy direction, to lack of finance.

Many of the water experts said they were frustrated by the difficulty of assessing clear information and guidelines about how to implement water conservation policies and practices, and how to adapt them to their own local needs. The report recommends establishing a centralised and comprehensive information service to promote practical water treatment measures. The information database would include specific town planning controls, best practice guidelines, case studies of successful demonstration sites, estimated costs to build and maintain assets over 10 years, and an educational database.

Participants in the survey agreed there is a need to develop a range of education and training programs for community groups, developers and water practitioners. Training and professional development could occur at various levels, from short duration workshops for industry staff to fully accredited TAFE or university courses for water managers. Training would also address different levels of awareness and motivation by councils.

The report suggests the production of technical manuals, demonstration sites and promotional materials would be useful in spreading the message about water sensitive urban design. Documenting and sharing the information in publications, online and in various media will generate more interest with decision-makers in industry and government. The report also highlights the need by local council staff, particularly in small and rural councils, to contact experts for technical advice and assistance. It suggests developing a pool of experts who can help councils' design and implement water conservation or treatment projects. The experts could be seconded from various organisations, such as universities or larger city councils, and located at smaller councils where specialist expertise is needed.

## **Knowledge and awareness of water sensitive urban design**

Most stakeholders including government planners, consulting engineers, landscape architects, and residential estate developers have a good understanding of the principles of water sensitive urban design, according to the survey.

They recognise there is a need to better manage stormwater runoff, groundwater and wastewater that flows into creeks and waterways from developed areas. They understand water sensitive urban design means better management of the whole water cycle, from upper catchment areas to the Bay.

Most urban planners, regulators and developers in the survey can recall specific objectives of water sensitive urban design. Their knowledge and awareness of structural initiatives, such as stormwater quality improvement devices, is high. Their knowledge of non-structural initiatives, such as town planning controls and education programs, is also high. They are familiar with other strategies to conserve water, such as greywater reuse and ground water recharge and recovery. The only initiative the survey group appeared unfamiliar with is xeriscaping, or water efficient landscaping, however many claimed to understand this approach.

The survey group said they mainly sought information and advice about water sensitive urban design ideas when it was necessary for a particular project being conducted by their organisation. Often, this was by staff working in private companies that embrace the principles of water sensitive urban design and actively seek to reduce the impact of their development on the environment. Others said they sought technical information to keep up to date with industry trends and best practice, or to get a competitive advantage over other companies.

The survey group said they had mixed feelings about the availability of useful information on water sensitive urban design research, case studies, project costs and management. Many were frustrated with the limited amount of relevant technical information they can access. This significantly limits their ability to design the best structural element for particular sites. They believe a centralised online library or database management system should be developed to collect and disseminate quality information on structural controls. An information management system would promote greater adoption of innovative water design solutions, help set industry standards, and save individual organisations time and money in building their own information databases.

The group said their main sources of information are publications, experienced experts, conferences and seminars, and the internet. Some sought out information by visiting particular development sites and estates to learn how design elements, such as constructed (artificial) wetlands, have been constructed. However, the survey found in nearly all instances, the best source of information is from other professionals who have experience in implementing successful water conservation and urban design projects. Brisbane City Council and Gold Coast City Council were cited as having more experience in water sensitive design than any other council in SEQ. Other professional organisations, such as the Institute of Environmental Engineers and Stormwater Industry Association were mentioned. A number of key individuals with expertise were also mentioned.

Survey participants are aware that Brisbane City Council is developing 'best practice' guidelines for water sensitive urban design. The guidelines are currently used by private organisations and by smaller councils. While they are generally well regarded, the group believe there is a need to develop a common standard of best practice examples and wider set of guidelines with a 'whole of catchment' perspective for the region. They said these new guidelines should be the responsibility of the State Government, who should take a stronger coordinating approach.

Participants in the survey feel that the State Government should take more of an authoritative planning approach and a 'whole of catchment' perspective, which would ensure greater consistency and support by local councils to adopt water sensitive design practices. The Office of Urban Management was suggested as the agency to assume overall responsibility for this coordinating process, along with other key organisations such as the Stormwater Industry Association and Environmental Protection Agency.

## Levels of adoption for water sensitive urban design

In the study, *‘Water Sensitive Urban Design: Research into Barriers to Adoption, Opportunities and Stakeholder Needs in South-East Queensland,’* representatives from government and the private industry identified a number of initiatives currently being implemented in south east Queensland. They include activities such as:

### Structural management initiatives:

- installing domestic rainwater tanks and reusing ‘grey’ water for gardens;
- building swales along roads, sediment traps in waterways and artificial wetlands;
- installing litter traps and gross pollution traps in stormwater drains;
- rehabilitating sites, landscaping drainage areas, and planting native vegetation and grasses;
- re-using stormwater on-site for gardens, ponds and wetlands; and
- using bioretention or vegetated infiltration systems.

### Other non-structural initiatives included:

- offering rebates to install rainwater tanks;
- conducting public awareness campaigns to reduce water consumption;
- developing technical guidelines and training courses for water professionals;
- preserving existing vegetation cover and buffer zones around creeks, gullies and water corridors; and
- regulatory and enforcement controls.

More than two-thirds of survey participants rate education and pollution prevention controls initiatives as the most widely adopted non-structural activity by any private company, large city council, and small or rural council in south-east Queensland. Similarly, they said pollutant and sediment traps to minimise impacts from urban stormwater are the most widely adopted structural initiatives by various stakeholder organisations in the region. Installing rainwater tanks is perceived as being the highest structural water conservation initiative compared to other measures, such as greywater reuse or ‘xeriscaping’.

There are differences in perceived levels of adoption of structural stormwater elements by difference stakeholder groups in the survey. Generally, private land developers were perceived as to be adopting water sensitive design principles, whereas small and rural councils were not. Private land developers generally claimed higher levels of adoption for water conservation measures. Nearly all in the group said they would like their organisation to do more but said there were many barriers to overcome, such as increased costs, lack of guidelines or lack of technical expertise.

In ranking how well their employing organisation adopts water sensitive design principles and practices, staff in private companies and large government organisations tended to rate their organisations highly. The lowest rated organisation was a small local council. Professionals with expertise in environmental planning or design, such as landscape ecologists, environmental and hydraulics engineers, and environmental scientists, were also seen as adopting water sensitive designs initiatives more than other professionals, such as builders and asset managers. Stakeholders in the survey generally agreed that, apart from a few exceptions, private developers had lower levels of adoption. They also indicated that water design initiatives in south-east Queensland lag behind those in New South Wales and Victoria, which implemented water sensitive urban design practices earlier, and which have stricter government legislation.

# Barriers to adoption

The report combined information from interviews and discussion groups to identify a range of barriers to implementing water sensitive urban design in south-east Queensland. Survey participants listed nine barriers. They are:

1. **Policy, regulations and approvals (including legislation, enforcement and administration)**
2. **Finance and costs**
3. **Awareness and training (including access to information)**
4. **Social demand and consumer affordability**
5. **Technology and design (including expertise and performance monitoring)**
6. **Lack of incentives**
7. **Risk management and assessment (including public health)**
8. **Political or senior management support**
9. **Peer cooperation (such as sharing ideas and information)**

## 1. Policy, regulations and approvals

Water professionals in the study considered issues relating to policy, regulation and approvals as one of the most important barriers to the adoption of water sensitive urban design by private and public stakeholders.

The group said current public policy is not broad enough to deal with the goal of water sensitive urban design, and is inconsistent between councils. Local councils are faced with State level policy requirements designed without an adequate understanding of how councils operate. Legislation is not strong enough to be enforceable and is not adequately enforced. An appropriate balance between policy and incentives is needed.

The report revealed government approval processes lack detail, varies in quality and efficacy depending on the individuals undertaking the process, and is being undertaken without adequate staff or financial resources. In addition, because some councils do not fully understand water sensitive design principles, they sometimes lessen the desired outcomes.

Existing regulations do not cover the broad intent of water sensitive urban design. The regulatory framework is more of a problem at the State government level than the local council level, although there are inconsistencies within local councils. The current mix of regulatory requirements is thought to be more of a disincentive on builders and developers to adopt water conservation and design practices. For example, fines to developers for breaching regulations are perceived as inadequate. Administrative red tape was linked to other barriers, while some survey participants identified this issue as a major barrier in itself.

## 2. Finance and costs

Profitability of water sensitive urban design is not seen as a barrier for people who are environmentally conscious and are willing to pay a premium for structures and services.

The report found that costs were perceived as a barrier by local government and private industry stakeholders alike. For example, developers perceived infrastructure or capital costs to be a major obstacle. Smaller councils, on the other hand felt that ongoing maintenance costs were the greater barrier. This may lead to some projects failing to achieve desired outcomes. Survey participants said that some costs could be offset by additional revenue, and even save governments money in the long-term, but true cost savings still need to be identified.

Ongoing maintenance costs, including upgrades or replacement of infrastructure, is perceived as another obstruction. As some structural initiatives are seen as labour intensive and more visible in new residential or public areas, there may be additional demands placed on local councils. The report suggests they could be shared among residents, councils and developers.

One potential problem however, is that increased cost of land in south-east Queensland, combined with actual or perceived costs of design modifications, may reduce profitability for some developments and make some projects unviable.

## 3. Awareness and training

The report found local councils are generally aware of the benefits of water sensitive urban design, although not all councils are the same. It found there are differences in awareness between local and State government departments. The low level of awareness by executive level staff in State government is seen as more of a problem that needs to be overcome. Where positive attitudes do exist within government, they are viewed as short-term political reactions.

The report says where positive attitudes exist in government or industry; they do not always translate into action. There is a lack of awareness about good quality information, and easy ways to assess that information. There are knowledge gaps about principles and practices of water sensitive urban design – one of these is that the development industry does not fully understand why these practices should be adopted. To overcome this barrier, a comprehensive training program is recommended, which shows how water sensitive urban design can be applied in different geographic areas of south-east Queensland.

Professional training, site inspections, technical workshops and short courses are suggested as ways to build knowledge and expertise. Some survey participants suggested an award scheme to recognise outstanding water conservation and design projects. Educating residents about water conservation and catchment management is also seen as an area to focus on.



#### **4. Social demand and consumer affordability**

The report found that consumer demand for water sensitive developments is not likely to be widespread in the community. It suggested that the principle concept of water sensitive urban design, and any associated infrastructure costs, would appeal to certain groups, mainly from higher socio-economic groups who are environmentally motivated. However, survey participants believe that, provided the concept was marketed correctly, with information about costs, benefits and rewards, this barrier could be overcome. A key factor in marketing the concept and benefits is to highlight successful developments around south-east Queensland that have incorporated good water conservation and design projects. The report also suggests that while consumers may think water sensitive urban design is a worthy idea in principle, it may not lead them to spend money retrofitting their homes.

#### **5. Technology and design**

The report found that technology and design, which includes technical expertise and information, could be a barrier to adoption, but it is not a major one, and underpins a number of the four top barriers (described above). Survey participants agreed that adequate technology already exists to address the challenge of water sensitive urban design – however it is the lack of clear guidelines about how to apply different design approaches in different situations that is the problem. Some participants said there is still uncertainty about how to use several tools to support water-planning projects, such as computer models for stormwater processes.

The group believed there is a lack of substantial evidence about the long-term cost-effectiveness of many structural and non-structural initiatives to the environment. They said there are still gaps between theory and practice in the water sensitive design area. Tools to support improved integration of water cycle management aspects during design stages were also identified as lacking.

#### **6. Lack of incentives**

Lack of incentives to motivate social, industry and political change is seen as a barrier that cuts across government and industry. The report says the central problem is that current incentives are not large enough to promote greater adoption and application of practices that support water sensitive urban design.

Rebates, such as the \$500 that Brisbane City Council provides to install water tanks, are highly regarded. However, there is potential to introduce a range of other financial incentives, such as savings by developers for 'headworks charges' (the fee paid by industry to local government to contribute to the cost of drainage, water, sewage and transport infrastructure). Lack of incentives is a significant reason that some smaller rural councils do not view water sensitive urban design projects favourably.

Several survey participants did not see incentives as a significant barrier because they considered them as having no real impact on the adoption of improved urban design. They said that resources should go into targeting other more important barrier areas.

#### **7. Risk management**

The report found that public health and safety could be seen as a barrier where residents are less prepared to take personal responsibility for their actions. Some survey participants said it is difficult for government to make things compulsory and that some sectors of the community may oppose some initiatives. An example given was that some people might perceive open swales or open storm water drains to be dangerous. The survey group felt that health and safety concerns could be overcome with a careful management approach, and by appropriate information provided to the community.

#### **8. Political and senior management support**

The report identified that political and senior management support for water sensitive urban design is not high in terms of political priorities and therefore does not translate into action or government funding. Others suggested that the inertia among senior bureaucrats is due to an inherent conservatism or lack of political will. Survey participants indicated that the only way to overcome this inertia is through consumer demand and social pressure.

#### **9. Peer cooperation**

Peer cooperation is seen a minor barrier and one that is being largely overcome by inter-disciplinary and inter-agency cooperation. Survey participants said there is now considerable discussion about water sensitive urban design in south-east Queensland. Where lack of cooperation exists, it was attributed to an absence of a centralised coordinating body promoting information about water sensitive urban design issues.

## 1. Policy and regulation

Some survey participants believe the best solution is to make water sensitive urban design compulsory with stronger legislation, new regulatory guidelines and enforcement. They believe this would ensure consistency and establish minimum standards of compliance. The study found that incorporating water sensitive urban design into existing standards and legislation could also change council attitudes.

Some survey participants believe that improving and streamlining the approval process by ensuring greater coordination between local, state and Australian government agencies would reduce red tape and avoid application rejections. Most survey participants believe it is imperative to improve the efficiency of the planning and approval process.

One suggestion to overcome this barrier is to assess sites at the initial stages of a development proposal, gain agreement on a vision for water sensitive design, discuss options and estimated costs, get advice from specialists, and work through a planning checklist.

## 2. Finance and costs

The report suggests one key approach to address the perceived additional costs associated with water sensitive design initiatives is to share costs between multiple developments in the same geographic region. For example, instead of having five wetlands on five properties, one could be designed to service all properties. Another approach suggested involves replicating existing contribution schemes for infrastructure charges, such as for sewerage and parks.

The group recommended improving design guidelines and detailed specifications for an initial site layout. The earlier that design elements, such as bioretention systems being integrated into roads and onsite greywater reuse, are included as part of an overall plan, the lower the overall project costs will be. Constant changes and regular additions to project design, particularly in its latter stages, can make the project more expensive. An audit could be undertaken in the region to ascertain what's already working, particularly in small-scale housing estates.

The report acknowledges that there are risks with many urban design projects. It states the concept is still developing, and that sharing the risk is needed to generate more widespread support within the community. Demonstration sites of successful projects will help overcome uncertainty and popularise the concept.

## 3. Stakeholder support and training

The report recommends developing a range of professional training services at different levels for different groups. Participants said courses, workshops, seminars and extension programs will improve peer cooperation, consistency and ownership of the concept. They said professional organisations, academic institutions and TAFE colleges should deliver training.

Survey participants said training should focus on the environmental benefits of water sensitive urban design. They said a coordinating group should be established and work closely with the policy and planning group to develop a consistent approach. The group could lobby to promote design guidelines and greater implementation in both government and private development industry. It should involve people who are passionate about water sensitive urban design. Another area where support and training could focus is in educating consumers about the fundamentals of water conservation and the water cycle.

The suggested umbrella group, linking with government and educational institutions, could help overcome problems of resources and expertise in smaller councils by facilitating specialist exchanges of staff. Technical manuals could be developed and distributed throughout the workplace. Targeted advertising and promotion of water sensitive urban design to industry, government, councils and specialist staff is recommended.

## 4. Technology and design

The report suggests more research should be conducted on the efficacy and long-term performance of water sensitive urban design in the region. More studies into the implementation, operations and cost-effectiveness of various design projects are needed. Actual cost data is needed to overcome the current perception that design costs are high. Comparisons should be made to long-term savings, environmental restoration costs, and social values should be undertaken. Trials could also be undertaken into the cost-effectiveness of retrofitting older suburbs in Brisbane. The report says this could be a useful social change marketing project.

## 5. Lack of incentives

One approach recommended by survey participants is to amend the current system of subsidies so they can extend indefinitely and cover the cost of replacement. Often, consumer subsidies and rebates are for set periods of time and omit costs to maintain or provide for a replacement.

Some councils obtain revenue by selling water. The report suggests introducing a reduced water consumption incentive and removing any links between selling water and local council revenue. It also suggests that State government could provide more tied funding to smaller and rural councils for specific water sensitive urban design projects.

Survey participants suggested that another strategy to reduce water consumption is by developing a water rating system, similar to the five star energy efficient system, which is well known in the community.

There is agreement among survey participants of small rural councils that water conservation and design guidelines should be incorporated into rural residential developments, and that developers should incur the implementation and maintenance costs. This group also felt that developers should be responsible for promoting and marketing water sensitive design initiatives to rural residents. This is because small councils do not have the staff or financial resources to do so themselves.

# The way forward

Survey participants believe the fastest way to adopt water sensitive design initiatives in south-east Queensland is by introducing regulations and providing incentives. There is a preference by private industry however for incentives over legislation. Some people believe if there were a 'big stick' approach, some organisations would never adopt, and may even resist adopting water sensitive urban design principles and practices.

Financial incentives, primarily directed by government, are the most common method suggested by the participants to achieve significant change in the short-term.

The report says that there are no current strategies that will lead to a rapid adoption of water sensitive urban design practices, but some strategies are more successful than others. The SEQ Regional Plan is cited as a worthy initiative that gives water sensitive urban design a stronger regional focus. It says getting this issue into planning schemes is a very good first step.

Communicating research results, long-term performance information and successful case studies of urban water design projects is very useful in promoting support for the movement. While many reports are published about interstate examples, a growing number now document successful water sensitive urban design projects in Queensland. The report recommends further research be undertaken on this subject, including targeted research that encourages further development and implementation of water sensitive design initiatives in south-east Queensland.

The report recommends tracking trends and setting targets over time. The survey group believe the best measure to assess progress over the next one-to-two years is through measurable and quantifiable information.

Some performance data that could be used are:

- number of new WSUD dwellings as a proportion of total new dwellings in a particular area
- quality of water run-off and receiving waters
- quantity of water consumed per household
- whether consumption goes up or down compared to population increases
- number of dwellings with water-saving devices
- awareness level by consumers, developers and government

The study participants also recommended further research be undertaken on this subject, including targeted research that encourages the development and implementation of water sensitive development in south-east Queensland.

The report '*Water Sensitive Urban Design: Research into Barriers to Adoption, Opportunities and Stakeholder Needs in South-East Queensland*' is available from the Moreton Bay Waterways and Catchments Partnership on request.

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