

## **Implementation impediments to institutionalising the practice of sustainable urban water management**

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### **ABSTRACT**

It is now well accepted that there are significant challenges to realizing the wide-spread and self-sustaining implementation of sustainable urban water management. It is argued that these challenges are entrenched within the broader socio-political framework, yet often unsuccessfully addressed within the more narrow scope of improving technical knowledge and design capacity. This hypothesis is investigated through a comparative analysis of three independent research projects investigating different dimensions of the water cycle including stormwater management in Australia, and sanitary waste management and implementation of innovative technologies in the UK. The analysis reveals significant and common socio-political impediments to improved practice. It was evident that the administrative regime, including implementing professionals and institutions, appears to be largely driven by an implicit expectation that there is a technical solution to solve water management issues. This is in contrast to addressing the issues through broader strategies such as political leadership, institutional reform and social change. It is recognised that this technocratic culture is inadvertently underpinned by the need to demonstrate implementation success within short-term political cycles that conflict with both urban renewal and ecological cycles. Addressing this dilemma demands dedicated socio-technical research programs to enable the much needed shift towards a more sustainable regime.

### **KEYWORDS**

Administration; Impediments; Implementation; Socio-Political; Urban Water

### **INTRODUCTION**

It is now well accepted that traditional approaches to urban water management contribute to the degradation of waterways, facilitate the wastage of a valuable water resource and no longer reflect the environmental values of society (Niemczynowicz, 1999; Ashley *et al*, 2004). Since the 1980s there has been a plethora of research into sustainable urban water management technologies and systems, however, experience reveals that there are many and significant challenges to implementation in practice.

The term sustainable urban water management (SUWM) is typically used in various government policy statements and guidance literature but rarely made explicit in terms of the

implications for social, economic and ecological systems and processes. Mouritz (1997) and Newman and Kenworthy (1999) have proposed a series of water-orientated management goals for 'closing the loop' in pursuit of sustainable cities, and include:

- ocean and river wastewater outfalls being no longer necessary;
- recycling of wastewater and urban stormwater for various urban and peri-urban uses;
- creeks and wetlands form an integral part of the city but are managed for their ecological integrity;
- increased extent of pervious surfaces and reduced urban sprawl for urban stormwater retention; and
- reduced requirements for large centralised transportation pipes.

The pursuit of such management goals needs to be considered within broader sustainability imperatives including: 1) maintaining or improving the ecosystem health of the local environment; 2) supporting local social, health and economic well-being; and 3) prioritizing the avoidance (through precautionary measures) of detrimental impacts outside the boundaries of the system being managed. Crucially, the value and definition of each of these qualities is context specific and requires authentic input and engagement of local stakeholders as well as those who reside or work in the area. Consideration to goals such as these strongly highlights how SUWM can be seen as an ideal that is a radical departure from conventional urban water management practice, and therefore, it is inevitable that there will be implementation challenges to be addressed.

This paper is founded on the premise that these challenges are entrenched within the broader socio-political framework of conventional urban water management and that the dominate focus on issues such as inadequate technical design capacity does not engage at the right level to advance on-ground change towards SUWM. An example is that of urban drainage, which is typically undervalued as a waste and usually managed for its economically efficient removal and disposal. Considerable organisational, institutional and value transformations are needed before a shift towards a more sustainable regime is realised in which wastewater is valued as a resource and managed to achieve community based objectives (Brown, *in press*). Although there are some examples where wastewater is being reused it is typically driven by the physical limitation of water scarcity rather than by explicit precautionary planning.

## **RESEARCH INVESTIGATION: IMPLEMENTATION IMPEDIMENTS**

The aim of this paper is to highlight the sources and drivers of strategic impediments to advancing on-ground SUWM practice. This is investigated through reviewing the research outcomes and the principal impediments experienced across the following three independent projects involving:

1. implementation research of a State Government legislative direction on 166 local government organizations across New South Wales (Australia) to prepare and implement sustainable urban stormwater management plans
2. behavioral and life cycle analysis research related the disposal of large domestic sanitary waste items, later followed by a review of structural management measures within the wastewater system in the UK, and
3. meta-analysis of policy and research findings to understand the poor uptake of innovative SUWM technologies across the private house-building sector in the UK.

While each author has been closely involved in one of each of these research projects, this is not the only reason for their selection for this analysis. While each project relates to different

urban water industries, in one way or another each of these industries claim the pursuit of advancing more sustainable urban water management. Despite these claims and the research undertaken, there has been little shift in on-ground practice beyond the status quo for each of the respective research projects. This is an essential dynamic to empirically capture, understand and learn from for formulating future research needs and directions. The longer term intention of this research is to critically inform the development of pathways and strategies for moving forward which specifically enables strategic impediments to be overcome.

## **FINDINGS OF RESEARCH CASE STUDIES**

### **Sustainable Stormwater Management across the Australian Local Government Sector**

This five year research project involved investigating the uptake of sustainable urban stormwater management practices across 166 local government organisations across New South Wales, Australia (Brown, 2003 and *in press*). In 1999 a legislative requirement was placed on these organisations to prepare new stormwater management ‘plans’ in collaboration with catchment stakeholders including the community, as part of a broader State Government stormwater reform program (see Sharpin *et al*, 1999). This did not result in the anticipated wide-spread change and improvement with on-ground stormwater management action, but rather the production of ‘plan documents’ that met with regulatory compliance criteria. While five organisations were identified as implementing leading edge urban stormwater management practices as an outcome (Brown, 2003), the vast majority of organisations (over 100) realised no on-ground change and adaptation towards sustainable urban stormwater management (Brown *et al*, 2001).

One of the most significant criticisms of the program outcomes was that the majority of the plans included solutions that predominately consisted of large and expensive end-of-pipe physical interventions such as large gross pollutant traps and treatment wetlands, with minimal attention to social, policy, planning and administrative interventions concerned with preventative and protective source actions. Many of the technologies listed in the plans added up to well beyond the annual budget of the significant majority of the local organizations. In addition, the research also identified that there was a lack of broader organizational knowledge, let alone commitment to implementation, of the planning process taking place. The research revealed a number of important variables throughout the planning process including (Brown, 2003) including the dominance of engineering consultants leading the planning process, implementers lacking expertise for working with the non-technical community, implementers wrongly believing that the community ‘did not care’ nor were ‘smart enough’ to be involved in the process.

The research did identify positive outcomes such as the development of first time working relationships between different local and state government officers, and the corresponding increase in officer awareness of about the need to manage the effects of poor stormwater quality. However, these positives were severely outweighed by the broader socio-political and expertise impediments. What was clearly identified as an implication of the research is that urban water reform programs require an explicit recognition of the existing and/or potential for professional and institutional inertia (Brown, *in press*). Traditional ways of managing urban water problems are likely to prevail if the local political and community capacity is not directly empowered by the planning process. Understanding the interaction between the expert, social and biophysical interface is the key for building effective relationships and the

support needed to advance on-ground implementation. To effectively move forward the evidence supports the need for capacity building strategies for SUWM including:

- *political support*: necessary for redistributing funding, promoting organisational change, facilitating broader community awareness and maintaining professional and organisational momentum for innovation and focus on preventative strategies through process empowerment;
- *commitment to communities*: a disposition necessary for clinching local political support. This requires appropriate training and skilling of staff and an appreciation of the power of shaping local social norms and behaviours for effectively addressing urban water problems;
- *transdisciplinarity*: necessary for promoting a climate in which a range of expertise is valued including local, community and indigenous knowledge. Also important for addressing the professional inertia in the urban water industry and being catalyst for developing innovative sustainable solutions.
- *institutional capacity*: necessary for strengthening the key relationships between all the players in the catchment and developing a common focus on the health of the aquatic environment. This capacity has the potential to create and shape existing decision-making frameworks that can create action and change to improve urban water management. (Brown *et al*, 2001)

### **Sustainable Sanitary Waste Management across the UK Water Industry**

Two aspects of this major study into the way in which water services can be provided more sustainably in the UK have illustrated how best intentions do not necessarily lead to the best outcomes. These studies both examined the way in which the large domestic sanitary waste items are disposed of in the home. In the first (Ashley *et al*, 2005), it was shown that it was more sustainable to dispose of these items via the solid waste stream rather than down the toilet and that it was feasible to convince populations to change their behaviour if the process was set about in a logical and structured way. This involved being particularly aware of the perceptions and needs of individual communities, rather than presuming that a 'blanket' approach were appropriate. In the second study, the first question was enlarged to investigate whether there were other options than simply switching from toilet flushing to the solid waste stream that may be more sustainable (Ashley *et al*, 2002). Here it was concluded that whilst the removal of these items from the wastewater stream was indeed the more sustainable solution, there were other sewer-related options that could be effected and which avoided the risk that those who had switched behaviour might return to flushing sanitary waste in the future. These options were more sustainable than current practices and indicated that the removal of stormwater as far as practicable, from combined sewers, was a more sustainable solution than fitting screens at overflows and outfalls. In fact any solution that used screens was found to be in the 'least sustainable' group.

Since the first study was undertaken in Scotland, a number of initiatives by the then Water Authorities were set up to run behaviour change campaigns, and several tens of thousands of the population in Scotland were exposed to these, with up to 90% reported behaviour change. The designated title 'think before you flush' was selected to avoid the reluctance to draw attention to having a specific bin in the bathroom for these wastes; a conclusion obtained from detailed public attitude surveys (Ashley *et al*, 2005). Recently the Water Authorities in Scotland were brought together as 'Scottish Water'. As a consequence, most of the staff of the former Authorities engaged in these activities were either moved to other positions in the new organisation or were encouraged to leave. In 2003, the new Scottish Water dropped the 'think-before-you-flush' campaigns and reverted to the discredited UK national (and blanket

applied) ‘bag-it-and-bin-it’ programme. This was despite having invested about £0.25M in the specific Scottish programme and some 15 years of detailed research.

Ironically, in the early part of the European industrial revolution, human waste at least (‘night soil’, or ‘pure’) was valued and the rights to collect and market it were highly prized. In the intervening period humanity has learnt a lot about the disease risks associated with such practices, and has also built up a cultural aversion to anything to do with ‘using the toilet’, to such an extent that ‘sanitised’ names have been invented to describe not only these basic bodily functions, but also the places in which these functions are carried out. Failure to recognise this has meant that the UK water industry’s public awareness program designed to discourage people from flushing non-human wastes via the WC, known as ‘bag-it-and-bin-it-don’t flush it’ is not as effective as it may be. This is because there is a reluctance on the part of many women (those responsible for flushing tampons and sanitary towels) to have a bin located in the bathroom specifically for such waste. The perception is that this bin contains both ‘embarrassing waste’ and it also adds an increased health risk to the household population (Ashley *et al*, 2005).

In the second study, despite concluding that screens were not the more sustainable solution, screens are now widespread across the UK on CSOs and outfalls from combined sewers. This is because they are prescribed by the environmental regulators as mandatory, despite the regulator’s duty to encourage sustainability.

These two aspects of the same study demonstrate a number of important features about the search for sustainability:

- The need for champions with clear vision within both the service provider organisation and also any regulatory bodies to ensure that ‘sustainability’ is understood in the widest sense
- More flexible institutional and regulatory systems – the water service providers are driven by their need to invest in capital works and hence are unwilling to deal with the real source of poor practices, only the symptoms and the environment agency actually behave as if they only wish to protect the environment – i.e their view is one of ‘environmental sustainability’ not a true one
- The need for engineers and scientists to better understand cultural and social factors in effecting better ways of service delivery (i.e. do we need the service at all in some instances?), and
- The need to ensure that public relations organisations actually know something about the real motives behind behaviours that are perceived to require changing.

### **Sustainable Water Techniques across the UK Private Housing and Building Sector**

This meta-analysis of research findings and grey literature was prompted by the difficulty of identifying case studies for an investigation of water innovation implementation in the UK. It sought to answer the question: ‘why are there so few examples of innovative water management being implemented in the UK private house-building sector?’ In particular, the types of innovations that we had expected to find (but did not) were the use of water saving devices like low flush toilets or spray taps, the implementation of sustainable drainage schemes, or the use of rainwater harvesting. The answers to these questions related to the nature of the UK house-building sector and the very limited regulations which oversees the water-related issues around these developments.

For some commentators, the British housebuilding sector does not innovate because of standardization. In particular, UK housebuilding is a specialized sector concentrated in a few companies in which much of the profit arises from land-banking (Adams and Watkins, 2000). As a result, construction is speculative and favours high volume 'pattern-book' developments of identical units, with no room for innovation (Shove and Guy, 2000). Myers (2004: 245) adds to this that the use of many small contractors that combine together for fleeting periods on one development is a further incentive to use simple standard designs. Myers (2004) and Howarth (2000) further recognize that (perceived or real) customer desires form a barrier to innovation in the view of the construction companies. Finally, but crucially Franklin (2001) and Adams and Watkins (2002) both emphasize the lack of regulation of the sector.

There are two obvious routes that could be used to regulate water use in private sector housing developments: the planning system and the building regulation system. Recent developments indicate that the UK government has selected the latter route. The planning system has considerable control over the supply of housing land, with decisions about need made by central government, and local planning authorities then responsible for identifying the appropriate area of housing land to meet the perceived level of demand, as well as approving specific developments. The factors local planners can use in making these decisions are strictly controlled: while vulnerability to flooding does constitute a 'material consideration', neither water supply systems nor sewage capacity can be considered. Consequently, while the planning system offers considerable potential to respond to regional water issues, this tool is as yet of little use in relation to sustainable water management apart from with respect to flooding issues. Indeed, in seeking to meet housing demand in the water-poor south-east of the UK, this system could be argued to be working in opposition to the sustainable use of water at present.

The Building Regulation system is the means by which the health and safety of buildings has traditionally been controlled, and until very recently there is has been no scope to promote sustainable water management. The 'Sustainable and Secure Housing Bill', passed in the 2004 session of Parliament, gives the Government the right to amend Building Regulations to encourage structural reductions in the use of resources like energy – the main driver for the bill – and water use (Stunnen, 2005). The details of these new regulations are yet to emerge, but signs are that some very low 'minimum requirements' will be ratcheted up through time, signaled in advance through a voluntary 'Code for Sustainable Building' (Sustainable Buildings Task Group, 2004).

The strength of using building regulations to control water aspects of developments is that it creates a 'level playing field' in which all construction companies are faced by the same, known, requirements. The use of the Code for Sustainable Building means that future changes will also be known. Its weakness, in comparison to the use of the planning system, is the 'one size fits all' nature of the solution, and the corresponding lack of ability to respond to regional or local circumstances. Given the significant differences in the nature of 'sustainable water issues' across the UK, this solution does appear blunt and potentially ineffective at addressing water supply issues in areas of greatest stress.

## **COMPARATIVE CASE IMPLEMENTATION IMPEDIMENTS**

Each of these research projects clearly demonstrate is that despite the significant technological advances over the last 20years, the on-ground and wide-spread implementation of SUWM techniques and processes is limited. These research insights demonstrate the

implicit inertia of the 'status quo' – the existing technocratic governance of urban water issues. This is indeed cause for significant concern, particularly with evidence such as the lack of uptake of SUWM technologies and retrofit in the private UK housebuilding sector which inevitably perpetuates the existing unsustainable use of water and future social relations and expectations with the urban water environment.

In the Australian urban stormwater case study, it was evident that the process was dominated by technocratic expertise and resulted in plans with a series of technologies with little consideration to the socio-political development strategies needed to enable political relevance and need within the community and the broader local administrative system. The program involved a centralized authority directing local government to prepare plans in consultation with the community, which was unsuccessful, yet all of the plans achieved regulatory compliance. The legislative direction was based on a false technocratic assumption of how to enable change. It involved one set of centralized technical experts directing another set of local technical experts to develop engineering plans. As it turned out this was indeed a naive approach for enabling change towards a more sustainable urban water future, with the idea that the identification of technologies will 'somehow' translate to the necessary political and social capital needed to advance institutional change and implementation.

The UK sanitary waste management case study also demonstrates the many impediments to learning and advancing sustainable outcomes. Despite the behavioral research findings clearly demonstrating the significant potential for specifically designed behavioural change campaigns to reduce the solid loads entering the wastewater systems, an alternative marketing program was eventually implemented. Due to the perceived 'risk' of a behavioural solution, a technological investigation was undertaken. Despite the fact that the removal of stormwater from the wastewater systems was identified as the most effective, and screens were the least sustainable option, the regulative system privileged the screen option. This case also shows that there is a strong expectation and belief that there is a technical solution that is going to solve water management issues in a more sustainable way, rather than needing to tackle the issues requiring political leadership and social changes. The analysis also revealed how this belief led to exaggerated claims of the need for a 'screen' so that the difficult job of finding political solutions is not faced.

The UK housebuilding research also demonstrated, as with the stormwater and sanitary waste case studies, how the regulatory system privileges wide-spread technocratic solutions that are efficient to regulate and mandate, yet are not sensitive to the local and/or regional context. The need for a 'one size fits all' suits a technocratic approach where a technological solution is devised and then mandated in one way or another. This socio-political and institutional context protects the status quo, and inadvertently disadvantages non-technical change management strategies that are essential for enabling SUWM philosophy, strategies and techniques into the future.

## **CONCLUSION**

We have to believe that a solution can be found to get round these difficulties and move towards urban water and drainage systems that are more sustainable. Clearly the key impediments are located within the technocratic culture and structure of the system which includes the institutions, organisations and professions that currently support urban water management. Unless broader strategies such as political leadership, institutional reform and

social change are addressed current research and practice will remain just tinkering around the edges.

It is incumbent on all professionals to understand these issues and to disseminate this understanding throughout our working sphere of influence. This includes the entire stakeholder chain that we deal with, from client to citizen. There is need to expand the boundaries within which we operate, with due account being taken of the need to consider resource, waste and material flows into and out of the boundary and hence the inter-relationship with other sectors (such as energy, transport etc.). This is all likely to necessitate some quite radical changes in institutions and governance frameworks if sustainable water systems are ever to be delivered.

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