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# **The Role of Landscape in Achieving Water Sensitive Cities: the importance and potential of landscape architecture in influencing change towards sustainable water use in Australia's urban environments**

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## **Highlights**

- The existence of desensitised relationship to water in Australian cities is examined for causes and its impacts on sustainable water use are discussed
- The gap between achieving the vision of a water sensitive city and current research efforts in the field is identified
- The application of design research from the discipline of landscape architecture is identified as necessary for understanding relationship to water in urban environments
- Greater engagement of urban design processes is shown as necessary in order to achieve the vision of a water sensitive city
- How the engagement of urban design processes, specifically through landscape architecture, is outlined

## **1. Introduction**

This paper discusses research related to generating water sensitive cities in Australia, using Perth, Western Australia, as a site for testing potential applications of landscape architectural design research to do so. The concept of water sensitive cities has newly emerged and its full ramifications have yet to be explored. There is a need particularly to better engage with how cities are designed in order to readdress the relationships to water within them, with a view to realigning them as water sensitive. The research discussed in this paper has been conducted as part of a Doctorate of Philosophy at the University of Western Australia that has yet to be completed.

The idea of a 'water sensitive city' is now seen as the ultimate goal of water sensitive urban design. Without addressing the entirety of urban water systems, it is questionable that the change required to realise a water sensitive city is achievable. There needs to be exploration into what it means for an urban environment and its inhabitants to be 'water sensitive.' This paper discusses how this might be done through design based research in landscape architecture. It outlines the research findings to date generated through a critical enquiry study, which identified the key issues that are proposed as the focus for a responding design phase.

## **2. Background and Literature Review**

The complexity of the relationship between water and its users are essential issues for consideration if we are to achieve more sustainable relationships with water through water sensitive cities. In the book *City of Flows: modernity, nature, and the city*, author Maria Kaika explains the breadth of these issues in western urban environments. Kaika tracks the path to complete separation of water from the individual by the modernist period of urban design, by which time all water systems were rendered invisible beneath the surface of an idealised relationship with 'nature'. Nowhere is this separation greater than in what she describes as "the private sphere... of newly created private suburban paradises" (Kaika 2005 p 48). In this

consequent “new” realm, the individual “would have no reference (aesthetic or functional) whatsoever to the production relations underneath... complet[ing] the severing of ties between surface appearance and the underground flows and networks.” The importance of this disconnected relationship as a consequence of the design of the urban realm is especially pertinent to water sensitive cities. The need to consider how a desensitised relationship to water is embedded in the design of the urban realm is missing and is therefore a focus of this study.

The role of urban design in shaping relationships to water systems in Australian cities is discussed by Patrick Troy in *Troubled Waters: confronting the water crisis in Australia's cities*, for which he is both editor and a contributor. Troy explains the relationship between the design of cities and of water systems as a reciprocal one that has occurred for the last one hundred and fifty years, based primarily on Edwin Chadwick's water-based sanitation solutions first appearing in the UK in the 1840s. He advocates reviewing this relationship with the aim of identifying and breaking down dependency on potable water for all water uses (Troy 2008 p 197). Troy's argument is that it is necessary to break down the relationship between urban design and urban water systems, especially with regard to their inbuilt, large-scale, consumption-based, supply and waste removal processes.

The document *blueprint2012: Stormwater Management in a Water Sensitive City* from the Centre for Water Sensitive Cities in Australia, also discusses the need to move away from existing water management processes:

*“The Water Sensitive City requires the transformation of urban water systems from a focus on water supply and wastewater disposal (the ‘taps and toilets’ water utilities) to more complex, flexible systems that integrate various sources of water, operate through a combination of centralised and decentralised systems, deliver a wider range of services to communities (e.g. ecosystem services, urban heat mitigation) and integration into urban design”* (Wong et al. 2012 p 3).

The *blueprint 2012* is primarily focused on stormwater systems and specifically their transformation as the means to achieve a water sensitive city. While the described ‘transformation’ addresses points that align with Troy's proposed changes, it misses the reciprocal nature of the relationship between how cities are designed and how water is managed. There is an acknowledgement “...that other parts of the urban water network such as water supply catchments, sewage management, demand management etc., are also important in progressing the objectives for a [sic] water sensitive cities” (2012 p 1). It must be acknowledged that stormwater is only a *part* of this transition and that the benefits linked to it, such as the protection of waterways, would potentially grow exponentially if the water sensitive city first sought to break down inbuilt, reciprocal relationships between the way we manage water and the way we build our cities.

The “form” of urban environments is described by Troy as both created by and a creator of demand for water in contemporary Australian cities (2008 p 191). Stephen Dovers, a contributor to *Troubled Waters*, explains the relationship between water and cities as essentially about the individuals *using* the water, as well as the institutions and systems that harness and deliver it to them (Dovers 2008 p 84). Dovers says “[w]e talk of ‘water management’ but really it is about

managing people, whether individually or collectively in households, firms, communities and cities.” Within this context Dovers explains that institutional change is a central issue to be addressed in achieving more sustainable use of water and this must be achieved through governance including “state, private sector, civil society and public” interactions (2008 p 85). Dover distils this down further, saying that reform and policy – the tools of governance – should be directed at “how human behaviours are managed.” The difference between this sort of approach to sustainable water use in cities and *blueprint2012*’s focus on stormwater as the key to the water sensitive city is striking and demonstrates the need for further consideration on how to achieve ‘sensitivity’.

A key question for research in the field of water sensitivity is therefore to what degree the design of the city can engage with the processes that drive water use. Human behavioural change or the harnessing of an underutilised, problematic resource like stormwater may both only go part way to generating more sustainable water use. It is clear that the use of water and the design of the city occupy a reciprocal relationship. This research explores how landscape architecture can assist in finding mutually beneficial process of designing urban environments and re-designing the management of water systems by focusing first on relationships to water.

### 3. Methods

This research uses a mixed methodology of written work and design work. Both written and design work follow a Subjectivist research paradigm, as defined by Deming and Swaffield in the text *Landscape Architecture Research* (Deming and Swaffield 2011). The written component is defined as a process of critical enquiry, building a theoretical perspective in which the origin, history, practice and proposed future of the water sensitive city are examined. The design phase of the research responds to this examination using a projective design research strategy. In doing this the limitations as well as the possibilities of what landscape architectural design tools can do must be considered. As discussed by Deming and Swaffield, design is not a “science” (2011 p 221). It is instead “a mediated way of engaging the world based on situated knowing and *imaging*.” Both the written work and design components work towards the research goal of asking the essential questions associated with Subjectivist research of “how might things be done differently?” and “what are the consequences?” of an existing condition (2011 p 36). The findings generated in seeking to achieve this goal then inform the aim of the research project. This is to test the ability of landscape architectural design research to generate a response to the challenge of achieving the vision of a water sensitive city.

The paradigm of Subjectivity lists projective design as a research strategy. In projective design the act of design itself is the creator of new knowledge. For this to be done successfully design processes and outcomes must be transferrable as knowledge to more than just the specific problem or question explored. Deming and Swaffield explain this by saying “[d]esign only becomes an autonomous research strategy when it produces new generalisable knowledge about the world through its purposes, protocols and outcomes” (2011 p 206). They characterise projective design as “systematic” and concerned with the “enhance[ing] our understanding of the relationships between the world as it is... [and] what it might become” (2011 p 209). Under this definition, projective design in landscape research has the ability to re-imagine the urban realm and water systems within it.

The written component of this research is presented as a series of three essays, each answering a question that collectively equate to a scoping out of the issues, challenges and future vision of the water sensitive city in the context of Australia. The discussion arising within these essays is proposed to constitute the first half of the thesis' findings.

The second phase of the research is being undertaken as a series of design processes, following the strategy of projective design. The design phase responds to the written component of the research, first in the form of a brief, prepared as a design manifesto for achieving water sensitive cities. The next and current component of design work explores relationships to water in the study site of Perth, Western Australia. This begins with a series of 'evidence walks' in which the presence of water in key locations related to the form of the city and its hydrology is documented. Proposed further design processes include representation of water and its relationship to other systems, intended to also communicate conceptual scenarios and proposals for a more 'sensitive' relationship to water in Perth.

#### **4. Results**

The results achieved in this research so far are the outcome of the written phase of critical enquiry. The written work represents, through discussion and argument in essay style, the scope of the task required to achieve a water sensitive city in line with the vision and theories it is based on. As this begins with an examination of the use of water in the cities of western societies from the time of industrial revolution, it is not possible in this paper to provide a full presentation of the outcomes. Instead this paper will discuss in summary three of issues that were identified as critical for design research to address.

The first of these is the mismatch between the vision of a water sensitive city as it is currently written about and promoted in Australia, and its targeted focus on stormwater in practice. Instead it is proposed that the relationships with water on behalf of individuals in urban environments must be the primary focus of the water sensitive city in both.

Water sensitive urban design in Australia to date promotes a tenuous and problematic 'naturalistic' aesthetic. The *blueprint2012* proposes a relationship between stormwater management and landscape systems to generate a new infrastructure in urban environments. This infrastructure is described as "a network of green and blue corridors of open spaces and productive landscapes that also detain flood water..." (2012 p 11). The development of a new infrastructure that hybridises water management and landscape systems holds great potential, but it must be acknowledged that there are potentially intrinsic negative outcomes for water in this approach, the most potent being representations of nature. Kaika proposes a re-framing of relationships to water by redefining the concept of 'nature'. She uses the example of drought to demonstrate a redefinition of 'nature' as "socially produced" and no longer "external to society (or indeed to the socio-natural hybrids called modern cities)" (2005 p 163). In the case of drought, Kaika explains that breaking down the myth of the natural as separate or external to cities could mean "water shortages would no longer feature only as the direct outcome of a prolonged dry period; rather, they could be understood as the outcome of long periods of interaction between available resources, human labour, and the economics, politics, and culture of urbanisation and water use." To date there has been little critique of the aesthetic of water sensitive urban design and consequently the proposed water sensitive city. This alone points to a need for a much greater engagement with the design disciplines, and especially landscape architecture. The enquiry process found that a major missing element from the vision of the

water sensitive city is a discourse about how it uses aesthetics, and what this means with regard to its ultimate aim of a sensitive relationship to water within urban environments.

The second outcome of the written work is the identification of barriers to change embedded within the urban realm and a discussion on their impacts. These barriers are complex and are the result of interaction between many factors, including cultural and historical relationships to water, the position of political institutions as controllers and providers of water, water based sanitation for human health and the dominance of engineering in shaping large scale water infrastructure across Australia. At their worst these barriers result in an ‘out of sight, out of mind’ attitude to systems of water, representing one of the greatest challenges to the notion of water sensitivity and all it seeks to achieve. These barriers are also the result of the legibility of water in urban design processes, pointing to the need for design research.

In the introductory essay of the text *Water Urbanisms*, titled “Water and the City,” Kelly Shannon demonstrates urban design’s disconnection with water over the nineteenth and twentieth century. Shannon scans the “classic handbooks of urbanism – Raymond Unwin [1909], Werner Hegemann [1922], Harold Maclean Lewis [1949]” and concludes that “one does not find a single substantive component that attends to the relation between water and urbanity” (Shannon 2008 p 5). This is in opposition to what Shannon describes as a previously-existing “tradition of more than 2000 years in which the water structure – artificial or natural – was a keystone of the constructed urban structure... [T]he definition of the city (structure) was unconceivable without river(s) or canal(s) as cornerstones” (2008 p 5 - 6). The loss of water systems as the ‘conceptual’ origin for the structure of the city is explained by Shannon as the result of the characterisation of water as the agent of sanitation. The perceived primary role of water as the method for achieving sanitation changed our relationship to it with vast consequences for the design of the city:

*“...water became an absent presence in modern urbanism, an engineering trick – out of sight and, consequently, out of mind. Sanitised, canalised, covered, cleaned, piped – hidden. Urban water was absent”* (2008 p 6).

This was not the only cause of a disconnected relationship to water within urban environments and therefore a barrier to change. Further to the ‘engineering trick’ of making water disappear through pipes and drains, engineered systems were built on a scale never seen before to capture, redirect, and discharge the volumes of water that cities began to demand. In his research titled “Down the gurgler: historical influences on Australian domestic water consumption,” Professor Graeme Davison of Monash University outlines that “[o]ur present ways of using water are a product, not of primal needs, but of history” (Davison 2008 p 38). As water has been made readily available through feats of engineering our reliance on supply has grown in volume and in function. Water is still the agent of sanitation, but its meanings and uses have compounded into a position where its use is now unconsciously incorporated into much of daily urban life. Davison summarises this position, describing our relationships to water in Australian cities as “shaped both by culture (tastes, fashions, perceptions of health, virtue and comfort) and by path dependency (the particular array of technologies, governmental and pricing regimes we have created to supply and use water” (Davison 2008 p 38). In creating a situation of path dependency Australian urban societies have reached a point where they are seemingly locked

into the processes of control, supply and disposal that the design of the city has steadily relied on as given over the course of the last century. How design might address barriers to change, particularly through processes of revelation, has therefore become a focus of the design phase.

The third and final finding from critical enquiry included in this paper is the scope of change required. The scale of this is potentially colossal and must at least encompass cultural, social, political, economic, infrastructural and environmental systems that relate to water. Within this discussion the landscape architectural design research processes that may assist in this are outlined. Landscape architectural design, and in particular theories of landscape urbanism, are highlighted as capable of generating synthesised responses that can tackle a range of issues with respect to their individual complexity, as well as their combined impacts. Ultimately the written phase of the research proposed that landscape architectural design research using landscape urbanist theories is the best method for exploring how to achieve sensitive relationships to water in Australian cities.

Much of the most recent discussion in landscape architectural theory has been about a move away from being the ‘exterior decorators’ of the built environment towards an engagement with the systems of landscape and by extension all that connects to it, from politics to ecology to economics. The text *Recovering Landscape: essays in contemporary landscape architecture* is an important example of the examination of landscape architectural theory with regard to its more recent developments and possible future. Editor and contributor James Corner in his essay “Eidetic Operations and New Landscapes” proposes what he describes as “[a] move away from ameliorative and scenographic *designs* towards more productive, engendering *strategies*.” By undertaking this repositioning of landscape towards a strategic, interventionist focus, Corner outlines a “necess[ary] parallel shift from appearances and meanings to more prosaic concerns for how things work, what they do, how they interact, and what agency of effects they might exercise over time” (Corner 1999 p 159 - 160). Corner advocates “[a] return to complex and instrumental landscape issues.” In this context landscape’s position “involves more organisational and strategic skills than those of formal composition per se, more programmatic and metrical practices than solely representational.” This positioning of landscape architecture as concerned with “how things work, what they do, how they interact” and their “effects... over time” was found to demonstrate the real potential of landscape architecture in imaging, developing and eventually achieving the water sensitive city.

The water sensitive city is meant to be a realisation of integrated water management (IWM) processes, usually referring to urban environments specifically rather than the broader context of IWM theory, much of which is concerned with water resources outside of cities. The *blueprint2012* clarifies the function of a water sensitive city as an environment “in which urban water cycles are designed and managed as integrated systems enmeshed with urban design and communities...” (2012 p 3). The concept of integrating water systems is a central issue for the future development of a vision for a water sensitive city. A finding of this research has been the identification of a parallel with integration theories, most importantly its strategic, systems-based processes which mirror similar conversations in landscape architecture. An example of this is the theory of landscape urbanism, which explores systems-based, synthesised design responses.

Charles Waldheim, who named the theory, describes landscape urbanism as “a new language” in which landscape becomes central to all other processes (Waldheim 2006a p 19). Waldheim credits landscape as the “most relevant disciplinary locus for discussions historically housed in architecture, urban design or planning” (Waldheim 2006b p 37). In landscape urbanism landscape architecture becomes the discipline most able to realise the whole-of-system approach it has always claimed but not necessarily achieved. Very significantly, landscape urbanism has the capacity to support change through strategic interventions that address systems other than water, an essential component of achieving sustainable water management within integrated water management theory (Lenton and Muller 2009).

Integration is used in integrated water management to mean the coordination of specialised systems in water (Lenton and Muller 2009 p 8). It also recognises that all systems are interconnected. Landscape urbanism is the realisation of a discipline breakdown and therefore the coming together of previously disparate disciplines. The presence in both fields of trans-discipline processes demonstrates another example of an existing alliance between them. Integrated water resource management and landscape urbanism both understand the world as dynamic, shifting and evolutionary. They do not seek a fixed end point but rather work to facilitate adaptive design. There is no end point in achieving integrated water resource management but rather the intention is to achieve continual, responsive and adaptive change (2009 p 13). Similarly landscape urbanism is described by Corner as “a kind of urbanism that anticipates change, open-endedness, and negotiation” (2006 p 31).

What this demonstrates is the potential of a synthesis between theories of landscape urbanism and integrated water management to break down and reconstruct our relationships to water and rebuild them as ‘water sensitive’ over time.

## **5. Discussion and Conclusion**

This research has yet to be concluded and as such its findings are incomplete. What it does represent thus far is a complete examination of what it means to be water sensitive and, specifically, the gap between current research and this outcome. It shows that there is a great need to engage the design disciplines in research that explores the relationships between individuals in urban environments and the water systems they rely on. It begins to explore ways in which this may be done using landscape architectural design processes, and in particular a synthesis between landscape urbanism and integrated water management.

Efforts to find more sustainable ways of using water in Australia have the potential to benefit urban environments globally. Australia’s interests in developing water sensitive cities, especially if better aligned to urban design processes, would set a global precedent that is greatly needed. The International Water Association (IWA) have called for a greater partnership between designers of cities and designers of urban water systems. They explain that this is “key to realising the aspiration of Cities of the Future” and should involve “the expansion of collaboration of the water sector to include those responsible for all facets of city planning, infrastructure and service delivery” (Binney et al. 2010 p 1). A reciprocal broadening of urban design processes to better engage with water management has been identified as missing in the discourse of water sensitivity in Australia. This research represents an example of working towards achieving this through landscape architectural design research.

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