Changing Water Values in Urban Waterway Naturalisation: findings from a Sydney case study

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Abstract: The naturalisation of altered creeks, and the reconfiguration of their surrounds, is an emerging issue in Sydney's water management. This is evidenced by the rising number of plans for naturalisation initiatives. With particular reference to Johnstons Creek Stormwater Channel in inner-western Sydney, this paper examines community and managing bodies' changing perception and values of urban waterways. In addition, it explores the way in which these perceptions and values intertwine with the politics of urban water management and influence the outcomes of the naturalisation process. This research, undertaken using community surveys, observations and key informant interviews, indicates that there is an emerging preference for the naturalisation of altered waterways by the surrounding community. However conflict between human centred and decentred values is also evident. Ecological objectives remain secondary to the dominant political boundaries put in place. Therefore attempting to reinstate natural elements to the urban landscape is still strongly defined by human centred values and objectives, reflecting a continuation of conflict in society-nature relations. These findings add to the increasing body of literature on water sensitive urban design (WSUD) as well as providing insight into the liveability of cities.

1 Introduction

Urban water management practices in Australia have largely come to treat water as a commodity and waterways as a tool for altering flows to provide particular services. Historically, natural waterways within urban areas have been altered and reconfigured to meet the needs of urban residents. The way in which humans value and perceive environments ultimately underpins this alteration and is a part of the multiple characteristics and processes of the urban city which produces the nature within it (Heynen et al., 2006). Through this alteration simplified linear environments have been created, which then impact upon the surrounding urban development. Therefore, the management of urban water is a significant area of interest for all stakeholders, particularly in the city of Sydney, due to pressure from rising demand, high consumption practices and the need for infrastructure (Randolph & Troy, 2008).

Urban water management approaches are changing. Social conflict and policy reform play a part in shifting perceptions and values. Put simply, values are socially and culturally constructed (Howitt, 2001). Established water values, by which we mean psychologically and culturally embedded values, have the power to shape the urban landscape through policy, and may be physically represented through water systems infrastructure such as concrete stormwater channels (Brown et al., 2009). In addition, water values determine how we perceive waterways and manage urban water. As part of this change in values, naturalisation of concrete channels is emerging as a common practice. It is an innovative management technique which aims to incorporate multiple established values (Hillman, 2006), but this is not without complications. Naturalisation, as a feature of WSUD, can also be referred to as urban water renewal, regeneration or restoration.

As a result of the commoditisation of nature, as part of an advanced capitalist political economy, the role of urban nature along with how humans relate to it is altered. Components of nature are reworked and transformed in order to generate revenue and profits (Gandy, 2002). Water as a commodity can be defined as an economic good which is given full cost pricing and market based regulation, with set goals for efficiency and water security (Bakker, 2011). Access to it is considered a human need, rather than a human right (Bakker, 2011). However, water is not necessarily a true commodity as it has numerous dimensions (Bakker, 2010).

The dominant framing of water as a commodity reflects conceptions of urban nature as situated within wider political and ideological discourses, including political ecology (Heynen et al., 2006). Political ecology is a mode of analysis which can explore the interrelationships between various social concerns

(Bakker, 2010). It is useful as a framework for rethinking processes surrounding the politics of distribution and the production of water and waterways (Heynen et al., 2006; Sairinen & Kumpulainen, 2006). In addition it can be utilised to examine how dominant economic values, through configurations of power, have shaped human relationships with waterways and constrained the values which allow naturalisation to occur (Heynen et al., 2006), for example how productions of commodities and power can undermine the foundations of other value systems (Howitt, 2001), in this case, the ecological.

This paper provides a unique political ecology perspective on the role of values and perceptions in urban areas through the exploration of the changing physical form of urban waterways. Consideration of the process by which different values influence naturalisation and the role of political ecology in determining what is achieved, as Robbins (2004) suggests, is critical to understand how political processes produce environmental change and ecological conditions.

Johnstons Creek Stormwater Channel in Annandale, Sydney, was used as a case study to explore conflicting values as they emerge in the process of urban water naturalisation. In this paper the research approach and qualitative methodology will be briefly outlined, followed by a discussion of key research findings, including changes in established urban water values which underpin action in regards to the reconfiguration of the landscape. In addition, the current perception of urban waterways, the increasing value of 'natural' elements within environments, and the tension between constraining and enabling factors will be explored. This paper concludes by suggesting diverse values must be better reflected in management approaches such as naturalisation, as engineering values currently dominate the management process which undermines the ultimate goal of naturalisation.

2 Research Approach and Methodology

2.1 Overview of Johnstons Creek Stormwater Channel

Our case study is a former natural meandering creek, now stormwater channel (Figure 1), within a densely populated urban area in Sydney of which parts are to be naturalised at an undetermined future date (see Master Plan for Johnstons Creek Parklands 2013). Johnstons Creek Stormwater Channel, which is approximately 2 km long and up to 5 metres wide, is largely located in the inner-western suburb of Annandale and is bordered by Rozelle Bay, Parramatta Road and Whites Creek Stormwater Channel (Stening, 2011). The water currently within the concrete lined channel is brackish and has tidal fluctuations within the predominately shallow basin. The channelisation of this waterway was initiated by the government due to health concerns and was converted to a wide and shallow concrete channel around 1897 (NSW Public Works Department, 1987; Stening, 2011). It has continuously shaped the surrounding parklands and residences, yet it also reflects key changes in urban development and social valuation of ecosystems and their services (Costanza, 2000).

Figure 1. Extract of Map of City of Sydney Local Government Area 2008, showing Johnstons Bay to the North and Johnstons Creek to the South-East.
Source: City of Sydney Council (2008).

A number of significant physical, political and social changes have shaped the suburb of Annandale. In direct challenge to Aboriginal occupation, the landscape was converted to farmland by 1830, though this gave way to expanding industry in the 1840s (Solling & Reynolds, 1997). The area then went through extensive subdivision for residential, commercial and industrial uses (The Annandale Association, 1980; Stening, 2011). The area known as Johnstons Bay was reclaimed during the late 19th century (1880 and 1890) to form new land for these increasing developments (Stening, 2011; Leichhardt Council, 2003). With the construction of the stormwater channel and other infrastructure the water management system evolved from water supply city to a sewered and drained city which was driven by desires for water supply, access and security as well as public health and flood protection (Brown et al., 2009).

The transformation of Johnston Creek from natural waterway to stormwater channel is a manifestation of changing values and reflects wider political economic and social changes. In particular, the construction of the channel aided in flushing pollution away from the residents and into the harbour, preventing it from accumulating and causing significant health problems (Stening, 2011). As a result, natural spaces and processes were both interrupted and sped up, causing widespread loss of water-land gradients, loss of vegetation, and intense periodic flooding, suggesting a complete lack of concern for urban nature and water (Sabolch, 2006).

An increase in green spaces occurred in the 20th century and industry moved out of the area (Stening, 2011; NSW Public Works Department, 1987), suggesting a shift to a ‘waterways city’ which improved social amenity and environmental protection (Brown et al., 2009). Presently the local council maintains the areas of green space, including salt marsh, an endangered ecological community in NSW, and grey mangroves, whilst continuing to invest in new recreational spaces and facilities. They maintain a ‘water cycle city’ with limited natural resources, yet promote waterway conservation and protection (Brown et al., 2009)

Recent efforts to restore the area surrounding Johnstons Creek and include naturalisation in long term plans reflect the increasing practice and importance of restoration. Notable naturalisation initiatives nationally reveal the inclusion of multiple values and a convergence of the enabling context. Firstly, the naturalisation of Merri Creek, within rural Victoria and inner-city Melbourne, was initiated in 1989, and involved the removal of weeds, revegetation, the introduction of signage, and planned ecological burns over numerous grassland and wetland sites (Bush et al., 2003). Secondly, Clear Paddock Creek in Fairfield, outer western Sydney, was naturalised initially in 2011, including the removal of 2.5 km of creek channel, the placement of pollutant traps and the construction of sediment ponds and wetlands (Frost et al., 1997). Finally, the naturalisation of three sites along the Cooks River, Sydney, including the removal of concrete and placement of sandstone banks, construction of pathways, planting of native species including saltmarsh and the production of wetlands were initiated in 2008 (Sydney Water, 2008). These examples, along with Johnstons Creek, highlight a move towards a 'water sensitive city' which incorporates intergenerational equity and adaptation as well as resilience to climate change with the development of infrastructure and urban design elements which reinforce water sensitive behaviours (Brown et al., 2009). The City of Sydney Decentralised Water Master Plan 2012-2030 (2012) is another example of a strategy to effectively reach sustainable targets for water use in future.

2.2 Research Question and Methodology

This study seeks to understand community and key stakeholder values which underpin the shift towards naturalisation as a management practice. It predominately focuses on how clearly, and in what way, are a diverse range of values reflected in local activities and community perceptions. This approach will provide insight into how these values link to our human relationship with nature and how we understand urban nature.

Qualitative methods, including community member surveys, observations, key informant (KI) interviews and attendance at public meetings and events (Table 1), were utilised, from July to October 2012 to explore these issues. . Key informant interviews were the main method used to gather data for this study. A qualitative approach is most suited to the research concern as it captures thoughts, feelings and perceptions of how we relate to the self, others and nature.

Table 1. Methodology: purpose and detail

Purpose	Detail
Community Member Survey	
To examine the views and values of those who interact with the waterway and their interpretation of a natural versus channelised waterway	A short six question survey (without a definition of naturalisation for comparison) was developed and randomly distributed to 36 individuals
Observations	
To compare activities undertaken in the area and identify the elements of the landscape which were valued by users	Age group, gender and activity were recorded for one hour time periods in the morning, early afternoon and late afternoon, repeated on a weekday and weekend
Key Informant Interviews	
To examine key stakeholders' professional roles as well as personal opinions and values in relation to the naturalisation process	Eight semi-structured key informant interviews were conducted by phone and face-to-face
Attendance at Public Meetings and Events	
To provide a direct connection to local urban water management issues, community opinions and council priorities (Valentine et al., 2010)	The researcher attended Johnstons creek Parklands Masterplan community consultation, Leichhardt Council Environment and Recreation Committee meeting and Footprints Eco festival at Whites Creek
Data Analysis	
To identify common repeated words, phrases and	A constructivist approach was used for data

significant themes related to the questions	analysis to reflect the researchers' and respondents constructions of the world (Gibbs, 2008)

3 Results

This section firstly outlines values and perceptions expressed towards the current channelised waterway, secondly, looks at local and wider community ideals for its naturalisation, before finally discussing the numerous enabling and constraining factors which influence the extent to which naturalisation occurs.

3.1 Values and Perceptions of the Current Channelised Waterway

The particular ways in which the local and wider community value the channel provides insight into how it is perceived, how well their interpretation of naturalisation would be regarded, and what precisely that would entail. From the data collected there is a mixed perception of the channel, though it is predominately negative.

In reference to the community survey, seven of the total thirty-six respondents (19.5%) preferred the waterway in its current channelised state than to what they consider to be naturalised. The waterway was described as 'good' by four respondents, 'beautiful' by three respondents and 'clean' by two respondents. In addition, one key informant stated that "the park areas are increasingly being used and I think that does mean people like the creek" (KI#3). In addition, a state government representative stated that 'there is the public perception that turning waterways into wetland areas or other types of stormwater management can be a negative' (KI#1). This suggests that the current condition of the channel has not detracted from the overall value of the parklands.

Likewise in the community survey responses, twenty nine of the thirty six respondents (80.5%) would prefer, what they considered to be, a naturalised waterway. This perception is the basis for a value of naturalisation. The more negative terms used by respondents to describe the waterway were 'ugly', by ten respondents, 'smelly', by seven respondents, 'dirty', by seven respondents, 'littered', by seven respondents, 'tidal', by seven respondents, and 'drain', by five respondents. These numerous terms suggest that the waterway is perceived as unpleasant overall, and though it is somewhat functional as a drain, it has little intrinsic, utility or heritage value in its current state.

3.2 Local and Wider Community Aspirations for the Naturalisation of the Channel

Numerous common features arose in peoples ideals for a restored channel. Those most important to respondents included more 'native plants', mentioned by twenty respondents, 'access', mentioned by ten respondents, 'rocky banks', mentioned by ten respondents, and also 'less concrete', mentioned by nine respondents. This suggests there is a value for the removal of obvious human modifications to urban waterways, including concrete banks and a lack of vegetation.

There are many ideals for the naturalisation of Johnstons Creek. Community survey respondents (SR) had numerous justifications for their ideals which also reflect perceived benefits. These can be categorised as both anthropocentric and eco-centric, both of which cover a wide range of areas. Those which are anthropocentric include aesthetics and cleanliness (reduced graffiti), utility of the area (improving the environment and access), relaxation and recreation (for dog walking) (Figure 2).

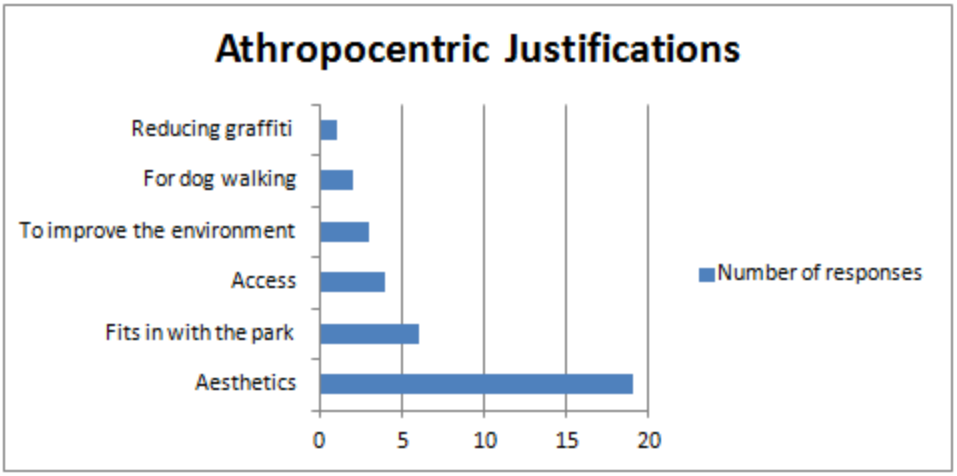

Figure 2. Anthropocentric justifications for ideals

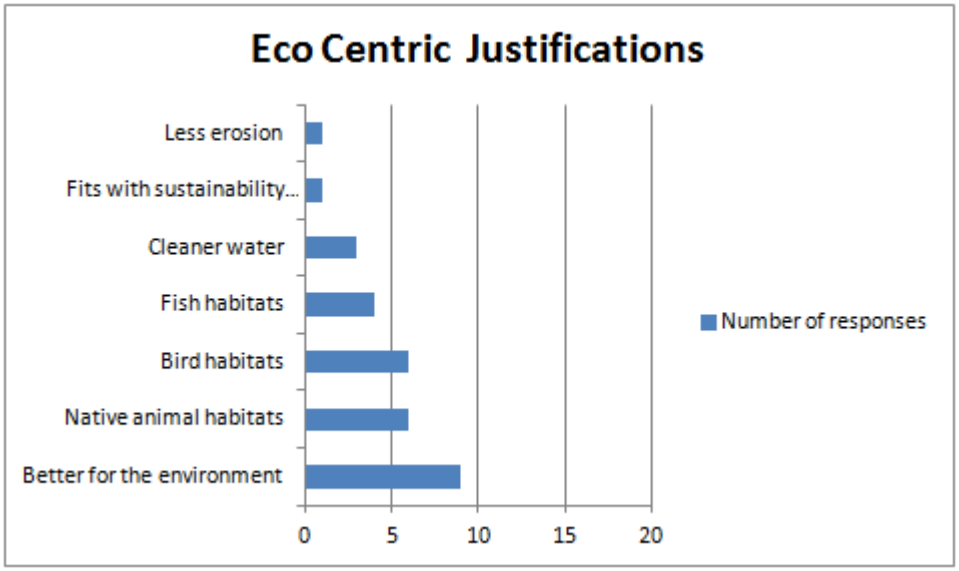

Figure 3. Eco-centric justifications for ideals

In contrast, those which are eco-centric, include improvements to the physical landscape (less erosion and cleaner water), improved biodiversity (through increased habitats for birds, fish and other native animals), continuity and responsibility for the environment (fits with sustainability and better for the environment) (Figure 3). These various anthropocentric justifications provided by community respondents are due to the popularity of the area for numerous activities, though predominately walking and bike riding (Figure 4).

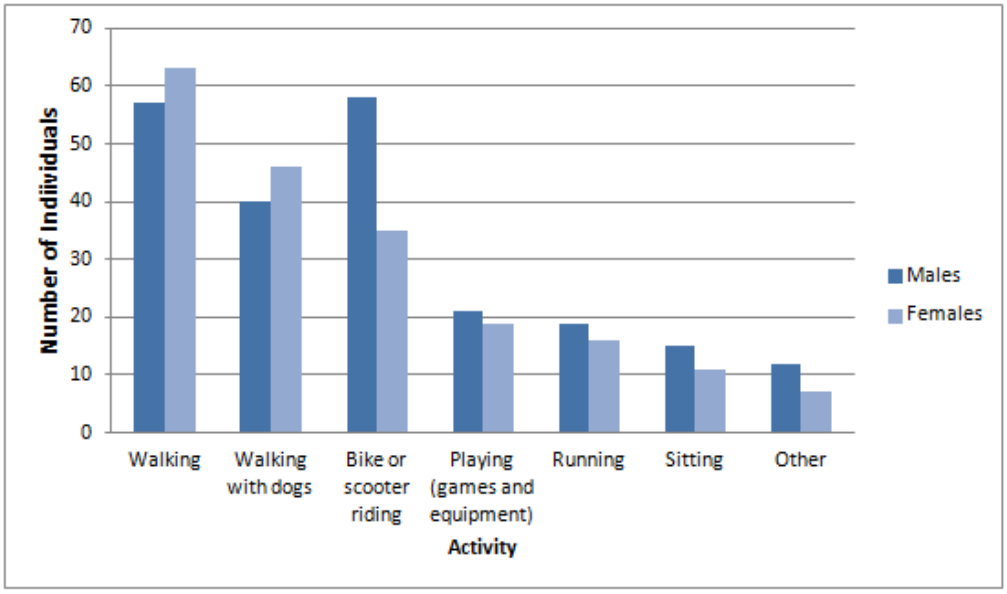

Figure 4. Activities undertaken in the research area by gender

These activities vary according to gender; women walk more often than men, while men are more likely to bike ride. This influences personal preferences for the outcomes of naturalisation and may result in conflict over land use. For example, walkers and those who walk dogs have differing views on the use of space and likewise male bike riders may come into conflict with female walkers on shared pathways.

3.3 Enabling and Constraining Factors

Certain enabling and constraining factors influence the extent to which particular values shape the naturalisation process. There may be increased recognition of certain values, but inclusion of these in practice is a challenge. There is a question of whether ecological values are granted greater validity within policy and decision making than engineering values and other constraints (Bush et al., 2003). So far we have outlined anthropocentric and ecological justifications for naturalisation as a reflection of numerous ideals and values. The recognition and inclusion of these values in management decision making practices is difficult as they may be incompatible or in conflict. Moreover, many are intangible in an economic sense (Costanza, 2000). Constraining factors, the presence of which signifies that certain values do not shape the naturalisation process, prevent transformations in urban water management. The most significant constraining factors which emerged in KI and SR responses include the potential for flooding, the heritage of the channel, lack of waterway visibility and the cost of initiatives.

The potential for flooding was a major concern to all respondents due to the nature of alteration of hydrological processes within the catchment, which currently overloads infrastructure. Little of the catchment area is pervious (26.3%) with the majority consisting of roofs (35.7%), road (16.9%), and hardstand (i.e. paved or concrete surfaces) (20.9%) (Figure 5) (City of Sydney Council, 2012). As a result of the impervious surfaces, there is significant stormwater runoff and, in addition to high rain events, localised flooding often occurs (City of Sydney Council, 2012). In low rain events the channel serves as protection from flooding, prevents short term loss of open space (due to inundation), minimises risks to humans and property, and allows for the quick flushing of polluted water out of the area.

The value of the post-European settlement heritage of the channel, predominately the age and form of construction which date back to the 1890s (Stening, 2011), impedes the naturalisation process with certain stakeholders expressing a wish to conserve these. A key informant provides an example, in stating “there’s one project...where its state heritage listed, and that becomes, it sort of jumps up in the priority listing. It sort of jumps ahead of environmental and biodiversity [values]...” (KI#7).

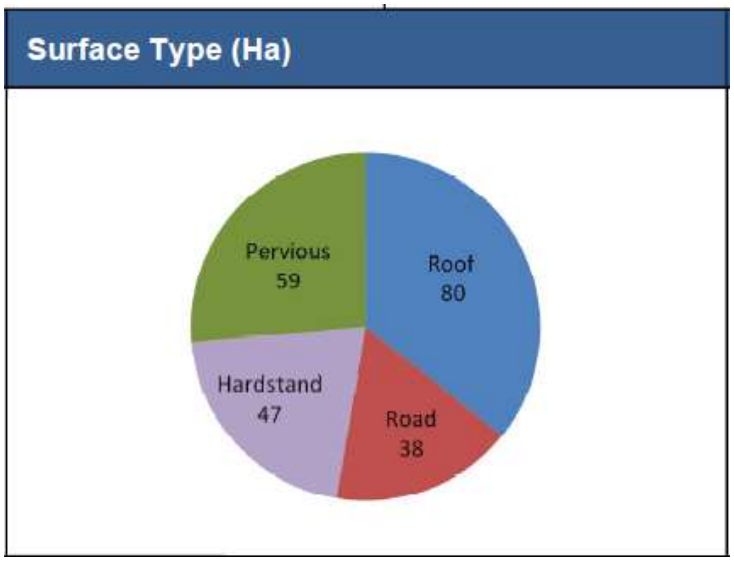

Figure 5. Surface type of Johnstons Creek catchment area
Source: City of Sydney Council, 2012

Lack of visibility and awareness of urban waterways is a third constraint, as construction of infrastructure acts to hide water systems. One state government representative stated that "...people don't see that a lot of these creek areas have actually been, you know, covered over, and people don't actually know that a creek or stream is there..." (KI#1). Waterways have become intangible and unknown to the surrounding community, and the ability of people to actually observe and interact with waterways impacts upon how they are perceived. It is difficult to value something that is not seen or interacted with. This constraint essentially forms a key justification for naturalisation as a way to encourage greater valuing of the environment or urban nature. We will return to this point later.

Finally, the cost of naturalisation initiatives is a very significant constraint as there must be clear public interest and justification for spending large sums for such projects. One key informant estimated that to remove the concrete banks alone would cost between ten and fourteen thousand dollars per metre of channel (KI#7), amounting to hundreds of thousands of dollars. As noted above, some respondents stated that the funds were better spent elsewhere. Projects must be cost effective for all key stakeholders involved. Catchment wide processes contribute to a kind of lock-in to particular outcomes and to restore natural processes would require considerable coordination across a catchment.

Creating an enabling context is challenging, as it requires collaboration between numerous actors across numerous sectors and scales. The most predominate factor required is 'champions' (Brown, 2008); individuals who personally and professionally value urban waterway naturalisation as a viable management practice, and play a role in generating institutional and community action towards a more water sensitive approach. In this case, champions from local councils, community and key figures in the water industry play a pivotal role.

Secondly 'community support' and involvement is necessary as it can prevent over-expenditure and facilitate long term naturalisation outcomes. As part of this, an ethic of care can establish community responsibility for the local environment and associated ecosystem services (Costanza, 2000). The role of the community (including visitors) at Johnstons Creek is mixed. The majority expresses an ethic of care towards the creek and some participate directly in naturalisation efforts, be it attending community meetings or becoming involved in local volunteer projects. This active involvement of the community in naturalisation helps validate ecological values in the decision making process (Bush et al., 2003). Without such active community involvement key decision makers may disregard the values which underpin this ethic of care.

In addition, funding across all levels of government is essential for an initiative of this scope and scale. Funding is required for all stages of naturalisation and therefore capital from numerous actors is vital for restoration efforts, though it is widely recognised as lacking. A clear justification for spending the large sums of money associated with naturalisation is required.

Finally a 'catalyst' or opportunity is required to initiate management decisions and therefore the naturalisation process. This catalyst may be political, physical or social in nature. In this case, the re-development of Harold Park Paceway and former Rozelle tram depot site, which will deliver new parklands, 1,250 new dwellings and new paths for pedestrians and cyclists (Central Sydney Planning Committee, 2011), provides a significant change in the local area and an opportunity for naturalisation to be incorporated into future development plans. Water has become more valued with a changing climate and sustainable practices are increasingly becoming a social norm. Major stakeholders are reflecting this change. The naturalisation of Johnstons Creek Stormwater Channel has been incorporated into future plans due to long term community support, change in water infrastructure and park use, and the degraded nature of the concrete in the more open end of the channel. Such factors come together to make naturalisation more economically viable. These four factors together provide clear management opportunities for improving water practices and WSUD.

4 Discussion

In light of the above results, this section discusses the changing values of water apparent in our case study, the potential for integration of ecological and anthropocentric values, conflicting values and value recognition within water management.

4.1 Changing Values of Water

The connection between the diverse ways water is valued and the actions taken to manage urban waterways are shaped by political, economic, cultural and scientific processes (Gandy, 2002). Understanding these connections has implications for our relationship with constructed urban natures (Heynen et al., 2006), the liveability of cities, urban water management and the naturalisation process. In this case, the process of naturalisation potentially renews the links between nature and the community, and provides new meaning and identity to the area through the re-conquest of nature (Euzen & Morehouse, 2011).

The relationship of the community with Johnstons Creek is changing. Individuals greatly value localised naturalisation, suggesting a social shift in perceptions of nature and expectation of urban waterways. These urban water values have evolved over time (Euzen & Morehouse, 2011); in this instance from an unhygienic drain, to a vital improvement to the suburb, and now an unappealing feature of the landscape. Community responses suggest that the public desire to revalorise waterways, reflecting their perception as a source of biodiversity, aesthetic pleasure and use for recreation (Euzen & Morehouse, 2011). In addition, the preference for naturalisation likely stems from the lack of green space in the local area. These scarce green spaces have become the new backyard for urban dwellers, both on weekdays and weekends, and the community aspires to have an improved landscape to match their shifting expectations.

However, there remains some aversion to naturalisation in the community due to the perception that it has remained the same for a long time, and the funds allocated to naturalisation should be prioritised elsewhere. The channel is also considered to be a safe guard against flooding, as one respondent noted: "I'm more reassured that the channel is there as protection from flooding" (SR#34), though the channel cannot currently cope with extreme flows.

4.2 Ecological and Anthropocentric Values

Whilst the majority of respondents desire a naturalised waterway, there are mixed views on the last remaining strongly natural element: tidal changes. One respondent stated that 'it's not a waterway when the tide is out' (SR#25), suggesting that this remaining natural element is undesirable and water must be continuously present for it to be considered 'natural'.

The desire for naturalisation reveals that the general perception of and engagement with the channel the waterway is changing from that of a stormwater channel, fulfilling a necessary functional role in the urban water system, to a degraded creek which requires human intervention to recreate 'nature'. To many this 'nature' includes vegetated landscapes and meandering, flowing waterways, and is strongly preferred by the majority of the local and surrounding community (Kenwick et al., 2009). It significantly does not include concrete. In an attempt to achieve these goals, the integration of both ecological and anthropocentric values is required. However, certain natural elements are not readily adapted to, but continue to be perceived as a problem. Economic and political factors, along with conflicting community values and activities in the area, constrain the extent of naturalisation.

4.3 Conflicting Values

Although a majority of key informants also preferred a naturalised channel, some questioned the feasibility of completing a project entailing such major works when there are numerous challenges. In particular, the different jurisdictional boundaries between councils and other agencies causes constraints, as noted by one local council informant who stated that "[the naturalisation cannot] damage or remove park infrastructure that we've just spent lots of money putting in, like a shared path, lighting and other stuff that goes with that" (KI#5). In addition, threats of flooding, community conflict between those for and against naturalisation (KI#2) and negative preconceptions of naturalisation (KI#1) must be overcome.

Numerous incompatible objectives for the channel reflect different ideals for human interactions with urban nature. Therefore, it is likely that in the event of naturalisation taking place there will be conflict over whose vision of naturalisation will be reproduced, as well as contestation between ecological, recreational and political values (McManus, 2006). The most significant of these is aesthetics.

The results suggest that aesthetics is the most common factor underpinning a value for naturalisation of the channel, and therefore respondents aspire to a more aesthetically pleasing waterway and surrounding landscape. The issue with this however, is that natural environments are messy and naturalisation may not provide the desired aesthetic improvements. A landscape with natural features may not necessarily meet community expectations, as it is more conducive to biodiversity than a carefully landscaped, aesthetically pleasing environment for recreation. For example the planting of mangroves on the foreshore of Rozelle Bay was undertaken due to the community desire for visual diversity, softening of the foreshore, educational opportunities and to increase mangrove sites in the area (McManus, 2006). However, the desired outcomes have yet to be reached. Access likewise may impede on biodiversity and aesthetics as it reduces the capability of stakeholders to improve the area in close proximity to the waterway. Instead, nature has its own agency and is subject to biophysical processes, including sunlight, water, soil quality, temperature, extreme weather events as well as competition between or within a species. This prioritisation and numerous ideals suggest that human centred values do, even in efforts to 'naturalise', continue to dominate justifications for naturalisation.

4.4 Value Recognition

Monetary exchange values are produced as well as prioritised due to the commoditisation of water (Bakker, 2010). Other values therefore, are often omitted or only weakly represented in the policies which underpin urban water management (Gandy, 2002; Heynen et al., 2006; Euzen & Morehouse, 2011). Decisions are made in terms of industry gain as well as protecting public and private assets, rather than improving ecological functioning, even when social change reflects greater environmental values. However, constraining and enabling factors are influencing the practice of prioritising exchange. A lack of value recognition in management, as well as unequal power relations within political ecology and economy have, and continue to, constrain the full potential of naturalisation. This lack of value recognition must be addressed in order to reconsider our relationships with nature and water, particularly in the process of naturalisation (Swyngedouw, 2004). Enabling factors, including champions of the cause, support and involvement of the local community, economic capital and finally a catalyst or opportunity, have the ability to come together to form a context shaped by diverse values. There is an increasing prospect of achieving this enabling context as urban water values of key stakeholder continue to change.

5 Conclusion

This study demonstrates that human connections with urban nature, particularly urban waterways, are changing. This is due to the shifting environmental and social context in which urban water management occurs, with values as a significant driver of change. Our results show that few of the community respondents or key informants interviewed disliked or rejected the concept of a naturalised channel in place of the current concrete waterway. Our case study indicates that there is a greater appreciation and value of natural elements and processes in urban areas, as well as the benefits they provide. Responses suggest that previous interference with the natural landscape should be reversed, however, only to a certain extent.

There is a tension between key enabling and constraining factors which impacts upon and restricts decisions in both the community and managing bodies. These constraints, structured by wider scale processes, such as competing economic priorities, catchment conditions, heritage restrictions and community conflict, play a significant role in determining what can be realised. In addition, current regulatory water management bodies and their political practices still do not adequately acknowledge the various and inseparable values or cultural meanings of water (Leybourne & Gaynor 2006), though they may try. Water management bodies are at least now attempting to reach the goal of 'water sensitive city' (Brown et al., 2009).

In this case, the constraining factors continue to dominate the process of naturalisation, even when significant changes in ideas and practices are occurring at multiple scales. The regulatory framework expresses competing values held by different stakeholders yet ultimately some dominate more than others. Environments continue to be reconfigured by humans through urban water management processes and other types of initiatives, as the traditional view of seeing a waterway as a tool continues to dominate and constrain community and institutional thinking. Consequently, the re-conquest of nature is still prevalent and water management continues to be defined by human centred values and objectives. These constraints ultimately limit what can be achieved in a radically modified urban environment and how much 'nature' can be restored. Can these constraints be overcome in such a way that allows ecological values to truly shape management processes? Is this possible in such a radically modified and interconnected environment? For this to occur, a significant rethink of how initiatives are coordinated and carried out is required, and in certain instances naturalisation can be achieved.

Constraining factors dominate even when changes in ideas and practice on multiple scales have occurred. Hence, the outcomes of restoration will likely reveal which of these conflicting values dominate in the institutional landscape and naturalisation process. Identifying these focuses our attention on specific sites and opportunities for contestation and change.

The convergence of the enabling context, in which the community and their place based interactions are at the centre of and connected to the wider scale naturalisation process is likely to result in greater inclusion of all values which are then reflected in naturalisation outcomes. Naturalisation, and the elements that make up community ideals, are interconnected with the everyday place based encounters and interactions with urban nature. By ensuring place based values shape management processes at wider scales, the likelihood that ecological values will dominate increases. Naturalisation projects of this nature require a coordinated scaling up of management. However, there is then a risk that through this scaling up attention on place based values may be lost. If naturalisation efforts are pursued in an ad hoc and isolated manner the ecological results are likely to be transient, literally washed away with the next peak rainfall event. Instead, community efforts need to guide, connect with and be supported by wider catchment scale nauralisation efforts.

This study provides an original political ecology perspective on urban water and what Allon (2006) describes as the wider cultural, social and emotional field in which values and practices of stormwater exist. Political ecology provides an understanding of the values and perceptions of urban nature, the politics underpinning decision-making and the current urban water systems theory and practice. As humans share many common experiences in regards to their engagement with water (Leybourne & Gaynor, 2006), the findings of this study can inform urban water management contexts nationally and internationally.

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