CHAPTER FOUR - IMMERSION – ‘LIKE WHEELING STACKED WATER’

Whilst it appears we have set off on the path to change with the work being done by local governments, water boards, the Office of Living Victoria and various government commitments it is well worth reminding ourselves of the extent of the task, the need to resist making assumptions about how speedily or readily change can be effected and the importance of a continued commitment to change.

It is important to remember that it is in the context of climate change and great uncertainty that we strive to make the changes we clearly need to our cultural understandings of water. Deconstructing centuries or even decades of habitual behaviour is a challenge – if it were easy we would have done it a while ago.

A scan of the scholarship and of developing practices assures us that we will need more than technical fixes and isolated and site specific projects to resolve known, and anticipated, contemporary water issues efficiently and in a cost effective manner.

What follows is a discussion of the ongoing challenges, even in a climate of reform.

Issues relating to law reform have been discussed earlier but those issues and the questions that discussion raises are of relevance here as well.

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4.1 Interdisciplinarity – not just wanting but designing and effecting change

Where we need to be – from technological innovation to the new norm

Over the last 10 to 15 years, Australian practitioners in urban water management have shown a willingness and an ability to transition to Integrated Water Cycle Management and Water Sensitive Urban Design. This has occurred as the technology, disciplinary understanding, language and ethos of this approach has developed to industry standards. Innovation has also been increasingly referenced in multi-disciplinary settings and in policies and, to varying degrees, in practice across all levels of government.

Leadership, strategic business planning, good and purposeful management and governance structures, efficiencies, full cost life cycle accounting and integrated resources management are better understood as is the need to align and integrate to effect change.

To realise the vision of a water sensitive, equitable green city and economy we will need to cultivate:

… a cross-disciplinary approach involving design professionals … who will base their design decisions on evidence derived from a range of academic disciplines including the biological sciences … social sciences … and sciences that deal specifically with relationships between biological and built environments.

Intelligently understanding the multiple values of water, and valuing and pricing its use and wastage properly, the smart city, and its residents, all tiers of government, office workers, manufacturers and retailers, will have a range of roles in appreciating the significance of design and best practice.

Design which integrates multiple knowledges and which is responsive to multiple-use scenarios and also specific but sometimes shifting demands will be pivotal to sustainable outcomes.

Knowing that the tools for this interdisciplinary rethink already exist - integrated water cycle management, water sensitive urban design, green infrastructure, systemic practices – but that they still appear to struggle for recognition, we need to actively promote a new water sensitive multi-disciplinary design paradigm to ‘mainstream’ change.

Design, broadly understood as a practice and an ethic, will underscore the built environment we aspire to but it will also have a role in the way we understand the use of space and landscape, incorporating, for instance, the skills of landscape designers as well as architects. Localised recycling of sewage linked to local productive landscapes is perhaps the simplest form of resource recovery (producing both water and nutrients), but the landscape design which can underpin it is much more than an exercise in utilitarianism. This will be the case with each of the disciplinary specialisations we need to deploy: they will produce practical and deeply disciplined but also aesthetic possibilities.
4.2 The new applied research agenda

Scientists and engineers will play a role in designing the new systems and structures. Water recovery technologies are already well developed and energy recovery technologies are advancing. Emerging research efforts include those directed at phosphorus and potassium recovery to overcome imminent global peak production of phosphorus and potassium. Innovations present as opportunities on a number of levels.

Water corporations like Melbourne Water will find themselves in a position to increase their links with researchers in areas as diverse as the Green Building Council, the Committee for Melbourne and CEDA, think tanks like the Grattan Institute, and less formal organisations with green energy and other interests. Through these links we will see the grounded application of instruments like the Cities of the Future Principles. This ‘new normal’ interdisciplinary research agenda will need to cross domains as diverse as landscape architecture, social and development aid discourses, sociology, anthropology (all about public participation, evaluation and, more abstruse, the cultures which attach to our understandings of water) and the design professions. The range will extend to those concerned about water conservation and efficiency, including those already working in water organisations. The disciplines which need to be included to address supply security will extend beyond engineering and even environmental engineering. The role of engineers in understanding the cultural meaning of water should not be underestimated.

When we spoke to water engineers associated with irrigation work being undertaken in the Wimmera in 2011 they were a mine of information about water and culture in their region. They also talked about the meaning of the Wimmera River to them, not just as a source of water but as a place of multiple meanings. We are witnessing shifts in knowledge across a range of planes, and a willingness to share. We need to exploit or capitalise on this.

To attain the outcomes we desire we will need to include the insights of public health professionals, geo-morphologists, water body health scientists and the public; biodiversity scholars, wetland ecologists, design scholars and social scientists with an interest in amenity and recreation and environmental interpretation.

The new planning paradigm will need research to go beyond the existing knowledge bank, and include both thematic aspects such as water production, harvesting, anticipating extreme events and spatial scales which transport us from households to landscapes.

Carbon accounting experts will be required to take integrated water cycle design into the carbon constrained world we are entering. Scholars with an interest in addressing the urban heat island effect, including the urban forest practitioners, will find their skills required. This extensive list of disciplines would also need to include those involved in the work around resilience in ecology and the economy. Law reform will also need to draw upon a range of knowledges, including but not exclusively, lawyers.
What a dialogue this anticipates.

**Interdisciplinarity in action in other places**

In case we feel our ambition is too great, for an illustration of the importance of expanding the disciplinary input, we should seek out demonstration sites from a wide range of places, and study projects that show us we can ‘transcend … the mere pragmatic necessities of the city’ and incorporate the social, cultural and ecological.\(^{208}\)

We should study the impact that ‘daylighting’ rivers can have on a cityscape, its people and its economy, taking as our example the Saw Mill River in Yonkers, New York.\(^{209}\)

The ‘daylighting’ of the Saw Mill River in Yonkers now provides American eels with fish ladders and the people of New York with a range of community, social and economic benefits.\(^{210}\)

The Harvard School of Design brings disciplines together in interesting and exciting ways. The work the HSD has done in relation to the Cheonggyecheon River in Seoul, formerly little more than a drain is instructive.

*Cheonggyecheon River, remnants of motorway, Seoul.*

The deconstruction/reconstruction of the Cheonggyecheon River in Seoul\textsuperscript{211} has revived a river buried under a motorway so that it now provides a major tourist attraction and improved micro climatic conditions.\textsuperscript{212} Culturally and socially the river now presents the public with a

‘three mile infrastructure of slowness, and an urban theatre with ecological and cultural ambitions.’\textsuperscript{213}

Addressing biodiversity issues, the audit of the project’s environmental outcomes is increased numbers of:

- plants from 62 to 308,
- fish from 4 to 27,
- birds from 6 to 34,
- aquatic invertebrates from 5 to 53,
- insects from 15 to 206,
- mammals from 2 to 4 and
- amphibians from 4 to 8.\textsuperscript{214}
These facts provide an ‘irrefutable signal of the transformation of central Seoul into an ecologically friendly metropolis’.215

Beyond numbers, and addressing climate change issues

- the river restoration has acted as a cooling agent lowering maximum temperatures by 10%
- public transport use has increased
- and congestion has reduced notwithstanding the ‘loss’ of a major motorway.216

In Nagoya, Japan, planning over the last two decades has focused on integrating the commons, the urban fabric, the forest corridor and the water corridors of the Kiso and Shinsakai Rivers. Hydrological cycles, the enhancement of biodiversity and the provision of recreational activities are being promoted as an integrated response to community needs through partnerships between the public and the municipality.217 Disciplines well beyond those historically used have come together to render change.

Makassar City in Indonesia and Can Tho in the Mekong Delta in Vietnam illustrate the extent of possibilities.

Scientists, planners and the public have partnered with CSIRO and submitted to physical scientific and social scientific evaluations of outcomes which:

- determine climate change impacts on urban water services
- rank water use priorities
- assess water needs across an integrated terrain
- highlight better outcomes by generating capacity to deliver integrated urban water cycle management.218

From Philadelphia to Curitiba water design practice and scholarship is being embraced by organisations, administrators, engineers, scientists, architects, landscape architects and the public. Projects are being sponsored by governments which recognise the need for integrated scholarship around water cycle planning. In circumstances where administrations are pro-actively working with such a range of collaborators ambitions of conserving, sparing, and clever, water use are being delivered without large engineering storage works.
4.3 Organisational change – aligning different ways of knowing and doing

Organisational and structural change will not be delivered easily and the water sector is famous for its multiple mandates and lack of co-ordination, competition and even its confusion.\(^{219}\)

It has to address:

‘…uncoordinated institutional frameworks; ineffective regulatory frameworks; limited community engagement, empowerment and participation; unclear, fragmented roles and responsibilities; technocratic path dependencies; and little or no monitoring and evaluation’.\(^{220}\)

We will require transformative thought and action in organisational and institutional settings to ensure climate change adaptation is mainstreamed.\(^{221}\) Improvisation and technical versatility together with a steady and undiminished methodological and philosophical commitment to ‘social’ learning\(^ {222}\) and to ‘learning alliances’\(^ {223}\) will be necessary in organisational and community settings to effect change.

Across a wide disciplinary and institutional base it is apparent that promotion of meaningful and purposeful collaborations between scientists, policy makers and other stakeholders are as yet embryonic.\(^ {224}\) These new and barely untested partnerships involve fundamental shifts in habits or mind and action.\(^ {225}\) And, they will require an insistent commitment to the dialogue in organisational settings.\(^ {226}\)

Techniques to be deployed in knowledge brokerage will include mapping and diagramming, novel media technology, intermediary objects, ready acceptance of the use of metaphor as a communication tool, systemic inquiry, systemic development and the building of communities of practice. All of this will need to be built into organisations operating out of the engineered understanding of water as a ‘resource’ in which there is fixed and fluid value, and in the context of water as a biophysical and cultural ‘need’ and as an unpolluted necessity.

This conversation will be complex but the necessary disciplinary connectivity can promote the alignment of multiple forms of knowledge in practical ways for meaningful outcomes. Organisational structures will play a pivotal role in ensuring this occurs. We commented upon the ways in organisations can re-engineer themselves in the Structures for Sustainability Strategic Audit 2011 and used as a prime example Yarra Valley Water and the methodology deployed by that organisation commends itself to broad scale application in the water industry.
Building capital – social and natural

As we generate the new multidisciplinary environment, in and beyond organisational structures, we still have a great deal to learn about marrying principles and practice, exploring the benefits of both top down and bottom up solutions and keeping those on the many paths to change in an active and enlivening discussion.

All our efforts will need to align and integrate with local issues and solutions.²²⁷

We have moved through generations of practical application and theory, from the unmanaged, to the centralised, the ‘early days’ of water cycle management, and we now need the step change to more sophisticated participatory efforts.²²⁸

Unless new technologies are embedded into the local institutional and social context and a systems approach is taken to the development of the change agenda, even the acceptance of an integrated water cycle management urban design approach will not be enough to ensure successful implementation.

Despite a plethora of new sustainable water technologies and infrastructure we still appear to need leadership to affect the social and institutional capital so fundamental to attaining the goal of water sensitive city scapes.

Public commitment is a foundation stone for change and it needs to be cultivated. The Clearwater Advisory approach adopted by Melbourne Water is commendable in the manner in which it worked with the public in the regions and we should actively invest in this type of work and in the authoritative evaluations of good and less sound practice which we can derive from it.

Prosaically, it will be important to signpost the path we take with public information campaigns, with interpretive signage, with funding and by the celebration of successes.
Conditions for change

To achieve the goal of integrated water cycle management and deliver water sensitive urban design - with all its multiple attendant benefits - the attainment of the following social, economic and environmental ethos will be necessary:

- A community with a heightened receptivity to innovative practices for sustainability which is also striving to live an ecologically sustainable lifestyle, aware of the balance and tension between consumption and the conservation of the city’s natural capital
- Reflective practitioners threaded through the water industry demonstrating inventive capacity and showing an active interest in innovation and adaptation
- Enabling regulatory regimes and policies, formulated by pro-active governments which will be familiar with facilitating an ongoing adaptive evolution into the water sensitive city.

The highest priority should be afforded to a number of mutually reinforcing conditions for change.

These conditions will include:

- the establishment of a new economic valuation framework for urban water projects
- the fostering of evidence-based policy development as a product of strengthened science-policy partnerships
- active community engagement, as has been suggested by the National Water Commission Planning Report Card 2012 for Victoria.

Expedition of policy will be needed and it will have to explicitly attend to:

- determining the economic value of urban water infrastructure and water reuse benefits
- identifying decision-support frameworks for policy makers
- establishing a clear delineation of current governance strategies.

Smart policy design is essential to overcome obstructions in new resource management policy development. Collaborations will underpin this policy design and the two should be encouraged to mutually reinforce each other.
Figure 24: Western Port Basin.
Source DPI (Vic) Earth Resources. CfES modified.
4.4 We are the cartographers

Having deconstructed some parts of the water cycle management environment it is clear that we will need to accept collective responsibility for the changes necessary to adapt to and insulate ourselves from the impacts of climate change.

With responsibility comes the need for intellectual rigour, structural flexibility and the acceptance of risk management. Collective risk ownership amongst all stakeholders will need to be fostered as will an agreed level of service based on local context and community needs.

Co-governance and collaborative design practice is important and supports will be required to facilitate the emergence of partnerships between water utilities and local government in the strategic and structural planning of urban environments. Partnerships across sectors of government such as energy, health, planning, environment and finance, will be an essential ingredient for change.

Collaborations with the public will be engendered and sustained if they receive support and local immersion is recognised as important. These collaborations will have their best effect if they are invited to impact governance, design and the operation of water infrastructure.

The establishment of the Office of Living Victoria and the elevation of the integrated water cycle research agenda across Commonwealth, state and international jurisdictions through the Centre for Water Sensitive Cities (2012) suggest we are approaching the fourth generation of water cycle management.

Other cities and states have started to develop as global testing grounds for new ideas and these cities and states have demonstrated the possibilities and prospects across deltas, from Japan to Rotterdam and the Indian subcontinent, and in water-poor and water-rich sites from Masdar City (at a cost), to Lodz and Singapore. Clever solutions are being designed and they will be integrated.

If we take the twin challenges of climate change and population growth seriously, determine that we do need to design for the 21st century not the 20th, and commit to collaborations which are robust and responsive in a principled and flexible way, we can carve out a leadership role for our state, inspire others and leave a legacy for the 22nd century.

Roadmaps are available.

In this driest habitable continent we should ensure we are amongst the principal cartographers.