Planning Against the Current:
Integrated Water Cycle Management

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Infrastructure systems are the arteries and veins of urban environments. An integral component is the supply, treatment and drainage of water. The development of an integrated resilient water system can contribute to the economic, environmental, social and cultural sustainability of any city. As planners it would be reasonable to expect water planning and related infrastructure to be at the core of our profession.

In recent times the technocratic nature of water treatment, drainage and supply has been the domain of engineers. The failure of planners to embrace the effect that water planning has on the sustainability of future growth means that many Australian cities are ill-prepared for the implications of drought, climate change and increasing population while also coping with an inefficient, ageing and degrading water infrastructure system (Brown et al 2007:5, PMSEIC 20007:ii, Keath & Brown 2008:1).

The benefits of current established centralized water infrastructure systems include the ability to provide widespread access to safe drinking water, flood mitigation and the protection of public health through wastewater management (Keath & Brown 2008:1). Unfortunately the traditional utilisation of potable water for a wide range of non-potable uses has made many regions (including Queensland's Sunshine Coast) almost completely dependent on the storage of surface water in dams. This dependency on single centralised provision not only means that supply is unable to cope with uncertain future demands but is also incurring serious environmental and economic costs (PMEIC 2007:ii, Keath & Brown 2008:1). Mitchell (2006:590) outlines how the implementation of such systems over time has lead to

- modifications in natural ecosystems due to reduced environmental flows;
- increased waste discharged into waterways, resulting in negative consequences for native flora and fauna and stream flow quality of river basins and coastal waters;
- inadequate handling of contaminants and nutrients;
- significant energy and chemical usage (e.g., chlorine); and
- high economic cost of rehabilitation and replacement of aging water infrastructure in highly developed urbanised areas.

In an effort to create awareness and stimulate cross-fertilization between public and private sector stakeholders, the Environmental Industries (Sunshine Coast) Water Working Group initiated a 'Sustainable Integrated Water Cycle Management Forum' (the Forum) at the University of the Sunshine Coast on the 3rd December 2008. Guest speakers from Queensland and interstate presented the benefits, barriers and their experience with application of best practice urban water management. A panel discussion and workshops enabled interaction among participants.

While there is a diverse range of perspectives on 'Integrated Water Cycle Management' (IWCM), in general, the central theme rests in viewing water supply, drainage and treatment systems holistically and comprehensively 'within an organizational framework and a broader natural landscape' (Mitchell 2006:589). On this basis the Forum's approach was to provide a thought-provoking overview of the economic, social and environmental implications of implementing IWCM practice on the Sunshine Coast.

The possibilities and experiences of IWCM were delivered through a series of presentations aimed to stimulate panel and workshop discussion. The speakers presented on a range of topics which included:

- The state of environmental technology industries on the Sunshine Coast (Munroe and Uhrig, Eco Nova);
- Sunshine Coast as a Sustainable region (Mayor Abbott, Sunshine Coast Regional Council);
- State government perspective on managing water (Cox, NRW);
- Benefits (including financial) and experiences with implementing IWCM (Coombes, Cullen, and McAlister, consultants); and
- A council's viewpoint using Pimpama Coomera master plan development as a Case Study (Khan, Gold Coast Water).

A common theme was the need for the Sunshine Coast to diversify its infrastructure options for water supply and decrease the load on current drainage and treatment networks. The implementation of diversified, decentralized water systems was estimated to be able to achieve a 75% to 80% reduction in potable water mains demand and wastewater discharge (McAlister 2008:25, Coombes 2008: 14). Current available technologies can allow 450 megalitres of water to be treated onsite for the equivalent amount of energy that it takes to pump one kilolitre of water for one and a half kilometers (Uhrig 2008:6). The integration of such technologies could provide more environmentally and economical robust responses to the challenge of increasing water supply demands than that of continuing current water infrastructure practice.

The statement that the plight of Australia's urban water supply was the result of climate change and not poor planning was refuted by Dr. Coombes. Statistics from the last hundred years show that there have been relatively few places in Australia that are experiencing significantly less rainfall (Coombes 2008: 14). This is not dismissing the anticipated effects of climate change, as temperature data indicate that many cities within Australia have shown significant temperature increases over the same period of time. The issue is not a lack of rainfall overall, but rather reduced run-off and the capture of run-off in dams. A "once-through" water supply and disposal system based on one hundred year old technology is being applied to today's much more complex built and natural environments (Coombes 2008:15).

This aging, degrading technology often delivers water from other catchments via long distribution systems that have begun to leak with age, consume large amounts of energy and consequently have become expensive to operate. Dr. Coombes (2008: 14) estimates that 'between $100 and $200 billion is needed to replace and upgrade buried infrastructure networks to get them to a reasonable standard'. Cullen (2008: 22), an economist, outlined that the inefficiency and necessary long-term planning for traditional infrastructure systems place excessive costs on development which is directly related to housing affordability. This is through the effect of large scale engineering projects needed to be undertaken to provide future developments with mains connection. The delays on some projects are upward of twenty years. Cullen (2008: 22) outlined that

> the net present value of the cost of delay is in the order of forty percent of the land value and thirty percent of the sale price of the completed allotments. If this time was able to be shortened to five years by providing decentralized on site systems to cope with water treatment and capture, the cost is only fourteen percent of the land value and eighteen percent of the completed allotments.

Cullen's (2008: 22) research showed that there was also a '25% saving in sequential construction of infrastructure provision rather than in one large installment'. This data support the rationale for household or development scale water management rather than an 'expensive monopolized, high energy regional solution' (Coombes 2008:15).

To illustrate the evidence-based advantages of an integrated approach, an analysis of IWCM implementation at the Armstrong Creek development site, Geelong was presented. A number of different scenarios were compared for water provision, drainage and treatment including: a 'Business As Usual' approach relying on connection to traditional mains systems, as well as a diversified interconnected systems approach using mains water supply, rainwater tanks, water sensitive urban design (WSUD), wastewater reuse from nearby treatment plants used for toilet flushing-garden watering-open space irrigation, and water efficient appliances and gardens. The potential for a third pipe reticulation system was also factored in to provide class A+ treated effluent to households and commercial users (Coombes & Foster 2008:iii). The results revealed that alternatives which involved the largest portfolio of management options reduced demand on potable mains water supplies by 73%, minimized sewerage discharges by 63% and had a positive net present value, while reducing greenhouse gas emissions. This result was in stark contrast to the inefficiency of the Business As Usual approach and to the isolated evaluation of each measure (Coombes & Foster 2008: iv & 43).

The Pimpama Coomera Development, Gold Coast was described by Khan (2008: 31) as a Queensland case where similar technologies applied in a different context provided a:

- 75 - 84% reduction of potable water use
- 56% of recycled water reused – storage paramount due to seasonal fluctuations
- 55% reduction in volume of treated wastewater released to the Pimpama River (or GC Seaway)
- 17% reduction in quantity of storm water runoff – through rainwater tanks & storm water management
- Up to 30% reduction in greenhouse gases
- 50% reduction in nitrogen & phosphorous released via treated recycled water to Pimpama River (or GC Seaway)
- Wastewater management – 50 % reduced groundwater and storm water infiltration.

The failure of consistent implementation of IWCM systems is adding to ecological footprints significantly. It still requires six to seven square kilometres of catchment to deal with waste treatment from every one square kilometre of development (McAlister 2008: 25). Once-through traditional water supply and treatment systems are responsible for an estimated 50% of most councils' total energy consumption (Uhrig 2008: 6). The need to transition to IWCM techniques was generally agreed on at the Forum: the greatest discourse now is about how to facilitate this change.

Developers have recognized the benefits and the market for the provision of IWCM technologies. Yet they are often met with barriers by regulators who have a monopolized control of water (Coombes 2008: 15). It is important that planners, regulators, and the public are better informed of the potential of integrating IWCM practices. Although great examples of IWCM were presented at the Forum, they are still considered "boutique" (McAlister 2008:25). Yet IWCM is supported by an extensive literature. Brown (2008:221), well known for her calls for institutional change in the water industry, supports these claims with:

Today, urban water policies are beginning to reflect the Sustainable Urban Water Management philosophy, yet the rhetoric is often not translated into practice with the consistent failure to go beyond ad hoc demonstration projects.

Differing ideologies were presented on how to improve implementation of IWCM. Some advocated immediate mandating of the integration of IWCM into planning policy and development requirements. This was justified by the claim that given a population growth of 1% per annum and 1.5% - 3% urban renewal per annum, an estimated 30% of houses could have decentralized systems in place by 2030 (Coombes 2008:15, Panel Discussion 2008: 37). Such implementation can be compared to the compulsory implementation of dual-flush toilet systems. The 'Water for Our Cities: building resilience in a climate of uncertainty' (PMSEIC:2007:27) outlines similar views stating that 'A nationally mandated approach to minimum efficiency standards for water using appliances would have a significant impact on future household water demand'.

The counterpoint to this argument is that a mandated 'top down' approach could result in a political backlash. Surely a dialogue is needed around the questions – why should current populations be made to pay for the ills of the past? (Panel Discussion 2008: 39) and, why should future populations be forced to pay for present poor decisions?

A bottom up movement would see demand for retro-fit technologies grow. It would provide greater opportunity for private enterprise and competition which would theoretically drive down the price of retro-fitting technologies. As stated in the Forum's Panel Discussion (2008:39); 'If the solution is not to mandate, it is to make it as easy as possible for private enterprise to provide economical solutions for the consumer'.

Many advocates of IWCM insist that transition should involve a shift to an 'adaptive, participatory, and integrated approach' centered on social as well as technical management (Brown 2008:221). Jonker (2002:719) claims that the heart of integrated water management revolves around the management of people's activities. By changing the social perception towards water use, we can, in turn, 'improve livelihoods without disrupting the water cycle'. It is the use of non-structural management options to encourage a bottom up movement which will create the greatest demand for more sustainable practice from regulators.

The challenges faced in the water sector are not to be underestimated. Is the future going to reside in current practice or in the implementation of IWCM principles? Developers have recognised the benefits of creating greenfield developments that implement IWCM. The responsibility of planners is to provide a participatory, sustainable and resilient solution that creates trans-generational equity in water supply, delivery and wastewater treatment. The onus is on planners to develop and facilitate an approach which engages and educates the community and regulators to create a policy framework which encourages the transfusion of the urban water landscape and gives new life to our cities' circulatory system.

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