

Were load-based stormwater objectives a necessary mistake to progress water sensitive urban design?

O'Neill A¹, Weber T², Browning G³

1 Healthy Land and Water, lvl 19, 160 Ann Street Brisbane 4000 QLD, andrew.o@hlw.org.au

2. Alluvium, Suite 18, 36 Agnes Street Fortitude Valley 4006 QLD, tony.weber@alluvium.com.au

3. Healthy Land and Water, lvl 19, 160 Ann Street Brisbane 4000 QLD, glenn.b@hlw.org.au

Key Points

- Current LROs have only slowed but not halted waterway value decline
- This is due to threats from hydrologic change and legacy development not being adequately addressed
- Stormwater treatment objectives need to be modified to address spatial diversity, adaptive management principles

Abstract

The Queensland Environmental Protection (Water) Policy 1994 sets out the policy framework for the protection and enhancement of the ecological values of Queensland's waters. Almost 10 years ago, the State of Queensland acknowledging the impact of urban stormwater on waterway health, adopted urban stormwater pollutant load reduction objectives (LROs) for sediment, phosphorous, nitrogen and gross pollutants in policy that apply to new urban development. Our analysis shows that while there has been widespread adoption of the LRO to Queensland urban development, it has only reduced part of the impact, therefore stormwater remains a contributor to decline of waterway health. This is not an acceptable policy response in the context of Queensland policy because:

1. Mitigation measures do not adequately address the threat of flow change
2. Co-benefits of WSUD are rarely taken advantage of
3. Land use planning is disconnected from existing values and desired future states for waterways
4. Development can only legally be required to mitigate its own impact, not provide the avenue for waterway improvement.

We propose a new three-tiered objective that captures the needs for waterways from urban development based on current value and future desired value. The three tiers consist of:

1. Minimum standards
2. No net impact
3. Restoration / enhancement

We have collected evidence that this approach addresses many of the barriers and creates the framework for supporting institutional arrangements, policies, funding, design, and takes into account spatial and temporal variability such that a similar approach could be applied anywhere in Australia or internationally. In addition, the framework aligns the disciplines of engineering, science, planning and landscape architecture to ensure that outcomes are favourable for our communities and decision-makers.

Keywords

Urban stormwater, Waterway health, Pollutant load objectives, Policy

Context

In 2010, urban stormwater pollutant Load Reduction Objectives (LROs) for sediment, phosphorous, nitrogen and gross pollutants were adopted in the State Planning Policy – Healthy Waters. The State Planning Policy objectives were adaptations (through additional analysis) of LROs from investigations to help protect the receiving waters of Port Philip Bay in Melbourne. For Port Philip Bay, the LROs were based on a relatively sound technical analysis (an understanding of the sustainable loads to the bay) and an economic principle of affordability (constructed stormwater wetlands were sized at approximately 2% of the catchment area which was seen as a reasonable capital cost and land take for the economic conditions of the time)

Adapting the Port Philip Bay objectives to Queensland was sound in principle, particularly given the small amount of money, time and effort that had gone into understanding the needs for streams in Queensland. The objectives were first used really to address the issue of cumulative impacts that the use of water quality objectives (based only on concentrations) did not address.

It would appear that this was an acceptable adoption of the precautionary principle, which although contentious is widely adopted at least in principle in international environmental law. According to the Earth Summit's 1992 Rio Declaration, the precautionary principle for environmental management states that where there are "threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Furthermore, the Queensland Environmental Protection (Water) Policy 2009 sets the legislative framework for ecologically sustainable development, where the ecological values (EVs) of receiving waters are **protected** or **enhanced**. Our analysis shows that while there has been widespread adoption of the LRO to Queensland urban development, which has reduced the impact, it has only slowed the decline of waterway health rather than halt it.

Fran Sheldon work (UWSRA Tech report 106, McIntosh et al) showed this best.

Diagnosis of the current situation

Put simply, the waterway values continue to decline because our treatment measures do not completely address the threats to the waterway (refer Figure 1). Furthermore, the LROs in their current form do not provide any avenue for waterway improvement for a number of reasons:

1. There was never an understanding that these objectives would protect waterway values. Rather, they were designed as a balance between cost-effectiveness and water quality outcome
2. There was never an intent for these objectives to manage hydrologic change which is a major contributor to declining health
3. The urban development process is linear and by its nature rarely captures additional landscape amenity and liveability outcomes that can drive additional investment in the waterway
4. Land use planning is disconnected from desired future states for waterways
5. The application of the current policy framework in Queensland only captures a fraction of all new development and at the current rate it will take 50 years in rapidly redeveloping cities to capture a meaningful proportion of the catchment
6. Development can only legally be required to mitigate its own impact, not provide funds for improvement.
7. It is acknowledged that removal of the threats to a waterway will not guarantee an improvement of waterway value. Additional investment to **enhance** the local values may be needed (refer Figure 2).



Figure 1. Waterway Value (worst case - no intervention)

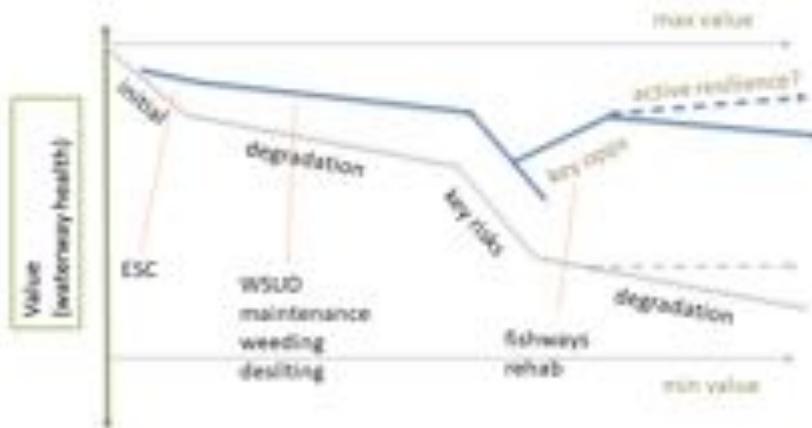


Figure 2. Waterway Value (best case – with intervention)

Adaptive management and resilience

The implementation of load reduction targets was a good first step to respond to the threat of diffuse stormwater pollution, however the industry regulation has not evolved and it is stuck in a holding pattern (refer Figure 3). There has been little adjustment of the regulations in response to observed post-development data. This is critical. There needs to be an evaluation phase to determine if our chosen solutions are meeting the objective of protecting and enhancing waterway value.

The current approach also fails to respond to changes in the climate / environment / social and political values. It is very static, one dimensional and does not take into account acute threats such as floods and droughts.



Figure 3. Business as usual approach

There doesn't necessarily need to be wholesale change of the stormwater regulation system but rather an evaluation of the current approach and then an adjustment and recalibration of regulations. This represents a typical adaptive management process (Refer Figure 2). It is important to note the evolution of best practice requires a number of human elements that are not science dependent (i.e the willingness to change).



Figure 2. The adaptive management approach

Adoption of an adaptive management approach to stormwater management can help to instill resilience into our socio-ecological systems. This will help our waterways and the societies that depend on them to recover from severe disturbances such as floods and droughts. The Stockholm Resilience Centre has outlined 7 key principles for managing the resilience in socio-ecological systems [1]. Figure 5 shows how this can be incorporated into the Adaptive Management Framework described above.

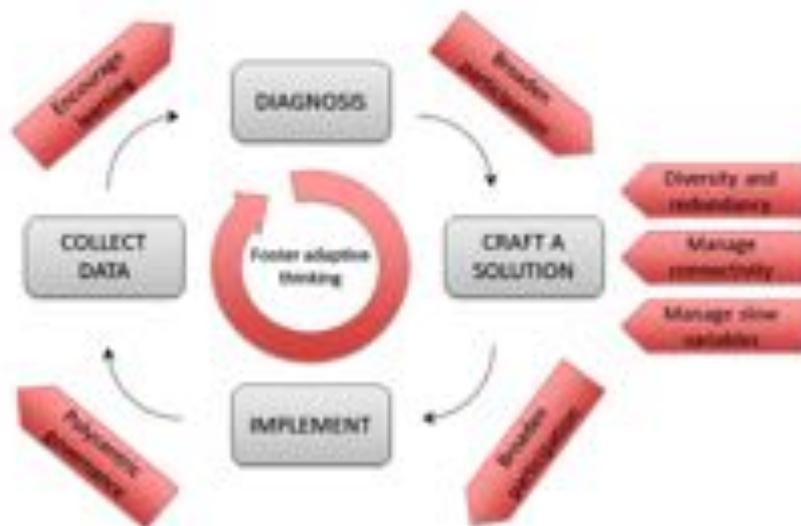


Figure 5. Resilience and the adaptive management approach

Proposed Solution

The Queensland State Government in conjunction with Healthy Land and Water and Alluvium are currently reviewing stormwater regulations throughout the state. There is now a window of opportunity to reflect on progress to date and effect changes to the process. It is the opinion of the authors that there is a need to incorporate evidence-based adjustment to policy. The policy should also have the flexibility to respond to changing climate, ecology and social values via an adaptive management framework. We propose that three new initiatives are needed to address the inevitable shortfall in the current LRO:

1. A three-tiered objective that captures the needs for waterways from urban development based on current value and future desired value. This needs to be based on knowledge of waterway values and be connected to strategic planning for urban growth / densification / redevelopment:
 - i. Minimum standards: apply an easy to assess and economically sustainable objective for at-source management of stormwater where current and future values are low, but where ultimate receiving environments require improved water quality
 - ii. No net impact: objectives are set for all new and existing development that address water quality, hydrologic change and other threats to waterway health. These are met for all new development, and progressively for existing catchments, based on waterway values, and where a sustainable funding model has been implemented.
 - iii. Restoration / enhancement: Where clear restoration plans exist for waterways in a local government area, money is applied strategically to achieve these goals.
2. A legal driver to partition the required capital and operational money for existing urban, in addition to programs to address institutional issues such as urban planning, existing developed urban areas, assessing outcomes from new development, offsets and maintenance. The financing system of stormwater management may also be investigated to explore equity issues between legacy development and newly developing suburbs. It is suggested that stormwater treatment costs be spread across the population base with a polluter pays principle incorporated where possible.
3. A mechanism for good design, innovation and evolution of best practice (e.g. Living waterways[2 & 3]) to be encouraged, embraced and celebrated

We believe that this approach addresses many of the barriers and creates the framework for institutional arrangements, policies, funding, design, and takes into account spatial and temporal variability within the State of Queensland such that a similar approach could be applied anywhere in Australia. This approach allows for developers to manage their impacts appropriately, but also requires a clear vision of what restoration outcome is needed for a waterway. It is intended to allow for a range of approaches dependent on what those visions are.

Acknowledgments

Everyone that has contributed to stormwater management ever. Especially the guy that invented the French drain.... I think he was French.

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Full Paper

O'Neill A. et.al.

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