

The case for unearthing urban streams

By Mark Lewis, landscape architect, Boffa Miskell

Adverse weather events like the 'atmospheric rivers' that have brought weeks of torrential rainfall and flooding through January and February of this year, are very likely to intensify over the coming decades. Increasing heat energy in the Pacific rapidly draws high temperature seas into the cloud systems, to be released as increased precipitation in higher latitudes. Storm systems are also becoming increasingly 'moored' over New Zealand between large high-pressure systems to the east and west of the country, and dropping larger cumulative volumes of rainfall onto saturated ground. How our cities prepare and respond to these rainfall events will determine how much damage we sustain, and in the worst case, how many lives might be lost.

Currently our urban channels and stormwater systems are imperfectly designed, as they typically accommodate discreet events, notionally set at the 10-year return period, with an acceptable loss of service for our roads and infrastructure during larger events. These systems are under increasing pressure because city-building has removed the hydrological buffering and resilience associated with supporting natural environments.

Thankfully, across the globe, many of our urban areas are re-establishing natural systems as part of their long-term infrastructure goals, re-planting trees to capture rainfall, daylighting pipe networks as streams for increased detention, and creating an appropriate balance of open spaces, floodplains, and wetlands to attenuate runoff and infiltrate it to ground.

This approach, which has many monikers (water sensitive design (WSD), nature-based solutions (NBS), engineering with nature (EWN) or ecological infrastructure), has the added benefit of re-establishing green assets into our towns and cities, achieving a multitude of other recognised economic, ecological, public health, and well-being outcomes.

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This re-appropriation of natural systems is often achieved through 'greenways', a network of open spaces typically associated with water bodies, connecting ridgelines and hilltops to coastal environments, and in this way becomes a readily understood datum that connects neighbourhoods and natural systems, a corridor of high amenity that supports gathering and recreation, and active transport routes.

Green infrastructure implementation has been very deliberate in many places across the globe. In the megacities of Seoul, Korea, and Singapore, there are targets for open space that require vast parks and greenways to be constructed. This is not seen as mutually exclusive to an increasing population, as redevelopment and intensification provides the opportunity to reconfigure environmental infrastructure.

The targets for these cities are upwards of 30 percent of open space, requiring bold urban planning. One of the best examples of this is the Cheong Gye Cheon River in Seoul, a river that was rehabilitated from a culvert through the heart of Seoul.

The river now moderates flooding and has led to significant economic growth, with an estimated half a million tourists visiting the restored river walk every week. The project necessitated significant redevelopment of the centre of Seoul, the removal of a 12-lane expressway, and the advent of a new public transportation network.

Another example of bold environmental planning is from the Rijkswaterstaat, the Dutch environmental and agriculture agency, responsible for protecting a country that is 60 percent flood prone. Their 'delta approach' has seen levees relocated backwards within floodplains like the Meuse River, to allow for farmland to be periodically inundated and to restore wetlands on a vast scale to intercept and hold onto water like a sponge.

Within the programme they have also sought to 'rewild' vast areas of the river plain, re-creating the biodiversity hotspots that rivers naturally provide, and creating opportunities for citizens to enjoy these wild places. In doing so, they have reawakened an understanding of the natural heritage of these river systems and their importance to the region's identity.

Ideally New Zealand's current resource management reform could provide a basis for similar bold planning endeavours for blue-green networks.

In particular, proposed Regional Spatial Strategies would provide an opportunity to give strategic direction to both future land use and infrastructure decisions,

identifying potential blue-green corridors for protection and enhancement in each region.

However, Regional Spatial Strategies will be reliant on the National Planning Framework, which ideally would provide guidance on the minimum requirements for green infrastructure, above and beyond reductionist targets, and more along the lines of 'te mana o te awa', a 'best for river' and collaborative approach to infrastructure planning.

At the local scale, the Natural and Built Environment Plans would need to reinforce blue-green networks, with appropriate regulatory controls and policy support, particularly in the absence of strong direction in the National Planning Framework.

Such networks would also need to be supported by infrastructure planning at regional/local level that includes the



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minimum conditions for green infrastructure and the avoidance of development in areas that do not have an appropriate environmental framework to support them.

Auckland was recently named one of the 'spongier' cities in the world in a report by the international consultancy firm Arup. A 'sponge city' typically maintains aquifers, floodplains, and wetlands to slow, spread, and capture stormwater, to reduce the overall 'work' on our systems, and replenish our groundwater.

Interestingly, this also contributes to stream base flows and soil moisture levels that support vegetation in dry periods, to protect us from arid, erodible, and fire-risk conditions as well as flooding. This is something to be keenly considered in terms of the seasonal wet-dry extremes increasingly associated with climate change.

For those of us who have been recently and directly impacted by the recent flooding in Auckland, there is an irony to our recent crowning as the 'spongier city'.

It is likely that Auckland was assisted in the title by our vast volcanic areas that freely drain our stormwater runoff, but we should also certainly be proud of the efforts over the last two decades towards investing in green infrastructure in our city, a move that was a paradigm shift from the concrete waterways of the 80's and 90's. In fact, I had the experience of working with an engineer on La Rosa Reserve project who had installed the stormwater pipes and thoroughly enjoyed the fact that he was then daylighting the pipes and restoring streams in their place.

Thankfully, our green infrastructure projects fared well in the recent storm events in Auckland.

At the time of writing this article, there has been favourable reporting from Hobsonville's greenways, and Te Ara Raata's restored stream, and from the recently daylighted section of Te Ara Awataha in Northcote.

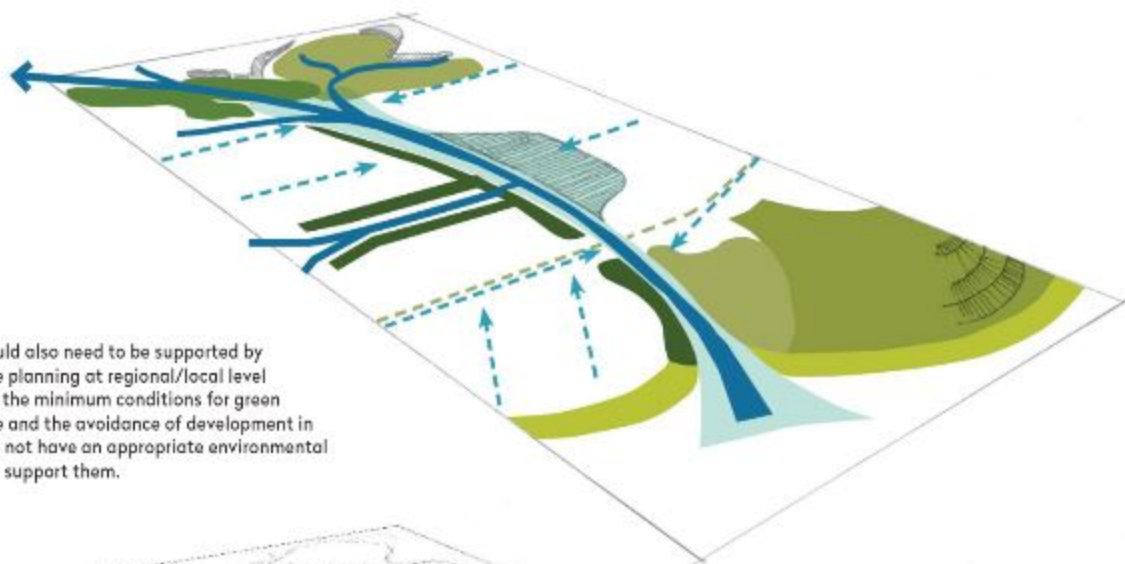
I was compelled to check on Te Auaunga through Underwood and Walmsley reserves, a project only three years old, which replaced two kilometres of concrete channel with daylight streams and tributaries and restored eight hectares of wetland and floodplain environments.

The project did things the right way around from a water sensitive design perspective - building the green infrastructure first, to support the future intensified development form in the area.

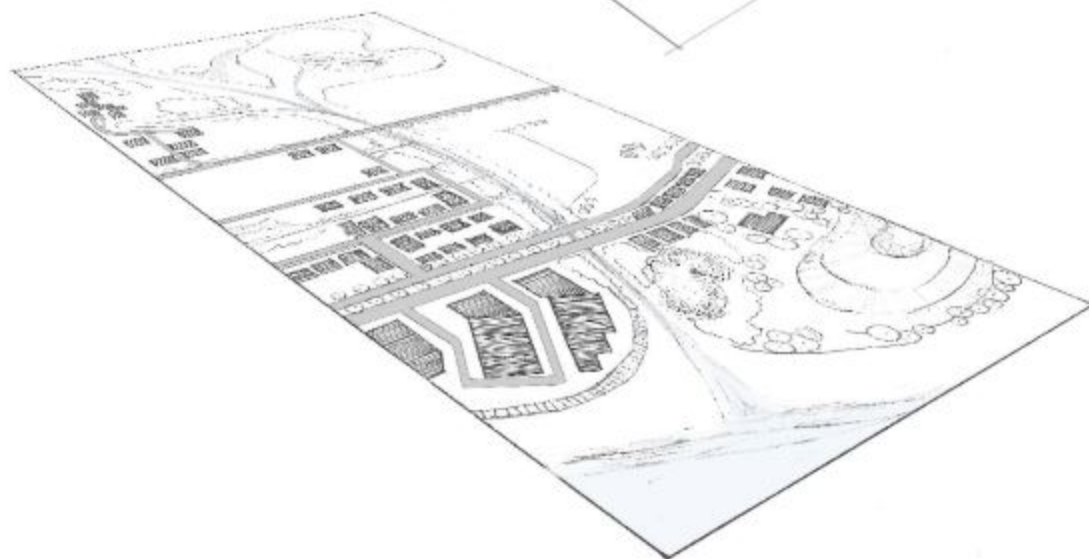
The project received several awards since its implementation, including the IPWEA Australasian Excellence Award in Environment and Sustainability, so it was important that it stood up to the testing floods of late January.

Thankfully, the stream held up exceptionally well and more importantly it reduced flooding to the adjacent residences, which prior to the project's implementation in 2016 had seen flooding of the adjacent streets and residences, and before this in the late 70's had seen yards and 200 homes under extensive flood waters.

That is not to say that this project is a panacea for flooding in the area. The project sought to restore a part of the expansive ancestral wetland Wai-o-Rakataura, but it did not replicate its size or resilience.



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The natural next phase from the project is to continue the restoration upstream on Te Auaunga and also 'sideways' into the residential and commercial areas within the catchment where intensification provides further opportunities for green infrastructure to be woven into the future development form, and to support future increased density.

This might go some way to ameliorating the overall effects of rainfalls across the catchment and to protect the very lowest reaches of Te Auaunga which unfortunately did not fare as well from the vast flood volumes coalescing in the urbanised catchment and piped network.

We know that green infrastructure is a solution to moderate climatic threats and rejuvenate our urban landscapes with quality environments, and while the multiple benefits of blue-green networks are well understood, their implementation at-scale in urban areas

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still represents an ambitious approach.

With reference to international case studies (Kazmierczak & Carter, 2010) it found the implementation of successful blue-green corridors relies on several critical factors:

- Regulation and policy at both the national, regional, and local level;
- Availability and quality of data and information;
- Cross agency and stakeholder collaboration;
- Public engagement, awareness, and strong sustainability focus; and
- Access to funding.

Similarly, a recent New Zealand survey of nature-based solutions (relating to coastal hazards in this case) found that there was significant community support for green infrastructure and that the technical challenges were not overwhelming.

However, in general there is a necessity for strong collaboration and the sharing of information for appropriate implementation and management to occur, and there is a need for monitoring and reimplementation of these projects to occur as widely as possible.