



Greening our cities: from vision to value

How valuing the invaluable can change our future urban landscapes

Government policy is increasingly putting green infrastructure front and centre of its vision for the future cities where most of us will live. Urban green infrastructure refers to the canopy, parks, waterways, vegetation, wetlands and lakes in our cities. More than just urban nature, these features are assets which deliver valuable services. They can make our cities cooler, healthier, more ecologically sustainable, and attractive places to live and work. To realise a policy vision of greener cities and change our future urban landscapes, we need to start treating green infrastructure in the same way we treat traditional physical 'grey' infrastructure – by subjecting it to rigorous economic assessment and assurance processes.

This isn't easy, but it can be done. Right now there is significant opportunity to embed green infrastructure in growth areas as part of the urban fabric, especially in areas with large greenfield developments in the planning phases (such as in NSW). But the clock is ticking as development continues, and this needs to happen quickly. This bulletin explores how we can build green infrastructure into our infrastructure planning processes and what challenges still lie ahead for greener urban communities.

The NSW State Government in Australia recently released two documents that, together, indicate a policy vision for the role of green infrastructure in the urban environment. ['Greener Places'](#) from

Government Architect NSW outlines what green (and blue) infrastructure is in the urban context and how it can improve our cities. In addition, the discussion paper and draft ['50-year vision for Greater Sydney's](#)



[Open Space and Parklands](#)’ outlined four key strategic directions to grow and improve parks, open spaces, connectivity and greenery, and resilience.

Both documents convey a fundamental shift in thinking which considers urban nature as genuine infrastructure that delivers valuable services to the community and which merits policy and planning priority. They recognise that the natural green (and blue) assets of a city can deliver real public benefits like mitigating the urban heat island effect, protecting and restoring ecological health, promoting active lifestyles, and providing beautiful places to live, work and play. These benefits can be measured and quantified in dollar terms such that they are no longer an incidental bonus of investment, but part of the baseline justification and cost-effectiveness of green infrastructure in delivering critical services to the community.

A clear government policy vision for green infrastructure is a good (and necessary) start. But for green infrastructure to be funded it must be robustly integrated into formal proposal, evaluation and assurance processes. Realising a vision for greener cities will depend on how effectively we can develop rigorous processes, methods, resources, datasets, and capabilities to value and assess green infrastructure as an ongoing, long-term package of service-delivering investments.

Capturing the value of green infrastructure

There are different ways we could embed active consideration of green infrastructure into our planning and decision-making processes on a more equal footing with traditional ‘grey’ infrastructure options.

For example, government policy could mandate investment in green infrastructure. But green infrastructure will not always be the best option in all circumstances and prescribing a one-size-fits-all approach does not guarantee smart investments. The alternative approach is to assess green infrastructure proposals on their individual merits—by requiring a fair, rigorous, quantitative assessment of the

economic, environmental and social impacts of each investment—as we do with traditional physical ‘grey’ infrastructure. Investment would then occur where and when it can be demonstrated to deliver genuine community value relative to the alternative levers available.

However, green infrastructure impacts can be tricky to evaluate because:

- the benefits, in both biophysical and monetary terms, are often hard to quantify and value
- the causal chains between the initial investment and the final outcome are often complex.

We look at each of these issues below.

Challenges with valuing the benefits of green infrastructure

Decisions to invest in infrastructure by governments or other parties are (or should be) determined by the relative weight of benefits to costs. A cost-benefit analysis is the formally preferred evaluation tool of state treasuries and infrastructure agencies around the country and is essential to ensure that limited public money is used as wisely as possible.

Although measuring the costs of green infrastructure is (mostly) straightforward, many of its benefits are not as easy to identify or measure. This can lead to a cost side of the equation that looks robust, ‘real’, and in many cases relatively large, but a benefit side of the equation that looks vague, unreliable and risky.

Take the example of a neighbourhood park. The costs of building and maintaining it are easy to estimate. We could look at what other, similar parks have actually cost. Or, a landscaping firm could provide an estimate of the cost of design, earthworks, materials, park benches, tree planting, tree trimming, etcetera. But how do we measure the benefits of that park to the local community? It’s irrefutable that we value relaxing, exercising, and socialising in parks. Parks clearly provide a range of identifiable community services for mental and physical health, amenity, and aesthetic enjoyment (and others). But none of those benefits are directly paid for per use or otherwise traded directly in a market (for most parks). This



means there's often no observable price to provide some indication of the value of park visits – a so-called 'non-market' benefit.

But this does not mean those benefits aren't real. It does not mean that the community will be better off if we choose not to build that park, or preserve urban canopy, or restore an urban waterway. It simply means that we have to work harder and smarter to identify the end-use benefits of these investments, quantify these (with scientific and engineering tools), and convert those benefits to a robust and fair estimate of value in dollar terms.

Economics has a range of methodologies that can assist (e.g. willingness-to-pay methods, hedonic pricing modelling, productivity cost methods, and more). While these methods require assumptions and are affected by uncertainties, they are a great deal better than nothing and can be refined over time as more and better data become available. The key is executing these methods well. This means exploring (rather than shying from) core uncertainties in the modelling, be those assumptions or data inputs.

Linking investment to impact: the challenge of complex causal chains

To ensure a consistent and systematic treatment of non-market impacts of green infrastructure, it is also important to understand what effects green infrastructure actually has in the urban environment.

A core principle of good cost-benefit analysis is that we only compare costs and benefits that are clearly and exclusively caused by the proposed investment, and not those which would happen anyway, or which would happen under every alternative option. This is the incremental impact of investment, and this is the end measure we convert to a monetary value to tally up different types of costs and benefits.

Nailing down the incremental impact of an investment with rigour can be the most difficult, resource-intensive step in the evaluation process. This is because it requires both a) a defensible case that green infrastructure causes the impact, then b) a defensible measure of how big that impact is.

Demonstrating causal links for green infrastructure is challenging, partly because scientific research and data cannot always readily establish a) and b) above. Further, green infrastructure evaluation can require multiple causal chains to be articulated and linked in a sequence to establish the final incremental impact of investment. This can be extremely complex.

Cooling by urban canopy

A key policy concern is the risk to health, life, and urban amenity of extreme city temperatures. Climate change will likely increase the number of 'very hot' (over 35 degrees) days, exacerbated further by the urban heat island effect. This heat can have serious consequences for health, and is a contributing factor for mortality, especially among the elderly and infants. It is also an extreme (and expensive) stress on our electricity infrastructure.

Urban canopy is one form of green infrastructure that can help reduce these impacts. The natural evapotranspiration processes of trees can cool surrounding air temperature. But the first step to evaluating the cooling benefits of urban canopy is to estimate, for the specific site and proposed investment (including what kind of trees, in what numbers, in what kind of environment, at what scale, etc.), the *amount* of cooling caused by increasing urban canopy. This is a non-trivial exercise, heavily reliant on the state of scientific research and site-specific modelling. Even once achieved, this will only establish *one* quantified causal chain – how much change in air temperature will result from additional urban canopy (a similar process applies to the case of cooling from retaining water in the landscape).

The second step involves quantifying the causal link between air temperature changes to human health, electricity infrastructure requirements, and potentially other recreation-related outcomes.



Again, this would require scientific research and is a data-intensive task.

But both steps are required to eventually establish the benefits, in monetary terms, that result from investment in urban canopy. Recent work in Western Sydney indicates that these benefits can be significant, and more than outweigh the additional costs.

This example demonstrates that that if this process is to be applied as the standard for green infrastructure proposals, it will require developing, accessing and expertly using high-quality, localised primary research and data. Much of this data will be scientific in nature. However, empirical economic data is also critical. Economic research using best-practice research methods is required to uncover the best possible estimates of what value the community places on alternative possible services provided by green infrastructure.



Where to from here?

Being able to assess good green infrastructure options from bad is critical. Valuation is a key element and as we have seen, can be a difficult process. Too often this step is avoided, with the focus on 'how to invest' (e.g. funding, delivery, governance etc), prior to answering the question 'should we invest'.

This may be accomplished more easily in some sectors than others. Water utilities, for example, already have experience in the kind of robust green infrastructure evaluation processes described above.

This is because many of the 'assets' they build and manage include multi-service delivering natural features. For example, from a traditional water industry perspective, an urban wetland might be one way to manage stormwater quantity, quality *and* floodplain issues. This is one manifestation of Water Sensitive Urban Design (WSUD), which is now a standard industry concept that prioritises smarter use of nature and its materials to provide services in all stages of the water cycle.

But that wetland is *also* a piece of green infrastructure that delivers open space, recreational opportunities, wildlife habitat, and possibly other services (for example, large water in the landscape might also be able to cool urban temperatures). The water industry has developed capability because of the regulatory framework that requires scrutiny of spending by utilities. The resultant expertise, datasets, and experience includes quantification of impacts of green infrastructure and the values placed on these impacts by the community (for example, impacts of WSUD options on water quality and species diversity). Sharing and accessing the information held by various sectors will be a key part of unlocking the data and skill required in the valuation process across different forms of green infrastructure.

Government policy encouraging different industry sectors to view our future urban environments with a green infrastructure focus invigorates the approach to infrastructure development and broadens the horizons for what our future urban landscapes can become. Policies should encourage industry players to factor in liveability, amenity, sustainability, the circular economy and a range of other urban policy goals in infrastructure development. However, demonstrating the value that could result from these investments (or broader interventions) is critical. If we genuinely see these investments as value-enhancing community infrastructure, this step must come first. Further, it must be done well if the case is to be made convincingly and for the long-term that multi-servicing delivering green infrastructure is a sound use of the community's resources.



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Frontier Economics has been providing independent advice to businesses, regulators and governments for over 20 years. From offices in Australia and Singapore, our team has a diverse range of skills and experiences to support the needs of our clients.

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