

# Harnessing the Potential of Biophilic Urbanism

## In Australia, an Economic and Policy Investigation

As Australia's cities grow to accommodate a burgeoning urban population it is increasingly important to find innovative ways to reach a balance between the levels of nature necessary for health and well-being, and the performance demands of infrastructure. 'Biophilic urbanism' will be a critical part of urban change as the economic need for large, dense cities and particularly dense centres, continues to grow. Such elements range from green roofs, green walls, and indoor plantings, to green verges, green islands, green corridors, urban farming, and regenerated waterways.

Biophilic urbanism is delivering a range of benefits in cities, such as: reducing the urban heat island effect; reducing heating and cooling loads in buildings; improving air quality; allowing urban food production; and improving stormwater management. Such elements can provide aesthetically pleasing surroundings that have been shown to enhance urban liveability, reduce crime and violence, reduce depression, and encourage greater community connectivity. Biophilic urbanism has also been linked to reducing stress, improving health and well-being, increasing cognitive abilities, improving productivity, and enhancing early childhood development.

This project focused on three key industry needs expressed by project stakeholders, namely:

- 1) providing a clear description of a range of biophilic urbanism options;
- 2) investigating the costs and benefits of various biophilic urbanism programs; and
- 3) investigating actual biophilic urbanism policies and programs to inform efforts in Australian cities.

The mainstreaming and development of metrics on biophilic urbanism outcomes appear to be the next phase in this new phenomenon.

## The research

As part of the SBEnrc's focus on industry-led research, two stakeholder workshops were held in the early stages of the project, hosted by SBEnrc core members, the Western Australian Department of Finance in Perth, and Parsons Brinckerhoff in Brisbane. The workshops involved the research team presenting the key findings of the literature review and working with a total of 25 key stakeholders to identify areas of interest for the project to develop. The result of the workshops was a project scope that investigated key areas of interest to partners and that were seen to be areas that would provide clear benefits to industry and government. The workshop format was based on the methodology of 'Collective Social Learning', created by Emeritus Professor Valerie Brown, which guided participants through a process to consider a vision for a 'nature loving city' and the aspects that both enable and disable achieving such vision.



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## Aims

Based on industry engagement the project focused on:

1. Providing a 'clear description' of a range of biophilic urbanism options.
2. Investigating the 'costs and benefits' of various biophilic urbanism programs.
3. Investigating 'actual urban greening policies and programs'.

## Key findings

The imperative to respond to climate change, increasing costs of energy, and steadily growing urban populations means that companies and governments must take innovative approaches. The popularity of biophilic urbanism is rapidly growing as it provides a proven innovative approach to urban development that can deliver a range of benefits. Developing an evidence base, however, can be complex. At some point, it requires adopting some level of risk to trial and demonstrate new tools and techniques. The key findings of this project will contribute to managing risk, by providing a foundation of evidence for the application of biophilic urbanism. Table 1 highlights a growing number of cities developing regulations and incentives to support biophilic urbanism that are delivering multiple benefits.

**Table 1: Examples of requirements and incentives for biophilic urbanism in cities**

Location	Name of Policy	Key Policy Requirements
Linz, Austria	<i>Linz Green Space Plan</i>	New buildings with area of over 100m <sup>2</sup> and a slope of up to 20° <u>require</u> a compliant green roof with a <u>subsidy</u> available.
Port Coquitlam, Canada	<i>Zoning Bylaw, No 2240 and 3569</i>	All new commercial and industrial buildings of greater than 5000m <sup>2</sup> <u>require</u> a green roof of at least 75% of the roof area.
Toronto, Canada	<i>Toronto Bylaw No 583, 2009</i>	All new developments above 2000m <sup>2</sup> <u>require</u> 20-60% green roof. (Except residential buildings of less than or equal to the greater of six storeys or 20 metres.)
Faenza, Italy	<i>Municipal Structural Plan</i>	<u>Subsidies</u> offered to encourage developments to maximising ground permeability and water and include green areas and appropriate landscaping, by offering greater building sizes and tenant use types.
Berlin, Germany	<i>Development Code: Biotope Area Factor</i>	New residential structures <u>require</u> 60% ecologically effective area and new commercial structures 30%. (Only mandatory in areas with legally binding landscape plans.)
Cologne, Germany	<i>Cologne Green Roof Policy (Flood Mitigation)</i>	A 50% stormwater fee <u>subsidy</u> is offered to compliant green roofs.
North Rhine Westphalia, Germany	<i>Initiative for Ecological and Sustainable Water Management</i>	Offers a <u>subsidy</u> for green roofs with either a minimum depth of 15 cm or certification of a runoff coefficient of less than 0.3.
Singapore, Singapore	<i>'Green Mark' certified</i>	All new public buildings and those under retrofitting above 5,000 m <sup>2</sup> are <u>required</u> to be 'Green Mark' certified after 2007.
Basel, Switzerland	<i>City of Basel's Building and Construction Law</i>	All new and renovated flat roofs <u>require</u> a compliant green roof with native vegetation.
Chicago, USA	<i>Stormwater Management Ordinance</i>	<u>Requires</u> developments that are over a certain size and density to manage the stormwater falling on the site.
Portland, USA	<i>Stormwater Management Manual</i>	New developments and redevelopments with over 500ft <sup>2</sup> of impervious surface are required to manage stormwater onsite through replicating as much as possible the pre-development hydrological conditions.
	<i>Building Code Floor Area Ratio Bonus</i>	Developers <u>offered</u> an extra 3ft <sup>2</sup> per foot of green roof without additional permits, along with a <u>grant</u> of \$5/ft <sup>2</sup> for stormwater retention.
New York City, USA	<i>New York State Law</i>	<u>Subsidy</u> offered for a green roof of more than 50% of available roof space.
Seattle, USA	<i>Seattle Green Factor</i>	Requirement for 30% landscaped area for commercial developments.

## Economic assessment key findings

The project distilled a number of economic considerations for urban greening, highlighting the emergent stages of the field and the need for further inquiry to support mainstreaming of urban greening practices:

- *Understand the opportunity cost of biophilic urbanism:* Governments and citizens rarely understand the full cost of urbanisation challenges and are therefore often unaware of the need to address these challenges, or the scale of the benefits possible through urban greening.
- *Find the balance of economic argument versus social and environmental obligation:* Berlin, Singapore, and Chicago have shown that an economic argument is not always a strong driver for biophilic urbanism, as it can be marketed on platforms of innovation and world-leading practice, urban beautification, and enhanced liveability. A partial cost-benefit analysis can be sufficient to justify action, particularly when it is recognised that other benefits will result.
- *Generate data on financial costs and benefits of urban greening:* A lack of an economic study of the costs and benefits of urban greening may prohibit a holistic approach and consistent support. Economic reporting can support benchmarking, demonstrating how effective biophilic elements are and fostering knowledge-sharing between cities worldwide. Elements can be used to boost revenue in avenues such as property and sales tax, stimulate real estate development, improve the standard of living and enhance tourism.
- *Provide financial incentives:* Meaningful financial incentives can encourage private property owners to integrate nature into their property, especially for more costly biophilic elements such as green roofs and green walls.
- *Communicate the competitive advantage that urban greening provides:* Visionary and innovative approaches to urban planning have given cities like Germany and Singapore a competitive advantage in various green technology markets, as well as lead the global environmental sector workforce. The head of Singapore's Lee Kuan Yew Public Policy Centre Dr Balakrishnan said at the World Cities Summit in 2012 'cities that provide a green and welcoming environment soothe their citizens and gain a competitive advantage...people want to stay and invest in your economy'.
- *Implement creative funding systems that respond to local context:* A creative financial scheme that attracts private and public funding is particularly important to ensure a consistent source of funding for a project (such as an urban park) and to minimise the cost to tax payers.

## Policy and program key findings

The project distilled the following key considerations for policy and program design:

- *A focus on specific outcomes from biophilic urbanism:* Biophilic urbanism can provide a range of benefits including: improving stormwater management; increasing urban amenity; economic revitalisation of derelict urban areas; enhancing international competitiveness; countering the loss of biodiversity and ecosystem services; and mitigating the urban heat island effect. Tailoring projects to areas that are of specific relevance to a given city can be more effective than concurrently promoting all possible benefits.
- *The need for a high level champion:* Cities that have successfully encouraged biophilic urbanism have typically had a political champion, such as Mayor Daley in Chicago and Prime Minister Lee Kuan Yew in Singapore. This can drive trial and demonstration projects and help overcome barriers surrounding a lack of experience and evidence.
- *Begin with demonstration and evaluation:* Government supported demonstration projects that test and evaluate techniques and technology provide evidence and experience necessary for public and industry support. As many benefits of biophilic urbanism are difficult to quantify, personal experience and interaction through demonstration projects can build broader understanding and awareness of these benefits. Outcomes of demonstration projects should be measured where possible and widely communicated across government, industry and the community.
- *Overarching policies or visions:* High level governance frameworks, such as the German and Berlin Nature Conservation Acts, provide a central focus for issue-specific policies, plans and programs. Multi-departmental advisory boards, or instituted mechanisms for cross-departmental communication and collaboration such as the Chief Sustainability Officer and Bureau of Environmental Services in Portland, maintain consistency and enable synergies between governance areas.
- *Provide incentives for private property owners:* A range of financial incentives have been shown to encourage the use of biophilic elements, and can address the issue of split incentives. Several cities investigated as part of this project charged property owners separately for stormwater, providing a discount where it was managed onsite, principally through the use of biophilic elements. These schemes generally raise awareness about the costs of stormwater management, and engage property owners as partners of the city to manage the issue together.
- *Develop mandatory, performance-based requirements:* For new and renovated properties, performance based requirements for biophilic elements enable innovation. Evaluating outcomes can help communicate benefits and drive continual improvement. Some examples include Portland's stormwater and drainage management policies, and Berlin's Biotope Area Factor.

# Benefits to industry and government

**Industry Benefits:** Governments and citizens alike are increasingly demanding smart, sustainable, sophisticated urban design solutions to meet the pressing challenges facing cities today. Biophilic urbanism provides such an approach and the outcomes of this project are of benefit to industry in the following ways:

- *Building Demand for Biophilic Urbanism:* Benefits of biophilic urbanism to encourage a greater requirement in urban development proposals and tenders.
- *Forecasting Future Requirements:* The current level of requirements for biophilic urbanism in cities around the world to inform forecasts of future such requirements in Australia.
- *Improving Strategic Positioning:* Guidance to industry on current and future opportunities for harnessing biophilic urbanism to strengthen project and service offerings.
- *Increasing Capacity Building:* A clear and structured understanding of how key elements of biophilic urbanism can be practically applied along with the associated benefits.
- *Reporting Industry Perceptions:* An indication of the perceptions of biophilic urbanism held by the industry.

**Government Benefits:** The key findings provide valuable insight on the range of benefits associated with biophilic urbanism that will enhance government programs. As such the outcomes of this project are of benefit in the following ways:

- *Benefits to Government:* Enhanced stormwater management; reduced urban energy demand; reduced urban temperatures; reduced impacts of heat waves; and increased tourism and sales tax revenue.
- *Benefits to the Community:* Enhanced liveability in cities; increased health and well-being; improved productivity; increased real estate value; and reduced crime and violence.
- *Informing Policy Design:* Evidence of the current level of requirements for biophilic urbanism in a number of cities around the world to inform policy development.

The **Sustainable Built Environment National Research Centre (SBENrc)** is the successor to Australia's CRC for Construction Innovation. The SBENrc is a key research broker between industry, government and research organisations servicing the built environment.

The SBENrc is continuing to build an enduring value-adding national research and development centre in sustainable infrastructure and building with significant support from public and private partners around Australia and internationally.

Benefits from SBENrc activities are realised through national, industry and firm-level competitive advantages; market premiums through engagement in the collaborative research and development process; and early adoption of Centre outputs. The Centre integrates research across the economic, social and environmental sustainability areas in programs respectively titled: Driving Productivity through Innovation; People, Processes and Performance; and Greening the Built Environment.

**This research wouldn't be possible without the ongoing support of our industry, government and research partners:**



## Project partners:

- WA Department of Finance
- Parsons Brinckerhoff
- Curtin University
- Queensland University of Technology
- Townsville City Council
- PlantUp
- Green Roofs Australasia



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