

Australia and New Zealand Green City Index: Perth Urban islands in a rural sea

The Australia and New Zealand Green City Index, a research project conducted by the Economist Intelligence Unit, commissioned by Siemens, seeks to assess city environmental performance across a range of criteria. This paper is intended to provide Perth's stakeholders with an overview of findings and tools to understand and better address their environmental challenges. Accordingly, it profiles Perth's particular strengths and weaknesses across an array of individual categories such as: CO₂, energy, land use, buildings, transport, water, waste, air quality and environmental governance. Furthermore, the report places Perth's performance in a regional and global context and presents leading best-practice ideas from across the globe.

Australia and New Zealand are among the least densely populated countries on earth. According to the World Bank, Australia – with three people per square kilometre – ranks 208th out of 211 countries for density, while New Zealand is 179th. Perceptions about the two nations draw on images of vast, lightly populated rural spaces with unique landscapes and wildlife.

At the same time, Australia and New Zealand are also two of the world's most urbanised countries (89% in Australia and 86% in New Zealand), according to the United Nations Population Division. Slightly more than half the world's population lives in urban areas with the percentage rising to 78% in developed countries. More than in other regions, Australians and New Zealanders live in urban islands set in a sparsely populated rural sea. This fact does not diminish the importance of the environment in the countryside, but it does mean that urban policies and the behaviour of city residents largely define the environmental impact and quality of life for the vast majority of those living in the two countries.

In comparison to the cities in the European and North American Green City Indexes, those in Australia and New Zealand scored relatively well in air quality and the availability of green space. But Australian cities, in particular, need to find ways to reduce urban energy and water consumption to make these supplies more sustainable. Both countries face on-going challenges in limiting urban sprawl, discouraging low-density development and promoting the use of public transport. These efforts, in turn, will affect the two countries' outcomes in other areas, such as energy usage and carbon emissions. An example of remaining challenges is that none of the cities in this index requires energy efficiency audits of buildings—although all offer information on how to decrease energy usage in buildings. Similarly, the low availability of public transport makes it difficult to bring about a meaningful modal shift away from car usage which could in turn do much to reduce energy consumption and resultant emissions.

The broader message is that every city has examples of very good practice and also significant challenges. Wellington, which does well on CO₂, energy, waste and air quality, could benefit from reforms in both water and land use. Sydney, which excels in land use, transport and water, is sorely behind on improving the energy efficiency of its buildings. Auckland in parallel demonstrates relatively weak environmental governance, despite its solid performance in CO₂, energy and air quality. Perth lags on energy and CO₂ but performs well on land use and environmental governance.

Robert Crawford, lecturer in construction and environmental assessment at the University of Melbourne and a member of the Green City expert panel, finds this unsurprising. "No city is perfect," he explains. "What is critical is that we learn from other cities that are exemplars of best practice, as should these cities learn from others in areas where they perform well below par." This report will point to many best practice examples around the world, but in Australia and New Zealand there are also some worth pointing out: Wellington's introduction of a curb-side recycling scheme in 2011, Sydney's "Greening Sydney" plan to increase the urban canopy by 50% by 2030, Melbourne's carbon-neutral Pixel building and Perth's Metropolitan Region Scheme to improve and expand its open space.

Perth: car dependent and energy intense

Perth, the capital of the state of Western Australia, is the fourth most populous city in the Australia and New Zealand Green City Index, with 1.7 million residents across the metropolitan area. Industry makes up an estimated 30% of the city's economy, the highest figure in the Index. Perth was traditionally a hub for iron ore mining, but this has diminished over the last decade due to the expansion of mining production into the state's regional areas. Nevertheless, Perth has experienced strong growth in construction, one of the city's most lucrative sectors. Perth's GDP per capita is an estimated US\$30,300, below the Index average of US\$35,500. This is using inflation adjusted 2000 dollars at purchasing power parity to account for variation inherent in comparing other data across a range of sources. In purely nominal terms, Western Australia's state product per capita is roughly twice that level. Data for Perth relates primarily to the metropolitan area, but for some policy scores the Economist Intelligence Unit evaluated the City of Perth as there is no single administrative entity covering the entirety of the metropolitan area.

Overview

Perth generally performs below its regional peer cities across a range of sustainability issues. It places near the bottom in seven of the nine individual categories assessed, leaving the city with substantial challenges to overcome to improve the greenness of its metropolitan region. Nevertheless, there are some areas where Perth is leading. For example it has the most green space per capita in the Index and performs in the top tier for land use. The city has also taken positive strides in environmental governance, where it ranks highly. Perth has initiated a number of community support programmes to help residents and businesses improve energy and water efficiency, and promoted the use of public transport.

Perth faces many environmental challenges but it is taking some steps to reform. The city's environmental governance performs best with reasonably robust community engagement. In parallel, its land use policies are a source of strength deserving high marks for its green spaces and brownfield redevelopment endeavours. Perth's water and waste categories leave room for improvement though its air quality policies demonstrate the city's concerted efforts. More problematically, its CO₂ emissions are high both in absolute terms and per unit of GDP.

Research scope

The seven cities selected for this research endeavour are the five most populous in Australia and the two most populous in New Zealand. Christchurch was not included because of concerns that earthquake damage would make it difficult to get accurate data on infrastructure and also might give an inappropriately negative view of its long-term performance. All cities were picked independently by the Economist Intelligence Unit, in order to enhance the Index's credibility and comparability.

The methodology was developed by the Economist Intelligence Unit in cooperation with Siemens. It relies on the expertise of both organisations, a panel of independent urbanisation experts, and the experience from producing Green City Indexes for Europe, Latin America, Asia, the US and Canada, and Africa. An important strength of the Australia and New Zealand Green City Index is the breadth of information it uses. Over thirty individual indicators across nine categories were assessed for each city, and these indicators are often based on multiple data points. The process was intended to be replicable and to reveal sources of best practice.

Unfortunately there has been a lack of comparable data. While there are important differences, the top line rankings were unduly influenced by a small subset of the quantitative data. This made certain key proxies, in particular energy and CO₂ emissions, more relevant than they would have been in other indices. The small sample size combined with such data inconsistencies catalysed a shift in our approach to this research. Rather than publication, this has been reformulated to suit a more discursive treatment of the research.

Perth results

Land use

Perth performs well in the category of land use, aided in large part by its active endeavours to provide for open space. Perth's Metropolitan Region Scheme (MRS), a consortium of local governments, has been operating since 1963 to improve and expand open space in the metropolitan region. The MRS has bipartisan political support and the power to tax. It has used revenue to buy land from the private sector to set aside as reserves, and as one of the consequences, Perth has the highest amount of green space per capita in the Index, at an estimated 1,400 square metres per person across the metropolitan region, more than twice the Index average of 633 square metres.

Perth's population density is roughly average for the region at 1,213 people per square kilometre (the regional Australia and New Zealand average is 1,290 per square km). Perth is generally strong in other areas of land use policy, including efforts to redevelop brownfields. The Perth City Council, in cooperation with a regional authority, has contributed A\$100 million of total value in cash, land and upgrades to develop affordable housing on three brownfield sites – two along the Swan River and one in the city centre.

CO₂

Emissions figures place Perth's emissions at 31.1 tonnes per person, well above the region average of 20.4 or even the Australian average of 25.8 tonnes per inhabitant. For context, the average of the US/Canada and European indices were 14.5 and 5.2 tonnes per person respectively. However for the Australian and New Zealand cities, these data are proxies drawn at the state level for which city level data is often spotty at best. When only Local Government Area data are included, the situation appears still worse with Perth's emissions rising to 77.6 tonnes per person against a regional average of 27.4 tonner per person. Either way this is calculated, the general message implies substantially higher emissions than the norm across developed cities. Heavy iron and steel production, car emissions and coal-fired electricity generation all contribute to these high emissions statistics. Furthermore, even when CO₂ emissions are calculated on a US\$ GDP basis, Perth is still more in line with high US emissions than with European cities. Based on the state-wide data, it is estimated that the city emits 652.2 grams per unit of GDP; this is well above the regional average of 583.3 grams per unit of GDP.

Energy

Perth is a large energy consumer. The success of mining and other energy-intensive industries in the state, associated with their concomitant population boom, contribute to Perth's high energy consumption figures. The city has the highest energy consumption rates in the region, with an estimated 437 gigajoules per person, compared to the Index average of 227 gigajoules. This is over five times the European Index average of 81 gigajoules. Without looking so far afield, New Zealand residents also use much less energy, at 89 gigajoules per person. Per unit of GDP, the city consumes an estimated 9.3 megajoules, compared to the Index average of 6.5 megajoules. On this basis the differences are less extreme, with Perth's consumption slightly more than twice the European average of 4 instead of five times higher.

As with CO₂ data, the energy consumption figures for the Australian cities (at an average of 283 gigajoules per person) were based on state-level data, in the absence of comparable urban-level statistics. Consequently, the results will be skewed somewhat by manufacturing and agricultural activity taking place outside the urban boundaries, and by the amount of fuel needed to cover the vast distances in the Australian outback. The presence of heavy industry in and around Perth is one source of emissions. However, the importance of the mining industry yields particularly substantial rural emissions included in the state data.

Unfortunately, regarding its energy policies, the city receives lower marks than most other cities in the Index. There are no large scale renewable energy projects in the city nor a comprehensive framework to

incentivize them. Perth has initiated some smaller-scale projects such as energy-efficient lighting and solar-powered car park ticketing machines but this is not at a scale to shift the city's energy usage patterns.

Transport

As in most major Australian cities, tackling afternoon peak-hour traffic congestion is a top priority. However, not enough is done to balance investment in public transport, walking and cycling with an efficient road network. Bikeways are one means of moving commuters away from car usage but the city has only an estimated 175.4 metres of bike lanes per square kilometre, less than half the regional average of 412.1 metres per square kilometre.

Perth is below average in the region with under 16% of commuters walking, biking or taking public transportation to work against a regional index average of 20%. Moreover in Europe, fully 42% take public transportation alone leading to a fraction of Brisbane's car dependence. Perth is below the regional average both for public transport use and for the percentage walking or cycling to work. Furthermore, Perth has only an estimated 50.1 metres per square kilometre of superior public transport lines (trains, trams and guided bus ways), well below the regional average of 82.4 meters per square kilometre. While this measure excludes standard bus lines, the lack of an efficient public transport alternative is a challenge. As Peter Newman, professor of sustainability at Curtin University in Australia, puts it, "High car reliance is a real vulnerability in Australia and New Zealand cities."

Water

Australia is confronted with recurring droughts and a paucity of water even in the best of times. This means that issues of consumption and usage have substantial salience. This is of interest around the world as many other countries may begin to face such challenges as climate change shifts global weather patterns. Rationing is at times needed and the agricultural use of water supplies can conflict with the needs of urban areas. Addressing these challenges, cities need to be innovative and efficient in their resource use.

Perth's record is mixed. The city's water leakage rate (at 10%) is better than the US/Canada average of 13% and substantially below the European (23%). There is still room for improvement in water consumption. Perth consumes 383 litres per person per day, which exceeds both the Australia/New Zealand regional average of 319 L/person/day and the European Index average of 288 L/person/day. Perth's consumption is around twice that of Amsterdam, one of Europe's best performers. Nevertheless, compared to the US and Canada average, a deplorable 587 L/person/day, Perth consumes only around two-thirds of the water resources despite some similarities with this region. But with drought being an important and recurring climatic challenge across the Australian continent, consuming less is important.

Waste

Overall, the city performs poorly in the waste category as it lacks efforts to limit waste prevalent in other cities in the Index, for instance pay-by-weight or similar schemes. However, the Mandarie Regional Council, a conglomeration of seven member councils of which Perth is one, has implemented an innovative waste management initiative – a Resource Recovery Facility – which converts 100,000 tonnes of waste from the region into compost.

With its prominent industrial base, Perth produces the highest amount of waste in the Index, at 876 kg per capita across the metropolitan area, compared to the Index average of 427 kg. Moreover, it recycles only 36% of its waste, below the regional average of 42%. The city outperforms the US/Canada and European averages of 26% and 18% respectively. However, there is still significant scope for improvement: Singapore, for example, recycles 59% of its waste and San Francisco a remarkable 77%.

Environmental governance

Perth generally receives high marks for the environmental governance policies evaluated in the Index. Perth has a dedicated authority, called the City Sustainability Unit, which deals with all matters pertaining to environmental strategies, programmes and projects. The city also scores well for its overall environmental strategy and its membership in the Cities for Climate Protection campaign, an initiative by ICLEI, the consortium of local governments from around the world taking measures to tackle greenhouse gas emissions. Another highlight of the city's efforts in this category is Perth's umbrella programme to promote public awareness and drive behaviour change relating to the environment in

homes and businesses. As part of the programme, the city identified 23 key behaviours it is promoting and recognising, including water and energy efficiency, and resource conservation.

More broadly Perth, like many cities in Australia and New Zealand, produces regular environmental reports, gives the public access to city environmental data and encourages public input into decisions that will have an environmental impact. While these policies at times surpass cities in other developed regions, heavy resource consumption and urban sprawl remain very pronounced.

In common with many cities in its region, Perth faces administrative and jurisdictional barriers to actually implementing policies, with responsibility for metropolitan areas spread throughout competing jurisdictions and fragmented administration. "Australasian cities are rich in the production of publicly available data and in public discourse over plans," Dr Guy Salmon, Executive Director of the Ecologic Foundation says, "but weak in the capacity to actually implement plans. This is a crippling problem for Australasian cities in the face of today's sustainability challenges."

Buildings

There is very significant scope for upgrading the quality of Perth's built environment and improving its policy framework. The city shows a lack of Green Star-certified building projects (a voluntary environmental rating system). It has the lowest figure in the Index, at an estimated 1.2 buildings per 100,000 people compared to the Index average of 2.4. Even this regional average is quite low leaving substantial room for improvement. To put this in context, Perth has only a small fraction of the US and Canadian average of 6.4 Leadership in Energy and Environmental Design (a comparable ratings system) certified buildings per 100,000. Leaders such as Seattle may have upwards of 17 buildings per 100,000, nearly fifteen times the number in Perth.

This performance is exacerbated because Perth lacks mandatory environmental regulations for new buildings. The city does provide incentives for developers to incorporate energy efficiency and environmental principles into designs for public and private projects. These include, for example, giving preference to bids proposing to use environmentally sustainable building materials. However, they lag behind leading European cities, like Stockholm or Berlin, which have more robust incentives and more stringent energy codes.

Air quality

Australian and New Zealand cities have among the cleanest air in the world. Perth lags in this group, but the rest of the Australia and New Zealand region has pollutant levels that are below the World Health Organisation's recommended limits. For particulate matter, Perth (at $15.9 \mu\text{g}/\text{m}^3$) is worse than the regional average but below the WHO's recommended $20 \mu\text{g}/\text{m}^3$. Sulphur dioxide ($2.9 \mu\text{g}/\text{m}^3$) and nitrogen dioxide ($12.3 \mu\text{g}/\text{m}^3$) levels in Perth are more in line with the region as a whole which averages $2.4 \mu\text{g}/\text{m}^3$ and $15.3 \mu\text{g}/\text{m}^3$ respectively. For context, the average figure in the European Index for particulate matter, at $35 \mu\text{g}/\text{m}^3$, is far higher than Perth's $15.9 \mu\text{g}/\text{m}^3$. Furthermore, at $2.9 \mu\text{g}/\text{m}^3$, sulphur dioxide is under half of the European average ($7 \mu\text{g}/\text{m}^3$).

Despite its outlier status in Australia and New Zealand, Perth has a less acute need for policy change in this category. While steps can be taken to improve air quality, in global terms this is an area of comparative strength.

Leading Perth initiatives

Transport: A car park for electric vehicles

Perth's commercial parking operator, City of Perth Parking (CPP), has been a leader in using green technology in its parking bays and ticket machines. The launch of the Elder Street car park in 2010, CPP's newest development, was the first parking facility in the state to provide electric vehicle charging capabilities. The facilities are fuelled by energy generated from solar panels on the car park's roof. CPP has also installed 54 bicycle parking bays at Elder Street, making it the first car park in Australia to offer these facilities to non-motorised vehicles. Patrons can leave their bicycles

at Elder Street and commute to the city centre using the city's free bus service that operates around the central business district.

Water: Joining the international Water Campaign

In 2004, the Perth City Council joined the Water Campaign, an international program run by ICLEI. Through the campaign, which sets milestones to encourage water conservation, the council has reduced water consumption from city operations by 43% from the 2001/2002 baseline level. This has comfortably surpassed the initial reduction target of 20% by 2012. The city took a number of measures under the programme, including metering and monthly monitoring of groundwater usage, implementing an automated irrigation system to conserve groundwater and installing dual-flush toilets.

Energy: Sustainable business health checks

Perth's Sustainable Business Leader's program, launched in 2010, incentivises small enterprises to become more environmentally friendly. Seven businesses were selected from a large pool of applicants to participate in 2012. They receive access to an industry expert who will help conduct a sustainable business health check and prepare a sustainability action plan. In 2011, one participating business saved A\$1,200 in energy bills through the programme.

Global best practice initiatives

[Relevant ones to be added]