

Urban Sustainability in Melbourne, Australia

Major Qualifying Project
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Abstract

The goal of this MQP is to paint a picture of current sustainability efforts throughout the city of Melbourne and use indices and best practices to identify the areas in which the city could be doing more to incorporate sustainability into its planning efforts. I accomplish this through thorough research, analysis of indices, and evaluation of data and information to provide recommendations for the city of Melbourne.

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Chapter 1: Introduction

Melbourne, Australia was the land of the Kulin Nation Aboriginal peoples before 1835, when European settlers arrived. In 1847, Queen Victoria officially made Melbourne a city. Throughout its history, Melbourne has seen plenty of extremely different planning documents made by inherently political departments and organizations. Unfortunately, sustainability was not a major factor of any of those planning documents until well into the 20th century. Recently, Melbourne has been named the world's "Most Livable City" from 2010-2017 by the Economist Intelligence Unit, and in 2018 coming in close second for that title. But how exactly did the city get there? Through decades of intricate, comprehensive, multi-level urban planning that was able to attract a plethora of new residents while diversifying their planning methods. Recently, like many other major cities around the globe, Melbourne has put a strong emphasis on sustainability and the environment placing 32nd most sustainable city worldwide in the 2016 Arcadis Sustainable Cities Index.

The City of Melbourne is the fastest growing city in Australia which makes it a difficult city to plan for. Planners and city officials need to account for that growth when deciding major urban strategies such as transportation and housing. Planning for Melbourne is a responsibility taken on by the City Council as well as the Victorian State Government. It is important to note that I discuss planning documents from both governmental bodies to create a complete picture of the planning history of Melbourne. The State of Victoria has created plans for the entire Metropolitan region of Melbourne since 1929 when the first strategic plan for the City of Melbourne was created. Since then there have been about six more strategic plans created for Melbourne, each implementing new policies and strategies as the State learned from previous mistakes. Meanwhile, the Melbourne City Council has created a comprehensive metropolitan plan, Future Melbourne 2026. State and local plans work in tandem to achieve the goals set forth by their respective plans.

In this paper, I include an analysis of Melbourne's urban sustainability through two different indices used to measure urban sustainability and provide examples of best practices that have been implemented in other cities. The goal of this report was to accurately paint a picture of current sustainability efforts throughout the city of Melbourne and use indices and best practices to identify areas where the city could be doing more to incorporate sustainability into its

planning efforts. I accomplished this by completing three objectives. My first objective was to research urban sustainability and sustainable development processes and theory to familiarize myself with the topics and get a good overall view of the themes at hand. My second objective was to delve into urban sustainability within and around Melbourne by analyzing any current sustainability practices through the lens of two different urban sustainability indices and current best practices being implemented in cities worldwide. Finally, after evaluating the information gathered and analyzing it all together, I provided recommendations of practices that could be included in, or supplement, Melbourne's comprehensive plan *Future Melbourne 2026*.

Chapter 2: Literature Review

2.1 Sustainability

This section focuses on sustainability as a whole and then moves into the international and national reception, integration, and adoption of sustainability principles and practices. I address the efforts made to achieve sustainability within Australia which provides context for later sections.

2.1.1 Concepts and Goals

There are many schools of thought on the topic of sustainability and what the word and idea mean academically and colloquially even. Many experts have debated the definition of sustainability, what it includes, and how it should be used since the 1970s when the concept first began to be bounced around in global discourse. The most widely accepted or agreed upon definition of sustainable development is the one given by the Brundtland Commission in 1987 which states “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This is the most popular definition and for the most part gets straight to the point on what sustainability itself means.

There are generally considered to be three pillars thought to make up the concept of sustainability or sustainable development, those are the three “E’s”, economy, environment, and equity (Portney 2015). Think of these pillars as three circles in a venn diagram as shown below in figure 1.1. These pillars are ways in which we can study or implement sustainability as a practice as well as a simple way to think of it conceptually. One strategy to successfully achieve sustainability is to reach goals that promote all three pillars, essentially a government or organization trying to be sustainable should try to keep these circles as equal as possible to achieve success in all aspects of sustainability.

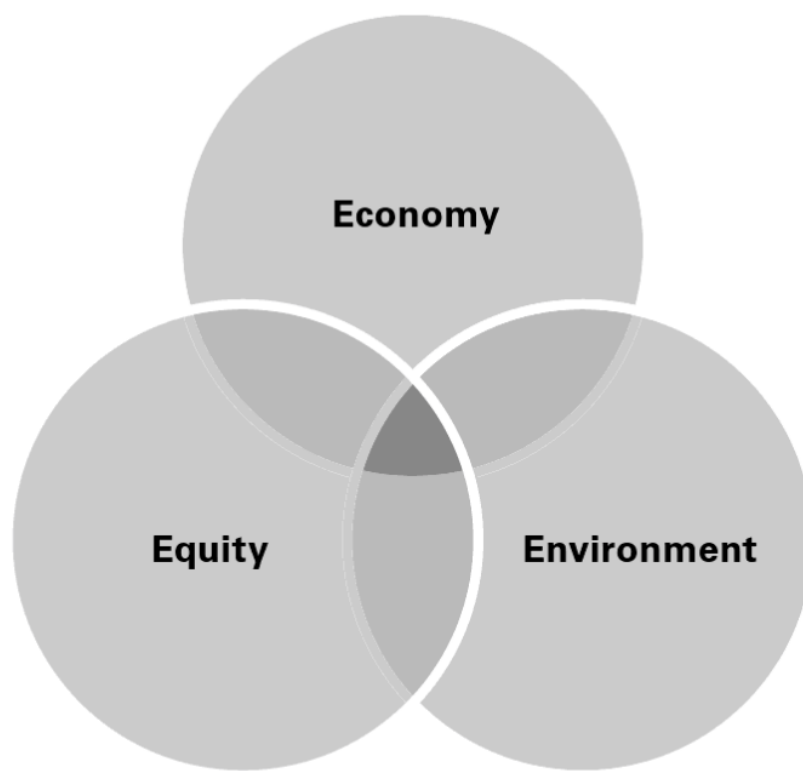


Figure 1 The three overlapping pillars of sustainability (Portney).

There are experts that have attempted to define sustainability by dividing its definition into six different parts or roots. The six roots according to Brown et al. are carrying capacity, sustainable use of biological resources, sustainable agriculture, sustainable energy, sustainable society and economy, and sustainable development (Brown et al. 1987). It is clear that these can be then formulated into two groups one focusing more on the environment and the other on the economy. Altogether these definitions make up sustainability as a whole. It is a clearer and more precise way than just thinking of the three pillars as mentioned above.

Carrying capacity can be boiled down to how many people the Earth can support. An idea first introduced by Thomas Malthus as he argued in the late eighteenth century that population growth would eventually outstrip the Earth's ability to support said population (Portney 2015). Sustainability is not necessarily focused on what the Earth's maximum carrying capacity is since this is more focused on the largest population the Earth can possibly hold without any resource scarcity but on optimal carrying capacity that is geared towards a smaller population that will be less vulnerable to environmental disruptions (Portney 2015). According to Brown et al., sustainable agriculture includes being able to keep farming productive during and after catastrophic events such as floods or disease while sustainable use of biological resources is the maximum sustainable yield from natural systems such as forests and fisheries (Brown et al. 1987).

With the issue of climate change at hand there is a global shift to more sustainable energy sources such as renewable energy or nuclear power. Sustainable energy is a focus on decoupling human reliance on fossil fuels because of the extremely negative environmental impact and also a focus on technological advancements in the field of energy efficiency and alternative fuels. There is an inherently socio-political aspect to sustainability that Brown et al. cover in their definition of sustainable society and sustainable economy which focuses on social conditions within the economy, and questions whether economic well-being and human well-being are the same. This fits into the third pillar of sustainability equity. Ensuring that everyone in the population has access to the same resources is an important part of sustainability that is often looked over in many instances. Finally, sustainable development is defined by Brown et al. as the relationship between natural resources and the economy as two inseparable factors which is why we should be looking at how to most efficiently use those resources while keeping in mind all of the previous definitions as well.

There are many goals of sustainability that can be extrapolated from the various definitions discussed above, but no matter what definition used there are certain goals that stay constant in the realm of sustainability. These goals include mitigation or adaptation to climate change (depending on the geographical location), protecting water supplies, becoming more resilient to environmental catastrophes, and reducing the amount of toxic and industrial waste being released into waterways and underground.

Climate change is recent phenomenon that has taken place globally and has caused a variety of effects on the Earth's environments most notably temperature rise, which in and of itself causes a whole host of other effects. Sea level rise, ocean acidification, increase in frequency and intensity of storms and hurricanes, droughts, floods, and more have been recorded in recent years around the world as just some of the effects of climate change. As a complex and intricate system of concepts, sustainability is one way individuals, governments, organizations, and corporations can attempt to begin the mitigation and/or adaptation to the effects of climate change. Mitigation is actions that reduce the effects of climate change, for example reducing fossil fuel use will lead to less carbon emissions and therefore reduce the extent of the effects of climate change such as temperature rise. While adaptation focuses on actions that can prepare an area to be more resilient to the effects of climate change such as a sea wall for sea level rise. Resiliency has many definitions but in this case is used to mean the protection of populations or

geographical areas to certain environmental catastrophes and to ensure that said population or area can recover quickly and efficiently.

Protecting waterways includes ensuring that a natural resource as essential as water is available worldwide. The United Nations has estimated that nearly half of the world's population does not have access to clean drinking water (Portney 2015). This is becoming even worse due to sea level rise as salt water intrusion deems many water sources undrinkable and temperature rise causing droughts and disappearances of entire waterways. Ensuring that populations have access to clean drinking water includes improved understandings of hydrology and water management that coincide with many sustainability principles and practices.

Going hand in hand with protecting waterways is the goal of reducing toxic and industrial waste in waterways and underground. Many times with that goal in mind, there are efforts to just reduce the production of toxic waste in general.

2.1.2 Sustainability in Australia

In the early 1990s, Australian environmental groups had strong political power and came out with the definition of ecologically sustainable development which is defined as “using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased” (McManus 2012). This definition was turned into federal policy quickly after the 1992 United Nations Conference on Environment and Development held in Rio to meet the global agenda put forth in the *Rio Declaration* (Dovers 1994). The National Strategy for Ecologically Sustainable Development (NSES) is a range of policies that include innovative and inclusive policies such as the Landcare Program that has given rise to some 4200 community groups, integrated catchment management, co-management arrangements with indigenous groups, and research and development initiatives (Dovers 1994). It was identified by many policy advisers that these policies were not performing adequately.

Most recently, after Australia’s adoption of the Sustainable Development Goals (SDG) that were prepared by the Bertelsmann Stiftung and the Sustainable Development Solutions Network at the United Nations in 2015, they have fallen short of meeting many of the sustainability goals. The STG Index for 2018 ranks Australia as 37th out of 156 countries that have accepted the goals, down from 26th last year. Many developed countries are ahead of

Australia including the United States, United Kingdom, and New Zealand. Australia ranks the worst performing country in climate action in the world. This goal includes meeting certain indicators and the index measure success by measuring energy-related CO₂ emissions per capita (of which Australia's is higher than Saudi Arabia even), CO₂ emissions embodied in fossil fuel exports, and imported CO₂ emissions.

As for the future of Australia's sustainability policy, according to Hatfield-Dodds et al. there are a few courses of action that could be taken. Using the Australian National Outlook 2015 report prepared by the Commonwealth Scientific and Industrial Research Organization, Hatfield-Dodds et al. completed an assessment of Australia's current materials-intensive industries and what the future of Australia's economy would look like under certain conditions using nine linked simulation models. The study produces 20 scenarios of the future that are embedded in one of four possible settings including different population trajectories and global carbon prices leading to 2, 3, or 6°C of temperature increase above pre-industrial levels in the year 2100. All scenarios predict that Australia's gross domestic product will more than double by 2050, contingent on Australia adopting a carbon pricing scheme which at the moment they do not have. According to the findings from the study the two possible pathways include continued resource intensive-growth as long as governments and other institutions restrain the pressure being put on environmental systems, or an economy shaped by innovation, technology, and labor instead of energy and resources which would mean less restrictive policies. "Australia is free to choose which path to follow" (Bodirsky 2015).

2.2 Urban Sustainability

In this section I discuss the principles of urban sustainability as they are described by certain indices and then include some examples of successful attempts at putting them into practice in certain cities. The indices I will be focusing on are the Taking Sustainability Seriously Index (TSSI) and the Arcadis Sustainable Cities Index.

2.2.1 Indices

Urban sustainability is the concept of implementing sustainability principles in urban areas to successfully minimize environmental impacts. There are several indices that have been used to measure urban sustainability within cities and countries around the world. The difficulty

in creating indices arises when having to account for cultural, geographical, political, and other difference among many cities. There is no one size fits all index for urban sustainability. I have chosen to focus on three indices for this section to get a holistic view of urban sustainability in Melbourne. I will be describing the indicators and process of each index below and see where Melbourne stands on each index in my analysis later on. These indices are not the end all be all of sustainability but they provide two separate contexts in which to analyze Melbourne's overall sustainability with.

The first index is the Taking Sustainability Seriously Index (TSSI) created by Kent Portney. There are 38 total indicators, detailed in Figure 4, separated into seven sections. Essentially the more indicators met, the higher the score, and the more sustainable the city in study is. The seven sections included in the index are sustainable indicators project, smart growth activities, land use planning programs policies and zoning, transportation planning programs and policies, pollution prevention reduction and remediation, energy and resource conservation/efficiency, and organization/administration/management/coordination/governance. Each section has a set of elements pertaining to that sections theme and the elements are either policies or programs. This index is a good measure of what organizations, programs, and policies are put in place in a certain city but not whether or not these policies and programs are actually working or making a difference (*Portney 2013*). The figure below shows the elements for the TSSI organized into their respective categories.



Figure 2 The Taking Sustainability Seriously Index elements (Portney).

The Taking Sustainability Seriously Index (TSSI) was created by Kent Portney to measure how seriously cities are taking sustainability within their respective local governments. The index itself measures whether or not certain programs or policies are adopted by the city council. Each section of the index pertains to a different aspect of sustainability that city councils should be addressing if they want to take sustainability seriously. The elements shown above make up the TSSI as a whole, which, when completed, becomes an indicator of whether a city is taking sustainability seriously or not. One of the most important elements of the TSSI is whether a city has an active sustainability indicators project to ensure that the city is measuring its sustainability efforts. In the context of this paper, I chose this index to figure out where Melbourne is in a more general sense whereas the Arcadis SCI goes into much more detail.

The Arcadis Sustainable Cities Index takes a deeper dive into whether cities are accomplishing urban sustainability by examining indicators from three different angles, people, planet, and profit, which coincide with the three pillars of sustainability mentioned in the previous section. The sections shown below in figure 4 each have indicators used to measure a city’s urban sustainability.

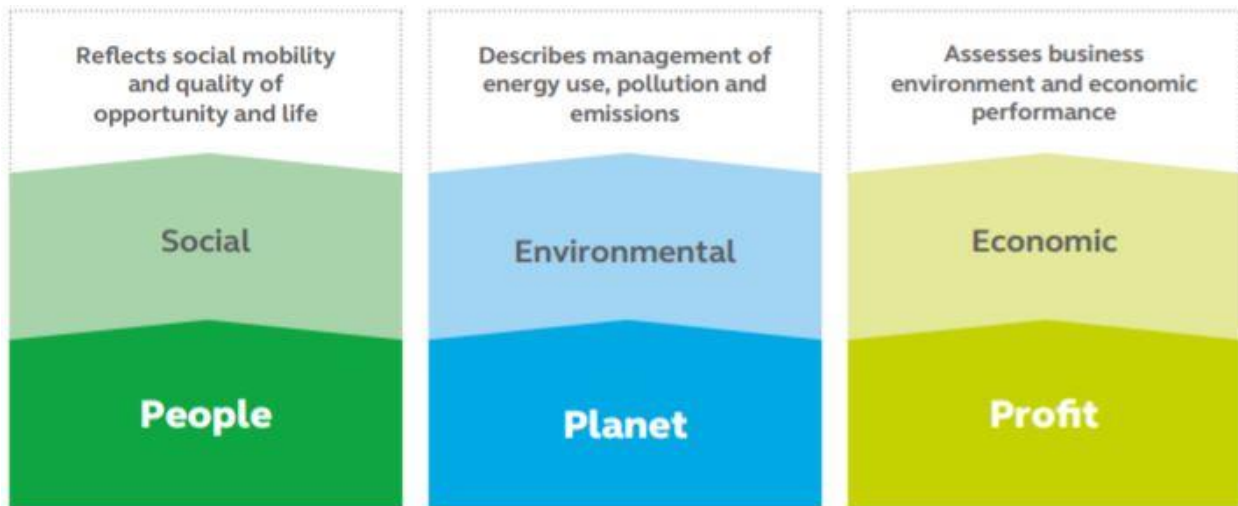


Figure 3 Arcadis Sustainable Cities Index sub-sections (*Sustainable Cities Index*).

Within the people subsection there are metrics including personal well-being which measures health, education and crime, along with working life which measures income inequality, working hours, and the dependency ratio, and an urban living metric measuring things such as transport accessibility, digital services and other amenities. The planet subsection includes many social-environmental metrics such as measuring the immediate needs of citizens by evaluating the availability of water supplies, sanitation, and air pollution. The planet subsection also calls for measurements of long term impacts that can help assess a city’s contribution to climate change, some indicators include energy consumption, recycling rates, and greenhouse gas emissions. Other indicators within the planet subsection are measuring renewable energy, bicycle infrastructure, electric vehicle incentives, natural catastrophe exposure, and risk monitoring. These indicators will assist in measuring a city’s investment in low carbon infrastructure and resilience to natural disasters. Finally, the profit subsection measures effectiveness of transport by looking at rail, air, and traffic congestion, along with economic performance and business infrastructure by using a city’s GDP per capita, employment rates,

ease of doing business, tourism, and their position in global economic networks. The Arcadis Sustainable Cities Index is an award winning index that is highly revered around the world for its work in the field of urban sustainability (*Sustainable Cities Index*).

2.2.2 *Best Practice*

Every city has differences in culture, population, location, politics, infrastructure, environment, economy, and more. Yet, still one of the best ways to engage in urban sustainability concepts is to adopt ideas that have worked for other cities similar to the city in study. Although the cities will never be the same, it is possible that what has worked for one may work for the other if some minor changes take place. In this subsection I will be chronicling the paths that some cities have taken towards urban sustainability to use as “best” practices.

The first city whose urban sustainability challenge I will describe is Calgary, Alberta, Canada. Calgary is an oil and gas town with over 900 oil company head offices located in downtown. This means that the average per capita income is quite high making the demand for single family homes also high. The low density, high urban sprawl city is known for its hastily designed streets and highways that make little to no sense in terms of urban design. Despite this fact, Calgary takes the idea of sustainability very seriously attempting to incorporate it into every department in the local government. The Office of Sustainability is run by only three staff people whose responsibilities are to ensure that sustainability goals are implemented and integrated into departments throughout the local government through the imagineCalgary comprehensive plan and the Triple Bottom Line policy, which combines 350 policy statements into 20 themes. Calgary puts a large emphasis on social sustainability, its policies and practices on the ground. The Office of Sustainability along with a division in the Community and Neighborhood Services (CNS) called the Family and Community Support Services (FCSS) created the Social Sustainability Framework (SSF). The SSF was created to help combat the recurring issue of social aspects of sustainability being swept under the rug due to timing and administrative problems. Since there is a newly elected council and mayor every three years the priorities of each new council changes causing many social issues to be put on the backburner. The SSF identifies social priorities that are grounded in the imagineCalgary plan and the TBL policy so when new policies or projects are proposed to the city council they will need to outline what the

social impact of that policy or project will be. The SSF is focused on two key areas of social sustainability and that is social inclusion and strong neighborhoods.

Focusing on another aspect of sustainability is Vancouver, British Columbia, Canada that has made the bold statement to become the world's greenest city by the year 2020. Their main way of ensuring that goal is met is through their Greenest City Action Plan that was put in place in 2011 which is organized into 10 main goals. Within these 10 goals there are targets, baseline numbers, highest priority actions, key strategies to 2020, and "what it's going to take to get there" sections. The 10 main goals detailed in the plan are green economy, climate leadership, green buildings, green transportation, zero waste, access to nature, lighter footprint, clean water, clean air, and local food (Greenest City, 2012). Vancouver has an advantage of having a citizenry that is very in touch with nature and the outdoors, therefore they are extremely concerned with climate change and the effects it may have in and around their city. One thing that stands out with the Greenest City Action Plan, besides being extremely ambitious, is that there are measurable and accountable targets for every goal listed (Greenest City). The language used throughout the plan is candid, inspirational, and motivating. From the Greenest City Action plan stemmed other programs such as the Greenest City Action Fund, created to help fund small, neighborhood-led sustainable projects such as community gardens, recycling projects, and more (Towards the Human City).

2.3 Melbourne

This section focuses on the City of Melbourne, its demographics and form of government, along with its planning history and current comprehensive plans written by the City Council as well as the Victorian State Government.

2.3.1 Demographics and Form of Government

As mentioned in the introduction, Melbourne is the fastest growing city in Australia set to surpass Sydney as the most populated city in the country by 2026. The Greater Metropolitan area of Melbourne shown in figure 1, is growing at a rate of 2.65% annually with a current population of about 5 million people (Linco 2018). Figure 1 is a map created by the State of Victoria Department of Environment, Land, Water, and Planning that divides the Melbourne Metropolitan area into regions that the State then uses for planning and partnership purposes as can be seen in

the map legend. The City of Melbourne, shown in figure 2, is made up of the center of the city or the Central Business District (CBD) and a few inner suburbs, and has a population of over 148,000 people as of 2016.



Map 13

Metropolitan Melbourne regions

Local Government Area boundary Metropolitan Partnership boundaries Part of Mitchell Shire⁽¹⁾

Map key

Local Government Area	Inner Metro Region	Inner South East Region	Western Region	Northern Region	Eastern Region	Southern Region
	1. Melbourne 2. Port Phillip 3. Yarra	4. Stonnington 5. Bayside 6. Boroondara 7. Glen Eira	8. Melton 9. Brimbank 10. Hobsons Bay 11. Wyndham 12. Moonee Valley 13. Maribyrnong	14. Banyule 15. Whittlesea 16. Nillumbik 17. Hume 18. Moreland 19. Darebin 20. Mitchell (part)	21. Manningham 22. Whitehorse 23. Knox 24. Yarra Ranges 25. Maroondah 26. Monash	27. Kingston 28. Frankston 29. Cardinia 30. Casey 31. Greater Dandenong 32. Mornington Peninsula

Source: Department of Environment, Land, Water and Planning

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Environment,
Land, Water
and Planning

Figure 4 Map of Metropolitan Melbourne divided into regions (State of Victoria).

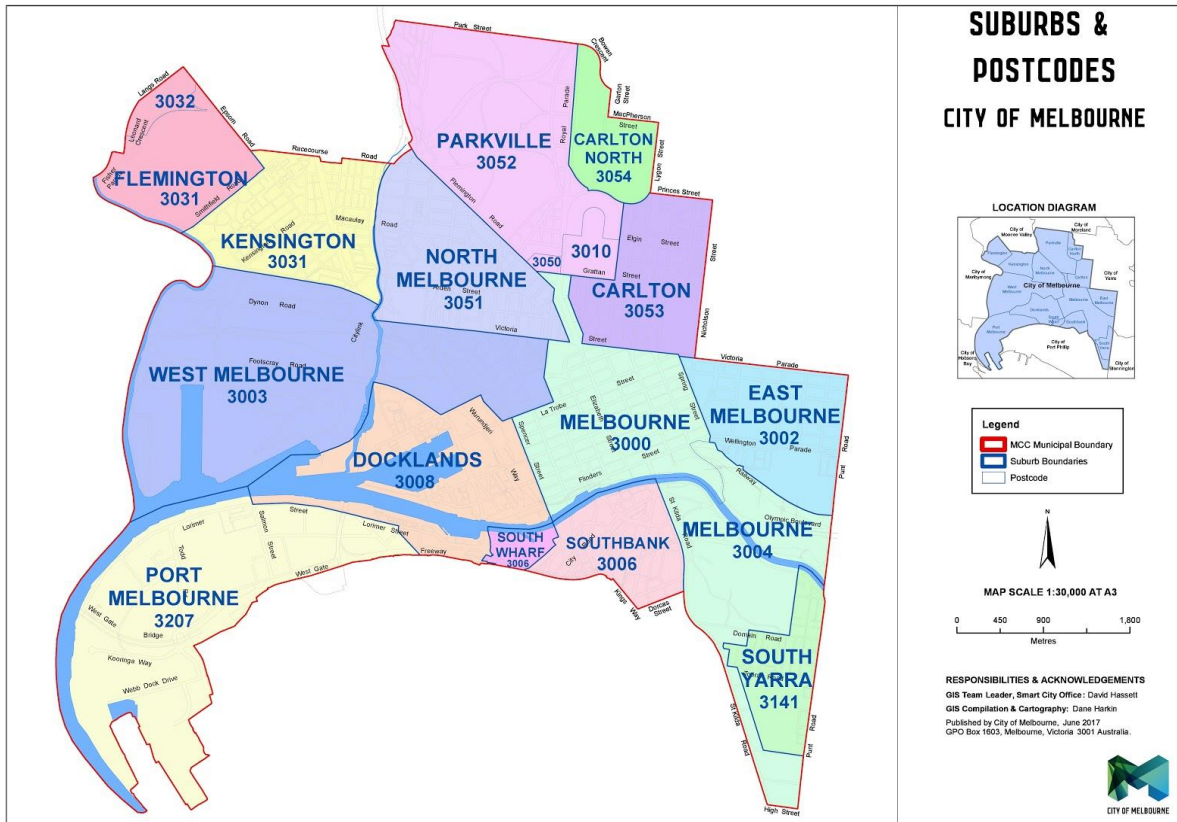


Figure 5 Map of the City of Melbourne showing suburbs and postcodes (City of Melbourne)

Over half of Melbourne’s residents were born overseas making the city very culturally diverse; over 100 languages are spoken in the city. Mandarin is the most popular of those languages with 16% of Melbourne’s population being born in China. There are also significant Greek and Italian populations in Melbourne. The City takes great pride in being the first in the country with a Reconciliation Action Plan for Aboriginal Australians and strives to bring cultural awareness to all residents in Melbourne. The median age in Melbourne is 28, making it a relatively young city (Residents Profiles 2016).

As for the economy of the city, it is a largely service-based economy with only about 10% of jobs in the industrial, manufacturing, or construction sector. Median household income, calculated on a weekly basis, is \$1,354 AUD (\$964 USD) and 27% of households are considered low income. A large percentage of residents are renters, at about 66%. Residents, on average, spend about 30% of their income on housing alone (Residents Profiles 2016). Melbourne ranks 58th most expensive city in the world according to a Mercer cost of living survey and 64th most expensive in the world on another survey by Numbeo (Cost of Living Index 2018).

Melbourne's local government is a Mayor-Councilor form of government, with an elected Lord Mayor and Deputy Lord Mayor, followed by nine elected councilors each appointed to head one of thirteen committees or portfolios. The Councilors appoint the Chief Executive Officer (CEO) that is responsible for the implementation of the Council's programs as well as managing the Council's organizational structure. The CEO appoints the Executive Leadership Team that is in charge of leadership and general governance of the organization. There are over 1300 staff to assist in the day to day tasks of council.

The main committee charged with implementing City Council sustainability plans and programs is the Future Melbourne Committee or FMC, which was created from the *Future Melbourne 2026* plan discussed in further detail later in the report. The FMC is in charge of implementing plans and policies surrounding 13 different themes or portfolios, earlier mentioned as committees: Planning, Finance and Governance, Arts Culture and Heritage, Major Projects, Major Events, Transport, Environment, Prosperous City, Small Business, Retail and Hospitality, Knowledge City, People City, International Engagement, and Aboriginal City. These portfolios are the committees the Council is organized into where each of the nine sitting Councilors and the Deputy and Lord Mayor, is the head of at most two portfolios. The FMC is responsible for monitoring the progress of the entire Council in each of these portfolios, approving or recommending approval of proposals for activities related to their goals and for the expenditure of resources relating to these goals. The general public is encouraged to attend their meetings that occur twice a month and are led by the Lord Mayor (Leadership and Structure 2018).

2.3.2 City Planning

Future Melbourne 2026 was created by the Melbourne City Council in 2016 to refresh the Future Melbourne 2008 plan. The plan was produced by Melbourne's community and has been an important strategic guide for Melbourne's City Council (City, 2018). The plan was created in three phases, share your ideas, bringing your ideas together, and deliberation but began with the city council appointing six community leaders to be ambassadors to the process. Phase one was framed around gathering ideas from the general public. Over 2000 people participated in 30 face to face events, online conversations, and surveys which produced 970 ideas for the Future Melbourne 2026 plan. In phase two the planning committee synthesized and analyzed all ideas gathered and set a direction for the plan. Finally, in phase three a citizen jury of 50 people representing

Melbourne's demographics and having an even number of business owners, employees, and residents took the information produced in phases one and two and completed a draft of the Future Melbourne 2026 plan. The ambassadors then made a number of changes to the draft

The first goal or vision focuses on making Melbourne a city that cares for its environment. This includes priorities that work towards decreasing greenhouse gas emissions, using resources efficiently, and adapting to climate change. The second goal is to make Melbourne a "city for people". This includes priorities that work towards affordability, creating quality public spaces, and services for the homeless. The third goal is to have a creative city. Melbourne wants to encourage innovation and invest in creative industries. The fourth goal is to have a prosperous city by providing more transportation services, promoting inclusiveness, and making Melbourne a place for tourism. The fifth goal works towards becoming a knowledgeable city which includes priorities like providing excellent childcare and early education, primary and secondary education, and adult education. The sixth goal is working towards a connected city which includes priorities like providing a quality pedestrian network, providing a bicycle program, and connecting regionally and globally. The seventh goal is to be a deliberative city. By leading in participatory democracy and empowering local communities they hope to become a more collaborative city. Additionally, they will make government data a public resource. The eighth goal is to be a city that manages change through growth and technological advancement. This includes priorities like managing increasing population density, planning infrastructure for the long-term, and using urban technology. The last goal is to have Melbourne be a city with an Aboriginal focus and to create a treaty with the Kulin Nation, educate Melbourne's community with their Aboriginal culture, and engage with Aboriginal people in urban land management (City, 2018).

Future Melbourne 2026 provides the Melbourne City Council with a Council Plan. The planning framework includes an annual plan and budget along with an annual report. Every four years, a council plan, a municipal strategic statement, and an organizational plan is created by and for council. Every ten years, a future Melbourne community plan is revisited and updated. The plan outlines the priorities listed under each goal and lists the things that Melbourne will provide, while also indicating how they will measure its success.

2.3.3 State Planning

In 2011, the Victorian government replaced their *Melbourne 2030* plan with a new planning strategy called *Plan Melbourne*. This plan is geared towards planning between now and the year 2050. *Plan Melbourne* focuses on how the population is projected to grow and how the economy and workforce will adapt to this change. It also focuses on how housing and transportation will have to evolve with this increase in population. Along with this, the plan works to help the city become more environmentally sustainable and maintain and improve the community aspect of the city. To achieve this plan there are 9 principles to guide the policy and actions, outcomes to state the goals of the plan, 32 directions to outline how the outcomes will be achieved, and 90 policies to explain how these directions will be converted into actions. The plan is split into 3 different timeframes to complete each action. The actions labeled as short term are to be completed by the end of 2018 (0-2 years), medium timeframe actions are to be completed by the end of 2021 (2-5 years) and the long term actions are to be completed beyond 2021 (more than 5 years) (State, 2018). Each action is also given a designated a lead agency to ensure that the actions are being completed. A report on the progress on 2018 was conducted after it was implemented in 2017.

The first outcome is focused on making Melbourne a city that attracts investment and encourages innovation. This includes actions to increase employment and economic growth that is closer to where people live and create more opportunities for development on urban renewal precincts in Melbourne. The indicators of these goals will be seen with an increase of access to employment and activity centers with structure plans. The increase in sites for urban renewal will also be an indicator.

The second outcome works to provide housing choices in locations that are close to jobs and services. This will be achieved by managing new housing and putting them in the right locations to help manage population growth and create a sustainable city. The success will be indicated if there is enough affordable housing to meet the demand. There will also be a diversity in housing choices as well.

The third outcome has Melbourne integrating a transport system that connects people to jobs and services. This includes initiatives that help to support a productive city and will increase the number of workers in large employment areas can access. This outcome will also include initiatives to improve transportation to other suburbs and will be indicated by an increase of access

to employment and education in other suburbs. There will also be initiatives working towards improving freight efficiency and capacity. This will be indicated with the compatible land use around the Principal Freight Network.

The fourth outcome ensures that Melbourne is a distinctive and livable city with quality design and amenity including programs like increasing green wedges and strengthening the community participation in planning the changes in the city. This will help to increase a sense of community in Melbourne.

The fifth outcome works to make Melbourne a city of inclusive, vibrant and healthy neighborhoods by having initiatives to make 20-minute neighborhoods, maintaining the status of fast growing suburbs as great places to live and work, and providing targeted support for disadvantaged communities. These actions and initiatives are working to ensure that the neighborhoods are attractive and livable to citizens.

The sixth outcome works to make Melbourne a sustainable and resilient city by restoring and protecting natural and historic habitats by improving river quality and increasing the number of areas that are natural habitats. It will also work to reduce waste and improve the waste management practices. This will be indicated by a decrease in waste going to landfills.

The last outcome works to have regional Victoria be a productive, sustainable, and supportive of jobs and economic growth. This will be done through actions to help improve connections between cities and regions. The progress will be indicated by the increase in public transportation and the frequency of public transport between regional cities around Melbourne.

Plan Melbourne has several action plans set in place. It defines the overall outcome, and then narrows down the process by defining action plans and policies. It includes the *Plan Melbourne* direction that these policies are working towards as well. The policies then include action details and a timeframe to have them completed and include lead agencies to implement the strategy along with implementation partners that will help the lead agency achieve their goal. It can be concluded that the plan set in place is a sustainable and productive way to work towards achieving their goals since it includes a detailed explanation of its action plans and indicators along with a progress report that provided updates on the plan's success.

Chapter 3: Analysis

3.1 Indices

Among the two indices that I articulated in detail in the previous chapter, the city of Melbourne is considered quite average in terms of sustainability when compared to other major cities worldwide. I completed the Taking Sustainability Seriously Index myself whereas the Arcadis Sustainable Cities Index was completed by the Centre for Economics and Business Research which was commissioned by Arcadis. I first go over how Melbourne ranked in the TSSI in detail and then move on to the Arcadis SCI.

3.1.1 Taking Sustainability Seriously Index

Overall Melbourne scored a 34 out of 38 points on the Taking Sustainability Seriously Index. The 38 points are detailed in the literature review but there were only four points that Melbourne was missing in this index. Melbourne did not score points for limiting downtown parking spaces, tax or fee incentives for environmentally friendly development, zoning used to delineate environmentally sensitive growth areas and eco-industrial park development. These are the opportunities that Melbourne has to expand its policies and regulations. By including these important aspects of sustainability into its future plans, Melbourne will be better equipped to deal with other sustainability issues in the future. At the end of this section I included a table to organize the TSSI score and explanations for each element.

Melbourne could expand on the already existing Parking Plan created for 2008-2013 by including a limit on parking spaces in the Central Business District to decrease the traffic in one of the most congested and busiest parts of the city. Melbourne is a city that has an extensive plan for its sustainability but often does not enforce the policies it wishes to pass. In the plan 1200 Buildings, the city encourages people to equip their offices, homes, and other facilities with sustainable water and energy technology by 2020. The city offers a list of reasons why the plan would be beneficial, such as support from environmentally conscious customers, lower maintenance costs, and long term savings, however, it does not offer any monetary or regulatory incentives. Plan Melbourne Implementation Action (PMIA) #94 lays out guidelines for the most prosperous mix of legislative, regulatory, and economy based incentives to regulate development. Their main strategy for enforcement is redistributing the responsibility to a local

government level. No fees or taxes are mentioned regarding development or environmental management. The city tends to encourage local government to enforce standards, but it would be beneficial to the entire municipality to set standards that are accessible, comprehensive, and economically enforced. The city of Melbourne is committed to conserving the natural flora and fauna of the region. In order to delineate certain growth areas, the city has promoted plans like the Open Space Strategy, discussed in more detail later on, and PMIA #95 the protection of coastline environments. This allows for environmentally sensitive areas to be conserved, yet also allows development in surrounding areas. PMIA #95, the environmental protection of coastlines and waters of Port Phillip Bay and Western Port works to improve the protection of Melbourne's coasts and waters through local planning schemes. The state of Victoria along with the City of Melbourne work together to address sites that are not available for development or expansion. All areas will be evaluated for potential harm to the environment and proper waste disposal. Despite the steps the city is taking to delineate environmentally fragile growth areas, Melbourne lacks specific zoning policies to regulate the urbanization of these areas. Melbourne currently does not have plans in place to develop any eco-industrial parks. Despite the absence of the specific parks, Melbourne has a variety of other eco-industrial structures and strategies. In the city's 2017 Nature in the City Strategy, a plan is laid out to create and maintain biodiversity and thriving ecosystems within the city. This plan worked primarily towards three goals: creating increased diversity, connection, and resiliency within the natural environment, connecting people to nature and demonstrating city leadership in the areas of urban ecology and the conservation of biodiversity. In addition to NCS, the city is implementing a program called CitySwitch, which provides resources and services to companies to help them increase their green footprint. Ways the program can help companies include offering tools, self-assessment templates, funding, networking events, and free workshops. Working to improve the knowledge and resources for citizens helps them make more environmentally conscious decisions at work. An urban forest strategy is also being utilized, with over 77,000 trees within the city. With the goal of increasing the canopy cover from 22% to 40% by 2040, comes the hope that the urban forest will help to manage climate change, population growth, and drought. In the future, Melbourne could expand its Nature in the City Strategy to include the development of an eco-industrial park.

Aside from the points that Melbourne did not achieve, there are also points that they did achieve in which they could improve. As was mentioned by Portney himself, even though cities

receive high scores on the TSSI it is all about how well these policies and regulations are implemented and how they work in tandem with each other. Melbourne can and should create a much more detailed brownfield redevelopment strategy that includes more specific information on environmental contamination. The Victorian Government has briefly addressed the redevelopment of brownfields in Melbourne through PMIA action #109 which pushes to introduce a strategic development system within the city that focuses primarily on urban renewal areas, brownfield sites, and activity centers. The encouragement of brownfield development has also been paired with a sustainability index informative action. Sustainability Index is a comprehensive guideline created by the city for businesses that are involved in either the design, project management, or retrofitting of new buildings. The biodiversity checklist details companies must protect and conserve remnant indigenous landscapes, protect existing habitats and establish new ones, and promote biodiversity on flora and fauna. The plan also specifies that the design sector must concentrate development primarily on brownfields in order to leave undeveloped land for the conservation of natural flora and fauna. In order to accurately portray the potential dangers of developing on brownfield sites which are usually contaminated areas, Melbourne should have a much more detailed brownfield redevelopment strategy.

The Census of Land Use and Employment (CLUE) is Melbourne's main comprehensive land use plan and source of information on urban development. CLUE consists of data on industry structure and type of industry, infrastructure size and layout data, employment type, and city spatial layouts. To collect data for CLUE and develop a strategic plan for sustainable city development, each business in the municipality is surveyed every two years. Building in Melbourne is controlled by the Victorian Building Act 1993, set in place to protect the health and safety of building dwellers and enhance building amenities. Building Regulations 2018 was produced to tailor several parts of BA93, however, the focus was primarily on policies for permits, orders, and notices. The plan did not address urban development in regard to the environment.

The city's Open Space Strategy addresses zoning in relation to climate change. The Open Space Strategy is a 15-year plan created in 2012 that calls for the expansion of the city's 148 open space sites that span over approximately 555 hectares. Open space is the city's way of planning around environmental issues including the drought, flood management, and cooling of the city in general.

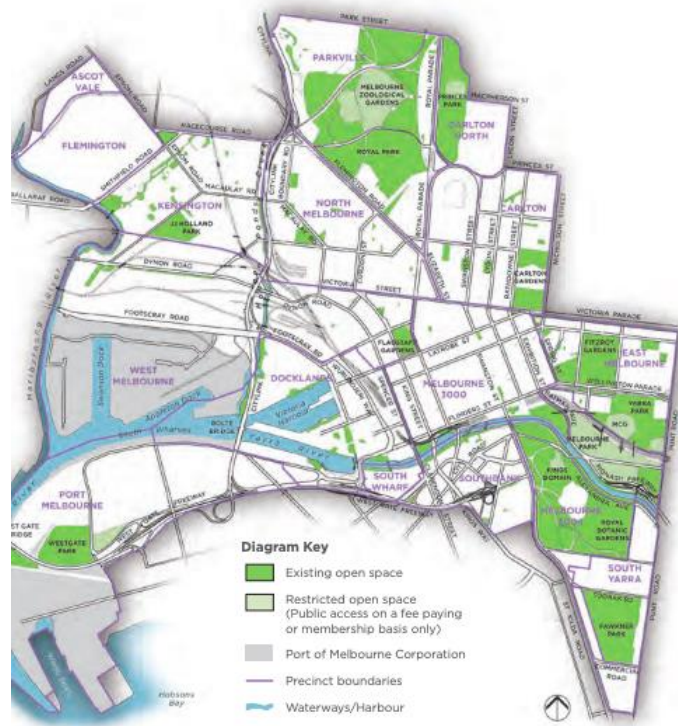


Figure 6 Map of Melbourne’s open space (City).

In 2012, 15% of the city was comprised of open space. This included public parks, gardens, large sporting centers, and/or plazas. According to the World Cities Culture Forum, as of 2016, Melbourne has only 10% public green space coverage, with 20% public open space. Any kind of open space will benefit the public, with mitigation of urban heat, encouraging of physical health and wellbeing, and development of communities. Melbourne has a strong plan for open space, as well as urban limits and infrastructure regulation, however, the city lacks a concise document discussing the direct relation between new buildings and the conservation of open space. Although the city does have a comprehensive land use plan and addresses its environmental impact, it would be much more impactful if the information was condensed into one comprehensive plan. The table below was included to better organize and visualize the TSSI score and explanations for each element of the index.

TSSI Element	Score	Explanation
Indicators project active in last five years	1	The <i>Future Melbourne 2026</i> plan has environmental indicators
Indicators progress report in last five years	1	Melbourne city council has provided updates to the <i>Future Melbourne 2026</i> plan
Does indicators project include “action plan”?	1	The council has a separate council action plan document, the Plan Melbourne Implementation Actions
Eco-industrial park development	0	No eco-industrial park in Melbourne, they do have 2017 Nature in the City plan that encourages eco-industrial park development
Targeted or cluster green economic development	1	PMIA #2 focuses on economic development within Melbourne CBD including green economic development
Eco-village urban infill or transit oriented housing project	1	PMIA #3 focuses on developing walkable communities while PMIA #16 focuses on urban renewal projects, specifically transit-oriented communities
Brownfield redevelopment project	1	PMIA #109 focused on renewal of brownfield sites through strategic development
Comprehensive land-use plan that includes environmental issues	1	Census of Land Use and Employment (CLUE) along with the Open Space Strategy is used for land-use development and has sections on climate change but there is no concise document with a clear environmental focus
Zoning used to delineate environmentally sensitive growth areas	0	PMIA #95 addresses coastal environmental development but there is no general zoning policies for environmentally sensitive growth areas
Tax or fee incentive for environmentally friendly development	0	Plan 1200 Buildings encourages environmentally friendly development with no direct incentives and PMIA #94 lays out guidelines for the best kind of development but there is no economic incentive to complete any of this.
Operation or sponsorship of public transit	1	The Victorian State government sponsors most public transportation including trams, trains, and buses
Limits on downtown parking spaces	0	There is no limit on parking spaces but there was a Parking Plan implemented in 2008-2013 that could be renewed and adjusted to include this element

Carpool lanes or HOV lanes on city streets	1	Melbourne is home to the first ever carpool lane, they are found on most roads in the city
Alternatively fueled city vehicle (green fleet) program	1	Green Share Car stations are located in the CBD with 200 cars in the fleet so far.
Bicycle ridership or bicycle sharing program	1	The city does partner with a bike sharing service and as part of PMIA 94 plans on increasing bike infrastructure throughout the CBD
Household solid waste recycling	1	High Rise Recycling project
Industrial recycling	1	Environment Protection (Industrial Waste Resource) Regulations of 2009 and Waste Resource Recovery Strategy 2030
Hazardous waste recycling	1	Detox Your Home project funded by Victorian State Government
Air pollution reduction program i.e. climate action plan	1	Melbourne works with the state government to reach the goal of net zero emissions by 2050, outlines in the Victoria Climate Change Act 2017
Recycled product purchasing or preferred procurement by city government	1	Sustainability Victoria Waste Wise Purchasing Guide for Government and Industry regulates product purchasing in Melbourne.
Superfund or other hazardous waste site remediation	1	EPA Contaminated Environments Strategy works to reduce environmental and health impacts of historical contamination.
Asbestos abatement with assistance to building owners	1	Environment Protection (Industrial Waste Resource) Regulations 2009
Lead paint abatement with assistance to building owners	1	Environment Protection (Industrial Waste Resource) Regulations 2009
Pesticide reduction program	1	Public Health and Wellbeing Regulations 2009 regulates the use of certain pesticides and chemicals by individuals.
Urban garden/sustainable food system or agriculture program	1	Guide to Community Garden Guidelines was created to support urban sustainable farming and the initiative Food City focuses on food education and community development.
Green building program	1	1,200 Buildings program to help renovate already built buildings and Environmental Upgrade Agreements is to

		assist in planning and building new buildings under environmental codes
Green affordable/low-income housing program	1	State government has outlined in Outcome 2 of <i>Plan Melbourne</i> how they will create more affordable housing close to public transportation and jobs.
Renewable energy use by city government	1	Renewable Energy Project is currently being implemented.
Energy conservation effort	1	Partnership with Go5 nonprofit to encourage and educate citizens about energy efficiency and conservation
Alternative energy offered to customers	1	Solar energy programs and partnerships with Positive Energy and Go5
Water conservation or protection program	1	Urban water plans and a stormwater harvesting programs are in place
Single government office or nonprofit responsible for implementing sustainability programs	1	Future Melbourne Committee which focuses on the implementation of the comprehensive plan which includes sustainability programs
Sustainability an explicit part of comprehensive plan	1	Within <i>Future Melbourne 2026</i> there is a “city that cares for its environment” section
Involvement of city council	1	City council creates the plans with the help of the community, they attend all meetings as they make up the Future Melbourne Committee
Involvement of mayor or chief executive officer	1	CEO runs all committee meetings
Involvement of metropolitan or county-wide council	1	State government is very involved with the planning in Melbourne and works closely with them to implement their own plan known as <i>Melbourne 2030</i> with a committee Plan Melbourne
Involvement of business community	1	Businesses are encouraged to engage with planning efforts by the city council
General public involvement	1	Public involvement is highly encouraged from the city council <i>Future Melbourne 2026</i> was created with the help of over 15,000 residents, businesses, and organizations
Total: 34 out of 38		

3.1.2 Arcadis Sustainable Cities Index

Melbourne is the lowest ranked Australian city in the Arcadis Sustainable Cities Index 2018 coming in 56th overall. The last few years have seen Melbourne shift beyond green sustainability to social sustainability. Both government and private developments are increasingly focusing on how projects can better improve communities, including financial gains and community wellness. Within the three sub-indexes of the Arcadis Sustainable Cities Index Melbourne performed quite averagely. In the people and profit sub-indexes, Melbourne was 38 and 43 respectively, whereas in the planet sub-index they ranked 81.

Melbourne was ranked above Brisbane in the people sub-index but below Canberra and Sydney. Melbourne scored particularly low in the public transit, affordability, demographics, and cultural offerings indicators. Although it should be noted that the public transit indicator will improve in future rankings due to the current investment in metro and light rail networks. The demographics indicator was calculated using the age dependency ratio to ensure that there is a large working-age population to reduce the strain on healthcare and educational systems. Arcadis used the World Bank Australian national statistic of 52.71 to calculate this indicator for all four Australian cities included in the SCI. After calculating Melbourne's specific age dependency ratio using 2016 Australian Census information, Melbourne actually has an age dependency ratio of 15.37 which is much better than the Australian national age dependency ratio. The cultural offerings indicator was calculated by counting the number of "things to do" on Trip Advisor, meaning there is definitely room for improvement as Melbourne continues to make it a goal to be an inclusive and inviting city for everyone. Arcadis calculated affordability of Melbourne by using the residential rents and a basket of consumer goods as a share of GDP per capita. Affordability directly affects the quality of life of citizens so it is an important indicator of sustainability.

The planet sub-index was the weakest for all Australian cities but in particular, Melbourne as it placed 81, the lowest of them all. Melbourne scored the lowest in the greenhouse gas emissions, green spaces, bicycle infrastructure, electric vehicle incentives, and environmental exposure indicators, with the greenhouse gas emissions and environmental exposure indicators practically nonexistent. Greenhouse gas emissions data was retrieved from the Carbon Disclosure Project (CDP), an organization that collects climate change data for cities, corporations, and governments. CDP states that the total greenhouse gas emissions for

Melbourne in the 2014-15 year were 5,319,010 metric tonnes CO₂e, to put this into perspective Sydney had 3,783,982 metric tonnes CO₂e that same year despite having 74,595 more people than Melbourne living within city limits. CDP measure scope one, two, and waste scope three emissions to calculate the total basic emissions for Melbourne and other cities. Environmental exposure was calculated using the International Disasters Database. Unfortunately, I do not know what calculations were used to capture environmental exposure for a specific city, region, or country. The International Disasters Database merely provides data on total deaths, total affected, and total damage in USD by disaster group and type. Melbourne is particularly affected by droughts, bush fires, and heat waves according to their government website. It is important that the city council keeps these environmental risks in mind especially with the looming threat of climate change that could make many of those risks much worse. Greenspaces were calculated using the Siemens Green City Index by calculating green space as a percentage of city area. According to the Victorian Planning Authority, Melbourne has 10% green space and as a comparison, Sydney has 46% green space which is why it performed so much better in the planet sub-index. Melbourne does not have any incentives for electric vehicle ownership instead what Melbourne is doing is focusing on car sharing. Melbourne has developed policies and legislation to regulate rideshare services within the city. These regulations are looking at making taxi and hire-car services safer, more responsive, and more accessible. As a way to combat push-back from taxi drivers, the city has established a fund to assist taxi license holders in transitioning to the new system. Melbourne will have 2000 car share spaces installed in the municipality with about 500 car share vehicles located in the city. The city is encouraging the transferring of taxi services and the implementation of shared cars shows that they are in favor of reducing the number of privately owned vehicles. This will help to reduce carbon emissions and congestion within the city but for the Arcadis SCI they received little to no points for this indicator. The last indicator in the planet sub-index that Melbourne performed poorly on was the bicycle infrastructure indicator which was calculated by looking at bicycles per capita and the availability of bike sharing schemes. The city runs a bike sharing service with 600 bikes and 50 docking stations throughout Melbourne. The city is walkable, and the condensed grid layout makes it easy to navigate the city. Even so, cycling only made up nine percent of all vehicle movement into the city in 2008 then, after the creation and implementation of the City of

Melbourne Bicycle Plan in 2016, cycling as of March 2017 makes up 16% of all vehicle movement into the city during city morning peak hour.

The final sub-index of the Arcadis SCI is the profit sub-index in which Melbourne placed 43, third among the four Australian cities. Melbourne scored moderately in the employment and tourism indicators, and poorly in the transportation infrastructure indicator along with Sydney and Canberra. The transportation infrastructure indicator is then divided into five more sub-indicators including congestion, rail infrastructure, airport satisfaction, transport economic opportunity, and transport public finance. Congestion was measured using the Tom Tom Traffic index which states that Melbourne’s congestion level causes 33% extra travel time throughout the city, a four percent increase since last year. In a worldwide survey that received over 13 million responses, Melbourne’s Tullamarine International Airport was ranked 27 in the world and included a whole host of different topics for survey respondents to rank (Skytrax World Airport Awards 2018). Some topics included ease of access, public transport options, taxi availability, cleanliness, comfort, and more. Arcadis used the World Metro Database to rank rail infrastructure in Melbourne, yet when I attempted to find the data on Melbourne’s rail system on the database, there was none. Similarly, Arcadis did not provide the calculations they used to figure out transport economic opportunity and transport public finance, nor what exactly would be a good score for those indicators. Melbourne does have current plans to expand its metro system that are in development that could change its rankings for next year’s SCI.

Below I have included a table of the indicators Melbourne scored most poorly on in the Arcadis SCI and have included both the Arcadis source of information and my own. The weighting and rationale are both from the Arcadis SCI as they chose the weighting for their own index. I included affordability, environmental exposure, and transportation infrastructure even though I could not find relevant data nor the calculations that Arcadis used to score those categories.

Indicator Name	Indicator Description	Main Source(s)	Arcadis Weighting	Rationale
Demographics	Age-Dependency ratio	National statistics, Census statistics	6%	A large working age population is important in ensuring that various social systems can be well-funded.

				It also reduces the strain on educational / healthcare systems.
Cultural Offerings	Number of 'things to do' on TripAdvisor	TripAdvisor	5%	
Affordability	A basket of consumer goods (as a share of GDP per capita) (30%) Residential rents (as a share of GDP per capita) (70%)	UBS Prices and Earnings, Numbeo		The affordability of a city directly impacts the quality of life of its inhabitants on a daily basis.
Greenhouse Gas Emissions	Emissions of CO2e metric tonnes (per capita)	CDP Cities	12%	This, along with four other indicators, measures central aspects of a city's environmental sustainability today, so have been allocated the highest weightings.
Bicycle Infrastructure	Bicycles per capita and bicycle sharing schemes	City of Melbourne Bicycle Plan	8%	While promoting the use of bicycles is important for cleaning up the air in cities, its environmental significance is somewhat lower than other indicators.
Electric Vehicle Incentives	National and local government incentives for electric vehicles	City of Melbourne Website	8%	Promoting the switch towards electric vehicles will be crucial in improving air quality in the future. This indicator has been given a slightly lower weighting because electric vehicle take-up remains fairly low in a majority of cities.
Green Spaces	Green space as % of city area	City of Melbourne website	11%	While this indicator is an important determinant of quality of life, it is less fundamental than the higher weighted indicators.
Environmental Exposure Indicators	Natural catastrophe exposure, including	International Disasters Database	5%	This has been given a slightly lower weighting because many cities in

	drought, earthquake and extreme temperature			the index are not affected significantly by natural hazards.
Transportation Infrastructure	Congestion, Rail Infrastructure, Airport Satisfaction, Transport Economic Opportunity, Transport Public Finance	TomTom Traffic Index, Metrobits.org, World Airport Awards 2018, Financial Statements of Transport Providers, Local budgets	15%	A good transport network facilitates economic interactions and promotes a more integrated city. However, it is less of a direct measure of a city's economic potential than the higher weighted indicators

Arcadis grouped up clusters of cities that have similar factors that contribute to their respective sustainability efforts. For example, Sydney, Canberra, and Brisbane are part of the “balanced innovators” cluster and Melbourne is part of the “post-industrial opportunist” cluster. Each cluster has a set of eight city archetypes that combine in unique ways to describe the cities in the respective cluster. The eight archetypes and their definitions are, sensing: using integrated sensors to manage city services, resilient: at risk from disruption and heavily invested in mitigation measures, informal: unplanned cities where citizens create their own services and structures, enterprise: aligned to the needs of businesses and their employees, disrupted: facing economic decline and needing to reinvent, balanced: prosperous, healthy and with a good work-life balance, automated: run to an increasing extent automated processes and AI, and accessible: using accessible infrastructure to enable all people go about their daily lives. In figure 7, the post-industrial opportunistic defining archetypes are shown.

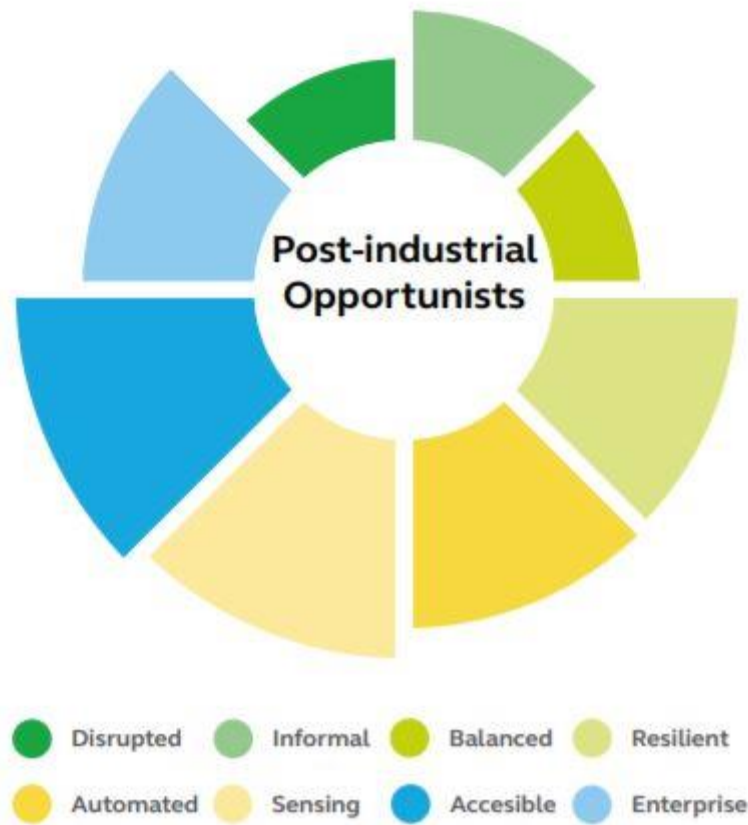


Figure 7 Post-industrial Opportunists defining archetypes (Arcadis SCI 2018).

Melbourne’s defining archetypes are accessible, automated, resilient, and sensing. Melbourne has a balanced economy which is why it is considered resilient however there are definitely underlying tensions associated with trying to upkeep that resilience and balance it with long-term sustainability. The Arcadis SCI uncovered many of Melbourne’s fallbacks in its journey towards sustainability and there is much room to improve its sustainability efforts and organization especially in terms of environmental sustainability.

3.2 Examples

I ended up choosing two Canadian cities to be a part of the best practices examples to assist in my analysis of Melbourne’s sustainability. Calgary is known for its social sustainability framework explained in detail in the literature review and this is an idea that Melbourne could adopt and make their own. Meanwhile, Vancouver is a city that Melbourne could look towards because of their Greenest City Action Plan which has a hefty goal of making Vancouver the greenest city in the world by the year 2020. Melbourne should focus on environmental policies

and regulations to become more environmentally sustainable, some ideas could definitely be drawn from the Greenest City Action Plan put forth by Vancouver.

3.2.1 Calgary

Melbourne is already a city focused on inclusivity and community engagement, but as a city with a large international population, it is even more important that it takes into account the social capital that may be involved with any and all policy measures. Much like Calgary, Melbourne could create a Social Sustainability Framework that focuses on their diverse international community and Aboriginal/Torres Strait Islander people. Currently, Melbourne has a few programs in place to help already established citizens be welcoming to refugees and immigrants alike, but there is no program or framework that requires the city council itself to be inclusive. The Social Innovation Partnership grant is given to an applicant that has an organization dedicated to social inclusion and strengthening communities, there are also community grants and Aboriginal grants for similar purposes. Melbourne does have a goal through the *Future Melbourne 2026* plan to be a city for people. Unfortunately, that does not seem to mean much as many of the indicators listed in that goal are vague and unhelpful, there are also no indicators that hold city council accountable for including social sustainability in all future policies. Melbourne should use the SSF as a guide for creating a more detailed goal with measurable outcomes as well as work alongside social wellness organizations to meet these outcomes. The indicators and outcomes for Melbourne total only four pages, while the SSF for Calgary is a 19-page document that details how they are going to accomplish their goals, who they will be working with, how funds will be allocated to achieve these goals, and what their mid-term and long term measurable outcomes are. As a city with 50% of its population born overseas, it is important that communities in Melbourne feel inclusive, welcoming, strong, and healthy for everyone living there.

3.2.2 Vancouver

Much like the goal to be a city for people, the *Future Melbourne 2026* plan also includes a goal dedicated to being a city that cares for their environment. Unfortunately, like the previous goal mentioned, the environment goal is simply not detailed enough to get Melbourne where they need to be in terms of environmental sustainability. As discussed earlier, Melbourne scored

the lowest of all four Australian cities on the planet sub-index in the Arcadis SCI which means there is a lot of room for improvement in their environmental policy as a city. One detail in particular that I noticed is that the environment is seen as a goal within the *Future Melbourne 2026* whereas the Vancouver Greenest City Action Plan is seen as the city's comprehensive plan. This proves Calgary's commitment to being a sustainable city, all other aspects of local government are essentially filtered through the Greenest City Action Plan assuring it's sustainability before becoming an official program or policy. Melbourne could definitely benefit from reorganizing their *Future Melbourne 2026* plan into a plan that is more focused on the environment and that looks at all goals through a sustainability lens. The goals of the *Future Melbourne 2026* plan are currently fragmented and seem to have nothing to do with each other, even though all of the goals have a direct tie to sustainability as a whole. The 16 key programs and actions that are located on the environment goal page of the city government website could easily be condensed and included in a comprehensive environmental plan for the city. Individual plans such as the climate change adaptation strategies and the green our city action plan would still have their own individual documents, but having an overarching environmental plan would assist in the organization of plans and decrease any confusion that could stem from keeping everything fragmented and separate.

3.3 Overall Sustainability Analysis

Overall, Melbourne is an average city when it comes to sustainability which is good because that means there is a lot of room to improve. The city performed well in the TSSI and moderately in the Arcadis SCI. Melbourne has a lot to learn from other cities globally in terms of organization, sustainability ideas, and detailed measurable outcomes. Melbourne needs to focus on environmental policies that will help them achieve sustainable development and in turn, create a more livable atmosphere. The Arcadis SCI categorized Melbourne as a post-industrial opportunist meaning that the city has a resilient economy that is largely focused on industry and technology advancements. While this is an important aspect of life within Melbourne, it is equally as important to not lose sight of social and environmental sustainability, where Melbourne performed the lowest in both the Arcadis SCI and the TSSI. Being a very diverse city, it is important that Melbourne City Council makes sure that access to resources and opportunities are available for all populations and that the city council is accounting for this

while creating new policies and programs. As the fastest growing city in Australia, Melbourne needs to focus on creating environmental and social sustainability frameworks and plans that will work for a continually growing population. Creating transparency, honesty, and inspiration among citizens should be some of the goals the city council should be working towards when creating a comprehensive environmental sustainability plan.

Chapter 4: Summary

4.1 Recommendations

Overall, Melbourne is a city with an average sustainability profile. There is a lot of room for improvement in their greenhouse gas emissions, organization, and incentives for sustainable development. These are my main three recommendations for the City of Melbourne to consider as they become a more environmentally aware city. Calgary and Vancouver are just two of many cities across the world that have been implementing new and innovative sustainable solutions. The transfer of knowledge and best practices is important for cities as they are on their journey to becoming more sustainable.

There is a plethora of strategies for reducing greenhouse gas emissions and after analyzing Melbourne through the lens of two different indices it is clear that this should be Melbourne's top priority. This goal could be achieved through improvements on already existing plans or regulations such as the Parking Plan 2008-20013, the Census of Land Use Development, and improving their incentives for switching to electric vehicles. Although these recommendations do not tackle the problem head-on, Melbourne should focus on already existing plans to improve on before tackling another possibly massive greenhouse gas reduction plan. It would be beneficial for the city to take a look at other manufacturing heavy cities and how they have reduced their greenhouse gas emissions as well.

In terms of organization, Melbourne has an easy to navigate comprehensive plan *Future Melbourne 2026* that is well organized, but not as focused on the environment as it should be. Cities such as Vancouver and Seattle have made it a point to make their sustainability plan their comprehensive city plan which assists the city council in looking at all issues as a sustainability issue. Almost any aspect of a city's development can be seen through the lens of sustainability. In reorganizing their comprehensive plan to focus on sustainability from all aspects including what is already in their plan such as knowledge exchange, Aboriginal rights, creativity, tourism, and more, Melbourne can shift their focus towards sustainability as it has to do with each of these topics. Along with a change in the organization of their main comprehensive plan, including a table of accountability in their Council Plan will keep citizens aware of who is in charge of getting any one aspect of the plan implemented. Holding politicians accountable for their actions or inactions.

Finally, many of the points made throughout both the TSSI and Arcadis SCI included whether or not cities had financial incentives for environmentally friendly development which Melbourne, unfortunately, does not implement. If Melbourne could implement another form of incentive to assure that all businesses, new infrastructure, and even private citizens are being as environmentally friendly as possible the city could decrease their carbon footprint as a whole and assure future generations the security of resources and an environment to enjoy. Being environmentally friendly is where Melbourne is lacking the most in the sustainability pillars that I discussed in the literature review section. If the city could work on strengthening that pillar along with social pillar, they could become one of the greenest cities in the world and add that to their already prestigious award of the most livable city in the world.

4.2 Conclusion

Moving forward it is important that academic institutions, non-governmental organizations, and governments all over the world bring their best minds to the table to discuss future plans for cities such as Melbourne and their sustainability efforts. With over half of the world's population living in urban areas, it is of utmost urgency that we work at the local level in our respective cities to encourage green infrastructure, environmentally friendly practices, equity for all, quality education, clean air and water, healthy foods, and access to public transportation. Sustainability is much more than good environmental practices, it is ensuring the future of our current population and assuring that future generations have equal access to resources and the environment. With climate change effects being felt all across the world, including in Melbourne, we as humans have a small time frame to become as sustainable as possible. With more and more people becoming aware of some of the atrocities that have been committed against the environment, it is clear that we are moving towards an environmental revolution.

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