Point. Advisory

Fishermans Bend

Net Zero Carbon strategy

Prepared for:

Department of Environment, Land, Water and Planning

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The findings in this report have been formed on the above basis.

1 VERSION CONTROL

Version	Date	Author	Project Director
V1	31/10/2017	C. Brulliard	C. Knaggs
V2	13/11/2017	C. Brulliard	C. Knaggs
V3	19/1/2018	C. Brulliard	C. Knaggs
V4	12/2/2018	C. Brulliard	C. Knaggs

CONTENTS

2 EXECUTIVE SUMMARY

This document presents the results of the work undertaken for and in collaboration with the Fishermans Bend Taskforce in developing an emission reduction strategy and database of possible actions for Fishermans Bend.

2.1 Context and objective

Fishermans Bend is currently the largest urban renewal area in Australia and a project of State importance. The area is close to the Melbourne CBD and presents many opportunities to create vibrant employment and residential neighbourhoods connected to both the City of Melbourne and the City of Port Phillip. It presents a unique opportunity to put in place strategies and structures to deliver superior GHG emission performance without compromising on other sustainability and liveability goals.

2.1.1 Fishermans Bend planning

The Fishermans Bend Taskforce (the Taskforce) was established to develop Fishermans Bend's Framework and planning controls.

The work of the Taskforce is informed by:

- the vision for the district published in 2016, that defined eight sustainability goals, including the commitment to create a low carbon community within Fishermans Bend.
- the Draft Fishermans Bend Framework (Draft Framework), that elaborates on these goals and sets some proposed planning controls; this has been released in October 2017 for public consultation.

The Draft Framework confirms some of the key development objectives for Fishermans Bend that have structured the present strategy, including:

- the objective to create 80,000 jobs within the district and house a population of 80,000 residents
- the objective to make the Employment precinct "Australia's leading design, engineering and advanced manufacturing precinct" with half of the jobs created in the precinct
- the eight sustainability goals set for Fishermans Bend, informing a series of targets, objectives and strategies for the area
- the objective to "develop Fishermans [Bend] as a zero net emissions precinct", under Sustainability goal 7 "a low-carbon community".

2.1.2 Policy commitments

The latter commitment is in line with:

- The commitment made by leading cities around the world to act to keep the world average temperature increase under 2°C, and preferably under 1.5°C, at the Paris Conference of the Parties (COP21) in 2015 (Melbourne is part of the C40 network).
- Australia's international commitments to reduce emissions by 26-28 per cent below 2005 levels by 2030.
- Victoria's climate change policy and targets to achieve net zero emissions for the whole state by 2050 (and related interim targets), embedded in the *Climate Change Act 2017*.
- City of Melbourne's *Zero Net Emissions Strategy*, which sets a target of net zero community emissions by 2020

- City of Port Phillip's *Toward Zero Sustainable Environment Strategy 2007-2020,* which includes a 50% reduction target in community greenhouse gas emissions by 2020 (and is currently being reviewed)

2.1.3 Opportunity and challenges

Urban renewal presents opportunities to deliver "step change" in GHG emission performance as appropriate strategic choices can to be made to encourage innovation and adoption of technologies able to effectively and reliably reduce GHG emissions at the precinct level as well as the building level.

However, a primary consideration is that Fishermans Bend has already been re-zoned and the land is controlled by multiple private landowners with very limited land area in public ownership. This means that the vision and strategies for Fishermans Bend need to rely on what can be achieved through the planning system rather than direct control.

It is also worth noting that the Taskforce has only been created to complete the initial planning for Fishermans Bend, and that the future governance arrangements for Fishermans Bend are not known at this stage.

2.1.4 Standards

Carbon emissions calculations underpinning the strategy are informed by the requirements of two main standards (see Methodology Framework):

1. The GHG Protocol for Community-Scale Emissions (GPC) (WRI, 2014), that aligns with City of Melbourne's net zero carbon community calculations.
2. The draft National Carbon Offset Standard (NCOS) for precincts standard (Department for the Environment and Energy, 2017), which has since been published as a final standard.

The work undertaken has been based on desktop analysis, underpinned by extensive collaboration with the Taskforce. The material used in the analytical process includes information and background reports commissioned by the Taskforce, and energy benchmark and literature publicly available or extracted from our consulting team's own records.

2.2 Business As Usual emissions

BAU emissions for the district are driven by assumptions about the rate of development of the district and about the trajectory of the electricity grid emission factor: the sooner the grid decarbonises, the sooner Fishermans Bend's carbon footprint will reach an inflexion point and start trending downwards. However, emissions for Fishermans Bend do not reach zero by 2050 under any scenario without further intervention.

Several scenarios assume differing levels of optimism (optimistic, neutral or pessimistic) and grid decarbonisation (high, medium and low) is shown in Figure 1. As demonstrated in Figure 1, external factors and uncertainty greatly influence the baseline and therefore the magnitude of the emission reduction opportunities. A breakdown of emissions sources under a BAU moderate decarbonisation scenario is presented in Figure 2 below..

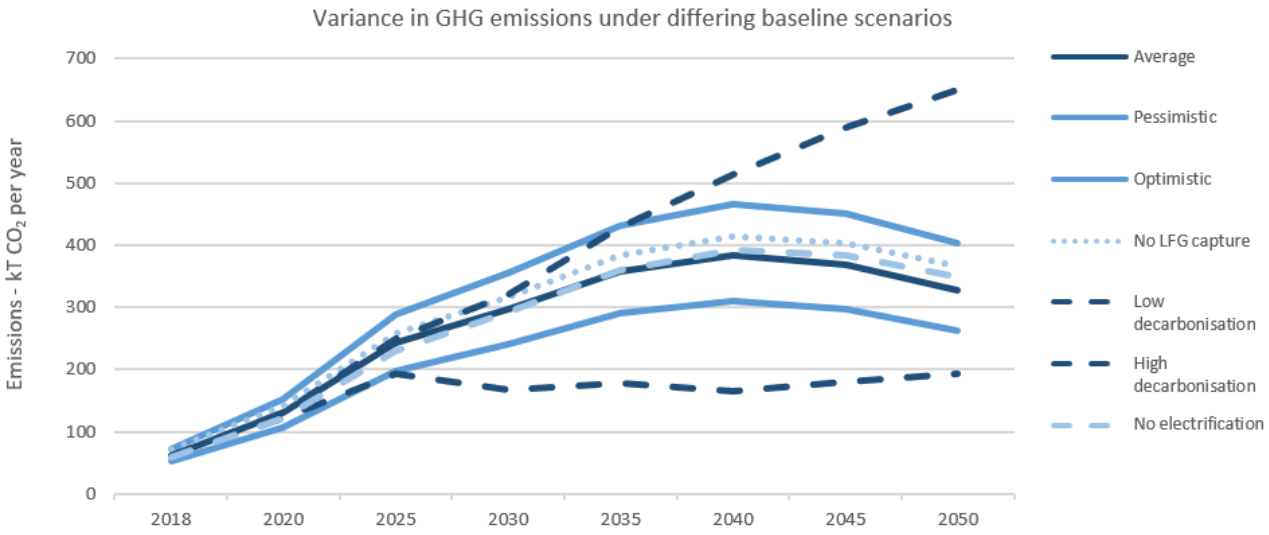


Figure 1 Baseline emissions under differing levels of optimism, decarbonisation, electrification, and LFG capture

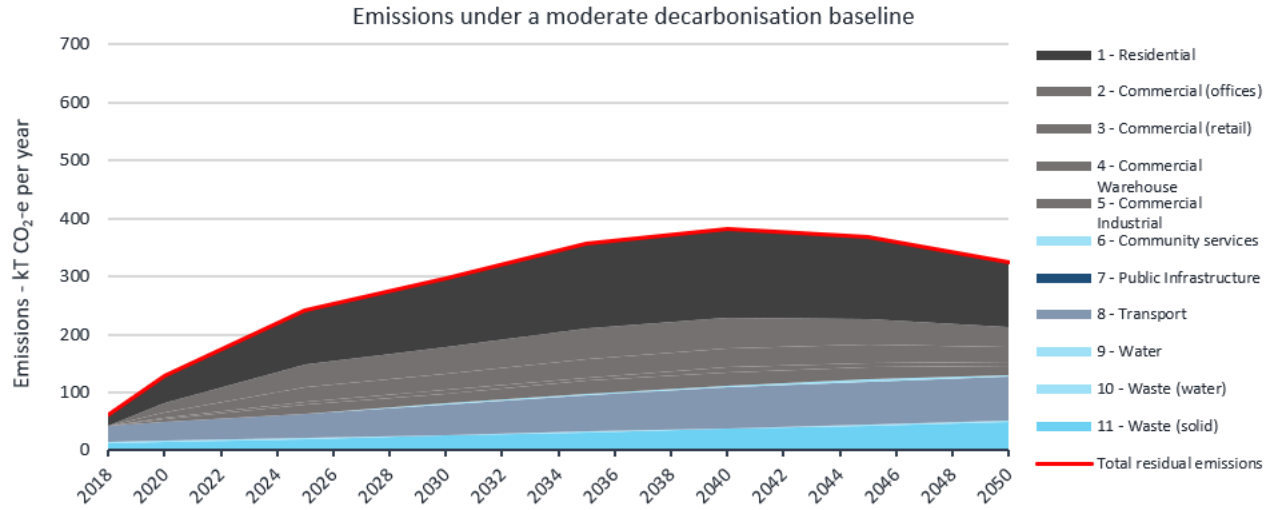


Figure 2 Emissions by category under a moderate decarbonisation baseline assumption

A significant source of uncertainty relates to emissions linked to the economic activity taking place in the district, beyond the use of buildings. For example, it is anticipated that large data centres will be built in the district, which could result in as much as 90GWh of electricity consumption each per year. Five data centres would represent 450GWh of energy consumption or up to 50% of the electricity used in the district.

The large associated increase in emissions resulting from this economic activity is shown in Figure 3.

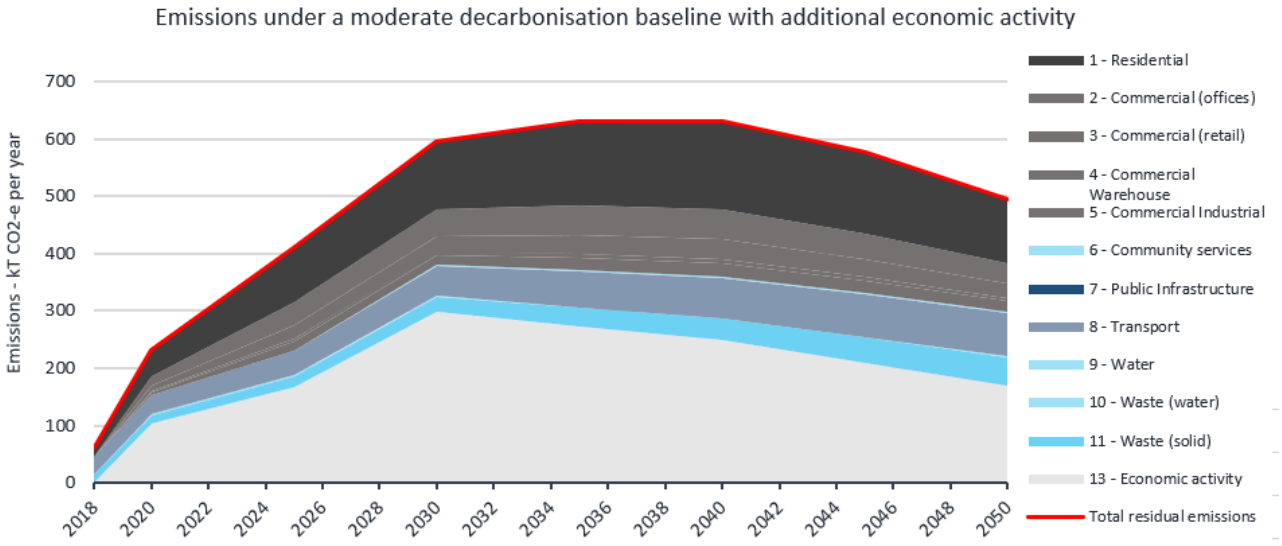


Figure 3 Emissions by category under a moderate decarbonisation baseline assumption, with hypothetical economic activity added *(economic activity in light grey at the bottom)*

2.3 Emission reduction opportunities

2.3.1 Enablers and levers for reduction opportunities

The Taskforce (and the government and cities) can use a range of instruments or levers to unlock emission reduction opportunities:

- **Direct investment** in infrastructure will be necessary to ensure that public transport and active transport infrastructure offer attractive and altogether preferable alternatives to private transport. Direct investment is also likely to be required to upgrade waste management infrastructure.
- **Planning controls** are likely to be the most effective in curbing GHG emissions from buildings (the control would be set by reference to a performance rating system, NABERS or equivalent, thus leaving flexibility to achieve the target performance through whatever energy efficiency or renewable energy measures are the most adapted and cost effective); this would offer the opportunity of positioning Fishermans Bend as a leader in urban redevelopment; setting the bar too high may however trigger some pushback from key stakeholders and hamper the progress of the redevelopment process; setting the bar too low may come to a significant offset cost for the cities and the states to meet net zero carbon commitments.
- **Incentives** are useful in ensuring that demonstration projects occur within Fishermans Bend; the impact on the overall carbon footprint is likely to be limited, unless incentives are particularly generous (and hence costly for the public purse).
- There is a role for **advocacy** and **influence on other federal, state and agency decision makers** to help ensure that building standards (National Construction Code) and appliance standards (Minimum Energy Performance Standards) are updated regularly and are stringent enough to meet targets.
- **Influence** and **engagement** with developers and the community will play an important role to support the success of other actions.
- The value of **data collection** and **keeping options open** is essential to continuous improvement over the period to 2050: some of the recommended actions have no direct impact on the carbon footprint of the district, but could

be very useful for facilitating the development of future opportunities and actions (through data analytics or rolling out new technologies).

These categories have been used to structure the development of detailed opportunities presented in this strategy.

2.3.2 Public / private costs and benefits

In making decisions about pursuing these opportunities, the private / public split of costs and benefits will need to be considered:

- Some opportunities described in the strategy require significant investment from the public sector (transport infrastructure, waste infrastructure, public lighting).
- Conversely, most of the buildings-related opportunities may lead to additional upfront costs to the private sectors (developers) and result in long term savings (energy savings). However, these savings are likely to benefit occupiers, not developers, as would co-benefits (comfort, health benefits); addressing these split incentives will always be a challenge for any planning entity.
- A balance will therefore need to be found between acceptable costs and anticipated benefits (beyond carbon) by the Taskforce, so that measures put in place are not met with opposition from stakeholders.

2.3.3 Renewable electricity bulk contracting and offsetting

In addition to emission reduction opportunities, it is highly likely that renewable energy bulk purchasing and / or offsets will be required to achieve net zero emissions for the precinct. An example of how this gap could be covered is presented in Figure 5.

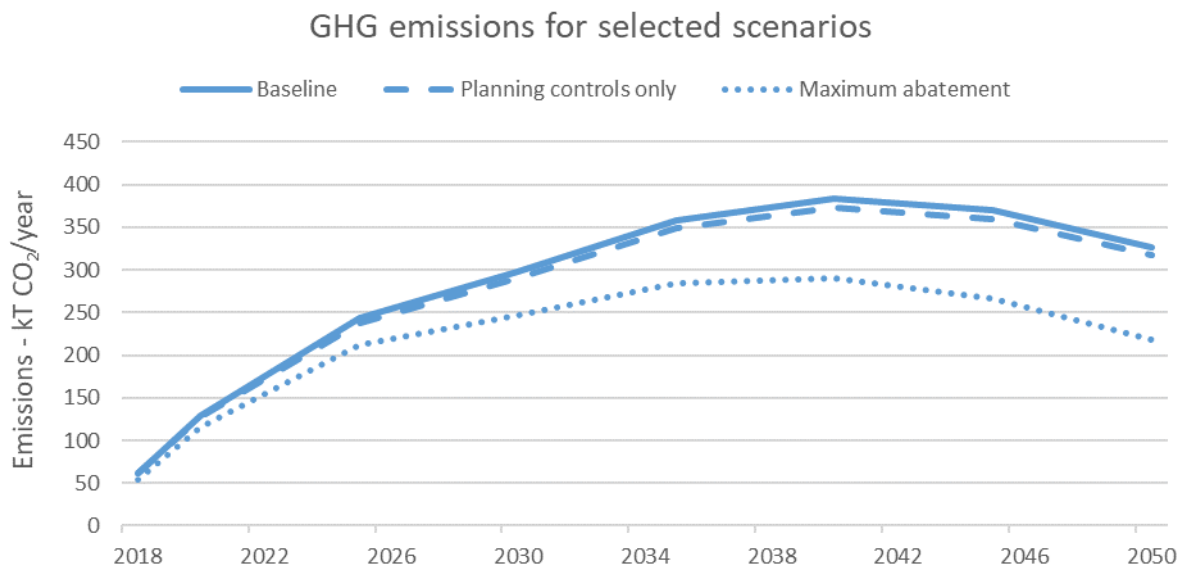


Figure 4 Emission reduction opportunities - possible pathways

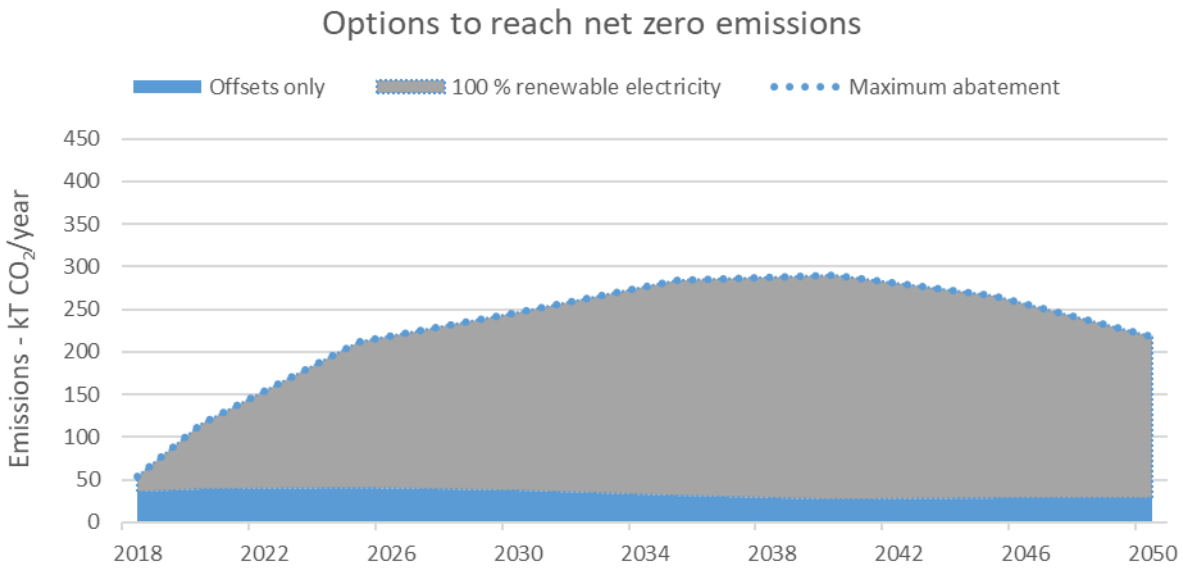


Figure 5 Options to reach net zero emissions

2.4 Selecting a pathway for Fishermans Bend

Multiple pathways are laid out in this strategy that identify a combination of opportunities to reach net zero carbon by 2050. It is recommended to pursue most of the opportunities described in this strategy in parallel as there is only limited overlap and/or incompatibilities between the emission reduction opportunities identified. Reaching net zero emissions by 2050 is very likely to require sourcing offsets to cover residual emissions.

An important consideration is that Fishermans Bend can become net zero carbon at any point in time by sourcing renewable electricity and carbon offsets. A decision will need to be made whether Fishermans Bend becomes carbon neutral or whether each city (City of Port Phillip and City of Melbourne) fulfil their own commitment in accordance with their own timelines (and budgets). It is highly likely that within the next 5 to 10 years carbon neutrality commitments will become much more common than they are today and Fishermans Bend will have to take this into account when deciding on a net zero carbon trajectory.

In selecting a course of action, the following considerations should be taken into account:

- Relying on the **decarbonisation** of the grid to do the "heavy lifting" is not a safe strategy, as it would not leverage the benefits of reduced energy costs for occupants of the district; it also introduces significant uncertainty in the planning process (see Section 3.1).
- Failing to **act quickly** to curb emissions would send weak messages to stakeholders and result in using up some of the "carbon budget" for the district. Delaying action can also prove altogether more expensive.
- Relying on **market forces** to drive energy efficiency in buildings is only a viable strategy if there is symmetry of information between renters or buyers and developers providing the market is not skewed in favour of one economic actor (as is the case when there is a scarcity of dwellings available for example). A pre-requisite for relying on market forces to drive the market would be to make energy performance disclosure mandatory: this would allow investments in better performance to be monetised by developers.
- **Electrification** opens the possibility for buildings to become net zero carbon by sourcing 100% renewable electricity.

While buildings are often the focus for strategic planning, other components of the footprint should not be neglected:

- Energy use and emissions from operational processes from companies settling in the district are highly uncertain and have the potential to exceed any other component of the footprint.
- Emissions from transport and from solid waste are likely to be the most challenging to address, requiring significant long-term investments; as the buildings' emissions decrease over time (with increased efficiency and decreasing grid emissions factor), the relative significance of the waste and transport components of the footprint becomes more prominent.

2.5 Recommendations

With sustainable urban renewal set as a top priority for Fishermans Bend and viable but sometimes opportunities to reduce emissions identified, it is essential to create the right environment for the implementation of the strategy.

2.5.1 Governance

There is a need for a strong ongoing governance structure to be created for Fishermans Bend to take carriage of the implementation of the strategy, including:

- Ongoing updates of planning controls
- Monitoring, evaluation of overall progress and individual initiatives and adaptive management decisions
- Operational management of assistance needs, incentives (if appropriate) and coordination of initiatives involving residents and businesses in Fishermans Bend
- Carbon accounting and sourcing of renewable energy or offsets (as the case may be).

2.5.2 Planning Documents

The following messages could be reinforced in the framework next stages of planning documents, such as Precinct Plans:

- The need for rapid action, to avoid eating into the carbon budget
- The need of concerted action: all actors, from government to developers and land owners be prepared to take responsibility and act upon what it means for them
- The cross-overs between sustainable transport, waste reduction and reduction in carbon emissions could be emphasised. Waste and transport are not the most significant components of the carbon inventory at this stage, however they will become more prominent as building energy efficiency increase. Behavioural change from precincts' residents and workers will be required to achieve targets, which has been historically quite hard to achieve and maintain over time and should be communicated as soon as possible
- As electricity prices increase, reducing energy use will deliver economic benefits to residents and businesses.

The following observations on the draft Framework are made :

- The planning controls outlined under strategy 7.2.1, "Require new developments to meet 4 Star Green Star Standards or equivalent now, and clearly indicate future increases to performance requirements", will need to be rapidly ramped up to avoid locking in poor building performance .
- The two targets set under sustainability goal 7 in the draft framework are to achieve zero net emissions by 2050 and to deliver 50% tree canopy coverage in public space. Regarding these targets:
  - It is recommended to set some emission reduction target prior to 2050 to ensure that the district is on track to achieve this ultimate goal; this target could be an emission intensity target calculated before any offset to ensure that efficiency is prioritised;
  - Responsibility or carriage for achieving this target will need to be clearly identified.

- It may be beneficial to explore the possibility of splitting targets into sub-targets: for community renewable energy, for residents, for office buildings, for operational energy; this will allow a finer grain definition of responsibilities and actions for each of these segments of the strategy.
- It is important to recognise that tree canopy cover is likely to benefit climate change adaptation more than it will deliver climate change mitigation benefits. Whilst this has not been part of our calculations, the ability of city trees to absorb carbon is negligible compared to Fishermans Bend's potential carbon footprint.

3 GLOSSARY

Activity data: Source data that quantifies an emission generating activity, such as fuel usage and electricity consumption, and that can be used to determine greenhouse gas emissions.

Australian carbon credit units (ACCUs): Each ACCU represents at least one tonne of carbon dioxide equivalents (CO2-e).

Additionality: A requirement that a project or activity results in carbon abatement that is unlikely to occur in the ordinary course of events in the absence of the project or activity, including due to any existing commitment or target publicly agreed by the entity responsible for issuing the units. Abatement must not be double counted under another system.

Carbon account: A measure of the carbon dioxide equivalent emissions attributable to an activity. A carbon account can relate to the emissions of an individual, household, organisation, product, service, building or precinct. This can also be known as a carbon footprint or emissions inventory.

Carbon dioxide equivalence (CO2-e): A standard measure that takes account of the global warming potential of different greenhouse gases and expresses the effect in a common unit.

Carbon neutral: Refers to a situation where the net emissions associated with an activity are equal to zero because emissions have been reduced and offset units cancelled to fully account for all emissions.

Carbon sink: A natural or manmade reservoir, such as a forest, that stores carbon.

City: Refers to any geographically discernible subnational entity, with a local government, such as a community, town, city, or province, and covers all levels of subnational jurisdiction as well as local government as legal entities of public administration.

Emission factor: A factor that specifies the kilograms of CO2-e emissions per unit of activity.

Emissions abatement or carbon abatement: means either (a) the removal of one or more greenhouse gases from the atmosphere; or (b) the avoidance of emissions of one or more greenhouse gases.

Greenhouse gases (GHG): The atmospheric gases responsible for causing global warming and climate change. The Kyoto Protocol currently lists six greenhouse gases -carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydro-fluorocarbons (HFCs), per-fluorocarbons (PFCs) and sulphur hexafluoride (SF6). Emissions from additional greenhouse gas types, for example Nitrogen Trifluoride (NF3), may be included in future editions of Australia's national greenhouse gas inventory. The list of gases to be reported under this Standard may therefore also be updated.

GreenPower product: Any product or service that enables customers to voluntarily contribute financially to Renewable Energy generation from GreenPower Generators, and has been accredited under the National GreenPower Accreditation Program.

Green Star: Green Star is an internationally recognised holistic sustainability rating system that provides that provides independent verification of sustainable outcomes throughout the lifecycle of the built environment. It is composed of four rating tools: Green Star – Communities (for precincts in development), Green Star – Design & As Built (for new buildings), Green Star – Interiors (for new fitouts), and Green Star – Performance (for buildings in operation).

Kyoto protocol: An international treaty which was created under the United Nations Framework Convention on Climate Change (UNFCCC) in 1997 and entered into force in 2005. The Kyoto Protocol sets binding targets for the reduction of greenhouse gas emissions by developed countries and countries in transition. It includes individual emission reduction targets for those countries ('Annex I countries') to be met within the first commitment period of 2008-12.

National Australian Built Environment Rating System (NABERS): NABERS is a national rating system that measures the environmental performance of Australian buildings and tenancies. Put simply, NABERS measures the energy

efficiency, water usage, waste management and indoor environment quality of a building or tenancy and its impact on the environment.

National Administrator for the National Australian Built Environment Rating System (the NABERS Administrator): NABERS is a national program managed by the NABERS National Administrator, NSW Government's Office of Environment and Heritage, and overseen by a National Steering Committee. The NSW OEH manages the operation and development of NABERS throughout Australia on behalf of the National Steering Committee.

National Carbon Offset Standard: A standard for making carbon neutral claims; maintained by Australian Government Department of the Environment and Energy; sets rules for measuring, reducing, offsetting and reporting emissions. The standard is available for:

- Organisations: National Carbon Offset Standard for Organisations
- Products and Services: National Carbon Offset Standard for Products & Services
- Buildings: National Carbon Offset Standard for Buildings
- Precincts: National Carbon Offset Standard for Precincts

National Carbon Offset Standard for Precincts (the Standard): Is a standard for making carbon neutral claims for precinct operations. The Standard is maintained by the Australian Government Department of the Environment and Energy. It sets the rules for measuring, reducing, offsetting and reporting emissions as required to make a carbon neutral claim for a precinct.

Offsetting: The activity of cancelling offset units.

Offset unit: Represents reductions of greenhouse gases or removals of greenhouse gases from the atmosphere by sinks, relative to a business-as-usual baseline. Offset units are tradeable and can be used to negate (or offset) all or part of another entity's emissions.

Precinct: A precinct or district is a discernible area "more than a building and less than a city" and is primarily defined by its geographical boundaries, which, at a minimum, must incorporate public infrastructure beyond a single building.

Scope 1 emissions: The release of greenhouse gas into the atmosphere as a direct result of activities at a facility.

Scope 2 emissions: The release of greenhouse gas as a result of electricity generation, heating, cooling or steam that is consumed by a facility.

Scope 3 emissions: Greenhouse gases emitted as a consequence of a facility's activities but emitted by another facility.

Sequestration: The removal of atmospheric carbon dioxide, either through biological processes (for example, photosynthesis in plants and trees), or geological processes (for example, storage of carbon dioxide in underground reservoirs).

Introduction

Purpose and context

1 PURPOSE OF THE STRATEGY

1.1 Context

Keeping the world average temperature increase under 2°C, and preferably under 1.5°C, is an imperative for humanity, and, after the Paris Conference of the Parties (COP21), leading cities around the world are increasingly and formally committing to align their carbon reduction strategies with these goals.

The Fishermans Bend urban renewal area (Fishermans Bend) presents a unique opportunity to put in place strategies and structures to deliver superior GHG emission performance without compromising on other sustainability and liveability goals. A unique challenge of the area is its multiple ownership structures and the fact that it has already been rezoned, prior to planning controls being put in place to encourage sustainable development outcomes. A Taskforce led by the Department has been formed to oversee the planning work for Fishermans Bend. The Taskforce commissioned this net zero carbon strategy to inform the work to be done in relation to carbon emissions.

1.2 Fishermans Bend as a precinct

Fishermans Bend is effectively a collection of five precincts:

- four residential and mixed-use precincts: Montague, Sandridge, Lorimer, Wirraway; and
- one employment precinct of national importance: National Employment and Innovation Clusters (NEIC).

Fishermans Bend straddles the jurisdictions of the City of Melbourne (Employment district and Lorimer) and the City of Port Phillip (Montague, Sandridge, Wirraway).

As the definition of a precinct is not strict and usually based on “geography, unified planning or management intents and a sense of place” (GHG Protocol for Community-Scale Emissions, 2014), it is legitimate to consider Fishermans Bend as a single precinct for the purpose of determining a strategy towards carbon neutrality.

Given its size, the redevelopment of Fishermans Bend is a project of state importance. However, future operational governance arrangements for the district remain to be decided.

1.3 Vision and Draft Framework for Fishermans Bend

The work of the Taskforce is informed by:

- the vision for the district published in 2016, that defined eight sustainability goals, including the commitment to create a low carbon community within Fishermans Bend
- the Draft Fishermans Bend Framework, that elaborates on these goals and sets some proposed planning controls; this has just been released (October 2017) for public consultation.

The Draft Framework confirms some of the key development objectives for Fishermans Bend that have structured the present strategy, including:

- the objective to create 80,000 jobs within the district and house a population of 80,000 residents
- the objective to make the Employment precinct “Australia’s leading design, engineering and advanced manufacturing precinct” with half of the jobs created in the precinct.

While the Draft Framework is structured around eight sustainability goals, most of these are inter-related. For example, a sustainable integrated transport plan will have a significant impact on Fishermans Bend's transport emissions.

Therefore, the background reports informing the various goals included in the framework have been used to develop the Net Zero Carbon strategy, as well as planning documents providing some additional details on the projected development of the district.

1.4 Net Zero Carbon commitment

Objective 7.1 in the Draft Framework is to "Develop Fishermans Bend as a zero net emissions precinct" and strategy 7.1.2: "Develop a comprehensive net zero emissions strategy for Fishermans Bend", directly corresponds to this piece of work.

Objectives 7.2, "Design buildings to best practice green building standards" and Objective 7.3 "Maximise renewable energy generation, storage and distribution" relate to some of key opportunities presented in this strategy, in particular those that relate to proposed planning controls (going beyond what is currently included in the Draft Framework and Draft Design Standards for the district).

The objective of developing a Net Zero emissions precinct is also linked to City of Melbourne's net zero emissions target for municipal emissions by 2020 and the City of Port Phillip's 50% reduction in community emissions by 2020.

1.5 Policy context

The various levels of government all have policies dealing with climate change mitigation.

1.5.1 Federal commitments

Under the Paris Agreement Intended Nationally Determined Contributions (INDCs) – non-legally binding pledges made by countries participating in the agreement to limit or reduce greenhouse gas emissions – Australia set targets to reduce emissions by 26-28 per cent below 2005 levels by 2030, which builds on the 2020 target of reducing emissions by five per cent below 2000 levels[1]. This is setting the pace for emission reduction policies and programs at the federal level, including:

- The Emission Reduction Fund (ERF), with the accompanying safeguard mechanism
- The currently in development National Energy Guarantee (NEG) that could be seen as the successor of the Renewable Energy Target (RET).
- A continuation of the voluntary National Carbon Offset Standard (NCOS), that now provides specific pathways for buildings and precincts to become carbon neutral certified under the standard.

Some level of uncertainty however remains as to how quickly this suite of policies will drive the decarbonisation of the Australian economy.

1.5.2 Victoria's climate change policy

In the last couple of years, Victoria has comprehensively revised its climate change policy, , starting with a *Climate Change Framework, Victoria's Climate Change Adaptation Plan 2017-2020,* and reflecting the spirit of the Paris Agreement (and the commitment to limit the global average temperatures rise to 1.5°C to 2°C by the end of the century) in the *Climate Change Act 2017 (see break-out box below)*.

The Victorian government has set strong targets for the state:

- 15-20 per cent below 2005 levels by 2020

[1] http://www.environment.gov.au/climate-change/government/international/paris-agreement

- a commitment to set interim emissions reduction targets in 2018 for 2021-25 and 2026-30 under the Climate Change Act 2017
- net zero emissions by 2050
- Victorian renewable energy generation targets (VRET) of 25 per cent by 2020 and 40 per cent by 2025; these targets will be supported by a competitive reverse auction scheme.

The Victorian Government has also committed to reduce mandatory reported emissions from its own operations by 30 per cent below 2014/2015 levels by 2020.

The state government has identified the need to create a more compact, sustainable city. Plan Melbourne identifies approximately 700 hectares of land available for urban renewal close to central Melbourne, including around 480 hectares for Fishermans Bend.

1.5.3 Local Government Policy Framework

As mentioned above, Fishermans Bend is split between the City of Melbourne and the City of Port Phillip. Both councils have strong climate change mitigation commitments. This provides strategic context for this work and, given its size, the development of Fishermans Bend will impact on the ability of these councils to meet their goals and targets. As such the Fishermans Bend Net Zero Emissions Strategy must have regard for these strategies and consider how it can effectively support their implementation, and how monitoring and review processes should interact.

City of Melbourne: Zero Net Emissions Strategy - Melbourne has a target of zero net emissions by 2020. This Strategy is expected to be updated in 2017-2018[2].

City of Port Phillip: Toward Zero Sustainable Environment Strategy 2007-2020 – Port Phillip has a target of zero emissions from council by 2020 and 50% reduction in community greenhouse gas emissions by 2020[3]. The City of Port Phillip is currently updating its strategy for post 2020 emissions and environmental impacts.

[2] http://www.melbourne.vic.gov.au/about-council/vision-goals/eco-city/Pages/zero-net-emissions-strategy.aspx

[3] http://www.portphillip.vic.gov.au/climate_change_commitment.htm

The *Climate Change Act 2017*:

- contains a duty for the Victorian Government to embed climate change in its decisions, policies, programs and processes by having regard to the policy objectives and guiding principles of the Act;
- requires a Climate Change Strategy every five years to set out how Victoria will meet its targets and adapt to the impacts of climate change (from 2020);
- establishes a pledging model to reduce emissions from government's own operations and from across the economy (from 2020);
- requires Adaptation Action Plans every five years for key systems that are vulnerable to the impacts of climate change (from 2021); and
- establishes a system of periodic reporting to provide transparency, accountability and ensure the community remains informed.

1.6 The Net Zero Carbon strategy

1.6.1 Objective of the strategy

The objective of the Net Zero Carbon strategy for Fishermans Bend is to provide a framework to achieve the set Net Zero Carbon emissions target by 2050 or earlier, by developing sectoral pathways to reduce emissions and incorporating existing constraints.

The strategy seeks to articulate options where they exist and is based on an analysis of existing planning documents and supported by a carbon emissions model (developed in Excel) developed using data and assumptions available at the time. It is however recognised that this will evolve over time and both the model and the strategy should be considered as tools to be owned and used by the Taskforce in their planning work, rather than as set documents.

1.6.2 Structure of this document

This document presents the summary outcomes of the collaborative work done by Point Advisory and their subcontractors Aurecon with the Taskforce in defining the key elements of a Net Zero Carbon strategy for Fishermans Bend:

- Section 2 presents a brief overview of the methodological approach adopted.
- Section 3 summarises high level considerations and conclusions about the pathways to Net Zero emissions.
- Section 4 details an action plan for each segment of the Fishermans Bend's carbon footprint, identifying roles for the Taskforce and for other entities, noting possible barriers and uncertainty where they are apparent; this is the core component of the document.

Apart from the Excel model, a number of documents were produced as part of the analytical process leading to this strategy. They should be considered as Appendices to the strategy and referred to when seeking more detail on specific technical elements:

- Appendix 1 presents a methodology framework report, that outlines the key steps undertaken and limitations encountered to identify, characterise and prioritise emission reduction opportunities for the precinct, in the lead to the development of possible pathway(s) to Net Zero Emissions.
- Appendix 2 contains the baseline report with all assumptions and data sources for the baseline footprint calculations that are presented briefly in section 4 of this report.
- Appendix 3 reports on key characteristics of carbon offsets.

These various reports were validated by the Taskforce as the work progressed.

Methodology

How does it work?

2 METHODOLOGY

This section presents a summary of the key points from the Methodology framework report in Appendix 1.

2.1 Alignment with existing standards

The two main points of reference for defining Fishermans Bend's footprint are:

- The GHG Protocol for Community-Scale Emissions (GPC) (WRI, 2014), that aligns with City of Melbourne's net zero carbon community calculations.
- The draft National Carbon Offset Standard (NCOS) for precincts standard (Department for the Environment and Energy, 2017), which has since been published as a final standard.

The reference to these standards, in particular the NCOS for precincts, does not mean that there is any commitment for Fishermans Bend to become certified carbon neutral under NCOS; simply that there is a desire to align with a scheme that:

- is robust
- is comprehensive
- encourages emission reductions and continuous improvements before any offsets are considered
- has been used as a reference for other projects (e.g. Barangaroo South in Sydney)
- is consistent with international best practices guidelines
- aligns with industry standards and trends, (Green Star and NABERS in particular).

The consulting team has also met with the City of Melbourne to identify potential sources of discrepancies between the work done by the City in respect to their community's net zero emissions commitment and the present piece of work.

2.2 Boundary setting

Defining the emissions boundary means deciding on inclusions and exclusions of sources of emissions, it is therefore an important step in the methodology. They are classified as scope 1, 2 or 3 in accordance with the GHG protocol depending on whether or not emission sources are located within the boundary of Fishermans Bend, but this has little bearing on the footprint calculation exercise for the purpose of this report. Below is a summary of the key points that are detailed in the Methodology Framework report:

- Only emissions from operations are included in the footprint, as opposed to emissions associated with construction and demolition activities; it is acknowledged that every effort should be made to reduce lifecycle emissions associated with building materials and emissions from construction machineries and other activities, however, establishing a benchmark footprint for such activities goes beyond the scope of the present piece of work.
- Buildings-related emissions include base building operations and energy consumption by occupants (residents and companies).
- Solid waste emissions for waste managed on-site or offsite are included.
- Emissions associated with water and wastewater are considered as part of Fishermans Bend's footprint and are calculated based on a standard, volume-based emission factor.
- Public and private transport are included, as much as emissions can be estimated from the limited information available. This includes:
  - 100% of the freight traffic resulting from the commercial activities within Fishermans Bend, but classified under "economic activity" for the precinct (see below),
  - 100% of the intra-boundary transport, and

- half of the transport generated by the activities of the occupants of the precinct (in alignment with the GPC and NCOS, the rationale being that the other half falls within the jurisdiction of another district, should there be a reconciliation of carbon footprint).

For practical reasons, freight traffic for Fishermans Bend was estimated as part of the economic activity (see section 4.9) and intra-boundary trips were ignored, considering that a portion of them would be included into the extra-boundary trips included in the carbon footprint (i.e. 50% of them).

- Other than public transport, precinct infrastructure using energy or responsible for GHG emissions is limited to public lighting (street lights and outdoor facilities).
- Renewable energy generated in the district is deducted from the total energy use, regardless of the fact that 100% of renewable energy generated may not be used within the district due to oversupply at specific times of the day.
- Fuel used by co and tri-generation systems is within the inventory boundary, however none is expected to be developed at this stage.

It is important to note that, under NCOS rules, renewable energy generated under the Large-scale renewable energy target (LRET) can only be considered as zero-emissions energy if the equivalent number of Large Generation Certificates (LGCs) are voluntarily retired.

In the modelling undertaken as a support for this strategy, the possibility that some solar PV systems might be large enough to fall under the LRET scheme (100kW) has not been considered. The underlying assumption is that none of the systems within Fishermans Bend will generate any Large-scale Generation Certificates (LGCs). Should it not be the case, then the estimated renewable energy within the precinct should be reconsidered in the short term; however, by 2050, the LRET is likely to be superseded and any renewable energy generation validly accounted for.

In terms of incentive schemes:

- Australian carbon credit units (ACCUs) from emission reduction projects occurring within the boundary of a precinct can only be claimed as a reduction if the ACCUs from the projects are voluntarily retired.
- Accessing Victorian Energy Efficiency Certificates does not impact the validity of emissions reduction under the NCOS carbon neutral program.

Exclusions from the footprint are:

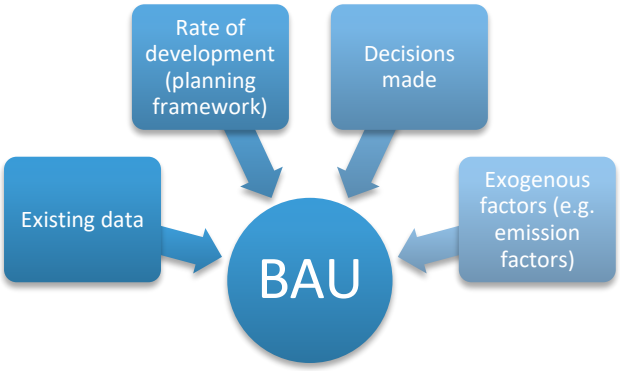
- Residents' consumption (e.g. food, clothing, etc.)
- Consumables, services and products used by companies to carry out their economic activities

Emissions from such products and services would be very difficult to track.

2.3 Emissions calculations

As a high-level rule, emissions are calculated for each source of emissions by multiplying activity data (e.g. the volume of fuel used or quantity of electricity purchased) by the relevant emissions factor. The challenge is to ensure that activity data estimates are defensible and based on transparent assumptions (see Figure 6).

Figure 6: Modelling approach



Assumptions and emissions calculations are detailed in the Baseline Assessment report (presented in Appendix 2) and have been broken down into the following components:

- Residential buildings (multi-storey)
- Commercial buildings (offices)
- Commercial buildings (retail)
- Commercial buildings (warehouses – employment precinct only)
- Commercial buildings (light industry – employment precinct only)
- Community services buildings (and indoor sport facilities)
- Public Infrastructure (streetlights and outdoor sport facilities)
- Transport (mode share)
- Waste transport and management
- Water and wastewater
- Space for local renewable energy generation capacity: mainly roof space.

The key drivers and assumptions for the model are:

- The **rate of development** assumed for Fishermans Bend:
- it has been assumed that 100% of the district would be redeveloped and only these emissions are considered in the model (not emissions from current buildings or activities occurring within Fishermans Bend);
- a linear development scenario has been assumed, up to the fully developed district by 2050.
- **Electrification**: full electrification of buildings (as opposed to using gas for heating / hot water) may happen just through market forces, but it is difficult to be definite about this; the model therefore includes scenarios with and without electrification.
- **Grid emission factor**: this is the greatest source of uncertainty in the model, as the rate of "decarbonisation" of the grid over time is surrounded with high political, and to a lesser extent, technical uncertainty. Three scenarios for grid decarbonisation to 2050 have been defined for inclusion in the model, plus one scenario where the grid factor remains at the current level (scope 2 + scope 3 emissions = 1.19 kg CO_2-e per kWh): see Figure 7. Note that the gas emission factor is assumed to remain the same over the period.
- Apart from the above, a large source of **uncertainty** is the type of industries likely to settle within Fishermans Bend, in particular in the Employment district. Their operational energy use could dwarf that of any other component of the footprint.
- Assumptions about building form, floor space and public infrastructure are presented in the Baseline assessment report.

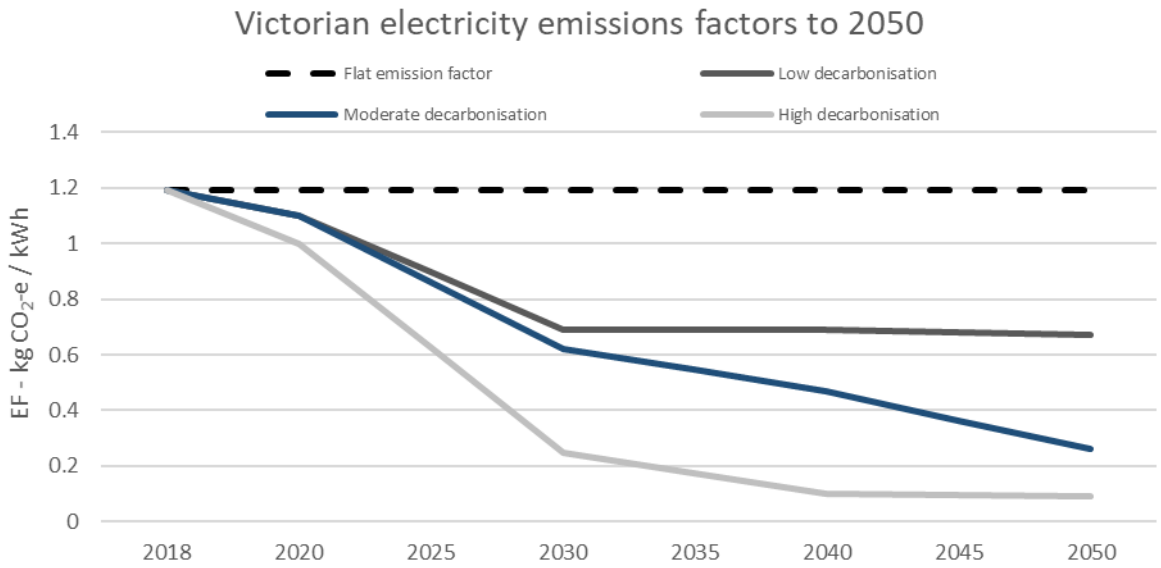


Figure 7 Grid emission factor to 2050 (source: interpreted from the Climate Change Authority)

2.4 Identifying emission reduction opportunities

The identification of emission reduction opportunities called upon a desktop review of available information and the experience of our consulting team (See Figure 8 for a schematic of the opportunity identification process). The main focus of the consulting team has been to link emissions reduction potential with the controls or instruments that need to be put in place to ensure expected emission reductions are realised.

In identifying and modelling the potential for each opportunity to deliver emissions reductions, we considered the following criteria, which were defined in collaboration with the Taskforce:

- Alignment with policies / objectives for the district
- Level of control by the Taskforce or subsequent governing body
- Acceptability / resistance by stakeholders
- Relative cost impost
- Likelihood of success / implementation risk
- Co-benefits (other than carbon emission reductions)
- Sequencing and interdependencies.

It should be noted however that the process of prioritisation was not supported by a formal, quantified multi-criteria analysis, as this might have given a false sense of accuracy that cannot be achieved given the level of uncertainty surrounding most of the parameters at this point in time.

The outcome of this process is presented in section 4 below.

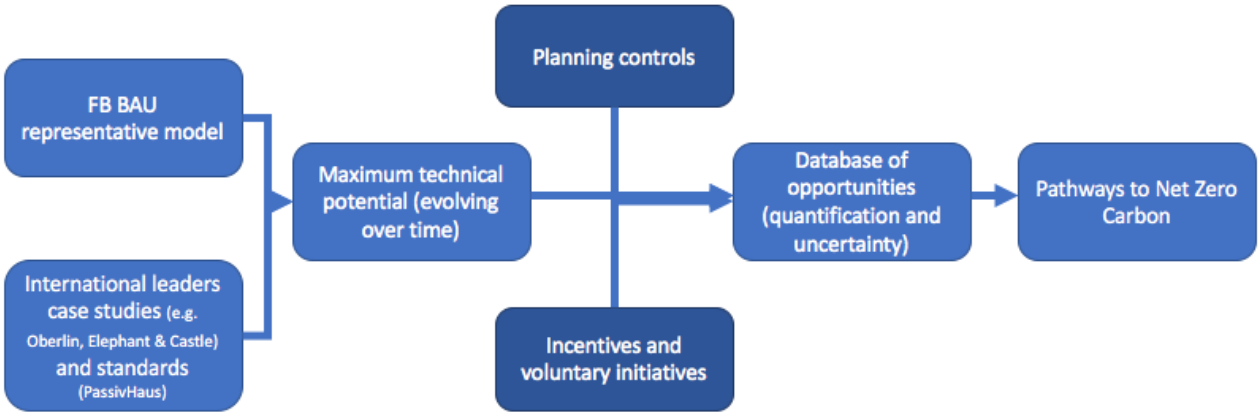


Figure 8: Identifying opportunities

2.5 Implementation: instruments, responsibilities and governance

This part of the work was purely analytical and based on the experience of the consulting team.

As mentioned above, the identification of appropriate levers, be they regulatory or voluntary, to trigger potential emission reductions was part of the work done on identifying opportunities.

In the continuation of this work, the consulting team identified what entity or broad type of entity would be responsible for implementing the action and who could help by implementing supporting actions. Timing was also a consideration, although most of the actions need to be implemented as soon as possible and there is a need to maintain the momentum all through the period.

While there are a lot of decisions still to be made in relation to the governance of Fishermans Bend, some recommendations could be made and are documented in section 4.1.1.

Pathways to Net Zero Emissions

For Fishermans Bend

3 PATHWAYS TO NET ZERO EMISSIONS

3.1 The lure of the silver bullet

To be able to keep global warming under the COP21 agreed 2°C or even 1.5°C target, and for Australia to meet its international obligations under the Paris Agreement, the electricity grid needs to be decarbonised as quickly as possible.

It would therefore seem that one strategy for Fishermans Bend could be to strongly advocate for both:

- Electrification of buildings and transport so that a minimum of other energy is used within the district by 2050.
- Decarbonisation of the electricity grid at the national, or at least the state level, so that the electricity consumed within the district has a low carbon intensity.

As a fall-back position, electricity could be sourced for Fishermans Bend from offsite renewable power plants using Power Purchase Agreements (PPAs).

This "silver bullet" strategy does not, however, align with leading practices and can be considered high risk, as:

- Progress towards a decarbonised electricity grid is highly political and almost entirely dependent on exogenous factors outside the control of the Taskforce.
- This pathway is likely to be high cost for residents and businesses as energy consumption, while low-carbon, would remain high in the absence of a focus on energy efficiency, demand management, peak demand management and local renewable energy generations - all strategies with the potential to reduce energy costs to energy users.
- This pathway does not involve innovation and as such, Fishermans Bend may not be able to claim to be amongst leading precincts around the country and may struggle to score Green Star Communities innovation credits.
- If there is a delay in driving Fishermans Bend's carbon emissions footprint down, the "carbon budget" consumed in the meantime will contribute to global warming. This would probably not be in line with a 2°C or 1.5°C target.
- Finally, as a mixed-use district open to all types of businesses, it will be very difficult to predict whether energy intensive industries may settle in Fishermans Bend and whether they would be able to fully electrify or indeed whether it would be affordable to source large amounts of off-site renewable energies to satisfy their demand. It would therefore be necessary to engage with every one of them to ensure energy demand from their operations is monitored and managed.

For the reasons mentioned above, it is highly recommended that Fishermans Bend adopt a more sophisticated approach to devising a pathway to a net zero carbon precinct. A hierarchy of actions based on broad principles is described below.

3.2 A hierarchy of actions for logical pathways

While pathways are flexible and will differ between each segment of the emissions inventory, the same broad principles and categories of enacting mechanisms can be applied.

3.2.1 Principles

Broad principles can be articulated as follows:

- In the long run, **investing in the right infrastructure upfront** is the most cost-effective option: this is valid for private infrastructure (buildings) as well as for public infrastructure (transport or street lights). This does not mean that this needs to be achieved regardless of the upfront cost, but taking a long-term view on investments and keeping options open for likely changes in infrastructure needs (e.g. electric vehicles) will reduce the cost of redevelopment in the future.
- As mentioned above, the development rate of the district is uncertain and setting appropriate standards and expectations **early** is necessary to avoid to "locking in" emissions from under-performing infrastructure (especially building envelopes). The "envelope" for buildings and infrastructure create some restrictions to what is achievable, as far as carbon emissions reductions are concerned. It is therefore important to push requirements are far as

possible, as early as possible. Some other actions (e.g. advocating for higher appliance standards) can occur more progressively as the shorter life of equipment allows it to be upgraded over time.

- **Performance validation** is important: there has been an historical focus on theoretical or design performance (in buildings in particular), with real life performance too often falling short of modelled performance. Putting in place measures to ensure that final performance is in line with modelled performance, and that performance doesn't 'drift' over time, should be integral to the emissions reduction strategy.

3.2.2 Mechanisms

The generic types of enacting mechanisms or levers that have been identified are outlined below. Actions recommended in the next section (Action Plan) provide more specific detail on how these levers may be brought to bear.

- **Fishermans Bend design standards** stand at the "command and control" end of the spectrum for private infrastructure (essentially buildings) and are a "push" factor. Provided compliance is enforced, thresholds set in the design standards are an effective and reliable way of driving emissions reductions linked to building envelope thermal performance and base building services. Standards also apply fairly to all stakeholders.
- Influencing **general legislation and standards** is another way to give the market a "push". While this may not always be possible or may not happen in a timely manner, advocating for tightening standards at the national or state level has the merit of achieving broad impact. Ensuring that National Construction Code (NCC) requirements are set at the level of international best practices will send a signal to the whole building sector and facilitate an orderly transition to a low energy built environment. It may also be better for Fishermans Bend to be ahead of the NCC but not so far ahead that it creates a perception of unreasonably high and difficult standards to reach, thus discouraging development in the precinct.
- Acting on **market drivers** is more akin to a "pull factor", i.e. offering desirable characteristics that translate into customer demands and rapidly evolve into a market standard. For example, 4G mobile coverage has become an expectation in most large cities of the word, and in the same vein it is conceivable that buildings with no electricity bills might become market standard at some stage in the near future. The premium office market is certainly heading that way under the influence of organisations such as the GBCA and government-led initiatives such as NABERS. The Taskforce can consider actions that may reinforce such trends, including through **building rating systems and disclosure** (mandatory and voluntary).
- **Incentives** can also be provided to encourage early adoption of technologies or emission reductions activities. Incentives can create a "pull" in the market by removing some of the risks for private investors or supporting market development in its early stage. They can also be seen as cost-sharing mechanisms benefitting those prepared to invest in actions or infrastructure that will deliver "common good", for example the provision of green space accessible to the public or providing a cooling effect where it is most needed.
- Finally, **providing support and building capacity** within the industry may help remove some of the residual barriers and foster collaboration where private companies are not necessarily used to collaborating.

The pathways recommended for Fishermans Bend combine these various elements. However, the model delivered with this report will allow the Taskforce to test the impact of different types of actions implemented together by tailoring the model through an interactive user interface.

3.3 Optimal pathways to net zero emissions

The modelling undertaken suggests that, as much as possible, all mechanisms should be exercised to provide Fishermans Bend with the best chance to achieve Net Zero emissions in the best conditions and for the lowest ongoing cost to the entity(-ies) that will ultimately be funding the offsetting of the residual carbon footprint (through the purchase of renewable electricity and/or carbon offsets).

The magnitude of remaining emissions depends on how quickly and how successfully emission reduction opportunities are implemented and how rapidly the electricity grid decarbonises.

While pathways are flexible, there are a number of priorities that the Taskforce need to take into account:

- **Getting residential building envelopes right**: to avoid locking-in high emission intensity for residential buildings, pushing for the highest possible design standard should be a priority, particularly as this market segment has historically lagged the market in terms of energy performance standards. This is likely to require the use of planning control and to involve intensive engagement with the residential development industry.

- Making sure **options for innovation** are kept open: access to solar PV, battery storage, electric vehicles and preparedness for demand response are some of the technology evolutions happening at the moment and it is important to ensure that building design makes future adaptations or technology enhancements possible.
- Use **direct investment** to innovate and send signals to the market: government does not own much of the land within Fishermans Bend, but there are still some opportunities to influence some of the sites' development (e.g. the ex-GM site). Direct investment in active transport, public transport and waste management will also be required to unlock emissions reductions for these activities within Fishermans Bend as there is little opportunity for the private sector to lead the necessary changes.

The figures below present the uncertainty around the BAU (or baseline) emissions (Figure 9), then a summary of emission reduction opportunities under specific select trajectories (Figure 10) and, finally (Figure 11), some options to use offsets and bulk renewable energy purchase to reach net zero emissions.

The model that is a companion piece to this report provides additional detail on these trajectories and emission reduction "wedges" that are difficult to present in a report.

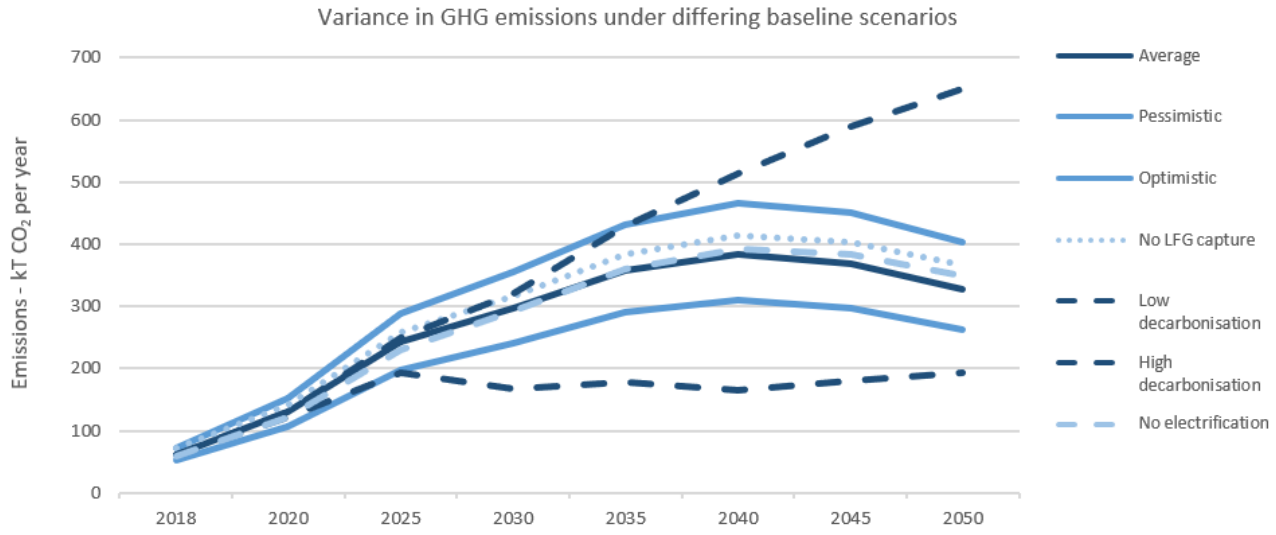


Figure 9 Change in emissions according to external factors

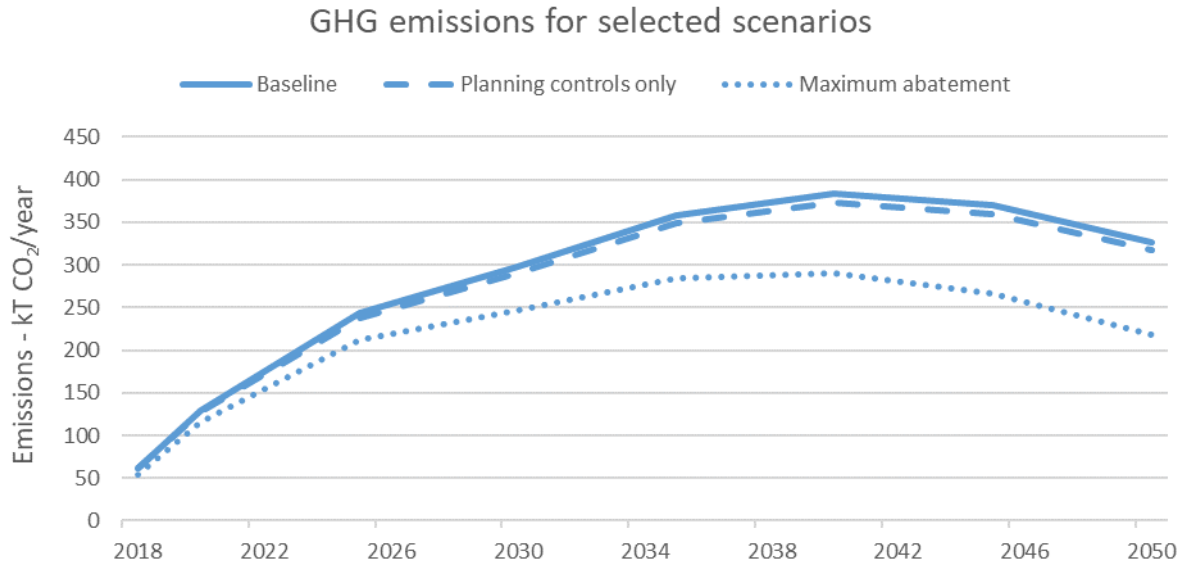


Figure 10 GHG inventory with abatement - for selected scenarios

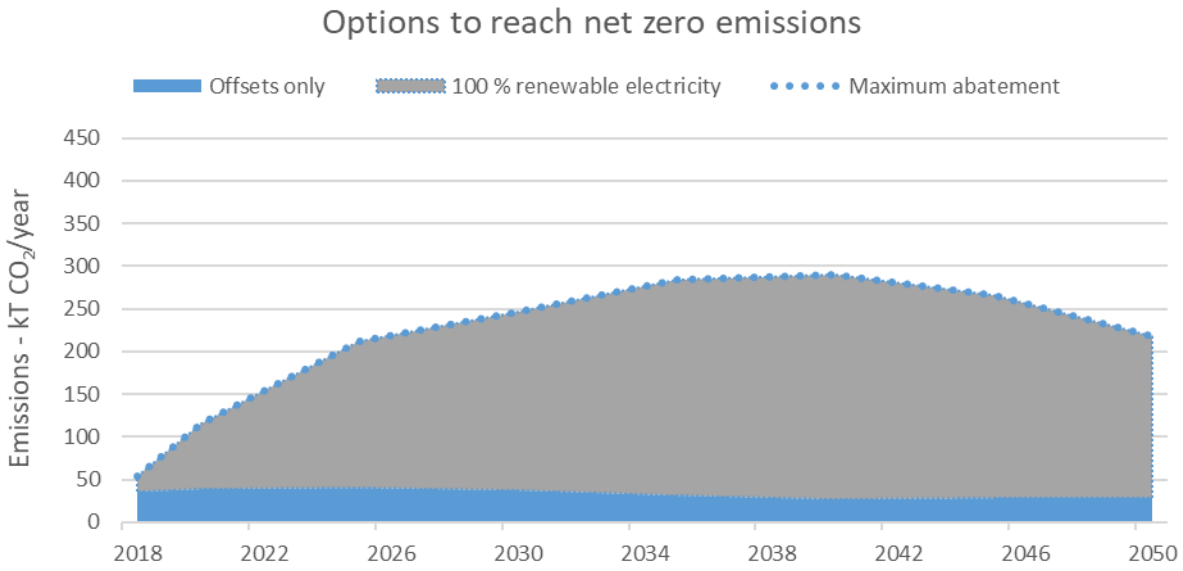


Figure 11: Options to reach net zero emissions

Action plan

Supporting the pathways

4 ACTION PLAN

This action plan details the recommended measures and actions that the Taskforce, broader government and other stakeholders should consider implementing to drive emission reductions within Fishermans Bend.

Conflicts and synergies between these measures and actions have been identified wherever relevant, as well as potential overlaps with other strategies, in particular with the climate change adaptation strategy.

Some general, structural recommendations are presented in section 4.1 before going into the detail of each segment of the Fishermans Bend's emissions inventory.

4.1 General recommendations

4.1.1 Governance

Whether Fishermans Bend formally commits to carbon neutrality or is aspiring to be a leader in carbon emissions reduction, an appropriate governance structure needs to be in place to support the achievement of such aspirations. Key governance considerations are described below:

- **Commitment and leadership**: Going beyond existing standards is hard and a unifying leading force is required to maintain the commitment and energy of all parties involved. Any lack of direction or leadership (with a specific mandate and targets relating to the Fishermans Bend's carbon footprint reduction) is virtually certain to lead to a failure to achieve the goals.
- **Coordination and ongoing decision making**: In addition to leadership, experience has shown that a coordination entity is required to make sure decisions are made and followed through, stakeholders remain engaged and emissions remain under control. This coordination entity is as essential as strong leadership.
- **Management budget and capacity:** To implement any incentive programs or support actions mentioned in the plan, the management and coordination team need to have access to adequate resources in terms of budget and manpower.
- **Monitoring and oversight:** Accountability comes from a clear reporting structure and oversight, as well as a pre-agreed monitoring and evaluation framework. The City of Melbourne, City of Port Phillip and the Victorian government are likely to all be involved in the oversight of the strategy implementation in the long term and should be involved in the development of appropriate KPIs.
- **Reporting**: Each of the governance elements mentioned above will come with their own reporting obligations. However, specific attention should be given to the reporting of performance to businesses and residents within Fishermans Bend, as they need to be engaged around the goal of achieving a net zero carbon district.

4.1.2 Advocacy

Advocacy for the **improvement of standards** and for **grid decarbonisation** is seen as a "no regrets" action. This is for three reasons::

- Even if Fishermans Bend achieves very high standards of efficiency on its own, better standards and rapid decarbonisation will help bring emissions down even further within the precinct and will also help lower emissions in broader society.
- A decarbonised grid and powerful exogenous drivers for energy efficiency would reduce the cost of offsetting any residual emissions to make the district net zero carbon, and would allow funds to be reallocated to harder-to-access emission reduction opportunities.

- Considering the cross-over with climate change adaptation measures, more efficient buildings are likely to perform better in heatwave conditions (or in colder conditions) when pressure on the grid may cause black-outs. More efficient buildings are likely to also be more resilient and able to withstand longer periods without electricity without endangering their occupants.

Advocacy for, or encouragement of, the full **electrification** of buildings and cars is a preliminary step in pursuing a strategy to source renewable electricity to cover a high proportion of the footprint's components. In most cases, it also facilitates efficiency gains and it also follows a current market trend.

There is a good alignment between recommended advocacy work with current government (e.g. the National Energy Productivity Plan, NABERS) and industry (GBCA, ASBEC) activities, as summarised in the table below.

Table 1: Advocacy actions alignment

Advocacy action	Policy or initiative	Recommendation
Better building standards	Out of 34 actions in the **NEPP** work plan, one supports the strengthening of the National Construction Code and one relates to better compliance with the regulations. The release of a new NCC is planned for 2019.	Push for stringency and frequency of updates, in particular for the residential sector
Building rating schemes and disclosure	**GBCA** and **NABERS** are expanding their reach and tightening benchmarks on a clear trajectory to net zero emissions. Under its program to "empower customers", the **NEPP** is intending to provide support for building energy ratings and disclosure.	Advocacy could aim for: • Mandatory disclosure to increase visibility and "pull" effect • Pathways to net zero emissions to achieve maximum rating
Market reform to facilitate renewable energy integration in the grid	The **NEPP** incorporates in its work program generic actions to support such reforms The **Finkel** review addresses the question of "dispatchable" capacity for renewable energy power plants, which could impact a large solar generator within Fishermans Bend, requiring "firming" battery capacity to be added. The review also recommended a Clean Energy Target to replace the RET, a recommendation the federal government appears unlikely to accept, proposing a National Energy Guarantee (NEG) instead. The Australian Energy Market Commission (**AEMC)** is working on providing "reliable, secure energy at the best price for consumers" and has issues recommendations to government on integrating energy and emissions reduction policy and has been working on design options for a Clean Energy Target.	Risk that the uncertainty around the policy direction may continue and may hold back private investment in an otherwise very favourable market (high electricity prices, decreasing costs of renewable energy infrastructure, in particular solar PV) Strong advocacy for solving technical and market issues relating to the integration of high proportions of renewable energy in the electricity grid is therefore required

Advocacy action	Policy or initiative	Recommendation
Technical innovation / Better appliance standards	Innovation relates to both: • "soft" solutions (software, systems, market innovation) aiming to better manage existing generation capacity and demand peaks • "hardware" solutions, relating to generation and storage capacity and the flexible management of the network through smart metering and smart appliances Innovation needs to be supported through its initial cycles: • Through demonstration cases and trials • Through subsidies before the market achieves a critical size allowing prices to drop • Through initial "de-risking" when the market is reluctant to adopt new technologies • Through standards to catch laggards once the technology matures	Advocacy by the Taskforce can therefore address both components: • Advocate for innovation funding by all levels of government • Advocate for standards to closely follow market innovation

Source: NEPP, AEMC

Several credible not-for-profit or research organisations have published programs advocating policy and market reform in relation to energy efficiency and renewable energy. For example:

- The Energy Efficiency Council published for the first time in July 2016 a comprehensive "Australian Energy Efficiency Policy Handbook" ("Save Energy, Grow the Economy").
- ClimateWorks has published various reports on sectoral decarbonisation of the economy.
- The AEMC has done some work around emission reductions in the electricity sector (see http://www.aemc.gov.au/Major-Pages/AEMC-work-overview/Integrating-energy-and-emissions-reduction-policy.aspx).
- The Climate Change Authority has commissioned and published valuable analyses on how to meet Australia's commitment under the Paris Agreement and on longer term pathways to decarbonisation.
- In their Net Zero Emissions strategy, the City of Melbourne has considered in some level of detail advocacy actions necessary to support their own work plan.

These documents, and many others, could be drawn upon to refine the advocacy program the Taskforce might want to consider.

NEPP: 34 actions in the work plan, across the following themes

Efficient incentives

- cost-reflective pricing
- VEET and other schemes
- ERF and RET

Empowering consumers

- Make choice easier
- Support vulnerable consumers
- Building energy ratings and disclosure
- Help business self-manage energy costs
- Support voluntary action
- Research business benchmarks and success factors
- Sectoral action (freight, government buildings)

Innovation support

Competitive modern markets:

- technology, gas supply, governance
- develop an Energy Use Data Model for better planning
- Smart metering
- Improve the exchange of market data
- Build service provider capacity
- New market mechanisms for demand response
- Competitive retail markets in electricity and gas

Consumer protection measures:

- National Construction Code
- Improve compliance with building energy efficiency regulation

4.2 Residential buildings

For each of the following sections, refer to Appendix 1 for a detailed table of actions to be considered.

4.2.1 BAU scenarios

In the absence of specific actions, the BAU emissions for Fishermans Bend based on the assumptions documented in the baseline report are presented in Figure 12.

The footprint increases to 2040 as Fishermans Bend develops (more or less linearly), at which point the assumed grid decarbonisation impact outweighs the increased number of dwellings and the footprint starts to decrease.

Total energy use, however, continues to increase over the period.

Note that these projections do not incorporate on-site or off-site renewable energy as this has been dealt with for the whole district in a separate section.

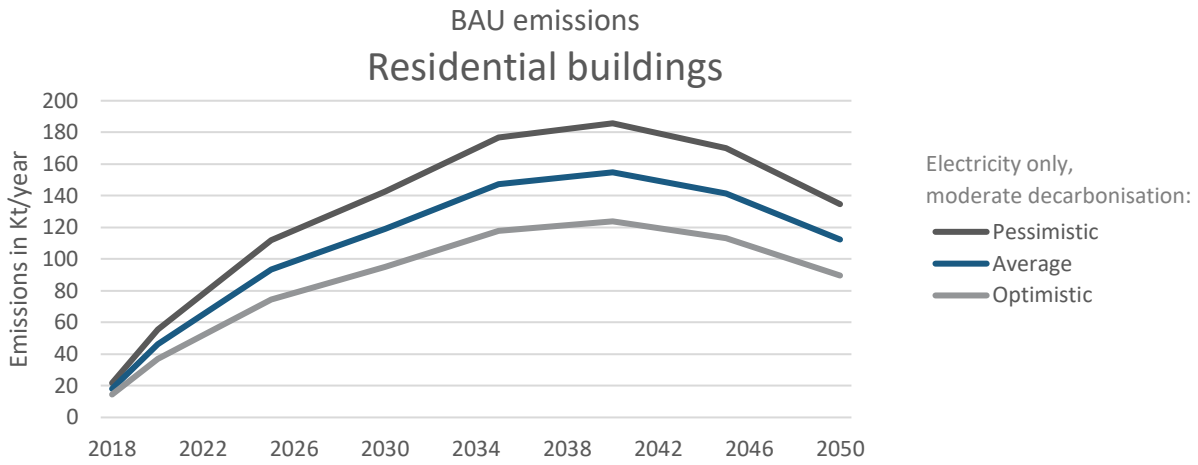


Figure 12 Residential buildings BAU footprint

4.2.2 Emission reduction opportunities

These opportunities have been selected based on the criteria defined above (2.4). They are presented in order of priority. The same type of emission reduction opportunities exist for buildings using a mix of gas and electricity and those fully electrified, although the emission reduction "wedges" may be slightly different. As for other buildings and components of the footprint, full electrification offers the opportunity to source renewable energy to fully offset the energy use of the building (refer to section 4.8).

3.1.1.1 Actions for the Taskforce

Key considerations/actions for the Taskforce include:

- The single most effective opportunity is to apply planning controls (through the Design Standards) to residential buildings, anticipating the likely tightening of the National Construction Code (NCC).
  - The recommended control is to require residential buildings to achieve a 5 Star Green Star Design and As-Built rating (or equivalent) in addition to a 7 Star NatHERS rating as soon as practicable, and then regularly tighten the requirements ahead of the NCC, delivering a 20% performance improvement on the NCC all through the period (and hence a 20% saving over the BAU). Note that Green Star provides multiple pathways for demonstrating emissions reductions under the Greenhouse Gas Emissions credit, providing Developers with significant flexibility. It is likely that future changes to the NCC will allow the use of the Green Star GHG methodology for NCC compliance purposes, as has already been proposed for non-residential buildings under the 2019 NCC.
  - 5 Star Green Star certification is consistent with a zero net carbon trajectory as it will impose a conditional requirement to reduce Greenhouse Gas Emissions by approximately 20% below NCC compliance, a benchmark which will reduce over time as the NCC increases in stringency.
  - Using planning controls seems unavoidable as the residential buildings market has historically not been driven by high consumer expectations (as opposed to the premium office building market for example). Sending a strong signal through achievable but markedly higher than average requirements is necessary to set the pace for the district, deliver emissions reductions and protect the interests of future residents.
  - As a supporting measure, stronger controls should be put in place to ensure that building performance is in line with the design requirements.

- To avoid misunderstandings and opposition, developers must be brought on board through engagement. They should integrate into their market strategies the fact that by adopting higher standards, the reputation of Fishermans Bend will be enhanced and this will improve the marketability of residential units.
- The modelling is however contingent on the NCC being regularly updated and Fishermans Bend keeping ahead of the NCC. Should there be delays in the NCC being updated, the Fishermans Bend's design standards should still be updated in line with the trajectory assumed in the modelling to deliver the forecast savings.

- To achieve even higher performance standards for some of the residential buildings, an **incentive** would be required, most likely in the form of a **Floor Area Uplift** (FAU). This measure can be put in place immediately and should be updated over time to ensure that the requirements remain significantly higher than Fishermans Bend's Design Standards.
  - To start with (2018), the requirement could be to achieve a 5 Star Green Star Design and As-Built rating (or equivalent) and an average NatHERS rating of 8 Stars and 6 points under the Green Star credit for Greenhouse Gas Emissions[4].
  - This would deliver an estimated 40% performance improvement over the BAU for participating buildings, but it was estimated that only 10% of the buildings (i.e. between 5% and 20% in terms of low / high estimates) would be attracted by the incentive. There is however no benchmark for the uptake of this type of incentive.
  - Achieving 6 points under the Green Star credit for Greenhouse Gas Emissions is consistent with the energy performance of a 6 Star Green Star building under the tool's conditional requirements[5].
  - The level of incentive required to trigger a market response will need to be determined carefully. It is acknowledged that the same instrument (FAU) could be used to incentivise different outcomes and that it might be a difficult to ensure that all of these are met. As such the modelled benefits are highly uncertain.
  - A sole reliance on voluntary uptake of incentives is unlikely to be sufficient to trigger a significant movement in the market and hence to deliver significant savings over the baseline, unless the incentive level is very attractive to developers. This, however, would likely require unacceptable trade-offs in other aspects of building planning (built form, etc).
  - In terms of actions that would support this measure and that could be developed by others (city / state / national government), the following should be considered:
    - educating the market, i.e. the purchasers of multi-residential apartments
    - encouraging voluntary disclosure of energy ratings or mandating disclosure to allow comparison, at the point of sale or time of rental.

- Another recommended **planning control** (although it will not deliver immediate emissions reductions) is to incorporate in the Design Standards low cost and no cost requirements to plan for future upgrades and **enabling technologies**, for example, space in common areas (carparks or storage areas) for battery storage (with appropriate cabling for associated solar PV panels), smart grid-ready appliances, user displays, etc.
  - This will facilitate the implementation of future opportunities. The Taskforce should consider doing additional work to refine and prioritise these technical requirements.
  - Due to the uncertainty of what these opportunities could be, this was not quantified as part of the modelling exercise, but it is considered an important measure.
  - Similarly, a requirement for buildings to be ready for "**demand response**" programs could be introduced in the planning scheme.

[4] Rather than prescribe the pathway under Green Star, it is suggested is to assume that points are approximately equivalent, and to base the points target on the percentage beyond code which is most clearly communicated under pathway 15E.

[5] While 6 points has been the basis of the projections, an incentive based approach could encourage performance significantly beyond 6 points. The 6 points could be all services, or a combination of fabric and services. On-site renewables and GreenPower products can be part of this approach to reach net zero emissions.

- **Supporting measures** requiring budget allowances should also be considered:
  - **Technical support** services for developers, design professionals and construction contractors to encourage the design of buildings with improved energy performance:
    - This measure is based on the assumption that the industry is lacking overall knowledge and capacity and that "non-core" efficiency elements are not incorporated in building designs, because of this lack of capacity, even though they may be cost-effective. In the absence of compliance requirements, access to efficiency and sustainability specialists is considered a dispensable cost.
    - By providing free access to such professional assistance, Fishermans Bend could take a collaborative approach to ensuring energy reduction opportunities are taken up.
    - There is again a lack of documented evidence about what quantum of savings could be achieved through this measure, and this has not been modelled, however 5% of building energy use seems a reasonable assumption.
    - It was assumed that a free service would attract participation, however, there could be some additional incentives for developers to participate, such as a smoother planning approval process.
  - **Technical support** to monitor and avoid **performance drift**:
    - This drift occurs over time when buildings are not "tuned" and / or maintained appropriately on an ongoing basis. Research reveals a vast range of case studies for such drift in residential buildings in particular, but there is a lack of robust, large scale studies determining statistically the magnitude of the drift. In the modelling, it was assuming to be 2% on average.
    - Technical support available to all buildings' body corporates was assumed to reduce this drift to zero.
    - Participation in drift reduction programs could potentially be made mandatory if it is found that a free service does not generate sufficient interest.
  - **Education programs** for residents are a complementary measure to help maintain momentum. This is not expected to bring significant reductions as a standalone measure.
- **Advocacy** actions have been listed in section 4.1.2:
  - In some instances, advocacy may be the only measure available to drive emission reduction opportunities: appliances and equipment are covered by Minimum Energy Performance Standard (**MEPS**) and there is scope for increasing the stringency of these standards.
  - Advocating for **mandatory energy performance disclosure for residential buildings** is unlikely to be welcomed by some segments of the industry; however, this has the potential to transform the industry by empowering end-customers (owners / renters) and allowing them to make informed choices and providing a market premium for better performing buildings.
- **Enabling measures** should also be considered to give Fishermans Bend the capacity to innovate over time:
  - Subject to an appropriate governance structure, buildings should commit to making energy and carbon performance data available broadly to facilitate future analytics (even if de-identified). This could enable better monitoring, diagnostic and eventually energy management programs to be devised.
  - Another role for the Taskforce could be to **facilitate / broker** demand response mechanisms by selecting or endorsing a preferred partner (e.g. Energy Services Company) or providing some rate reduction incentive for those joining the scheme.

3.1.1.2 Actions for other agencies

Other agencies' actions in facilitating a transition to better performing residential buildings mirror the Taskforce's advocacy actions:

- The Office of Environment and Heritage has commenced development of a NABERS Energy tool for multi-unit residential buildings which would cover energy consumption associated with common areas. This tool is due for release in 2018 and in conjunction with compulsory disclosure requirements has the potential to drive increased market competition around energy performance in the multi-unit residential market. The NABERS benchmark could serve as an alternative tool for planning controls and incentives in the near future.
- The federal government controls the MEPS (see above) as well as the process of updating the NCC. The latter needs to be updated more regularly, sending a clear signal to the industry about the energy performance expectation and its trajectory in the coming years.
- The state or federal government should consider setting mandatory disclosure energy performance requirements for multi-unit buildings, both at the point of sale and for rental properties.
- Agencies such as Sustainability Victoria and the City of Melbourne or City of Port Phillip may offer support and assistance to multi-unit owner corporations and help raise expectations

Implementing some of these actions results in the emissions abatement shown in Figure 13 below. Mandating 5-star Green Star ratings and 7-star NatHERS ratings, in conjunction with additional services to reduce performance drift, result in the highest abatement and lowest emissions from residential buildings.

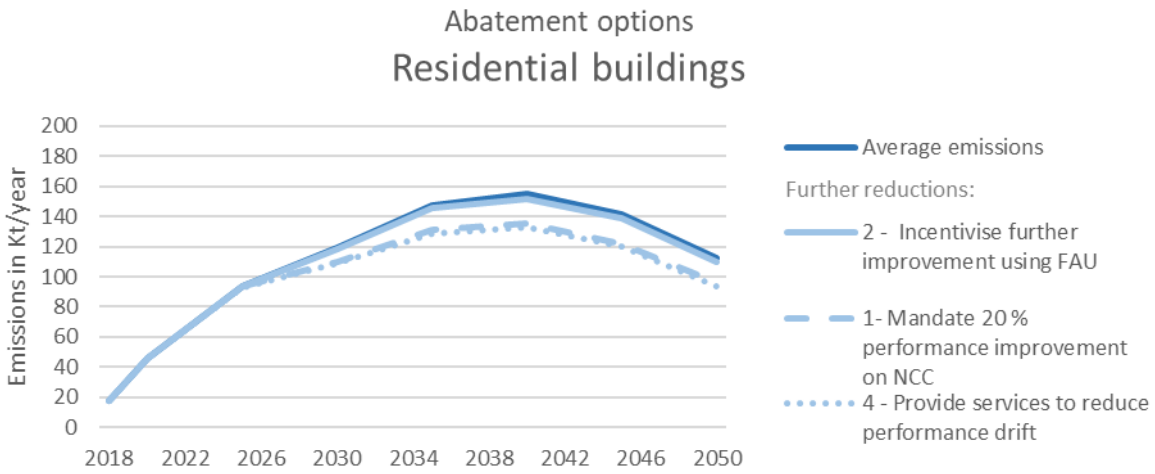


Figure 13 Residential buildings actions to reduce emissions

4.3 Commercial buildings: offices

The target for Fishermans Bend is to host 80,000 jobs, across all types of economic activities. The planning projections, at this stage, are that the Employment precinct will host 40,000 of these jobs and will be the most diverse precinct, ranging from universities to light industrial and probably incorporating data centres and other high-tech types of industries. The remaining 40,000 of jobs will be hosted in the mixed used districts (Wirraway, Sandridge, Montague and Lorimer) and will be less diverse: it has been assumed that they would be split between office jobs and retail, and the footprint modelling has followed that assumption.

This section reports on opportunities identified for buildings with a majority of office space, be they in the employment district or in the other districts. It should be noted that some of the office areas that may be attached to different types of buildings (e.g. light industrial) may not present the same opportunities and that may need to be further explored later in the planning process.

4.3.1 BAU

The premium office buildings segment in Australia has been progressing along the low-carbon path under its own steam in recent time, due to a mix of factors including regulation (mandatory disclosure), customer requirements (to disclose and / or reduce carbon footprint) and industry leadership (through industry associations such as ASBEC or the GBCA).

It is, at this stage, uncertain which market segments will be targeted for offices built in Fishermans Bend; it is probable however that the district will not be considered to be on par with the Melbourne CBD and will comprise a larger proportion of non-premium office buildings.

Various assumptions have been incorporated in the baseline, depending on the mix of buildings that will end up being developed.

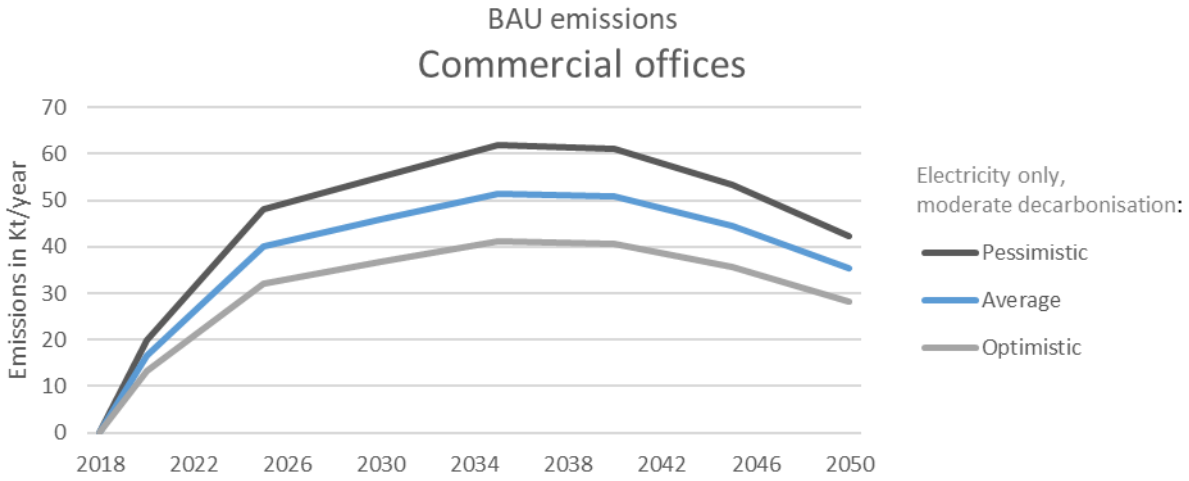


Figure 14 Office buildings BAU footprint

4.3.2 Emission reduction opportunities

Regardless of the BAU considered, the same opportunities exist. However, the savings associated with these opportunities will be the greater when the BAU energy consumption and GHG emissions are high. As the market has pushed new office buildings to adopt good energy performance standards, superior to what is required by the NCC, the size of opportunities for this segment is not very large and the emissions reduction wedges are fairly narrow. Pushing the requirements higher (e.g. 6 Star NABERS) could potentially mean discouraging development in the district in the short term or lead to push back from the industry.

Emission reduction opportunities are presented in order of priority. The same types of emission reduction opportunities exist for buildings using a mix of gas and electricity and those fully electrified, although the emission reduction "wedges" may be slightly different. As for other buildings and components of the footprint, full electrification offers the opportunity to source renewable energy to fully offset the energy use of the building (refer to section 4.8).

The opportunities presented below fall into the same categories as those detailed in the previous section for residential buildings, although the specifics differ. Only these specific details are provided below.

3.1.1.3 Actions for the Taskforce

Actions for the Taskforce include:

- **Planning controls** (through the Design Standards) applying to office buildings, anticipating the likely tightening of the NCC:

- The reference suggested for office buildings is the **NABERS** scheme: buildings should be designed to achieve a NABERS Energy Base Building or Whole Building 5.5 Star rating (excluding Green Power).
- Industry intelligence is that developers of new offices are regularly committing to 5 stars NABERS, even though the buildings are easily capable of achieving 5.5 stars (almost 100 buildings Australia-wide to this date), indicating that the concern about committing to beyond 5 star performance may often be unfounded.
- Prior to the commencement of any works, the permit holder must provide an approved NABERS Commitment Agreement. Such commitments are rare at present but are likely to become more common as a result of planning controls, financing arrangements and market forces.
- Note that putting the same planning controls in place **without NABERS Commitment Agreement** is still considered as beneficial, although some developers may not put as much effort in achieving the best possible rating.

- Another measure (that can be complementary to the first opportunity) could be to provide **incentives** for developers to target a higher building performance in exchange of a Floor Area Uplift (FAU) and / or specific benefit.
  - They could be required to achieve 6 Star NABERS (excluding Green Power) with a Commitment Agreement to access the incentive.
  - The requirement could be tightened over time to ensure buildings achieve net zero carbon (including renewables).
- As for residential buildings, **technical support services** could be made available to developers, design professionals and construction contractors to encourage the design of buildings with improved energy performance (at no additional cost through the design phase for the developers).
- **Planning control** with low cost requirements making it easier to:
  - undertake future upgrades and future possible implementation of smart grid, virtual power generation (list to be refined);
  - ensure the building is “demand response ready” and that any technical barriers are removed.
- **Influence MEPS** for appliances performance.
- **Requirement** to make energy and/or carbon performance data available to the Taskforce to facilitate future analytics and unlock associated benefits.
- Another role for the Taskforce could be to **facilitate / broker** demand response mechanisms by selecting or endorsing a preferred partner (e.g. Energy Services Company) or providing some rate reduction incentive for those joining the scheme.
- **Support or subsidise** education programs for building managers or building users.

3.1.1.4 Actions for other agencies

Other agencies’ actions in facilitating a transition to better performing residential buildings mirror the Taskforce’s advocacy actions:

- The federal government will have a role in pushing MEPS and buildings standards to be ever more stringent and in line with the highest international standards.
- Sustainability Victoria and other government agencies may partner with the Taskforce to contribute their expertise and design the most appropriate and effective support mechanisms for developers and buildings owners in Fishermans Bend.

Implementing some of these actions results in the emissions abatement shown in Figure 15 below. Applying stringent building standards with agreed commitments, along with a FAU incentive, results in the highest abatement and lowest emissions from commercial office buildings.

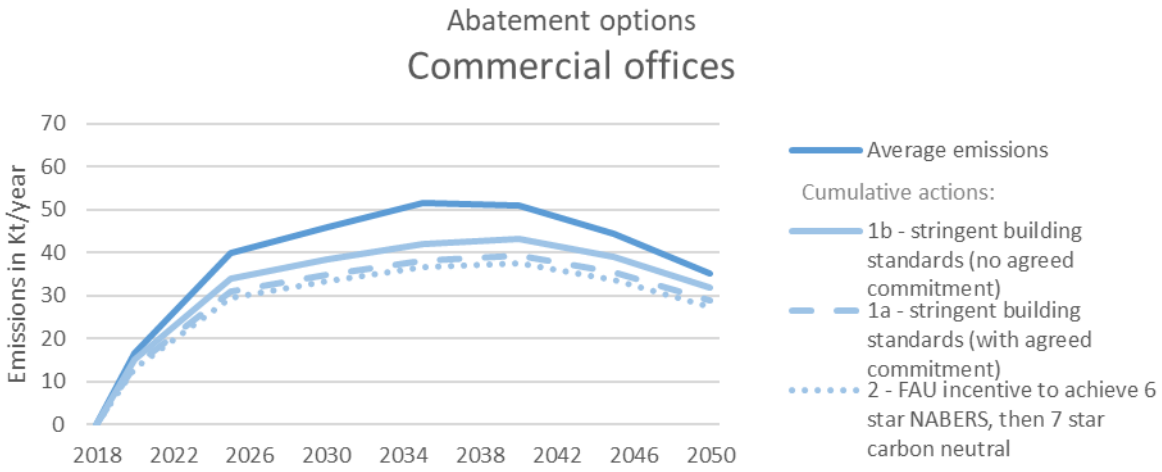


Figure 15 Commercial offices actions to reduce emissions

4.4 Commercial buildings: retail

Retail is a diverse category in itself, encompassing supermarket, shopping centre, street retail or energy-intensive, food-related retail (e.g. fast-food). All these categories have been assigned a different energy use profile for the purpose of this modelling. However, the split of forecast retail space into these categories is based solely on assumptions, as detailed in the Baseline report. This can be further complicated by the fact that retail areas are often just the street level areas of an office or residential building, with some of the determinant of performance being the same as those of that building and some other being totally different. Uncertainty is therefore high.

It should also be noted that no supermarket or large commercial centre is currently planned in the Employment district, hence only the other two categories of retail will be represented.

4.4.1 BAU

The projected emissions from all retail categories is shown in Figure 16.

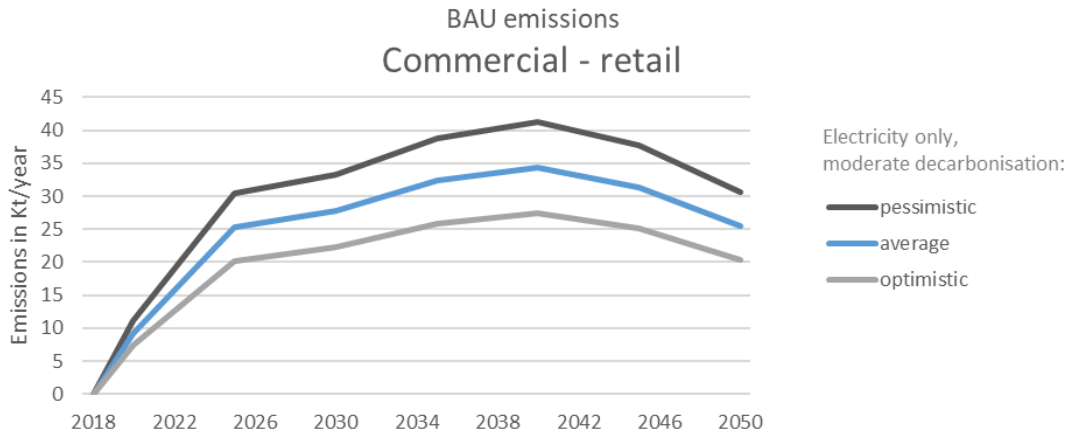


Figure 16 Retail BAU footprint

4.4.2 Emission reduction opportunities

Depending on whether or not a NABERS rating can be obtained for retail areas (which is available for shopping centre / retail areas over a certain size), emission reduction opportunities need to be defined in a different way. Fewer generic opportunities are available for this segment of the market given the complexity of addressing a diversity of retail areas. However, there would be merit in engaging coherent groups of retail businesses to identify more specific possible actions for their own category.

The following emission reduction opportunities summarised below take this into account:

- The Taskforce can define **planning controls** (through the Design Standards) to increase building envelope performance, e.g.:
  - Requiring a NABERS commercial centre Base Building 4 Star rating (excluding Green Power) where GFA is greater than 15,000 m^2
  - Where NABERS is not applicable requiring that building energy use demonstrate a 10% improvement on minimum NCC compliant building.
- As an **enabling measure**, and in line with other building categories, there could be provisions in the Design Standard to ensure that retail areas are ready for future upgrades and possible implementation of a smart grid (enabling demand response for example).
- In addition, a **Requirement** to make energy and/or carbon performance data available to the Taskforce to facilitate future analytics and unlock associated benefits should be considered.
- As for residential and office buildings, the Taskforce or other entities could consider providing **technical support services** to developers, design professionals and construction contractors to encourage the design of buildings with improved energy performance (at no additional cost through the design phase for the developers).
- The Taskforce should also **advocate** for a **tightening of MEPS** for appliances performance.
- Another role for the Taskforce could be to **facilitate / broker** demand response mechanisms by selecting or endorsing a preferred partner (e.g. Energy Services Company) or providing some rate reduction incentive for those joining the scheme.
- Finally, **subsidised** education programs for energy or waste intensive retail businesses could encourage ongoing savings. This can be organised by the Taskforce or other entities.

The main quantifiable opportunity is presented in Figure 17 below.

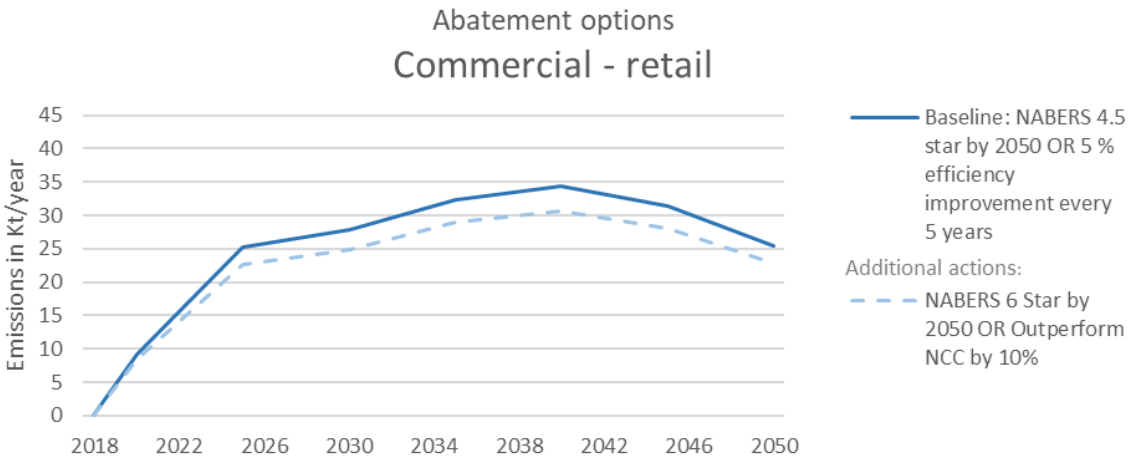


Figure 17 Retail - actions to reduce emissions

4.5 Commercial buildings: other buildings

4.5.1 BAU

It has been assumed that, in mix-used districts, commercial buildings will be retail outlets or offices. This category of "other commercial buildings" will therefore only be relevant for the Employment district. The function of these buildings could be quite diverse and their exact nature will likely be dictated by the economic activity of companies looking to settle in the district. There will therefore be significant uncertainty around any modelling of such buildings' footprint. For the present exercise, it has been assumed that other buildings would fall into the "light industrial" or "warehousing" categories. In the absence of any available rating scheme to serve as a reference for this category, the NCC energy performance requirements have been used.

Their standard energy use only incorporates building related operations (lights, heating), not the operational energy use relating to the activity of the companies occupying these buildings. Operational energy use is also hard to forecast and may vary significantly from company to company. This is discussed in section 4.9.

The projected emissions from other commercial buildings is shown in Figure 10. The uncertainty around these projections is high, as any given building's energy use is likely to deviate significantly from the mean, depending on the usage profile and exact nature of the activity.

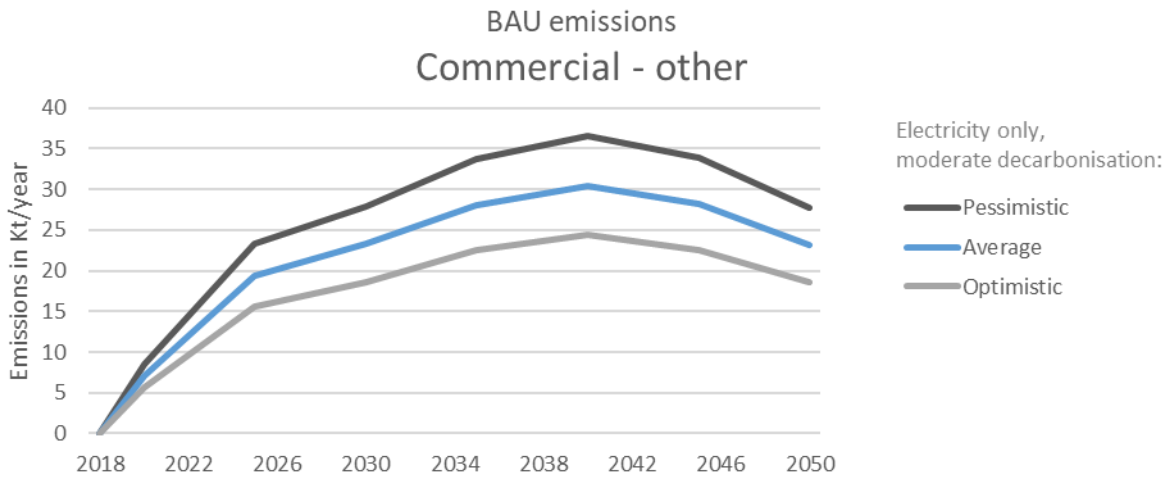


Figure 18 Other commercial buildings BAU footprint

4.5.2 Emission reduction opportunities

The following opportunities have been identified:

- The main action the Taskforce may pursue is to include in **planning controls** a requirement to demonstrate building is designed to achieve a performance at least 10% over minimum NCC energy performance standards.
  - As an **enabling measure**, and in line with other building categories, there could be provisions in the Design Standard to ensure that these buildings are ready for future upgrades and possible implementation of a smart grid (enabling demand response for example).
- To foster a **collaborative** effort, **technical support services** could be made available by the Taskforce or others to help developers, design professionals and construction contractors design buildings with improved energy performance.
- The Taskforce should also **advocate** for a **tightening of MEPS** for appliances performance.

- Another role for the Taskforce could be to **facilitate / broker** demand response mechanisms by selecting or endorsing a preferred partner (e.g. Energy Services Company) or providing some rate reduction incentive for those joining the scheme.

Implementing these actions could result in the emissions abatement shown in Figure 19.

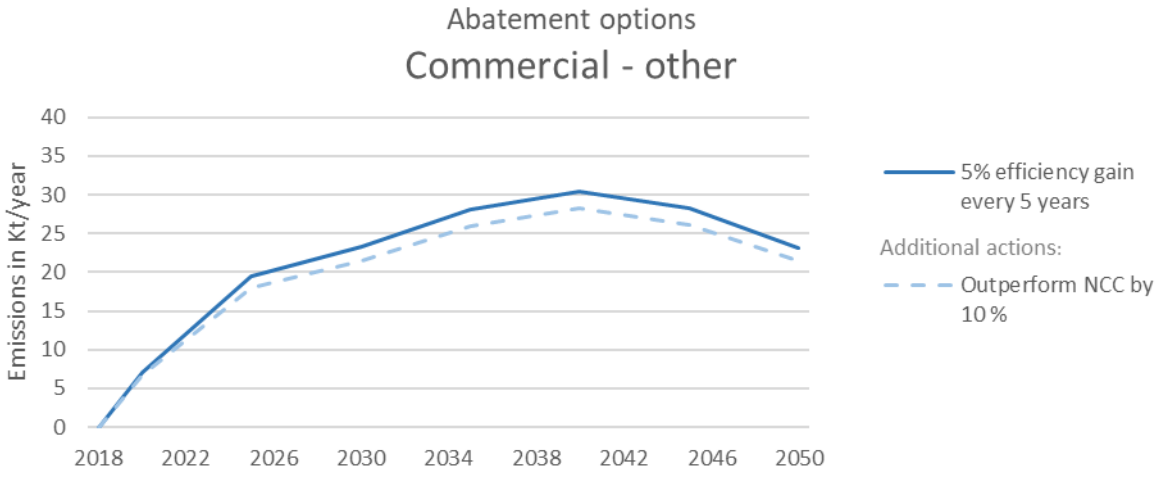


Figure 19 Other buildings actions to reduce emissions

4.6 Community buildings

4.6.1 BAU

As mentioned in the Baseline report, community facilities are likely to only contribute marginally to the overall footprint of the precinct, given their relatively small contribution to total building area. However, as they will be controlled directly by local government, the mechanisms for action to reduce emissions at these facilities will be much more direct.

The energy use per m^2 for community buildings is assumed to be higher than commercial buildings, primarily due to a higher utilisation profile.

The projected emissions from community buildings is shown in Figure 20. The large increase in emissions around 2030 is due to the assumption that the bulk of the community infrastructure (schools, day care, etc) would need to be built between 2030 and 2035 – although some construction will happen earlier in districts such as Montague.

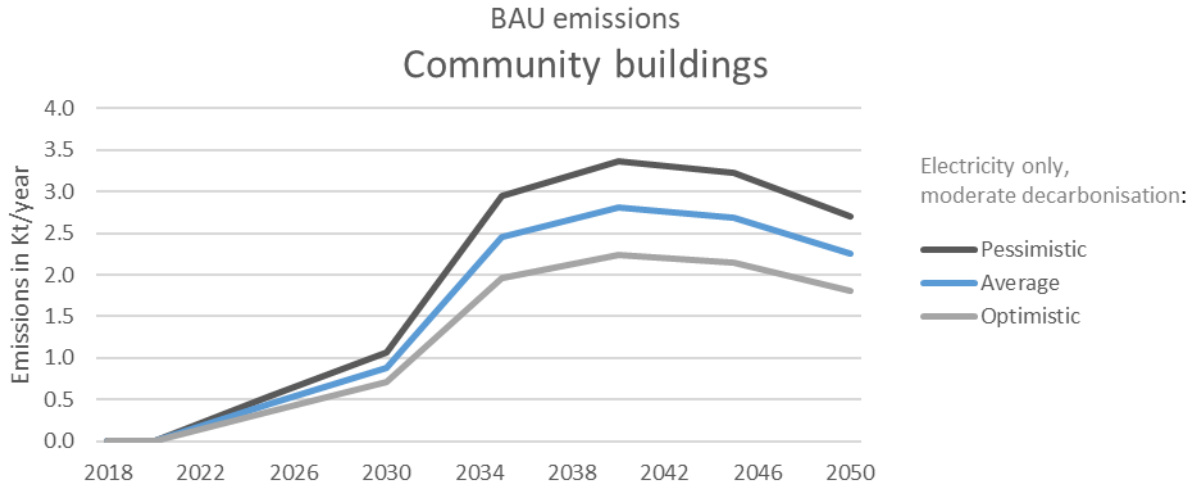


Figure 20 Community buildings BAU footprint

4.6.2 Emission reduction opportunities

Improving on BAU for community buildings should demonstrate a strong level of ambition, as:

- Government (i.e. the State or local government agencies) have direct control over this community buildings, as they will have to fund them.
- These buildings present the opportunity to act as demonstration projects, setting a benchmark for performance excellence.

It is acknowledged, that, in some circumstances, this may be more difficult to achieve as community facilities will be delivered as part of an office or residential building complex and that some trade-offs may need to be made (in particular when delivered at no cost to government as part of an FAU agreement with developers).

Notwithstanding, it has been considered achievable and desirable to make ensure that the NCC requirements are consistently outperformed by 10% (Figure 21).

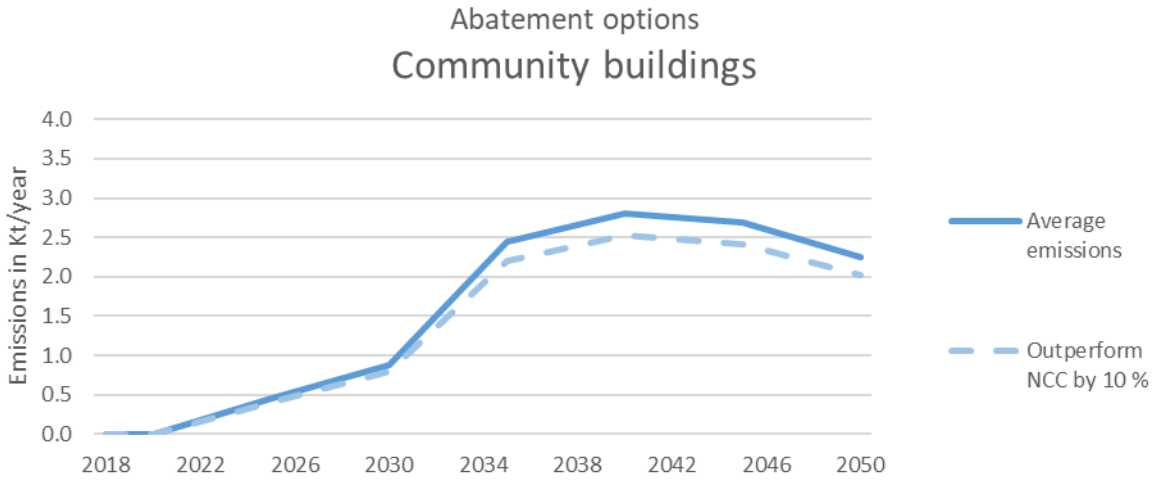


Figure 21 Community buildings actions to reduce emissions

4.7 Carparking (commercial and residential)

Note that the emission estimates for carparking have been included in each of the previous sections on residential and commercial buildings, as the ratings for each type of building typically incorporates carparking performance. It was however considered useful to identify in this section the specific measures relating to carparking and to highlight their link to the transport strategy.

Car park areas have been calculated based on the planning data available to date and based on assumptions made for retail and other types of commercial buildings. The uncertainty about the number of car spaces required by different types of activities is therefore compounded.

What is known, however, is that there will be very limited possibility of underground carparking due to the location and geology of Fishermans Bend. Whatever the type of building they are attached to, carparks are likely to require the same types of energy-consuming services: ventilation and lights. The opportunity common to all of them is to use natural ventilation as much as possible, taking advantage of the fact that carparks will be above ground. This may not always be possible due to other planning constraints such as street activation, but should nevertheless be explored in most cases.

4.7.1 BAU

The results shown below assume that 90% of carparks would use natural ventilation (this assumption can be tailored if need be). The energy consumption, and hence carbon emissions for carparks, could be much larger should it prove necessary to mechanically ventilate the space. Emissions related to carparks is therefore relatively negligible only if the assumption of natural ventilation stands.

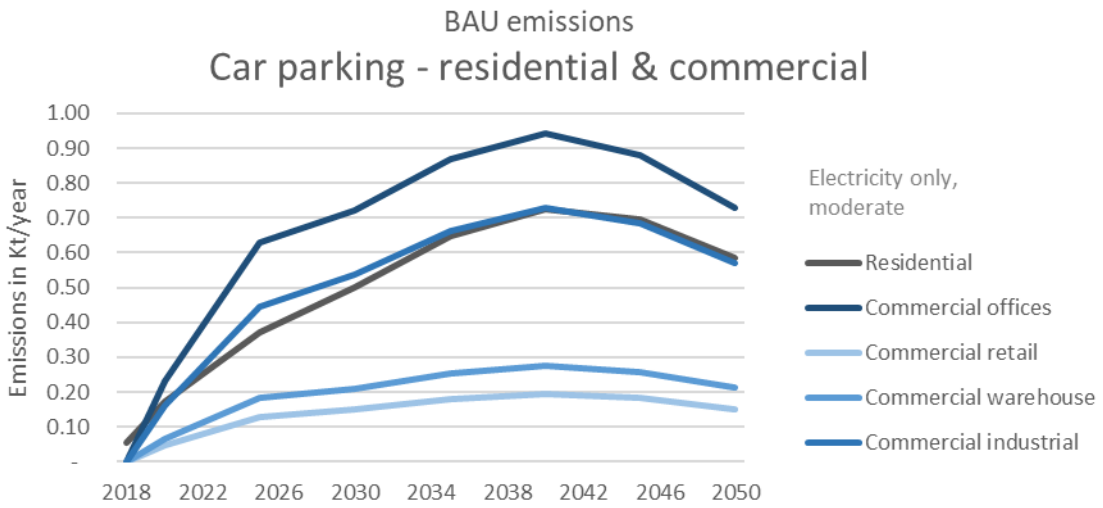


Figure 22 Carpark BAU footprint – included in the buildings' footprint

4.7.2 Emission reduction opportunities

As mentioned above, emission reduction opportunities for car parks face similar challenges and offer similar opportunities notwithstanding the type of buildings. However, carpark areas are typically included in the NABERS ratings of the various types of buildings they are attached to and emissions related to carparks have been included in the previous sections. Commonalities in emission reduction opportunities include:

- **Planning control** requiring carparks to be **naturally ventilated** unless it can be demonstrated that mechanical ventilation is necessary due to other planning constraints (e.g. street activation).

- **Planning control** requiring design features for carparks making it easy to convert them to other uses if and when the need for car parking disappears (see transport section 4.12). This will avoid creating a glut of carparking that could slow a transition away from private car ownership. Specific requirements will need to be investigated in further detail, but will include floor heights compatible with other uses and designing car ramps for easy conversion.
- Note that other planning controls will apply to car parking, in particular making them "Electric Vehicle ready": see transport section 4.12).

4.8 Renewable energy

4.8.1 Technical potential

The technical potential presented below is based on broad assumptions and calculations of the possible available roofspace. For the purpose of estimating total on-site generation potential from renewables, only roof-top solar was examined. The cost-effectiveness of other forms of renewable energy generation (i.e. solar PV facades and glazing, small scale wind, geothermal) is, at this stage, too uncertain to be incorporated in calculations. Batteries will work well with solar PV and improve the business case, particularly if peak demand management capacity is rewarded in the future. However, batteries will not influence the overall amount of renewable energy produced and are therefore not considered here. Prudent assumptions have been made in relation to technology efficiency.

At this stage, it is not known what building form will prevail where in Fishermans Bend, there is therefore significant uncertainty around these estimates. The estimates below do not discriminate between the scale of systems (small / large), the technology or the governance / financing arrangements (e.g. community solar schemes). They are simply broad estimates of what could be produced in Fishermans Bend under set assumptions, described in the baseline report, including:

- Net building footprint areas (ha)
- Portion of roof space available for solar panels depending on the building type
- Portions of areas not shaded.

As many assumptions needed to be made, the calculated maximum R.E. potential should be taken with caution and considered as indicative only until more specific studies are undertaken to define the potential.

It is even more difficult to assess how much of the maximum solar potential could be realised under a market-driven scenario. In the current context, with high electricity prices and low cost of solar panels, conditions are favourable, but barriers such as split incentives between owners and occupiers of buildings and the risk of overshadowing could lead to a low penetration of solar panels in Fishermans Bend.

The opportunities listed in the next paragraphs aim to ensure that uptake should be as high as possible.

Table 2: Maximum potential roof-top solar by 2050

	Wirraway	Sandridge	Montague	Lorimer	Employment precinct	TOTAL
Area of solar panels (m^2)	107,972	162,946	62,413	60,999	524,600	**918,931**
Peak installed capacity (MW)	32	49	19	18	157	**276**
Annual generation potential (MWh)	43,384	65,474	25,078	24,510	210,790	**369,237**

4.8.2 Emission reduction opportunities

The following opportunities have been identified to ensure that the most is made of the solar PV potential in Fishermans Bend. It does not mean that other forms of renewable energy should not be explored too, but solar PV is currently the most "investment ready" source of renewable energy in an urban environment, as it is scalable, compatible with local battery storage and capital costs have reached a low enough level for making investment an interesting proposition.

The magnitude of the emissions reduction the following opportunities are likely to deliver is surrounded by significant uncertainty, as both the supply and demand sides of the modelling will need be refined and confirmed over time.

It must be also noted that 2050 is beyond the life expectancy of solar panels that will be installed in the next few years, hence some re-investment in more performance solar PV can be expected (and potentially controlled centrally) towards the end of the development period.

Opportunities for the Taskforce to consider include:

- **Planning control**, requiring developers and buildings to consider solar PV and energy storage where and if possible, unless green roof or overshadowing precludes solar PV.
- To make **community renewable energy** easier, the right to access roofspace suitable for solar PV could possibly be embedded in the planning scheme: this could lead to a centrally managed local PV panel scheme on available large roofs (in particular in the employment district), accessible to residents and businesses for investment. Thus, the owners would not have to invest themselves, but would have to make their roof available for such schemes.
- A complementary **planning control** aiming to maximise the technical performance of solar panels could be introduced (e.g. module level optimisation, high efficiency panels).
- As an alternative for a set requirement, better technical performance could be achieved through the provision of **information and capacity building** on minimal technical performance of solar panels to builders and developers for example, through design and installation guidelines, training classes, PV centre with mock-up installations.
- As an alternative to planning controls, or as a complementary measure, the Taskforce of the municipalities could offer **subsidised design and feasibility studies** for RE on each building, regaining some indirect control over the broad planning of RE in the district.
- Another complementary measure could be to offer **rewards for innovation**, for example rates rebates, FAU or other incentive mechanisms for solar innovation (such as BIPV).
- An action for the Taskforce and others (State, cities) would be to ensure government owned land or buildings apply best practice and maximise use of solar PV.
- Another measure for the Taskforce and others (State, cities) could be to facilitate joint **Power Purchase Agreements** for off-site renewable energy (as was done by the City of Melbourne with the Melbourne Renewable Energy Project).
- An appropriate **monitoring and evaluation** structure should be put in place so that the renewable energy generation capacity installed within Fishermans Bend can be tracked, for technical reasons of planning for capacity, but also to learn from successes or barriers encountered. This will need to be maintained over time and hence is closely linked to the governance requirements for the district (see 4.1.1).

4.9 Employment precinct – Economic activity

As mentioned above (section 4.3), the employment precinct will house a variety of businesses as it undergoes a transition from its current occupancy. While some projections have been made about the industry sectors that could make up the bulk of the precinct's activity by 2050, the energy intensity of the specific companies settling in the district is not possible to forecast. It has therefore been decided to include only the buildings' energy use in the precinct's footprint (section 4.4) and present some "case studies" of a range of industries' operational energy use to

test what impact it could have on the precinct's footprint. These have been selected based on what is currently known about likely energy-intensive industries settling in the district.

4.9.1 BAU

Three case studies have been selected to explore the impact specific activities might have on the Fishermans Bend's emissions profile:

- **Data centres**, while energy intensive and employing few people, are already in planning or under construction in the district. They are also essential to support digital and innovative activities. There is a trade-off to be considered in relation to data centres: they are energy intensive, but on the upside, appropriate engagement and their inclusion in a carbon neutral district such as Fishermans Bend will help reduce their impact on global emissions.

  The emission profile of data centres in the future is impossible to forecast: while improvement in the efficiency of ancillary equipment can be estimated, the increase in data volumes resulting in energy use increases cannot be forecast, except to say that it will continue to grow dramatically. Technical breakthroughs in managing data can also be expected, but are by definition not known today.

  The current emission profile of a large data centre (15,000m^2) can vary between 40 and 120 GWh/year. It was assumed that up to 5 data centres using 90 GWh/ year could settle in Fishermans Bend, resulting in a footprint of 450 GWh/year, a significant percentage of the overall footprint.

- **Cement mixing plants**: such activities are already operating within Fishermans Bend and as construction activity intensifies, it will make sense to remain close by to support this activity. High level investigations however revealed that the processes undertaken at the plants within Fishermans Bend are likely to be only the less energy intensive part of the cement and / or concrete making processes.

  The electricity requirement for a 40,000m^3 cement mixing facility was estimated at 17 MWh/year (14-20MWh)

  Even if up to 10 batching facilities operate in the district, this will only add up to 170MWh/year, which is negligible compared to data centre.

- **Freight**: industrial and warehousing activities can generate significant road freight activities. Road freight is likely to rely on diesel powered truck for the foreseeable future and would require very specific strategies to reduce emissions. This activity has therefore been deemed of interest.

In the absence of indication on the freight activity that could be generated by the district, ABS data on freight traffic for the whole of Victoria was used as a reference (ABS, total tonne-kilometres travelled by origin and destination, by vehicle type, by year of manufacture, 2013-14). After converting tkm for articulated and rigid trucks into litres of diesel consumed and applying the appropriate emission factors, this translated into 5,397kt CO_2-e per year.

A high proportion of these emissions are attributable to regional Victoria, due to the remoteness of regional centre. The share of Metropolitan Melbourne is 30%. It is acknowledged that this may not be relevant, as freight going to regional areas may start from Fishermans Bend and this was not applied to estimate the higher end of the freight emission bracket.

This was then scaled down to Fishermans Bend using the number of jobs as an indicator of activity. It is acknowledged that this is an imperfect indicator, as general employment is not necessarily aligned with freight activities.

These calculations led to estimates of 67kt CO_2-e per year for the estimate where Fishermans Bend represents 4.1% of the Metropolitan Melbourne freight traffic and 136 to 202kt CO_2-e per year when scaling Fishermans Bend against the whole of Victoria.

This shows that freight could be a significant (and difficult to address) component of the Fishermans Bend's carbon footprint.

4.9.2 Emission reduction opportunities

Whatever the industry, the emission reduction opportunities will need to be determined in close collaboration with each company. Apart from potential access to large renewable electricity joint procurement schemes (see section 4.8), other opportunities will be specific and tailored to the activity of each company. It may be decided to leverage energy efficiency programs existing at the state or local level, or to allocate specific budgets to assist companies within Fishermans Bend.

3.1.1.5 Actions for the Taskforce

The following suggestions are presented for the Taskforce's consideration:

- **Leverage government ownership** of buildings and land to be leased: public land ownership is minimal in Fishermans Bend, hence the scale of this opportunity is modest. However, there is at least one large site that was bought by government (the former General Motors factory) and by setting ambitious energy management targets for this site would be valuable, both to set the tone for the Employment precinct and because it is a sizeable site.

  The Taskforce should identify all such sites, identify key decision makers and develop an engagement plan to ensure that carbon emissions feature on their agenda.

- **Engage** with industries settling into the employment precinct. As mentioned above, specific measures will need to be developed for specific companies. There are a number of actions that the Taskforce (or any entity in charge of the supervision of the district) could take to assist with the management of these companies' energy use and carbon footprint, including:

- **Refining the Taskforce's understanding** of the types of activities likely to settle in the district, possibly by creating a registry of who has made decisions to move out of or into the precinct.

- **Developing an engagement protocol** for new companies coming into the district, making sure that energy use and carbon emissions are signalled as important considerations, but also assessing their assistance needs, in relation to (for example): energy efficiency audits, access to existing programs (and financing), internal capacity building, etc.

- **Negotiating access** to electricity and gas consumption data upfront, to facilitate footprint development, monitoring and reporting: setting up data access agreements with retailers at from the very start would be easier than trying to do it subsequently.

- To be able to provide valuable **assistance** to companies within the Employment district, it will be necessary to allocating an appropriate support/assistance budget to Fishermans Bend's industries, specifically around carbon management.

  Such incentives may not be direct assistance but could be wrapped into reduced rates for companies meeting some specific benchmarks.

- The Taskforce could also act as a **facilitator**:
  - for **demand response mechanisms**, which would not have a large impact on energy demand but are nevertheless important in terms of energy affordability, allowing to differ network augmentation works;
  - for **Power Purchase Agreement** for off-site renewable energy (see 4.8.2).

- The Taskforce can advocate for grid decarbonisation (see 4.1.2).

3.1.1.6 Actions for other agencies

Other agencies also have a role to play:

- Government agencies such as Sustainability Victoria and DEDJTR have programs support industries in increasing their energy productivity. DEDJTR's energy efficiency program is about to be released.

- The City of Melbourne may also consider investing in the energy productivity performance of companies settling in their jurisdiction.

4.10 Public lighting infrastructure

This part of the footprint is assumed to include general street lights and public lighting, including lighting for outdoor sporting infrastructure. No major sporting facilities (e.g. outdoor stadiums) have been factored into the footprint at this stage, as per the planning details available at the time of the writing.

It is assumed that all the streetlight infrastructure in Fishermans Bend will be replaced with the most efficient available equipment as the precinct redevelops. It is assumed that the infrastructure remains in place to 2050.

However, both the City of Melbourne and the City of Port Phillip have committed to sourcing 100% renewable energy for streetlights, hence this part of the footprint is considered to be carbon neutral.

4.10.1 BAU

Although renewable energy electricity will be sourced for streetlights, the energy consumption of the target infrastructure (full development, based on assumptions only at this stage) is presented below. Due to the assumed efficiency of the infrastructure, this is not a large portion of the district's precinct.

Note that the information presented below does not correspond to the current public lighting infrastructure in place but to the target infrastructure. The line in dotted points presents the projected energy consumption using traditional streetlights (now largely outdated, but still in place in some areas) and the blue line presents the projected energy use with up-to-date technology. Note that the possibility of replacing these lights with even more efficient lights over time has not been factored into the modelling.

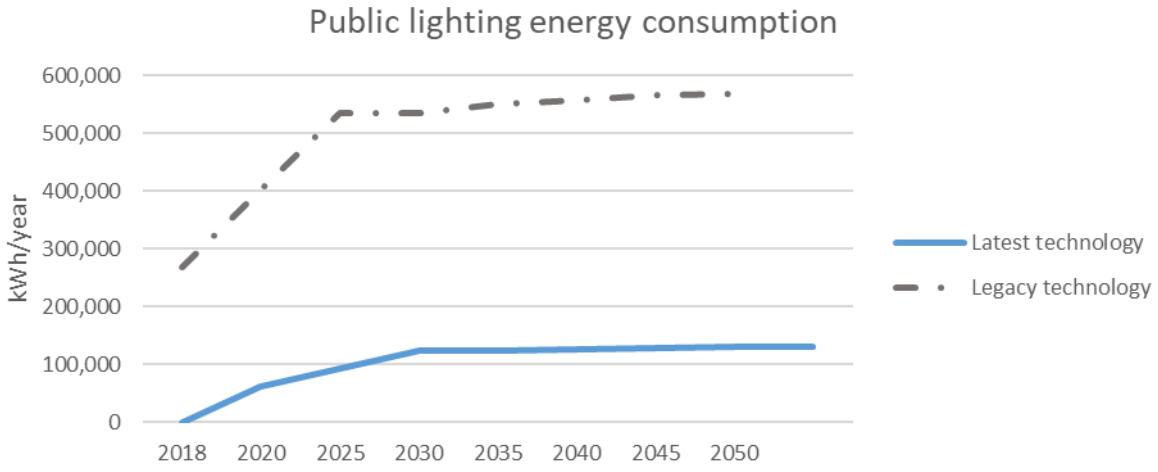


Figure 23 Public lighting BAU – energy use

4.10.2 Emission reduction opportunities

The pathway for public lighting is straightforward and in line what is likely to happen in the BAU:

- Make the infrastructure as **energy efficient** as possible using cost-effective lighting equipment available at the time that also meet requirements in terms of light pollution (to satisfy GreenStar communities requirements).
- Then source **100% renewable electricity** to power this infrastructure (through PPAs or other arrangement).
- Avoid over-lighting areas.

These actions are likely to fall back to the City of Melbourne and City of Port Phillip, unless specific arrangements are made for Fishermans Bend. The Taskforce's role is to make sure that this commitment is acted upon at the time of developing the infrastructure.

If other entities happen to have responsibility for some of the public lighting (e.g. parks / sportsground under trust or community management), then the Taskforce should make sure that the same commitments are made by these entities.

Compared to other components of the footprint, uncertainty relating to public lighting meeting the objective of net zero carbon is small.

4.11 Solid waste

Solid waste is a significant component of the footprint, that needs to be considered carefully, mostly because:

- Emissions projections are not sensitive to assumptions around grid decarbonisation, as they mostly correspond to fugitive methane emissions.
- They are directly correlated to volumes of waste produced, in particular the organic component of waste, which does not show any downwards trend over time (some analysts even predict increases in waste volumes per capita).
- Waste management in multi-unit residential environments has always been a difficult topic, due to multiple factors, including the difficulties of educating a transient resident population and the attribution of responsibility for contamination of recycling waste streams, amongst other issues.

However, solid waste management solutions are considered at the regional level by the Metropolitan Waste and Resource Recovery Group (MWRRG) and precinct-scale solutions are unlikely to present significant benefits compared to regional scale solutions, as waste transport has been found to contribute proportionally little to the overall Fishermans Bend waste footprint.

4.11.1 BAU

The projected emissions from solid waste is shown in Figure 24, based on assumptions of population growth, flat waste volumes per capita and unchanging emission factor.

Note that an assumption was made that 50% of landfill gas fugitive emissions would be captured in the BAU. This assumption was initially excluded from the modelling undertaken by AECOM, which seemed at odds with the fact that the Wyndham landfill, where Fishermans Bend waste is directed has an objective to capture 75% of landfill gas emissions by 2020. To be conservative (as it is difficult to assess what percentage of fugitive emissions from landfill are indeed captured), a percentage of 50% landfill gas capture has therefore been assumed.

Using the assumptions presented in the Baseline assessment report, the BAU solid waste footprint trajectory is linear, in line with population growth in Fishermans Bend (Figure 24). The optimistic and pessimistic scenarios are based on slightly different trajectories for per capita waste generation: in the optimistic scenario, waste generation reduces by 2% every 5 years whereas in the pessimistic scenario, it increases by 2% every 5 years. This only makes a small difference overall.

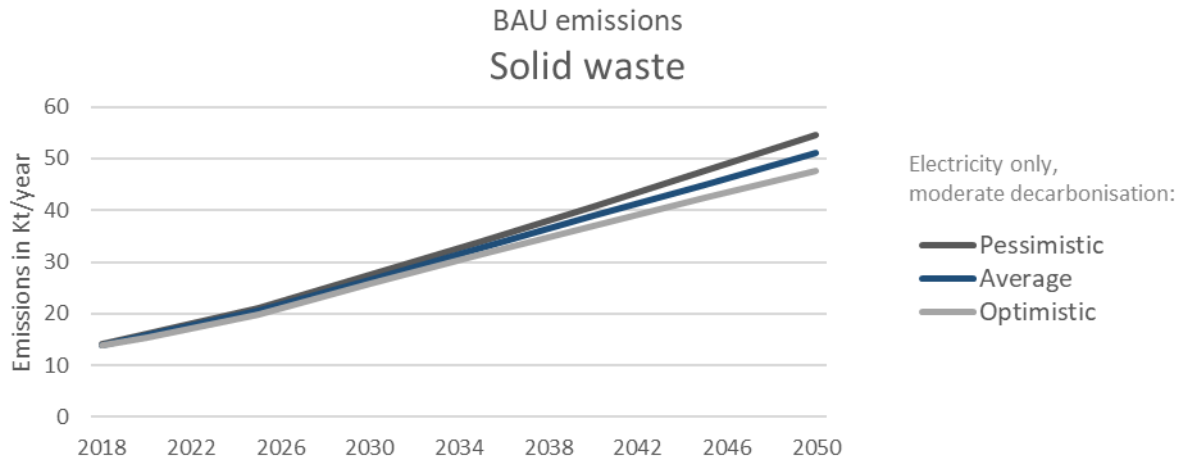


Figure 24 Waste BAU footprint

4.11.2 Emission reduction opportunities

As mentioned above, emission reduction opportunities for Fishermans Bend may depend on decisions made on waste management at the metropolitan region level.

At a local (Fishermans Bend) level the following opportunities should be considered:

- The Taskforce should encourage **waste reduction campaigns** across the various types of waste residential (food waste), retail (food waste and packaging), C&I (packaging and other). This could be done by leveraging campaigns devised by others (e.g. Sustainability Victoria).

  It is not possible to predict the outcome of such campaigns, but the reduction in emissions will be directly proportional to the reduction in volume of organic waste achieved.

  While not necessarily delivering the greatest emission reduction benefit, this action is aligned with multiple policies and campaigns and delivers multiple benefits, hence it was positioned as a priority action.
- A **planning control** for the Taskforce to consider would be to require developers and building owners to provide space for source separation of organics and in-vessel composting so that such solutions can be implemented at a later stage, if required and if desired by residents.
- A **collaborative** measure for the Taskforce to consider would be to provide technical guidance on best practices for waste management in multi-unit buildings and for C&I waste. This could include ways to engage residents or advice on how to select the most appropriate organics waste composting equipment.
- The Taskforce could also **influence and organise** the collection of waste data for monitoring, evaluation and continuous improvement in the medium term.

Technical waste management solutions that make a significant difference in emissions can be implemented either at a precinct or regional level. The preferred solution from an emissions point of view appears to be to implement source separation of food and garden organics and an **in-vessel composting** at the precinct or regional level with the residual waste to landfill having at least 50% landfill gas capture. Alternatively, when taking into account multiple criteria, the incineration of residual waste (instead of going to landfill) in a waste-to-energy facility would also deliver benefits (see AECOM report).

As supporting measures to the above the Taskforce should **advocate** for:

- An increase in methane capture at the Wyndham landfill and strong controls over the estimates of volumes captured.

- In the medium to long term, a reduction of transport emissions by switching the fleet of collection truck to EV and requiring waste contractors to source renewable electricity to power these vehicles (through contract procurement). This will also deliver benefits in terms of noise and air pollution.

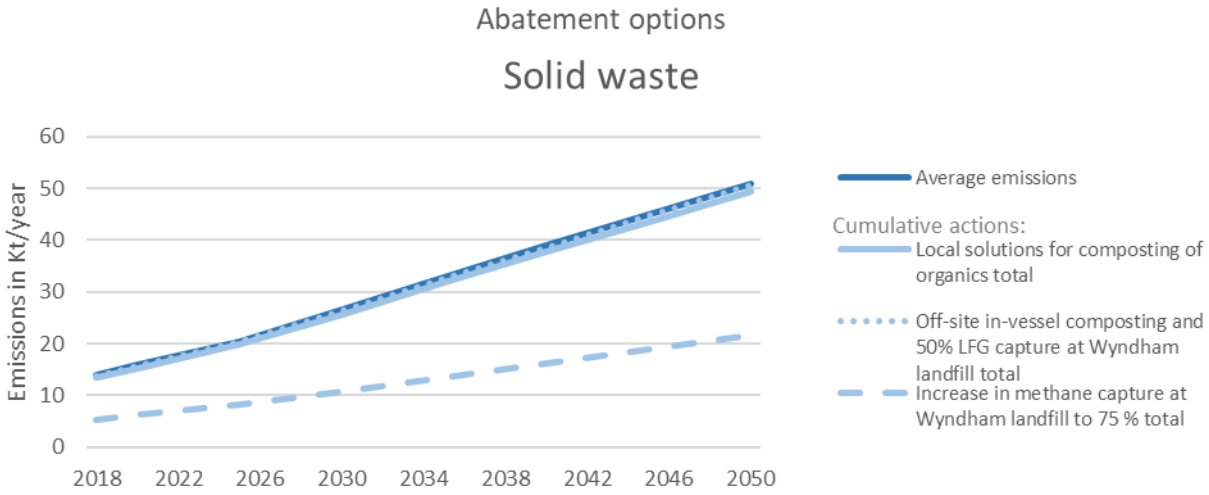


Figure 25 Waste actions to reduce emissions

4.12 Transport

Transport is a key component of Fishermans Bend footprint, even when excluding freight (which is considered as part of the economic activity of the precinct (see section 4.9)). Commuting by the 80,000 workers in the district and travel decisions made by 80,000 residents not only add up to a significant carbon footprint, but it is one that is difficult to tackle, as:

- it largely depends on individual choices or circumstances;
- infrastructure (public transport and active transport) that is controlled by the State or the cities is costly and is only a condition, rather than a guarantee, for a successful transition away from private cars; and
- vehicle fuel efficiency is only progressing slowly and a switch to plug-in hybrid and electric vehicles will only be beneficial if accompanied by a rapid decarbonisation of the electricity grid.

According to the NCOS for precincts, half of the transboundary transport should be accounted for in carbon accounting for a carbon neutral precinct, with the other half falling outside the reporting boundary. This is to allow for easy consolidation of transport carbon accounts between precincts. This rule was followed in the modelling. Should the Taskforce wish to account for the full transport related carbon footprint, figures shown below should simply be doubled. This will have no bearing on the opportunities listed in 4.12.2 below.

4.12.1 BAU

The projected emissions profile for transport is shown in Figure 26. Transport emissions arise from the operation of public transport and use of private vehicles, based on assumptions detailed in the Baseline report. It should be noted that the level of uncertainty around these assumptions is high, as the integrated transport report does not focus on km travelled or mode share, more on transport development strategy.

Key assumptions for the BAU ignore the stated objective of achieving 80% sustainable transport trips by 2050. This has been considered as a goal that could only be reached through strong, concerted action from the Taskforce and other government entities. The BAU scenario is built on the following assumptions:

- A modal share dominated by private transport (93%), with active transport being less than 2% and public transport (bus) about 5%; this scenario assumes that no tram or train line services Fishermans Bend and that no investment in active transport infrastructure is made.
- A market penetration of Electric Vehicles (EV) of 25% by 2050, which contributes to the observed moderation of emissions growth in around 2040, as the grid decarbonises (Figure 26).
- A fuel economy improvement of 30% by 2050 for non-hybrid fossil fuel powered vehicles: this may seem conservative, but engine efficiency improvements achieved in the past have been largely compensated by increases in vehicle weight and functions.

The average scenario presented in the graph below reflect the assumptions described above, with the pessimistic and optimistic scenarios representing respectively +20% and -20% emissions compared to this average.

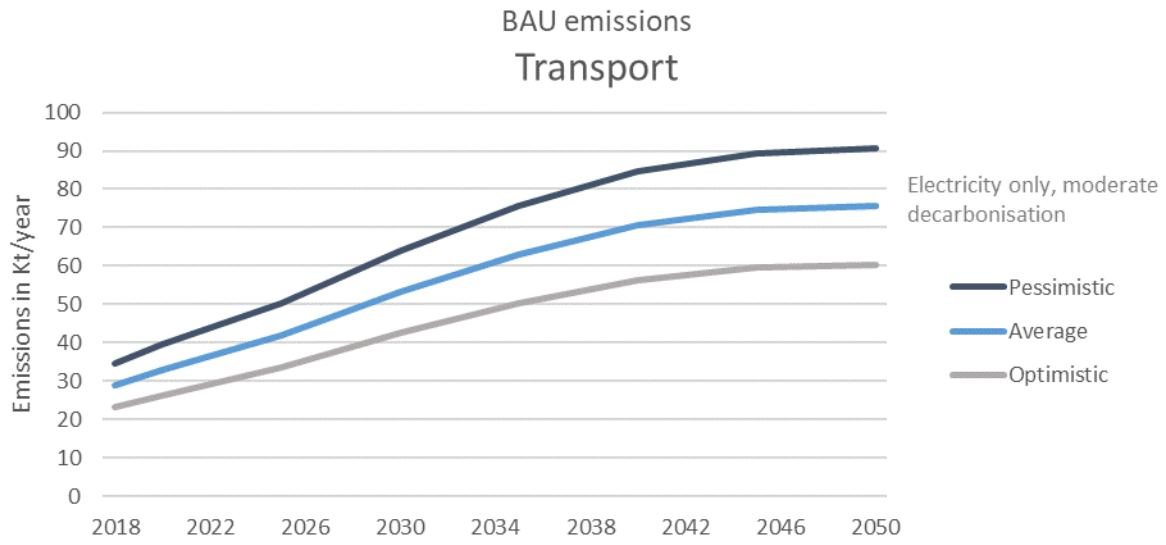


Figure 26 Transport BAU emissions

4.12.2 Emission reduction opportunities

To significantly reduce Fishermans Bend's transport footprint and achieve the target of 80% sustainable transport trips, a major shift in transport mode share, away from BAU, is necessary. Broadly, this will require that the Taskforce ensure that:

- Public and active transport infrastructure is pre-emptively planned and built.
- Uptake of public and active transport is encouraged.
- Uptake of electric vehicles, with renewably sourced energy is encouraged.

The relative carbon benefits of each of these tactics were examined by modelling the potential benefit (in terms of total emissions prevented to 2050) of a range of emission reduction options if applied in isolation. The outcomes of this examination are presented in Figure 27. The dependencies and interactions between each option were then taken into account and a set of actions was defined (forming this strategy). The forecast total benefit of the strategy is shown in Figure 27. Figure 28 then shows the impact that each individual tactic could have on the transport emissions trajectory out to 2050 (assuming medium grid decarbonisation).

3.1.1.7 Actions for the Taskforce

- Advocate for significant **investment in public and active transport** infrastructure and supporting design and planning measures aiming to:
  - facilitate pedestrian and cycling traffic and safety

- bring forward investment in train and tram infrastructure[6] and make public transport links with the CBD rapid and reliable and by giving priority to trams when mixed with car traffic

- Aim to change people's attitude and behaviour away from private transport by **reducing parking** opportunities and through **communication campaigns,** including for example:
  - **Planning controls** requiring buildings and businesses to provide end of trip facilities for cyclists
  - **Partnering** with health funds, VicHealth and others to promote the benefits of active transport
- Advocate for a rapid transition to **electric powered transport** and the sourcing of **renewable electricity** to power infrastructure and vehicles. It is noted that:
  - In the medium to long term, buses will be able to be switched to EV and RE electricity as technology costs decrease.
  - Residents and business could be encouraged to switch private cars to EV and to source RE electricity to power them.
  - Yarra Trams have committed to be powered by renewable electricity from 2025 onwards. Should other public transport operators follow suit and source renewable electricity for suburban trains (and eventually buses), the sustainability of Melbourne's metropolitan transport would improve significantly.
- The Taskforce can use **planning controls** to ensure Fishermans Bend is set up for a smooth **transition to EV** by requiring that all residential, commercial and business developments install EV charge points in carparks and/or that carparks should be "EV ready" (i.e. allowance made in designs to permit future installation of electrical conduits and charge points in all car parks).

3.1.1.8 Actions for other agencies

- Actions required from the City of Melbourne and the City of Port Phillip include working together with the Taskforce to ensure that Fishermans Bend's transport infrastructure is logically connected to neighbouring areas, especially the CBD and shopping and entertainment areas.
- The State and the Federal governments will need to play a major role in the transition to EV, as it will only happen if Australia aligns with international leaders in this respect, with the additional benefit that air quality in city centres will increase dramatically as a result of the shift.

Implementing these actions could result in the emissions abatement shown in Figure 28, noting that assumptions on uptake of different transport modes had to be made and are surrounded by high uncertainty. Actions in Figure 28 are shown in three broad groups: increasing active transport and public transport infrastructure; sourcing energy from renewables for public transport; and sourcing renewable energy for electric cars. The abatement shown for electric cars assumes a high uptake of private EVs. More detailed emission reduction wedges are shown in the Excel model companion to this report.

[6] Note that reliance on busses, as opposed to trains and trams, was examined as an option. It was found that in terms of carbon emissions, trains and trams will result in a marginally lower cumulative impact by 2050, relative to busses (see Figure 27). This is largely due to the relative trajectories of grid decarbonisation and EV uptake. Furthermore, it is considered that strategic reliance on trains and trams presents a lower risk in terms of carbon footprint reduction, compared to reliance on busses. Uncertainty about the carbon benefits of trams and trains is dictated by the uncertainty of grid decarbonisation. However, for busses the uncertainty of carbon benefits is dictated by two contributing factors: the uncertainty of grid decarbonisation, as well as the uncertainty of EV uptake.

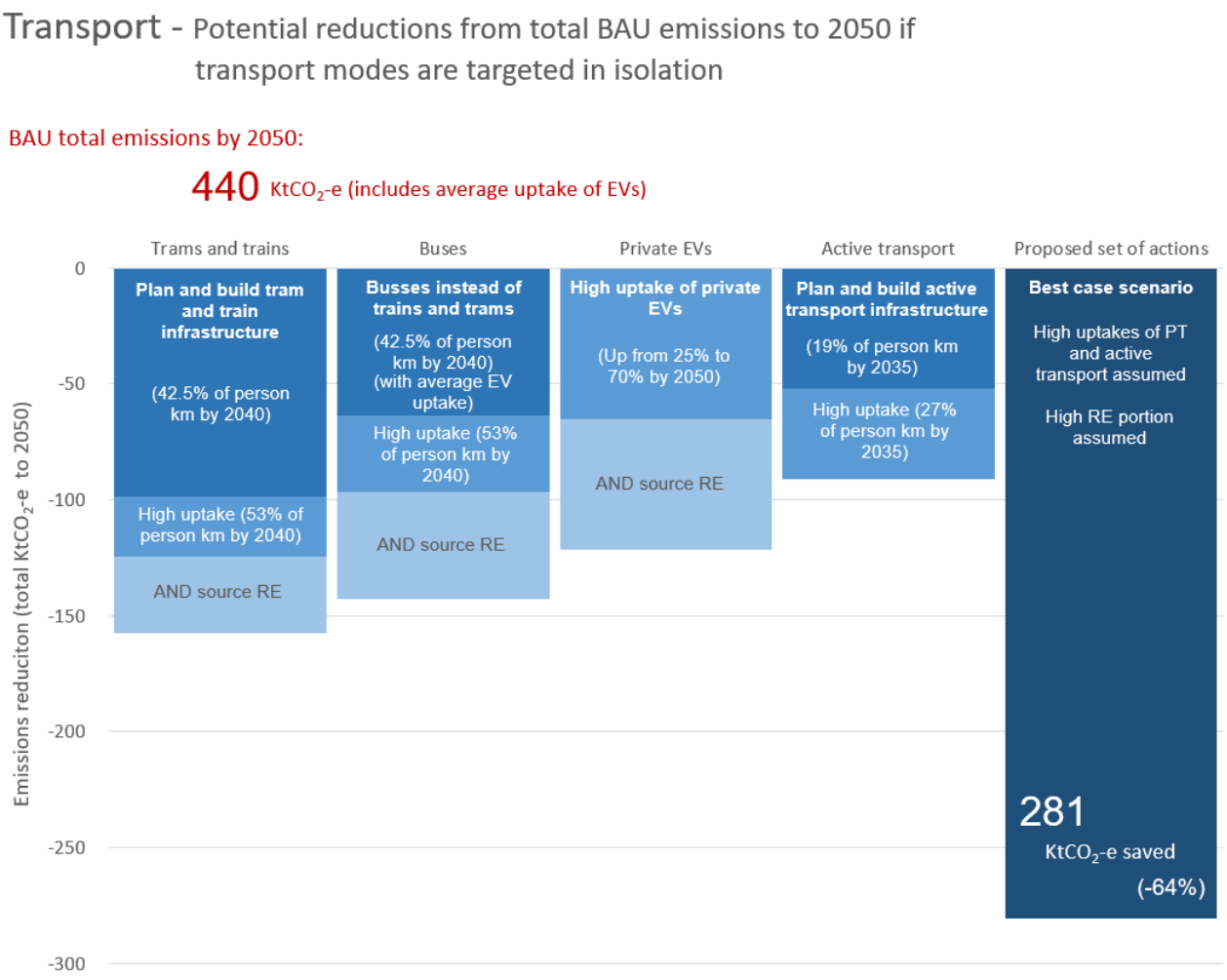


Figure 27 Potential benefits of transport actions – in isolation

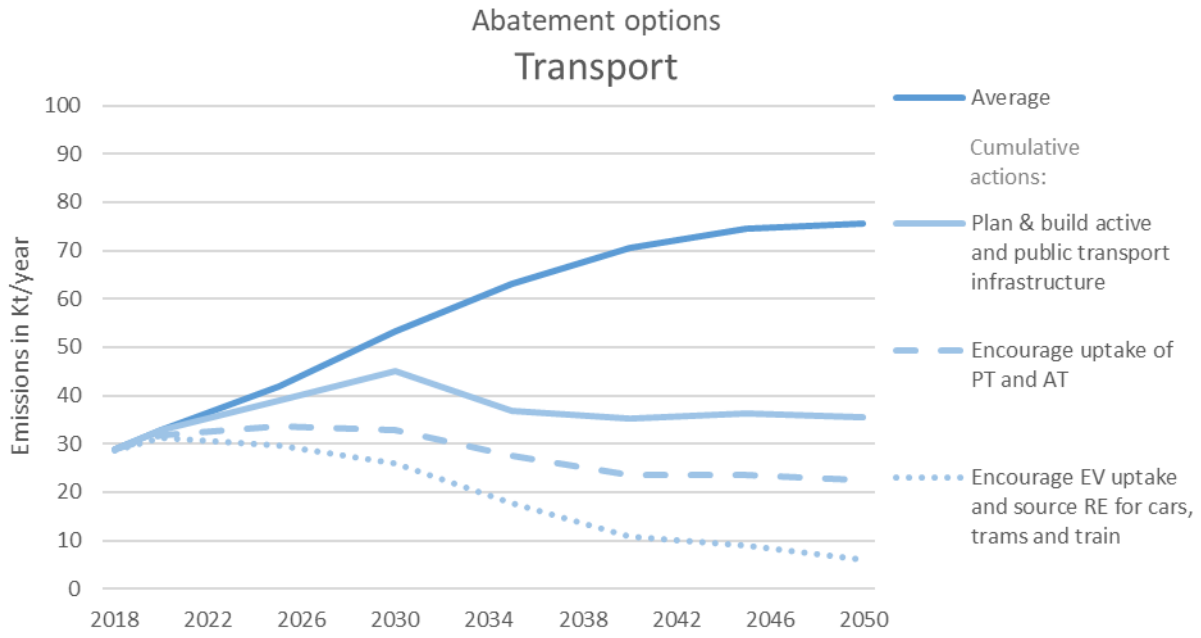


Figure 28 Transport actions to reduce emissions

4.13 Water and Wastewater

The water and wastewater carbon emissions model are primarily driven by the number of people (residents and workers) in the precinct.

For potable water, emissions are essentially associated with treating freshwater and pumping it through the system. These emissions can be avoided if rainwater harvested on the district or recycled water is substituted for uses that do not call for potable standards.

Wastewater generated is assumed to be a set percentage of water use and emissions are associated with the pumping of the wastewater and its treatment at a centralised wastewater treatment plant (in Fishermans Bend's case, the Melbourne Western Treatment Plant). These emissions can be avoided if the wastewater is recycled on the premises (then the recycling process would produce emissions associated with the specific treatment process); this is not likely to happen in Fishermans Bend.

Under BAU, recycled water will be provided to Fishermans Bend through a third pipe and will be used for outdoor use (private and public green spaces) and indoor use (toilets and laundry). This is only assumed to occur in 2040 when a Sewer Mining Plant (SMP) will be built and operated, mining wastewater from the Melbourne main sewer line bringing sewerage to the Western Treatment Plant, through Fishermans Bend. The Sewer Mining Plant will extract volumes of wastewater from the sewer that are likely to exceed the volumes of wastewater produced by Fishermans Bend, and this wastewater will come from the whole of Melbourne. As the SMP will be located within the district, associated emissions will be accounted for in the district's footprint.

As water authorities responsible (South East Water and Melbourne Water) for the plant and the operation of the water and wastewater networks have announced plans to be carbon neutral by 2030 or before, the emissions associated with both the SMP and the traditional distribution and collection networks will be able to be considered as carbon neutral from Fishermans Bend's perspective.

4.13.1 BAU

The BAU emissions presented in Figure 29 are based on water use forecasted for the district by South East Water and include wastewater. While emissions will drop to zero at the time the South East Water and Melbourne Water's operations become net zero carbon (2030), the emissions from freshwater and sewer mining have been represented on the graph for reference.

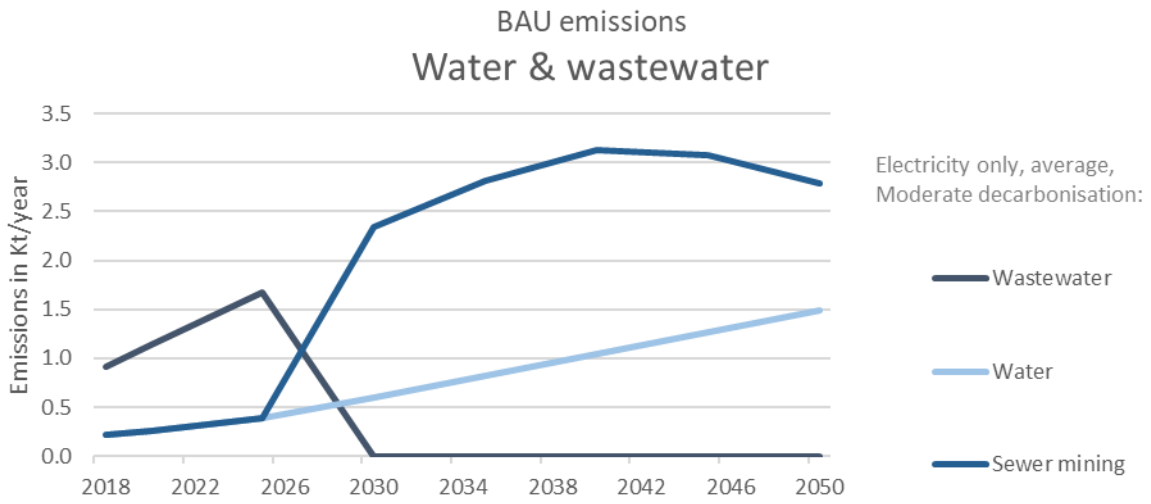


Figure 29 Water and wastewater BAU emissions

4.13.2 Emission reduction opportunities

3.1.1.9 Actions for the Taskforce

While there is little uncertainty that water authorities will become carbon neutral at some stage over the period, there are still good reasons to address this part of the footprint at a strategic level:

- Water scarcity: as climate changes, there is an increasing case for conserving water; with a reduction in demand of potable water (or recycled water) comes a decrease in associated emissions. The assumed per capita water demand assumed in the model (on South East Water's advice) is 193L/person/day whereas City of Port Phillip's target is **155L/person/day**, a long standing target supported by Melbourne Water during the Millennium Drought. It is suggested this target should be adopted for Fishermans Bend, as it will also reduce the short-term carbon footprint associated with water distribution.

  This can be done by encouraging (or mandating through planning controls) **appliance efficiency and behavioural change**, targeting hot water in particular (to also support savings in water heating).

- **Potable water substitution**: as mentioned above, treatment and pumping costs associated with potable water can be avoided by substituting potable water with stormwater captured on the premises.

  The Taskforce can mandate or encourage stormwater capture through **planning controls**. This element is not further developed here as it will be primarily dictated by the climate change adaptation considerations (see related strategy).

3.1.1.10 Actions for other agencies

The role of water companies is essential in achieving this component of the footprint, by:

- Upholding their commitment to carbon neutrality for their operations.

- Promoting water saving measures and innovative stormwater capture and management.
- Making appropriate decisions in relation to wastewater recycling, a process that can be energy intensive, when it comes to detailed design of the infrastructure.

The projected emissions from water and wastewater is shown in Figure 30. Emissions decrease to zero when South East Water and Melbourne Water's operations become carbon neutral (see dotted line). If the water authorities did not become carbon neutral in 2030, capturing stormwater and substituting it for potable water use and reducing water demand both decrease water emissions. Without carbon neutrality commitment by South East Water, wastewater emissions would go off the chart below.

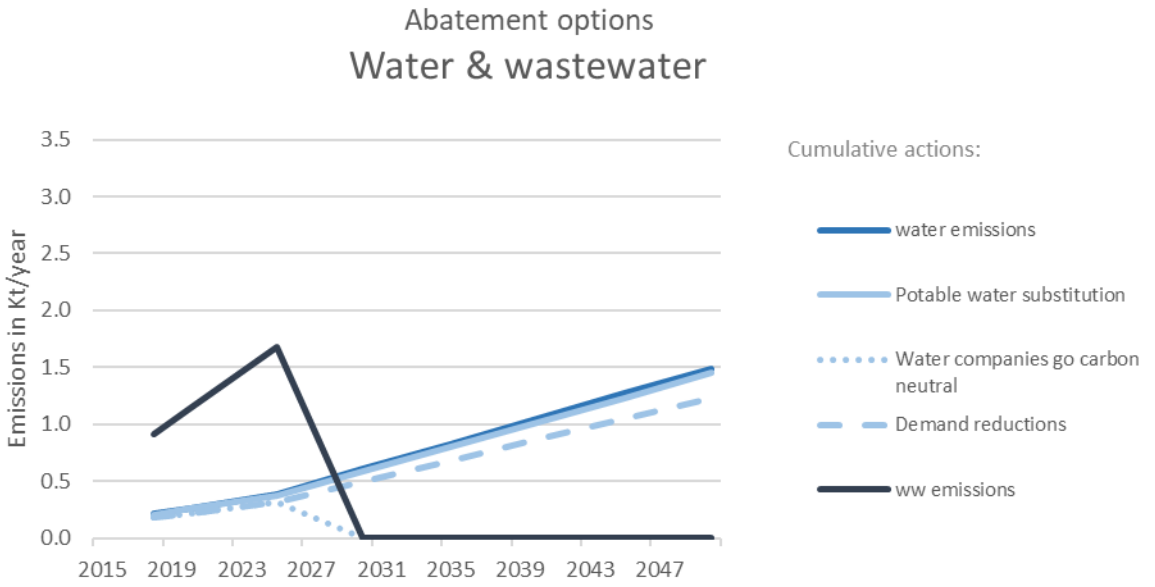


Figure 30 Water and wastewater actions to reduce emissions

5 CONCLUSION

5.1 Summary of actions

The redevelopment Fishermans Bend is already in progress and there exist constraints linked to the limited government ownership of land and the fact that the land has already been rezoned. These constraints cannot be underestimated. However, there are still many opportunities for the Taskforce to guide and influence the Fishermans Bend's carbon emission trajectory:

- Using **planning controls** to set higher standards than those required by the NCC or already observed in the industry (in particular for offices, where the industry is ahead of the NCC). It is noted that:
  - If the right balance of planning controls is struck, this can be done without jeopardizing the development prospects, as a net zero carbon strategy can be couched in terms of affordability at a time when energy costs are front of mind for an increasing number of companies and households. This then becomes a "marketable" benefit for developers in the area.
  - Such controls will help avoid "locking in" high emissions, particularly in multi-unit residential developments, where industry has not so far demonstrated the same ability to drive up the standards.
- Putting in place **performance validation** processes to ensure that actual performance is in line with designed performance.
- Ensuring there is adequate **investment** in **the right infrastructure** to encourage a shift in behaviour, particularly in relation to public transport and waste. It is noted that whilst transport and waste are not the most significant components of the footprint initially, they are difficult to address and sustained collective behavioural change is required to make a difference; a mix of "push" and "pull" actions over the long term is therefore likely to be required.
- **Advocating** for and **influencing** strong policies and standards at all levels of government. In doing so, it is worth noting that:
  - The higher the standards and the stronger the policies and programs applying to the whole of Australia or Victoria, the easier it will be for Fishermans Bend to achieve ambitious targets without running the risk of entering in unhealthy competition with other districts to attract developers with lax standards.
  - Performance standards for appliances can only be set at the federal level.
  - Reducing the grid's emission factor will benefit the whole of Victoria as well as reducing the cost of making Fishermans Bend net zero carbon.
- **Providing incentives** for going beyond required standards and establishing new benchmarks of performance.
- Providing **supporting mechanisms** to assist developers and residents to achieve higher performances and remove barriers to access for, for example, community renewable energy or PPAs, or demand response mechanisms.
- **Engaging** with companies and organisation establishing within Fishermans Bend to encourage them to adopt ambitious operational energy and greenhouse gas control strategies, as this component of the footprint could prove to be the most material part of the inventory. In doing so, it is worth noting that:
  - Each company will have a specific profile and corresponding emission reduction opportunities, which are impossible to predict.
  - Each company will have different organisational and financial capacities and different needs for support.

Most of the recommended actions are compatible and can be implemented concurrently. A suggested priority order has been provided in each section of this report.

As Fishermans Bend is already open for development and indeed a relatively significant number of applications have been granted approval, it is important to put controls and incentives in place rapidly, to avoid an inflation of the cumulative carbon footprint for the district. Delays in doing so increase the risk that underperformance could be locked in,

particularly for buildings. With initial underperformance comes the risk that Fishermans Bend might acquire the image of a development project with limited climate action ambition.

5.2 Recommendations

Based on the work done in the development of this strategy, the Taskforce may wish to consider the following recommendations, in relation to the future governance structure to be put in place for the management of Fishermans Bend's net zero emission strategy (and potentially other strategies).

5.2.1 Governance

There is a need for a strong ongoing governance structure to be created for Fishermans Bend. To do so:

- One entity will need to take carriage of the implementation of this strategy. Ongoing updates of planning controls will be required, well beyond the existence of the Taskforce. Coordination and leadership are essential to the success of such a strategy, as many parties need to work together towards the same goal to increase chances of success.
- Monitoring, evaluation and adaptive management (corrective actions) are essential to the achievement of long term objectives.
- Whether the process is certified or not, the calculation of a carbon footprint will require a central coordination agency and an authorised entity to take responsibility for the purchase of offsets.

A number of the actions recommended in this strategy will also require an appropriate management entity to lead practical initiatives. Specifically:

- Assistance will need to be provided to developers, property owners and resident, and ongoing training and reinforcement will need to be organised.
- Budgets and appropriate resources will be required to achieve this.

Finally, Fishermans Bend is highly unlikely to achieve net zero emissions without recourse to:

- Bulk sourcing of renewable energy (through joint power purchase agreements for example) and / or
- The purchase of offsets.

5.2.2 Fishermans Bend draft framework

The Fishermans Bend draft framework was put out for consultation in October 2017 and contains a number of climate change mitigation directions and goals. This strategy meets one of the objectives stated in the Framework (7.1.2. Develop a comprehensive net zero emissions strategy for Fishermans Bend).

However, the following messages could be reinforced in the draft framework:

- The need for rapid action: to be net zero carbon by 2050 at lowest cost, there is a need for early and sustained action, always keeping ahead of national standards.
- The need of concerted action: all actors, from government to developers and land owners, need to be in agreement not only with a general low-carbon goal, but be prepared to take responsibility and act upon what it means for them. This will require specific engagement with these stakeholders.
- The cross-overs between sustainable transport, waste reduction and reduction in carbon emissions could be emphasised. As mentioned above, waste and transport are not the most significant components of the carbon inventory at this stage, however they will become more prominent as building energy efficiency increase. Reducing emissions will also require behavioural change from precincts' residents and workers, which has been historically quite hard to achieve and maintain over time.
- The benefits of reducing energy use in buildings and increasing energy productivity for companies within Fishermans Bend are also financial and economic: as electricity prices increase, the financial return on energy efficiency measure increases. By addressing barriers to uptake of energy efficiency and productivity, future economic benefits for the state can be expected.

The draft framework nominates some specific actions and targets that could be strengthened:

- In relation to strategy 7.2.1, “Require new developments to meet 4 Star Green Star Standards or equivalent now, and clearly indicate future increases to performance requirements”, the stringency of the requirement will need to be rapidly increased to avoid locking in poor building performance.
- The two targets set under sustainability goal 7 in the draft framework are to achieve zero net emissions by 2050 and to deliver 50% tree canopy coverage in public space. Regarding these targets:
  - It is recommended to set some emission reduction target prior to 2050 to ensure that the district is on track to achieve this ultimate goal; this target could be an emission intensity target calculated before any offset to ensure that efficiency is prioritised; responsibility for achieving this target will need to be clearly identified.
  - It may be beneficial to explore the possibility of splitting targets into sub-targets: for community renewable energy, for residents, for office buildings, for operational energy; this will allow a finer grain definition of responsibilities and actions for each of these segments of the strategy.
  - It is important to recognise that tree canopy cover is likely to benefit climate change adaptation more than it will deliver climate change mitigation benefits. Whilst this has not been part of our calculations, the ability of city trees to absorb carbon is negligible compared to Fishermans Bend’s potential carbon footprint.

5.2.3 Further work to be considered

At this stage of the planning process, significant uncertainty remains and ongoing work will be required to both refine some of the components of the strategy and redefine them as decisions are made and more information on planning development become available. In particular:

- It has been assumed that all buildings would be redeveloped; if a significant number of buildings were to remain then more emphasis should be put on the transition strategy outlined under 7.2.2 of the draft framework.
- The ability of government to influence developments on their own sites has not been specifically assessed. Working on a comprehensive strategy for government owned sites, with ambitious emission reduction objectives, will be required.
- It was not known with certainty whether one or several university campuses will be established within the district, nor what portion of the district’s office area or job numbers these would represent. Should plans for university development be advanced, then additional work could be done to refine this part of the carbon inventory.
- The potential for renewable energy generation (solar PV) in the district has been estimated, but is highly uncertain: should more specific building footprint and roof availability data become available, then this potential could be refined.
- Still in relation to solar PV generation, the potential benefit of and willingness to participate in community energy schemes organised by a central authority should be further explored.
- The potential for more detailed transport-related emissions reduction needs to be refined and the assumptions for transport mode share revised as integrated transport planning evolves.
- Solid waste planning at a regional level is bound to evolve, requiring the assumptions made in this report to be revisited.
- The public lighting calculations have been based on assumptions and, while negligible compared to the overall footprint, they should be updated as information becomes available.
- Finally, it is recommended that a data collection strategy should be developed to complement the present carbon reduction strategy. This will make the calculation of future carbon inventories for Fishermans Bend easier, more reliable and more cost-effective to put together.

APPENDIX 1: GREEN STAR COMMUNITIES CREDITS

Green Star Communities is a rating system developed by the Green Building Council of Australia aiming to provide a formal, independent and holistic assessment of the sustainability of a precinct, neighbourhood or community across five impact categories, including environment. The point score systems across a large variety of credits leads to the attribution of a number of stars, 75 points being required to reach 6 stars.

The Environment category assesses the impacts of projects on land, water, and the atmosphere. This includes "credits" related to energy management and greenhouse gas emissions. The full assessment of the precinct's potential to achieve a given star rating has been done separately to this project. However, below are some insights gained from this project that may be relevant to the following two credits:

- Credit 23: Peak Energy Demand
- Credit 25: GHG Emissions - assumed 1-2 points at this stage.

1.1 Peak energy demand

The ability for Fishermans Bend to achieve the "25% reduction in predicted peak electricity demand" over the baseline (required for maximum Green Star points in this category) would be closely linked to the industrial demand profile and / or ability to respond to demand management signals (as well as investment in potential solar PV and battery systems by the local utility or others in response to some kind of incentive).

While some mechanisms, such as calling on an Energy Services Company to manage all or part of the district electricity demand, could well allow Fishermans Bend to meet this objective, there is not commitment at this stage to go down that path. This uncertainty rather than the technical feasibility points to a prudent approach to renounce targeting this credit.

1.2 GHG emissions

Green Star Communities reference case: Our understanding is that the Green Star reference case should be based on the same parameters as the "business as usual" reference scenario developed for this project, but with minimum standards based on building code minimum requirements (for buildings) and average performance for the rest of the infrastructure (e.g. streetlights), provided this is deemed acceptable by GBCA.

The largest unknown relates to the economic activity carried out within the precinct. As a reference case is difficult to define for such activity, it is assumed it is outside the scope of Green Star Communities.

Credits: If the reference year for certification is 2050, it can be assumed that by them the grid factor and building code will have dramatically progressed. It seems logical to assume that, over such a long timeline, Green Star Communities is mostly concerned with improvement in building efficiency, regardless of what the grid emissions factor is. This would mean that Fishermans Bend should target a reduction in energy demand (rather than a reduction in GHG emissions) to meet the spirit of Green Star Communities.

Under these assumptions, achieving more than 20% of reduction in energy demand (required to get more than 1 point under this credit) is certainly possible but will require strong, consistent and early action on Fishermans Bend's energy demand and goodwill from residents and businesses.

The maximum achievable reduction estimated in this report is around 58% compared to the baseline before contracting off-site renewable energy or buying offsets. This would allow Fishermans Bend to score 4 points under this credit, but require all projected abatements to be achieved. Targeting 1 or 2 points may be a more prudent strategy, unless offsite renewables and offsets are allowable and Fishermans Bend has an appetite for making such a commitment at this early stage of the development work.

APPENDIX 2: BASELINE CARBON FOOTPRINT REPORT

See separate document.

APPENDIX 3: CARBON OFFSETS

3.1 Overview

3.1.2 Background

Fishermans Bend is currently the largest urban renewal area in Australia and a project of State importance. The area is close to the Melbourne CBD and presents many opportunities to create vibrant employment and residential neighbourhoods connected to both the City of Melbourne and the City of Port Phillip. Of particular importance to the two cities and to the State is the question of net carbon emissions from the development, as the State has committed to ambitious greenhouse gas (GHG) emissions targets. Specifically, the City of Melbourne has a net zero emissions target for municipal emissions by 2020 and the City of Port Phillip has a target of 50% reduction in community emissions by 2020.

In order to encourage the development of a built environment that performs in alignment with the emissions targets of the City of Melbourne and the City of Port Phillip, the Fishermans Bend Taskforce is developing a comprehensive strategy for the precinct to achieve Net Zero emissions by 2050, or earlier. As part of this Net Zero Emissions Strategy, offsetting will play an integral part in bringing emissions to zero. Point Advisory have developed this 'Carbon Offsetting' memo to provide a high-level review of key considerations for the Taskforce in defining their offsetting strategy.

3.1.3 Objectives

The purpose of this memo is to recommend relevant and robust offsetting measures and offset procurement strategies for the short, medium and long-term Net Zero Emissions Strategy. In addition, we have provided estimated costs and uncertainty ranges, and social, environmental and economic co-benefits considerations.

3.2 Carbon offsets analysis

Based on the analysis conducted by the Taskforce for the Net Zero Emissions Strategy, it was identified that the 'most likely' emissions for the precinct could range from 300,000 to 1,000,000 t CO_2-e per year by the time the district is fully developed (2050), depending on assumptions made about the grid's emission factor at that date and operational energy use by companies settling in the Fishermans Bend's employment district and depending on the level of on-site renewable electricity generation.

Therefore, the Taskforce will be required to either source renewable energy from off-site generators and / or purchase carbon offsets in order for the precinct to be considered zero emissions in any given year.

This document provides some insights into the current market for carbon offsets, noting that this analysis will need to be amended over time, as the offset landscape evolves.

Based on current information, the procurement strategy for these offsets should be based on the following key criteria:

- The **geographic location** of offsets: offsets can be local, regional or international.
- The **project sector** of the offsets: e.g. renewable energy, energy efficiency, land sector, methane capture.
- **Co-benefits**: most offsets available generate additional co-benefits linked to the projects they relate to. Co-benefits relate to social, economic and environmental impacts. For instance, Gold Standard projects must comply with seven sustainability principles to be certified.
- **Independent accreditations**: it is important for the Taskforce to ensure that any offsets purchased are credible and verifiable.
- **Costs:** The price of offsets can vary widely depending on the above-mentioned criteria. For example, a reforestation project in Australia generating Kyoto Australian Carbon Credit Units (ACCUs) will produce more expensive offsets than a hydropower project in China.

3.1.4 Selecting carbon offsets

By selecting types of projects underpinning carbon offsets, the Taskforce has the opportunity to claim and market additional benefits that align with their values. Sub-criteria for choice include:

1. **Geographic location** of the project: essentially full flexibility exists: Victoria, Australia, developing countries (to the exclusion of some of them for political reasons if required), developed countries.
2. **Project sector:** type of carbon abatement activity that is most aligned with the values of the Taskforce, the City of Melbourne, the City of Port Phillip, and its stakeholders (knowing that they will all deliver the same standard quantity of carbon abatement), for example:

- Renewable Energy
- Energy Efficiency
- Methane Capture
- Forestry & Land Use
- Industrial Gases
- Fuel Switching
- Agriculture

3. **Type of co-benefits:** there is no pre-determined list, however they can be classified into three main categories for convenience, which are not exclusive of each other:
    a. Social:
        i. Health outcomes
        ii. Poverty alleviation
        iii. Education
        iv. Women empowerment
    b. Economic
        i. Job creation
        ii. Agricultural development
        iii. Clean electricity generation
        iv. Cleaner industrial production
        v. Balance of payment impacts
    c. Environmental
        i. Habitat for specific species
        ii. Clean water
        iii. Reduction of air pollutants (non-carbon)

3.1.5 Carbon offset accreditations

As carbon offsets are generated from a vast range of projects, they can have a very different impact on the environment and community. The risk attached to choosing the appropriate carbon offsets lies in the potential for underlying offsets projects to be discredited, either on social or environmental grounds, or because they are not delivering the promised carbon benefits. Carbon credits should also adhere to the principles of additionality, permanence, measurability and verification. For these reasons, selecting carbon offsets certified under reputable standards is advisable. For example, the National Carbon Offset Standard (NCOS) is a credible and government-backed standard for carbon neutral claims. The NCOS provides useful information regarding the credible types of eligible compliance and voluntary offsets for organisations wishing to make carbon neutral claims. NCOS specifically allows the following offset units:

- Australian carbon credit units (ACCUs): Issued for Australian emission reduction or sequestration projects regulated by the Clean Energy Regulator. These can be Kyoto or non-Kyoto ACCUs. Kyoto ACCUs are issued if the relevant offsets project is an eligible Kyoto project and the reporting period ends on or before the Kyoto abatement deadline. Non-Kyoto ACCUs are issued if the relevant offsets project is an eligible non-Kyoto project, or if the relevant project is an eligible Kyoto project but the reporting period ends after the Kyoto abatement deadline.
- Eligible international emissions units (EIEUs): Issued under the Kyoto Protocol, also known as Certified Emissions Reductions (CERs), emission reduction units (ERUs) and removal units (RUs).
- Verified Emissions Reductions (VERs) issued by the Gold Standard.
- Verified carbon units (VCUs) issued by the Verified Carbon Standard.

Internationally, the Verified Carbon Standard (VCS) and the Gold Standard (GS) are the main reputable standards used to certify offsets, with VCS having the greatest number of references and GS being the premium option because it also verifies sustainable development claims.

3.1.6 Factors influencing price

The price of the offsets is a major factor when considering purchasing a large quantity of offsets, as would be the case for Fishermans Bend. Generally, as the marketability of the offset increases, mainly due to the co-benefits associated with it and its accreditation status, the price increases. If the Taskforce has a specific budget for purchasing offsets, this will ultimately determine what type of offsets can be purchased. However, we have provided an analysis of typical price points for different offset units available for Fishermans Bend that may guide in choosing the most appropriate offsets purchasing strategy. Table 3 provides a short summary of a range of typical carbon offsets project examples, with typical price points. References to specific projects can be provided on request.

Table 3. Carbon offsets cost matrix (examples only)

Cost	Sector	Types	Sub-Type	Country	Unit	Est. $ Range Per Tonne
$	Renewables	Hydropower	Large scale	China	CERs	AUD 1.00 – 1.50
	Renewables	Biogas	Co-generation	India	VCUs[1]	AUD 2.00 – 2.50
	Renewables	Wind Power	Small Scale	Turkey	GS VER[2]	AUD 2.00 – 3.00
	Renewables	Solar	Small Scale	China	GS VER	AUD 4.00 – 5.00
$$	Energy Efficiency	Supply side	Generation EE	China	CERs	AUD 5.00 – 6.00
	Forestry/Land Use	ARR[3]	Reforestation	USA	VERs	AUD 7.50 – 8.00
	Forestry/Land Use	ARR	N/A	Panama	VCUs	AUD 8.00 – 8.50
$$$	Renewables	Avoidance	Landfill Gas	Australia	Kyoto ACCUs	AUD 13.00 – 16.00
	Forestry	Protection	N/A	Australia	Non-Kyoto-ACCUs	AUD 9.50 – 11.50
	Forestry	ARR	Reforestation	Australia	GS CER[4]	AUD 15.00 – 20.00
	Energy Efficiency	Demand Side	Household	Netherlands	GS CER	AUD 15.00 – 20.00

1. VCU – Voluntary Carbon Units
2. GS VER – Gold Standard Voluntary Emissions Reductions
3. ARR – Afforestation, reforestation & revegetation
4. GS CER – Gold Standard Certified Emissions Reductions

Source: Point Advisory's own database

It should be noted that these prices are indicative only, and valid at a point in time only. A range of factors will impact the price paid for offsets, including the deal type for purchasing offsets and the volume of offsets to be purchased. Considerations to take advantage of positive volume effects include:

- **Retail versus wholesale volumes.** There can be significant savings had when purchasing offsets in wholesale (commercial) quantities. Typically, wholesale quantities start around 10,000 tonnes in a single transaction (offsets originating from one project).
- **Bundling different projects together**. There can be some (smaller) savings in bundling different offsets (projects) together in one parcel, especially when purchasing offsets from one single broker, agent or developer. The discount relies basically on the client's bargaining power.
- **Forward-contracting larger volumes**. Another option when purchasing offsets is to forward contract several years (vintages) in advance. This can help to secure future offset supply (from a specific project of interest) whilst also locking in a fixed price now to help with future budgeting. This option however requires more complex contractual arrangements. More detail on forward contracts is provided above.
- **Banking offsets.** Any offsets purchased and not retired immediately can also be banked for future requirements (i.e. for use in coming years), thereby building the case for buying offsets in bulk if the opportunity presents itself.

It should be noted that the price of offsets can vary greatly, and is impossible to forecast for 2050. These potential costs are just given as a very high-level indication of what the Taskforce could expect to pay. Despite this uncertainty, there clearly is a huge spread in the magnitude of costs, and on face value it may seem favourable to choose the cheapest option, especially if there is a fixed budget for purchasing offsets.

5.2.4 Appropriate offsets for Fishermans Bend

The choice of appropriate offsets for Fishermans Bend is quite wide. The selection process can be approached from two different angles:

- either by setting an overall budget for carbon offsets first and looking at which offsets are available under a set price, or;
- by determining desired characteristics for carbon credits first and selecting those that meet the criteria and working back to the overall number of offsets required.

Selection criteria are provided at a high-level in Table 4.

Table 4. Selection criteria for carbon offsets

Price	Risk	Social responsibility / Communication
• Influenced by factors mentioned in Section 3.1.6. • Fluctuates greatly in time • As the market is currently fragmented and because of various attributes attached to carbon offsets, a vast range of offset prices may correspond to offsets meeting same set of criteria	• NCOS is the reference in Australia for Carbon Neutrality claims (government endorsed). It has a long list of eligible carbon offsets. Using NCOS approved offsets, even without referring to NCOS carbon neutrality methodology reduces risk. • Other standards are referenced by NCOS (e.g. Gold Standard). There has not been much issue with credibility of the underpinning carbon offset generating projects so far for those offsets generated under reputable standards. This therefore reduces the risk. • A more detailed investigation into track records of project proponents and technical criteria of offsets can further reduce the risk.	• Underlying projects generating credits allow to "tell a story". • Country of investment, type of industry targeted or social groups benefitting are all relevant criteria of choice for "co-benefits". • Some carbon offsets come with significant amount of detail around co-benefits. This can be used as marketing material, and highlights commitments to all types of sustainable actions within the Fishermans Bend precinct.

Other factors should also be considered, depending on the governance defined for the precinct. The precinct is located within the City of Melbourne and the City of Port Phillip, both of whom have committed to climate change mitigation targets in the past. City of Melbourne has a commitment to reduce emissions from the municipality to zero by 2020. In addition, the City wants to promote sustainability across the community, and be an advocate for climate change action. Therefore, the choice of offsets projects that align with these values, may make the most sense from a consistency and marketability point of view.

3.3 Key findings and recommendations

Point Advisory offers the following key findings and recommendations in relation to offsetting the Fishermans Bend precinct emissions in 2020 and beyond:

- The Taskforce should consider a range of factors when identifying what type of offsets to purchase. These criteria are split between price, risk and social responsibility / marketability. The Taskforce should consider all of these criteria before entering a deal to buy carbon offsets.
- If it is not economically viable to purchase all offsets with co-benefits that align with the precincts and Melbourne's core values of social, moral and environmental responsibility, it is recommended to consider the option to bundle both low and high-cost offsets together. This will enable the Taskforce to promote their support for offsets projects with multiple co-benefits, but at a lower cost than purchasing all high-cost offsets.