

South West Victoria 2012 – 2050 Are the Settlements Sustainable?

J. M. Herron, D. Jones, J. Rollo, Deakin University, Williamstown, Australia

Over the past few decades coastal cities around the world have grown at an incredible rate. With this growth have come major challenges relating to land use planning, social relationships, economic development, bio diversity and the ecological footprint.

The following paper selects three regional coastal towns (Warrnambool, Portland and Port Fairy) situated in the Australian state of Victoria, and addresses the issues of: increasing population and population density; open space requirements; residential density issues; public transport coverage; employment and employment density; a shifting economic climate; environment and climate change; water quality issues and building energy consumption with subsequent CO₂ emissions.

Through a series of simulations the nine issues for each of the three cities will be examined from 2012 through to 2030.

The goal is to highlight the current and simulated future impacts of the selected issues and propose solutions that could mitigate those impacts.

1 Introduction to the Study Area

The study area for this research is represented by the cities of Warrnambool, Port Fairy and Portland and surrounding area in South West Victoria. Warrnambool is approximately 300 kilometres west of Melbourne; Port Fairy is 25 Kilometres from Warrnambool while Portland is located 100 kilometres west of Warrnambool.

Warrnambool was first incorporated as a municipality in 1855 and is the largest settlement in South West Victoria with a population of 32,000. Warrnambool is the administrative, educational and commercial centre for South West Victoria.

Port Fairy can be traced back to 1810. Port Fairy is the largest settlement in Moyne Shire with a population of 2,800. Port Fairy, is the administrative and commercial centre for Moyne Shire. The bulk of the commercial activity is focused on municipal government and tourism activities.

Portland is the oldest European settlement in Victoria with the first settlers appearing between 1815 and 1820 and is the major residential and commercial centre for Glenelg Shire with an approximate population of 10,000. Warrnambool, Port Fairy and Portland with their locations respective to the rest of Victoria are shown in Figure 1.

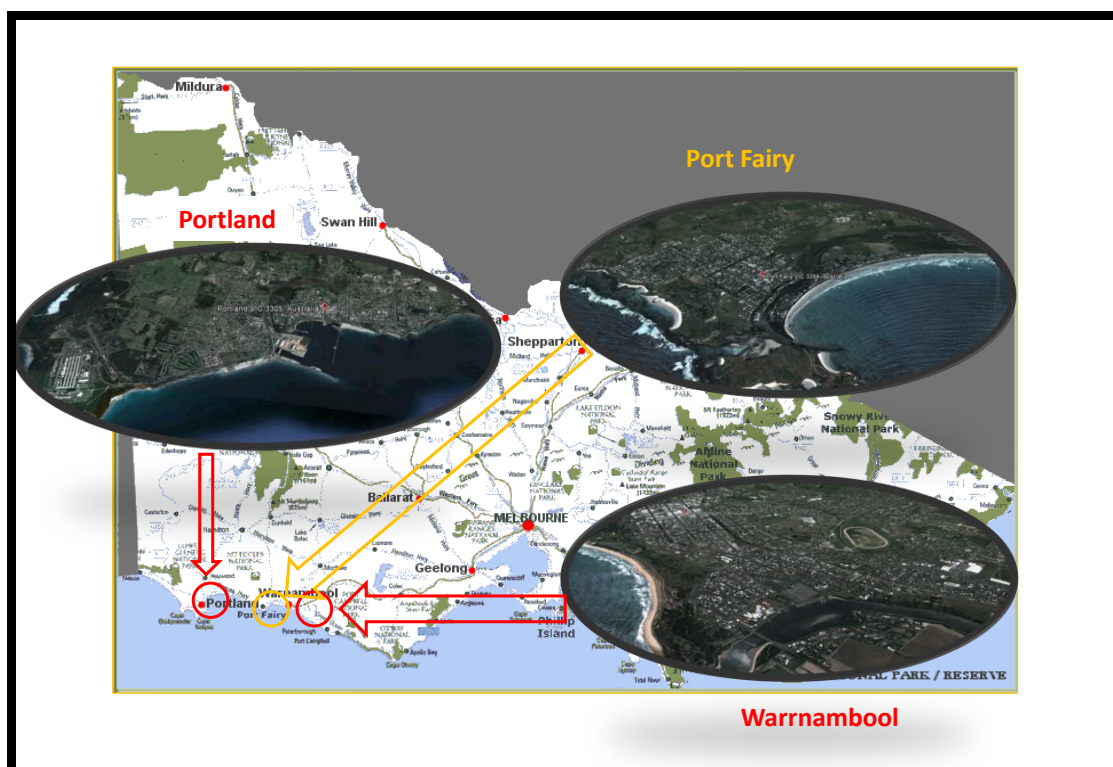


Figure 1 Greater Study Area Including the Cities of Warrnambool, Portland and Port Fairy

Source:(Goggle 2013; Herron Murray 2013)

Throughout their entire existence Warrnambool, Portland and Port Fairy have been major ports for South West Victoria and South Australia. The port facilities for the three cities are an integral part of each city and provide a direct input into whether or not each of the three

cities can continue as a sustainable settlement. Warrnambool, Portland and Port Fairy in the last two years have outlined plans to redevelop either their respective port facilities or Central Business District (CBD) area. This paper will examine the current urban design frameworks for Warrnambool, Portland and Port Fairy and through the use of scenarios assess the sustainability of each settlement.

“Urban Design is the art of making places for people. It includes the way places work and matters such as community safety, as well as how they look. It concerns the connections between people and places, movement and urban form, nature and the built fabric, and the processes for ensuring successful villages, towns and cities” (Strzelecka 2010)

Urban Design has eight objectives:

1. Character - A place with its own identity
2. Continuity and enclosure – A place where public and private spaces are clearly distinguished
3. Quality of the public realm – A place with attractive and successful outdoor area
4. Ease of movement – A place that is easy to get to and move through
5. Legibility - A place that has a clear image and is easy to understand
6. Adaptability – A place that can change easily
7. Diversity - A place with variety and choice
8. Sustainability- A place that meets the needs of today without comprising the future

The structural components of an Urban Design Framework are shown in Figure 2. This type of framework was used to influence and direct the current and future design characteristics and features of Warrnambool, Portland and Port Fairy.

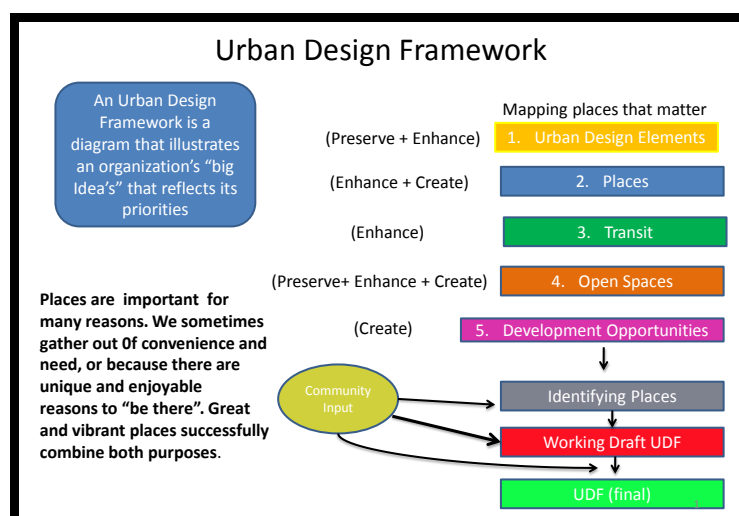


Figure 2 Urban Design Framework

Source:(Herron 2012)

1.1 Warrnambool

Warrnambool urban design framework focuses on five themes:

- i. City spaces and landscape
- ii. Pedestrians and accessibility
- iii. Cars and parking
- iv. Land use and activities
- v. Built form and heritage

The themes have a series of objectives including:

1. Ensuring that the Warrnambool City Centre continues to be the primary retail and services centre
2. Encouraging a diversity of new investments in the City Centre, encompassing retail, commercial, entertainment, recreation, community, cultural and residential services and facilities;
3. Supporting the development of medium density residential development within walking distance of the City Centre;

Source:(City of Warrnambool 2011)

The urban design framework drew attention to the lack of land that could be used for development and to water and energy conservation measures that improve Warrnambool's sustainability.

1.2 Port Fairy

The town of Port Fairy has been transformed over the last decade or so from a local service centre and fishing port with a tourist and recreation profile to an iconic high profile tourist and resident destination.

That transformation has partly been driven by some forces internal to the town but it has largely been imposed by external trends and factors which have impacted on many coastal communities.

There is an emerging concern about aspects of the town's future. These concerns range across an agenda comprising social economic and environmental elements.

1. the scale and form of much recent development
2. the capacity of the town to retain its character and identity in a growing urban area
3. the impact of existing and projected developments on the built heritage and the natural features associated with the coast, the Moyne River and the Belfast Lough
4. the provision of housing that can meet different household needs and provide affordable options

5. the lack of long term, permanent work in the town and the capacity of the town to retain and attract young people and new entrants into the workforce
6. the implications of an increasingly aged population and the implications of such a demographic structure for services and facilities
7. a growing questioning as to whether development for developments' sake is necessarily compatible with Port Fairy as a town and community
8. a growing concern that the scale of recent development and the level of likely future development may be detrimental to the qualities that are valued by long term residents and those who have been attracted to shift to and visit Port Fairy

Source:(Moynes Shire 2012)

The Port Fairy Urban Design Framework drew attention to the flooding issue and to the scale of development that was occurring in Port Fairy.

1.3 Portland

The City of Portland has recently completed an urban design framework for the Port of Portland area along with the Central Business District (CBD). The framework commented on the lack of available land for development in the CBD area and greater Portland area and the potential long term weakness and uncertainty in the Portland economy.

1.4 Frameworks Inner Workings

Each of the three design frameworks had a set of pre-determined parameters for Character; Continuity and enclosure; Quality of the public realm; Ease of movement; Legibility; Adaptability; Diversity and Sustainability. The parameters were generated through a series of ongoing public consultations and resident surveys.

The Portland design framework was influenced by the Portland Land Use model. This model which had its origins as a theoretical model was modified to become a practical applied planning tool. The Portland model was comprised of four sub models (Soils, Settlement, Population and Climate Change) along with a series of legal and physical constraints to reflect the current planning landscape and legal framework. The Portland Land Use Model includes a series of components including: an External Factor Evaluation matrix; Internal Factor Evaluation matrix; Scenarios and a Quantitative Strategic planning matrix.

An External Factor Evaluation Matrix is a strategic management tool often used to assess current conditions. It is a good tool used to visualize and prioritize the opportunities and threats that an organization is facing and is composed of five steps. The steps include (1) listing the factors; (2) assigning weights; (3) rating the factors; (4) multiplying the weights by ratings; and (5) Summing the weights by the ratings.

The Internal factor evaluation (IFE) matrix is a strategic tool used for evaluating strengths and weaknesses in organizations. The IFE matrix together with the EFE matrix is a strategy formulation tool and is created in three steps: Identifying the Key internal factors; Assigning Weights; and Rating:

Scenarios in land use planning have traditionally focused on: Population growth by a specific percentage each year; Expansion of various type of land zonings; the development of

specific facility such as a an industrial park; the development of an Urban Design Framework; The allocation of public space; and the advent new public transportation routes.

2 Current Status of the study area and the three cities (Warrnambool, Portland and Port Fairy)

2.1 Current Population

The population of the three cities and surrounding area according to the ABS Census 2010 was 44,812. Double digit population growth occurred during the following time periods 1947-54; 1954-61 and 1961-66 with the City of Warrnambool having a population of 32,000 followed by the City of Portland with 10,000 and the Town of Port Fairy with 2,800

2.2 Land Use

The three settlements and surrounding area contain approximately 32,000 individual land parcels and represent over 1367 square kilometres of area. Warrnambool has a total area of 35.04 square kilometres and contains 13,812 parcels. Portland is 34.48 square kilometres in size and is comprised of 7,029 parcels while Port Fairy is the smallest settlement in area (8.13 square kilometres) and the number of parcels (3,025).

The overall current population density in the three settlements and surrounding area is 32.75 per residents per square kilometre with Warrnambool having the greatest density with 913 residents per square kilometre followed by Port Fairy with 344 and Portland with 290 residents per square kilometre.

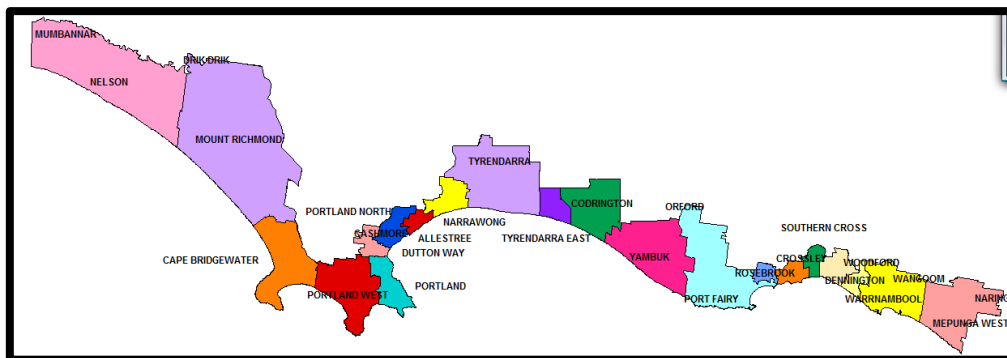


Figure 3 Study area in greater detail

Source:(Herron Murray 2013)

2.3 Building Structures and Housings

The total number of all dwellings in the three settlements is 20,531. This figure is comprised with Warrnambool having 13,931 private dwellings followed by Portland with 4,672 private dwellings and Port Fairy with 1,426 private dwellings.

2.4 Open space

The amount of land dedicated to open space (i.e. parkland (municipal and state parks, gardens and reserves and sporting reserves) for the combined three settlements and surrounding rural areas entire is 63987.5 Ha or 1.42 Ha per individual. This figure is misleading as the study area has 61,820 of state forest and park. Once this amount is removed from the total only 2168 Ha of open space has been allocated for the combined three cities and surrounding rural area with Warrnambool having 1572.54 Ha (i.e. 0.04 Ha per resident) Portland having 229.78 Ha (i.e. 0.0229 Ha per resident) and Port Fairy 363.86 Ha (i.e. 0.129 Ha per resident).

2.5 Public Transport

Each of the three settlements has a viable municipal mass transit system comprised of private bus operations, Vline train service to Melbourne and scheduled airline services to Melbourne.

2.6 Current Water Resources

Ground water is the major source of water in South West Victoria. Groundwater is defined as “water that it is found under the ground. It is stored in and can flow through discrete layers know as aquifers.” (Glenelg Hopkins Catchment Management Authority 2003)

Ground water is extracted from the aquifers through the use of a bore hole. Eleven hundred and eighty nine (1189) are situated in the three settlements and surrounding country side.

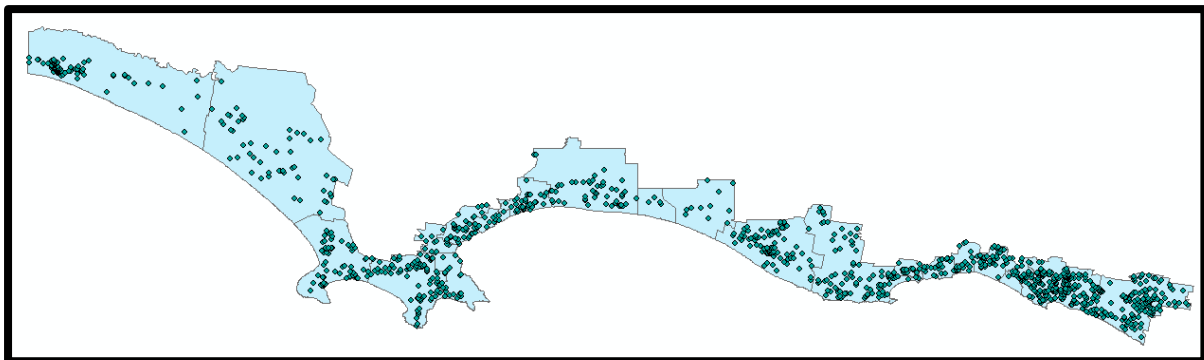


Figure 4 Ground Water and Borehole location for the three Cities and surrounding rural areas

Source:(Victorian Department of Primary Industry 2010)

The ground water is used in a variety of applications such as domestic & stock water supply; domestic water; ground water recharge; industrial and commercial water applications; irrigation and waste disposal.

2.7 Climate Change

The impacts of Climate Change on the three settlements and surrounding rural area include; increased evaporation rates, increased bush fire risk, more frequent and severe droughts; a projected decline in Victorian farm production; sea level rise of 0.8m by 2100 and more intense storms threatening coastal infrastructure.

2.8 Current Employment

The employment patterns from 1947 through 2010 shows persons in employment grew from 6,322 to 19,823 an increase of 13501 or 213.56%. The industries in the study area that have a local or national competitive advantage are: Manufacturing; Retail; Transport; Electricity Gas Water & Waste Services; Information, Media & Telecommunications; Accommodation; Public Administration and Agriculture

3 Future Scenarios for the Study Area and Settlements

A series of scenarios were developed to test the how sustainable the three settlements were. The scenarios involved:

1. Forecasting future population growth and its impact on land and water supply, urban and open space density the resulting increase or decrease in CO2 emissions generated by human activity and forecasting the changing economic and employment environment.\

3.1 Scenario 1

Population increases

The state government has development population forecast for the period 2011 through to 2031 (i.e. 2011, 2016, 2021, 2026 and 2031).

Table 1 Forecast Population Increases for Warrnambool, Portland and Port Fairy

Town	Era	Forecast population Increase	Year	Total Population	Increase
Warrnambool	2011-2016	8.17%	2016	36,988	2795
	2016-2021	6.56%	2021	39,416	2428
	2021-2026	5.90%	2026	41,740	2324
	2026-2031	5.26%	2031	43,934	2194
Portland	2011-2016	3.12%	2016	11,891	2795
	2016-2021	3.76%	2021	12338	360
	2021-2026	3.47%	2026	12766	447
	2026-2031	3.16%	2031	13169	428
Port Fairy	2011-2016	6.08%	2016	2,970	696
	2016-2021	5.36%	2021	3,129	651
	2021-2026	4.82%	2026	3,280	617
	2026-2031	4.18%	2031	3,417	561

Source; (Victorian Department of Planning and Community Development 2012)

3.2 Landuse and future Land Requirements

Portland, Port Fairy and Warrnambool each have a land budget which contains a 10 year supply of vacant land for future residential, commercial or industrial expansion. Table 3 indicates the number current of vacant lots per city; the number of lots needed to house the expected increased population by era and the number of additional lots that will be required by 2031.

Table 2 Land Budget for expected housing growth

Location	Era	Expected Households	Lots Required for increased population	Surplus or Deficit of lots	Number of new lots required or created
Warrnambool	2011-2016	14,664	1285	Deficit	847
	2016-2021	15,904	1240	Deficit	2087
	2021-2026	17,063	1159	Deficit	3246
	2026-2031	18,158	1090	Deficit	4336
Portland	2011-2016	4486	166	Surplus	456
	2016-2021	4659	173	Surplus	283
	2021-2026	4819.	160	Surplus	123
	2026-2031	4970.	151	Deficit	28
Port Fairy	2011-2016	2052	122	Surplus	127
	2016-2021	2178.	126	Surplus	2
	2021-2026	2295.	118	Deficit	116
	2026-2031	2401.	106	Deficit	222

Source:(Herron Murray 2013)

3.3 Warrnambool Sustainability

As shown in Table 3 Warrnambool has a chronic residential land shortage needing a predicted 4,400 lots to meet the expected population increase by 2031. To resolve this issue Warrnambool has several options at its disposal:

1. Developing more residential land by rezoning the last agricultural land in the city;
2. Decreasing lot size and increasing urban density; and
3. Working with the surrounding municipality to co develop new residential areas adjoining Warrnambool and Port Fairy

Warrnambool is not sustainable in its current form. Residential density will increase from 913 individuals per square kilometre to 1253.82 in 2031 while open space density will decrease from 0.04 Ha per individual to 0.0346 Ha per individual. The density issue will need to take into consideration that the fastest growing segments in the Warrnambool population are the 45+ and 65+ age groups.

Warrnambool consumed 475 ML of its total water allotment of 750ML in 2010 (i.e. 62%). The current water consumption per dwelling is 166 kilolitres per dwelling per year, using this figure and extrapolating it forward to 2031 water consumption would go up to 3,014,228 Kiloliters or 3014.228 ML over four times the entire current water allotment. This factor again brings into consideration whether or not Warrnambool is sustainable.

There is a solution - Warrnambool currently has 4674 ML of recycled water at its disposal and to date has used not one drop of this resource, Warrnambool uses only 8.70% of its total water resources.

The Warrnambool Public Transport and bus system has the ability to expand to carry additional passenger and additional routes.

The Victorian State government believes the current and future economic growth of Warrnambool will *“focus on key industries where new investment is anticipated including dairying, energy and tourism with significant opportunities for further value-adding in major industries.”* (Victorian Department of Planning and Community Development 2013)

“By 2031 the largest sectors in the economy are projected to be healthcare, agriculture, manufacturing and construction. Other high growth sectors will include retail trade, financial, professional and scientific services and accommodation. This highlights a shift from primary production to a more service-based economy and will require workforce changes and services to support skills development and productivity improvements. Employment in manufacturing is expected to decline between 2011 and 2031, with healthcare, retail trade, accommodation and food being the largest employers by 2031.” (Victorian Department of Planning and Community Development 2013)

Limiting this scenario is managing competing demands for agricultural land, particularly in the corridor from Warrnambool to Portland, including limiting urban encroachment into highly productive agricultural areas. The reduction of agricultural land for housing will impact on future agricultural production and overall economic returns.

With the indicated expansion of Warrnambool population CO₂ emissions have been forecast to double by 2050. This factor will be compounded by the effects of Climate Change on the Warrnambool coastline and landscape. Warrnambool has developed an environmental strategy that focuses on coastal management, waterways and wetlands, pest plants and animals, flora and fauna protection, parks, reserves and public open space development, community awareness and involvement, water and energy efficiency, recycling and accountability. The question is will this program be sufficient to ensure that Warrnambool will still be sustainable and liveable as it is today?

3.4 Port Fairy Sustainability

As indicated in Table 3 Port Fairy starts out with a residential land surplus and by 2031 has a chronic residential land shortage needing a predicted 222 lots to meet the expected population increase by 2031. To resolve this issue Port Fairy has two options at its disposal:

1. Developing more residential land by rezoning agricultural land that surrounds the city; and
2. Decreasing lot size and increasing urban density

To make Port Fairy sustainable in its current form residential density will increase from 344 individuals per square kilometre to 420.29 in 2031 while open space density will decrease from 0.129 Ha per individual to 0.106 Ha per individual. This density increase will need to take into consideration that the fastest growing segments in the Port Fairy population are the 45+ and 65+ age groups.

Port Fairy consumed 702 ML of its total water allotment of 1026 ML in 2010 (i.e. 68.4%). This figure takes into consideration the large agricultural component of water usage by the Port Fairy dairying industry which is one of the largest in Victoria.

The current water consumption per dwelling is 136 kilolitres per dwelling per year, using this figure and extrapolating it forward to 2031; water consumption would go up to 326,536 Kiloliters or 325.536 ML. This figure then needs to be added to agricultural water usage component (i.e. currently 425 ML per annum) to get a total water usage figure of approximately 750 M/L per annum. This amount of water is currently under the yearly water allotment of 1026 per annum. In addition Port Fairy has an additional 999 M/L of recycled water at its disposal giving the community a total volume of 2025 ML at its disposal. Port Fairy will not face a water shortage for the foreseeable future

The Port Fairy Public Transport and bus system has the ability to expand to carry additional passenger and additional routes.

As stated earlier the Victorian Government believes the current and future economic growth will focus on certain industries. In Port Fairy's case those industries are tourism, agricultural and retail based activities.

The reduction of prime agricultural land to support the increased housing demands of Port Fairy and Warrnambool will need to be managed to minimize the damage residential expansion will have on agricultural production.

Port Fairy is large producer of CO₂ emissions as a result of its large dairy industry. The increase in population by 2031 will further add to this total. Port Fairy has just introduced an environmental strategy which focuses on three issues: water conservation; soil quality and conservation and green house gas emissions.

Port Fairy is also subject to severe coastal flooding and erosion as the result of climate change. This issue is the number one long term factor threatening Port Fairy's sustainability. Port Fairy currently is sustainable but the long term prospects could be another matter.

3.5 Portland Sustainability

As shown in Table 3 Portland starts out with a residential land surplus and by 2031 has a residential land shortage needing a predicted 28 lots to meet the expected population increase by 2031. To resolve this issue Portland has several options at its disposal

1. Developing more residential land by rezoning agricultural land that surrounds the city
2. Decreasing lot size and
3. Increasing urban density

Portland is not facing the residential land issue that face both Warrnambool and Port Fairy.

Portland consumed 1797 ML of its total water allotment of 6222 ML in 2010 (i.e. 28.8%). This figure takes into consideration the large agricultural and industrial component of water usage by the Portland agricultural sector and the Portland Aluminium Smelter which is one of the largest in the world.

The current water consumption per dwelling is 158 kilolitres per dwelling per year, using this figure and extrapolating it forward to 2031 water consumption would go up to 785,260 Kiloliters or 785.260 ML. This amount of water is currently under the yearly water allotment of 6222ML per annum. In addition Portland has an additional 1235 M/L of recycled water at its disposal giving the community a total volume of 7457 ML at its disposal.

The Portland Public Transport and bus system has the ability to expand to carry additional passenger and additional routes.

As stated earlier the Victorian Government believes the current and future economic growth will focus on certain industries - in Portland's case those industries are industrial, transportation, tourism, agricultural and retail based activities.

Two key economic drivers for the Portland area are the Portland Smelter and the scheduled plantation forestry harvest. The Portland Smelter represents 700 jobs and 15% of the entire export GDP for the State of Victoria. The smelter has electricity contracts with the Victoria government until 2025 while the sustainable forestry plantation harvest was severely impacted by the Japanese earthquakes and corresponding nuclear events that occurred in 2010-2011. The entire forestry harvest was destined for the Japanese pulp and paper industry over a 20 year period. This industry is wholly based in the area affected by the tsunami and subsequent nuclear power-plant disaster, and has no immediate short or medium term date for the recommencement of pulp and paper production. The harvesting of the forest crop will not commence until the Japanese pulp and paper industry recommences the production of pulp and paper.

Portland is large producer of CO₂ emissions which are the result of the Portland Smelter which consumes 25% of all electricity generated in Victoria all which is generated through the burning of brown coal.

Portland is also subject to severe coastal flooding and erosion as the result of climate change. This issue will be a long term factor that threatens Portland's sustainability.

4 Lessons learned and Further Applications

The use of the design framework has been expanded in Portland and Port Fairy. In Port Fairy the 2012-2013 flooding study conducted by the University of New South Wales outlined the impacts of flooding throughout the Port Fairy area. This information will in turn be used to broaden the parameters of the design framework to acknowledge the threat and impact of flooding in the Port Fairy region.

In Portland, the urban design framework is being adopted and used to frame the redevelopment of the Portland Waterfront. In the proposal the Portland waterfront would be transformed in to a waterfront precinct.

Warrnambool has used its design framework for the partial redevelopment of its CBD, further commercial development to the western and eastern sections of Warrnambool will be guided by the design framework.

5 Summary

The continued sustainability of the three cities hinges on factors which are controlled by the cities themselves. In Warrnambool's case higher density limits and the use recycled water will ensure a sustainable future.

For Port Fairy the major issue is flooding and coastal erosion both of which can be mitigated through coastal management.

Portland faces issues of economic sustainability and is the most vulnerable of the three settlements. Portland must foster and develop other industries beside the smelter and the economic exploitation of natural resources for its future prosperity.

The urban design frameworks have identified specific concerns for each of the settlements. As stated earlier *Urban Design is the art of making places for people...People and their actions will make a place sustainable or not. (Marshall 2001)*

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