

Climate Change in the City of Port Phillip

An initial perspective

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Prepared by the City of Port Phillip

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Introduction

This **inaugural Climate Change Discussion Paper and Report** provides an initial overview of the effects and consequences of climate change and rising greenhouse gas emissions on the City of Port Phillip and globally. It also provides a comprehensive perspective on the resulting policy and strategic directions that are emerging for Council and the community.

It has been prepared because Port Phillip City Council believes that climate change is set to pose unprecedented challenges to the way the City develops and the community behaves, now and in the future. These challenges are also global and faced by other Cities and communities around the world.

Council is committed to initiating a proactive and comprehensive *Climate Action Plan* to become a low-carbon, climate-adept City before 2030. As climate change does not begin or end at municipal or regional boundaries, Council also recognises that it will have new challenges in forging regional, national and international alliances and networks in order to develop the global solutions to greenhouse gas abatement and climate adaptation.

This report provides a perspective on the following -

- o **Part 1** – An Executive Summary of the Key Finding and Recommendations for action to be considered by Council
- o **Part 2** - The scientific and economic case for local and global action
- o **Part 3** - The emerging policy and strategy directions; internationally and for Australia; the resulting advocacy and collaborative directions for Local Government
- o **Part 4** - An examination of the City of Port Phillip's climate footprint – greenhouse gas emissions, water use and availability, climate change impacts and their associated risks, and the resulting climate challenges faced by the City; and the NATCLIM report - **Appendix 1** - which provides a case study of the local impacts of climate change on the City of Port Phillip
- o **Part 5** - An outline of the resulting assessments and actions Council will consider between 2007-2010 to achieve a comprehensive action plan of local, regional and global greenhouse gas abatement and climate adaptation; and **Appendix 2** – An example of planning for a recommended Council action – a draft proposal (with outline of kit) of the community climate change campaign.

This report is an **initial perspective** because Council recognises that it will have to continue to develop and collate local and regional data and research, models and instruments over the next 4 years to foster, build and enable a sustainable City and community, even while it moves urgently to reduce the City's greenhouse gas emissions.

Part 1 - Executive Summary & Recommendations for Climate Actions in 2007

The era of procrastination, of half measures, of soothing and baffling expedients, of delays, is coming to its close. In its place, we are entering a period of consequences.

Winston Churchill, 1936

Why Plan for Climate Change Action Now?

The climate is changing, and it will profoundly affect the way we live & produce.

With no action to cut greenhouse gas emissions, the planet will warm a further 2-3°C within 50 years – it has already warmed by 0.7-0.8°C since 1900. If greenhouse gas emissions grow at the current rate, carbon dioxide concentration levels in the atmosphere will reach 550-600 particles per million by 2050 or sooner – driving global temperature to over 3°C above pre-industrial levels.

At 2°C and over, climate change will seriously affect ocean acidity and could also release natural stocks of carbon from soil or permafrost, further intensifying atmospheric levels of greenhouse gases and resulting climate change. Southern and Eastern Australia will become progressively dryer and warmer, with significant falls in water yields and rainfall. Australia will also experience some coastal inundation, almost total loss of its alpine ecosystems, extensive coral bleaching and loss of wetlands and rainforests. In other words, a business-as-usual approach to greenhouse gas emissions will have serious, irreversible impacts on the way we live, develop and produce in the future.

Over the last 12 months, the international consensus has extended to the requirement for an urgent global response now to avoid the worst impacts of climate change. Globally, we have only 10-20 years to stabilise emissions before potential runaway climate change sets in. What we do over the next 2-3 decades will not do much to mitigate the climate change that will occur over the next 30 years, but can do much to mitigate the worst effects of climate change by 2100. Responding to climate change is clearly a three-pronged approach – **act** now, **abate** greenhouse gas emissions and **adapt** to climate change.

Climate change poses new challenges and solutions – it also requires new ways of doing and thinking. Equally, many of the solutions to greenhouse gas abatement in energy technology and transport are already there. It is clearly possible for those of us, especially in the developed world, to rise to the climate change challenge. We are the primary emitters of global greenhouse gas emissions. We are also the most capable of initiating urgent and strategic responses to prevent further climate change by changing the way we behave and develop. We in the developed world have a growing responsibility to find the solutions – technology, products, services and instruments – that can assist in the global transition to a low-carbon, climate adept future.

Part 1 presents a summary of the report's findings and the subsequent recommendations for action by Council over the next 6 months. The findings include –

- the global scientific and economic conclusions on the effects of climate change,
- Council's commissioned report on the local effects of climate change, and analysis of the municipality's greenhouse gas emissions and water use
- the emerging global policy and instruments – directions for Local Government collaboration and advocacy
- a series of recommendations for Council to consider and initiate within the next 6 months.

1.1 The Global Scientific & Economic Conclusions

Part 2 of this report presents a comprehensive summary of the current scientific and economic indicators and conclusions on global warming and climate change. In particular, it focuses on the following three:

- o The latest assessments and interpretations by the scientific world authority – the Intergovernmental Panel on Climate Change (IPCC) – in the draft *4th IPCC Report* (final to be released from February 2007). The IPCC has provided an essential foundation stone in interpretation and understanding of global climate science and developed increasingly exacting measures for climate change estimations into the future.
- o The most comprehensive global economic review to date – *the Stern Review* – released in November 2006. A watershed in cutting through the scientific evidence to its ultimate implications (with regard to risk and uncertainty) on government and economic policy.
- o The outcomes of the last United Nations *Convention of Parties on Climate Change* (UNFCCC 12th COP) held in Nairobi in December 2006. COP allows the collaborative agreements of national governments in setting global policy, regulatory and development instruments for future global directions. COP agreements and protocols are likely to become an increasingly urgent and necessary responsibility for all nations.

The findings and conclusions of all three (presented in Part 2) are convergent and clear – our burning of fossil fuels is heating the planet fast, and this global warming will profoundly change the planet and climate within the next 15-30 years. This will have serious impacts and consequences on growth, development and vital resources unless we act now.

We are already experiencing some of the impacts of climate change through increased storm patterns, reducing rainfall and droughts. Significantly however, we are currently being buffered from the real impacts because our natural systems are still functioning well enough to absorb Co₂ (carbon dioxide). Many of these natural systems, critical climate regulators in themselves, are now showing increasing signs of stress, leading to less capacity to absorb Co₂ and support climate regulation. As a result, we are starting to experience rapid climate change.

Climate impacts we are increasingly likely to experience within 10-20 years include reducing water and rainfall availability, variations and reductions to crop production, total collapse in some fisheries, increasing loss of marine and terrestrial ecosystems such as coral reefs, wetlands and rainforests. Some of these ecosystems are, in themselves, vital support components in climate regulation. The diagram that follows demonstrates the resulting flow-on effects of climate change on people, the planet and productivity as global temperatures rise.

The latest research and evidence suggest that the threshold for irreversible impacts and consequences of climate change will come when Co₂ levels in the atmosphere reach 550 ppm (parts per million) – about double their natural levels. At current emissions rates, this is predicted to happen by around 2040-50. All three – the IPCC Report, Stern Review, and the Convention – suggest that if we take **action immediately** to significantly reduce greenhouse gas emissions, this might allow mankind to hold atmospheric Co₂ levels at around 450 ppm.

At Co₂ levels of 450 ppm, we face about a 2°C rise in temperature from pre-industrial levels. In 2006, we were at 381 ppm and on the current trajectory of greenhouse gas emissions, are likely to reach 450 ppm by 2025-30.

There is a growing consensus for stabilising climate change at 2°C above pre-industrial global average temperatures by 2050. This is, in part, because current emissions and climate changes suggest an inevitable rise of 2°C. A 2°C temperature rise will have profound effects on water supplies, food production, and the planet's ecology while also triggering more extreme weather events. Despite these impacts, this stabilisation target will avoid the worst impacts of climate change.

This means acting now to **reduce global greenhouse gas emissions by the equivalent of about 75% of current emissions by 2050** (25% reduction on current levels by 2050 in the context of a growing world economy by 2050). This level of abatement is an unprecedented challenge that is only the necessary first step to mitigating further global warming. It also means taking immediate **adaptation action** to invest in, and foster, the tools and technology for as smooth a transition as possible into a climate-adept future. The Stern Review recommends acting now **at a cost of around 1% global GDP per year, now and forever, and a 2-5-fold increase in low-carbon technology investments**.

Greenhouse gas abatement and climate adaptation is a **current and long-term responsibility** because over half of human-induced greenhouse gas emissions live for a long time in the atmosphere. This means the extent of action now will only really provide benefits in climate regulation in a few decades.

Global Warming & Resulting Flow-on Effects of Climate Change (Action Now & BAU Approach)						
0°C	0.5°C	1°C	2°C	3°C	4°C	5°C
Ghg Emissions	Action now to permanently stabilise at 2°C higher = global Ghg abatement of around 75% below current levels, by 2050. Abatement effects not felt until after 2060.			Action here = Zero global Ghg emissions now to stabilise at 3-4°C higher for at least 150 yrs. Runaway climate change impacts will continue & intensify for longer than that.		
Water	Water supply & availability decreases in many regions. Falling rainfall in some regions		Significant decreases in water availability. Total collapse of many inland freshwaters			
	Moderate to significant decreases in rainfall in many dry regions.		Desertification increases & accelerates. Declining water quality in many regions.			
Food	Possible rising yields in some high latitude areas.	Falling crop yields in some developing areas		Falling yields in many regions, 15-40% reduction in global crop production. Total collapse of many dryer crop regions		
	Krill decreases (ocean food chain).	Ocean health in moderate decline with significant loss of sensitive ecosystems, & sudden loss of parts of the ocean food chain.		Widespread famine in many regions		
		Increasing food shortages & famine.		Ocean health & food chain irreversibly affected.		
Global GDP	BAU = at least 5-35% decrease in global GDP, now & forever			Abatement investment now = spiralling costs & relatively ineffective		
	Abatement investment now = at least 1% decrease in global GDP forever.			Abatement investment now = at least 20-40% reduction in global GDP forever & less effective.		
Rising Sea & Storm/ Tide Surge	Inundation & human displacement of low-lying islands/regions.		Increased salinity 'creep' inland, affecting coastal human settlements & ecosystems irreversibly.			
	Increased storm surge damage to coastal settlements, ecosystems & infrastructure		Flooding & inundation of most low-lying regions			
	Tidal flooding of some densely populated & built-up cities/regions.		Coastal erosion accelerates in built up areas			
Extreme Weather	Increasing magnitude of 1-off snowfalls, rainfalls, avalanches, hurricanes etc.		Significantly increased likelihood of widespread devastation of regions vulnerable to extreme weather.			
Human Health	Rapid spread in diseases like malaria					
	Increasing spread of water-borne diseases					
	Increased respiratory & cardiac difficulties					
	Increasing malnutrition in many regions.					
Ecosystems & Species	Extensive bleaching of coral reefs		Rapid species extinction & ecosystems collapse.			
	Profound impacts on polar ecosystems & species		Sudden extinction of many alpine & marine species/ecosystems			
			Many coastal ecosystems become too saline.			

The inevitable temperature rise of 2°C is now an international aspiration to stabilise atmospheric Co2 at 400-450ppm by 2050 .

1.2 The City of Port Phillip's Primary Climate Challenges

Part 3 of this report provides a comprehensive summary of findings on the local pressures on, and impacts of, climate change for the City of Port Phillip. Specifically, they comprise of –

- o An analysis of the municipality's greenhouse gas emissions and water use, completed in December 2006
- o A case-study report of the anticipated local impacts and consequences of climate change by **NATCLIM** (research team commissioned by Council), completed in December 2006

Together, they provide some clear data and information on the greenhouse gas abatement and climate change adaptation challenges faced by the City of Port Phillip. The conclusions are presented as follows.

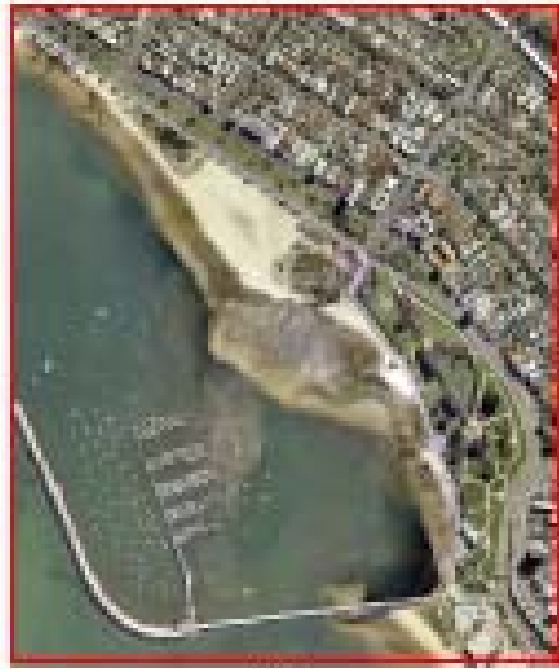
1. Our regional **climate is getting hotter and dryer**, and we are more likely to experience drought and heatwaves, as well as increased use of the City's recreational facilities, parks and beaches
2. Our **City's greenhouse gas emissions have risen** by almost 20% averaged across all sectors) in the last decade. Emissions from both stationary and transport energy is rising across all sectors of the community. We use almost 40% more energy than the OECD average per household. This rise, despite Council and stakeholder advocacy and programs to the community, is in part because while the community has become more energy efficient in some ways, these efforts are neutralised by a commensurate jump in energy use (through energy intensive appliances, materials and lifestyles).
3. We have **done little to move toward a low-carbon future** and still predominantly use brown-coal fired electricity and fuel inefficient vehicles.
4. Our **City's potable water use has decreased** by 20% since 2001 (averaged) across all sectors of the community; however, we still use 30% more than the OECD average per household.
5. Over the last decade, **average annual rainfall** has been over 100 mm below the Melbourne average (539 vs 655mm p/y) and **likely to decrease by almost one third (465mm p/y) by 2050**. Melbourne's average water yields (tap water) have been 30-60% below average over the last decade, and **total available water yields are likely to fall by upto 25% by 2050**.
6. In collaboration with state and federal agencies, we will have to **develop planning and building frameworks and zoning conditions that require sustainable (especially energy and water efficient) AND climate-adept built form**.
7. Increased building mass decreases permeability and increases stormwater pressures across the municipality. Our onsite development frameworks provide for some permeability and stormwater amelioration, however, **planning policy may have to be assessed in order to increase onsite permeability and stormwater reticulation capacity across the municipality**.
8. In collaboration with other stakeholders, we will have to **assess our current infrastructure for capacity in increased storm weather, flooding as well as increased and prolonged hot conditions**, particularly our stormwater and drainage management frameworks, road materials, and power supply infrastructure.
9. The development of open spaces and sites **will need to use water sensitive urban design** to increase permeability, provide stormwater calming and increase the quality of stormwater discharge.
10. We will have to **develop parks, open spaces and gardens that are increasingly drought tolerant and water-wise**.
11. We will have to **consider the effects of coastal inundation and sea rises** on:
 - a. **Foreshore** buildings, infrastructure and recreational activity
 - b. **Beach quality** and erosion, **beach pollution** and debris
 - c. **Coastal reserves, parks, vegetation and wildlife**.

12. Our topography and placement along the coastline means that we are more **likely to have saltwater damage to beachside public spaces and infrastructure.**
13. We will have to **consider the development/revision of local and regional drought, flood and emergency response management plans.**

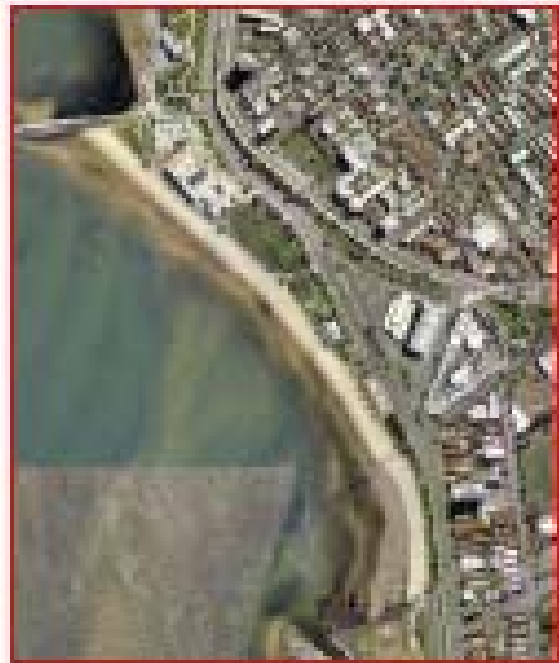
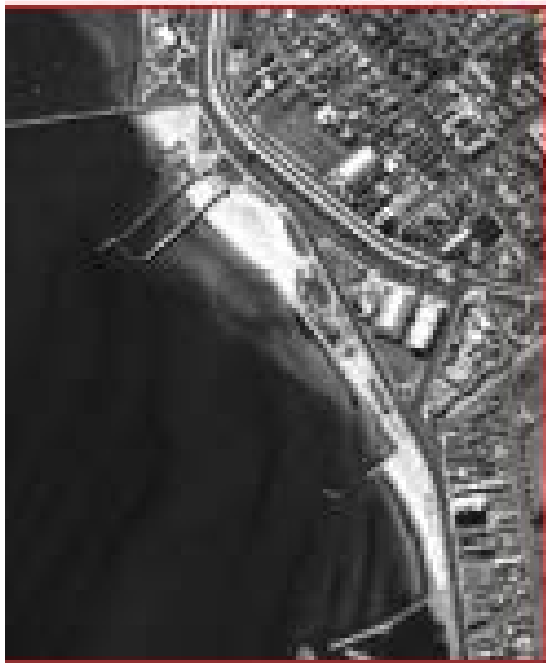
The image below demonstrates aerial views of beach erosion that has occurred on St. Kilda Beach over the last 40 years.



1974



2004



1.3 Emerging Advocacy & Regional Collaboration Priorities for The City of Port Phillip

The findings and conclusions of both the global and local analyses of the effects of climate change suggest a clear agenda for abatement and adaptation from now for the City. Because climate change is a global phenomenon and its effects are variable by region, Cities and Shires are faced with new challenges and parameters in forging collaborations and alliances to advocate for good federal and state policy and instruments, as well as to leverage investment and innovation in local abatement and adaptation action.

Part 4 of this report provides a series of international, national and state priorities and instruments that provide opportunities and considerations for Council in its advocacy and regional collaboration directions. The following is a summary of the emerging ethical principles, instruments of abatement and adaptation, national and state policy with regard to climate change. They are followed with **recommendations on approaches to advocacy and regional collaboration for Council to consider**.

1. The primary **ethical principles for climate change action** come from the first *United Nations Conference on Environment and Development (UNCED)* or Rio Earth Summit in 1992. This conference set the Convention on Climate Change, initiated Agenda 21 – the blueprint for sustainability, and instigated the international agreements and protocols processes that led to outcomes such as the Kyoto Protocol. The following two principles are emerging as critical to how Local Governments approach their policy and strategy with regard to greenhouse gas abatement and climate adaptation.

- o The Precautionary Principle – to take a responsible and long-term view to preventing the degradation and destruction of our living systems, natural and social capital; to become change-adept and risk-adept in finding new solutions and ways to prevent irreversible damage to our natural and social capital
- o Inter and Intra-generational Equity – to equity between and within generations, current and future; to responsible and efficient resource use; to sufficient social capital; to wearing the cost of unsustainable development and polluted environments.

The City of Port Phillip will apply these principles in its primary approaches to implementing and finding solutions to greenhouse gas abatement and climate change adaptation in its City and globally.

2. The **International Instruments of Abatement and Adaptation** that have evolved from international and United Nations efforts include -

- o The likelihood of increasingly stringent global greenhouse gas abatement targets
- o Carbon pricing
- o International and national regulations on products and technology standards
- o Deployment and development of low-carbon energy technologies and products
- o Investment that factors in the costs of carbon and low-emissions options
- o Emissions trading.

Together with other Local Governments in Australia and internationally, the City of Port Phillip will consider its role and capacity to fully apply and participate in all of the above instruments of greenhouse gas abatement and climate adaptation. The primary context will be enabling the City and community to become low-carbon and climate-adept in a proactive, equitable and precautionary way.

3. Globally, Australia is uniquely placed in being both rich in carbon-based energy and uranium deposits, as well as being blessed with abundant renewable energy capacities (solar & wind). Australia is also poised to face more extreme effects from climate change than many of its Northern Hemisphere counterparts. To date, **the Australian Federal response** to climate change has been poor, does not consider the imperative for significant greenhouse gas

abatement within the next 15-20 years. Nor does it offer consistent national policy on a low-carbon and climate-adept future for Australia. In particular, there has been a failure to:

- o Develop a national bipartisan Energy Policy for a transition to a low-carbon future
- o Recognise the critical role of greenhouse gas abatement in reducing the long-term effects of climate change
- o Introduce stringent and timely greenhouse gas abatement targets for Australia
- o Provide research and investment to develop Australia's capacity in low-carbon energy technologies and energy efficient products for itself and to market to developing nations
- o Provide economic and regulatory instruments to foster and enhance business and industry confidence in developing new energy technologies and markets
- o Address climate change adaptation for the particular risks facing Australia.

The City of Port Phillip will, in collaboration with other Local Governments and sectoral stakeholders, advocate to the Federal Government of Australia to urgently and strategically develop, set and act on national abatement and adaptation measures.

4. Primary tenets of **Australia's national, regional and local climate action plan** would include -

- o A Coalition of Australian Governments (COAG) long-term, low-carbon energy policy
- o Significant greenhouse gas abatement
- o Low-carbon energy sources
- o Addressing reduced water availability and inflows, and their effects on all sectors of the community
- o Climate adaptation.

The City of Port Phillip's Climate Action Plan will actively pursue all of these considerations in enabling and fostering local, regional and international approaches to a low-carbon and climate-adept City.

5. **The Victorian Government** has introduced a number of greenhouse gas abatement, water conservation and climate change adaptation strategies, which are provided in Part 4. These begin to set some regional basis and instruments for engagement and collaboration with Local Governments.

The City of Port Phillip will, in collaboration with other Local Governments and sectoral stakeholders, seek cooperative investment, resources and action with the Victorian Government to adopt and accelerate mechanisms, instruments and programs that enable greenhouse gas abatement and climate change mitigation in the community, and in state planning and development policy.

1.4 Recommendations – Climate Impacts Assessment and Action Plan 2007

The combined global and City of Port Phillip's climate footprint analyses and the resulting climate challenges and recommendations provide for a series of emerging actions to be considered and undertaken to become a low-carbon, climate adept City and community.

Part 5 of this report synthesises these findings and emerging priorities into a series of recommendations or outputs for Council to consider.

In the first instance, these 17 recommendations are offered for an initial action plan of assessment and actions to be implemented or completed by the end of 2007. Some of these include current actions, assessments of, or consideration for enhanced efforts in current actions. Others are assessments or considerations for Council to implement over 2007, ahead of the development of specific climate adaptation actions and planning for their resourcing.

Many of these outputs also rely on Council's capacity to advocate for and leverage stakeholder collaboration, investment and innovation. **The statements for consideration provided in 1.4 (section before) are for application in the consideration of each of these recommendations.**

The key recommendations outlined below cover three primary directions for the City and community – greenhouse gas abatement, water conservation and climate adaptation.

Greenhouse Gas Abatement & Water Use Reductions

1. Council will work with key state, federal and regional stakeholders to gain the following outcomes across the municipality by 2020, as outlined in its *Sustainable Environment Strategy 2007* -
 - o 50% reduction in **community greenhouse gas emissions** by 2020 (from 2000 levels)
 - o 50% reduction in **community water use** by 2020 (from 2000 levels)
2. Council will initiate a Community Climate Campaign to manage community concerns and expectations regarding climate change, as well as enable community capacity in greenhouse gas abatement and climate adaptation. (A draft outline of this action is provided as an example in **Appendix 3**)
3. Council has set the following targets for its **corporate activities** in its *Sustainable Environment Strategy 2007* –
 - o Zero greenhouse gas emissions by 2020
 - o 70% reduction in potable water use by 2020 (on 2000 levels)
4. Enhanced efforts to develop **energy efficient facilities, infrastructure and street lighting** through Council's *Energy Management System*
5. Enhanced efforts to develop **sustainable transport modes and infrastructure**, in collaboration with key stakeholders
6. The development of a Council strategy to move toward onsite, grid-connected **renewable energy generation** for its buildings and facilities
7. Enhanced efforts to use **recycled water and stormwater for irrigating** public parklands, reserves, parks & gardens, in collaboration with key stakeholders
8. Enhanced efforts to develop **water-wise and drought-tolerant** parks, gardens, reserves and water management systems
9. **Water-sensitive urban design** in all council developments and redevelopments and planning requirements.

Climate Adaptation -

10. **Expansion of the scope of NATCLIM** regionally to the Association of Bayside Municipalities (ABM) to provide the following primary outputs –
 - o Comprehensive local climate data, modelling and research across Port Phillip Bay over the next 4 years
 - o A Local Government climate risk assessment tool to strategically identify priorities & develop solutions
 - o Regional and national collaboration to achieve the other recommended outputs.
11. An **assessment of Council infrastructure** with regard to capacity to be climate-adept – this includes Council's stormwater and drainage systems, road infrastructure in identified risk areas such as coastal roads and low-lying areas, and coastal public amenities
12. An **assessment of Council assets** with regard to capacity to be climate adept – this includes most of Council's public buildings, coastal parks and reserves, and recreational facilities along the foreshore.
13. An **assessment of Council's management plans and contracts** with regard to managing climate change impacts, particularly in - drought management, beach cleaning and maintenance, vegetation management, site development or redevelopment.
14. Enhanced efforts to gain **changes to state planning policy for sustainable and climate-adept built form** through the planning and zoning process. Consideration of the **development of a planning tool** that works side-by-side with the STEPS/SDS tool to assist all developments, redevelopments & renovations in the municipality to become more sustainable and climate-adept.
15. **Water sensitive urban design** to develop a City with increased permeability, reduced water needs, & climate adept systems & infrastructure
16. An **assessment of the local economic and social effects** of climate change with regard to primary Council Units such as Business & Tourism and Aged Care Services.
17. Increased efforts to **regionally advocate for and collaborate on climate change action** through Council's current regional Local Government fora such as IMAP (Inner Melbourne Action Plan) and ABM (Association of Bayside Municipalities).

Plan for the Proposed 2007 Climate Action Plan

These 17 recommendations form the current sum of climate impact assessments that need to be performed on current Council activities as well as in consideration of emerging activities. The scope of assessment is offered as a *Climate Impacts Assessment & Action Plan*. It is proposed that within the next 6 months, Council consider the following implications for each recommendation -

- The current capacities of a system, process or activity (eg. stormwater management plan) to cope with the likely local consequences of climate change
- The additional requirements or actions for this activity to become climate-adept and/or low/no-emissions
- The policy, legislative, strategy and cost implications of acting on each recommendation.

This scope of assessment will have to be initiated with a cross-Council consultation process that allows relevant business Units to gain an understanding of the perimeters of local climate impacts and consequences on Council's responsibilities and core business. This allows the above *Climate Impacts Assessment and Action Plan* to lead on to the provision of comprehensively assessed and planned implementation frameworks for Council's abatement and adaptation actions from 2008 onward.

Part 2 - The Case for Action

Part 2 provides an overview of the science and economics of global warming and climate change, and their flow-on effects on people, the planet and productivity. It also includes the outcomes of the recent United Nations 12th Convention of Parties to Climate Change. It provides the evidence for why climate action must be taken now.

The Climate is Changing

Climate conditions have always been critical to where and how humans live, produce and consume.

There is now strong international consensus that climate change is happening. We humans have directly altered the way global climate works through the unprecedented release of greenhouse gas emissions. Increased emissions have led to a change in the composition of the atmosphere, resulting in increased global average temperatures especially in the last 30 years.

At a 0.7-0.8°C temperature rise since 1900, we are already experiencing some of the early impacts of climate change. The current climate change effects include reducing water availability and rainfall, increasing heat and drought periods, increasing storm events, rising sea levels with some low-lying islands threatened with inundation, and ocean health declining.

2.1 The Science of Climate Change

Doubling of carbon dioxide levels in the atmosphere between 1950-2050 (to 550 parts per million) has the potential to heat our planet by as much as between 3-6°C in the same period.

Intergovernmental Panel on Climate Change

The climate change reports of the Intergovernmental Panel on Climate Change (IPCC) are the primary foundation of our understanding of climate science. The IPCC's international scientific consensus is the result of over 30 years of collected data, measurements and analysis by about 2000 regional groups of scientists. The data is then developed into a global climate change report once every 5 years.

The IPCC's 3rd Report (2001) and 4th Report (2006/7) provide clear evidence that climate change is happening, and accelerating. The following covers the primary data and estimates on greenhouse gas emissions, global warming, and the resulting climate change indicators. It then provides an assessment of their impacts and flow-on effects on people and the planet.¹

Co-relation between Greenhouse Gas Emissions & Global Warming

Carbon dioxide (Co2) and other greenhouse gases allow sunlight to come into the atmosphere while also retaining some of the outward radiation from the Earth's surface. This warms the atmosphere, with the long-term, constant temperature (about 14°C) having been very conducive to human health, prosperity and welfare for over 10,000 years.

Increased Co2 in the atmosphere admits additional heat, which warms the atmosphere further. This additional Co2 also traps radiative energy - the energy radiated back to space from the earth's surfaces - thus creating a positive feedback loop which forces the Earth's temperature upward.

¹ All data and estimates provided in this section are sourced from IPCC 3rd Climate Change Report 2001, World Meteorological Organisation Report 2005, Nicholls & Collins 2006, and CSIRO modelling and data for Australia.

Effectively, rapid increases in greenhouse gas emissions over a short period of time are in turn, quickly increasing average surface temperatures on Earth.

Co₂ is also very long-lived in the atmosphere – around 56% of all human-induced Co₂ is still present in the atmosphere. In other words, over half of all greenhouse gas emissions produced today will still be in the atmosphere in 100-150 years. Equally, anything we do today to abate greenhouse gases will not begin to take effect until a few decades from now.

Greenhouse Gas Emissions

TRENDS IN GHG EMISSIONS & CO ₂	1990	2005	2025	2040	2050
Atmospheric Levels of Co ₂ (ppm)	340 ppm	381 ppm	450 ppm	500-550 ppm	600-650 ppm
Global Ghg Emissions (Gt C/yr)	37	45	55	75	83

Atmospheric Co₂ levels did not exceed 280-300ppm (parts per million) for most of the last 650,000 years, including cyclic warming periods between ice ages. However, there has been a steady rise since the post-industrial era, rapidly increasing over the last 30 years, with Co₂ concentration levels in the atmosphere at 381ppm in 2005. If we were to continue on a business-as-usual approach, it is estimated that Co₂ concentration levels in the atmosphere will exceed 600ppm before 2050 (or double within 100 years).

Global greenhouse gas emissions were 42 billion tonnes of Co₂-e in 2000. The primary sources are: Fossil fuels to generate electricity – 24%; Transport fuel – 14%; Industry – 14%; Agriculture – 14%; Changes in land use (primarily deforestation) – 18%; Buildings – 8%.

Australia contributes to 2.2% of greenhouse gas emissions globally. Australians are the largest per capita emitters of greenhouse gas emissions in the world today at 28tonnes Co₂-e p/y per person; over 25% more than the average American, the next biggest per capita emitters.

Global Warming

The Earth has already **warmed by an average of 0.7-0.8°C since 1900**. However, this rise has not been evenly continuous. Since 1976, the rate of warming has increased at an average of 0.18°C per decade, with the 1990s being the warmest decade at an average of 0.38°C (Northern Hemisphere) and 0.23°C (Southern Hemisphere) respectively. To put this in perspective, Northern Hemisphere measures of temperature over 1000 years demonstrate that for most of that period, cyclic warming of temperature has never increased by more than 0.1°C.

ACTUAL & ESTIMATED DEGREE OF GLOBAL WARMING - 2005-2100				
Global Average Temperature Rise	0.7°C higher (since 1900)	0.5-1.2°C higher	1-2.5°C higher	1.4-5.8°C higher
Year	2005	2020	2050	2100

Stronger climate science modelling over the last 5 years, coupled with the rapid increase in global average temperature over the last decade have led to the recent scientific consensus that there now a greater risk that the upper end of the estimates for 2050 and 2100 will be reached or exceeded by those dates. This means that we will see increased climate change impacts, regardless of the extent of action taken now and in the next 20 years. This also means that we are at a greater risk of reaching or exceeding the upper range estimates of temperature rises, and sooner than expected.

Since 1950, Australia's average maximum temperatures have risen by 0.6°C and average minimum temperatures have risen by 1.2°C. Between 1910-2004, the average surface temperature in Australia increased by 0.9-0.2°C greater than the average global increase in temperature.

Australia's contribution to global warming is estimated at about 1.5%.

Observed and Estimated Climate Change

As a result of global warming, our climate is changing.

While temperature itself is a gauge of warming, there are several other indicators or 'canaries' of climate change. Most of these climate canaries are, in themselves, critical regulators of climate. They include our polar icecaps, the ocean, ecosystems such as wetlands, rainforests and alpine glaciers. Rising temperatures significantly affect them. In turn, these climate indicators both demonstrate the effects of climate change as well as further compound global warming.

The diagram that follows provides the primary climate change indicators resulting from global warming and increasing greenhouse gas emissions.

Climate Indicator	Trend	Explanation, Actual & Estimated Rises
Ocean Warming	↑	Global ocean heat content has increased by the equivalent of average warming of the entire ocean by 0.037°C . The sea surface temperatures of all major ocean basins have demonstrated warming anomalies at an increased rate, particularly between 1961- 2000. Ocean warming - 1950, 2000, 2050, 2100 (IPCC) or Predicted and Observed sea surface temperatures 1940-2004 (IT-pg79)
Polar ice, Glacial & Ice Melt	↑	Almost all of the world's glaciers are melting, many rapidly in the last 50 years. The total surface area of glaciers globally has decreased by 50% since 1900 . The Arctic and Antarctic have also been losing ice shelves and sea ice at an increasingly high rate. The extent of Antarctic sea ice, stable from 1840-1950, has decreased by 20% in the last 50 years. Since 1979, over 20% of the Arctic polar ice cap has melted away.
Sea Level Rise	↑	There has been a global average sea level rise of 19.5cm between 1870-2004 . The rises recorded over the last 135 years contrast with the previous 6000-7000 years during which sea levels have either been stable or fallen slightly. Estimated average global sea level rise - 6cm by 2030, 13.5cm by 2050, and 28.5cm by 2100.
Ocean Acidity	↑	Up to one-third of all greenhouse gas emissions sink into the ocean, which has impacts on the acidity levels of the ocean. The PH of the ocean is an essential regulator of ocean health. There has been a ph decrease of 0.1 units (to 8.2) since 1975. Estimated average decrease in ocean PH (increased acidity) - 0.5 units (7.7) by 2020 and by 1.5 (6.7) by 2050.
Average Precipitation	↑	Globally, the amount of overall precipitation has increased by almost 2% in the last 100 years . Critically however, global warming also relocates the resulting rainfall and snowfall from increased precipitation. In short, rainfall is now appearing at different times, frequencies (up and down), and regions than previously experienced. In some parts of the world, there has been a significant decrease in precipitation over the last 100 years. Southern Australia has experienced decreasing precipitation, and this trend is set to continue.
Average Evaporation	↑	Warmer global temperatures also increase the rate of evaporation from soil and vegetation. In short, warmer temperatures lead to less moisture retention, more evaporation and less condensation on surfaces and in the air, in turn leading to dryer terrestrial and atmospheric conditions in many regions of the world.

In effect, the global warming that has already occurred is having a noticeable impact on some of the critical regulators/indicators of climate. Global warming is also accelerating. This could profoundly change the Earth's entire climatic patterns.

Significantly, global climate is non-linear – climate change is not gradual. While science can calculate the climate impacts and their sources to date, then extrapolate estimations based on current climate behaviour, climate science contains the uncertainties of not knowing the total 'tolerance' (carrying capacity) of a climate regulator such as polar ice and ocean acidity. In short, the Earth's climate is sensitive - some aspects of climate change can come suddenly, and with greater intensity, than anticipated. Taking action now to become climate-adept and abate greenhouse gas emissions also assists in reducing the long-term risks associated with climate change uncertainties.

A further factor of climate change that science has recently discovered is that climate effects and global warming may be compounded – global temperature and its effects on the climate's critical regulators (like polar and sea ice and ocean levels) seem to be accelerating, more than explained by just increased greenhouse gas emissions levels in the atmosphere. Moreover, these have further flow-on effects; for instance the danger of the Gulf Stream shutting down its regulation of warm and cold ocean currents. In other words, small changes in climate can significantly compound the magnitude of change because of the increased temperatures and the resultant reduced effectiveness of climate regulators.

The diagram that follows looks at the impacts of climate change in two areas – the climactic and geographical impacts on the planet, and the flow-on effects or consequences on people and ecosystems. It largely does not factor in the uncertainties of compounded climate change as explained above.

Impacts & Likely Flow-on Effects from Climate Change

Indicator	Climate Impacts	Likely Flow-On Effects
Ocean Warming	<p>Increased storms, floods and extreme weather events – The frequency & strength of storms in both the Atlantic & Pacific have increased by 50% since the 1970s. There is now increased likelihood of rain instead of snowfall in spring (reducing vital summer inflows). The last decade has seen an increase in floods, big one-time rainfalls and snowfalls, & extreme weather events on every continent.</p> <p>Reduced ocean health - Extensive bleaching of up to 20% of the world's coral reefs, and a rise in 'dead ocean zones' and algae blooms over the last decade.</p>	<p>Increased downpours, snowfall, storms, extreme weather and flooding.</p> <p>Damage to buildings, infrastructure, agriculture and some ecosystems.</p> <p>Reduced rainfall and water availability in some regions.</p> <p>Ocean food chain & marine ecosystems affected.</p>
Polar Ice Cap, Permafrost, Glacial & Ice Melt	<p>Rising sea levels (see below)</p> <p>Reduced reflective ice surfaces at the poles - This not only further warms the Arctic and Antarctic because they are now smaller, but increases the intensity of global warming.</p> <p>Changed patterns of freshwater flow – Changes in the overall volume of snowfall and earlier seasonal melts lead to peak runoffs now occurring much sooner. This increases potential flooding and avalanches. Equally, not enough runoff is available for mid-summer, when the water is most needed. Reduced freshwater inflows and sources will mean reduced water supply in many parts of the world.</p>	<p>Inundation of low-lying islands and regions.</p> <p>Decreasing water availability and inflows to many inland areas.</p> <p>Decreased krill and fish production, leading to effects on ocean food chain.</p> <p>Threats to polar habitats, species, ecosystems and migratory birds.</p> <p>Increased global warming</p>
Sea Level Rise	<p>Sea and tide surge – The primary impacts of sea level rises do not result from the gradual rise, rather from the associated erosion, exacerbated storm surges & storm tides. Storm surges and storm tides are potentially destructive to coastal regions, with sea level rise and higher ocean surface and atmosphere temperatures likely to exacerbate their magnitude, intensity and frequency.</p> <p>Coastal Erosion - Coastal erosion is a natural process, which is likely to be accelerated by sea level rise & further exacerbated by storm surges & storm tides.</p> <p>Coastal inundation & Tidal river flooding – The primary impacts include erosion and siltation of coastlines and increased inundation risks coastal cities and cities with large tidal rivers</p>	<p>Inundation of low lying regions.</p> <p>Increased erosion in built-up coastal settlements and ecosystems, leading to damage.</p> <p>Flooding of some cities.</p> <p>Increased salinity creep inland – affecting infrastructure, buildings, vegetation and ecosystems.</p>
Ocean Acidity	<p>Rising ocean acidity will significantly affect some species and organisms in the ocean food chain especially crustaceans.</p> <p>Scientists are also concerned that as the ocean warms and its acidity levels rise, it will be less effective in absorbing carbon. That means that a primary greenhouse sink is being affected.</p>	<p>Reduced production & sudden drop-off of essential parts of the ocean food chain. Extinction of some marine ecosystems.</p> <p>Increased global warming.</p>
Average Precipitation	<p>Increased intensity and occurrence of storms and floods – Projections for Australia provide for an increase of between 5-70% in intensity of a 70-year event by 2050. CSIRO predicts a 5% increase in storm event rainfall per degree of climate warming. Storms and floods also increase the potential for soil erosion and loss of arable land.</p> <p>Increased drought conditions, dissipation of lakes and waterways and desertification – Some regions will experience dryer conditions with much less rainfall, which increases the potential for prolonged droughts and desertification, and higher dissipation of freshwater sources.</p>	<p>Varied rainfall patterns and frequency.</p> <p>Increased likelihood of storm events and floods.</p> <p>Lower crop yields, increased desertification.</p> <p>Increased risks of bushfire and fire damage.</p> <p>Increased dryland salinity.</p>
Average Evaporation	<p>Less Rainfall and Rainfall Retention, Less Water Availability and Increased Dissipation of Lakes and Waterways – Many regions of the world, including Australia, will have less water availability, less rainfall and increased dissipation.</p> <p>More Drought, Desertification and Salinity - These regions will also suffer more dry periods and the potential for desertification, which in turn, can increase dryland salinity. Fire-prone regions will have a higher risk of recurrent and extreme bushfires.</p>	<p>Reduced water availability</p> <p>Reduced rainfall.</p> <p>Rest as for precipitation effects.</p>

2.2 The Economics of Climate Change

The overall costs & risks of climate change without taking action will be the equivalent of losing at least 5-20% of global GDP each year – now & forever. In contrast, the cost of reducing emissions now to avoid the worst impacts of climate change can be limited to around 1% global GDP per year.

Sir Nicholas Stern, November 2006

In the last decade, there have been a series of assessments of the economic impacts of climate change, with the most recent and comprehensive being the **Stern Review**. Commissioned by the British Exchequer, it was prepared over a year by Sir Nicholas Stern, an internationally regarded economist, and released in October 2006.

The Stern Review looks at the global consequences of climate change as well as greenhouse gas abatement and climate adaptation action on:

- o **the planet** – impacts on ecosystems/species, resources and production capacity
- o **people** – impacts on water availability, agricultural productivity, food availability, disease and displacement
- o **the economy** - impacts on global per capita consumption under a business-as-usual scenario, pricing economic damage as a result of carbon outputs.

In short, its findings and conclusions point to the necessity for urgent and substantial action to abate greenhouse gas emissions, and the emerging policy foci. Whilst IPCC reports form the foundation stone of climate science understanding, the Stern Review takes it to the next level – implications on government and economic policy and decision-making. The Stern Review gives an international and regional focus on the scale and tools of abatement and adaptation required within the next decade. It has also set out a relatively sophisticated and comprehensive framework for the economic assessment of the effects of climate change.

The main findings, conclusions and recommendations of the Stern Review are as follows.

On the convergence between climate science and the economic impacts -

- o The Review describes climate change as the “greatest and most wide-ranging market failure ever seen”, and finds that presumptions of economic growth are no longer valid in view of climate change. Not addressing climate change immediately could lead to global economic upheaval on the scale of the 1930s Depression.
- o The current level of greenhouse gases in the atmosphere has ‘built into the system’ **an inevitable global average temperature rise of 2°C, regardless of the action taken now or in the future**. In other words, achieving a stabilisation level of 450 parts per million (ppm) is almost out of reach.
- o The risks of the worst impacts of climate change can be limited if greenhouse gas levels in the atmosphere are stabilised about 450-550 ppm Co₂ (equivalent to a 2-3°C rise). **Stabilisation in this range would require global greenhouse gas emissions to be at least 25% below current levels by 2050 - the equivalent of around a 75% reduction in current emissions across the OECD within the next 25 years**. Ultimate stabilisation, at whatever level, requires the annual emissions to be brought down to 60-90% below current levels for most developed nations.

On the economic effects of climate change -

- o **The economic damage caused by every tonne of greenhouse gas emissions currently emitted is estimated to be about US\$85.**
- o Slight warming may lift wheat and rice crop yields. **Beyond a 3°C temperature rise will produce increasingly negative effects**, with entire regions becoming unsuitable for crops. Parts of Australia, Africa, west Asia and the Middle East could lose between 15-35% of their main crops at a 3°C temperature rise. Increasing ocean acidity and sea surface warming is already affecting ocean health. On current projections for 2040-50, atmospheric Co₂

levels would be at least 550-600 ppm and would decrease ocean pH by 1.5 units – this could disrupt sea-life irreversibly, with dramatic knock-on effects on the ocean food chain.

- Doing nothing about climate change – **the business-as-usual (BAU) approach** – would lead to a reduction in global per capita consumption (GDP) by at least 5%-20%, now and forever.
- **If a wider range of risks and impacts is taken into account, the estimated reduction in global consumption per head is around 20%, now and into the future.** If direct impacts on the environment and human health are included, the estimate of the total cost of climate change increases to 5-11% of global GDP per year. If planetary sensitivity is factored in (eg. feedback effects increased), then the cost of climate change goes up to 14% of global consumption per year.
- All countries will be affected. The impacts of climate change are not evenly distributed and will affect the poorest countries and people earliest and most. This is despite more wealthy and developed nations being responsible for the majority of global greenhouse gas emissions. If the unequal burden was distributed more fairly, the estimate of the impact on GDP could rise by more than without such an adjustment.
- **In contrast, the costs of greenhouse gas abatement from now on to avoid the worst impacts of climate change can be limited to around 1% of global GDP by 2050 (essentially considerably higher for the next 10-20 years).** The costs of stabilising the climate are significant but manageable. Delay would be dangerous, much more costly, and less effective.

On abatement & adaptation policy and action –

- **“The need for action is urgent.... (and entirely dependent upon) the investments made in the next 10-20 years”.** Stabilisation is a major challenge requiring sustained, long-term action. It would already be very difficult and costly to aim to stabilise at 450-550 ppm CO₂-e (constitutes a 2-3°C rise in global temperature). Weak action over the next 10-20 years means that even the opportunity to stabilise at about 550 ppm CO₂-e (constitutes a 3-4°C rise in global temperature) might slip away.
- **Adaptation to climate change to build resilience and minimise costs in the next decade is essential. It is no longer possible to prevent the climate change that will take place in the next 20-30 years.** Adaptation will cost tens of billions of dollars a year in developing nations alone, and will put further pressure on already scarce resources. Adaptation efforts should be accelerated now.
- The extent of investment that takes place in the next 10-20 years to mitigate greenhouse gas emissions will have a profound effect on the climate in the second half of this century and in the next.
- **Tackling climate change is the pro-growth strategy for the longer term.** Action on climate change is required across all countries, does not cap the aspirations for growth in rich and poor countries, and will create significant business and market opportunities for new, low-carbon energy technologies, goods and services.
- **Three elements of policy for greenhouse gas abatement are essential** – a carbon price, low-carbon technological policy, and the removal of barriers to international change (behaviour, rogue nations). Leaving any one element out will reduce effectiveness and significantly increase the costs of action.
- **Actions should include –**
 - **carbon pricing** (through raising taxes, tougher regulation or carbon trading) to reflect the full contribution to emissions of a carbon-intensive action, and provide incentive to invest in low-carbon technologies
 - **new low-carbon technologies**, with an urgent need to find alternatives to coal and oil generated electricity, and a 2-5 fold increase in global investment and incentives in green technology (<> US \$34bn per year)
 - **robust international agreements** eg, on product standards, technology cooperation, adaptation development policy, emissions reduction targets
 - **halting deforestation** – a significant contributor to global greenhouse gas emissions.

2.3 UNFCCC 12th COP & 2nd MOP to the Kyoto Protocol

These statements (the 4th IPCC Report) will, I suspect, draw the most attention and the most political heat.

Dr, Geoff Love, head of the Australian Bureau of Meteorology & former secretary of the IPCC

The 12th Meeting of the Conference of Parties to the United Nations Framework for the Convention on Climate Change (UNFCCC 12th COP) and the 2nd Meeting of Parties to the Kyoto Protocol (MOP) took place in Nairobi in December 2006. It allowed the international community to discuss and set emerging international policy and strategy with regard to addressing climate change. The Conventions took particular notice of both the 4th IPCC Report on Climate Change as well as the Stern Review in considering agreements, instruments and protocol outcomes.

Primary outcomes included –

- o A consensus that a **2°C temperature rise is the aspirational target for climate change stabilisation**. This equates to seeking to limit the atmospheric levels of Co2 to 450ppm, and aligns with the Stern Review. **Effectively, it assumes that emissions will peak in 2010, followed by a 6-10% decline per annum thereafter. It endorses the need to dramatically cut our greenhouse gas emissions over the next 10-20 years to the equivalent of over 75% levels in 2000 within that period in order to stabilise Co2 concentrations in the atmosphere by 2050.**
- o Strong support for **legally binding targets and commitments** to address global greenhouse gas abatement and climate change
- o Increasing evidence that governments, businesses and environment organisations are responding to the Kyoto Protocol Frameworks
- o Achieving international consensus on a **Work Plan for analysis that will underpin new post 2012 commitments, to be completed by 2009**. This will avoid any gap between the first and second Kyoto Protocol Commitment Periods
- o Agreed to the **development of a substantive mandate to begin formal negotiations on post 2012 targets, with the qualification that this was an absolute necessity**. This will aid investment decisions particularly in low-carbon technologies and goods. (The Kyoto Protocol's first Commitment Period (CP1) is 2008-12 - a very tight timeframe for businesses to make investment decisions on assets that will last for 15 years or more. The absence of post 2012 targets creates a range of uncertainties about how all governments will go forward with climate policies, and has implications for international emissions trading schemes).

The primary conclusion resulting from COP & MOP for Australian governments and businesses is that climate change is no longer a fringe issue and **carbon constraints are now internationally accepted as the major factor in investment decision-making**. Australian businesses will also have to factor the cost of carbon into investment and development decisions in order to be globally competitive when the Kyoto Protocol's 1st Commitment Period begins next year.

As such, emerging issues for national and regional discussion and policy include –

- o setting stringent national greenhouse emissions reduction targets, ahead of international agreements and caps on greenhouse gas emissions
- o setting a cap on carbon through emissions trading or carbon taxes
- o developing a long-term, low-carbon energy strategy for Australia
- o developing a risk-adept climate adaptation strategy for Australia.

Part 3 – The City of Port Phillip's Climate Change Footprint

What gets us into trouble is not what we don't know, it's what we know for sure that just ain't so.

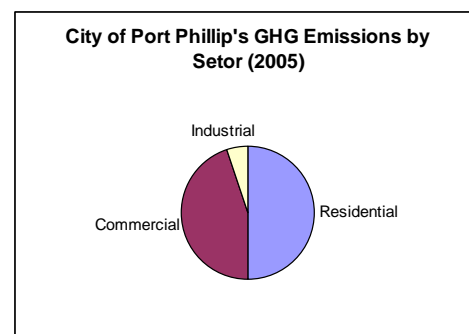
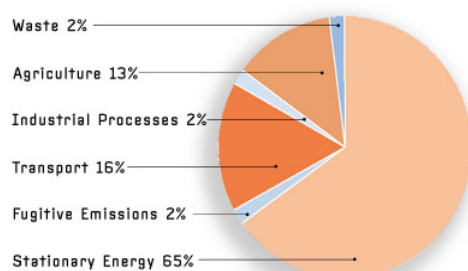
Mark Twain

Part 3 provides an assessment of the current and estimated future greenhouse gas emissions, water use and climate change issues that face the City. This assessment has then been analysed to identify the primary global warming and climate change risks facing the City.

This section concludes with the potential impacts of these findings for the City.

3.1 Greenhouse Gas Emissions in the City of Port Phillip

Victoria's Ghg Emissions by Sector (2002)



Victoria's stationary (gas and electricity) and transport energy use together form 81% of the state's total greenhouse gas emissions. As is typical for an inner urban municipality, the City of Port Phillip's stationary & transport energy use together form over 97% of the City's total greenhouse gas emissions, with the remainder from industrial processes & waste.

The City's greenhouse gas emissions from electricity by community sector is as follows – Residential 40%, Commercial 55%, Industrial 5% (2005). If emissions from transport & gas are included, total greenhouse gas emissions by community sector is estimated to be - Residential 50%, Commercial 45%, Industrial 5% (2005).

The City of Port Phillip produced approximately **1,867,649 tonnes of greenhouse gas emissions** from electricity (70%) and gas consumption (15%) and transport emissions (15%) in the 2005/06 financial year. This represents **an increase of approximately 32% (455,011 tonnes eCO₂) since 1996**. The City's per capita emissions is 21.4 tonnes of CO₂ per person per year, below the Victorian average of 24.7 tonnes of CO₂ per capita.

GHG EMISSIONS (VIC)	% INCREASE 1990-2006	Mt Co2-e
Stationary Energy (Electricity & Gas)	46.2%	21.8 Mt Co2-e more
Transport Emissions	16.4%	3.1 Mt Co2-e more
Domestic Electricity Use per VIC household	17%	1 tonne Co2-e more

While it is currently not possible to estimate what proportion of total electricity consumption is coal-fired, green power or another form of alternative energy source, about 80% of Victoria's electricity is produced from coal-fired generation. The City's electricity generated from fossil fuels can be assumed to be in line with this figure.

COUNCIL'S CURRENT CORPORATE EMISSIONS BY SECTOR (in tonnes equivalent carbon dioxide or e-Co2)				
Sector	Tonnes e-Co2 1996 (baseline)	Tonnes e-Co2 2005	% of total current Ghg emissions	% of total Ghg Reductions since 1996
STREET LIGHTS	8,357	6,716.4	49.5%	Decreased by 9.3%
BUILDINGS/FACILITIES	7,082	5,923	43.7%	Decreased by 6.7%
VEHICLES (FLEET)	894	937	6.8%	(Sector increase of 5%) --
TOTAL	16,333	13,576.4	100%	Total Decrease of 16%

Council's corporate emissions represent less than 1 percent of total greenhouse gas emissions across the municipality.

Council's greenhouse gas emissions grew by 18.7% between 1996-2000 (3.7% p/y average). Between 2000-2006, Council **reduced its greenhouse gas emissions by 16% (2,756 tonnes e-Co2 reduced permanently since 1996)**. At the end of 2005, Council's total Ghg emissions were 13,576.4 tonnes e-Co2.

In summary, the City now produces **28% more greenhouse gas emissions** from stationary and transport energy use than it did in 1996 (average growth of 2.8% p/y). 85% of this is from stationary energy emissions, 15% from transport emissions.

On current trends, **greenhouse gas emissions will double across the municipality by 2035** (on 1996 levels, including population rises).

The Primary Impacts and their Associated Risks from Increased Ghg Emissions

- o **Increasingly rapid global warming** as a result of unchecked greenhouse gas emissions
- o The **climate change effects** of a warmer planet, which are estimated to be more extreme for southern Australia.
- o **Urban energy use and energy loads** – Our lifestyles are energy intensive; our transport habits are greenhouse intensive; our buildings are not greenhouse friendly - thermal efficiency means higher energy use on warmer days, as well as winter heating, which places increased pressure on summer energy loads.

3.2 Water Use in the City of Port Phillip

As is typical for other inner urban municipalities, 68% of all water used in the City of Port Phillip is in the residential sector. The City's **total water use was 9,959,733 kilolitres in 2005/2006**.

Water Use (VIC)	% Decrease 2000-2005	Kilolitres
Water use per capita - Victoria	22%	81
Water use per Victorian household	17%	209
Water Availability (Melbourne)	% Decrease 1995-2005	Kilolitres/mm rain
Water Yield (inflows into catchments)	30-60% (drought exacerbates low yield)	555,000,000
Annual Rainfall (local/Melbourne)	16% (from 655-539mm p.year)	

The City of Port Phillip's **water use per person decreased by 17% between 2001-2005** (from 164kL to 136kL per household). This is largely as a result of water restrictions for 3 years and the Victorian Government's 'Save Water' campaign. In the same period, non-residential water use declined by 26% (1.1 gegalitres), one third of which came from water efficiencies introduced into Council's corporate operations.

COUNCIL'S CORPORATE CURRENT POTABLE WATER USE BY SECTOR (in Megalitres or MI) 1 MI = 1 million litres					
Sector	MI water use 00/01 (bs'line)	MI water use 03/04	MI water use 05/06	% total current water use	% total reductions since 2000
PARKS/OPEN SPACE	338 MI	171 MI	190 MI	59.0%	27.9%
SPORTS & RECREATION	69 MI	56 MI	61 MI	19.0%	1.5%
COUNCIL BLDGS	36 MI	27 MI	23 MI	7.1%	2.5%
PUBLIC AMENITIES	51 MI	16 MI	21 MI	6.5%	5.7%
PRIVATE-COPP PTR'SHPS	13 MI	11 MI	8 MI	2.5%	1.0%
OTHER (INCLUDING STH MELBOURNE MKT)	23 MI	14 MI	18 MI	5.6%	0.8%
TOTAL	531 MI	294 MI	322 MI	100%	39.4%
Please note - JL Murphy Reserve not included above because it is currently irrigated entirely with recycled water (Barry Bros – Telstra pit). Estimated site use – 6 MI pa.					

Council's **corporate water use forms 15% of the City of Port Phillip's total non-residential water use**, and includes all municipal parks, gardens, reserves, buildings, public amenities, median strips and some local sporting facilities. Council's water use **decreased by 39.4% between 2001-2005** (8% p/y average). This was achieved through the introduction of more efficient irrigation systems and watering regimes, and planting drought resistant species in parks and reserves.

In summary, the **City now uses 20% less water than it did in 2001**. However, **the City faces reduced rainfall and water yield of at least 25% by 2050**.

Water Availability to the City

Rainfall - In Melbourne, the last 10 years have recorded annual rainfall of over 100 mm below the Melbourne average (539 vs 655mm p/y). This is likely to decrease to 510 mm p/y by 2020 and to 465mm p/y by 2050.

Inflows to Catchments - Over the last decade, Victoria has experienced well below average inflows to reservoirs by between 30-60% (overall about 45% decrease on pre-1997 levels). Under a medium climate change scenario, Melbourne's potable water availability is estimated to fall by over 25% by 2050 (CRSWS). This means Victoria is increasingly experiencing both low inflows and perpetual rainfall deficits, thus increasing the potential for both drought as well as regional shifts to a new, drier and hotter climate.

The Primary Impacts and their Associated Risks from the City's Water Use and Water Availability to the City are:

- **Reduced water yield and rainfall** – Increased dependence on potable water during dry periods (spring and summer)
- **Reduced water quality** – Lower rainfall can progressively reduce the quality of stormwater entering Port Phillip Bay
- **Drier, less humid conditions** - Gardens, parks and sporting ovals will continue to face dry conditions and increased evaporation, as well as increased runoff from sudden storms.

3.3 Climate Change in the City of Port Phillip

In October 2006, Council's Environment Policy & Planning Unit commissioned the **NATCLIM** research group (Earth Systems & Planning Research Centre, University of Sydney) to develop a climate change case study for the City of Port Phillip, to provide an initial assessment and the resulting planning considerations for Council.

Completed in January 2007, the report provides an initial assessment of:

- o potential climate issues and their associated risks for this City
- o the consequences on impact areas – built environment, water management, transport infrastructure, tourism and the natural environment
- o resulting adaptation and abatement recommendations for Council to consider in actively reducing the City's vulnerability to climate change.

The case-study area extends from **Middle Park (north) to Elwood (south), St Kilda Road (east) and the coastline (west)**. The case study area encompasses many of the City of Port Phillip's key tourist attractions, 3 activity centres, is about 60% residential and contains an extensive amount of Council provided and/or managed infrastructure (roads, stormwater systems, foreshore public amenities).

The full report, including the risk assessment methods, is included as **Appendix 1** of this report

Primary Climate Trends, their Impacts and Associated Risks for the City

The diagram that follows provides the local climate trends, the impacts and their primary associated risks for the City of Port Phillip.

Indicator	Local Climate Impacts	Primary Associated Risks
Sea Level Rise, Storm Surge & Storm Tide	<p>Over the last 10 years, an average sea level rise of 3cm has been estimated for Port Phillip Bay. The observed rises in sea level for the City are largely consistent with the global trend.</p> <p>Average sea level rises for the City are estimated to be 4.5cm (3-10cm range) by 2020, 13.5cm (5-30cm range) by 2050 and 28.5cm (10-88cm range) by 2100.</p> <p>As linear extrapolation of current trends may not be an accurate indication of future changes of variables that increase risk, the ranges above (IPCC and CSIRO) provide indicators of upward variability.</p> <p>Potential future storm surge levels in Port Phillip Bay include a 1.65m with a 35cm sea level rise, a 2.06m with an 80cm sea level rise, or a 2.31m storm surge with an 80cm sea level rise and a 10% wind speed increase.</p>	<p>Infrastructure Instability – Beachside buildings and infrastructure, particularly in St. Kilda (St. Kilda Pier, Marina, Baths & Luna Park) and residential areas adjacent to Elwood Canal, are especially at risk. The City's coastal bike trails and paths and beachside amenities are also at significant risk.</p> <p>Loss of beaches - Coastal infrastructure combined with severe storm events has already contributed to significant coastal erosion around Port Phillip Bay in the last 50 years. Modelling of the Middle Park Beach indicates that with a mean sea level rise of 30-50cm, the actual recession of the beach berm may be between 3.5m and 5m respectively. Middle Park and St. Kilda Beach are susceptible to erosion and potential loss as a result. West Beach is particularly susceptible to subsequent sediment deposition – this could result in siltation and subsequent obstruction of the Royal Melbourne Yacht Squadron slipway entrance.</p> <p>Impacts on planning zones – Increased storm surges & tides leading to potential flooding mean planning designations are likely to be affected in the future. Flooding was the third highest primary risk, & has a lower likelihood of occurrence in the short term, but is likely to be the primary driver behind planning zone impacts. The areas most at risk from coastal inundation and resultant salinity are low-lying areas around the St. Kilda foreshore and Elwood Canal. Flooding of these areas is likely to affect key infrastructure and areas such as Acland Street, Catani Gardens, The Esplanade & Beaconsfield Parade, and residential properties around Elwood Canal.</p> <p>Flooding of coastal properties, – Erosion increases the vulnerability of coastal infrastructure and buildings to wave attacks during storm events. The City has over 9000 addresses within 3 km of the coastline and below 4m in elevation – these are the most at risk from beach erosion and subsequent flooding. Key tourist attractions (Acland Street, Baths, Luna Park) are also at risk of flooding.</p> <p>Additional Impacts – Damage to coastal ecosystems and vegetation, deposition of debris on beaches.</p>

Indicator	Local Climate Impacts	Primary Associated Risks
Intense Rainfall	<p>As discussed previously (Part 1), climate change will increase the magnitude (duration, intensity and frequency) of storm events.</p> <p>The following storm intensity estimations are likely for the City – 5% increase in intensity of a 20 yr event by 2020, 35% increase in intensity of a 20 yr event by 2050, 70% increase in intensity of a 20 yr event by 2100.</p> <p>CSIRO also predicts a 5% increase in storm event rainfall per degree of climate warming. It is estimated that a 5% increase in intensity of the standard design 1 in 100 year ARI would result in an additional 1.8mm of rainfall per 2 hour storm event, and a 10mm increase in flood levels. In short, it results in a 130-year event becoming a 100 year event.</p>	<p>Stormwater Runoff – Impacts focus around the quality, quantity and flow rate of stormwater; which in turn depend on the amount of impervious surface and storm intensity/duration. High resolution aerial photography (2004) of the study area suggests that about 80% is impervious. In dry periods, the permeability of pervious surfaces decreases, and is not as capable of dealing with intense rainfall, resulting in runoff. Primary impact areas as a result of the primary risk areas include <u>stormwater management, stormwater quality and planning zone implications</u> for onsite stormwater management and increased permeability.</p> <p>Flooding – Flooding can occur from accumulated stormwater runoff that drainage infrastructure is unable to cope with. There are approximately 4000 residential properties within the existing ARI flood extents and are at very high risk from future flood events. The City's roads are also susceptible to flooding – this increases the risk of lack of access for people moving in/out of the City as well as emergency services, and can impede transportation services.</p>
Extreme Weather Events	<p>There will be an increased frequency of strong winds, hailstorms and lightning. It is estimated that changes to hailstorm and lightning events will be negligible. The primary impact is strong winds.</p> <p>Like storm surges and intense rainfall, increased strong winds indicate changes to atmospheric and surface temperatures, which affect pressure systems resulting in increased wind speeds. Strong winds can therefore exacerbate the effects of storm surges and intense rainfall.</p>	<p>Roof and Structure Damage – corrugated iron roofs and fences are particularly susceptible</p> <p>Damage to Buildings, Powerlines and Roads from falling trees and branches – general infrastructure damage, energy infrastructure damage, indirect roof and building damage, increased maintenance and clean-up.</p> <p>A 25% increase in peak gust can cause a 650% increase in building damages (AGO 2006). Wind gusts during the February 2005 storms reached 104 km/h and resulted in 300,000 worth of damage to trees and over 12,000 reports of building damage (Port Phillip City Council, 2005).</p>
Temperature Rises	<p>The best available predictions for Port Phillip indicate that the increased mean temperature may be 0.5°C 2020, 1.5°C by 2050, and 2.5°C 2100 as a result of climate change. This is equivalent to towns in southern Australia shifting northward by about 100km (BOM, 2006). The number of days over 35°C in Melbourne will increase from 9 days to 11 days per year by 2020, 16 days by 2050 and as many as 40 days by 2100.</p> <p>In 2005, the average Australian temperature was 1.09°C above the standard 1961-1990 average. There has also been an increase in the frequency of heat waves in the last 5 years.</p>	<p>Heat-related illness – Primary risks are heat stress, heat stroke, heat exhaustion and dehydration, as well as exacerbation of respiratory and cardiac conditions. The primary group at risk is the 25% of the City's population over 60 years. The secondary group are the anticipated increased numbers of beach-goers.</p> <p>Water and Energy Demand – Extremely hot days generally result in sharp increases in peak energy and water demand.</p> <p>Infrastructure Risks – Extreme heat can affect road materials and undermine their stability, leading to drying out and cracking of building materials. However, these impacts are more as a result of persistent increased mean temperatures.</p> <p>Fire Risk – Increased fire risk and propensity to bushfires across Victoria, as well as increased smog mean that Melbourne's air quality is likely to deteriorate during hot and dry periods. Timber structures and other flammable materials in residential properties are also at increased risk of fire.</p>
Decreasing Precipitation & Increasing Evaporation	<p>Regional predictions for Victoria indicate a decrease in precipitation per degree of climate warming (against the global trend). Future precipitation decreases across the City include a decrease of 2% by 2020, 4% by 2050 and 15% by 2100. Coupled with decreasing precipitation is the potential increase in evaporation. The average potential evaporation for Melbourne is estimated to increase by 3% by 2020.</p> <p>In effect, our climate and terrestrial surfaces are becoming progressively dryer, with even less humidity.</p>	<p>Water Availability - Coupled with falling rainfall and inflows to Melbourne's catchments, Melbourne is likely to continue experiencing dry spells and droughts, as well as significant water shortages.</p> <p>Water Quality - Decreased precipitation can affect water quality. Negative water quality impacts on Port Phillip Bay are possible due to increased concentrations of pollutants entering the Bay coupled with higher ambient bay water temperatures. Decreased stream flow can also reduce the quality of water entering Melbourne's catchments.</p> <p>Biodiversity, Parks & Gardens – Changes in precipitation coupled with less rainfall and encroaching saline waters will significantly impact on both vegetation and wildlife.</p> <p>Infrastructure Damage & Thermal Comfort – Moisture loss from building materials and soil (ground subsidence) can lead to warping in timber and cracking in mortar, as well as consequent instability of building foundations.</p>

The Resulting Primary Climate Challenges for the City of Port Phillip

These findings provide some clear data on the greenhouse gas abatement and climate change adaptation challenges that the City of Port Phillip faces. It also provides some primary outcomes and messages about what the data means for the community of Port Phillip into the future.

1. Our regional **climate** is getting hotter and dryer, and we are more likely to experience drought and heatwaves, as well as increased use of the City's recreational facilities, parks and beaches
2. Our **City's greenhouse gas emissions** from both stationary and transport energy is rising across all sectors of the community. We use almost 40% more energy than the OECD average per household.
3. We have done little to move toward a **low-carbon future** and still predominantly use brown-coal fired electricity and fuel inefficient vehicles.
4. Our **potable water use** is decreasing across all sectors of the community; however, we still use 30% more than the OECD average per household.
5. **Annual rainfall and water yields** have been below average over the last decade, and are likely to fall by upto 25% more by 2050
6. Our **buildings and dwellings** currently contain design and construction materials that are greenhouse and water intensive and not necessarily climate adept. We will have to develop planning and building frameworks and zoning conditions that require sustainable as well as climate-adept built form.
7. Increased building mass decreases **permeability** and increases **stormwater** pressures across the municipality. Our onsite development frameworks provide for some permeability and stormwater amelioration, however, planning policy may have to be assessed in order to increase such capacity across the municipality
8. Our current **infrastructure** will have to be assessed (in collaboration with other stakeholders) for capacity in both increased storm weather and flooding as well as increased and prolonged hot conditions, particularly our stormwater and drainage management frameworks, road materials, and power supply infrastructure.
9. The development of open spaces and sites will need to use **water sensitive urban design** to increase permeability, provide stormwater calming and increase the quality of stormwater discharge.
10. Our **parks, open spaces and gardens** will need to be increasingly drought tolerant and water-wise.
11. We will have to consider the effects of coastal inundation and sea rises on:
 - a. **Foreshore** buildings, infrastructure and recreational activity
 - b. **Beach quality** and erosion, **beach pollution** and debris
 - c. **Coastal reserves, parks, vegetation and wildlife.**
12. Our topography and placement along the coastline means that we are more likely to have **saltwater damage** to beachside public spaces and infrastructure.
13. We will have to consider the development/revision of **local and regional** drought, flood and emergency response **management plans**.

These conclusions have formed a primary component of the resulting recommendations in **Part 5 - Climate Impacts Assessment and Action Plan 2007**.

Part 4 - Emerging Policy, Ethics & Instruments: Considerations for Local Government Advocacy & Collaboration

The next 10 years are crucial. In that decade, we have to achieve serious reductions in carbon emissions. After that time, the task becomes very much harder.

Richard Betts, Leader, Hadley Centre for Climate Protection (British BOM) & IPCC scientist
– The Sunday Times, London, 28 January 2007

Part 4.1 outlines emerging international principles of practice and instruments of change in addressing greenhouse gas abatement and climate adaptation. **Part 4.2** outlines emerging Australian (national and Victorian) directions and considerations. Together, they provide some emerging considerations and directions for Local Government action, advocacy and collaboration.

As climate change does not begin or end at municipal boundaries, the City of Port Phillip is faced with developing new approaches to advocacy and regional collaboration in order to become a low-carbon, climate-adept City and region. Council has significant capacity for advocacy and regional collaboration to -

- o Leverage the development of good public policy and investment in local sustainability action
- o Strategically pursue change strategies and policy that enable and enhance local abatement and adaptation
- o Develop local innovation and tools.

To this end, a series of commitment statements are provided throughout **Part 4** for Council adoption in achieving good practice, advocacy and collaboration on abatement and adaptation. These are to be considered with the recommendations for assessment and action in 2007 in **Part 5**.

4.1 Global Instruments of Policy & Strategy

Emerging Ethical Principles for Climate Change Action

The essential climate change messages from the Intergovernmental Panel on Climate Change (IPCC), UNFCCC 12th COP and the Stern Review suggest strong endorsement for 2 primary ethical principles of sustainability in guiding policy and strategy on climate change action. They are as follows -

Inter-generational and Intra-generational Equity – equity between and within current and future generations, to responsible and efficient resource use; to sufficient social capital; to wearing the cost of unsustainable development and polluted environments.

Why? Because -

- o The impacts and costs of climate change will be disproportionately distributed globally, with the poorest nations affected the earliest and most severely, despite developed nations producing the majority of emissions.
- o If we do nothing, we will be leaving future generations with the burden of runaway climate change, dramatically reduced living standards and conditions, and with less opportunity and far more costs in attempting to reduce greenhouse gas emissions.

The Precautionary Principle - to take a responsible and long-term view to preventing the degradation and destruction of our living systems, natural and social capital; to become change-adept and risk-adept in finding new solutions and ways to prevent irreversible damage to our natural and social capital.

Why? Because -

- o If we do nothing to abate greenhouse gas emissions, Co2 levels in the atmosphere will cause between a 3-4°C temperature rise in global temperatures. This will have severe impacts on climate, geography, ecosystems and species, ocean and land-based food chains, water availability, human settlements and global economic production within 20-30 years.
- o If we do not act urgently and make significant gains to reduce and prevent greenhouse gas emissions, we may miss the opportunity to stabilise global temperatures and wear the impacts of run-away climate change.
- o We cannot estimate the full effects of climate change on an increasingly vulnerable and heat-sensitive planet. Our actions to mitigate greenhouse gas emissions and adapt to climate change must focus on low-carbon energy technologies and products while adapting to an increasingly unstable climate and geography.
- o A growing proportion of future rapid growth in greenhouse gas emissions is likely to come from developing nations that are currently significantly increasing their energy demands. Developed nations have to increase their collaborative efforts, research and investment in developing low-carbon energy technologies and products in developing nations.

The City of Port Phillip will apply these principles in its primary approaches to implementing and finding solutions to greenhouse gas abatement and climate change adaptation in its City and globally.

Emerging Instruments for Sustainable Energy Markets and Greenhouse Gas Abatement

There is also strong international consensus and interest in driving investment and expansion in sustainable energy markets and greenhouse gas abatement. To drive these, six primary instruments are likely to set current and future policy, strategy and international regulations.

1. Stringent greenhouse gas abatement targets –

In order to stabilise at a global temperature rise of 2°C, most developed nations will have to set stringent reduction targets of at least 50% below 2000 levels by 2050. Targets also allow developing nations to check the growth of greenhouse gas emissions in their growing economies. Targets (together with carbon pricing) are also an essential mechanism in developing and delivering viable emissions trading.

2. Carbon Pricing –

Placing a price on carbon allows markets to factor in the cost of greenhouse gas emissions in an investment decision or economic activity. This activity within itself allows the capacity to create carbon markets – from factoring in the carbon cost (intensity) of an activity, to developing carbon-trading schemes. A major challenge is setting a global carbon market price.

3. International and National Regulations –

The first commitment period for the Kyoto Protocol begins in 2008. Whilst Australia is currently not a signatory to the Kyoto Protocol, Australian corporations and business practices will nevertheless have to consider the burden of carbon in their investments in order to be globally competitive. Emerging international agreement directions include collaborative fostering of low-carbon products and services standards, low-carbon product and energy technology investment, consistent national and regional responses and responsibility toward greenhouse gas abatement.

4. Deployment and development of low-carbon energy technologies and products –

Strong growth in research, development and incentives investment, particularly in low-carbon electricity generation, green energy technology and low-carbon products. Developed nations are well placed to respond to the rapid development and implementation of low-carbon energy technology, electricity generation, transport modes and vehicles, products and services.

5. Investment that factors in the costs of carbon and low-emissions options -

As suggested above, the first Commitment Period for Kyoto Protocol begins in 2008, and will provide some frameworks for developing investment that factors in carbon costs. In other words, business-as-usual accounting and economic frameworks are changing to factor in the previous externalities such as greenhouse gas emissions as primary to investment and growth decisions.

6. Emissions trading –

Carbon trading is increasingly likely as an international instrument, with the EU emissions trading scheme is looking set to continue and expand. It has provided some essential first lessons to carbon pricing, investment and trading formats, with a primary outcome being that there will have to be an international format in order to allow national and regional schemes consistent practice and equitable implementation.

Together with other Local Governments in Australia and internationally, the City of Port Phillip will consider its role and capacity to fully apply and participate in all of the above instruments of greenhouse gas abatement and climate adaptation. The primary context will be enabling the City and community to become low-carbon and climate-adept in a proactive, equitable and precautionary way.

4.2 Emerging Climate Change Directions for Australia

Australia has a wealth of renewable and clean energy sources that can be deployed utilising a diverse range of technologies. They are available now.

Peter Szental, January 2007
President, Australian Business Council for Sustainable Energy

Australia faces critical challenges in several directions if it is to foster and move toward a low-carbon energy future and become climate adept. The effects of climate change are estimated to be more extreme in Australia, and include a progressively hotter and dryer climate prone to droughts and bushfires; reducing rainfall, inflows and water availability in many regions; more extreme weather events and flooding; increasing salinity and desertification; and coastal inundation in some areas.

The following are primary national, state and local considerations.

Bipartisan Energy Policy

At the highest policy levels, Australia needs to urgently consider the development of a bipartisan Energy Policy that enables a long-term and strategic platform for rapid transition to a low-carbon economy and lifestyles.

Greenhouse Gas Abatement

Primary abatement measures include:

- o Setting and achieving reduction targets – for instance, scientists estimate that Australians will have to achieve a 70-80% reduction in Co2 (from 1990 levels) by 2050 as their contribution to global greenhouse gas abatement, in order to stabilise at 2°C higher than present in the latter part of this Century.
- o Energy efficiency standards and practice for buildings, products and behaviour
- o Low emissions vehicles and transport modes,
- o Carbon capture and sequestration through carbon sinks, the elimination of deforestation and revegetation
- o Carbon pricing and/or taxes to prevent future rises in sectoral emissions; to finance research and investment in low-carbon technologies, goods and services,
- o Adaptation to low carbon lifestyles and economic activities.

Low-carbon Energy Sources

- o Significant increase in the investment and development of alternative low-carbon energy sources and technology such as wind and solar for the domestic market – the Stern Review recommends a 2-5 fold increase low-carbon energy technology now.
- o Significant regulatory shift away from protecting Australia's electricity generation from fossil fuels, and formats for a smooth transition to low-carbon sources.
- o A responsible and equitable format to assist in the timely global transition into alternative and low-carbon energy sources.

Addressing Reduced Water Availability and Inflows

- o Water efficiency standards and practice for Australia's agricultural and manufacturing sectors, buildings, products and community behaviour
- o An accelerated shift to recycling and capturing water onsite for all non-potable water uses
- o Improved water quality of all discharge to bays and waterways, and the use of water sensitive urban design for all future developments
- o Enhanced environmental flows and the vegetation supporting inflows
- o Retiring some regions of Australia from cropping and pasturing activities, to be replaced by native vegetation to increase our greenhouse gas sinks
- o Enhanced drought and fire management regimes
- o Adaptation to lower water yield lifestyles and economic activities.

Climate Adaptation

The combined effects of climate change on Australia have significant and urgent implications for how we:

- o develop our cities and coastlines
- o manage our land, water, vegetation, and biodiversity resources and values
- o develop buildings and infrastructure
- o behave.

As such, Australia also needs to consider the development of a raft of climate change policies and regulations to enable communities, commerce and industry to become increasingly climate adept.

The City of Port Phillip's Climate Action Plan will actively pursue all of these considerations in enabling and fostering local and regional approaches to a low-carbon and climate-adept City.

Australia's Report Card on Greenhouse Gas Abatement and Climate Adaptation

BP accepts the need for sustained precautionary action in relation to global climate change and we see a 'carbon shock' coming. Australia needs to find its own 'elegant solution' to meet that carbon shock.

Greg Bourne, Regional President BP Australia, July 2002

Australia is only 1 of 3 countries not signed up to the Kyoto Protocol – together, these three emit the world's largest per capita emissions. Combined, they represent over 41% of global greenhouse gas emissions.

Australia, unlike every other OECD nation, is allowed to emit 8% above 1990 levels by 2008; others are required to reduce emissions by 9% below 1990 levels. So when Australia says it is meeting its greenhouse gas emissions targets, it means this target to increase emissions.

The Australian government has also failed to set national targets (or ratify the Kyoto Protocol) – an essential aspect of developing a national emissions trading scheme or fostering globally competitive Australian businesses. It has also refused to accept that greenhouse gas emissions caused global warming and climate change until 2006.

There has been a notable absence of proactive and strategic policy and action for greenhouse gas abatement and climate change adaptation at the Federal level. Most critically, there has been an abject failure to:

- o Recognise the critical role of greenhouse gas abatement in reducing the long-term effects of climate change
- o Introduce stringent and timely greenhouse gas abatement targets for Australia, and support the Kyoto Protocol
- o Provide research and investment to develop Australia's capacity to implement currently available and feasible low-carbon energy technologies and energy efficient products
- o Provide economic and regulatory instruments to foster and enhance business and industry confidence in developing new energy technologies and markets
- o Address climate change adaptation for the particular risks facing Australia. These include a progressively dryer and hotter climate that will significantly reduce water availability, increase the occurrence of droughts, bush-fires, floods and extreme weather events,

The City of Port Phillip will, in collaboration with other Local Governments and sectoral stakeholders, advocate to the Federal Government of Australia to urgently and strategically develop, set and act on national abatement and adaptation measures.

The Victorian Government's Climate Change Action Plan

The Victorian Government has introduced a number of Policies and Plans to guide state directions in greenhouse gas abatement and climate change adaptation.

Greenhouse Gas & Climate Change Policy & Strategy –

The Victorian Government acknowledges the pressing need to cut greenhouse gas emissions to avert dangerous climate change and the need to adapt to a changing climate. However it has does not set a target for greenhouse gas emissions reduction for the state of Victoria.

The *Victorian Greenhouse Strategy (2002)*, *Victorian Greenhouse Strategy Action Plan Update (2005)* and the *Our Environment Our Future Sustainability Action Statement (2006)* are the principle policy documents outlining the state government's response to Climate Change. Actions are divided into the areas of Energy Efficiency, Renewable Energy Generation and Climate Change Adaptation. Significant actions identified by the State Government include:

- o A communications campaign featuring Black Balloons to raise community awareness of climate change and encourage individuals to be energy efficient
- o A commitment to develop a national emissions trading scheme, as outlined in the *Discussion Paper: Possible Design for a National Greenhouse Gas Emissions Trading Scheme (2006)* that was released in collaboration with other State and Territory governments.
- o **The Victorian Renewable Energy Target** – Outlined in the *Renewable Energy Action Plan*. The State Government has set a target of increasing the share of Victoria's electricity generation from renewable energy sources to 10% by 2016.

Water Policy & Strategy –

The State Government acknowledges that under business as usual scenarios a combination of climate change and population growth will lead to demand for water outweighing supply some time this century. As a result it has made the management of water a primary focus of its tenure.

The State Government's Water Strategy was outlined in the *Victorian Government White Paper: Securing our Water Future (2004)*. Also of significance to the City of Port Phillip is the *Sustainable Water Strategy -Central Region Action to 2055 (2006)* that includes water conservation and management of surface and groundwater resources plans for Melbourne. The Strategy provides:

- o A commitment to establish water use reduction targets of at least 25% on 1990 levels by 2015, increasing to 30% by 2020 for the Central region; in line with estimated reduced water yields of up to 25% by 2050
- o A commitment to develop water recycling infrastructure
- o A recognition of the need to maintain minimum environmental flows to keep rivers and surface water systems healthy

The City of Port Phillip will, in collaboration with other Local Governments and sectoral stakeholders, seek cooperative investment, resources and action with the Victorian Government to adopt and accelerate mechanisms, instruments and programs that enable greenhouse gas abatement and climate change mitigation in the community, and in state planning and development policy.

Part 5 – Recommendations: The City of Port Phillip's Climate Impacts Assessment & Action Plan 2007

Infrastructure almost assumes the mean, and for an engineer, every 1% you assume climate is going to vary from the mean costs more to build. There is at least a 10% chance of a 6°C temperature rise by 2100... that, to me for a society is too high a risk. When you're talking about planetary life-support systems... my God, 10% is like playing Russian roulette with a Luger.

Prof. Stephen Schneider, leading American scientist with the IPCC,
The AGE newspaper – 29 January 2007

Port Phillip City Council believes it is possible to protect societies and economies from some of the primary local impacts of climate change, as well as enable and foster a low-carbon, climate-adept future for our City and regionally. Council also believes it is possible to find solutions to the climate challenges before us.

Part 5 outlines 2 essential areas for Council's consideration –

1. **Part 5.1** provides a summary of Council's current activities in greenhouse gas abatement and climate adaptation across the municipality
2. **Part 5.2** provides recommendations on Council's current and emerging agendas for greenhouse gas abatement and climate adaptation across the municipality.

5.1 The City's Current Activities in Abatement

Port Phillip City Council has been providing community advocacy and programs in energy efficiency, fuel efficiency, greenhouse gas reductions and water conservation for almost a decade.

Many of these have proved successful in raising community awareness, gaining incremental reductions in energy and water use, and improving Council's environmental performance. A primary difficulty in **measuring the overall success of Council environment programs to the community** is that there are currently no comprehensive formats for effectively measuring the quantitative reductions in energy or water use. To do so requires state government collaboration to provide current community emissions and water use databases, as well as investment in smart meters for each household or organisation that participates in efficiency programs.

Whilst much of its infrastructure management and planning policy has significant capacity for the particular geographical conditions in the municipality, there are **currently no climate adaptation activities for Council operations or the community**.

The following are the primary current policy levers and programs offered by Council for greenhouse gas abatement and climate adaptation in both Council operations and to the community.

Current Policy Levers

The draft *Toward Zero – Sustainable Environment Strategy (2007)* is a recently revised update of Council's vision & umbrella strategy to all environment sustainability actions in Council & for the

community. It sets targets & directions forward for 8 key sustainability challenges, which include –

- a. **Toward Zero Greenhouse Gas Emissions** – supports Council's *Greenhouse Gas Strategy* and *Energy Management System* and targets zero emissions for Council operations by 2020 & 50% reduction in community emissions by 2020 (on 2000 levels)
- b. **Toward Zero Potable Water Use** – supports Council's *Water Use Action Plan* and targets a 70% reduction in Council's potable water use by 2020 (on 2000 levels) & a 50% reduction in community potable water use by 2020 (on 2002 levels)
- c. **Climate change adaptation** to develop infrastructure & planning policy & tools that enable building a climate adept city
- d. **Sustainable Built Form** – supports the *Sustainable Design Strategy 2006* and targets sustainable built form (especially energy and water efficiency) requirements for all Council buildings and 50% of buildings in the municipality by 2020.

Toward Zero aligns with international and state government policy levers outlining aims & targets in greenhouse gas abatement, reducing potable water use, & climate change adaptation. These include the:

- o Central Region Sustainable Water Strategy 2005
- o Victorian Greenhouse Strategy 2004
- o Victorian Climate Change Action Plan 2006
- o IPCC 4th Report and Stern Review greenhouse gas abatement targets and policy to reduce climate change impacts
- o Targets set and instruments proposed under the Kyoto Protocol.

The City's Greenhouse Gas Abatement & Water Efficiency Measures

Over the last decade, Port Phillip City Council has been implementing greenhouse gas emissions reduction and water conservation programs and measures in its own operations and across the municipality. Today, Council has strategic sustainability capacity and officers who are delivering council & community programs & tools in energy and water efficiency, sustainable transport, sustainable homes & living, designing & building sustainable buildings & dwellings, waste minimisation & water-wise gardening. The following demonstrates the considerable and diverse activities in greenhouse gas abatement and water conservation across the community and Council operations.

Implemented systems & programs for Council operations & services -

- a. **Integrated Energy Management System** – uses data & auditing of Council sites & services to identify & develop sustainable energy solutions
- b. **Energy Revolving Fund** to be introduced in early 2007 to assist in the progressive retrofitting of all Council buildings facilities for energy efficiency – the resulting annual energy cost savings are revolved back into the Fund for further energy efficiency retrofits.
- c. **Sustainable Design Strategy & Sustainable Environment Strategy** design & checklist tools / contract specifications for the development & maintenance of energy efficient, low emissions Council assets & facilities; and uses the STORM tool to assist in onsite stormwater retention.
- d. **Water Use Action Plan** – Annual water conservation projects, design and checklist tools, and specifications for water efficiency, water reuse and recycling, the application of water sensitive urban design, water quality (stormwater and local waterways).
- e. **Permeability** – Council is working in collaboration with other Councils and state agencies, to maintain and enhance permeability across the municipality.
- f. **Stormwater Management Plan** – the draft brief specifies options for water sensitive urban design, stormwater storage and reuse, stormwater calming, and improved stormwater quality.
- g. **Natural Way of Working** – is an environmental program for all office based workplaces within the City of Port Phillip. The aim of the program is to better align staff working habits with the basic principals of environmental sustainability,

specifically in the areas of energy use, water consumption and waste generation. The pilot for this program has been run at the Port Melbourne Town Hall since September 2006 with a view to extend its learnings to the whole of the organisation with the move to St Kilda Town Hall expected in late 2007. Results of the pilot to date include:

h. **Internal Transport Initiatives** – these include:

- **Free Public Transport Tickets**
- **Easy Rider** - a car pooling initiative set up by 4 CoPP staff, participation is estimated to cut drivers' fuel bills and emissions by 10% or more
- **Commuter Club** - designed to encourage Port Phillip staff to use public transport to commute to work, and provides incentives such as discounted MetCards .
- **Ride to Work Day** - an annual Bicycle Victoria event run each October to encourage more people to cycle to work
- **Internal Green Fleet Program** - Greenhouse gas emissions from CoPP vehicles have been offset by tree planting through council's participation in Green Fleet. Council's Green Fleet membership lapsed at the end of the 2005-2006 financial year.
- **Travelsmart surveys** - CoPP staff has participated in the DoI TravelSmart surveys. The November 2006 survey showed 11% greater use of public transport, 4% higher rates of cycling and 9% less solo driving
- **Staff pool bikes** - CoPP has a pool bike system for staff to use for travelling to meetings and in between Town Halls.

Community tools & programs to enable the community of Port Phillip -

1. **STEPS/SDS** design tool for dwellings, commercial & industrial buildings – assists planning permit applicant to design for an energy efficient, low emissions, permeable & stormwater controlled site & building.
2. **Building Tune Up Program** assists commercial building owners & tenants to reduce their greenhouse gas emissions & water use by at least 25%.
3. **Sustainable Living @ Home** program provides a comprehensive 'how-to' format for City of Port Phillip residents to reduce their ecological footprint & become low-emissions households.
4. **The Eco Centre** is the key community environmental hub and provides demonstration, on-ground community projects, household sustainability awareness and a meeting space for the local community. Eco Centre also works extensively with local schools of building and maintaining water-wise gardens.
5. **Walking School Bus** - a group of children and adults who walk to school together along a set route. There are 'stops' or pick up points where children can join the group and walk with them. Parents volunteer to 'drive' the bus on a roster basis - each walking bus has an adult 'driver' at the front and an adult 'conductor' at the rear
6. **Community Bus** - A 25 seat fully accessible bus that services the Elwood, West St Kilda, East St Kilda neighbourhoods with a loop to the South Melbourne Market. Launched in May 2006 and continues to offer free transport 5 days a week to residents along the 3 routes, each starting and finishing in Carlisle Street opposite the St Kilda Town Hall.
7. **TravelSMART Business** - "TravelSMART Business - better ways to work" is a government program helping employers to reduce the financial costs and environmental impacts of staff travel. TravelSMART is being run by a number of councils, including the City of Port Phillip, in partnership with state government agencies and with Bicycle Victoria

These efforts in Council and community sustainability are considerable, critical to enabling community capacity, and have allowed a strong community response to Local Government capacity building programs.

5.2 Recommendations – Climate Impacts Assessment and Action Plan 2007

The combined global and City of Port Phillip's climate footprint analyses and the resulting climate challenges and recommendations provide for a series of emerging actions to be considered and undertaken to become a low-carbon, climate adept City and community.

The following is a synthesis these findings and emerging priorities into a series of recommendations or outputs for Council to consider.

In the first instance, these 17 recommendations are offered for an initial action plan of assessment and actions to be implemented or completed by the end of 2007. Some of these include current actions, assessments of, or consideration for enhanced efforts in current actions. Others are assessments or considerations for Council to implement over 2007, ahead of the development of specific climate adaptation actions and planning for their resourcing.

Many of these outputs also rely on Council's capacity to advocate for and leverage stakeholder collaboration, investment and innovation. **The statements for consideration provided in Part 4 are for application in the consideration of each of these recommendations.**

The key recommendations outlined below cover three primary directions for the City and community – greenhouse gas abatement, water conservation and climate adaptation.

Greenhouse Gas Abatement & Water Use Reductions

1. Council will work with key state, federal and regional stakeholders to gain the following outcomes across the municipality by 2020, as outlined in its *Sustainable Environment Strategy 2007* -
 - o 50% reduction in **community greenhouse gas emissions** by 2020 (from 2000 levels)
 - o 50% reduction in **community water use** by 2020 (from 2000 levels)
2. Council will initiate a Community Climate Campaign to manage community concerns and expectations regarding climate change, as well as enable community capacity in greenhouse gas abatement and climate adaptation. (A draft outline of this action is provided as an example in **Appendix 3**)
3. Council has set the following targets for its **corporate activities** in its *Sustainable Environment Strategy 2007* –
 - o Zero greenhouse gas emissions by 2020
 - o 70% reduction in potable water use by 2020 (on 2000 levels)
4. Enhanced efforts to develop **energy efficient facilities, infrastructure and street lighting** through Council's *Energy Management System*
5. Enhanced efforts to develop **sustainable transport modes and infrastructure**, in collaboration with key stakeholders
6. The development of a Council strategy to move toward onsite, grid-connected **renewable energy generation** for its buildings and facilities
7. Enhanced efforts to use **recycled water and stormwater for irrigating** public parklands, reserves, parks & gardens, in collaboration with key stakeholders
8. Enhanced efforts to develop **water-wise and drought-tolerant** parks, gardens, reserves and water management systems
9. **Water-sensitive urban design** in all council developments and redevelopments and planning requirements.

Climate Adaptation -

10. **Expansion of the scope of NATCLIM** regionally to the Association of Bayside Municipalities (ABM) to provide the following primary outputs –
 - o Comprehensive local climate data, modelling and research across Port Phillip Bay over the next 4 years
 - o A Local Government climate risk assessment tool to strategically identify priorities & develop solutions
 - o Regional and national collaboration to achieve the other recommended outputs.
11. An **assessment of Council infrastructure** with regard to capacity to be climate-adept – this includes Council's stormwater and drainage systems, road infrastructure in identified risk areas such as coastal roads and low-lying areas, and coastal public amenities
12. An **assessment of Council assets** with regard to capacity to be climate adept – this includes most of Council's public buildings, coastal parks and reserves, and recreational facilities along the foreshore.
13. An **assessment of Council's management plans and contracts** with regard to managing climate change impacts, particularly in - drought management, beach cleaning and maintenance, vegetation management, site development or redevelopment.
14. Enhanced efforts to gain **changes to state planning policy for sustainable and climate-adept built form** through the planning and zoning process. Consideration of the **development of a planning tool** that works side-by-side with the STEPS/SDS tool to assist all developments, redevelopments & renovations in the municipality to become more sustainable and climate-adept.
15. **Water sensitive urban design** to develop a City with increased permeability, reduced water needs, & climate adept systems & infrastructure
16. An **assessment of the local economic and social effects** of climate change with regard to primary Council Units such as Business & Tourism and Aged Care Services.
17. Increased efforts to **regionally advocate for and collaborate on climate change action** through Council's current regional Local Government fora such as IMAP (Inner Melbourne Action Plan) and ABM (Association of Bayside Municipalities).

Plan for the Proposed 2007 Climate Action Plan

These 17 recommendations form the current sum of climate impact assessments that need to be performed on current Council activities as well as in consideration of emerging activities. The scope of assessment is offered as a *Climate Impacts Assessment & Action Plan*. It is proposed that within the next 6 months, Council consider the following implications for each recommendation -

- The current capacities of a system, process or activity (eg. stormwater management plan) to cope with the likely local consequences of climate change
- The additional requirements or actions for this activity to become climate-adept and/or low/no-emissions
- The policy, legislative, strategy and cost implications of acting on each recommendation.

This scope of assessment will have to be initiated with a cross-Council consultation process that allows relevant business Units to gain an understanding of the perimeters of local climate impacts and consequences on Council's responsibilities and core business. This allows the above *Climate Impacts Assessment and Action Plan* to lead on to the provision of comprehensively assessed and planned implementation frameworks for Council's abatement and adaptation actions from 2008 onward.

Appendix 1 - NATCLIM Report (CD)

Appendix 2 – A Proposal for A Community Climate Change Campaign and Toolkit

Social capital, like the other capitals – natural, physical, financial and human – is a resource; but it differs significantly from others in that it originates in and grows from social relationships.

Jenny Wills, author of *Just, Vibrant & Sustainable Communities*

Over the last six months, there has been a significant increase in both media coverage of climate change, as well as community concern about it. Over September – November 2006, the Environment Policy & Planning Unit had several community queries about climate change and requests for assistance in becoming more sustainable, low-carbon and climate adept.

Critically, the level and pace of abatement and adaptation across the municipality and by the community is ultimately about community capacity to embrace change and enable solutions that create a smooth and quick transition to a low-carbon, climate-adept City. As such, any commitment by Council to abatement and adaptation needs to ultimately enable proactive community action to become resilient and sustainable. Moreover, it needs to occur now in order to have effective actions and abatement levels within the 10-20 year timeframe we have to minimise the worst impacts of climate change.

How the climate change 'story' and emerging community actions are communicated and provided to the community – in other words, the approach - is a significant aspect of motivating positive, proactive and clever community solutions.

Communicating the Climate Change Story and its Solutions

Climate change discourse can often result in alarmist or doomsday community views that leave individuals, groups and communities feeling helpless, ineffective or disengaged from the 'problem'. Whilst we are facing significant climate change challenges, they are not currently unsurmountable. Council's governance, leadership, advocacy and capacity building roles are primarily about enabling three aspects –

- o proactive community engagement with the solutions to abatement and adaptation (rather than the problems)
- o for the community to undertake and increase actions that work
- o key stakeholder and regional collaboration to leverage shared investment and resources in developing a low-carbon, climate-adept City and community.

Any Council-initiated community forum or campaign will need careful attention to its approach and ability to make climate change action common sense, smart and achievable. It will also require focus on the use of motivational information, facilitation, forums and programs that are non-imperative and encourage shared values, peer learning/knowledge-transfer, and community engagement. It will have to consider the various 'audiences' in the community to target its messages effectively. Finally, it will have to consider approaches to gaining neighbourhoods, networks and precincts to work together collaboratively to maximise local potential for abatement and adaptation.

Options for a Community Climate Action Campaign

Options include –

- o **A Community Climate Change Information Day** that provides clear and consistent information and is facilitated to enable community engagement in climate action

- **Community Climate Change Tool Kit** – a one-stop shop for the residential and commercial communities in the City to develop and implement abatement and adaptation actions through information, Council programs, state/national programs.
- **Power point presentations for Council's climate action champions** – Mayor, Councillors and the Executive Team
- **Neighbourhood Forums** – listening, enabling understanding and access to information and actions
- **Community programs**, in collaboration with key regional, state, national and international stakeholders.

An Outline of a Draft Community Climate Action Kit

Introduction: What is Climate Change.....

- Science outline/references for further information
- Expected impacts outline – global, national, state, local

What Council Is Doing

SDS, Building Tune Up Program, SCPI, Green Power Purchase, SLAH, SES, Natclim
For more info see council's website

What You Can Do

In this kit are a series of Fact Sheets designed to assist you to reduce your greenhouse gas emissions and help in mitigating climate change and adapt to the changed climate that we are already living in.

How to use this toolkit

Residents:

See outline page, determine your area of action, access corresponding pages

Business and Commercial:

See business and commercial fact sheet

Climate Change Fact Sheets - Business and Commercial Energy and Water Use

Fact Sheets Series Make your business Energy and Greenhouse Smart	
Sustainable Building Tune Up Program	<i>Retrofit your building and business for energy and water efficiency</i>
Checklist to save energy in business (<i>Moreland Energy Foundation Series</i>)	<i>Office Equipment and Appliances Heating and Cooling Lighting Refrigeration Hot water Bakery Industry Association Info (energy and water saving)</i>
Where does your energy go?	<i>Developing an Energy Management System to identify your business energy use (Sustainability Victoria:) (medium – large enterprises)</i>
Using Green Power for your business	<i>Green Electricity Watch, Sustainability Victoria,</i>
Becoming a carbon neutral business	<i>Reduce your energy use and offsetting your greenhouse emissions (Easy Being Green, Greenfleet, Climate Friendly, Gold Standard)</i>

Becoming a Travel Smart business	<i>Developing your plan for your business, walking, cycling, public transport, car pooling etc. Smart car use – fuel efficiency, tuning etc</i>
Using vehicles in business	<i>Smart car use – fuel efficiency, tuning, driving techniques, etc</i>
Other useful information and references	<i>Eg: Melbourne Sustainable Business Directory – how other businesses can help you reduce your energy use and greenhouse emissions Sustainability Victoria; Australian Greenhouse Office</i>

Fact Sheets Series Use less water to make your business grow	
Sustainable Building Tune Up Program	<i>Retrofit your building and business for energy and water efficiency</i>
Where does your water go? (SaveWater Information)	<i>Accessing Water Efficiency Service to identify water and cost savings in your business water use</i>
Saving Water in Business (SaveWater Information)	<i>Information sheets for specific business types: Hospitality Food Processing Nurseries Construction Textiles Manufacturing Bakeries (energy and water savings)</i>
Water Saving Appliances and fixtures	<i>Common commercial water using fittings and appliances: Showers and taps Dishwashers</i>
Using alternative water supplies in business	<i>Using Greywater and Recycled Water Who to contact, what to do, associated issues</i>
Water Conservation programs with Government	<i>Pathways to Sustainability information</i>
Water rebate opportunities for business	<i>Need to identify what is available</i>
Other useful information and references	<i>Smartwater.com; SEWL; etc</i>

Community Climate Change Toolkit – Residential

Key Messages:

60% of all water we use in Melbourne is used in the home (Museum Victoria, Water Smart Homes) & more than 50% of greenhouse gas emissions are from homes and transport in the City of Port Phillip – so enough people taking the right actions will make a big difference. Together we can make a difference!

Energy Smart Homes are cheaper to run and can be more comfortable to live in. With 59% of energy used to heat and cool the average Melbourne home, it's clear that this is the area to focus on to reduce energy demand.

The Climate Change Action Hierarchy

The philosophy behind this toolkit is that in order to get CoPP residents to action on Climate Change Council must support them to build their knowledge, confidence and skills on how to act. The fact sheets in this kit focus first on what actions residents can take at home, moving from simple energy & water efficiency actions to completely water and energy self-sufficient dwellings, and once a resident has done all they can at home, they are encouraged to take their passion and expertise out into the community.

You will find supporting information for each of the following steps in this tool kit

Step 1 - Be Energy Efficient and Water Wise. Do all the things in your home to reduce your demand for energy and water through efficiency measures.

Step 2.- Upgrade your energy and water using appliances. Once you have reduced your demand start looking at the appliances you own and upgrade to more efficient and environmentally friendly models.

Step 3.- Buy accredited Green Power from your electricity retailer, and become energy and water self-sufficient. Once you have taken all the steps you can to reduce your greenhouse emissions and water use, look out how you can obtain your remaining energy and water needs from renewable sources by buying Green Power, or by installing rainwater tanks and solar panels.

Step 4.-Spread the word. Talk to your neighbours, friends, colleagues and family about what you've done on climate change and see if you can get them to do the same.

Step 5.-Remember that your voice counts. Write to newspapers and politicians urging more action be taken on a larger scale. Give your opinion a voice.

Fact Sheets Series

Step 1 Make your home Energy and Water Smart	
Understanding where is energy and water used the home	<i>Information sheets from Sustainability Victoria and Melbourne Water with pie charts</i> <i>Simple home energy and water audit sheet</i>
Guides to Reducing Energy Use in Your Home	<i>SLAH EnergyAction Challenge</i> <i>Heating</i> <i>Choosing a heating system</i> <i>Electric slab heating)</i> <i>Electric space heating</i> <i>Gas ducted heating</i> <i>Gas space heating</i> <i>Heat shifters</i> <i>Hydronic heating</i> <i>Portable heaters</i> <i>Reverse cycle air conditioning</i> <i>Wood heating</i> <i>Building</i> <i>Air movement)</i> <i>Benefits of insulation</i> <i>Insulation installation</i> <i>Insulation types</i>

	<p><i>Landscape design</i> <i>Siting and solar access</i> <i>Thermal mass</i> <i>Window placement</i> <i>Window protection)</i></p> <p><i>Hot water</i> <i>Choosing a hot water system</i> <i>Solar hot water</i></p> <p><i>Cooling</i> <i>Choosing a cooling system</i> <i>Renewable energy</i></p> <p><i>Solar Panels</i></p>
Guides to reducing water use in your home	<p><i>SLAH Water Action Challenges</i></p> <p><i>Melbourne Water</i></p> <ul style="list-style-type: none"> • <i>Rainwater Tanks</i> • <i>What is a Water Sensitive Home?</i> • <i>Porous Paving</i> • <i>Rain Gardens</i> • <i>Site Layout and Landscaping</i> <p><i>Shoestring Steps to Saving Water (Vic Water)</i></p>
Guides to reducing greenhouse emissions from your transport	<p><i>SLAH Transport Action Challenge</i></p> <p><i>Green Vehicle guide</i></p> <p><i>Melbourne Public Transport Map</i></p> <p><i>Drive your car efficiently – RACV</i></p> <p><i>Walks in Port Phillip</i></p>
Step 2 Fact Sheets – Upgrade your appliances to be Water and Energy Efficient	
Rainwater Tanks and Grey Water Systems	<p><i>Using Grey Water (DSE)</i></p> <p><i>Rainwater use in and Around the home (DSE)</i></p> <p><i>EPA Grey Water Reuse Guidelines – Summary</i></p> <p><i>Melbourne Water</i></p> <ul style="list-style-type: none"> • <i>Rainwater Tanks</i>
How to apply for a Water Rebate	<i>Water rebate opportunities DSE</i>
Guides to Solar Hot Water & Solar Power	<p><i>Sustainability Victoria</i></p> <ul style="list-style-type: none"> • <i>Solar Hot Water</i> • <i>Renewable Energy systems</i>
Guides to energy efficient appliances	<p><i>Electrical appliances - operating costs (237KB)</i></p> <p><i>Gas appliances - operating costs (267KB)</i></p> <p><i>Hot water</i> <i>Choosing a hot water system</i></p> <p><i>Cooling</i> <i>Choosing a cooling system</i></p> <p><i>Heating</i> <i>Choosing a heating system</i></p>

Step 3 – Buying Accredited Green Power from your Energy Retailer	
Using Green Power in your home	<p><i>Green Electricity Watch, Sustainability Victoria,</i></p> <p>Green Power Website</p> <ul style="list-style-type: none"> • <i>What's Green Power?</i> • <i>How Green Power Works?</i> • <i>Who sells Green Power?</i>
Becoming a carbon neutral	<i>Offsetting your greenhouse emissions (Easy Being Green, Greenfleet, Climate Friendly, Gold Standard)</i>
Step 4 – Spreading the Word	
Resources for Schools	<i>VAEE VELS resources</i>
Join the Port Phillip Eco Centre	<i>Eco Centre Membership Form</i>
Holding a Street Party	<i>The StreetLife toolkit,</i>
Step 5 – Making Your Voice Heard	
Advocacy Fact Sheet	<p><i>Who to write to</i> <i>Newspapers</i> <i>Politicians</i> <i>Environmental NGOS</i></p> <p><i>Get Involved:</i> <i>Join an NGO</i> <i>The Street life toolkit</i></p>