About Friends of the Earth

Friends of the Earth is a community based environment and social justice organisation. We work locally and nationally. Internationally we are linked to Friends of the Earth, which operates in 70 countries around the world (www.foei.org).

Friends of the Earth's Climate Justice campaign understands that climate change is an environmental issue with clear implications for human rights and human health. We recognise that climate change is caused by dangerous over production of greenhouse gases and is driven by systemic inequalities in global resource allocation and use. We aim for a global solution to the threat of climate change, based on a fair share of sustainable resource use for all people.

The author of this report

Josie Lee is a Climate Justice campaigner at Friends of the Earth.

Contact *josie.lee@foe.org.au*.

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Background

While mainstream debate currently focuses on science and the economic dimensions of climate change, there is also a growing awareness of its social costs. There is a mounting understanding that the effects of climate change will be disproportionately felt by already-vulnerable communities, including people on low-incomes and communities directly dependent on their local environment for survival.

Focusing on Victoria, this report identifies the projected direct and indirect effects of climate change and the likely impacts these will have on low-income communities. It also makes a series of recommendations targeted at government, specific industries and community sectors so that as a community, we can take appropriate action to curtail and reduce the likely adverse impacts of climate change.

Agriculture, food and water

The projected water restrictions, agricultural instability and crop failure associated with climate change are likely to cause increases in the price of food and water. Low-income earners have less financial capacity to absorb such increases and their access will decline accordingly. Decreased access to food and water can be expected to cause stress and health problems for these individuals and families. Projected decreases in agricultural production will also impact on rural communities, with most also likely to suffer income decline, unemployment and migration, undermining the viability of some towns. The environmental impacts of climate change are predicted to be most intense in the Murray-Darling Basin; hence it follows that the social impacts will also be focused on rural communities and Indigenous people in this region.

Energy

Utility stress has persisted for many years in Victoria and shows no signs of improvement. Sole parents, unemployed people, young people, large families, private tenants, people living alone and people with disabilities or chronic health problems are especially at risk. Climate change is likely to perpetuate this trend. Energy demand and energy costs are both likely to increase, with a corresponding escalation in the level of stress and financial burden on low-income households. People who have limited access to public transport will experience particular disadvantage.

Housing and human settlements

Homes and settlements will be affected by global climate change. The severity of these impacts will depend on the extent of climate change we experience and the ability of the Victorian community to respond and adapt. Human populations can best adapt to climate change with appropriate planning, foresight and appropriate technical, institutional and political capacity. It is likely that low-income communities will experience a disproportionate burden of climate change due to current disadvantage, regional location, inadequate housing (particularly among Indigenous people), and little adaptive capacity.

Settlements will be most at risk from decline due to agricultural loss of production and farm failure. Communities most at risk are: those dependent on particular industries that are vulnerable to climate change impacts (agricultural, tourism, etc.); those in coastal zones; Indigenous communities due to poor housing and infrastructure conditions; and those communities already disadvantaged (which includes most of those settlements mentioned above).

Employment and financial security

Whether it is from increased unemployment, lack of insurance or an economic downturn, Victorians everywhere are likely to face tougher conditions, but none more than low-income earners under business-as-usual emission scenarios. The increase in unemployment and the number of low-income earners projected is likely to overwhelm the social service sector and the government budget's ability to support people and juggle competing costs of climate change adaptation.

The Stern Review asserts that from all perspectives, the evidence they gathered leads to a simple conclusion: the benefits of strong, early action considerably outweigh the costs.[1] Certainly this is the case for Victoria and Australia, where strong action needs to be taken to reduce the risk to families and prevent a major economic recession.

Health and wellbeing

The burden of disease and ill health often increases with higher levels of socio-economic disadvantage. In relation to climate change, it is expected that health risks for low-income families will increase in frequency and intensity. These situations would arise as a result of direct and indirect impacts. Direct impacts include increased spread of disease, more temperature-related deaths, more death and injury due to extreme whether events, and trauma associated with displacement due to sea level rise.

Climate change could indirectly impact on low-income earners by increasing the severity of problems already affecting their health. Climate change impacts could: further decrease access to health services; diminish water and energy supplies; increase prices of food and utilities, further adding to fuel poverty and malnutrition; cause high levels of unemployment in some regions or sectors; present new health risks that people are uninformed about; reduce the amount of resources people have to cope with climate change, and exacerbate inadequate living conditions. This would, in addition to direct impacts, result in an overall increase in the level of broad ranging diseases and deterioration of mental health.

List of recommendations

Agriculture, food and water

- Governments should immediately begin a process of consultation, receiving input and guidance from rural communities themselves as to what approach would best help sustain and shift production to meet the needs of growers and the community under a changing climate.
- Governments should immediately undertake further research to assess the potential for shifts in regional crop production and the development of cultivars that are more drought tolerant and of temperature-stress resistant crops for the projected climatic shifts in the region.
- The state government should create a public awareness campaign particularly within rural communities about the potential impacts of climate change.
- State and federal governments should develop and begin allocation of money to a 'climate Change Rescue Fund' now. This fund would act as a financial reserve for pro-active research and solutions to agriculture issues associated with climate change. It would also provide financial support to farmers to transfer production in accordance with climate change.
- State and federal governments should continue programs to assess and develop water saving practices and infrastructure in agriculture and industry.
- State government should continue public awareness campaigns on water use.
- State government should mandate the installation and utilisation of water recycling facilities by 2015 for industries that use high volumes of water.
- State and regional authorities should consider water recycling and desalination facilities powered by wind or other renewable energy sources for regions where fresh water is scarce.
- State government should provide further incentives for water saving devices, water tanks and technological innovation in water use reduction practices and devices.
- Water saving devices should be provided and installed free of charge in all public housing and low-income earners' housing by 2012.
- The Federal Government should immediately increase the minimum standards on water efficiency to 5-star ratings for all appliances.
- The Federal Government should develop an extensive program of providing fortnightly food coupons, on top of existing government entitlements, for low-income earners and pensioners. This coupon would be exchangeable for fresh vegetables, whole grains and meat/fish only, to ensure access to these basic food requirements.
- The Federal Government should increase Centrelink entitlements in order to offset any price rises in water or appliances.

Energy

Initiatives such as the Victorian state government's plan to place solar panels on the roofs of high-rise public housing are to be commended as an important step forward. These trial projects, however, fail to achieve the kinds of cuts necessary to avoid dangerous climate change and fail to address impacts on low-income families. Friends of the Earth recommends that:

- State and federal governments should mandate and finance implementation of durable energy saving measures in public housing that equate to at least % of the household greenhouse gas emissions from direct energy consumption by 2020. This would help provide affordable energy services to low-income households and help reduce Victoria's greenhouse gas emissions. These measures should include:
    - Installation of solar electricity or solar hot water systems
    - Trade in services or direct provision of energy efficient appliances – particularly heating and cooling systems
    - Incorporation of passive design features in all new public housing
    - Retrofitting old public housing with energy-efficient design and facilities
- State and federal governments should undertake comprehensive social-economic impacts assessments before implementing climate change mitigation measures, and act in accordance with recommendations to minimise the impacts of price increases on low-income earners
- State governments should introduce mandatory energy and water efficiency ratings for private rental properties by 2008, and a mandatory efficiency standard by 2010
- The Federal Government should legislate mandatory minimum standards for energy efficiency in appliances, particularly heating and cooling systems
- State governments should coordinate and subsidise trade-in services or direct provision of energy efficient appliances – particularly heating and cooling systems – for concession holders
- The Federal Government should create an easy-to-understand information campaign on the energy embodied products, so people have a greater understanding of the impact of what they are purchasing
- The Federal Government should investigate vulnerability of energy infrastructure to potential climatic events such as heatwaves and severe storms. Upgrade the infrastructure to incorporate new risks
- Public transport services should be returned to government hands to ensure public control of equity within and access to transport services
- State governments should strongly reinvest in public transport services to increase standards, regularity and coverage of services to outer suburban areas. These services must aim to provide viable alternatives to car transport
- State governments should make public transport free or, at minimum, free to concession card holders.

Housing and human settlements

- State governments should make public any information they currently hold about human settlements likely to be affected by extreme weather.
- State governments should direct funds to researching and developing (in consultation with architecture associations and other stakeholders) standards for housing that accommodate likely temperature rises and increases in extreme storm conditions. Further, they should introduce a process to implement these standards immediately for all new housing developments.
- the Federal Government should develop a public awareness campaign, working closely with architectural associations, to disseminate information about the impacts of climate change on housing.
- state governments should immediately fund repairs and improvements in housing for Indigenous communities, particularly in relation to ensuring access to clean fresh water, adequate sewerage systems for communities, and repairs and maintenance.
- state governments should work with specific vulnerable communities (including Indigenous communities) to assess likely impacts of climate change and recommend and implement measures to ensure safety and access to fresh water, adequate housing, employment and emergency services.
- state governments should develop emergency service plans for a changing climate and fund/allocate resources necessary to cope with projected increased pressure of these services associated with climate change (in relation to bushfires, extreme storms and so on).
- the Victorian Government should undertake a comprehensive assessment of the state of public housing across Victoria and develop and implement a package of improvements that ensure the safety of dwellings and wellbeing of occupants, especially considering increasing temperatures and energy efficiency requirements.
- state governments should further investigate vulnerabilities of low-income earners and the homeless to the negative impacts on urban environments associated with climate change.
- the Victorian Government should increase the number of public houses and affordable housing across the city to reduce homelessness and waiting lists. Such housing should be designed using thermo-passive design principles, to reduce the need for heating and cooling.
- the Victorian Government should review planning restrictions and requirements in coastal zones to ensure safety in a changed climate/landscape.
- the Victorian Government and Melbourne Water should address inadequacies in Melbourne's sewerage system and upgrade the system in accordance with expected increases in both housing density and flooding.
- the Victorian Government should undertake a public awareness campaign advocating that households and communities build their resilience to climate change by, for example, installing water tanks, growing food in their backyards, installing solar panels, implementing passive heating and cooling designs and features in their homes, sharing knowledge and experiences, helping others to make changes etc.
- different levels of government, industry, scientists and community stakeholders and representatives all need to be involved in planning and decision making in order to ensure that action is relevant and meets the needs of stakeholders.

Financial impacts of climate change

- The Victorian and Federal Governments should begin to phase out fossil fuels and increase the proportion of renewable energy production facilities now. The sooner the adjustment begins, the more considered and less negative the impact on workers and local economies.
- The Victorian and Federal Governments should formulate 'just transition' models for structural adjustments in the energy industry.
- The Victorian Government should provide funds for the social service sector to research and report on the impacts of climate change on low-income earners. In the long term, funding will be required to accommodate increased pressure on this sector.
- The Federal Government should develop a means tested fund for disaster relief.
- The Victorian Government should continue to invest in and increase the capacity of public hospitals in order to cope with disasters.
- The Federal Government should begin planning for managing the distribution of losses in a situation where insurance costs increases hugely, insurance is withdrawn from high risk areas, or where one or more major insurance companies fail.

Health and wellbeing

- The Federal Government should fund further investigations into the impacts of climate change on health, particularly focusing on the risks and vulnerabilities of low-income earners and Aboriginal groups.
- The Federal Government should identify, in consultation with social service providers, current problems in access to adequate health care for low-income earners and address those problems in order to ensure less vulnerability in the future (including reducing public waiting lists for surgery and other forms hospital care and address shortages of general practitioners in disadvantaged areas).
- The Victorian Government should investigate and allocate resources to planning and implementation of health services provision and procedures in the case of severe health disasters associated with extreme weather events, including heatwaves where hundreds or thousands of people can require hospitalisation within a short timefra me.
- The Federal Government should develop a publicity campaign to highlight likely health impacts of climate change in order to strengthen the community understanding and capacity to cope at a local level. For example, inform food health and safety monitors of new risks.
- Governments at all levels should work in consultation with Indigenous communities and community organisations to decide on a course of action to ensure appropriate and responsive health care, taking into account changing needs that arise due to climate change.
- The Victorian Government should increase its investment in community health services and other community-based health organisations to better enable them to undertake their community capacity building role at the local level, particularly in areas of socioeconomic disadvantage.
- The Victorian Government should work with local governments to assess and identify areas where the urban heat island effects are severe, and act to remediate these effects through curb side tree plantings and other measures.

Introduction

Recognition of widespread health risks should widen debates [about the impact of climate change] beyond the already important considerations of economic disruption, risks to infrastructure, loss of amenity, and threatened species. The evidence and anticipation of adverse health effects will indicate priorities for planned adaptive strategies, and crucially, will strengthen the case for pre-emptive policies. It will help us understand better the real meaning of sustainability.

Hales, McMicheal, and Woodruff[2]

While mainstream debate currently focuses on science and the economic dimensions of climate change, there is also a growing awareness of its social costs. There is a mounting understanding that the effects of climate change will be disproportionately felt by already-vulnerable communities, including people on low-incomes and communities directly dependent on their local environment for survival.

Focusing on Victoria, this report identifies the projected direct and indirect effects of climate change and the likely impacts these will have on low-income communities. It also makes a series of recommendations targeted at government, specific industries and community sectors so that as a community, we can take appropriate action to curtail and reduce the likely adverse impacts of climate change.

This report aims to emphasise the importance of early action to significantly reduce greenhouse gas emissions and avoid dangerous climate change. Early action can contribute to economic stability and unnecessary suffering and loss of people's lives.

Adaptation, although extremely important for minimising the suffering and negative economic ramifications of variable climatic conditions, must always come second to effective mitigation actions to increase energy efficiency, shift to renewable forms of localised energy production, and reduce greenhouse gas emissions.

It is almost impossible to anticipate the full range of impacts of climate change. Who could have foreseen, for example, that in the 2003 European heatwave, over 35,000 people would die from heat-related illness in countries including France, Italy, UK, Germany, Spain and Portugal?[3] Or that the heatwave would cause bushfires and significant loss of crops?[4] We are – as yet – in the very early stages of understanding how a rise in global temperature will affect human and other life on this planet. For this reason, all of the figures cited in this report should be understood to be conservative estimates. They represent likely scenarios, based on what is already known to be occurring. We should expect these figures to be *underestimations* if scientists' predictions about feedback loops prove to be correct.

Background

Climate change

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has recognised that human induced climate change is occurring as a result of burning fossil fuels and land clearance.[5] In the 21st century an increase of anywhere from 2 to 4.5°C in annual global mean surface temperature is predicted. This increase will result in varying changes in the climate in different parts of the globe. The consequences of climate change are likely to be devastating for many. According to the IPCC, to stabilise greenhouse gas concentrations at the present level would require a reduction in annual global greenhouse gas emissions by at least sixty percent.[6] To realise this target will require significant international cooperation and economic transformation.

The impacts of climate change on the environment, economics and people are uncertain. Uncertainties are dependent largely on how quickly and effectively we mitigate our greenhouse gas emissions to minimise the impacts, the extent of global warming we experience, and how that interacts with the complex climatic and ecological systems. It also depends on how well we prepare for the impacts and our capacity to react to challenges and capitalise on opportunities. Projections and figures discussed in this report generally refer to those under scenarios where little is done to reduce greenhouse gas emissions or where actions are taken too late to avoid some of the more serious impacts. If emissions are reduced significantly and quickly, although some climate change is inevitable, the impacts on people and ecologies around the world would be considerably smaller.

Environmental impacts of climate change

Climate change has already begun. In 2005 Australia recorded its warmest year on record. The nation's annual mean temperature for 2005 was 1.09°C above the standard 1961–1990 average. The previous record of +0.84°C was set in 1998. In addition to being warm, the early months of 2005 were also very dry over much of Australia. The January–May period was the second driest on record.[7] Globally, trends in ice-sheet melt, increased drought and more extreme weather events all support climate change projections; however, it is difficult to attribute any given climatic event to human induced climate change due to the complexity of the global climate system. [8]

The environmental impacts of the enhanced greenhouse effect globally are extremely complex but are predicted to affect every single species on earth. In Australia the CSIRO projects effects such as more heatwaves and fewer frosts; more prolonged drought and heavy rains; increased sea-levels; an increase in severe weather events; higher risk of bushfire; and a change in ocean currents.[9] These environmental impacts will directly and indirectly affect people. A recent report for the Australian Greenhouse Office identified key vulnerable systems and regions in categories as broad as agriculture, energy, water supply, settlements and emergency services, ecosystems and biodiversity, and regional areas.[10]

Understanding the impacts on Australia and the world is important in our globalised system of food and material production and consumption. The economic and social stability of Victoria is heavily dependent on interstate and international economies and social pressures, and hence, what happens outside of Victoria is a crucial factor in threats posed within Victoria.

Environmental impacts of climate change in Victoria

The CSIRO projects that by the year 2070:

- Victoria is likely to be 0.7ºC to 5.0ºC warmer than it was in 1990
- the frequency of extreme maximum temperatures will increase, with up to 3.5 times more hot days in some areas of the state
- frosts are likely to decrease in frequency, with much of the state likely to become frost-free at the higher levels of projected temperature increases
- rainfall decreases are likely – in most regions, changes in annual rainfall ranging from -25% to +9% are projected
- spring rainfall is most likely to decrease through most of the state, with dry springs likely to become more common
- extreme daily rainfall events will become more intense and more frequent in many regions
- warmer conditions will lead to increased evaporation which, combined with reduced rainfall, is likely to increase moisture stress.[11]

Projected social impacts of climate change across the world

Climate change will affect everyone, but some will be affected more than others. According to the IPCC, the urban poor and older age populations face the biggest threat from extreme temperatures.[12] The most profound impacts projected globally include greater risk of death, injury, ill health and starvation in relation to heat stress, reduced agricultural production, rising sea-levels, extreme weather events, increased risk of skin cancer and increased transmission of vector-borne disease.[13] These impacts are likely to result in the creation of 'environmental refugees' (people who are displaced by environmental factors). According to the International Federation of Red Cross and Red Crescent Societies, more people are now forced to leave their homes because of environmental disaster then because of war.[14] Norman Myers of Oxford University projects that at conservative estimates, climate change will increase the number of environmental refugees six-fold over the next fifty years to 150 million. Some of these refugees will be from our regional neighbours in the Pacific.[15]

Specific threats faced by Victorians will be detailed in the body of the report.

Our responsibility for climate change

On a global scale Australia is not an exceptionally high greenhouse gas emitter due to our low population levels; however, on a per capita basis we are in fact one of the highest atmospheric polluters of all major emitters.

Of all the states in Australia, Victoria emits the highest greenhouse gas emissions on a per capita basis. In 2002 Victorians alone emitted 117 million tonnes of greenhouse gas emissions.[16] This is more than the total emissions of many industrialised nations with

significantly higher populations, such as Austria, Hungary, Portugal, Slovakia, Sweden and Switzerland.[17] This position can be in part attributed to our large cheap supply of low-grade coal, but also reflects a culture of inefficient and high energy consumption domestically, high meat and dairy consumption and production, energy intensive industry, land clearance, and car dependence.

The UNFCCC articulates the scenario well:

Global warming almost certainly will be unfair. The industrialized countries of North America and Western Europe, along with a few other states, such as Japan, are responsible for the vast bulk of past and current greenhouse-gas emissions. These emissions are a debt unwittingly incurred for the high standards of living enjoyed by a minority of the world's population. Yet those to suffer most from climate change will be in the developing world. They have fewer resources for coping with storms, with floods, with droughts, with disease outbreaks, and with disruptions to food and water supplies. They are eager for economic development themselves, but may find that this already difficult process has become more difficult because of climate change. The poorer nations of the world have done almost nothing to cause global warming yet are most exposed to its effects. 18

The need to act

With such widespread and grave environmental and human impacts predicted from climate change, Victorians and Australians have a moral responsibility to act, not only because we are in the privileged position of having the resources to be able to do so, but also because that privilege has been obtained through high historical and present day greenhouse gas emissions.

First and foremost governments, industry and communities must act to mitigate greenhouse gas emissions. The faster and more comprehensively the causes of climate change are minimised, the less the adverse impacts on society will be.

However, given that some level of climate change is already inevitable, it is also important for society to anticipate and plan for the impacts on a local and global scale, paying special attention and providing assistance to the most vulnerable groups to ensure the health, well-being and sustainability of all people and their environment.

Adaptation to climate change

Adaptation strategies aim to identify and anticipate consequences of climate change, planning and acting to increase the ability of human and natural systems to tolerate those changes. Adaptation is a framework for managing future climate risk. It offers the potential of reducing future economic, social, and environmental costs, protecting life and exploiting beneficial opportunities. In 2001 the IPCC concluded that adaptation is now a necessary strategy to complement emission mitigation efforts.

Developing adaptation strategies now is crucial for avoiding significant costs in the future. Policymakers and investors daily make decisions that have long-term and far-reaching and sometimes irreversible effects on the environment, economy and society. Consideration and integration of a precautionary approach to climate change into planning within all sectors of society could avoid significant costs and suffering down the track.[19]

The vulnerability of environmental, economic and social systems to impacts is a key factor in developing adaptation strategies. Systems that are highly exposed to climate factors, sensitive to change and less able to adjust are most vulnerable.[20]

Current vulnerabilities of low-income earners in Victoria

A recent report by the Victorian Council of Social Services (VCOSS) indicated that despite years of a growing Victorian economy, the living standards of many Victorians fall far below acceptable community standards.

In Victoria ongoing issues include:

- provision of quality basic services for all Victorians that are affordable including housing, health care, electricity and gas, water, transport and education
- protection of human rights and a fair go. Respect for human rights and a fair go is essential for a community to live with human dignity. Further reform and resources are needed to ensure the human rights of people in the justice and prison system are respected; to observe economic rights, such as the right to housing, employment, education and health care, and cultural rights, particularly Indigenous rights to culture and land
- failure to break down barriers to community participation, which include racism and discrimination, physical barriers for people with disabilities, and language and distance barriers to accessing community services
- lack of support for low-income earners (defined as those with an income of less than $35,000 per annum) to cope with rapid social and economic change from a growing population, and rising oil prices. There is a risk of polarisation between job-rich and job-poor locations in addition to climate change risks.[21]

Low-income earners broadly have been identified as a group likely to disproportionately experience the negative impacts of climate change. There are many subgroups within this larger social grouping facing specific risks; predominantly these are Indigenous communities, rural communities, and urban low-income earners including people who are elderly or disabled, refugees or single-parents.

The existing disadvantage of Indigenous people has been identified as including significant health problems, insecure and inadequate housing, comparatively lower standards of education and training, and lower economic standards of living. These factors render Indigenous people particularly vulnerable to the impacts of climate change.

Today, urban low-income earners face particular risks associated with inadequate housing, access to adequate health care, employment barriers, knowing their rights and being informed about issues that affect their health and wellbeing. Climate change is likely to place these people at further risk and put further strain on social service providers and limited government funding.

Rural communities, on a range of social and economic indicators, are already more disadvantaged than their metropolitan counterparts. This disadvantage is seen in lower incomes, higher living costs, unemployment, poorer housing quality, restricted service access, poorer health status, and lower levels of educational achievement.[22] Climate change is likely to stress communities as a result of farm failure and the associated declines in financial and liveability requirements in small rural towns and regional centres.

People most vulnerable to climate change

This report focuses on risks to low-income earners in Victoria, particularly those most at risk. However, it is important to recognise that people in northern parts of Australia might be even more vulnerable to the negative impacts of climate change, particularly in remote communities and areas susceptible to extreme storms and spread of tropical vector-borne diseases.

Globally, far greater impacts are projected on people of the majority world, who have few means to cope with the adverse impacts of climate change and who are directly dependant on agriculture for food and income. The UNFCCC explains:

The most vulnerable people are the landless, poor, and isolated. Poor terms of trade, weak infrastructure, lack of access to technology and information, and armed conflict will make it more difficult for these people to cope with the agricultural consequences of climate change. Many of the world's poorest areas, dependent on isolated agricultural systems in semi-arid and arid regions, face the greatest risk. Many of these at-risk populations live in sub-Saharan Africa; South, East and Southeast Asia; tropical areas of Latin America; and some Pacific island nations. [23]

Agriculture, food and water

Introduction

The predicted impacts of climate change would probably exacerbate hunger and poverty around the world. New and fluctuating weather patterns could have a strongly negative impact on economic activity, particularly in the natural resources areas. People who are highly dependent on farming, fishing or forestry may well see their livelihoods destroyed ... The poor would suffer the most because they have fewer options for responding to climate change.

United Nations Environment Program[24]

In 2005 the Australian Greenhouse Office report *Climate Change Risk and Vulnerability* assessed the agricultural sector as the most vulnerable to climate change. This is due to the dependence of agriculture on climate, exemplified by the $3 billion reduction in farm output in 2002–2003 as a result of extended drought.[25]

An adequate supply of food and water is essential to a healthy life. This section explains the projected impacts of climate change on water supplies and agriculture and the flow-on effects related to food production, including increases in the price of food, and water. It highlights that low-income earners and food producers will be most vulnerable to agricultural failure and fluctuations in food and water prices globally and locally.

Projected impacts of climate change on rivers, dams and water catchments

In Victoria, public and private industries are already subject to water restrictions and increasingly, the costs associated with accessing water supplies are rising. Climate change projections suggest that south-eastern Australia will experience a significant decrease in winter and spring rainfall of up to 40% and 15-40% more hot summer days by the year 2070.[26] This will constrain water supply for irrigation and metropolitan use. Yet climate change is also likely to increase water demand for irrigation and other uses due to warmer conditions, more extreme heat, less frequent frosts and increased evaporation. An increase in salinisation of water supplies is also expected. More extreme precipitation is also projected, so flooding is more likely. This would not only cause damage to topsoil and crops, it could prevent access to remote areas and might stress dam structures, posing threats to people, settlements and agriculture downstream.[27]

Studies thus far indicate that less than a 1ºC rise in temperature could result in a 3–11% decrease in Melbourne's water supply; a 1–2ºC degree rise could decrease flow by 12–25% in the Murray Darling Basin and result in a 7–35% decrease in Melbourne's water supply; and a 3–4ºC rise in temperature is likely

to result in a 16–48% decrease in flow in the Murray- Darling Basin.[28]

Climate change will place additional stress on rivers, ground-water systems and dams. The range of adverse social, economic and environmental consequences generated by this situation would be significant and will have numerous ongoing implications for society.

The recent confirmation of several years of drought across Victoria, and the exposure of the hardships faced by rural communities, provide an indication of the potential costs of climate change as drought conditions are exacerbated. The federal and state governments have created a fund of tens of millions of dollars to support farmers financially and emotionally, and to support townships.[29]

Impacts of climate change on agriculture and forestry

Impacts in Australia

In Australia the impact of climate change on the agriculture sector (which includes livestock production, crop production, horticulture and viticulture) are projected to include:

- an increase in the level of salinisation of dry-land farms and some streams
- increased risk of fires
- a shift from short term gains in productivity for wheat crops (associated with increased CO2), to longer term losses from increased aridity
- a reduction of quantity and quality of fruit produced
- a spread of woody weeds
- a spread in pests and diseases
- increased soil erosion
- a shift in net profit to loss as a result of bad years, especially due to drought.[30]

Agricultural businesses and regions most at risk will be:

- those already stressed — economically or biophysically — as a result of land degradation, salinisation and loss of biodiversity
- those at the edge of their climate tolerance
- those where large and long-lived investments are being made — such as in dedicated irrigation systems, slow growing cultivars and processing facilities.[31]

Limited information is available on the specific impacts of climate change in Australia, however some studies have indicated worrying impacts across the agricultural sector. For example a 3–4ºC temperature increase could result in:

- 32% chance of decreased wheat production (without adaptation)
- 45% chance of wheat crop value being below current level (without adaptation)
- 55% of core habitat lost for *Eucalyptus*
- 25–50% increase in 'generic' timber yield in cool and wet parts of southern Australia
- 25–50% decrease in 'generic' timber yield in northern Queensland and the Northern Territory
- 6% decline in Australian net primary production (for 20% precipitation decrease)
- 128% increase in tick-related losses in net cattle production weight.[32]

In Australia production is heavily dependent on water. Covering approximately 60% of Australia, the agricultural sector uses more land and water than any other domestic industry, with estimates in the *Water Account Australia 2000–2001* that agriculture accounted for 67% of water consumption in that year.[33]

As a result of the dependence on irrigation, the agricultural sector is particularly vulnerable to frequent drought and high evaporative loss of

stored water. The combination of rising average temperatures and more intense droughts (and floods) will have significant adverse impacts upon the viability of Australian agriculture.[34] Victoria is no exception in relation to these findings.

Rangelands (arid and semi-arid land where the rainfall is too low or too variable to support cropping) in Australia support cattle and sheep grazing. Already rangelands are vulnerable to drought conditions as they are a marginal form of farming. Decreases in rainfall in the south and unpredictable monsoonal conditions in the north, coupled with heat stress and disease spread create uncertainty and production is forecast to decline.[35]

The importance of the agriculture industry to the national economy is significant and the threat of climate change is of key concern. Australia's agricultural sector is predominantly export-orientated and represents approximately a quarter of Australia's total merchandise exports. The Australian Greenhouse Office's report on *Risk and Vulnerability* provides some assessment of the potential economic losses to the agriculture sector:

- drought reduction in pasture growth could cause an $8 billion loss in annual export earnings
- fruit and vegetable crop lost earnings of $2 billion annually
- perennial horticulture losses due to higher water demand and other costs to potentially reach $2 billion per annum
- losses of annual broad-acre crops in marginal areas worth as much as $8 billion.[36]

Currently there are uncertainties as to the impact of climate change on global agricultural production and markets, but changes in these areas are highly likely to impact on Australia.

Little is known about what the impacts of projected climate change might be on fisheries. This area is currently being investigated; it is likely that higher water temperatures will, at the least, affect the distribution of many species.

Impacts in Victoria

In Victoria projected increased drought and fire risk would provide the greatest threat and result in reduced productivity and increased stress on rural communities.

Some projected impacts include:

- reduced snow cover in the alpine areas in the east of the state would reduce spring water melt to water catchments.
- lower milk yield in the dairy industry, as a result of rising temperatures. by 2030, annual milk losses are likely to be between 250 and 310 litres per cow, depending on the rate of warming.[37]
- declines in forage and animal production in the case of reduced rainfall in winter and spring.[38]
- decline in fruit quantity and quality from orchards due to fewer frosts in temperate zones and storm damage. Stone fruit and apples in southern and elevated areas of Australia are particularly vulnerable. Impacts on viticulture (wine producing) regions will be mixed, with warmer regions suffering, while cooler regions may benefit.[39]

In summary, climate change is likely to have significant negative impacts on agriculture across Australia, with many risks specifically affecting Victoria. This scenario is likely to create uncertainties in food production and water supply.

Low-income earners' current access to fresh food and water

Access to fresh food is not guaranteed for low-income earners. Of the people surveyed in Anglicare's recent Financial Hardships in Victoria report:

- 78% of those surveyed spent over 20% of their income on food. Of these, over a quarter spent over 40% of their income on food
- all respondents noted that the cost of food had increased over the past year, with 86% spending more on food
- 92% of people surveyed listed fresh food, including fruit, vegetables and meat as the particular food items that are becoming more expensive to buy
- 80% of respondents would buy more fruit and vegetables each week if they were cheaper.
- meat was the food item that most individuals and families restrict each week due to cost.[40]

Increasing costs of fresh food is straining budgets of low-income earners with most reporting that they are no longer able to afford the daily quantities of healthy food recommend by the World Health Organisation.[41] Some low-income earners prioritise paying bills over buying fresh food.

Impacts of food and water insecurity on low-income earners

Decreased water supplies, reduced productivity of agriculture, loss of income or bankruptcy from farm failure and associated flow-on effects for rural towns are key factors affecting the low-income earners.

Access to water

Victorian legislation currently regulates water usage through the implementation of permanent level two restrictions. In 2007 we entered Stage 3a water restrictions, with further stages likely in the near future. Any prolonged water shortages arising from climatic change will certainly lead to increased competition between agricultural, industrial, metropolitan and environmental water use and allocation. The flow-on effects of this situation will likely lead to increased prices for water. This will not only place additional stress on water resources, but it will also directly impact on families who live an economically constrained lifestyle and often go without basic necessities such as nutritional foods when they spend a high proportion of their income on rent and utility bills.

Access to fresh food

Climatic conditions often interact with socio-economic conditions to undermine food security. Climate variability tends to have the greatest impact on people who are landless, poor, or isolated.[42] Internationally some one billion people may be at risk of hunger under projected climate change conditions.[43] Countries such as Ethiopia, Somalia, Mali, and Haiti are the least food-secure and therefore most at risk under climatic changes.

Climate change poses a serious threat to current agriculture productivity levels in Australia and Victoria. The projected changes in distribution and reduction in areas viable for particular forms of agriculture will upset current agricultural industries, practices and production levels. This will in turn affect local, national and global communities who depend on food production in Australia.

Currently, Australians source over 90% of their fresh food from within Australia. A significant proportion of frozen and tinned fruit and vegetables is also produced in Australia, however this figure is decreasing. Increasingly there is an exchange in products like tomatoes, asparagus and others between Australia,

the European Union, New Zealand and parts of America. Even with declines in production due to climate change, this position provides a relatively high level of food security for Australians, however how trends in export/import change will impact on this.

Australia is also a net exporter of agricultural products. The risk of reduced annual revenue because of declines in production and fluctuating global commodity prices as a result of global declines and uncertainties in food production is very real. The implications of this process are uncertain, but the likely result is that food prices will rise.

Increases in food costs, would exacerbate low income earners' lack of access to nourishing healthy food. Many of these people could become malnourished by eating low quality and processed food, or simply by going hungry.

Rises in the cost of food and water associated with climate change are likely to be compounded by other rises in cost due to factors such as declining oil and gas reserves.

Specific impacts on rural communities

Already rural and regional communities are experiencing a range of adverse social and economic issues. For example in the western region of Victoria, the Wimmera, research indicates that people in this region are concerned about:

- the declining and aging population
- the permanent departure of youth from rural areas
- attracting and retaining skilled labour
- sustainable natural resource management
- the need for new business and industry developments for regional growth.[44]

These issues, coupled with dependence on wheat and rangeland farming (which are projected to decline) and uncertainties in forestry and viticulture, will increase stress on families, communities, finances and business.[45]

Reductions in employment opportunities in particular regions will result in decreased income and the general health and wellbeing of those communities. The following case study highlights some of the issues that the community, future governments and industry sectors will face. (For more detailed discussion, see *Housing and Human Settlements* on page 26.)

Case Study 1

Stone fruit, apple & grape production in Victoria

This case study looks at the effects of increased temperature on stone fruit, apple and grape production and the projected flow-on effects on the wider community of Shepparton.

Increases in temperature will have a significant bearing on agricultural enterprises such as stone fruits and apple orchards. Although warmer temperatures will reduce the frequency and severity of frost damage and may present new horticultural opportunities, these temperate fruits need winter chilling to ensure normal bud-burst and fruit set, hence they are at risk of lower yields and reduced fruit quality. Increasingly unpredictable weather will also have an impact with frosts at unusual times of year. There is also the possibility of more hail, wind and heavy rain damage.[46] Higher temperatures will also affect viticulture production. Grapes are highly temperature sensitive so that higher ripening temperatures allow for an even shorter window from which to determine the optimum harvest time. Also, in intermediate climates the season will begin earlier and developmental stages will be accelerated leading to ripening in the earlier hotter months with the chance of reduced quality.[47]

By 2030 a cost of 0-25% to grape quality could be expected, with the suitable conditions for particular viticulture productions shifting southward.[48] This situation would reduce production and generate stress on communities, families, finances and farming business.

In Victoria the majority of stone fruit, pomes (apples and pears), and some grapes are grown around the Goulburn Valley region (around Shepparton and Benalla), along the Murray River around Swan Hill and Mildura, and east of Melbourne.[49] In 2003/4 fresh food exports were valued at $A261 million, while processed fruit exports were worth $A109 million.[50] Major processed fruit export commodities included preserved pears, preserved peaches, canned fruit salad, and sultanas, all of which are grown in these areas.

According to the ABS 2001 *Index of relative socio-economic disadvantage* (which considers low income, low educational attainment, high unemployment and proportion of workforce in relatively unskilled occupations), the Mildura Rural City Council, Swan Hill Rural City Council, Glenelg Shire Council, Benalla Rural City Council, Wangaratta Rural City Council, Moira Shire Council, and Greater Shepparton City Council areas are all disadvantaged[51] and all are fruit growing areas (the index does not account for disadvantage relating to distance, so these areas could be expected to have higher disadvantage than those disadvantaged areas in Greater Melbourne). Of these areas, Greater Shepparton, Glenelg and Mildura are

rated in the top twelve most disadvantaged local government areas.[52] Over the last seven years unseasonably dry weather conditions has resulted in a reduction in fruit production[53], which may have compounded the poverty.

These existing disadvantages experienced by these communities mean that they might have fewer resources to cope with the impacts of climate change. Given that the impacts projected pose greater risks to stone fruit, apple and grape growers, and communities that support specialised enterprises such as canneries may be disproportionately affected, these regions are at a compounded risk and deserve special consideration.

For example, Greater Shepparton located on the south-eastern reaches of the Murray-Darling Basin is the fourth largest provincial centre in Victoria. The region has a diverse population, with 15.7% of residents born overseas. The region is a major fruit and vegetable growing and processing centre, with two large canneries. There are also large dairy processing facilities located in and around Shepparton and irrigation is critical to agricultural production.[54]

The Murray-Darling Basin has been assessed as one of the most vulnerable regions to climate change because of increased drought, higher temperatures, and high levels of water stress, erosion and salinity already present in the system. The Goulburn Valley in particular has already experienced a warming trend of around 0.1ºC per decade since 1950. These trends are likely to be at least partly related to the effect of climate change. A 2ºC warming in the maximum temperature and a 20% decrease in annual rainfall (a moderate scenario for 2070) would make the climate of Shepparton more like the current climate of Condobolin in New South Wales.[55]

Growers around Shepparton are likely to experience tougher environmental conditions broadly, and coupled with the vulnerability of stone fruit, apple and grape production, are likely to be at greater risk of reduced production and reduced employment opportunities. With the predicted decline in precipitation and water supplies, and the dependence on irrigation for crop production, output in industry is also likely to decrease. This will have flow-on effects for the townships food processing factories. These enterprises are expected to experience higher unemployment rates as a result of downsizing in both production and downstream processing, which includes canning and preserving of fruit and crops. Lastly, with higher temperatures, increased heat stress in dairy cattle is expected to decrease milk production.[56] Hence all the major industries and the livelihood of the majority of people in and around Shepparton are likely to adversely affected by climate change.

Consequently, it is highly likely that the Shepparton township will experience an overall decline due to the compounding effect of various impacts of climate change, with flow-on effects of increasing unemployment and decreasing income, coupled with high levels of socio-economic disadvantage already experienced by the region. This might cause some migration out of the region by jobseekers compounding financial difficulties for local businesses and decreasing the liveability of the township. This scenario can be translated to many rural communities in Victoria which are vulnerable to becoming unsustainable.

Impacts on Aboriginal communities

Aboriginal and Torres Strait Islander communities in Victoria will experience further adversities as a result of climate change. Compared with the overall population of Victoria, Indigenous communities are more likely to be based in rural areas or regional centres. Overall, approximately 50% of the total Indigenous population lives in rural areas. In a number of centres, they constitute a significant element of the total population. For instance, in the Shepparton district – heavily reliant on agricultural production and processing - between 0.8 and 4.4% of the total population are Indigenous, amongst the highest percentage in the state. See *Housing and human settlements* on page 26 for further information on Indigenous communities in Victoria.

For a range of reasons, included the one cited above, many Indigenous people are dependent on rural industries for employment and, as outlined elsewhere in this report, a substantial number of these industries will be adversely impacted by global warming with expected economic and other costs for individuals, families and communities.

Many Aboriginal people retain a close connection to country and a deep sense of custodianship of the land. The impacts of loss of individual species, and, more broadly, impacts on landscapes and coastal and river systems will greatly affect their cultural landscapes.

Summary

The projected water restrictions, agricultural instability and crop failure associated with climate change are likely to cause increases in the price of food and water. Low-income earners have less financial capacity to absorb such increases and their access will decline accordingly. Decreased access to food and water can be expected to cause stress and health problems for these individuals and families. Projected decreases in agricultural production will also impact on rural communities, with most also likely to suffer income decline, unemployment and migration, undermining the viability of some towns. The environmental impacts of climate change are predicted to be most intense in the Murray-Darling Basin; hence it follows that the social impacts will also be focused on rural communities and Indigenous people in this region.

Recommendations

- governments should immediately begin a process of consultation, receiving input and guidance from rural communities themselves as to what approach would best help sustain and shift production to meet the needs of growers and the community under a changing climate
- governments should immediately undertake further research to assess the potential for shifts in regional crop production and the development of cultivars that are more drought tolerant and of temperature-stress resistant crops for the projected climatic shifts in the region
- the state government should create a public awareness campaign particularly within rural communities about the potential impacts of climate change
- state and federal governments should develop and begin allocation of money to a 'Climate Change Rescue Fund' now. This fund would act as a financial reserve for pro-active research and solutions to agriculture issues associated with climate change. It would also provide financial support to farmers to transfer production in accordance with climate change

- state and federal governments should continue programs to assess and develop water saving practices and infrastructure in agriculture and industry
- state government should continue public awareness campaigns on water use
- state government should mandate the installation and utilisation of water recycling facilities by 2015 for industries that use high volumes of water
- state and regional authorities should consider water recycling and desalination facilities powered by wind or other renewable energy sources for regions where fresh water is scarce
- state government should provide further incentives for water saving devices, water tanks and technological innovation in water use reduction practices and devices
- water saving devices should be provided and installed free of charge in all public housing and low-income earners' housing by 2012
- the Federal Government should immediately increase the minimum standards on water efficiency to 5-star ratings for all appliances.
- the Federal Government should develop an extensive program of providing fortnightly food coupons, on top of existing government entitlements, for low-income earners and pensioners. This coupon would be exchangeable for fresh vegetables, whole grains and meat/fish only, to ensure access to these basic food requirements
- the Federal Government should increase Centrelink entitlements in order to offset any price rises in water or appliances.

Energy

Introduction

Energy use affects all aspects of our lives ranging from food production to transport, heating and cooling. Consequently, the effects of climate change on energy such as energy availability, usage, and associated costs will be felt throughout a range of services.

Electricity, gas, water and access to transport are widely recognised as essential services required for a minimum standard of living acceptable. They are crucial to the health and wellbeing of families as well as playing a significant role in an individual's ability to participate in social relations. This section will examine projected trends in energy demand and prices, discussing the implications for low-income earners including those suffering from 'fuel poverty' or 'locational disadvantage'.

Projected impacts of climate change on energy

With the anticipated increase in temperatures worldwide, it is expected that the use of air conditioners by industries and households will increase. While winter heating may decrease, overall energy requirements are expected to increase.[57] This will lead to higher electricity peak demand loads. Electricity supply is sensitive to extreme weather-related events where both production and supply infrastructure might be damaged: in some cases temperature degrades transmission capacity of electricity; reduced rainfall and snowmelt may affect supply to hydro-energy facilities; and changes in cloud cover and winds could affect solar and wind energy generation.[58]

All these factors create uncertainties for future energy supply and increase costs associated with generation and supply.

Current trends reveal high and increasing levels of energy consumption in Victorian households and industry by world standards. Without government intervention this pattern is likely to continue, increasing pressure on limited resources.

A projected reduction in oil reserves globally over the next century is already increasing the cost of petrol. While not caused by climate change, this phenomenon unfortunately compounds the impacts of climate change. Increasing demand for oil for development, coupled with disruptions in supply due to extreme weather events (for example in the Gulf of Mexico), has resulted in a generalised increase in the global price of crude oil, with a corresponding rise in automotive fuel prices. This trend will only be exacerbated by reductions in supply over coming decades.

Price increases are highly likely to increase the price of products across the board, as many commodities require energy inputs and transport that are dependent on cheap fossil fuels and petroleum products.

Low-income earners' current access to energy

Electricity and gas

According to the Victorian Council of Social Services, low-income households spend a higher proportion of their household expenditure on essential items such as energy than wealthier households.[59] It is important to note that despite this, because of their constrained financial circumstances, these households still use less energy relative to wealthier households and hence contribute less to climate change.

The high proportion of expenditure on energy by low-income households can be partly attributed to the fact that a large proportion of their time is spent at home, indoors, as a result of limited funds and life choices. It is also attributable to purchase of affordable (often second-hand), but inefficient household goods that use high amounts of energy to operate, such as old washing machines, fridges, kettles and electric heating systems.

People on low-incomes often reside in rented, poorly insulated dwellings that have limited capacity for passive heating and cooling, are fitted with old, inefficient (sometimes electric) heating systems in inappropriate positions, and/or have inadequate curtains (for trapping heat). All these factors increase spending on energy. Unfortunately, at present, landlords are not obliged by legislation to comply with a minimum standard of energy efficiency ratings or guidelines.

According to Anglicare's Financial Hardship in Victoria Report, the increasing costs of gas and electricity are making it difficult for low-income earners to adequately heat their homes in winter.[60] Many Victorians experience 'utilities stress' (also known as 'fuel poverty'), where they are unable to heat their homes or must go without other essentials — such as food — to pay their utilities bills.[61]

Transport

Australian cities are marked by strong spatial socio-economic differentiation. In Victoria, Melbourne's inner-city areas with predominantly higher income households are transit rich, while the most highly disadvantaged households are situated in middle or outer suburban localities which are often dispersed and with poor transport services.[62]

Public transport services in the fringe areas of Australia's major cities are almost universally of low quality.[63]

Transport disadvantage is a critical issue in Victoria, especially because low-income earners are often forced to live in outer suburban areas for affordable housing.[64]

Transport costs on average make up around 15.2% of household budgets.[65] However this statistic hides the disproportionate burden of transport costs for people in outer suburban areas in general, and people living on low incomes in those areas in particular.

Poor public transport provision to outer-suburban areas means that those households have a higher proportion of cars ownership than inner-city households (1.9 vehicles per household compared with 1.43).[66] Car ownership imposes high costs on households, through purchase, depreciation, insurance, registration, maintenance and operating costs. According to recent research, 'Residents in Melbourne's "affordable" areas, in suburbs such as Beaconsfield, Pakenham or Officer, were spending up to 36 per cent of their income on fuel'.[67]

Clearly, low-income earners already pay a higher cost for both public and private transport services.

Projected impacts on low-income earners

Electricity and gas

In Australia, there are no reliable figures about the costs of transition to renewable forms of energy, the costs associated with reduction in oil and gas reserves, and the level and reliability of energy that could be produced using renewable forms of energy. This uncertainty means it is difficult to tell what the cost of energy will be in future years. However, it is likely that if trends in increasing energy demands and energy scarcity continue, the cost of energy will increase (possibly dramatically in respect to oil-based energy and products), increasing energy bills and the cost of many other products for many Victorian households. Even a relatively small increase in the cost of electricity would disproportionately affect low-income communities and households as compared to those who are better resourced.

Increases in energy demand could contribute to the enhanced greenhouse effect (assuming use of fossil fuels), worsening the adverse impacts on low-income earners. We therefore need to decrease demand and increase energy efficiency in industry and in homes.

One way of decreasing demand is to increase the cost of energy, providing an incentive for investment in energy efficient technologies that will save money in the long term. However, low-income earners do not have the financial resources to purchase new energy efficient products, so increases in energy prices would disproportionately affect them.

Recent research for the Brotherhood of St Lawrence by Dr Peter Brain from the National Institute of Economic and Industry Research found that 'the four household categories most adversely impacted in relative welfare terms by carbon pricing [specifically a carbon tax] are poor households, unemployed households, retired aged pension households and households with children where government benefits exceed 30% of income.'[68]

The social impacts, particularly impacts on low-income earners, of mechanisms to address climate change such as carbon taxes, congestion taxes, and others are areas that deserve more research.

Transport

Because of locational disadvantage, low-income earners are most vulnerable to increases in energy-related transport costs. Disruptions in supply from extreme storms and reductions in available quantities of oil, for example, would have significant socio-economic impacts that will be spread across different localities. Maps generated with the 'vulnerability index for petroleum energy rises' (VIPER) demonstrate that Australian cities have high levels of oil vulnerability and that localities situated in middle and outer suburbs are most vulnerable to the socio-economic impact of oil price rises.[69]

Those with adequate access to quality public transport services can switch to this mode of transport if driving a private vehicle becomes unaffordable or uneconomical. Unfortunately for those who live in poorly serviced areas, there is no viable alternative to car-based travel. The most vulnerable localities in Melbourne are those located on the urban fringe, but also within the ageing industrial areas, such as Sunshine and Altona in the west, Broadmeadows, Thomastown and Lalor in the north and greater Dandenong and Frankston in the southeast.[70]

Summary

Utility stress has persisted for many years in Victoria and shows no signs of improvement. Sole parents, unemployed people, young people, large families, private tenants, people living alone and people with disabilities or chronic health problems are especially at risk. Climate change is likely to perpetuate this trend. Energy demand and energy costs are both likely to increase, with a

corresponding escalation in the level of stress and financial burden on low-income households. People who have limited access to public transport will experience particular disadvantage.

Recommendations

Initiatives such as the Victorian state government's plan to place solar panels on the roofs of high-rise public housing are to be commended as an important step forward. These trial projects, however, fail to achieve the kinds of cuts necessary to avoid dangerous climate change and fail to address impacts on low-income families. Friends of the Earth recommends that:

- state and federal governments should mandate and finance implementation of durable energy saving measures in public housing that equate to at least 50% of the household greenhouse gas emissions from direct energy consumption by 2020. This would help provide affordable energy services to low-income households and help reduce Victoria's greenhouse gas emissions. These measures should include:
    - installation of solar electricity or solar hot water systems
    - trade in services or direct provision of energy efficient appliances – particularly heating and cooling systems
    - incorporation of passive design features in all new public housing
    - retrofitting old public housing with energy-efficient design and facilities
- state and federal governments should undertake comprehensive social-economic impacts assessments before implementing climate change mitigation measures, and act in accordance with recommendations to minimise the impacts of price increases on low-income earners
- state governments should introduce mandatory energy and water efficiency ratings for private rental properties by 2008, and a mandatory efficiency standard by 2010
- the Federal Government should legislate mandatory minimum standards for energy efficiency in appliances, particularly heating and cooling systems
- state governments should coordinate and subsidise trade-in services or direct provision of energy efficient appliances – particularly heating and cooling systems – for concession holders
- the Federal Government should create an easy-to-understand information campaign on the energy embodied products, so people have a greater understanding of the impact of what they are purchasing
- the Federal Government should investigate vulnerability of energy infrastructure to potential climatic events such as heatwaves and severe storms. Upgrade the infrastructure to incorporate new risks
- public transport services should be returned to government hands to ensure public control of equity within and access to transport services
- state governments should strongly reinvest in public transport services to increase standards, regularity and coverage of services to outer suburban areas. These services must aim to provide viable alternatives to car transport
- state governments should make public transport free or, at minimum, free to concession card holders

Housing and human settlements

Introduction

Urban areas and the built environment are constructed to manage and control climate. Our cities and infrastructure are built to accepted risk limits based on the expected return frequency of severe winds, heavy precipitation events, storm surges and so on. Below these thresholds, severe weather events usually inflict relatively light damage to property, human health and life. Above the thresholds, however, damage, injury and death can accelerate in a non-linear way.[71]

Human populations and infrastructure across the globe will be affected by climate change, but the extent of this impact will vary according to the location of the settlement, and the design and performance of buildings and infrastructure. According to the Munich Re Foundation (a part of large reinsurer Munich Re), the world suffered more than $200 billion worth of economic losses as a result of weather related disasters in 2005.[72] This was the costliest year on record and was associated with the record high number and intensity of the hurricanes in 2005. 'There is a powerful indication from these figures that we are moving from predictions of the likely impacts of climate change to proof that it is already fully underway,' said Thomas Loster, the foundation's director.[73]

Further, the Stern Review asserts that '…the additional costs of making new infrastructure and buildings resilient to climate change in OECD countries could be $15 – 150 billion each year (0.05 – 0.5% of GDP)'.[74]

The following section highlights some of the key issues associated with human populations, housing and climate change, demonstrating the vulnerability of low-income communities to climatic disturbances and the inadequacies of low-income dwellings.

Projected impacts of climate change on human settlements

The projected impacts of climate change in Victoria, which include bushfires, high winds, heavy rainfall, sustained heatwaves and storms, are likely to cause significant damage to housing and infrastructure. This is particularly so in inner areas of older cities that have progressively increased their population density and expanse of impermeable surfaces (most of these are over stormwater infrastructure put in place fifty or more years ago).[75] Our aging population means that an increasing proportion of the population will be at high risk.[76]

Geographic factors play an important role in determining the risk and vulnerability that regional communities face. Some communities are at greater risk of being affected by climate change, while others are more vulnerable to the impacts, especially if they are already under significant stress or are reliant on climate sensitive industries or systems. Vulnerable areas (and associated communities) include[77]:

- low-lying coastal population and resort centres
- tropical and sub–tropical population centres
- alpine regions
- centres with a high dependence on agricultural and/or eco–tourism activities
- remote indigenous communities
- areas of southern Australia facing acute water shortages and supply constraints.

Many rurals regions face increased risk due to their economic dependency on threatened industries. In the west of the State (around the Wimmera) it is risk of wheat and rangeland farming failure from drought and temperature increases; in Gippsland it is reduced crop and dairy production due to increased drought and higher temperatures, increased bushfire risk, loss of tourism income from decline in the snow cover in the alpine region and damage to Gippsland Lakes due to sea-level rise and the associated erosion; but in Victoria, the Murray Darling region has been identified as a region most vulnerable to the impacts of climate change.

Extreme storms

Little is known about the exact risks of storms in Victoria in a changed climate, however preliminary research indicates that for the east coast region of Victoria, severe storms are likely to occur every 83 years (compared with every 100 years now). On the south coast, extreme weather could be expected every 70 years (compared to every 100 years now).[78] Inclement weather would increase, despite an overall projection of decreases in lows (which bring rainy and stormy weather). This highlights the fact that changes in the average characteristics can often mask the changes occurring to the extremes within the distribution.[79]

Already weather-related catastrophes such as severe storms resulting in wind damage and floods are increasingly affecting urban populations. The annual cost of these catastrophes can run into millions of dollars. In Victoria the estimated number of flood-prone buildings in 1996 was 15,000. The annual average damage cost for buildings liable to flooding in a 1-in-a-100 year storm was $6.3 million (for 1996 monetary value). The actual damage caused by all flood events will be considerably higher as smaller storms often have locally isolated but still notable impacts. Whilst these statistics might seem insignificant in the broader scale of change, we must expect that they will escalate over time and that ever greater numbers of people will be affected.

Coastal populations and storm surges

In Australia, settlement predominantly focused on the coastline. The current population growth is also concentrated in coastal towns, with rising numbers of retirees and young people migrating to these areas. In Australia in 1996, some 83% of people lived within 50km of the coast. In Victoria, the most densely populated state, it is 85%.[80]

Projections about the effects of storm surges on particular localities are very uncertain, due to complex and varied potential climatic interactions. Nevertheless, many appropriately qualified experts have expressed concern at the effects of climate change on sea levels.

Scientists at the *National Oceans Conference* held in Tasmania in April 2004 warned that sea levels in the Australian region are rising at rates that will create major complications for future generations. A sea-level rise of 8cm to

80cm is expected during the 21st century and according to Dr John Hunter, of the Antarctic Climate and Ecosystems Cooperative Research Centre, this rise could have a huge impact on our coasts – as a rule of thumb, each centimetre rise causes sandy shorelines to retreat by about 1 metre.[81]

Despite this, the CSIRO projects that sea-level rise alone is not projected to cause excessive damage along the Victorian coastline over the century. However they do believe that temporary fluctuations in sea level, which occur as a result of storm surges, coupled with sea-level rise, are likely to be more destructive to the coastal zone. Coastal populations in low-lying areas and around the banks of rivers will be increasingly prone to flooding and soil erosion.

It should be noted that Dr Hunter's estimation of shoreline retreat indicates a far more serious situation than that which the CSIRO seems prepared to articulate (in CSIRO reports the erosive impact of sea-level rise is not widely discussed). And with CSIRO publicly unprepared to name suburbs or regions that are vulnerable to sea level rise, it is unclear where the line between uncertainty and censoring for political and economic reasons lies.

In the majority of cases, storm surges along the Victorian coastline over recent years have been caused by westerly winds associated with cold fronts and tended to occur during the colder months of the year.[82] According to the CSIRO, storm surges are becoming more regular and could become more extreme.[83] Areas vulnerable to sea level rise and storm surges in Victoria include low-lying regions of Port Phillip Bay. In sensitivity experiments conducted by the Environment Protection Authority, the unlikely worst-case scenario for 2070 revealed flooding in the north and south side of the Mordialloc Creek and Hobson's Bay including Williamstown and St Kilda), and sensitivity to sea-level rise around the Werribee region.[84]

Infrastructure at higher risk includes factories overlooking seagrass beds, housing and tourism infrastructure in mangroves, coastal buildings with underground garages and housing in the sand-dune zone. There are many examples of these types of scenarios around the bay and Victorian coastline.

Currently, at least a quarter of a billion dollars of real estate including some important Melbourne icons, such as Luna Park and a colony of Fairy Penguins as well as the low lying suburbs around the Elwood Canal and St Kilda foreshore are at risk from increased storm surge activity and flooding that is likely to be the result of climate change.[85] In the Hobson's Bay area (incorporating much of the City of Port Phillip), up to three square kilometres may be inundated under the worst case scenario. Around one-third of this would be under one meter or more of water.[86] The seriousness of this situation has been acknowledged by the local council which, together with Melbourne Water, has begun to implement a number of adaptation strategies including a requirement that new constructions in the area have floors that are at least 30mm above the predicted flood level.[87]

The council for the low-lying Gippsland coast has also expressed great concern about the impacts of sea-level rise on its fragile dunes and lakes systems, as well as tourism and agricultural enterprises. Preliminary studies by CSIRO indicate a maximum increase in the one in 100 year storm tide of approximately 69cm for 2070.[88] The same study showed that the coastline around Lakes Entrance had the highest storm surge potential, but when combined with tides, the highest sea levels occurred to the west of Wilson's Promontory.[89] Coastal flood risk along the Gippsland coast may also be exacerbated in the future by land surface subsidence. Studies have estimated that the coast could subside by between 13 and 977 mm at Alberton by 2070, although there is considerable uncertainty in some of the assumptions that were required to generate these values.[90]

While most higher risk storm surge zones in Port Phillip Bay fall in advantaged (St Kilda and surrounds), or moderately advantaged areas (Mordialloc and

Werribee), there are many rural coastal communities that are already disadvantaged and hence are more vulnerable to negative impacts. These include coastal regions of East Gippsland Shire Council, Glenelg Shire Council, Bass Coast Shire Council, Frankston City Council, and City of Greater Geelong.[91]

Flooding cost Victoria $1,267 million dollars between 1970 and 2000. That's an annual cost of around $41 million dollars. This figure can be expected to rise accordingly. In Australia, the number of flood related deaths are small. These figures are expected to increase, but are likely to remain minimal.

The projected impacts of climate change on these disadvantaged coastal communities indicate a change in extreme sea level events in the future that range from at best, little change from current climatology, to at worst, more severe storm surge events and coastal erosion. With this scientific uncertainty, precautionary prevention measures must be pursued in risk scenarios. The potential costs associated with prevention and restoration of storm surge events could significantly strain these low-income earning communities.

Bushfires

Fire danger periods currently threaten many rural and agricultural settlements throughout the State of Victoria. Victoria, which is already one of the most bushfire prone areas on Earth[92], is expected to experience an increase in the threat of bushfires. According to the Australian Greenhouse Office report Climate Change: An Australian Guide to the Science and Potential Impacts, extreme fire danger is well connected with periodic drought conditions leading to drying of fuel, and extremely hot summer and autumn days conducive to fire spread. These conditions are expected to increase with global warming under all plausible scenarios, at least in southern Australia.[93] Models also predict an increase in fire danger over much of Australia under scenarios of doubled CO2 levels.

Increased levels of bushfires under climate change would further threaten many rural communities and agricultural enterprises. Flow-on effects of bushfires include loss in general wellbeing of a community as a result of loss of livelihood from crop and stock damage, infrastructure damage, associated health risks and the environmental damage such as vegetation loss and soil erosion.

Projected impacts of climate change on housing and infrastructure

Housing being built now will have a projected lifetime to 2050, so placement, design and construction will be sensitive to climate change and needs to account for the risks of that particular location. The rate of house degradation is likely to increase in a changing climate, and coupled with increases in extreme storm events, houses and industrial buildings may have a reduced lifetime and require more maintenance.[94] Housing and infrastructure along river valleys or on coastal dunes will be most at risk.

The impact of storms is an area that deserves further research. Projected changes in the severity, frequency or geographic spread of extreme events may exceed the design and engineering capacity of current infrastructure and buildings, and their safety and emergency services provisions. For example, Coleman cites a 650% increase in building damages from a 25% increase in peak wind gusts, based on the Insurance Australia Group claims data.[95] In Victoria's experience to date, the major causes of damage are hail, floods, and wildfires.

If governments are to adequately address climate change, it is highly likely that there will be a requirement for housing that reduces the need to consume energy and adequately protects residents depending on the location and associated risks of flooding, sea-level rise, storms, drought, and/or bushfire. Passive heating and cooling will be needed due to rising

energy prices (as well as to mitigate climate change) and in order to reduce emissions. Many houses will need higher safety standards.

As discussed elsewhere in this report (see pp 22–25, climate change is likely to increase the chances of problems with energy supply due to transmission losses from increased ambient temperature, damage to energy infrastructure during extreme storms and increases in energy requirements (for air-conditioning) during heat waves.

Reports indicate that Melbourne sewerage system could be inadequate to deal with the impacts of climate change. There is likely to be:

- increased potential for corrosion and odours in the sewerage network as a result of increased sewage concentrations associated with water conservation, increasing ambient and seasonal temperatures and longer travel times within the sewer network
- increased incidence of sewer overflows due to increased rainfall intensity during storms
- increased risk of pipe failure and collapse due to dry soil conditions
- increased salinity levels in recycled water due to rising seawater levels resulting in increased infiltration to sewerage network and at wastewater treatment plants
- a decrease in water quality in Port Phillip Bay due to increase in pollutants.[96]

These problems would manifest in the urban environment if not dealt with in the near future.

Current vulnerability of low-income earners

Housing is one of the most critical issues facing low-income earners. According to VCOSS 211,000 low-income Victorian households were paying more than 30 per cent of their income in housing costs in 2002/03:

- almost half of those households (101,000) were paying more than 50 per cent of their income in housing costs
- in 2001, there was an overall shortage of affordable private rental in Melbourne suitable for low- and middle-income households of 38,000 homes
- the median house price in Australia is now equal to nine times average per capita income, compared to six times during the mid-1990s
- more than 100,000 people are homeless on any given night
- 46 per cent of Victorian families with children who seek emergency accommodation are turned away
- half of the women seeking help at homelessness services each day are turned away.[97]

According to Anglicare Victoria, people on government pensions (including aged, disability and sole-parent) were most likely to be spending the largest proportion of their income on housing. Housing costs increased in 2005/2006 for 42 percent of people surveyed in their Financial Hardships in Victoria report.[98]

Such housing costs have a devastating impact on the capacity of low-income households to meet other basic needs. Almost half of low-income private renters could not pay a gas, electricity or telephone bill, one in six went without meals and one in five said they couldn't pay their car registration or insurance on time.[99] This financial stress contributes to ill health and family breakdown, undermining the wellbeing of families and increasing costs to other areas of governments' budgets.

Housing and homelessness issues are most serious for Indigenous people. Housing insecurity and homelessness have ramifications for the broader social sustainability of Indigenous communities, and play a significant role in the whole-of-life conditions that result in overrepresentation of Indigenous people in prison.[100]

Impacts of climate change on housing for low-income earners

Housing for low-income earners is likely to be of poorer quality, in terms of structural stability, passive solar design, provision of efficient appliances and facilities, and so on. Low-income earners often rent, hence they have little opportunity to make structural improvements to their home (even if they can afford them). After their mortgage repayments, low-income homeowners have little disposable income to fund modifications to their house or to pay for comprehensive insurance. This leaves low-income earners with little adaptive capacity to cope with the impacts of climate change.

Vulnerabilities of rural communities to climate change

Rural populations, both on farms and in regional centres are already struggling due to a variety of factors including declining market prices plus rapidly escalating costs, loss of services and amenities, and population flow to urban areas. Any incremented change such as increased fire, higher temperatures and drought intensity predicted as a result of climate change, may cause loss in agricultural production and farm failure. Rural communities along coastlines will face the added pressure of costs associated with sea-level rise and storm surge damage prevention and recovery. Moreover communities highly dependant on particular industries, be they farming, mining or tourism, will become threatened if the industries they rely upon are threatened by climate change (see Case Study 1 on page 18).

The ABS (2000/01) found that the wage and salary earnings in regional Victoria is drastically smaller than that of the major cities.[101] This means that rural communities as a whole have fewer resources to adapt to climate change, let alone comparatively low-income households.

Case study 2: the Murray-Darling Basin

In Victoria, the Murray-Darling Basin has been identified as a region that will be particularly sensitive to climate change, given the stress already experienced by the system. The basin as a whole (spanning NSW, Queensland, ACT, South Australia and Victoria) is Australia's most important agricultural region. It:

- provides much of the food and fibre for Australia
- uses approximately 75% of water consumed for irrigation
- accounts for 41 per cent of the nation's gross value of agricultural production (1992 estimate)
- turns over more than $10.75 billion in the basin manufacturing industries (1992 estimate).[102]

Seriousness environmental problems already threaten the livelihood of people and their townships in the Murray-Darling Basin. Research conducted by the Murray-Darling Basin Ministerial Council on the social and economic impacts arising from the continued lack of environmental flow in the river Murray found that 'complacency on these [environmental] issues will have dire economic, environmental and social costs'.[103]

Communities surrounding the basin will be at increasingly high risk over the next century. Based on a 'business as usual' scenario of greenhouse gas mitigation, in the Murray-Darling Basin there would be a reduction in rainfall and an increase of water evaporation which could reach as high as 45% by 2070[104], causing further salinity, erosion and aridity.

The vulnerability of farms to drought is indicated in the *Agricultural State Profile*, which revealed that the number of farms in Victoria has dropped from 36,656 in 1997 to 32,463 in 2004, with the largest drop in 2002, the driest year in that period.[105] According to the Australian Government report on *Risk and Vulnerability*, a 50 per cent reduction in irrigation water allocations for five consecutive years was assumed to cause the economic failure of the farmer. By 2030, this threshold was exceeded in the Murray-Darling Basin by 20 to 30 per cent in a 'drought–dominated' climate scenario.[106]

This economic failure would impact dramatically on rural communities, increasing financial constraints and decreasing liveability of these regions.

Moreover, according to the ABS 2001 *Index of relative socio-economic disadvantage*, many local councils of the Murray Darling Basin in Victoria are already disadvantaged. These include areas in and around Loddon Shire Council, Greater Bendigo City Council, Wodonga City Council, Wangaratta Rural City Council, Mildura Rural City Council, Swan Hill Rural City Council, Benalla Rural City Council, Wangaratta Rural City Council, Moira Shire Council, and Greater Shepparton City Council, Strathbogie Shire, the northern ward of Mitchell Shire Council, Mount Alexander Shire Council and the Central Goldfields Shire Council. These areas also depend on vulnerable agriculture such as stone fruit, apples, grape vines, wheat, rangeland herding, and dairy farming. The outlook for these communities in a changed climate could be very bleak without government intervention and support from the community sector.

Specific vulnerabilities of Indigenous populations to climate change

The demography and settlement patterns of Aboriginal populations differ from mainstream populations in many ways. According to the Centre for Aboriginal Economic Policy Research, Indigenous households tend to be larger and more complex as they have more occupants, are often multi-generational and are more likely to be multi-family households.[107] This is in contrast to the national trend towards single persons and childless couples and is partly as a result of Indigenous people experiencing increased levels of poverty. The Australian Bureau of Statistics *Community Housing Infrastructure and Needs Survey* found that:

- 31% of Indigenous Housing Organisation managed permanent dwellings in discrete Indigenous communities were reported to be in need of major repair or replacement
- water quality was either not tested, or had failed testing in the 12 months prior to the survey in 46% of the 213 Indigenous communities that had a population of 50 or more and were not connected to a town water supply
- overflows or leakages from sewerage systems in the 12 months prior to the survey occurred in 48% of Indigenous communities with a population of 50 or more, affecting 1,520 (11%) permanent dwellings.[108]

Whilst these statistics are for Indigenous communities across Australia, they reflect conditions in Victoria. Victorian Indigenous communities, especially those located in isolated regions, are at risk from the impacts of climate change and their dwellings are ill equipped to deal with heatwaves and flash flooding.

Moreover a higher proportion (almost half) of persons identifying as Aboriginal or Torres Strait Islander origin live in rural areas. In 2001 the ABS indicated that approximately 13,394 Aboriginal people lived in rural or regional areas of Victoria, while 14,534 lived in Metropolitan Melbourne. They made up 1.09 and 0.38 percent of the population respectively.[109] For Indigenous and non-Indigenous people alike, the proportion of private dwellings in the lowest quintile of normalised gross household income increased with the degree of remoteness. However as compared with non-Indigenous individuals, Indigenous individuals are almost twice as likely to be in the lowest decile of normalised gross household income in major cities (30.6 per cent versus 16.9 percent), inner regional areas (41.6 per cent versus 22.7 per cent) and outer regional areas (51.6 per cent versus 26.6 per cent).[110] This reveals that not only are a higher proportion of indigenous Australians living in rural areas that are on the whole more disadvantaged, they also dominate the lowest decile of household income in these areas. This compounding disadvantage renders Aboriginal people at far greater risk than other social groups.

There is also often a lack of recognition and understanding of Indigenous issues by our political leaders and the non-Indigenous public. Indigenous people 'tend to be excluded from mainstream economic activity and modern technological education and experience higher levels of poverty, lower rates of employment, and higher rates of incarceration than the overall population'.[111] This, combined with other forms of institutionalised racism, is likely to mean that Indigenous people have less access to information about mitigating or managing the effects of climate change.

Summary

Homes and human settlements will be affected by global climate change. The severity of these impacts will depend on the extent of climate change we experience and the ability of the Victorian community to respond and adapt. Human populations can best adapt to climate change with appropriate planning, foresight and appropriate technical, institutional and political capacity. It is likely that low-income communities will experience a disproportionate burden of climate change due current disadvantage, regional location, inadequate housing (particularly among Indigenous people), and little adaptive capacity.

Settlements will be most at risk from decline due to agricultural loss of production and farm failure. Communities most at risk are those that are:

- dependent on particular industries that are vulnerable to climate change impacts (agricultural, tourism, etc.), or
- in coastal zones, or
- Indigenous, or
- already disadvantaged (which includes most of those settlements mentioned above).

Recommendations

- state governments should make public any information they currently hold about human settlements likely to be affected by extreme weather.
- state governments should direct funds to researching and developing (in consultation with architecture associations and other stakeholders) standards for housing that accommodate likely temperature rises and increases in extreme storm conditions. Further, they should introduce a process to implement these standards immediately for all new housing developments
- the Federal Government should develop a public awareness campaign, working closely with architectural associations, to disseminate information about the impacts of climate change on housing
- state governments should immediately fund repairs and improvements in housing for Indigenous communities, particularly in relation to ensuring access to clean fresh water, adequate sewerage systems for communities, and repairs and maintenance
- state governments should work with specific vulnerable communities (including Indigenous communities) to assess likely impacts of climate change and recommend and implement measures to ensure safety and access to fresh water, adequate housing, employment and emergency services
- state governments should develop emergency service plans for a changing climate and fund/allocate resources necessary to cope with projected increased pressure of these services associated with climate change (in relation to bushfires, extreme storms and so on)
- the Victorian Government should undertake a comprehensive assessment of the state of public housing across Victoria and develop and implement a package of improvements that ensure the safety of dwellings and wellbeing of occupants, especially considering increasing temperatures and energy efficiency requirements
- state governments should further investigate vulnerabilities of low-income earners and the homeless to the negative impacts on urban environments associated with climate change.

- the Victorian Government should increase the number of public houses and affordable housing across the city to reduce homelessness and waiting lists. Such housing should be designed using thermo-passive design principles, to reduce the need for heating and cooling
- the Victorian Government should review planning restrictions and requirements in coastal zones to ensure safety in a changed climate/landscape
- the Victorian Government and Melbourne Water should address inadequacies in Melbourne's sewerage system and upgrade the system in accordance with expected increases in both housing density and flooding
- the Victorian Government should undertake a public awareness campaign advocating that households and communities build their resilience to climate change by, for example, installing water tanks, growing food in their backyards, installing solar panels, implementing passive heating and cooling designs and features in their homes, sharing knowledge and experiences, helping others to make changes etc
- different levels of government, industry, scientists and community stakeholders and representatives all need to be involved in planning and decision making in order to ensure that action is relevant and meets the needs of stakeholders.

Financial impacts of climate change

Introduction

In Victoria, Australia and globally, the financial costs of climate change are likely to be severe. In 2006 the Stern Review estimated that comparing the social costs of carbon on a business as usual trajectory with a path towards stabilisation at 550ppm CO2 equivalent, there would be excess of benefits over costs, in net present value terms, from implementing strong mitigation policies this year.[112] Shifting the world onto the low carbon path, they estimate, would create a net benefit in the of the order of $2.5 trillion globally.[113] The Stern Review also estimated that a failure to address it could cut the world's annual economic growth by 20 per cent, now and into the future.[114]

The Stern review indicated that if we choose not to mitigate climate change, this will create risks of major disruption to economic and social activity – later in this century and into the next – on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century.[115] And, unlike those historical periods, the effects of climate change will be difficult or impossible to reverse.

In Australia, as for the rest of the world, the exact impacts of climate change on economic systems are uncertain. Impacts will be shaped by the extent of global warming we experience globally, and how that interacts with the complex global and local climatic and ecological systems. It also depends on how well we prepare for the impacts and our capacity to react to challenges and capitalise on opportunities. However, as the Stern Review indicates, the costs of business as usual are highly likely to be far greater and more disruptive, with people with few means suffering the most.

This section examines in brief the economic impacts on Victoria, highlighting the specific impacts on employment and insurance. These two areas of the economy have been selected because they are amongst the easiest to quantify and can signal the stability of an economy.

Climate change and employment

Impacts on employment

The main areas of significant job strain associated with climate change are likely to be in the agricultural sector and specialty industries such as tourism in the Alpine regions and the Great Barrier Reef. Financial impacts of climate change are likely to be widespread, affecting government, industry and business. Combined, these impacts would result in job losses across the economy.

In the agricultural sector increased drought, bushfires and higher temperatures, and the flow-on strain on farms and farm failure, is likely to threaten many agricultural jobs. In 2002/03 Victoria employed approximately 75,500 people in the agriculture sector and produced $A6.1 billion worth of food.[116] If these numbers decline, there could be significant implications for business in regional areas and a decline in the average income in rural areas.

Tourism is also incredibly vulnerable to climate change. The Great Barrier Reef, Alpine areas, Kakadu World Heritage Area and many other tourism areas face significant threats from loss of species, and an altered and degraded composition of the landscape.[117] The loss of biodiversity and amenity would be significant enough on ecological grounds, but added to it would be a decline in tourism value and flow-on effects for local employment and the economy.

Tourism forms a significant part of the Australian economy. Tourism accounted for $32.6 billion of total GDP in 2004–05, which equals 11.1% of total exports of goods and services.[118] Tourism continues to contribute significantly to employment, employing 5.6% of Australia's workforce in 2004–05.[119] Any downturn in the tourism industry would have huge impacts for livelihoods, and tourism oriented regions and townships.

The combined effects of these economic losses and stresses are likely (as the Stern Review indicated) to lead to an economic recession. The impacts of a recession on employment are significant, with many businesses cutting back on workers in order to survive. Clearly, climate change is likely to impact on workers everywhere – in terms of continuity of employment, pay levels and conditions.

Of course, Australia needs to make significant efforts to reduce its greenhouse gas emissions and there will also be strain on some jobs as the energy industry restructures. New workers will be needed in the renewable industry and workers, particularly from the coal industry and energy intensive industries, such as aluminium smelting, may need to be retrained or shift location in order to maintain employment. These adjustment costs would be greatly reduced if the required changes occur more slowly over a longer period.[120] When addressing the adjustment of such a major industry, it will be crucial to develop a framework for 'just transition' for workers in fossil fuel dependent industries.

The Stern Review explains however, that although costs will be incurred as the world shifts from a high-carbon to a low-carbon trajectory, there will also be business opportunities as the markets for low-carbon, high-efficiency goods and services expand. By 2050, the global market for low-carbon energy products to be worth at least $500bn per year, and perhaps much more.[121] If Australia invests significantly in this area, this will safeguard and perhaps even expand jobs in the energy industry.

Low-income earners and employment – current state of affairs

Today unemployment and disadvantage are closely correlated. In Anglicare's *Financial Hardships in Victoria* report, people seeking assistance were surveyed. This research indicated that:[122]

- 73 percent of survey participants of working age were unemployed
- Sole-parents were the most likely group to be unemployed with 83 percent unemployed
- 40 percent of those taking part in the survey who worked on a casual basis responded that they would be willing to work longer hours if work was available

Impacts on low-income earners

Any loss of jobs, particularly a significant loss associated with economic recession, would cause an increase in the number of people living on low-incomes. These people would be forced into insecure casual and part-time work with low

wages, or would have to resort to government allowances in order to survive.

An increase in the number of low-income earners would multiply the risk of social and economic marginalisation and amplify pressure the social service sector to provide resources and support. Government support for re-employment programs and job creation as well as social services would be required in order to cater for increased demand.

Climate Change and Insurance

Climate change and home insurance

In recent years the insurance industry has experienced an unexpectedly high number of large insurance claims due to natural disasters. It is now commonly accepted by the insurance industry that climate change has influenced the intensity and frequency of these events. In some cases, insurers have been caught unawares and have had their reserves stripped and profitability destroyed, leading to bankruptcy. For example, in 1992, Florida's Hurricane Andrew caused over 16 billion in insured loss[123] and nearly a dozen Florida insurance companies went out of business.[124] More recently, the economic costs associated with Hurricane Katrina in New Orleans was estimated to be over US$130 billion.[125]

Munich Re, one of the world's largest reinsurers has warned that climate change could increase the global insurance bill from $30 billion a year to $300 billion a year by 2050, and that if these warnings are not heeded, damage due to climate change could bankrupt the world by 2065.[126]

Climate change is likely to cause more extreme storms and weather, hence the level of damage to houses, infrastructure, cars and health is also likely to increase. Worst case scenarios suggest that if Australia was to experience an incident similar to Hurricane Andrew, and several insurance companies were to become bankrupt, the job loss would be significant, with ripple effects on the economy from the downsizing of the industry. While significant, these outcomes would not be as severe as the losses experienced on an individual level, by those without an insurance policy or the means to recover quickly.

Victorian households, like those in many parts of the world, are at increasing risk of climate change weather hazards due to their close proximity to the coast. Munich Re suggests that this increased risk will drive up the price of insurance, so that insurance becomes unaffordable to many, particularly those in especially high-risk zones. This reduction of demand for insurance would make it economically unviable for companies to offer services and in turn would be likely to lead to withdraw of insurance coverage in these high-risk regions. The consequences of this situation are likely to most impact on those people who reside in damaged dwellings and have few means to relocate.[127]

A somewhat ad hoc form of social insurance exists in the form of government-funded disaster relief initiatives. Society will often support those who have suffered due to a natural disaster – either through donations to charitable organisations or tax money being directed for relief. Although generous, to some degree the level of assistance provided by both charities and government will depend on the level of media coverage. This is often not proportionate to the needs of those most affected.[128] In any case, the level of demand for financial assistance is likely to be increasingly higher than can be met on an ad hoc basis.

Private health insurance

Currently, government policy encourages citizens to take up private health insurance in order to receive timely and affordable treatment for minor and critical health problems. The public health system has many strengths and some parts are gradually improving. However

hospitals remain under-resourced. Most have insufficient beds and continue to have difficulties coping with large influxes of emergency patients. In recent years cost cutting and waiting lists for outpatient services have had significant impacts.[129] Moreover, as time passes, and the population grows and ages, there is a pressing need for improvement and expansion of services in the health sector.

With an increase in severe weather events and other health costs of climate change, the rate of injury and disease is likely to increase. It is likely there will be a need for emergency services and hospitals to cope with a large influx of people at times of climate change disasters. Such an increase in pressure is likely to require investment and higher staff levels, which would drive up the cost of private health insurance.

Low-income earners' current access to insurance

In Anglicare's 2004 report *Financial Hardship in Victoria*[130], 98% of participants surveyed did not have private health insurance. In 2006 none of the low-income earners surveyed had health or life insurance.[131] This clearly indicates that private health insurance is not affordable for a large proportion of the Victorian community. If the costs of private health insurance rise due to increased pressure from climate change impacts, an ever-increasing number of people will be locked out of secure health care.

In 1999 the Insurance Council of Australia found that low-income earners were about 30 % of total households, however, they comprised over 80% of the uninsured.[132] In 2006, Anglicare found that while 68 percent of people undertaking the survey used a car as their primary method of transportation, only 16 percent had their car insured. All of the respondents who were paying a mortgage had their homes insured (a requirement by lending institutions), however only one of the five people who had paid off their homes still had insurance. Just 14 percent of people surveyed had the contents of their homes insured. This chronic underinsurance leaves these households vulnerable.

Impacts on low income earners

There are obvious disparities between those who can afford insurance and those who cannot. If people can afford a basic insurance policy, high-risk areas may still be left vulnerable as insurers change the terms of the policy in order to protect themselves. So, for example, furnishings may not be replaced new for old, but instead they might be paid out in cash at their depreciated value.[133] Losing a large amount of material possessions and receiving half of their original value in return will not only be distressing, but will also hinder the process of rebuilding people's lives and homes.

Those who cannot afford insurance are highly vulnerable to becoming homeless or losing all their material goods, with no means to replace them. Home owners, also risk having no financial resources to repair their home. This would dramatically increase pressure on the social service sector and cause great hardship for many Victorians.

Already many insurance companies are considering climate change risk in their decision making. Governments will need to consider the issues around the distribution of losses in the community arising from the possibility of either a withdrawal of insurance from covering some risks, a huge increase in costs, or the failure of one or more major companies.[134]

Under circumstances where no or only inadequate insurance can be afforded, a financial safety net may be required for the poorest people in society, who are likely to be the most vulnerable to the impacts and least able to afford protection (including insurance).[135]

Climate change impacts – financial synthesis

Economy-wide impacts

The natural environment affects every aspect of our economy and of our daily lives. From the production of food to the sale of insurance, the climate is an important determinant of the costs of goods and services. As climate change increases, so too will the cost of living.

In 1991, the annual cost of disasters was estimated for Australia are summarised in the following table.[136]

Disaster	$ Millions of Dollars
Flood	386
Drought	303
Tropical cyclone	258
Storm	202
Bushfire	68
Earthquakes	26
Surge/Erosion	7

Given severe weather events are projected to increase, these figures are highly likely to intensify, straining budgets and private finances.

Moreover, climate change is likely to require increases in public spending on infrastructure (such as roads and levies), warning systems, emergency services and disaster relief.[137] The distributional impact of this depends largely on how the revenue is raised to fund these expenditures. Additional taxation may be required, in which case the issue hinges on the progressiveness or otherwise of the tax structure some decades into the future.[138] Alternatively, the expenditure may be diverted from other areas of public spending, in which case it is not possible to make any observations on the distributional effects.[139]

Higher temperatures, drought and increased intensity of storms will also lead to:

- greater costs of fresh food and water
- increased energy demand for air conditioners and hence higher electricity costs
- more expensive insurance
- the need for increased spending on protective measures for homes
- higher medical expenses (see *Health and Wellbeing* from p 43 onwards).

Declines in agricultural output, slumps in tourism due to loss or degradation of natural features, increased unemployment and overall financial strain will have far reaching economic impacts. At a minimum these are likely to mean a decline in government revenue and increased demand for expenditure, but more likely is that they will lead to conservative purchasing and an economic recession.

Equally if government does act and we begin to significantly reduce our greenhouse gas emissions, there will be costs. However, the Stern Review asserts that the costs of mitigation, around 1% of GDP, are small relative to the costs and risks of climate change that will be avoided. While the review does admit that some internationally traded products and processes will lose out, for the economy as a whole, there will be benefits from innovation that will offset some of these costs.[140]

Key areas of economic benefit (for a steady state or growth economy) include the potential to root out existing inefficiencies. At a company level, implementing climate policies may draw attention to money-saving opportunities.[141] At the economy-wide level, climate-change policy may act as a lever for reforming inefficient energy systems and removing distorting energy subsidies[142] on coal mining or the aluminium industry for example.

Current economic disadvantage of low-income earners

Low-income earners, by definition are economically disadvantaged. Indigenous Australians are particularly economically marginalised, with the Victorian Indigenous adult population mean normalised gross household income in 2002 being just $423 per week, compared with $657 per week for the non-Indigenous population.[143]

Financial impacts on low-income earners

Without significant greenhouse gas emission reductions, we can expect an increase in the cost of living and a global economic recession. The seriousness of this scenario should not be underestimated, especially because when profound shifts occur in an economy, the people without resources to change their circumstances get left behind.

A great increase in unemployment in agriculture, tourism and across the economy would result in a dramatic increase in the proportion of low-income earners. A growing number of economically marginalised people would cause huge pressure on the social service sector and society, with many people likely to miss out on support services. At the same time, climate change impacts would lead to a decrease in government revenue. Overall, climate change will further increase the disparity between the rich and poor.

The benefits of mitigation of climate change are significant for people living on low-incomes, both now and into the future. Mitigation would result in better quality housing and lower fuel bills. In the future, it would help to avoid hardships associated with excessive home maintenance costs, medical care in case of injury and disease, price hikes, and so on. There could also be benefits for low-income earners for example in reduced urban air pollution as a result of a more fuel-efficient fleet.[144] Given that people on low-incomes tend to live in more industrialised areas, near major roads and/or in car dependent outer areas, any reduction in car emissions would have a particularly great benefit these communities.

Summary

Whether from increased unemployment, lack of insurance or an economic downturn, Victorians everywhere are likely to face tougher conditions in a changed climate, but none more so than low-income earners under business as usual emission scenarios. The increase in unemployment and corresponding number of people living on low-incomes is likely to overwhelm the social service sector. It is likely that demands on government will greatly exceed available revenue.

The Stern Review asserts that from all perspectives, the evidence points to a simple conclusion: the benefits of strong, early action considerably outweigh the costs.[145] Certainly this is the case for Victoria and Australia, where strong action needs to be taken to reduce the risk to families and prevent a major economic recession.

Recommendations

- the Victorian and Federal Governments should begin to phase out fossil fuels and increase the proportion of renewable energy production facilities now. The sooner the adjustment begins, the more considered and less negative the impact on workers and local economies.
- the Victorian and Federal Governments should formulate 'just transition' models for structural adjustments in the energy industry

- the Victorian Government should provide funds for the social service sector to research and report on the impacts of climate change on low-income earners. In the long term, funding will be required to accommodate increased pressure on this sector.
- the Federal Government should develop a means tested fund for disaster relief.
- the Victorian Government should continue to invest in and increase the capacity of public hospitals in order to cope with disasters.
- the Federal Government should begin planning for managing the distribution of losses in a situation where insurance costs increases hugely, insurance is withdrawn from high risk areas, or where one or more major insurance companies fail.

Health and Wellbeing

Introduction

Good health as defined by the World Health Organisation (WHO) is not just the absence of disease but also having a subjective sense of positive well being, being capable of doing what we normally do, being adapted to our environment and feeling fulfilled. [146]

Considerable government spending is orientated towards improving health services. However climate change is projected to negatively affect the health and wellbeing of human populations. These effects will vary in complexity and scale and will occur via direct and indirect pathways, reflecting the fact that climate change will alter many natural and physical systems that are integral to earth's life-support systems.[147]

Direct health impacts are likely to include increases in heat stress and respiratory, allergic, and communicable diseases. Indirect health effects would result from droughts, floods, and social and economic disruption.[148] The negative health effects of climate change would mostly impact people who are already susceptible to disease: those who are elderly, chronically ill, children, poor or malnourished. People in majority world countries, where governments are less able to respond to food and water shortages or to epidemics, would face the greatest risks.[149]

Under normal climatic conditions people adapt to the local prevailing climate via physiological, behavioural, and cultural and technological responses. However, extreme climatic events often stress populations, especially marginalised or vulnerable communities, beyond their adaptive limits.[150] Given the predicted increase in extreme weather events, higher temperatures and other significant changes in climatic conditions, anticipating climate change related health risks and developing pre-emptive policies and practices will be crucial to ensuring the health and wellbeing of Victorians. This section examines the potential health risks associated with climate change, highlighting how low-income earners would be disproportionately affected.

Projected health impacts for all Victorians in a changed climate

The Commonwealth study *Human Health and Climate Change in Oceania: a Risk Assessment 2002* details many of the projected health impacts associated with climate change.

This report indicates that direct impacts of climate change on human health in Victoria are likely to be caused by:

- exposure to weather extremes (heatwaves, winter cold)
- increases in other extreme weather events (flooding, storm serges, drought)
- rise in production of air pollutants and aeroallergens (spores and moulds).[151]

Indirect impacts of climate change on human health in Victoria are likely to be caused by

- changes in the patterns of transmission of many infectious diseases
- decreases in regional food productivity
- displacement of populations due to physical hazards, land loss, economic disruption or civil strife.[152]

The specific impacts on human health in Victoria are wide ranging[153]:

- there are likely to be between at least 350 additional heat-related deaths in Melbourne a year by 2050 (in the absence of adaptive measures). Currently 289 people aged over 65 die from temperature-related causes.
- malaria is anticipated as being a low risk to northern parts of Australia and hence should have negligible impacts on Victoria.
- if no other contributing factors were to change, people in northern parts of Australia could be exposed to increased risk of contracting dengue infection – between 300-500,000 in 2020, and 750,000-1,600,000 in 2050. This risk would in turn fall on domestic tourists from Victoria.
- an estimated 2-4 million cases of food-borne infectious disease occur annually in the whole of Australia. Diarrhoeal admissions are projected to increase as a result of water-borne diseases. Projected temperature increases will translate to an increase in admissions of 3-5% by 2020, and of 5-18% by 2050.
- the potential spread of Ross River virus and asthma under climate change is unclear and needs further research.
- preliminary evidence also suggests that higher environmental temperatures enhance UV carcinogenesis; if this were true, the effect of rising temperatures on skin cancer incidence may soon be greater than that of ozone depletion.[154]

The impacts of climate change on people's mental health and wellbeing has not been recognised thus far by governments. With climate change expected to cause widespread social, economic, and political disruptions and increased poverty, Victorias are likely to experience stress, trauma and emotional distress. This will be compounded by experiencing extreme weather events; losing loved ones, a home or possessions; being displaced; losing income due to rapid shifts in viable business and industry; and trying to meet increased costs of living due to energy, food and water price increases. The costs and impacts of a sense of despair for the future are likely to be immeasurable.

Another indirect consequence of climate change could be an increase in respiratory and cardiovascular illness and death due to higher levels of tropospheric ozone that have been linked with higher temperature, particularly in urban areas.[155]

In summary, health-related problems due to heat stress mortality, urban pollution-related respiratory problems and food-borne disease including diarrheal diseases are expected to escalate. These developments will impact on the whole community, with flow-on social and economic costs. These need to be carefully examined in anticipation of their occurrence so that preparation and appropriate policy and practical measures can be developed by governments and the wider community to ensure that efforts to maintain and ensure that the health of low-income earners, as well as the wider community, is not undermined.

Low-income earners' current state of health and wellbeing

A recent report by the Victorian Council of Social Services (VCOSS) indicates that:

Health inequalities continue to persist in Victoria, despite improvements in the overall health and wellbeing of Victorians over the last decade. The Victorian burden of disease study reinforces the findings of other research that socio-economic status is a major predictor of health outcomes. Health inequalities exist across a range of social and cultural measures, the most significant and persistent being education level, occupation, income, employment status, refugee background, Aboriginality and area-based measures of socio-economic disadvantage.

A strong correlation exists between social inequalities and poorer health outcomes. The social determinants of health, such as employment status, education attainment, housing status, environmental conditions, socio-economic status and level of social inclusion, have a significant impact on health and wellbeing. Housing is of particular importance, as a lack of access to well-located safe, appropriate and affordable housing is a profound barrier to attainment by many families of good health and wellbeing. Within health policy, it is therefore critical to understand and address the social and economic conditions that impact on people's health and wellbeing, through both the provision of universally accessible services and targeted initiatives at the local level.

VCOSS 2006[156]

There is unequivocal evidence that factors such as income, socio-economic status and educational attainment are strongly associated with inequalities in health. Considerably higher rates of hospitalisation and of avoidable mortality are recorded for the most disadvantaged people, including low-income earners, people in remote areas and indigenous people.[157]

Health inequalities are most marked between Indigenous and non-Indigenous Victorians. Indigenous people have poorer health across all age groups and across all measures, including life expectancy, cardiovascular disease, injuries and poisonings, respiratory diseases and endocrine diseases.[158] This renders them particularly vulnerable to impacts of climate change.

Vulnerability of minority populations to magnified health problems in a changed climate

Introduction

Socio-economic status and experiences of marginalisation and inclusion influence a population's current state of health and wellbeing, and also its capacity to adapt. Certain population groups face much greater health risks today, and these will be compounded by climate change in the near future.

In part, this greater vulnerability is because these people are believed to be less likely to be able to make the necessary behavioural, cultural and technological responses to cope with climate change, largely due to their financial and other resources. But additionally, the circumstances in which less affluent, minority populations live also make them more vulnerable to the effects of climate change.

Wealthier people can afford to live in areas with low air pollution and better water quality and superior amenities.[159] They are also better able to protect their environments through exertion of political power.[160] In Australia today, air quality is worse in areas where low-income households are located. A recent Australian study of lead levels in children showed that children from families with annual income levels below $20,000 had substantially higher levels of lead in their blood than children from families with incomes higher than $20,000.[161] If

greenhouse gas emissions continue to increase, this pattern is likely to continue, along with the associated cardiorespiratory health impacts and deaths.[162]

In general, environmental impacts fall more heavily on people who are poor. People and communities who are therefore most vulnerable to the effects of climate change are those who are Indigenous, living in a rural area, elderly, young or on low incomes.

Threats for vulnerable populations identified by the Commonwealth Report *Human Health and Climate Change in Oceania: a Risk Assessment 2002* include[163]:

- greater risk of **temperature related deaths** for people who have fewer financial resources (for example, to pay for air conditioning, better insulation, renovate their homes) and less choice (for example, to change their work hours) to enable them to manage extremes of temperature.
- greater risk of suffering the social and economic impacts of **flooding**. Although these secondary effects are not yet well quantified, effects on human health may include repercussions arising from vulnerabilities in the agricultural sector (such as changing crop suitability and enhanced spread of some agricultural pests), on water resources (such as impacts on water availability and quality, agricultural irrigation and power generation), and impacts on the coastal zone (such as loss of land, and damage to infrastructure resulting from coastal erosion and flooding). The direct costs of agricultural, housing, and infrastructure losses represent costs to individuals, communities, state governments, and the insurance industry. (See pages 27–29 for a more detailed discussion of issues associated with flooding.)
- greater vulnerability to the **spread of disease,** as low-income earners and rural communities have less access to health care facilities and are more vulnerable to diseases associated with poor housing, poor nutrition and consumption of low-quality food. For example, in Australia, an estimated 2–4 million cases of food-borne infectious disease occur annually.[164]

There is insufficient data to determine the relative vulnerability of people of different age groups, ethnic backgrounds and sexes within population sub-groups.

Many impacts of climate change are perhaps too complex to quantify, but nevertheless warrant serious investigation. Some of these are highlighted below.

A substantial decline in regional agricultural capacity and water supply, such as could plausibly occur through an intensification of droughts, or a shift in the range or intensity of the Asian monsoon, could result in a number of negative health outcomes. For people on low-incomes, rises in the price of food, water and energy (associated with increased scarcity and unreliability), would result in increased poverty and under-nutrition.[165]

Decreased disposable income is likely to impact on people's access to health services. It might also limit access to education, which has the potential to limit people's opportunities to learn about health and wellbeing and how to maintain a healthy lifestyle.

Increased prices will not only lead to fuel poverty and malnutrition, but also to an overall reduction of the resources people have to cope with climate change and an exacerbation of inadequate living conditions.

Accessible information and community education will be a crucial part of encouraging people to make behavioural and technological changes necessary to cope with climate change. Families with lower education levels, who live in remote communities, and/or who face language barriers may be more vulnerable to adverse health impacts if they lack an understanding of the health risks of climate change.

Increased stress could be placed on the health-care system as a result of spread in disease, increases in injury and death associated with extreme weather events, and heat waves, and increases in mental health problems. In the case of a crisis, it is often disadvantaged communities who will suffer the most when there is a lack of hospital beds and inadequacies in an over-stretched emergency services. This is largely because very few low-income earners have private health insurance.

Specific impacts on urban low-income earners

The urban heat island effect is the process whereby inner urban environments, with high thermal mass and low ventilation, absorb and retain heat amplifying and extending rises in temperatures (especially overnight). This process could magnify the level of temperature-related deaths under climate change.

While most health impacts of climate change will be detrimental, many mitigation activities might have positive outcomes. For example, if a reduction in vehicle emissions were achieved in part through a reduction in personal car use, and an increase in public transport and bicycle use, further substantial health benefits would be expected. A fifty percent reduction in vehicle emissions in Sydney and Melbourne airsheds would be expected to lead to substantial improvements in local air quality and corresponding reductions in adverse human health impacts. As low-air quality has been correlated with areas with a high proportion of low-income dwellings[166], these increases in air quality could be expected to be most beneficial in areas that are currently experiencing the most problems with air quality.[167]

Specific health risks for rural populations

Economic downturns, including unemployment or underemployment, in rural and regional areas are likely to impact on the physical and mental health of people in these communities. In the last few years, the number of doctors servicing rural areas has sharply declined and access to bulk billing has become further restricted. In the future, access to health services might be even more limited and there might be less social support if communities contract as people move elsewhere. Rural and regional populations are also at particular risk of injury and ill health due to bushfires.

Specific risks to Indigenous populations

As previously mentioned, studies have shown that there are strong links between low health status and low socio economic status. Thus, when considering that the most disadvantaged group in Australia is Indigenous people, one can assume that Indigenous communities will be most affected by any climatic changes.

Already Indigenous Victorians suffer low birth weights of babies, high perinatal mortality rate, high hospitalisation rates, poor health, younger age rates for contraction of diseases and conditions including diabetes, ischaemic heart disease, asthma, and injury and poisoning.[168]

Indigenous communities, particularly in rural and remote areas, are especially vulnerable because lack of infrastructure means they have limited access to resources and health services.

Under these conditions, disease is likely to worsen. For example, in Australia, an estimated 2–4 million cases of food-borne infectious disease occur annually.[169] In Indigenous communities, the relative proportion of cases is significantly higher

than in the overall population, due to poor housing and poverty related issues. By 2050 an annual increase in Indigenous admissions of 11% (5–18%) was predicted for diarrheal related hospital admissions in central Australia.[170] It is likely that such increases will be emulated somewhat in Victoria.

Summary

The burden of disease and ill health often increases with higher levels of socio-economic disadvantage. In relation to climate change, it is expected that health risks for low-income families will increase in frequency and intensity. These situations would arise as a result of direct and indirect impacts. Direct impacts include increased spread of disease, more temperature-related deaths, more death and injury due to extreme whether events, and trauma associated with displacement due to sea level rise.

Climate change could indirectly impact on low-income earners by increasing the severity of problems already affecting their health. Climate change impacts could: further decrease access to health services; diminish water and energy supplies; increase prices of food and utilities, further adding to fuel poverty and malnutrition; cause high levels of unemployment in some regions or sectors; present new health risks that people are uninformed about; reduce the amount of resources people have to cope with climate change, and exacerbate inadequate living conditions. This would, in addition to direct impacts, result in an overall increase in the level of broad ranging diseases and deterioration of mental health.

Recommendations

So far, there has been some basic research into the potential health impacts of climate change on the health of Australians, the results of which are indicated in this report. Further research is needed to identify additional indirect impacts that would have a disproportionate impact on low-income earners. There is also a need to assess the costs of health-specific adaptation strategies that might be needed, the direct costs of climate change to the health care and social service sectors in terms of prevention and treatment, and flow on costs, such as loss of productive income in cases of disease and disability, losses to tourism income in disease affected areas.

In the short term, there is a need to promote health as an essential asset for impoverished and vulnerable populations. Health promotion and relocalisation activities might greatly improve the resilience of individuals and communities in a changed climate.

Rapidly addressing current causes of higher rates of ill health amongst low-income earners now is also an essential step in averting future escalation in health problems.

Specifically:

- the Federal Government should fund further investigations into the impacts of climate change on health, particularly focusing on the risks and vulnerabilities of low-income earners and Aboriginal groups.
- the Federal Government should identify, in consultation with social service providers, current problems in access to adequate health care for low-income earners and address those problems in order to ensure less vulnerability in the future (including reducing public waiting lists for surgery and other forms hospital care and address shortages of general practitioners in disadvantaged areas).
- the Victorian Government should investigate and allocate resources to planning and implementation of health services provision and procedures in the case of severe health disasters associated with extreme weather events, including heatwaves where hundreds or thousands of people can require hospitalisation within a short timeframe.

- the Federal Government should develop a publicity campaign to highlight likely health impacts of climate change in order to strengthen the community understanding and capacity to cope at a local level. For example, inform food health and safety monitors of new risks.
- governments at all levels should work in consultation with Indigenous communities and community organisations to decide on a course of action to ensure appropriate and responsive health care, taking into account changing needs that arise due to climate change.
- the Victorian Government should increase its investment in community health services and other community-based health organisations to better enable them to undertake their community capacity building role at the local level, particularly in areas of socioeconomic disadvantage.
- the Victorian Government should work with local governments to assess and identify areas where the urban heat island effects are severe, and act to remediate these effects through curb side tree plantings and other measures.

Conclusion

Climate change poses an unprecedented challenge to human society. Not only is the challenge unique and of enormous scope, but tackling it will require a political consensus and determination never before seen at the global level. What's more, the predicted impacts of climate change may lead to economic and political instability, making it increasingly difficult for countries to respond to these impacts. At the same time, growing social and economic burdens may divert attention away from the need to address the underlying causes of climate change as well.

Information Unit on Climate Change[171]

In this country, climate change is one of the clearest indicators of our unsustainable and systemic over-consumption of the world's natural resources. To adequately address climate change and the injustice of pollution created by greenhouse gasses from the industrialised world, we will have to challenge core issues about the way we live and how we consider our relationship to other people and the earth.[172]

Although Australia has not signed the Kyoto Protocol, it is signatory to the United Nations *Framework Convention on Climate Change*, and as such is committed to acting to prevent dangerous levels of human induced climate change. The UNFCCC states that 'the parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities'.[173]

Consequently, as one of the world's greatest per capita greenhouse gas emitters, it is essential that Australia implement both mitigation and adaptation programs that aim to assist people living in poverty across the world's.

However, even if deep cuts are made in emissions, we will still experience significant climate change impacts. For this reason, adaptation as well as mitigation must be integrated into all policies and programs. States such as Victoria, as well as local councils, will be largely responsible for implementation of any adaptation strategies as a result of their key roles in public infrastructure, safety, health and land use planning and control. They have a responsibility to their constituents to act to ensure the health and well being of all. Adaptation issues span virtually all portfolios and levels of government, and hence pose a significant challenge in the integration of environmental and social justice concerns into areas that have been economically focused since industrialisation. Climate change also poses a significant opportunity for positive transformation of society, faced with limits to growth, to a more equitable and sustainable way of living.

In all countries it will be poor individuals and communities who struggle the most with adapting to climate change. In Victoria people who are on low-incomes, living in rural communities or Indigenous will be subject to some of the more severe impacts, particularly if little is done to mitigate climate change. Drought, bushfires, higher temperatures, and more severe storms are likely to cause significant health impacts as well as decline in agriculture; tourism and an overall economic recession. Increases in

the cost of food, water, energy and insurance would exacerbate conditions, particularly for those already economically struggling. Low-income earners, particularly those in rural Indigenous communities, live in lower quality housing and have few resources and no insurance, so projected storms, flooding, bushfires, heatwaves and disease spread could leave them with ruined homes, more illness and nowhere to turn.

Friends of the Earth strongly urges all government sectors, social service providers and the Australian community to consider the likely impacts of climate change, and in particular, the effect it will have on marginalised and disadvantaged people. Adequate structures, policies and responses must be developed and implemented with the aim of minimising the threats associated with climate change to ensure that people are protected and our environment is preserved for future generations.

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