


Western Australian Government Adapting to our changing climate



October 2012



Department of
Environment and Conservation

Our environment, our future 

Foreword

The Western Australian Government is committed to ensuring the future prosperity of our State, and minimising the effects that climate change will have on our environment, economy and community.

Climate change is happening now and will continue to occur and affect Western Australia's communities, industries and ecosystems as well as present challenges to managing our State's resources.

Whether at the national or international level, policy approaches to mitigate climate change will clearly impact on Western Australia. The State Government supports action to reduce Australia's greenhouse gas emissions; however, we need to ensure that we do not competitively disadvantage our export industries.

In order to protect our unique environment and our thriving economy, a number of policies and measures are needed to prepare Western Australia for the challenges of climate change now and into the future.

This statement focuses on climate change responses appropriate for Western Australia and outlines key policies the State Government will adopt to tackle this important issue.

The Australian Government introduced a carbon price on 1 July 2012 with a fixed starting price of \$23 per tonne, set to transition to an emissions trading scheme in 2015. The Western Australian Government's view is that decisions on the design, implementation and timing of the regulation of greenhouse gas emissions, and support for new low emission technology, are primarily matters for the Australian Government and the Federal Parliament.



Bill Marmion

Hon Bill Marmion MLA
Minister for Environment; Water

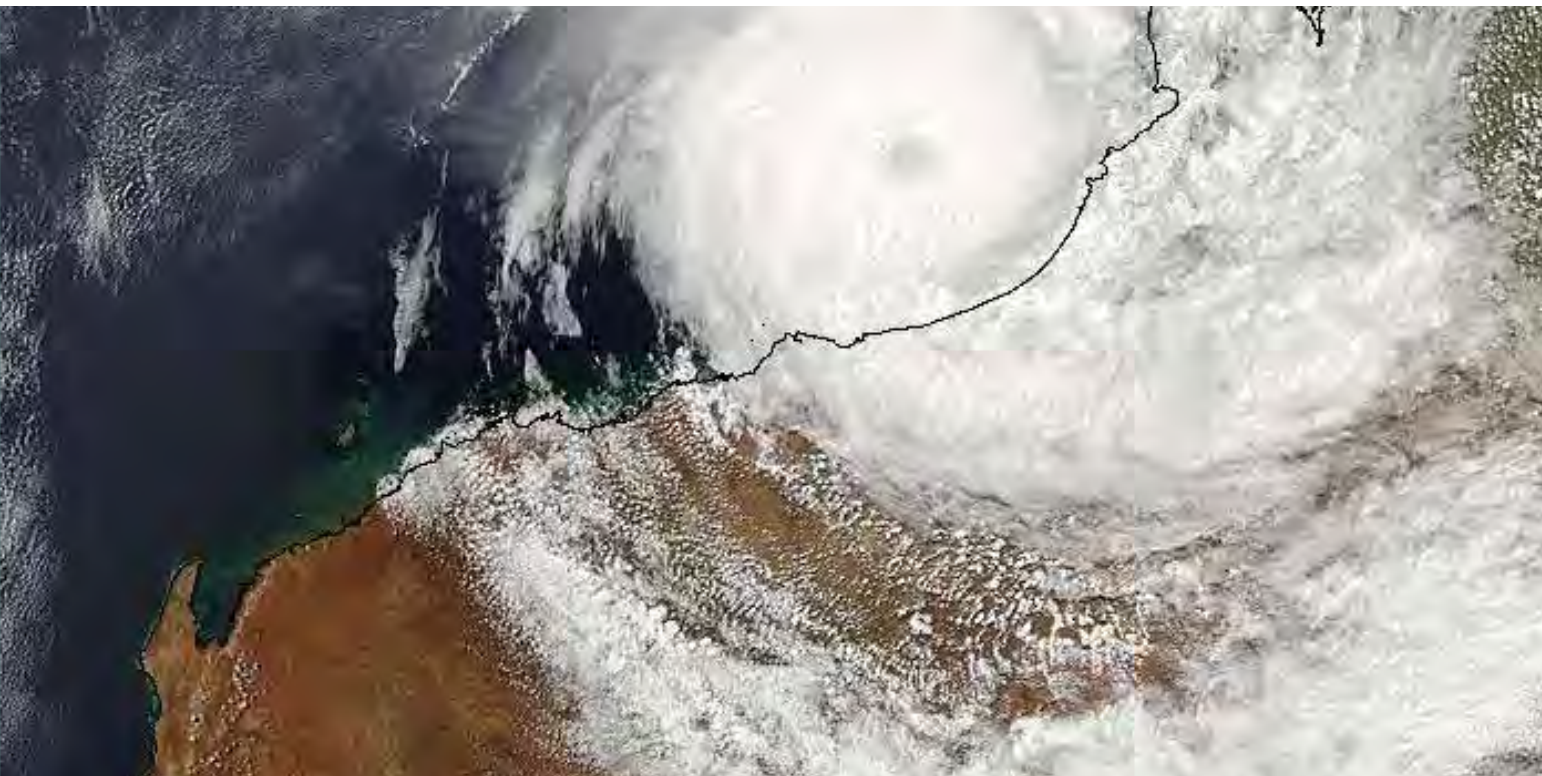


Photo – NASA

Climate change

Climate change is due to the 'enhanced greenhouse effect' caused by increased levels of greenhouse gases in the atmosphere which, in turn, result in more heat being trapped in the Earth's atmosphere.

Global concentrations of carbon dioxide and methane in the atmosphere have been rapidly growing over the past century and are now higher than at any time in the last 800,000 years. There is a time lag between the addition of emissions to the atmosphere and the climate's response. Even if greenhouse gas concentrations are stabilised at some point in time, global mean temperatures are likely to take decades after that to stabilise and associated impacts such as sea level rise may continue for centuries (IPCC, 2007).

Changes in the intensity and frequency of severe weather events have been observed throughout the world (IPCC, 2012). Heatwaves have been more prevalent in the past 50 years. There is also a trend towards more intense tropical storms and hurricanes (Elsner *et al.*, 2008).

Global climate change is also impacting on Australia. Indications of this include:

- virtually all areas of Australia have experienced warming over the past 50 years;
- since the 1950s, each decade has been warmer than the previous;
- since the 1990s, the frequency of very hot (greater than 40°C) daytime temperatures has been increasing;
- since 1910, annual-average daily maximum temperatures across Australia have increased by

0.75°C, annual-average mean temperatures by 0.9°C and annual-average overnight minimum temperatures by 1.1°C;

- recent decades have a trend of higher-than-normal rainfall in northern and central Australia and decreasing rainfall across southern Australia;
- between 1993 and 2011 the global sea level rose quicker (about three millimetres per year) than during the 20th century as a whole (about 1.7 millimetres); and
- since 1910, sea surface temperatures around Australia have increased by about 0.84°C.

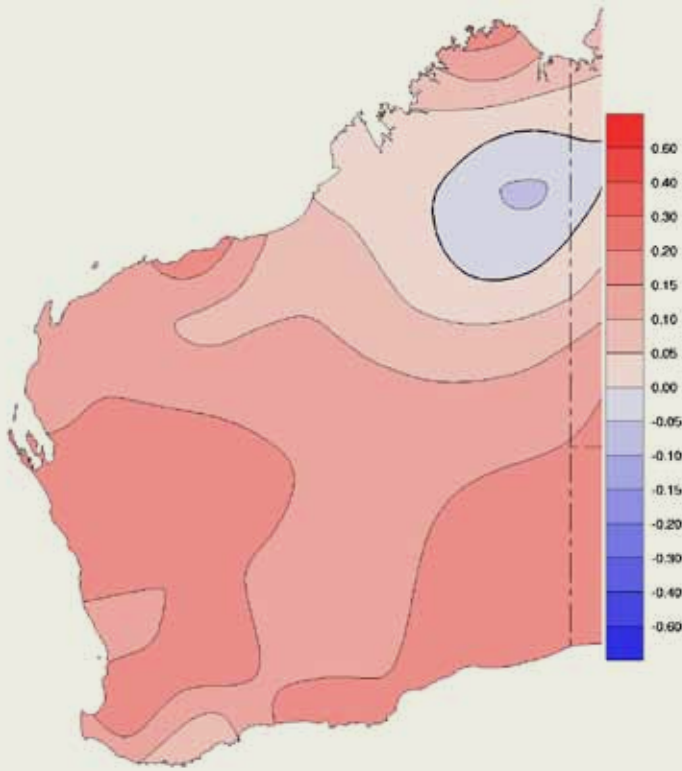
Climate change impacts on Western Australia include:

Temperature

- Since 1910, annual-average temperatures in Western Australia have increased by 0.9°C.
- Since 1950, most of Western Australia has experienced an increase of 0.1°C to 0.2°C per decade.

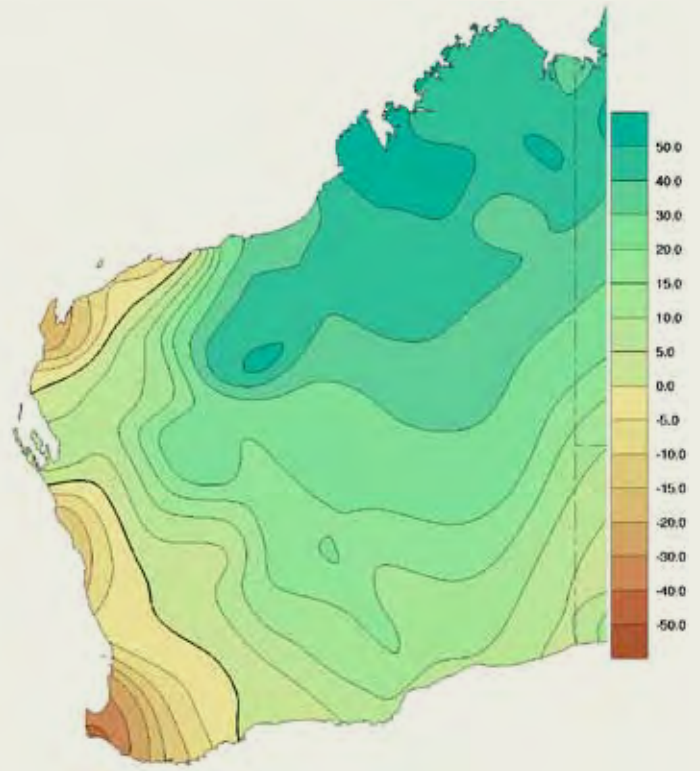
Rainfall

- Between 1950 and 2011, rainfall for most parts of Western Australia has increased, with the highest increase recorded in parts in the north-east of the State.
- Between 1950 and 2011, rainfall in south-west Western Australia has decreased significantly, with the largest decrease in the Bunbury to Walpole region, where it has fallen by up to 50 millimetres each decade.



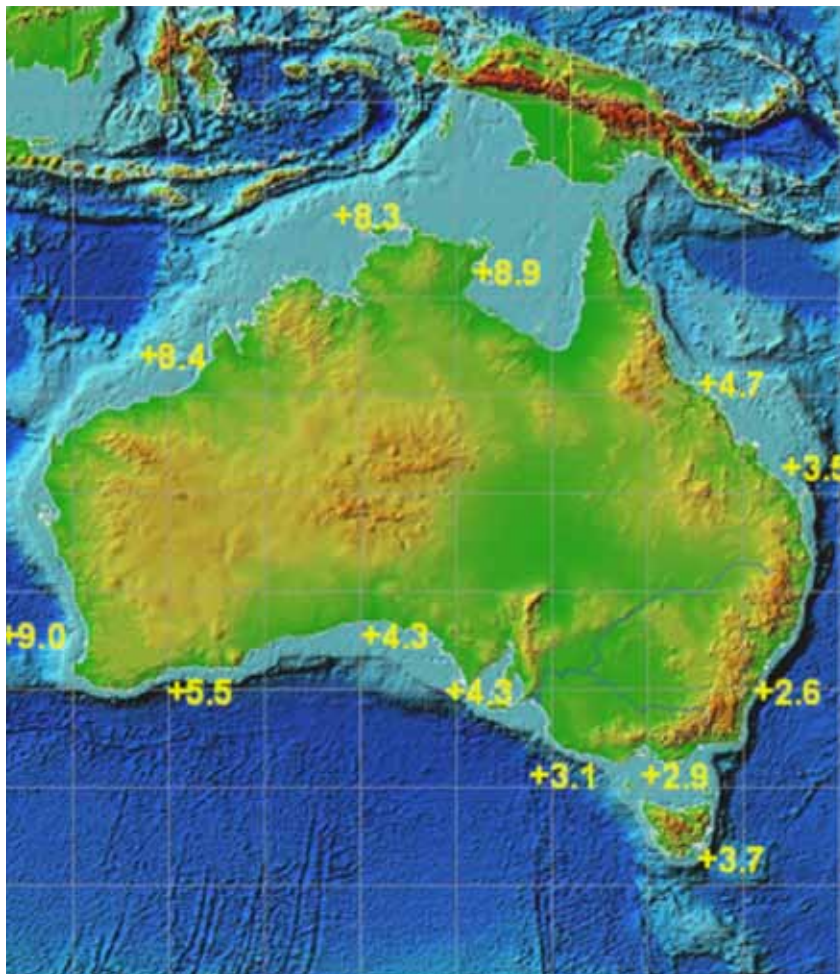
Trend in annual mean temperature for Western Australia between 1950 and 2011.

Image supplied by the Bureau of Meteorology. This trend map is based on the Australian Climate Observations Reference Network – Surface Air Temperature (ACORN-SAT) dataset (BoM, 2012a). These trend maps will be available at www.bom.gov.au/climate/change/ by July 2012.



Trend in annual total rainfall for Western Australia between 1950 and 2011

(BoM, 2012b).



Sea level rise

- Sea levels recorded at Fremantle indicate a long-term average rise of 1.5 millimetres each year over 1897 to 2004 (Pattiaratchi & Elliot, 2005).
- More recent shorter-term data from the Hillarys monitoring station indicate a greater increase of about nine millimetres each year between 1991 and 2011 (BoM, 2011).

Net relative sea level trend in millimetres per year from 1991 to the end of June 2011 from Australian Baseline Sea Level Monitoring Project data stations (BoM, 2011).



Climate change presents both challenges and opportunities for agriculture. Photo – DAFWA

Future climate in Western Australia

Projections indicate that continued greenhouse gas emissions will cause further warming globally during the 21st century that is likely to be larger than that observed in the 20th century (IPCC, 2007).

Indian Ocean Climate Initiative (IOCI) climate change projections for the south-west of Western Australia relative to 1960–1990 (Bates et al., 2008).

CLIMATE VARIABLE	2030	2070
Rainfall	Decrease by 2% to 20%	Decrease by 5% to 60%
Summer temperatures	Increase by 0.5°C to 2.1°C	Increase by 1.0°C to 6.5°C
Winter temperatures	Increase by 0.5°C to 2.0°C	Increase by 1.0°C to 5.5°C

- Indian Ocean Climate Initiative (IOCI) Stage 3 research has revealed that north-west Western Australia can expect a higher proportion of its tropical cyclones to be more intense.
- Cyclones are also expected to occur 100 kilometres further south compared to their current range.
- the need to accelerate infrastructure development, for example, additional water supply sources;
- increased risks to coastal settlements of coastal erosion, saltwater inundation and storm surge flooding;
- increased heat stress-related mortality and morbidity, particularly among the elderly;
- decreased agricultural production, potentially increasing the costs of both food and water and changing population distribution in regional areas;
- adverse impacts on recreation and tourism;
- increased risk of erosion in areas where low rainfall results in low biomass, especially where overgrazing occurs; and
- loss of terrestrial and marine biodiversity.

Likely impacts of climate change for Western Australia include:

- increased risk of bushfire and drought;
- decreased average rainfall in south-west Western Australia;
- less fresh water;



Climate change may result in an increased risk of fire frequency and intensity. Photo – DEC

Responding to climate change

Mitigation

Climate change mitigation means actions to reduce greenhouse gas emissions and enhance greenhouse gas sinks; for example, implementing energy efficiency measures or capturing carbon through planting trees. The Australian Government introduced a broad-based carbon price in July 2012 which initially takes the form of a \$23 per tonne carbon tax. The carbon price directly covers the larger emitters of stationary energy, industrial processes, waste and fugitive emissions. Parts of the transport industry have an equivalent price applied through a separate mechanism. Agriculture, forestry and other land-use sectors have the opportunity to participate by generating emissions credits.

The Australian Government has committed to a long-term goal of reducing Australia's greenhouse gas emissions to 80 per cent below 2000 levels by 2050. Its medium-term targets are an unconditional emissions reduction of five per cent by 2020 with an offer of up to 25 per cent below current levels "depending on the scale of global action" (Australian Government, 2011). While the Federal Opposition with its 'Direct Action' plan has a different view as to policy, it has similar targets to 2020.

The role of the Western Australian Government in

climate change mitigation needs to take account of the national and international context, and is focused on those actions that are most efficient and effective at the State level. An emissions reduction target is not considered appropriate for Western Australia, as the State falls under the overall national targets which will allow abatement to occur across the nation in the least-cost and most economically efficient manner. It is therefore clear that the bulk of mitigation policy will occur at the national level. However, the State Government sees a role for 'complementary action' which assists the national mitigation effort.

Adaptation

Climate change adaptation means adjustments in natural and human systems to avoid or minimise the impacts of climate change.

Warming trends and other impacts of climate change that are beginning to occur will likely become greater in the future. Western Australians will need to adapt in order to ensure the wellbeing of the community, the environment and the economy, and to minimise the costs of climate change impacts on society.



A passenger train on the Perth to Mandurah railway line – public transport supports people using non-car travel options, which can help reduce congestion, urban air pollution, energy use and greenhouse gas emissions. Photo – Department of Transport

Areas where adaptation will be needed include the following:

- **Water supplies** – continuing adjustment and management will be required to respond to reductions in rainfall in some regions and increased temperatures.
- **The agricultural sector** – which will face less water availability and potentially longer, warmer and drier conditions, including the possibility of more frequent and more intense droughts.
- **Buildings, transport infrastructure, such as roads and rail, and critical infrastructure that supply energy and water, health and communication services** – these will be required to adapt to impacts such as higher temperatures, reduced rainfall, larger storm surges and more frequent extreme weather events.
- **Health, social and emergency management service systems** – which will face additional demand from extreme weather events such as storms, floods, heatwaves and bushfires, as well as the likely increased incidence of food, water and vector-borne diseases.
- **Industries** – which will need to adjust to a range of predicted changes; for example, oil, gas and

mining operations in the north-west will need to adapt to more intense tropical cyclones.

- **Communities** – will need to adapt to the changes in lifestyle that climate change will cause.
- **Management of our natural environment** – this area will need to incorporate consideration of climate change risks and adapt in ways that will reduce impacts and maximise the resilience of ecosystems.

As a result of their key responsibilities in providing public infrastructure, health and safety services, land-use planning and natural resource management, State and local governments have a large role to play in adaptation. Adaptation measures are also best coordinated and implemented at the State and local level because the impacts of climate change are primarily dependent on a number of local and regional factors, including geography, local climate and local characteristics. Local knowledge is also an important element in developing adaptation responses. Effective and efficient adaptation will require cooperation between all levels of government, businesses and industry, individuals and communities.

Future directions and actions

The following strategic directions have been identified as areas central to the future standard of living, prosperity and environmental integrity of Western Australia. Each strategic direction sets out the climate change context and proposed State Government actions.

Water security

Climate change has contributed substantially to reduced rainfall and declining inflows to key public water supply dams and declining recharge to groundwater sources in the south-west. This has implications for the availability, cost and energy requirements of water for communities, industry and ecosystems.

Approaches to address these issues include:

- a move toward water pricing that reflects the true cost of water;
- actions to strengthen water efficiency and water recycling targets for Perth;
- strategies to increase the adoption of water-sensitive urban design;
- the development of new opportunities for water recycling, particularly for industrial, agricultural and recreational use; and
- the trial and implementation of managed aquifer recharge initiatives.

The Water Corporation's WaterForever is a 50-year plan to make Perth and surrounding areas more climate resilient, and ensure sufficient and sustainable water supplies for Western Australia. The Water Corporation is also providing investment in upgrading existing and developing new water sources, including the two seawater desalination plants which are independent of rainfall.

Agriculture, forestry and fisheries

The agriculture, forestry and fishery sectors are experienced at managing climate variability. Increasing the resilience of these sectors will be vital to maintaining their viability.

Approaches to address these issues include:

- improving the provision of information to key stakeholders to enhance understanding of future risks associated with climate change;
- assisting landholders to benefit from carbon capture opportunities;



The Albany Wind Farm, a popular tourist attraction, has the capacity to meet 80 per cent of Albany's electricity needs. Photo – DEC

- supporting development and commercialisation of technology to increase the resilience of agricultural, forestry and fishery businesses to climate change; and
- supporting research to enable adaptation to a changing climate, such as new crop varieties which can thrive in a hotter and drier climate.

The North Eastern Agricultural Region has experienced several poor seasons with reduced rainfall, and climate modelling predicts that this pattern is likely to continue. Managing seasonal variability has been identified as a major concern in terms of farm resilience. A strategy developed by the Department of Agriculture and Food Western Australia has multiple approaches to increasing resilience. These include a financial management tool to assist farmers to make better decisions on crop inputs during the growing season in order to reduce financial risk to their businesses; and investigating innovative practices and technologies that help adapt to seasonal variability, for example, fallowing, dry sowing, planting very short season wheat, perennial grazing systems and delayed germination via seed coating to assist with weed control.



Investment in new low emissions technology – buoyant actuator for Carnegie Wave Energy's wave power demonstration plant. Photo – Carnegie Wave Energy

Energy

While our economic prosperity requires secure, reliable and competitive provision of energy, Western Australian energy use currently accounts for about 84 per cent of the State's greenhouse gas emissions. Australian Government policies to mitigate greenhouse gas emissions are likely to result in increased generation costs through imposition of a carbon price and quotas for renewable energy technologies. Climate change will also impact on demand for energy.

Approaches to address these issues include:

- supporting energy efficiency in the residential, industrial and commercial sectors;
- improving building energy and water efficiency;
- ensuring that price signals for consumers are transparent to drive efficient energy use;
- supporting the transition from coal to gas by enhancing availability of gas in the domestic market;
- implementing a regulatory framework for geological sequestration of carbon dioxide in Western Australia;

- expanding the basin ranking map for geological sequestration in Western Australia to provide more detailed information; and
- supporting alternative forms of transport and fuel.

Western Australia is a party to the National Strategy on Energy Efficiency, a Council of Australian Governments measure to accelerate energy efficiency efforts that are already underway and introduce new measures to improve energy efficiency throughout the economy. Part of this strategy is to increase the minimum energy efficiency standards for all new buildings in the Building Code of Australia. From 1 May 2012, the 6-star requirements (including lighting efficiency) became mandatory in Western Australia.

Resilient infrastructure

A changing climate will mean increased risks to major infrastructure due to events such as floods, storms, heatwaves and bushfires. These impacts may interrupt rail, road and port operations, water and energy supplies, resources industries, and cause damage to private and public assets. Planning and



Fishing boats in Fremantle Harbour – research through the Western Australia Marine Science Institution has explored how ocean currents and marine conditions may change over time, to inform management of fisheries. Photo – Department of Transport

infrastructure provision can also have a significant impact on the opportunities to reduce greenhouse gas emissions.

Approaches to address these issues include:

- supporting infrastructure risk assessment and adaptation planning;
- integrating climate change considerations into development assessment, land-use and infrastructure planning, infrastructure procurement, management and maintenance programs; and
- ensuring that urban design reduces sprawl and encourages use of public and other alternative forms of transport, and considers transit-oriented and passive solar design.

The Western Australian Planning Commission is developing the directions strategy for a City of 3.5 million as a high level spatial framework and strategic plan. It establishes a vision for future growth of the metropolitan Perth and Peel region to promote a consolidated urban development front, reduce resource consumption and transport, and increase serviceability.

Healthy people and communities

Climate change is likely to have adverse impacts on the health and wellbeing of Western Australians. Heat-related deaths per capita are expected to rise due to the increasing frequency of summer day temperatures over 40°C and incidences of food, water and vector-borne diseases (such as Ross River virus) may also increase.

Approaches to address these issues include:

- identifying areas of the State and communities that are vulnerable to climate change impacts, and developing integrated adaptation strategies to address public health, sport and recreation and emergency management;
- supporting research into climate and health impacts;
- promoting public health training, monitoring and management of pests and diseases;
- implementing behaviour change and urban development initiatives that reduce emissions and waste, promote recycling, reduce energy and water consumption, and provide health and wellbeing benefits;
- ensuring that early warning and management systems for severe weather events (including cyclones and bushfires) and high quality prevention and control programs adequately address increasing risks from climate change impacts; and
- developing training and skills development programs for local government and community emergency management groups to incorporate climate change considerations into local disaster management plans.

Living Smart Households is a Western Australian Government behaviour change program which reduces energy, water and car travel and achieves positive environmental outcomes by providing localised information, feedback and interactive Eco Coaching conversations and events. Reducing energy use (both stationary and transport) means greenhouse gas emissions are lowered by around one tonne per household per year. Reduced water consumption



Changing behaviour – the Western Australian Government’s Living Smart Households program reduces energy, water and transport emissions. Photo – Department of Transport

allows households to respond to a changing climate where water is increasingly scarce. Switching car trips to public transport, cycling or walking reduces traffic congestion and pollution, increases levels of physical activity and improves health outcomes.

Healthy ecosystems

Western Australia’s unique environment is particularly susceptible to climate change impacts, with many ecosystems being sensitive to geographic and climatic characteristics and parameters. Climate change has the potential to fundamentally shift, reduce or eliminate some ecosystems.

Approaches to address these issues include:

- investigating and monitoring climate impacts on biodiversity including threatened species and marine and terrestrial ecosystems;
- developing options for future conservation management to increase ecosystem resilience;
- identifying, protecting and managing climate change refuges;
- establishing and maintaining ecological connectivity between habitats;
- moving species most at risk to secure sites;
- investigating opportunities for carbon farming projects with biodiversity conservation co-benefits; and
- establishing incentives to promote improved conservation management on private lands.

The Department of Environment and Conservation has a research program to develop an understanding of the impacts of climate change on biodiversity,

especially the impacts on the potentially ‘at risk’ species, communities and ecosystems of Western Australia. This understanding provides the basis on which management responses to climate change are formulated and undertaken.

Climate science information

Policy decisions, in particular around adaptation, will need to consider science as well as the risks and impacts of events related to a changing climate and the vulnerability to these impacts. The cost to the Western Australian economy as a result of poorly informed decisions could be significant. It is important that we have an understanding of the climate that Western Australia needs to adapt to, in order to ensure effective adaptation policies.

Actions to address Western Australia’s climate science information needs include:

- identifying whole-of-government climate science research priorities;
- developing an overarching strategy for climate science research for Western Australia; and
- communicating results to communities, government, businesses and industry.

The Western Australian Marine Science Institution (WAMSI) is a collaborative venture involving the Australian and Western Australian State Governments, research organisations, including the Bureau of Meteorology, CSIRO and the Australian Institute of Marine Science, together with Western Australian universities and the private sector. WAMSI undertakes marine research to support the conservation, sustainable management and utilisation of Western Australia’s unique marine endowment.

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