

# ClimateSmart Adaptation 2007–12

An action plan for managing  
the impacts of climate change



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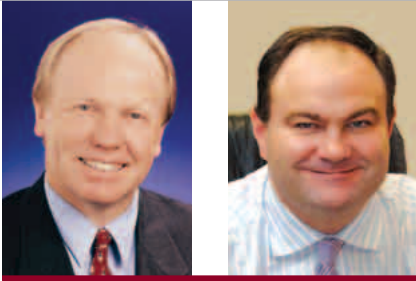
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## Foreword

With Queensland's annual average temperature projected to rise by up to two degrees Celsius by 2030, and rainfall to drop by some 13 per cent, we need to plan for and adapt to our changing climate.

Climate change is one of the most significant challenges facing today's world. It can seriously affect our water supply, food production, health and economy, and damage some of our more sensitive natural environments.

Recognising this, the Queensland Government recently launched *ClimateSmart 2050*—a staged strategy with a diverse range of short, medium and long-term policies that move Queensland to a ClimateSmart future and ensure the continued long-term prosperity of our state.

Complementing this strategy is *ClimateSmart Adaptation 2007–12*, which will deliver the next steps in Queensland's climate change response. It is a five-year plan that provides the foundations for building Queensland's resilience to climate change and is a response to public discussions and submissions about how we can prepare for climate change and lessen its impacts.

*ClimateSmart Adaptation* seeks to generate knowledge about climate change and include it in government and business decision making, thereby increasing Queensland's resilience to the potential impacts.

It includes 62 actions, focusing on a number of priority sectors: water planning and services; agriculture; human settlements; natural environment and landscapes; emergency services and human health; tourism, business and industry; and finance and insurance.

It is a strategy for action, building on the work that we are already doing to plan for and adapt to our changing climate by providing infrastructure and services to secure the state's water supply; researching and monitoring ecosystem health, and legislating to protect it.

Our state has led the nation in its efforts to address the causes of climate change by reducing greenhouse gas emissions through actions that include phasing out broadscale land clearing, funding innovative technology development, making new homes more sustainable and encouraging the uptake of alternative fuels.

These initiatives, combined with actions from *ClimateSmart 2050* and *ClimateSmart Adaptation* will firmly establish Queensland's credentials as a national leader in driving climate change science and policy.

*ClimateSmart Adaptation* will be implemented and coordinated by the Queensland Climate Change Centre of Excellence (QCCCE) over the next five years.

The QCCCE has a whole-of-government focus and will provide policy advice, information and science on climate change and its impact on the community, the economy and the environment to help Queensland plan for and adapt to climate change and maintain our lifestyle.

The earlier we act, the more effective our actions will be. We can also seize the opportunities presented by climate change to create jobs and build our state's economy. This is another example of the Smart State putting innovative solutions to work for all Queenslanders.

We commend the actions in *ClimateSmart Adaptation* because they provide an opportunity for us to pull together. Through partnerships we can deliver real and lasting benefits to make a difference and achieve the changes necessary to ensure our continued prosperity.

The Honourable Peter Beattie MP  
Premier and Minister for Trade

Craig Wallace MP  
Minister for Natural Resources and Water  
Minister Assisting the Premier in North Queensland



# Contents

<b>The case for action</b>	<b>6</b>
Climate change is happening	6
Early action is cost effective	7
Queenslanders support action	8
<b>Making it happen</b>	<b>8</b>
The framework	8
Implementation	9
Monitoring and review	10
Alignment with other initiatives	10
<b>Foundations for success</b>	<b>11</b>
Principles	11
Strategies	12
<b>Priority sectors</b>	<b>15</b>
Water planning and services	15
Agriculture	15
Human settlements	15
Natural environment and landscapes	16
Emergency services and human health	16
Tourism, business and industry	17
Insurance and finance	17
<b>Action Plan</b>	<b>18</b>
Agency acronyms	18
All sectors	18
Water planning and services	21
Agriculture	22
Human settlements	23
Natural environment and landscapes	25
Emergency services and human health	26
Tourism, business and industry	27
<b>References</b>	<b>28</b>

## The case for action

The available scientific evidence overwhelmingly indicates that climate change is happening, and is a serious global threat that demands an urgent response (Stern 2006). The possible impacts are significant for Queensland's environment, economy and communities.

### *Climate change is happening*

Although Queensland has one of the most naturally variable climates in the world, its climate is changing. Bureau of Meteorology data show that Queensland has become hotter and drier since 1910, particularly since the mid-1950s, with temperatures rising faster than the global average.

The Intergovernmental Panel on Climate Change (IPCC) provides the most authoritative scientific information on the topic, incorporating input from the world's leading climate scientists and climate modelling systems. Key findings from the IPCC Fourth Assessment Report (Alley et al. 2007) are that:

- most of the observed increase in globally averaged temperatures since the mid-20th century is very likely (greater than 90% probability) due to the observed increase in greenhouse gas concentrations caused by human activity
- warming of the climate system is unequivocal
- 11 of the last 12 years (1995–2006) rank among the 12 warmest in the instrumental record of global surface temperature, which began in 1850
- global average sea level rose approximately 17 cm during the 20th century
- the rates of observed warming and rise in sea level have accelerated over the last century.

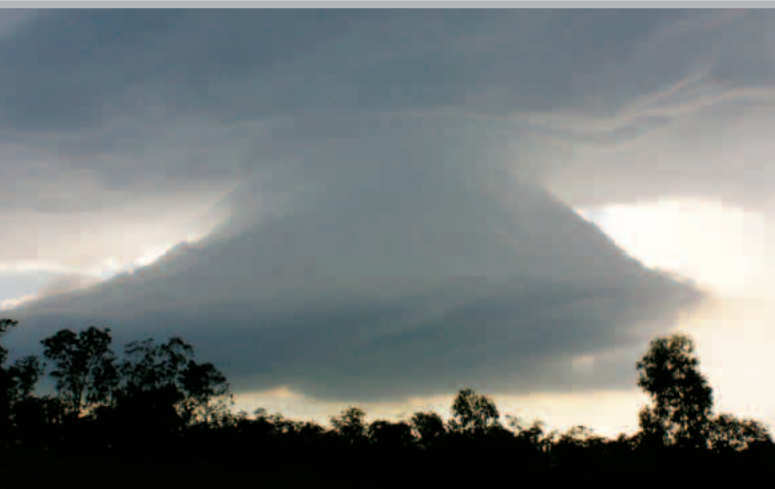
In 2005, Australia recorded its warmest year since reliable, widespread temperature observations became available in 1910 (Bureau of Meteorology 2006). Australian mean temperatures have increased by approximately 0.9 °C since 1910, which is consistent with the increase of 0.7–0.8 °C in global mean temperature since 1900 (Bureau of Meteorology 2007). In the last 50 years, annual average rainfall has increased in the north-west of the country and decreased in the south-west and in eastern areas, particularly along the coast. Recent studies indicate that the increased rainfall in the north-west is likely to be due to an increase in pollution, particularly in Asia. The cause of the decline in rainfall in eastern Australia is still being studied (Nicholls 2006).

Climate change could pose new risks that go beyond natural climate variability. CSIRO projections (Cai et al. 2005), developed using IPCC guidelines, suggest that it could make Queensland's climate more variable and extreme in the future, with the likelihood of more intense droughts and heatwaves, and fewer but heavier rainfall events. (See Synopsis 1.)

The nature, rate and extent of climate change will vary across the state. In far north Queensland there is likely to be more rain, particularly in summer, and more intense tropical cyclones. South-east Queensland could face major challenges as a result of drier conditions overall, a rise in sea level, increased coastal development, and rapid population growth.

Although more uncertain, the drying trend in central Queensland is likely to continue, while projections are that western Queensland will experience the greatest warming in the state, particularly in the south-west.

The work of the IPCC and CSIRO also suggests that future changes in Queensland's climate could be abrupt, with a possibility of 'surprises' because climate systems are complex and changes are difficult to predict.



## Synopsis 1. Climate change science—projections for Queensland

CSIRO projections for Queensland were developed from sophisticated computer-based models of global climate, and scenarios of future global greenhouse gas and aerosol emissions.

The projections (Cai et al. 2005) (relative to 1990 conditions) indicate the following:

- Higher temperatures: average annual temperature increases of 0.2–2.1 °C by 2030, and 0.7–6.4 °C by 2070, with the greatest warming in inland areas
- More hot days and fewer cold nights: 10–100% increase in the average number of days over 35 °C, and 20–100% fewer nights below 0 °C
- A tendency for less rainfall: annual rainfall change of -13 to +7% by 2030, and -40 to +20% by 2070 over much of the state
- An increase in cyclone intensity, with maximum wind speeds up by 5–10% by 2050, and rainfall associated with these events up by 20–30%
- A rise in global average sea level of 18–59 cm by 2100, with regional differences (Alley et al. 2007)
- Increased risk of storm surges along Queensland's coast, e.g. an expected 1-in-100-year storm surge in Cairns becoming a 1-in-55-year event by 2050.

### Note:

- The range in the projections reflects uncertainties due to the various emissions scenarios and model differences. There is more uncertainty about the climate projections for 2070 than about those for 2030, as the uncertainties relating to emissions scenarios increase with time.
- There is more confidence in temperature projections than in rainfall projections, and more confidence in broadscale average changes than in local changes.

## Early action is cost-effective

Research overseas and in Australia indicates that there are significant economic benefits to responding early to climate change. An extensive study in the United Kingdom by leading economist Sir Nicholas Stern estimated that if no action is taken, the overall costs will be equivalent to losing at least 5%, and maybe up to 20%, of global Gross Domestic Product annually. In contrast, taking action (e.g. by reducing greenhouse gas emissions to avoid the worst impacts) will limit annual costs to about 1% of global GDP (Stern 2006).

The Stern Review highlights that adaptation will be crucial to reducing vulnerability to climate change, and is the only way to cope with its inevitable impacts over the next few decades. It suggests that adjusting

economic activity in vulnerable sectors will, to some extent, protect societies and economies from these impacts.

According to the Review, government's role in fostering adaptation is to provide immediate policy guidance and support. It also advises strong and early action to mitigate the effects of climate change, as evidence suggests that the costs of adaptation will rise sharply as temperatures increase, and residual damage will be significant.

The Review confirms the results of similar research conducted in Australia by a cross-section of leading companies. A report by the Australian Business Roundtable on Climate Change (2006) suggests that the economic impacts of climate change are likely to be significant and widespread, and will particularly affect two leading export earners—agriculture and tourism. The report concludes that delaying our response is likely to be more costly for business and the wider economy than taking decisive action now.

CSIRO research supporting the report confirms that Australia must adapt now, and build resilience to the unavoidable effects of climate change in our national infrastructure, natural habitats, resource management and the economy.

The report recommends that building this national resilience be an essential component of Australia's response to climate change.



## Queenslanders support action

In late 2005, the Queensland Government released a discussion paper on adapting to climate change (Queensland Government 2005). This was followed by a Queensland Climate Change Summit in July 2006. These gave Queensland communities and stakeholders an opportunity to provide feedback on their concerns about how climate change might affect them, and on how the state can be better prepared to manage the impacts of this change.

An evaluation report on public submissions to the discussion paper was released in July 2006 (Queensland Government 2006a).

From the feedback provided, the government gained valuable insights into levels of understanding about climate change, the possible impacts of most concern, and how the state can adapt. Queenslanders strongly supported the development of a climate change adaptation action plan to deal with the inevitable change, and emphasised the need for a strengthened commitment to reducing greenhouse gas emissions.

Together with the best available science, the Queensland Government used this feedback, peoples' experience, and ideas from the community, businesses and all levels of government to develop the goal, desired outcomes, principles, strategies and actions of *ClimateSmart Adaptation*.

## Making it happen

*ClimateSmart Adaptation* confirms that the Queensland Government is committed to dealing with the important issue of climate change, and provides a direction for managing its impacts. It supports national actions for adaptation and, from stakeholder input and state priorities, identifies key outcomes and actions relevant to Queensland. It also aligns with initiatives such as the National Climate Change

Adaptation Framework being developed by the Council of Australian Governments.

Adjusting to the actual or anticipated consequences of climate change will enable us to minimise their impact, and to benefit from any opportunities they offer. The actions listed in the back of this publication, which are the foundation for building Queensland's resilience to climate change, will be carried out within the next five years, starting from now.

## The framework

The framework of *ClimateSmart Adaptation* is outlined in Figure 1. The goal, outcomes, principles, strategies and actions focus on 'enhancing resilience' to climate change. They build on the *Queensland Greenhouse Strategy 2004* (Queensland Government 2004a).

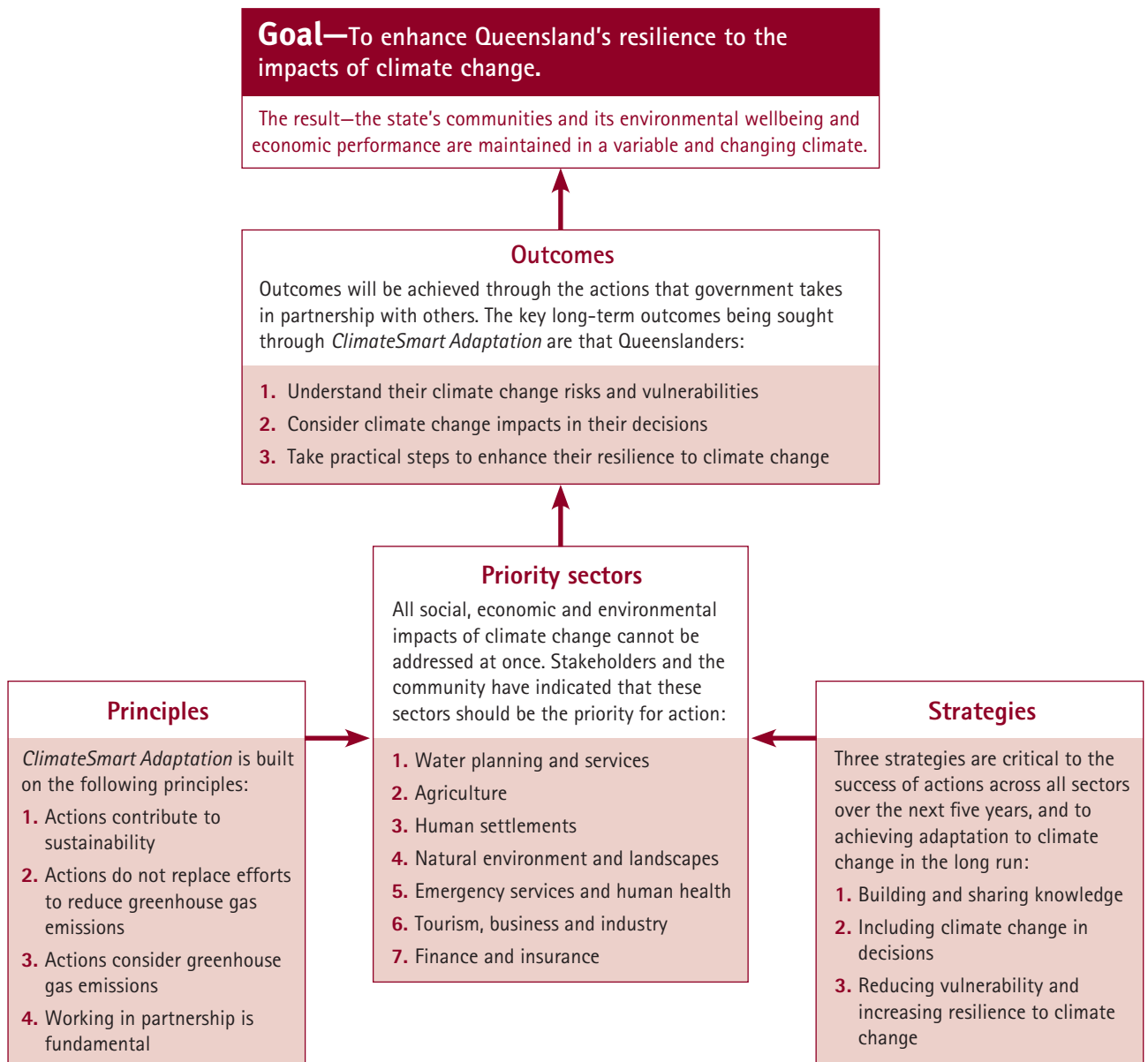
Adaptation is a long-term process, and the aim of this initial plan is to prepare Queensland so that it thrives in a variable climate and is resilient to the impacts of climate change—that is, can withstand or recover from them. Actions taken over the next few years will affect the viability and success of adaptation to the longer-term impacts.

The actions in *ClimateSmart Adaptation*:

- have the potential to capture benefits from early adaptation planning
- will reduce vulnerability in priority sectors
- establish the foundations needed for future adaptation actions.

Many organisations and businesses see climate change as a significant challenge, and have begun work to adapt to its possible consequences. The sectors listed in Figure 1 are the priority, and therefore the focus of this plan; however, some of their actions will benefit other industry and community sectors.



**Figure 1. Framework for managing the impacts of climate change**

## Implementation

Greenhouse gas emissions and the impacts of climate change are global issues that affect all Queenslanders, and collective leadership is needed to deal effectively with them. Under *ClimateSmart Adaptation*, the Queensland Government will implement a wide range of climate adaptation actions over the next five years.

The Queensland Climate Change Centre of Excellence (QCCCE) will lead and coordinate this implementation, and the monitoring, reporting, evaluation and review of the plan. It will also lead and facilitate whole-of-government collaboration and identify emerging priorities.

Working in partnership is a fundamental principle of *ClimateSmart Adaptation*. The government will therefore work with other governments and stakeholders to develop and deliver Queensland's response to climate change. In particular, it will help to develop locally relevant responses by working on a regional basis with local governments, as it recognises their important role in managing the impacts of climate change 'on the ground'.

As the participation of the community is also essential, *ClimateSmart Adaptation* includes actions to engage them and raise their awareness of climate change issues.

## Monitoring and review

To ensure that *ClimateSmart Adaptation* remains relevant and responsive to the needs of Queenslanders, and reflects improvements in the understanding of the impacts of climate change, the actions will be regularly monitored, reported on, and evaluated.

The implementation will also be monitored and evaluated on an ongoing basis, and a key action in the first year will be to develop performance indicators for this process.

Reporting mechanisms for *ClimateSmart Adaptation* will include:

- an annual report to the Queensland Premier
- a biennial Ministerial Statement to Parliament by the Minister for Natural Resources and Water
- regular updates of actions and achievements on the QCCCE website <[www.climatechange.qld.gov.au](http://www.climatechange.qld.gov.au)>.

This public reporting will ensure accountability, guide policy development, and help to set direction.

*ClimateSmart Adaptation* will be formally reviewed after three years. This will include a call for public submissions on its success, and ideas about future directions.

## Alignment with other initiatives

The Queensland Government will continue to play an active role in collaborative national initiatives that promote better management of the impacts of climate change.

The principles and underlying strategies of *ClimateSmart Adaptation* are consistent with national initiatives.

The plan builds on many actions identified at the national level, and complements the:

- National Climate Change Adaptation Framework
- *National Agriculture and Climate Change Action Plan* (Natural Resource Management Ministerial Council 2006)
- *National Biodiversity and Climate Change Action Plan* (Natural Resource Management Ministerial Council 2004)
- *Great Barrier Reef Climate Change Response Program* (Great Barrier Reef Marine Park Authority).

Other Queensland Government strategies that identify climate change as a critical concern for industry are:

- the *Queensland Tourism Strategy* (Queensland Government 2006b)
- the *Queensland Wine Industry Development Strategy* (Queensland Government 2004b).

Carrying out the actions in *ClimateSmart Adaptation* will help Queensland industries identify where they are vulnerable to climate change, and to incorporate this awareness into their business plans and decisions.

Plans aimed at broader goals have also recognised climate change as a key issue—for example, the 10-year plan *Blueprint for the Bush* (Queensland Government, AgForce Queensland & Local Government Association of Queensland 2006).

## Foundations for success

There will often be both costs and benefits associated with adaptation, and the aim of the principles and strategies of *ClimateSmart Adaptation* is to ensure that these are considered when developing responses, and that efforts focus on ‘enhancing Queensland’s resilience to the impacts of climate change’.

### Principles

#### Principle 1—Adaptation actions contribute to sustainability

Sustainability was selected as a key principle to ensure that the social, economic and environmental implications are considered when making adaptation decisions. Efforts aimed at sustainability will ensure that future generations are not forced to disproportionately carry the costs of adaptation, and that any benefits are shared across the community now and in the future.

A precautionary approach, which accepts that a lack of scientific certainty is not a reason for postponing adaptation, is central to sustainability. There is enough scientific agreement on the general direction and broad risks of climatic changes to justify planning and responding now.

#### Principle 2—Adaptation actions do not replace efforts to reduce greenhouse gas emissions

Despite efforts to reduce greenhouse gas emissions, some climate change is inevitable because of the concentration of these gases already in the atmosphere. However, adapting to this change doesn’t negate the need to reduce emissions—the only way to lessen the rate and overall magnitude of future climate change is to reduce emissions. A commitment to do so increases the likelihood of successful adaptation, and decreases the potential costs of climate change.

#### Principle 3—Adaptation actions consider greenhouse gas emissions

When developing adaptation responses it will be important to consider their effect on greenhouse gas emissions, especially when these effects will last for many decades. Careful evaluation of adaptation responses will guard against inadvertently increasing greenhouse emissions, thus further increasing climate change risks.

#### Principle 4—Working in partnerships is fundamental

Effective adaptation requires commitment and action from all parts of society. Individuals, communities, technical and professional disciplines, industry, and governments at all levels can contribute.

Working in partnerships is an effective way to access knowledge and skills, learn more, reduce duplication, and ultimately result in adaptation to climate change at the local level.

Working with others also helps to ensure that adaptation responses in one sector of the community do not have unintended effects on others.



## Synopsis 2. Queensland actions to reduce greenhouse gas emissions

In June 2007, the Queensland Government announced *ClimateSmart 2050*, its strategy for how Queensland will play its part in meeting a national greenhouse gas emissions reduction target of 60 per cent below our 2000 levels by 2050.

*ClimateSmart 2050* establishes Queensland's long-term goals and provides a platform for the government, community and industry to move to a low carbon future.

It is a \$414 million investment to deliver the next steps in Queensland's climate change response, and includes the following key commitments:

- establishment of a Queensland Climate Change Fund, with an initial capital contribution of \$300 million providing ongoing annual funding of approximately \$20 million for future climate change initiatives
- a \$55 million Smart Energy Savings Program to help business become energy efficient
- a commitment to a renewable and low emission energy target of 10 per cent by 2020
- \$50 million for a Renewable Energy Fund to promote research and development into renewable energy
- ClimateSmart Homes rebates to help people living in remote areas install energy and greenhouse friendly products including hot water systems, more efficient fridges and insulation
- increasing the existing 13 per cent Gas Scheme target to 18 per cent by 2020
- introducing new planning standards for commercial buildings by 2010
- making all Queensland Government office buildings carbon neutral by 2020
- phasing out electric hot water systems from existing homes from 2010.

These new investments will complement the government's existing \$300 million commitment from the Queensland Future Growth Fund to develop clean coal technologies. It also supports the Queensland Government's commitment to work with the Federal Government and the other states and territories to develop a national emissions trading scheme by 2010.

On 9 February 2007, the Queensland Premier, and the premiers and chief ministers of the other state and territory governments, signed the Declaration on Climate Change, paving the way for an enduring national response. The Declaration is supported by a series of high-priority actions that include:

- beginning to implement a national emissions trading scheme
- strengthening standards and ensuring consistent accreditation for GreenPower and emission offsets
- accelerating the National Framework on Energy Efficiency
- developing a national mandatory energy efficiency system
- exploring incentives for the take-up of decentralised renewables
- promoting the adoption of new technologies.

## Strategies

*ClimateSmart Adaptation* will be judged on the outcomes it delivers and how it contributes to managing the impacts of climate change in priority sectors. Fundamental to the goal of *ClimateSmart Adaptation* is a commitment to have these impacts considered in decisions at all levels.

### Strategy 1—Building and sharing knowledge

The approach to building and sharing knowledge is based on:

- providing information to help government, non-government and private organisations with adaptation planning
- raising awareness about the effects of climate change and the advantages of early action
- working with partners, including education, training and research providers, to help decision makers with adaptation planning.



To develop effective adaptation responses, it is necessary to clearly understand how Queensland's climate might change, and what the effects of the changes might be. Access to credible information on the latest scientific findings and climate change projections is essential if decisions on the best ways to manage the impacts are to be made in advance.

The Queensland Government has an important role to play in accessing, developing and disseminating the core body of climate change science and projections, which is critical to deliberations on climate change, and in providing leadership by integrating this information in its own decisions.

Lack of detailed understanding of the potential impacts of climate change at the regional and sector scale has been identified as a key barrier to adaptation. To enable effective business planning and development of appropriate response strategies, there is a need to provide relevant information at this level.

Decision makers need better knowledge of the regional and local influences that make their communities vulnerable (e.g. socioeconomic factors and critical system thresholds). Although national and international research and information on these topics is continuing to expand, further studies are required. This is an area in which the state's universities and research institutions will have a key role.

### Strategy 2—Including climate change in decisions

The need to manage a variable climate and extreme weather is not new, and many Queensland organisations are experienced in using a risk-management approach to do this. This has put Queensland in a better position than would otherwise have been the case. Building on this experience will improve our success in dealing with the impacts of climate change. However, when planning for the future, organisations cannot assume that the climate will be similar to what it is at present.



A risk-management approach involves:

- identifying potential impacts relevant to the decisions being made
- understanding the likelihood and potential consequences of those impacts
- developing appropriate responses.

A risk-management approach enables people to think about the possible effects of climate change and what can be done to reduce them, and enables them to more easily identify synergies and conflicts between adaptation and other issues. This is important because the nature, scale and timing of climate change will vary across the state, as will the vulnerability of different sectors and regions.

Risk management is the most useful way to ensure that adaptation responses are socially acceptable, cost-effective, practical, and consistent with the community's broader environmental, social and economic goals. It is an effective way to manage the uncertainties in climate change projections and assess the relative benefits and costs (including the impact on greenhouse gas emissions) of action or inaction.

The Queensland Government has an important role to play in providing guidance and advice on using a risk management approach.

### Strategy 3—Reducing vulnerability and increasing resilience to climate change

Reducing vulnerability and increasing resilience requires considering options such as:

- improving the ability to withstand climate change (e.g. designing infrastructure such as roads, bridges and buildings for future climatic conditions)
- improving communities' ability to cope with climate change (e.g. ensuring that they are prepared for severe weather events)
- enhancing the health of vulnerable natural environments (e.g. reducing air and water pollution, and habitat loss and fragmentation)
- avoiding decisions that make it harder to adapt, or that increase vulnerability (e.g. avoiding development in areas at risk of increased flooding, storm surges, bushfires and landslides)
- exploring alternatives to reduce vulnerability (e.g. meeting resource demands through reuse and recycling options and technologies).

The Queensland Government has an important role to play in developing policy, and providing guidance and advice about effective approaches to reducing vulnerability and increasing resilience to climate change.

## Priority sectors

Much of the state's natural environment and many communities and economic activities are climate-sensitive. The degree to which they are affected depends on their vulnerability—that is, how sensitive they are to even small changes, how exposed they are, and how rapidly and effectively they can adapt.

This section outlines the key climate change impacts and implications for Queensland's more vulnerable sectors. Those listed were identified by stakeholders and the community as being sectors at most risk, or those most likely to be affected by climate change. They are therefore the initial focus for adaptation actions. Other actions will be developed as further information on sectors and regions becomes available.

### Water planning and services

Water is essential to Queensland's prosperity, but the state's rainfall and streamflow are among the most variable in the world. Water security in the future is therefore one of the state's major climate change vulnerabilities.

Water demand will continue to rise with population growth and economic development. At the same time, rainfall is expected to decline over many areas of the state and become more variable.

Potential impacts of climate change on water include:

- more variable and less reliable rainfall and streamflow
- decline in available water as the climate becomes hotter and drier, and evaporation increases
- soil erosion and increased sediments and nutrients in waterways, which can result from more intense rainfall events
- more biological pathogens such as algal blooms and bacterial growth, which may result from declining water quality (reduced quantity, reduced flows and increased sedimentation).

### Agriculture

Agricultural industries are highly sensitive to climate change. The most vulnerable enterprises will be those that depend on resources that are already being managed near their sustainable limit.

Potential impacts of climate change on Queensland agriculture include:

- decreases in soil moisture and an increase in evaporation

- increased risk of soil erosion from more extreme rainfall events
- changes in plant growth and productivity, and possible changes in native and cultivated pastures as a result of carbon-dioxide fertilisation, hotter weather, and rainfall changes
- changes in distribution of existing pests, diseases and weeds, and the threat of new ones
- changes in the suitability of certain crop varieties, horticulture and forestry, as a result of changed growing conditions
- changes in growing periods, and the composition and quality of pastures and other feed important to animal production
- changes in optimum location and productivity of fruit, vegetable and forestry industries.

Recent drought conditions illustrate the effect that climate change could have on agricultural production. The drought has caused significant downturns, which have affected Australia's Gross Domestic Product and rural exports. This has had an effect on the overall economic growth rate and rates of employment. At the regional level, it has had significant social and economic effects on communities that depend on agricultural production for their wellbeing and sustainability.

On the other hand, changing global patterns of production might offer some opportunities (e.g. the chance to plant more frost-sensitive horticultural crops as a result of a decline in frosts; short-term benefits to the wine industry from drier summers).

### Human settlements

Cities and towns throughout Queensland will be vulnerable to the impacts of climate change because of their location and because they were designed for past and present climatic conditions. Some settlements will be more exposed than others.

Possible effects include:

- exposure of more people and infrastructure because of rapid population growth and development in coastal areas
- increased vulnerability of low-lying coastal areas to sea-level rise and storm surges
- increased flood risk, even in areas that have not previously experienced flooding, due to more extreme rainfall events
- increased risk of droughts and bushfires.

These events have the potential to cause significant social and economic impacts.

Rising temperatures, more extreme weather events and a decrease in available water have the potential to affect the built environment in the following ways:

- a change in the reliability and cost of energy and water, with some areas made more vulnerable by competing demands
- increased vulnerability of infrastructure that extends over large areas and has a long life span. Pipes, drains, power lines, bridges and other major facilities for towns and suburbs are built to last decades. Most are not at risk now, but they may need to withstand more extreme weather in the future.

Climate change should be a factor in decisions to replace or refurbish key buildings and infrastructure. Better land-use planning and infrastructure design standards, and amendments to the way new buildings are constructed, will make settlements and infrastructure more resilient.

### *Natural environment and landscapes*

Queensland is one of the most biodiverse regions in the world. The natural environment is highly vulnerable to climate change, especially if the change is rapid. Some ecosystems may not cope with a changed climate, and climate-sensitive species may disappear.

Queensland's natural environment and landscapes will potentially be subject to:

- changes in plant growth and native vegetation patterns due to hotter and drier conditions and carbon-dioxide fertilisation
- changes in the abundance and distribution of pests, weeds and diseases
- reduced streamflow and decreasing water quality in important river systems
- additional stress on already-threatened species, and ecosystems such as upland rainforests, reefs, arid and semi-arid habitats and aquatic ecosystems
- changes to breeding patterns and life cycles that affect population dynamics
- reduced viability of species or ecosystems, potentially leading to new threatened communities
- higher bushfire risk, intense tropical cyclones and droughts.

Many of the state's social and economic activities are tied to the natural environment. For Queensland's wellbeing and ongoing prosperity, it is essential to build the resilience of the natural environment to climate change, particularly by removing or

decreasing stresses, and implementing other strategies as the evidence base improves.

### *Emergency services and human health*

Extreme weather and natural disasters are already features of Queensland's highly variable climate. The projected increase in the number of heatwaves and heavy rainfall events, and the severity of tropical cyclones and bushfires, will increase the demand for emergency assistance.

Climate change could also affect the health of Queenslanders. As well as heat stress, it may contribute to:

- increased risk of food-borne illnesses due to hotter weather
- increased risk of water-borne diseases due to less rain and runoff and declining water quality
- changes in the incidence and distribution of mosquito populations and mosquito-borne diseases (e.g. dengue fever, Ross River virus and Japanese encephalitis) due to changing temperature and rainfall patterns
- increased stress or depression following economic hardship or losses.

Emergency service and health impacts from climate change will vary from region to region.

Rapid population growth and development in urban coastal areas may increase the number of people exposed to extreme weather events.

Those in remote locations may be more vulnerable, particularly after a disaster when essential services and infrastructure such as health and social services, financial services, electricity, clean water and sanitation are limited or unavailable for a brief time.



Uncertainties about the future risk of storms and other natural hazards make it difficult to develop appropriate adaptation responses for these events.

More demands on emergency service personnel and equipment are likely, but an ageing population may limit the number of volunteers available for emergency service work. There may be increasing requirements for different and additional equipment, such as helicopters and aircraft, to respond to extreme bushfires.

### *Tourism, business and industry*

Tourism is Queensland's third largest export earner, generating visitor expenditure of over \$18.4 billion annually and employing almost 140 000 people. The tourism sector is highly vulnerable to climate change as many of Queensland's major attractions rely on natural environments such as reefs and tropical rainforests that exist in a narrow climatic range and are sensitive to relatively small changes. However, the potential impact of climate change on tourism operations is uncertain, with limited knowledge of what the effect on various attractions might be, and how quickly changes might occur.

Tourism could be affected by:

- more extreme weather events (e.g. increased heavy rainfall events disrupting visitor numbers)
- reduced availability of water
- increased heat-related and other health impacts.

Conversely, a decrease in rainy days may encourage a steady flow of visitors.

There is not yet enough information on flood risk to understand its implications for transport, accommodation and some attractions. However, increased storm-surge risk and rising sea levels will

put waterfront infrastructure (boat ramps and jetties, restaurants, accommodation and other buildings) at greater risk.

Climate change may influence the cost of doing business, change the attractiveness of the state for some industries, and affect regional development and economic growth. An increase in extreme events could disrupt the supply of raw materials and the transport of products. A reduction in water availability could have a significant impact on key industries.

It will be necessary to base decisions on adaptation and development of emerging opportunities on an understanding of how Queensland businesses and industries are affected, compared with what is happening to others around Australia and in the rest of the world.

Climate change could offer the state an opportunity to position itself as an exporter and world leader in adaptation knowledge, skills and innovative technologies.

### *Insurance and finance*

Insurance is a mechanism that society uses to share risks. Climate change may affect its cost and availability, as the industry plays a significant role in covering weather-related damage.

Population growth and development in areas prone to flooding or storm surges, and buildings no longer able to withstand increasing wind strength, will increase the risks for both insurance and reinsurance. This will affect the community both directly and indirectly as businesses incorporate increased premiums into their costs.

Banks and other financial institutions will also be exposed to climate change impacts through their investment portfolios.



## Action Plan

### Agency acronyms

Below is a list of agencies responsible for carrying out the actions outlined in *ClimateSmart Adaptation* over the next five years.

AGO	Australian Greenhouse Office
BoM	Bureau of Meteorology
C-G	Coordinator-General
DES	Department of Emergency Services
DLGPSR	Department of Local Government, Planning, Sport and Recreation
DME	Department of Mines and Energy
DoC	Department of Communities
DoH	Department of Housing
DOI	Department of Infrastructure
DMR	Department of Main Roads
DPC	Department of the Premier and Cabinet
DPW	Department of Public Works
DPI&F	Department of Primary Industries and Fisheries
DSD	Department of State Development
DTFTWID	Department of Tourism, Fair Trading and Wine Industry Development
EPA	Environmental Protection Agency
NRW	Department of Natural Resources and Water
QCCCE	Queensland Climate Change Centre of Excellence
QH	Queensland Health
QT	Queensland Transport
QWC	Queensland Water Commission
TQ	Tourism Queensland

### All sectors

Action	Strategy	Responsibility	Priority	Completed
1. Prepare regional-scale climate change projections for priority areas, to offer more localised information for planning and decision making. 'Downscale' the broad climate change projections currently provided to enable assessments of the impacts of climate change.	1	QCCCE	High	End 2010
2. Access the best available climate change science, projections and data by maintaining and enhancing national and international research collaborations with agencies such as: <ul style="list-style-type: none"> <li>• CSIRO</li> <li>• Bureau of Meteorology</li> <li>• International Research Institute for Climate and Society</li> <li>• Hadley Centre of the UK Met Office.</li> </ul>	1	QCCCE	High	End 2012

3.	Prepare a climate change vulnerability assessment of Queensland's regions and sectors.	1	QCCCE	High	End 2007
4.	Build the capacity of priority sectors to avoid, reduce and manage the impacts of climate change by: <ul style="list-style-type: none"> <li>identifying critical information gaps in the understanding of climate change impacts</li> <li>communicating scientifically based information about climate trends, climate change projections, and potential impacts through various means (internet, regional briefings, interviews)</li> <li>developing decision-support tools for risk assessment, including tools for determining the costs and benefits of adaptation options</li> <li>facilitating sector-based risk assessments and response plans.</li> </ul>	1, 2, 3	QCCCE, NRW, DPI&F, DTFTWID, TQ, DoC	High	End 2011
5.	Support research into climate change impacts through the Growing the Smart State-PhD Funding Program, and ensure research findings are communicated to the relevant areas of government and the community.	1	DPC	High	End 2012
6.	Develop and disseminate public information materials about the potential impacts of climate change and recommended responses. Provide more specific information for vulnerable groups within the community as required and develop and implement stage 1 of the <i>ClimateSmart Living</i> campaign educating residents about the impacts of climate change.	1	QCCCE, EPA	Medium	End 2012
7.	Develop a web portal to provide a single point of access to: <ul style="list-style-type: none"> <li>Queensland Government climate change information and science</li> <li>tools for self-assessment of risk and vulnerability to climate change.</li> </ul>	1	QCCCE, whole-of-government	High	End 2010
8.	Qualitatively assess what core Queensland Government business is at risk from climate change and propose possible responses.	1, 2	QCCCE, Whole-of-government	Medium	End 2009
9.	Explore ways of incorporating climate change in the terms of reference for environmental impact statements and other relevant assessment processes.	2	QCCCE, EPA, NRW, C-G, DLGPSR	Medium	End 2007
10.	Contribute to the establishment of the national meta-database of climate change information, research, and adaptation actions.	1	QCCCE	Medium	End 2008

<b>11.</b>	Establish a network for Queensland climate change professionals to transfer knowledge, skills and experience, and to help build capacity in adapting to climate change.	1, 2	QCCCE	Medium	End 2007
<b>12.</b>	Develop performance indicators for meaningful reporting on the progress of actions in <i>ClimateSmart Adaptation 2007–2012</i> .	3	QCCCE, DPC, whole-of-government	High	End 2007
<b>13.</b>	Contribute to the implementation of the Council of Australian Governments National Climate Change Adaptation Framework.	3	QCCCE, whole-of-government	High	End 2010
<b>14.</b>	Contribute to collaborative climate change actions on biodiversity, agriculture, coasts and water being undertaken through the Natural Resource Management Ministerial Council.	3	QCCCE, EPA	High	End 2010

**Strategy 1**—Building and sharing knowledge

**Strategy 2**—Including climate change in decisions

**Strategy 3**—Reducing vulnerability and increasing resilience

## Water planning and services

Action	Strategy	Responsibility	Priority	Completed
<p><b>15.</b> Integrate climate change considerations and new projections into:</p> <ul style="list-style-type: none"> <li>• decisions about water infrastructure</li> <li>• water-quality management of dams and reservoirs</li> <li>• water planning (including water resource plans, resource operations plans, and regional water supply strategies) and water-quality improvement programs.</li> </ul>	2	NRW, QWC, EPA	High	End 2012
<p><b>16.</b> Diversify water-supply sources to reduce dependency on vulnerable supplies. This requires:</p> <ul style="list-style-type: none"> <li>• considering climate change in regional water security plans</li> <li>• investigating the potential of less climate-dependant water supply options.</li> </ul>	3	NRW, QWC	High	End 2012
<p><b>17.</b> Promote water-use efficiency by encouraging and supporting:</p> <ul style="list-style-type: none"> <li>• lower water consumption through water-efficient technologies and practices</li> <li>• installation of water-efficient devices through rebate or subsidy schemes</li> <li>• the development and adoption of better water-saving devices.</li> </ul>	3	NRW, DPI&F, QWC, DSD	High	End 2012
<p><b>18.</b> Further explore the use and management of recycled water on state-controlled roads in construction sites.</p>	3	DMR	Medium	End 2012
<p><b>19.</b> Continue with the joint NRW-AGO-BoM project to assess required changes to Probable Maximum Precipitation (PMP) estimates due to climate change.</p>	1, 2	NRW	High	End 2009
<p><b>20.</b> Continue to apply water management strategies in government-owned buildings, including fitting water-efficient devices.</p>	3	DPW, DoH	High	End 2012
<p><b>21.</b> Integrate downscaled and regional climate change projections into hydrological models for water planning and assessment of changes in flood risk for urban and infrastructure planning.</p>	1	QCCCE, NRW	High	End 2010

## Agriculture

Action	Strategy	Responsibility	Priority	Completed
<b>22.</b> Continue to work with the agribusiness sector to have climate change considerations included in farm management systems and whole-of-property risk planning.	2	DPI&F, QCCCE	High	End 2011
<b>23.</b> Explore opportunities to continue the climate workshops held for the agricultural sector.	1	DPI&F, QCCCE	High	Mid-2008
<b>24.</b> Continue research and development into farming practices affected by changed conditions to enhance market competitiveness.	1, 3	DPI&F	Medium	End 2012
<b>25.</b> Develop commodity-specific forecasting models for climate change scenarios at a regional scale. Assess the impacts of climate change on farm performance and quantify management options for climate risk (both climate variability and climate change).	1	DPI&F, QCCCE	Medium	Mid-2011
<b>26.</b> Implement actions to fulfil Queensland's responsibilities in the <i>National Agriculture and Climate Change Action Plan</i> .	3	DPI&F, NRW	High	End 2009
<b>27.</b> Undertake literature reviews/desktop research to determine suitable plant varieties (e.g. wine-grape varieties) for Queensland regions in a changed climate.	1	DPI&F, DTFTWID, QCCCE	High	End 2010
<b>28.</b> Maintain and build national research and development partnerships such as the Agricultural Production Systems Research Unit, to generate knowledge of the impacts of climate change on various agricultural commodities, and to assess adaptation options.	1	DPI&F, QCCCE	High	End 2012

**Strategy 1**—Building and sharing knowledge

**Strategy 2**—Including climate change in decisions

**Strategy 3**—Reducing vulnerability and increasing resilience

## Human settlements

Action	Strategy	Responsibility	Priority	Completed
<p><b>29.</b> Improve understanding about the risks and impacts of climate change to coastal Queensland:</p> <ul style="list-style-type: none"> <li>• continue storm-tide and wave monitoring systems</li> <li>• improve projections of inundation and flooding due to changes in sea level and extreme events</li> <li>• work with local government to identify and map areas most at risk from storm tides</li> <li>• integrate the information gained into advice and tools (e.g. digital elevation modelling of coastal Queensland).</li> </ul>	1	DES, EPA, NRW, DoC	High	End 2010
<p><b>30.</b> Contribute to the development of a Queensland Local Government Climate Change Management Strategy.</p>	3	QCCCE	High	End 2007
<p><b>31.</b> Ensure regional planning activities under the <i>Integrated Planning Act 1997</i> draw together state and local government responses to climate change, including the:</p> <ul style="list-style-type: none"> <li>• 2010 review of the SEQ Regional Plan</li> <li>• Far North Queensland Regional Plan.</li> </ul>	2	DOI, OUM, DLGPSR, whole-of-government	High	End 2010
<p><b>32.</b> Incorporate changes in flood risk due to climate change in the proposed State Flood Risk Management Policy, local government floodplain management plans and relevant state guidelines.</p>	2, 3	NRW	Medium	End 2010
<p><b>33.</b> Update the <i>Queensland Urban Drainage Manual</i> as needed to reflect changes in hydrology associated with climate change.</p>	1, 3	NRW	Medium	End 2012
<p><b>34.</b> Periodically review physical infrastructure to determine:</p> <ul style="list-style-type: none"> <li>• the extent to which climate change may affect operational performance</li> <li>• whether measures are needed to ensure system durability, safety and reliability.</li> </ul>	1	Whole-of-government	Medium	End 2010
<p><b>35.</b> Review the effectiveness of existing planning tools in addressing the increased risks from climate change, including the:</p> <ul style="list-style-type: none"> <li>• <i>State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide</i></li> <li>• <i>State Coastal Management Plan</i></li> <li>• local government planning schemes.</li> </ul>	2	DES, EPA, DLGPSR	Medium	Mid-2008

<b>36.</b>	Review planning guidance given to local government on shoreline erosion management to ensure it integrates climate change, and establish an associated grants scheme.	2	EPA, DLGPSR	Medium	Mid-2011
<b>37.</b>	Promote and ensure continual improvement in climate-sensitive design in the building sector through: <ul style="list-style-type: none"> <li>• the <i>Smart and Sustainable Housing</i> program;</li> <li>• the <i>ClimateSmart Living</i> program</li> <li>• updating building codes as required.</li> </ul>	3	DLGPSR, DPW, EPA	High	End 2012
<b>38.</b>	Review the capacity of Queensland's existing energy infrastructure to cope with climate change.	3	DME, QCCCE	Medium	End 2012
<b>39.</b>	Work with energy suppliers and network managers to ensure networks can cope with increased peak demand during higher temperatures and more heatwaves.	3	DME	Medium	Mid-2008
<b>40.</b>	Include climate change considerations in programs designed to improve the appeal and amenity of public transport.	1, 3	QT	High	End 2012
<b>41.</b>	Advance <i>Smart Travel Choices for SEQ</i> to encourage the community to replace some of their car journeys with walking, cycling or public transport, and help traffic and freight move more efficiently.	3	QT	High	End 2012
<b>42.</b>	Incorporate the latest technical information, such as the Australian Rainfall and Runoff Data, in risk assessment prior to designing and planning roads, bridges and other transport infrastructure subjected to flood and heat stress.	3	DMR	Medium	End 2012

**Strategy 1**—Building and sharing knowledge

**Strategy 2**—Including climate change in decisions

**Strategy 3**—Reducing vulnerability and increasing resilience

## Natural environment and landscapes

Action	Strategy	Responsibility	Priority	Completed
<b>43.</b> Review available options and mechanisms to manage the impacts of climate change on Queensland's at-risk ecosystems.	1, 2	QCCCE, EPA	Medium	Mid-2009
<b>44.</b> Identify critical information gaps in the understanding of the impacts of climate change on biodiversity, and identify the priorities for research.	1	QCCCE, EPA	Medium	End 2012
<b>45.</b> Develop climate change information and advice in a form that can be effectively included in conservation and natural resource management programs such as: <ul style="list-style-type: none"> <li>• protected-area planning, design and management</li> <li>• corridor and landscape planning</li> <li>• species management and planning</li> <li>• private land conservation initiatives</li> <li>• regional natural resource management planning</li> <li>• pastoral leasehold land management</li> <li>• water-quality improvement planning.</li> </ul>	2	QCCCE, NRW, EPA	High	End 2010
<b>46.</b> Continue to implement Queensland's responsibilities in the <i>National Biodiversity and Climate Change Action Plan</i> , including review of the plan during 2007.	1, 2, 3	NRW, DPI&F, QCCCE, EPA	High	End 2011
<b>47.</b> Work with the Great Barrier Reef Marine Park Authority to implement joint initiatives that address climate change in the Reef region.	1, 2, 3	QCCCE, NRW, DPI&F	High	End 2012
<b>48.</b> Undertake qualitative assessments, monitoring and modelling of the likely impacts of climate change on vegetation types, grazing land and cropping land. Advise and help landholders to manage changing landscapes.	1, 2	NRW, DPI&F, QCCCE, EPA	Medium	End 2012
<b>49.</b> Work with regional NRM (natural resource management) bodies to: <ul style="list-style-type: none"> <li>• communicate the best available information about climate change projections and potential impacts</li> <li>• ensure climate change issues are considered in the next review of regional NRM plans and investment strategies.</li> </ul>	1, 2	NRW, DPI&F, QCCCE	Medium	End 2010
<b>50.</b> Improve models for sediment movement and salinity intrusion in coastal and riverine environments to ensure they incorporate: <ul style="list-style-type: none"> <li>• sea-level rise</li> <li>• increases in rainfall intensity</li> <li>• changes to sediment supply</li> <li>• impacts on engineering, nourishment and other management measures.</li> </ul>	1	QCCCE, NRW, EPA	Medium	End 2011

## Emergency services and human health

Action	Strategy	Responsibility	Priority	Completed
<b>51.</b> Build the capacity of disadvantaged communities to effectively respond to the potential social and economic impacts of climate change.	1	DoC, QCCCE	High	End 2012
<b>52.</b> Continue to provide planning and emergency management advice on storm tides, and investigate whether measures are adequate for the next 30 years.	1	DES, NRW, EPA	High	End 2012
<b>53.</b> Ensure that reviews of local disaster management plans include relevant climate change issues.	2, 3	DES	Medium	End 2010
<b>54.</b> Implement actions from the 2006 Cyclone Summit, namely: <ul style="list-style-type: none"> <li>• provide households in a cyclone-prone area from Fraser Island to Cape York with the <i>Preparing for cyclones</i> booklet</li> <li>• undertake a feasibility study of a mass alert system that uses SMS and email to advise the community about approaching natural disasters</li> <li>• assist local governments in cyclone-prone areas with funding to prepare long-term shoreline erosion management plans</li> <li>• hold a yearly 'Cyclone Preparedness' summit</li> <li>• provide extra funding to help local councils rebuild after natural disasters</li> <li>• deliver the <i>Cyclone Recovery and Renewal – Economic and Business Strategy</i> in North Queensland, including a natural disaster resilience kit for business operators</li> <li>• carry out the <i>Improving Indigenous Communities' Resilience to Natural Disasters</i> project.</li> </ul>	3	DES, EPA, DPC, DSD, DLGPSR	High	End 2010
<b>55.</b> Extend 'preparedness and awareness' programs to communities where the risk of extreme climatic events has increased.	1	DES, whole-of-government	Medium	End 2012
<b>56.</b> Review the <i>Queensland Heatwave Response Strategy</i> to ensure it appropriately considers climate change.	3	QH, DES, whole-of-government	Medium	Mid-2008
<b>57.</b> Continue to invest in the prevention of mosquito-borne diseases, which includes: <ul style="list-style-type: none"> <li>• disease surveillance and response</li> <li>• mosquito surveillance and control</li> <li>• public education and awareness campaigns</li> <li>• management strategies for emerging risks due to climate change.</li> </ul>	3	QH	High	End 2012

## Tourism, business and industry

Action	Strategy	Responsibility	Priority	Completed
<p><b>58.</b> Through the <i>Queensland Tourism Strategy</i>, develop an online Best Practice Sustainable Tourism package that includes advice for businesses on:</p> <ul style="list-style-type: none"> <li>• best practice in environmental tourism and cultural heritage management</li> <li>• best practice in sustainable tourism infrastructure design</li> <li>• sustainable tourism principles and their commercial application</li> <li>• reducing waste, water use and energy consumption to decrease greenhouse gas emissions</li> <li>• identifying and responding to climate change impacts</li> <li>• benchmarking suitable accreditation programs.</li> </ul>	2, 3	EPA, QCCCE, DTFTWID	High	End 2008
<p><b>59.</b> Review and update the <i>ecoBiz</i> program to ensure it promotes adaptation to climate change.</p>	3	EPA	Medium	End 2010
<p><b>60.</b> Continue to support energy- and water-efficiency innovations through the Queensland Sustainable Energy Innovation fund and the <i>ecoBiz</i> program.</p>	3	EPA	Medium	End 2012
<p><b>61.</b> Work with the insurance and finance sector to develop a better understanding of the risks and potential costs of climate change.</p>	1	QCCCE	High	End 2012
<p><b>62.</b> Identify, evaluate and create momentum for investment and business opportunities for Queensland from climate change.</p>	1	DSD	Medium	End 2011

**Strategy 1**—Building and sharing knowledge

**Strategy 2**—Including climate change in decisions

**Strategy 3**—Reducing vulnerability and increasing resilience

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