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Australian Government

Department of Agriculture, Fisheries and Forestry

Submission to

House of Representatives Standing Committee on Climate Change, Environment and the Arts

Inquiry into Biodiversity in a Changing Climate

23 August 2011

EXECUTIVE SUMMARY

Biodiversity and the ecosystem services it provides are important to the viability of agricultural industries. Improved farm management practices, more sustainable food processing, and better adapting to climate change are ways the agriculture, fisheries and forestry industries can manage their impact on biodiversity in a changing climate.

This submission outlines the impacts on Australian agriculture, forestry and fisheries, deriving from climate change's impacts on biodiversity, and provides an overview of the work that the Department of Agriculture, Fisheries and Forestry is undertaking to address such impacts.

Climate change's impacts on biodiversity will have flow on impacts on agricultural industries. Some impacts on Australian agriculture are likely to include significant crop and pasture reductions by 2070 in southern Australian regions, reduced grain and grape quality, increased thermal stress on stock thus reducing productivity, changing animal health risks, increased incidence and distribution of weeds and increased fire risk. Climate change is predicted to affect native and planted forests through changes in rainfall, temperature and associated impacts on the key production species. In native forests, it will also affect the other species in the ecosystem. ABARES research predicts climate change will impact forests, wood production and investment more strongly in some regions.

Australia's wild fisheries and aquaculture sectors also face many challenges. Water temperatures off south east Australia have increased by two degrees above long term averages already. Ocean acidification in combination with increasing temperatures is affecting the reproduction and early life stages of marine organisms.

The department has put in place a number of strategies and mechanisms to address knowledge gaps, promote adoption of sustainable farming practices, facilitate the industries' adaptability to climate change, and enhance community engagement to improve productivity and conserve biodiversity in a changing climate. These strategies and mechanisms include the Caring for our Country initiative, the National Climate Change and Commercial Forestry Action Plan, the Forest Industries Climate Change Research Fund, the National Climate Change Action Plan for Fisheries and Aquaculture, the Australian Farming Future initiative, the Carbon Farming Futures initiative, Landcare, National Drought Policy, the National Weeds and Productivity Research Program, and Rural Research and Development Corporations.

The department has also contributed to the development, review and implementation of some key national polices addressing biodiversity in a changing climate. These are the Australian Weeds Strategy, the Australian Pest Animal Strategy, Australia's Biodiversity Conservation Policy, the Native Vegetation Framework, and the 2010 Principles for Sustainable Resource Management in the Rangelands.

INTRODUCTION

Biodiversity and the ecosystem services it provides are important to the viability of Australian agriculture, forestry and fishery industries. Ecosystem services derived from biodiversity include food and fibre production, genetic resources, disease regulation, water purification, nutrient cycling, soil formation and pollination. Climate change's impacts on biodiversity will have flow on impacts on agricultural industries.

The Department of Agriculture, Fisheries and Forestry welcomes the opportunity to provide a submission to the House of Representatives Standing Committee on Climate Change, Environment and the Arts.

The submission outlines the department's portfolio responsibilities, and addresses the Inquiry's Terms of Reference, by outlining the flow-on impact on agriculture, fisheries and forestry from climate change's impact on biodiversity; what DAFF is doing to address the challenges due to climate change's impact on biodiversity; and the future work that DAFF proposes to undertake to address the challenges.

Australia's agricultural sector is particularly vulnerable to the impacts of climate change because of its dependence on favourable weather conditions, natural resources and systems. The International Panel on Climate Change Fourth Assessment Report[1] 2007 predicts that climate change will bring major challenges for our primary industries including higher temperatures, longer and deeper droughts, and more intense extreme weather events such as tropical cyclones. It will be critical that Australia's farming sector adapts to climate change if it is to remain competitive, sustainable and profitable into the future.

Potential impacts on Australia's agriculture, fisheries and forestry sector include new biota, cropping change, changed prevalence of pests and diseases, ocean acidification and changes to animal health and marine reproduction. The following sections will examine these impacts in more detail.

The submission discusses climate change impacts on marine systems, rangelands, forests and other terrestrial landscapes managed by agriculture, fisheries and forestry, which include significant areas of remnant and planted native vegetation.

[1] Hennessy K, Fitzharris B, Bates BC, Harvey N, Howden SM, Hughes L, Salinger J, Warrick R. (2007) Chapter 11. Australia and New Zealand. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE. (eds). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.

ROLE OF THE DEPARTMENT

The department implements the Australian Government's policies and programs as they relate to Australia's agricultural, food and fibre industries and aims to:

- promote more sustainable, productive, internationally competitive and profitable industries through policies and initiatives that promote better resource management practices, innovation, self-reliance and improved access to international markets.
- safeguard Australia's animal and plant health status to maintain overseas markets and protect the economy and environment from the impact of exotic pests and diseases, through risk assessment, inspection and certification, and the implementation of emergency response arrangements.

Major priorities for the portfolio in 2011-12 include:

- improving productivity growth and sustainability of agriculture, fisheries and forestry and food production
- helping farmers to mitigate and adapt to the effects of a changing climate
- reforming national drought policy from a crisis management to a preparedness approach
- managing biosecurity and reforming the system[2].

The department provides specialised services to Australia's primary industries such as quarantine and inspection. The portfolio also includes regulatory and statutory marketing authorities, research and development corporations and advisory bodies.

The department maintains an interest in areas that are primarily the responsibility of other government agencies but which affect the agriculture, fisheries and forestry sector – for example, water, regional development, rural infrastructure and climate change. It advises the minister on portfolio interests in water reforms and rural infrastructure, and also administers programs that support agriculture across Australia.

TERRESTRIAL, MARINE AND FRESHWATER BIODIVERSITY IN AUSTRALIA AND ITS TERRITORIES

Climate change will affect individual species, leading to flow-on effects on the structure and composition of present-day ecological communities, and then potentially to changes to ecosystem function. Species, communities and ecosystems will also be affected indirectly, as climate change affects important processes such as fire and diseases[3].

Simplistically, survival options for species are to stay, move, or die out. As species disperse, adapt or potentially undergo rapid evolutionary change, this may result in changes in

[2] Budget 2011-12 Portfolio Budget Statements ,Budget related paper No. 11, Agriculture, Fisheries and Forestry portfolio, Australian Government, Canberra

[3] Steffen, W, Burbidge, AA, Hughes, L, Kitching, R, Lindenmayer, D, Musgrave, W, Stafford Smith, M & Werner, P (2009) *Australia's Biodiversity and Climate Change: A Strategic Assessment of the Vulnerability of Australia's Biodiversity to Climate Change*, Australian Government, Canberra.

population size, geographical distribution and ecosystem composition. New combinations of species may form in different locations as novel ecosystems.

Climate change impacts will vary with regions. Most of the climate change scenarios for Australia predict that southern and central Australia will become drier on average, while northern Australia may become hotter[4].

Human and land management practices contribute greenhouse gas emissions, including carbon dioxide, nitrous oxide and methane. For example, livestock produces methane. Greenhouse impacts occur globally through effects on large scale climate processes, and locally through natural resource condition and climate. Some land management practices can also sequester carbon or reduce emissions. Through improved farm management practices, more sustainable food processing, and better adaption to climate change, the agriculture, fisheries and forestry industries can also have a lower impact on the environment and biodiversity in a changing climate.

As climate change is only one of the factors influencing biodiversity, predicting the impacts of land use management is complex, and is complicated by a lack of information on species responses to climate change and land management.

Native biodiversity

Biodiversity includes above and below-ground plant, microbe and animal life. Ecosystems vary with location depending on a range of interacting factors including soil, climate and species dispersal.

Biodiversity provides a range of ecosystem services, as well as its own intrinsic value. For example, terrestrial vegetation supports beneficial predators and pollinators, and filters water through reducing erosion and controlling saline ground water tables.

Australian soils have a diverse but poorly understood biodiversity[4]. Soil biota is associated with soil structure, fertility and function, and many soil processes are influenced by microbes, which respond to temperature and moisture. Soil is fundamental to agriculture and forestry and land management affects production, sustainability and biodiversity.

Sixty one per cent of Australia's land is managed by agriculture[5]. Agricultural stakeholders play a key role in managing the Australian landscapes that support biodiversity. Lands managed by agriculture and forestry include areas protected as matters of national environmental significance including threatened ecological communities and species under

[4] The Australian Centre for Biodiversity, Monash University Victoria (2008) Biodiversity and climate change, In: The Garnaut climate change review.
[5] DAFF (2011) Issues paper to inform development of a national food plan—Summary, Department of Agriculture, Fisheries and Forestry, Canberra

the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, as well as other remnant and planted native vegetation.

In Australia, forestry is primarily located in medium to high rainfall areas of Australia, with some production areas in lower rainfall zones. Native forest areas are important reserves for biodiversity. Research shows planted native forests are also important – they have a lower vertebrate diversity relative to native forests, but higher than cleared agricultural land[6], and contribute to connectivity.

Agriculture in the medium to high rainfall zones includes a range of sectors (dairy, horticulture, meat and livestock and grain cropping), and a significant proportion of the landscape retains native vegetation. Some regions such as agricultural areas in south-eastern Australia and the south-west Western Australian wheatbelt, have been extensively cleared which reduces the capacity of the environment to recover from a range of pressures associated with its use[7.] Other regions still retain native vegetation on a significant proportion of the landscape.

About 81% of Australia is broadly defined as rangelands[8]. Rangelands extend across low rainfall and variable climates, including arid, semi-arid, and north of the Tropic of Capricorn, some seasonally high rainfall areas. They include a diverse group of relatively undisturbed ecosystems such as tropical savannas, woodlands, shrublands and grasslands. From an ecological perspective, 53 of Australia's 85 bioregions include rangeland ecosystems and 12 are located entirely within the rangelands. Together, they cover a huge diversity of habitats and ecological communities.

Pastoral industries are the dominant agricultural users in the rangelands, through extensive grazing on native vegetation. Rainfall is generally too low or erratic for agricultural cropping or improved pastures. Rainfall variability is a major driver of practices in the rangelands. Pressures that contribute to changes in biodiversity, in different regions and at different times, are inappropriate fire regimes, the spread of weeds, large numbers of native and feral herbivores and water extractions and diversions. For example, livestock activities impact on land, soil, water, biodiversity and climate change[9]. Despite these pressures, the rangelands still contain relatively intact ecosystems and much of Australia's biodiversity[10].

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[6] (e.g.) Kavanagh, R et al. (2005) Biodiversity in Eucalypt Planting Established to Reduce Salinity. RIRDC publication No 05/165, Rural Industries Research and Development Corporation, Canberra.

[7] Beeton, RJS, Buckley KI, Jones, GJ, Morgan, D, Reichelt, RE & Trewin, D (2006) Australian State of the Environment Committee), Australia State of the Environment 2006, Independent report to the Australian Government Minister for the Environment and Heritage, Department of the Environment and Heritage, Canberra.

[8] Bastin G and the ACRIS Management Committee, Rangelands 2008 Taking the Pulse, published on behalf of the ACRIS Management Committee by the national Land and Water Resource Audit Canberra.

[9] Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. and de Haan, C. (1996) Livestock's long shadow — environmental issues and options. FAO, Rome. (Available online at: http://siteresources.worldbank.org/INTARD/Resources/FinalMindingtheStock.pdf http://www.virtualcentre.org/en/library/key_pub/longshad/A0701E00.htm).

[10] Australian Collaborative Rangeland Information System (2008) Australia's rangelands 2008 — At a glance. Department of the Environment, Water, Heritage and the Arts, Canberra.

Relative to the pre-European (1750) extent, more than 87% of Australia's native vegetation cover remains[11], however vegetation condition varies and masks underlying decline of many ecological communities and that a range of native species have become extinct or threatened since European settlement. This is due to various factors including historical land clearing for urban and agricultural use, habitat degradation, invasive species, land management practices and altered fire regimes.

An assessment in 2009 found that even moderate climate change is likely to exacerbate existing stressors to Australia's biodiversity, and add additional stresses such as through declining water availability[12].

Due to a growing human population and the need for land, in particular for urban settlement and agriculture, it will not be possible to return to pre-1750 vegetation extent and biodiversity in Australia. The report "Australia's Biodiversity and Climate Change, Summary for Policy Makers" (2009) acknowledges that conservation efforts should be reoriented towards maintaining well-functioning ecosystems of sometimes novel composition that continue to deliver ecosystem services and maximise diversity.

Climate change poses many challenges for Australia's wild fisheries and aquaculture sectors. Climate change is already impacting on marine environments with waters off south east Australia having increased by two degrees above long term averages. In the marine environment the issue of ocean acidification is also an increasing threat to biodiversity. Recent research suggests that the combination of increasing temperatures in association with increasing acidification of the oceans is affecting reproduction and early life stages of marine organisms. It is likely that this is already impacting on biodiversity in ecosystems such as the Great Barrier Reef and is likely to cause more rapid decreases in biodiversity over the coming years.

Weeds and pests

Computer modelling and predictions have already provided a broad understanding of the future distribution and impact of weeds and pest animals under different climate change scenarios[13]. Changing land use as a result of climate change, and associated community perceptions of impact, will be the primary drivers for future plant or pest animal distributions.

As a result, the biggest threats to biodiversity will be weeds and pest animals already present, but not widely established, if local conditions change and give them an opportunity become more competitive.

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[11] Beeton, RJS, Buckley KI, Jones, GJ, Morgan, D, Reichelt, RE & Trewin, D (2006) Australian State of the Environment Committee), Australia State of the Environment 2006, Independent report to the Australian Government Minister for the Environment and Heritage, Department of the Environment and Heritage, Canberra.

[12] Steffen, W, Burbidge, AA, Hughes, L, Kitching, R, Lindenmayer, D, Musgrave, W, Stafford Smith, M & Werner, P (2009) *Australia's Biodiversity and Climate Change: A Strategic Assessment of the Vulnerability of Australia's Biodiversity to Climate Change*, Australian Government, Canberra.

[13] Stephens AEA, Kriticos KJ, Leriche A. 2007 The current and future potential geographic distribution of the Oriental fruit fly Bactrocera dorsalis (Diptera: Tephritidae). Bulletin of Entomological Research 97: 369-378.

Introduced plant and animal diseases also pose a threat to biodiversity, as well as forestry and agriculture, including significant disease risks such as the new Myrtle Rust outbreak.

CONNECTIVITY BETWEEN ECOSYSTEMS AND ACROSS LANDSCAPES THAT MAY CONTRIBUTE TO BIODIVERSITY CONSERVATION

Connectivity for species and ecosystems may be created through continuous vegetation corridors, or patches or stepping stones of habitat that assist migration and adaptation of biodiversity in response to climate change and other threats.

The importance of addressing connectivity between ecosystems and across landscapes that may contribute to biodiversity conservation has been recognised by the Australian Government through the Caring for our Country initiative. Within this, the Sustainable Farm Practices national priority area specifically includes landscape scale conservation as one of the areas for which funding is available. A key focus is on improving native vegetation and soil condition within farming systems and/or creating and protecting biodiversity assets such as native wildlife habitats.

There are a range of practices that can be implemented on-farm that will improve the connectivity and condition of native vegetation and contribute to improving biodiversity assets. At a local scale, practices can be applied by landholders:

- on adjoining properties which share a common biodiversity asset (such as remnant native vegetation, including native grasslands and riparian vegetation)
- on unconnected properties across the district that have shared biodiversity assets (such as paddock trees, rocky outcrops and wetlands)
- on a very large property that links biodiversity assets, in partnership with relevant expertise

By applying these practices strategically across multiple local or regional scales, landscape-scale improvements can be achieved. Information collected through the Australian Bureau of Statistics' Agricultural Resource Management Survey (ARMS) 2007-08 shows that an estimated 30% of agricultural businesses have part of their holding revegetated; the area revegetated covers more than 18 million hectares. Fifty one per cent of agricultural businesses with native vegetation are protecting it for conservation purposes, accounting for around 28 million hectares. Retaining existing native vegetation is the most common form of protection.

The Sustainable Farm Practice national priority area under Caring for Our Country has also supported agroforestry under the landscape scale conservation target. This provides groups with the opportunity for funding to assist farmers to integrate agroforestry into their farming system to achieve and maintain long term environmental benefits as well as production

benefits. Agroforestry provides environmental services by extending native vegetation connectivity at a landscape scale to improve biodiversity, protects soil, and provides private benefits including a product for commercial sale.

Another investment scope category for the Sustainable Farm Practice national priority area under Caring for Our Country is native grasslands and vegetation in northern and remote Australia. Northern and remote Australia covers 575 million hectares, 70 per cent of which is used for agriculture. Sustainable management of agriculture in this region requires a tailored approach, given the area's geographic scale, climate, soil types, biodiversity assets, cultural values and remoteness. This investment scope category can support large scale projects to deliver extensive native vegetation to improve groundcover and biodiversity.

The government recognises that connectivity also provides opportunities for competitive, highly mobile invasive species which will need to be well managed to ensure biodiversity conservation[14,15]. The need to manage threats from weeds and pests is recognised in national management plans for weeds and pests of national significance, Australia's Biodiversity Conservation Strategy 2010-2030, Caring for our Country, and the recently announced Clean Energy Futures Package.

HOW CLIMATE CHANGE IMPACTS ON BIODIVERSITY MAY FLOW ON TO AFFECT HUMAN COMMUNITIES AND THE ECONOMY

The ways in which biodiversity and climate change may interact with agriculture, fisheries and forestry are:

- choice of production management practices and their effect on natural resources
- conservation of biodiversity and habitats, within production areas
- direct impacts of climate change on biodiversity, with flow on affects to agriculture, fisheries and forestry production
- indirect impacts of climate change such as changes to land use type and distribution, with flow on effects on biodiversity
- quarantine and biosecurity.

Agriculture

The practices adopted by managers of agricultural landscapes can contribute to environmental sustainability and further improve the long-term security of food and fibre

[14] Forks in the Road: Choices in Procedures for Designing Wildland Linkages. Conservation Biology, 22: 836-851. 2007
[15] Important criteria and parameters of wildlife movement corridors - a partial literature review. Southern Columbia Mountains Environmental Sector of the West Kootenay. 1995

production. Equally, the long-term viability and health of our natural resources is critical to maintaining and building the productive capacity of Australia's agricultural industries.

The 2007 Intergovernmental Panel on Climate Change (IPCC)[16] report projects changes in Australian rainfall patterns, with northern Australia receive more rainfall while south and south-eastern Australia will likely receive less. As a result of reduced precipitation and increased evaporation, water security problems will intensify by 2030 in southern and eastern Australia. Annual stream flow in the Murray Darling Basin is likely to fall 10 to 25 per cent by 2050 and 16 to 48 per cent by 2100. Water supply and quality are also likely to be affected by higher temperatures, increased evaporation rates and changes in amount and patterns of rainfall.

Reduced water supply and quality are likely to affect agricultural production, and with flow-on effects on biodiversity where rates of water extraction and use significantly change the aquatic or terrestrial system.

Some other general impacts on Australian agriculture are likely to include significant crop and pasture reductions by 2070 in southern Australian regions, reduced grain and grape quality, increased thermal stress on stock reducing productivity, increased incidence and distribution of weeds and increased fire risk. Responses to climate change will include alterations in livestock production systems and some of these will have animal health implications. These changes may also affect the distribution, type and intensity of land use, with flow on effects on biodiversity and agriculture.

In the rangelands, about 6000 pastoral enterprises occupy 58 per cent of the rangelands' land area. These enterprises make significant contributions to the economy but are under increasing market, environmental and economic pressure. In this context, climate change will present further challenges.

Weeds and pests

Weed or pest animal migration or population expansions resulting from climate change may adversely affect agricultural productivity, profitability and possibly even viability. To remain productive, new agricultural industries or maintenance of current systems may require increased pesticide or herbicide use. This could lead to an increase in the number of chemical tolerant individuals amongst weeds and pest animals causing further increases in their distribution and abundance. This could potentially lead to and increase in herbicide and pesticide use to achieve the same production levels, or increased off-target damage to biodiversity.

[16] Hennessy K, Fitzharris B, Bates BC, Harvey N, Howden SM, Hughes L, Salinger J, Warrick R. (2007) Chapter 11. Australia and New Zealand. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE. (eds). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.

For example, in the United Kingdom and United States of America, there are already reports of changes in the distribution of insect pests over the past 20 years, believed to be associated with warmer temperatures and changed land use[17]. Warmer temperatures are associated with increased use of insecticide and herbicide applications to produce a marketable crop.

Farming practices responding to the drive to increase sustainability and biodiversity, as well as to production outputs, may cause unexpected interactions with weeds and pest animals.

For example, USA evidence is that adoption of no-till practices relying on herbicides for weed control may cause different, greater, or more frequent insect, disease, and weed problems than those occurring in conventional tillage crop production[18]. For example, rodent populations can also thrive under no-till conditions because burrow systems are not disrupted by annual ploughing and plant residues build-up on the surface, providing cover and insulation, causing mouse plagues when exceptionally good seasons occur[19].

Observations in Australia are consistent with the USA experience. In relation to the 2011 mouse plagues experienced in Australia, experts advise that reduced competition from livestock grazing in grain stubbles, more frequent cropping, stubble and trash retention and more diverse crops have increased the amount of grain available to mice, the time span over which high quality food is available, the amount of cover and prolonged the period of crops at vulnerable stages[20]. These changes can impact on biodiversity through changing the composition of food-webs.

Irrespective of whether a change in weed or pest animals' distribution is the result of climate change or some other factor there are already clear lessons learned from decades of managing weeds and pest animals. These are about surveillance, community engagement, management of impacts rather than numbers, protection of priority assets early, regional collaboration. These should be adapted to promote sustainable use of resources in a changing climate. The department is actively involved in facilitating a number of these activities for weeds and pest animal management through research and development of decision and risk prioritisation tools and asset protection, and the provision of strategic information and national coordination.

This role could be assisted by adapting relevant current information and research, including what is available from overseas, for use in Australia. For example, South Africa has many similar weeds to Australia and there is opportunity to work collaboratively on many biocontrol, and other management, research programs. Local trials are required to verify that results can be effectively transferred to Australia.

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[17] Changes in weeds, pests and diseases in Scotland over the last 20 years. The Scottish Agricultural College, TN604 2007 and *Climate Change and U.S. Agriculture: The Impacts of Warming and Extreme Weather Events on Productivity, Plant Diseases, and Pest.* Center for Health and the Global Environment 2000

[18] No-till planting systems. G4080, University of Missouri 1993

[19] Ecology and management of rodents in no-till agriculture in Washington, USA. *Integrative Zoology* 2007; 2: 154-164

[20] Greg Mutze, GRDC media release 23/02/2011
http://www.grdc.com.au/director/events/researchupdates.cfm?item_id=C0D3BAE1FFC4539195F3A38E1EDF0B43&pageNumber=9

Marine fisheries and aquaculture

Australia's commercial fishing and aquaculture industry's gross value of production is estimated at over $2 billion annually and employs around 16,000 people (9,700 directly and 6,200 indirectly)[21] Recreational fishing in Australia is also a multi-billion dollar per year industry and an important leisure activity for millions of Australians. Ecosystems such as the Great Barrier Reef and Ningaloo Reef are an important resource including for tourism. Seafood products make up an important part of the Australian diet while fishing for food is practiced by Indigenous Australians.

Any reduction in marine biodiversity brought about by the combined impacts of climate change and ocean acidification will impact on Australia's economy and communities. The way in which this will impact and the rate at which these impacts will occur are very complex and ongoing cooperative research is required to understand impacts on ecosystems.

Forestry

Climate change is predicted to affect native and planted forests through changes in rainfall, temperature and associated impacts on the key production species. In native forests, it will also affect the other species in the ecosystem.

The department has been leading two key initiatives designed to better understand how climate change will impact on forests and to better promote the sustainable use of forest resources in a changing climate. These are outlined in the subsequent section on strategies.

Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) - Climate modelling and impacts on forests and forestry project

A project on the effects of the projected climate change on Australia's physical environment, particularly its production forests and forestry has recently been completed and published by ABARES.

The aim of the study was to help governments understand effects of climate change on future wood yields and associated socioeconomic effects.

The assessments conducted by ABARES describe the possible effects of climate change on forest growth in six regions across Australia and estimate the resulting effects of those changes on wood production, the forestry and forest products industries and the communities that depend on those industries. The six regions included in the study are: Green Triangle; north-eastern New South Wales – south-eastern Queensland; northern Australia; south-eastern New South Wales – eastern Victoria; south-western Western Australia; and Tasmania.

[21] ABARE-BRS, 2010. Australian Fisheries Statistics 2009. Canberra, 96p

Climate modelling has shown that compared with 2005 most production forest areas in Australia would receive lower rainfall and experience an increase in temperature by 2030 and onwards to 2050. The effects of climate change on forest productivity would vary across regions and subregions of Australia; and wood yields are projected to decline in most commercial forest production areas of Australia. Predicted changes in fire frequency and intensity in response to climate change are also likely to affect forestry.

Modelled declines in wood supply may result in reduced investment in harvesting, haulage and log-processing capacity and could lead to reductions in the value of production and levels of employment. The estimates produced by this study do not take into account any measures that could be used to adapt to the new environment. Assessment of the relative vulnerability of forest and forestry-dependent communities has indicated that a number of communities across the six forest regions exhibit high to very high vulnerability, even in the absence of effects of climate change.

Plant and animal diseases

Climate change and environmental change are a subset of the larger set of ecosystem changes that are promoting the emergence and re-emergence of animal diseases. Plant diseases such as Myrtle Rust, cankers and phythopthora also affect biodiversity and have potential impacts on forestry and crops.

Climate change contributes to changing animal health risks both directly (e.g. via the effects of increasing temperature) and indirectly (e.g. via changes in production systems designed to mitigate or adapt to climate change), particularly when associated with other factors such as environmental degradation, intensive animal production, an increasing human population, and expanding urbanisation. From a global perspective, emerging diseases have often spread between countries, regions and continents. It is estimated that up to 75% of newly recognised infectious diseases of humans are zoonotic — that is, they can be transmitted between domestic animals and wildlife to humans. The effect of climate change on animal diseases has been reviewed globally[22] and for Australia[23].

In Australia, wildlife diseases can also have significant effects on the wildlife hosts themselves, in some cases threatening biodiversity (e.g. chytrid mycosis in amphbians, transmissible facial sarcoma in Tasmanian devils), and the livestock–wildlife interface is a source of introduction of diseases to domestic animals and humans (e.g. Hendra virus).

[22] de la Rocque, S., Morand, S. and Hendrickx, G., eds (2008) *Climate change: impact on the epidemiology and control of animal diseases*. Special issue of the *Revue Scientifique et Technique de l'Office International des Epizooties*, 27 (2). OIE, Paris. (Available online at: http://web.oie.int/boutique/index.php?page=ficprod&id_produit=116&lang=en&popup=true)

[23] Black, P.F., Murray, J.G., and Nunn, M.J. (2008) Managing animal disease risk in Australia: the impact of climate change. *Revue Scientifique et Technique de l'Office International des Epizooties*, 27: 563–580. (Available online at: http://www.oie.int/boutique/index.php?page=ficprod&id_prec=115&id_produit=704&lang=en&fichrech=1&PHPSESSID=ab2cd25c276e7df2be1017e606cf9828).

As both livestock producers and wildlife adapt to climate change (e.g. via changes in where livestock are farmed and changes in the distribution of wildlife populations in response to climate-induced changes to water and vegetation), opportunities will undoubtedly arise for further diseases of wildlife to infect domestic animals and humans. If one of the adaptations to climate change is increased intensification of animal production in some areas, there will also be further opportunities for the emergence of previously unknown diseases and the re-emergence of known diseases.

STRATEGIES TO ENHANCE CLIMATE CHANGE ADAPTATION, INCLUDING PROMOTING RESILIENCE IN ECOSYSTEMS AND HUMAN COMMUNITIES

The government is committed to supporting viable, sustainable agricultural, fishing and forestry industries that are resilient and provide essential ecosystem services in a changing climate.

Strategies and approaches supported by the government include policy support for climate change adaptation and mitigation, research and development, data and information collection, extension, and funding initiatives to help build resilience and capacity for landholders and community groups.

Policies which support decreased emissions and increased carbon sequestration are a means to reduce Australia's contribution to global emissions. Adoption of improved farm management practices can potentially reduce emissions, sequester carbon and provide production efficiency gains for rural industries. Sustainable farm practices can also benefit the environment and biodiversity through more sustainable use of natural resources.

Strategies include building resilience of ecological and production systems through sustainable farm practices, landscape scale conservation, increasing connectivity of fragmented systems, and management of invasive species. Flow on benefits for natural resource condition and biodiversity in a changing climate are also goals. Other strategies are to enhance adaptation by farming communities and rural industries and where possible to mitigate the effects of climate change. The department is also providing input into the reform of the national environment legislation, and funding research on drivers of agricultural practice change and the constraints in current native vegetation policy and legislative frameworks from the perspective of farmers.

The *Australia's Biodiversity Conservation Strategy 2010-2030*[24] notes that all Australians and all sectors of Australian society must take responsibility for biodiversity conservation (information available at http://www.environment.gov.au/biodiversity/strategy/index.html). The department recognises that this includes agricultural land managers.

[24] Commonwealth of Australia 2010, the *Australia's Biodiversity Conservation Strategy 2010-2030*,Canberra

In many cases, people in agricultural industry have voluntarily taken on practices to look after biodiversity in a changing climate. The department is promoting improved farm practices, through a range of strategies and mechanisms, which will be detailed in the sections below.

Legislation and policy frameworks

The Australian Government's aim for agricultural landscapes is to protect areas of high environmental value, while facilitating the ecologically sustainable development of natural resources. The Australian Government uses a range of policy measures, in cooperation with states and territories, to achieve these environmental and sustainable development objectives.

The Australian Government uses national environmental law (the *Environment Protection and Biodiversity Conservation Act 1999*) to protect environmental matters of national significance. State and local governments have regulatory frameworks in place to protect environmental matters of state and local significance.

Further to this, national frameworks guide protection and sustainable use of natural resources through a number of policy directives, such as *Australia's Biodiversity Strategy 2010-2030* and *Australia's Native Vegetation Frame*work (currently in review -information available at http://www.environment.gov.au/land/vegetation/review/index.html).

These aim to better integrate social and economic values with protecting and managing remnant native vegetation and encouraging revegetation to support resilient ecosystems.

The department is involved in the development or the review of the above policy measures, and will continue to be involved in their implementation.

Through initiatives such as the *Principles for Sustainable Resource Management in the Rangelands* and *Caring for our Country*, the department is a key contributor to the government's work to achieve sustainable land management in the rangelands.

The *National Guidelines and Principles for Rangelands Management*, published in 1999, established a framework for those with interests in the rangelands to develop strategies and actions to manage change and ensure a viable legacy for future generations. In April 2010, the Natural Resource Management Ministerial Council (NRMMC) endorsed the *Principles for Sustainable Resource Management in the Rangelands*, updating the 1999 *National Guidelines and Principles for Rangelands Management.*

The Australian and state governments have established the Australian Collaborative Rangelands Information System (ACRIS), as a coordinating mechanism that brings together rangeland information from state and Northern Territory agencies and other sources.

Forestry –action plan and research

National Climate Change and Commercial Forestry Action Plan 2009-2012

On 6 November 2009 the Primary Industries Ministerial Council, acting also on behalf of the NRMMC, endorsed the *National Climate Change and Commercial Forestry Action Plan 2009-2012*.

The action plan is intended to guide action by the forestry industry, with the support of governments, to respond to climate change through adaptation and mitigation, underpinned by research and development and communication.

The plan identifies knowledge gaps and proposes actions to assist forest industries to respond to climate change. Governments have consulted with stakeholders to develop practical strategies and actions to manage the risks, and take advantage of opportunities, brought about by climate change impacts and policy responses.

The National Climate Change and Commercial Forestry Action Plan covers the following sectors and activities:

a) Tree plantations developed for commercial purposes at all scales. This includes farm forestry, agroforestry, broad-scale plantations, and trees planted for a mixture of commercial and environmental purposes.

b) Wood production from native forests (excluding all native forests which are not harvested, e.g. national parks).

c) Processing facilities that rely on raw material from production forests, including sawmills, board plants and pulp and paper mills.

Since 2009, resources have begun to be directed by state and commonwealth governments at examining the effects a changing climate will have on the forest and wood products industry and further information is required. This knowledge is of critical value to the industry for the development of tools, processes and new methodologies to adapt to, and mitigate, the impacts of climate change. This requires a nationally coordinated approach by the forest and wood products industry, with assistance where necessary from Commonwealth, State and Territory Governments.

Forest Industries Climate Change Research Fund

The Forest Industries Climate Change Research Fund program opened on 16 June 2009 and ended on 30 June 2011. This program helped industry to better understand the implications of climate change and to build its capacity in the areas of adaptation, mitigation, bioenergy, and inventory and data collection.

Industry, scientific and government organisations across Australia were encouraged to apply for funding for research projects that help to address knowledge gaps about the impact of climate change on forestry and forest industries. The fund provided $4.76 million for 20 projects addressing a range of information needs in the four key areas:

a) Adaptation – enabling industry to adapt to new circumstances

b) Mitigation – enabling industry to contribute to the national climate change mitigation effort

c) Bioenergy – to promote the development of sustainable forest-based bioenergy on a commercial scale

d) Inventory and data – to fill data gaps so that quantitative analyses on climate change responses can be undertaken in the future.

Final reports for 15 projects have been received, with the remaining projects due to report by December 2011.

Agriculture – adaptation and research

The department is undertaking considerable work to address the challenges facing agriculture from climate change in general. Implicit in this is the department's direct and indirect efforts in responding to challenges facing agriculture due to climate change's impacts on biodiversity. For example, assisting farmers to adopt more sustainable farming practices can also minimise the impact of agriculture on natural systems and biodiversity.

Australia's farmers and rural industries have a long history of innovation and change to cope with climate variability, pest, disease and weed problems and declining natural resources among other things. This capacity to cope will be an important asset in dealing with the future impacts of climate change. Many farmers are already testing and using different farming practices to build the resilience of their farms and farming systems, so their businesses are better able to withstand drought and other extreme events. However, there is a reasonable expectation that the lessons learned from coping with present-day climate variability will not be a sufficient basis for action to address impacts of climate change. Farmers will need support and guidance to deal with climate change.

The Australian Government's response to climate change adaptation in agriculture is therefore to focus on providing fundamental information and knowledge, and the decision support tools that will allow farmers and rural industries to manage the risks of climate change.

This reflects the government's preference for markets to operate with minimal intervention, concentrating its role on situations where there is market failure, where there is a clear need to intervene to protect or maintain a public good, or where there is a high risk to assets of national significance.

For example, the National Weed and Productivity Research Program is supporting a project to look at the risk of weed invasions to the Murray Darling Basin under climate change.

Caring for Our Country—Sustainable Farm Practices

The Australian Government's investment of over $2 billion in the Caring for our Country between 2008 and 2013 initiative aims to restore the health of Australia's environment and improve land management practices.

Sustainable Farm Practices is a national priority area within the Caring for our Country initiative. It aims to help improve adoption of practices which will benefit soil condition and ground cover and indirectly, above and below-ground biodiversity. Sustainable Farm Practices also acknowledges the stewardship relationship that landholders have with biodiversity, by providing support for landscape scale conservation activities including protection of native vegetation and threatened ecological communities and revegetation.

Caring for our Country's long-term (20 year) projection is that Australia's agricultural lands will support and maintain clean water, biodiversity and healthy soils, while continuously improving food and fibre productivity. The agricultural sector will be based on the sustainable management of natural resources and be better able to respond to the threats and opportunities created by changing circumstances, particularly a changing climate.

Under this 20 year projection, one of Caring for our Country's 5 year outcomes is to assist at least 30 per cent of farmers to increase their uptake of sustainable and land management practices that deliver improved ecosystem services.

Through the *Caring for our Country* initiative, assistance is available to protect biodiversity and national icons through on-ground works and stewardship payments; and to build the capacity of farmers to adopt sustainable agricultural practices through supporting extension activities, information dissemination, and actions to demonstrate and pilot innovative practices on-ground.

Caring for our Country is currently under review; which will include consideration of future delivery of sustainable farm practices.

The Australia's Farming Future (AFF)

The government has implemented a number of programs that provide research, extension and training which will assist the agricultural sector adapt to climate change. AFF initiative is playing a key role.

The AFF is the government's key initiative for assisting primary producers to adapt and adjust to the challenges of climate change. The initiative consists of several elements that help build adaptable and resilient producers and industries and strengthen their ability to

manage climate change into the future. The AFF has two components that specifically address adaptation - The Climate Change Research Program and FarmReady.

Under AFF the government has established a comprehensive research framework through the $46.2 million Climate Change Research Program, to find innovative solutions to adapting to a changing climate, managing agricultural emissions and better soil management. This will assist the sector to adapt to the impacts of climate change while increasing productivity. The Climate Change Research Program is supporting large scale collaborative projects that involve a range of organisations such as research providers, industry groups, universities and state governments, resulting in leveraging of funds from partners by a factor of more than 1.5.

The program includes the Adaptation Research Program ($37.6 million with $11 million from the Climate Change Research Program) which supports producers to adapt to climate change, adopt sustainable and resilient production systems and capitalise on potential opportunities. This research is targeting the themes of climate ready crops, cropping management systems, industry opportunities, perennial horticulture, livestock systems and fishery systems.

The program is also funding research on-farm and by key food processers to demonstrate practical options and drive the take up rate of new technologies and systems ($25.8 million with $7.7 million from the Climate Change Research Program). The research is targeting soil carbon, biochar, climate change adaptation and methane and nitrous oxide emissions.

The $26.5 million FarmReady program aims to improve adoption of risk management and business management skills, increase adoption of new technologies and best practice management to enable primary producers, Indigenous land managers and agricultural industries to adapt and respond to the impacts of climate change.

The program runs until 30 June 2012 and consists of two separate elements:

- FarmReady Reimbursement Grants of up to $1500 per person per financial year to individual primary producers and Indigenous land managers to attend approved climate change training activities
- FarmReady Industry Grants to industry organisations of up to $80 000 per financial year to industry organisations, farming groups and natural resource management groups to undertake projects that will enable their members to adapt to the impacts of climate change.

ABARES research

Research by ABARES is investigating the drivers of agricultural practice change, and the drivers and barriers to better management of native vegetation on private land. This research will help understanding of farmer motivations to adopt change, and inform the design of Caring for our Country and future programs.

Rural research and development corporations

Australia's high agricultural productivity growth is largely attributed to the sector's culture of innovation, investment in research and adoption of findings.

A central feature of the rural research and development (R&D) system is the rural research and development corporation (RDC) model. Through the RDC model, the government and industry share the funding and strategic direction setting for primary industry R&D. The RDC model provides a vehicle for the government to help primary producers address major challenges such as adapting to the impacts of climate change.

With their extensive industry networks, the RDCs are a critical link between the science and producers, enabling research to be appropriately targeted and more effectively extended to end users. Research commissioned through the RDC model has provided farmers with a range of options for adapting to climate change, through the development of cropping systems that are more adaptable to climate change, practices that minimise on-farm greenhouse gas emissions and plant varieties with improved water-use efficiency or drought tolerance. Improved water use efficiency or drought tolerance allows decreased water usage per production area, with likely benefits for local and off site biodiversity.

RDC investment plans are guided by the Rural Research and Development Priorities, a shared set of high level objectives across sectors and jurisdictions. One of the priorities is "building resilience to climate variability and adapting to and mitigating the effects of climate change".

Carbon Farming Initiative (CFI) and the Carbon Farming Futures Fund

As outlined above, improved management practices can reduce climate change impacts globally and locally by reducing emissions or sequestering carbon, with secondary benefits for biodiversity. Activities could include site management, avoided deforestation, changed fire regimes, reduced livestock emissions, biodiverse revegetation, or soil improvement.

The government has also announced the Carbon Farming Initiative (CFI) and the Carbon Farming Futures Fund to reduce greenhouse gas emissions and boost soil carbon stores.

The CFI will provide $45.6 million over four years and a carbon crediting mechanism for land based activities to provide opportunities for farmers, forest growers and landholders to benefit by trading carbon credits to reduce carbon pollution. As part of the CFI, the government is also developing the $2 million Biochar Capacity Building Program for on-farm biochar research and demonstration.

The Carbon Farming Futures Fund, announced as part of the government's plan for a Clean Energy Future in July 2011, will deliver $429 million over six years to help farmers and other landholders benefit from financial opportunities under the CFI. The new program includes:

- $201 million Filling the Research Gap for research into new ways of storing carbon and reducing pollution in the land sector and a common practice survey to underpin the CFI additionality test
- $99 million Action on the Ground which will provide grant funding to regional landholders and research, industry and farming organisations across Australia to undertake projects to implement innovative management practices to achieve sustainable outcomes, reduce emissions and boost soil carbon stores. Grants will be available to landholders to take action on the ground including testing new ways to increase soil carbon
- $64 million over its first six years for Extension and Outreach activities to provide information and support to landholders in integrating carbon management into farm planning; new research and farm techniques; and improving productivity and farm sustainability
- $20 million to convert this important research into practical methodologies which are recognised under the CFI
- A 15% tax offset to encourage the uptake of conservation tillage farming techniques.

Filling the Research Gap, Action on the Ground and Extension and Outreach are managed by the Department of Agriculture, Fisheries and Forestry.

National Drought Policy

The Australian Government has a longstanding National Drought Policy, established in 1992, based on preparedness and risk management. The objectives of the National Drought Policy are to:

- encourage primary producers and other sections of rural Australia to adopt self-reliant approaches to managing for climatic variability
- maintain and protect Australia's agricultural and environmental resource base during periods of extreme climate stress
- ensure early recovery of agricultural and rural industries, consistent with long-term sustainable levels.

The objectives are consistent with sustainable farming practice and are often further supported by government through natural resource management programs, such as providing conservation tillage, native vegetation management and soil retention.

Recently, the implementation of the drought policy has been reviewed and as part of a response to this review, a new package of drought reform measures is being trialled in Western Australia. The key objective of the new drought pilot is to help farmers move from a crisis management approach to risk management. The aim is to better support farmers, their families and rural communities in preparing for future challenges, rather than waiting until they are in crisis to offer assistance. The policy has important underlying strategies that will enable farm businesses to remain profitable in the medium- and long-term by conserving the resource base, including conserving and enhancing biodiversity. These strategies align well

with the second objective of the 1992 National Drought Policy. The main purposes of the drought pilot are to:

- support farmers in managing and preparing for future drought and a changing climate
- increase the resilience and capacity of rural communities to cope with adversity
- better coordinate social support services in rural areas
- help families meet immediate basic household expenses during financial hardship
- connect current farmers and former farmers to discuss opportunities outside of farming.

This will be achieved through a number of measures including:

- Farm planning

  Courses for farmers to develop or update a strategic plan for their farm business. The plan will identify priority activities to help improve the risk management and preparedness of the farm business to respond to future challenges.

- Building farm businesses

  Grants to eligible farm businesses in two components:

  - Business Adaptation Grants—for eligible activities identified in the strategic plan that help farm businesses prepare for the impacts of drought, reduced water availability and a changing climate.
  - Landcare Adaptation Grants—for eligible activities identified in the strategic plan with a natural resource management focus and having a broader public benefit.

ABARES provides a supporting role to the implementation of the National Drought Policy, including the new drought pilot and current Exceptional Circumstances program, by collating, analysing and communicating climatic, water and economic information.

Fisheries

The National Climate Change Adaptation Framework was endorsed by the Council of Australian Governments in 2007 and recognised that Australian commercial, indigenous and recreational fisheries will be affected by climate change through: increasing ocean temperatures, changes to ocean currents, wind and nutrients, changed rainfall patterns, and ocean acidification.

In response to these concerns Australian fisheries and related agencies developed *The National Climate Change Action Plan for Fisheries and Aquaculture* which was approved for release by Natural Resource Management Ministerial Council in November 2010. This Action Plan is available from the department's website.

As part of implementing the action plan, the department is a member of the National Coordinating Committee on Marine Biodiversity, Resources and Fisheries which oversees

funding for research in this area. The Australian Fisheries Management Forum (AFMF) has also established a separate coordinating committee to consider implementation of the action plan and advise the AFMF of policy issues arising in climate change and ocean acidification.

The Government's Caring for Our Country 2010-2011 Business Plan included funding support for fisheries and aquaculture, recognising the role of these sectors in maintaining or improving the condition of marine and other aquatic ecosystems.

Reef Rescue is a key component of Caring for our Country, through improving the water quality of the Great Barrier Reef lagoon by increasing the adoption of land management practices that reduce the run-off of nutrients, pesticides and sediments from agricultural land.

Caring for our Country has also invested a total of over $22.5 million for activities under Caring for our Country Community Coastcare 2008-09, to protect and rehabilitating Coastal environments and critical aquatic habitats and enhance community skills, knowledge and engagement with Indigenous Australians, volunteers and coastal communities.

Animal and plant health

With respect to animal and plant health, the Australian Government is responsible for matters relating to quarantine and international animal health, including disease reporting, export certification and trade negotiation. It also advises and coordinates national policy and, in some circumstances, provides financial assistance for national animal disease control programmes. State and Territory governments are responsible for pest and disease control and eradication within their own boundaries. Consultative committees ensure coordination and work together to serve the overall interests of Australia. Additional links are provided by Animal Health Australia and Plant Health Australia, not-for-profit public companies with membership comprising the Australian Government, State and Territory governments, and the major national animal and plant industry groups. Importantly, governments have the final say on all matters relating to animal and plant health, including legislation, policy, certification and international agreements, and the management of emergency preparedness and response activities.

MECHANISMS TO PROMOTE THE SUSTAINABLE USE OF NATURAL RESOURCES AND ECOSYSTEM SERVICES IN A CHANGING CLIMATE

Choice of management practices by farmers and fishers impacts the condition of Australia's natural resources. The Australian Government is committed to increasing the adoption of management practices that continue to maintain and improve production, while delivering ecosystem services that benefit the whole community.

The Australian government is helping individuals, community groups and regional natural resource management bodies to manage Australian landscapes more sustainably, through grants and capacity building. This is being delivered through strategies and initiatives outlined above, including Caring for our Country, Australia's Farming Future, the Carbon Farming Initiative and aligned research.

Healthy soils are an integral component of a sustainable and productive natural resource base in Australia, and to the delivery of essential ecosystem services. Caring for our Country aims to optimise environmental services by reducing soil erosion and the risk of soil acidification and increasing soil carbon, to achieve improvements to air, water and biodiversity quality. One of Caring for our Country's targets is for an additional 42 000 farmers to have improved their management practices to reduce the risk of soil acidification, soil loss through wind and water erosion and increase the carbon content of soils by 2013. Funding has been provided to groups to encourage farmers to adopt management practices that improve soil health.

Trends in the adoption of land management practices are also being tracked across Australia using the Australian Bureau of Statistics' Agricultural Resource Management Survey. This information will help understanding of the effectiveness of Caring for our Country activities in changing land management practices.

Methods for monitoring the condition of the soil resource (carbon, water erosion and soil pH), and to implement an integrated wind erosion monitoring program, are also being developed through funded research. This information will help us understand how changing land management practices affect soil condition.

A key mechanism for promoting sustainable use of fisheries resources in Commonwealth fisheries is through the implementation of harvest strategies, developed under the *Commonwealth Fisheries Harvest Strategy Policy* 2007. Harvest strategies provide an agreed and transparent process for managing the key commercial species and can also allow for exceptional changes, such as climate-induced environmental changes. The policy is available from the department's website.

AN ASSESSMENT OF WHETHER CURRENT GOVERNANCE ARRANGEMENTS ARE WELL PLACED TO DEAL WITH THE CHALLENGES OF CONSERVING BIODIVERSITY IN A CHANGING CLIMATE

The 2009 report *Australia's biodiversity and climate change: summary for policy makers* noted that the challenge of conserving biodiversity in the context of climate change will demand more flexible and nationally coherent governance approaches.

Management of natural resources, including biodiversity, is primarily the responsibility of the states and territories. The Australian government is currently reviewing its national

environment legislation, the *Environment Protection and Biodiversity Conservation Act 1999*, with a view to streamlining regulation, increased coordination with state and territories, and use of strategic, regional assessments.

The biodiversity and native vegetation policy frameworks outlined above are supported by states and territories and will rely on collaboration and consistent approaches to implement goals and targets. Implementation of *Australia's Biodiversity Conservation Strategy 2010-2030* and the revised Native Vegetation Framework, once released, will be scoped by the new Standing Council arrangements following the cessation of the National Research Priorities and Programs Coordinating Committee (NRPPC) in June 2011.

DAFF works with the Australian Weeds Committee and the Vertebrate Pests Committee to help coordinate national management plans for Weeds of National Significance (WoNS) and pests of national significance. Through Caring for our Country the Australian Government supports a state and territory based network of national WoNS coordinators. WoNS coordinators champion the implementation of national management plans for each WoNS species. Nonetheless there are opportunities for improved integration of WoNS management with other weed management and government policies associated with agriculture, biodiversity and climate change.

Conservation of biodiversity, incorporating impacts of climate change, is not always explicit in initiatives to assist farmers and groups to implement more sustainable practices. Some aspects of this may be addressed through new initiatives such as the National Wildlife Corridors plan and the Clean Energy Futures package.

Mechanisms to provide policy advice and engage and consult with rural stakeholders are required to address the challenges of adapting to climate change, and adopting more sustainable farming practices which maintain ecosystem services. Institutional structures to improve feedback between communities and policy include Landcare. Australian Landcare has over 20 years of experience in bringing communities and government's together to support the sustainable management of natural resources. In 2010 the Landcare movement developed the Australian Framework for Landcare following an extensive community consultation process. The framework aims to support the future resilience and growth of the Landcare community and outline a vision for mobilising the broader community in support of the "three pillars "of sustainable agriculture: food, climate, and the environment.

The Australian Landcare Council (the Council) has been established under the *Natural Resource Management (Financial Assistance) Act 1992*, to make recommendations to the Minister for Agriculture, Fisheries and Forestry and the Minister for Sustainability, Environment, Water, Population and Communities on the approaches necessary to support the Australian Framework for Landcare.

The Council's Terms of Reference provide the authority and capacity they need to assist the Australian Government implement the Australian Framework for Landcare and associated

Action Plan. Two of the key tasks identified for the Council with respect to climate change are to provide advice on how to more effectively align government investment in R&D Corporations, and to outline the improvements needed to ensure that government, regional and community natural resource delivery models more effectively address food, environment and climate outcomes. The Council's Climate Change Working Group meets regularly to progress elements of the Action Plan.

MECHANISMS TO ENHANCE COMMUNITY ENGAGEMENT

The Government recognises that partnerships and volunteer community groups are the key to the strength and continued success of biodiversity conservation and adaptation to climate change. The government supports a range of initiatives aimed at building the capacity (transfer and generation of knowledge, enhance skills, and increase confidence) of farmers, land managers and community related groups to adopt sustainable land practices that promote sustainable production and biodiversity protection, and facilitate adaptation to climate change.

As well as the above-mentioned Farm Ready and Drought Policy programs, some of the mechanisms this Government has recently put in place to enhance community engagement include Landcare and Caring for our Country:

Landcare

Landcare is:

- funding a national network of regional Landcare facilitators to help groups to plan projects, apply for funding and coordinate training on issues such as activities to help mitigate climate change. Australian Government funding also supports local projects such as revegetation, sustainable farming practices, dune rehabilitation, field days, co-ordination services and activities.
- investing in Landcare infrastructure to support Landcare and related community groups. The infrastructure includes the Council, the National Landcare Facilitator and Landcare Australia Limited. Collectively these groups: raise awareness and support for Landcare at the government (and corporate) level, and are conduits between the community and the Australian Government by relaying and developing advice and feedback on Landcare matters.
- providing opportunities for Landcare groups to access grants for on ground works, including through the Caring for our County Business Plan and Community Action Grants.

Caring for our Country initiative –knowledge and skills target under the Sustainable Farm Practice national priority area

Under the Sustainable Farm Practice national priority area of Caring for our Country, a target is to increase by 42 000 land managers and farmers over four years (by 2013) who have demonstrated an improvement in knowledge and skills in natural resource management.

Under this target, Caring for our Country works with community and industry organisations, including Landcare and regional natural resource management bodies to accelerate the adoption of more sustainable farm management.

It supports the work of voluntary groups, to build the capacity of land managers and farmers to deal with emerging threats and opportunities relating to sustainable production and land management.

It also encourages effective partnerships between key stakeholders, including industry, regional, community and Landcare groups, research and teaching organisations and government which will drive on-ground practice change.

Caring for our Country's Community Action Grants provides small grants to established local community-based organisations that are successfully delivering projects to support sustainable farming or protect and enhance the natural environment. The grants help to support and encourage community engagement and participation, and encourage the recruitment and retention of volunteers in community organisations. The program aims to reach a broad range of community organisations across the country, including Landcare, Coastcare, 'friends-of organisations', Indigenous and other environmental and sustainable land management groups.

The recently announced Carbon Farming Initiative and Clean Energy Future Package will aim to provide support for landholders to establish biodiverse plantings, reduce emissions and adopt more sustainable farm practices.