

**The Environment Institute
University of Adelaide**

**Strengthening Basin Communities Program
Planning component Consultancy SBC033A.1/2**

**Adaptation and Emerging Opportunities Plan for the
SA Murray-Darling region**

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Milestone 4 Report



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Hayman, P. Thomas, D. Alexander, B. and Nidumolu, U. (2011). Climate Change Scenarios Information. Milestone 2 Report. Strengthening Basin Communities Program – Planning Component Consultancy SBC033A.1/2 Climate Change impact assessment, adaptation and emerging opportunities for the SA Murray-Darling region. The Environment Institute, The University of Adelaide.

Kellett, B., Summers, D., Barnett, K., Siebentritt, M., Meyer, W., Spoehr, J. (2010). Adaptation and emerging opportunities for the SA Murray-Darling region. Milestone 2 Report. A report prepared by SARDI Climate applications for the Environment Institute, The University of Adelaide, as part of the Strengthening Basin Communities Program Planning Component Consultancy SBC033A.1/2.

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EXECUTIVE SUMMARY

This report presents the results of the final component of the Strengthening Basin Communities Climate Change impact assessment, adaptation and emerging opportunities for the SA Murray-Darling region project. It draws on the results of other major analyses conducted for the project and has been shaped by the outcomes of a stakeholder engagement process and two workshops conducted specifically to seek feedback from stakeholders on how the region can adapt to future climate change and grasp emerging opportunities across multiple sectors.

Climate change will promote warmer and drier conditions in the SA MDB NRM region and see reduced flow in the River Murray. Without adaptation, this poses a major long term threat to region's economy, environment and community.

While the region has been able to adapt to periods of natural variability like drought, or to the threats posed by rising salinity in irrigation districts in years gone by, responding to the warming and drying trend that climate change will bring will require greater resilience and attention to adopting longer term adaptive measures. It will also bring new opportunities as governments and businesses invest in renewable energy, energy efficiency and land use change that combined will reduce the nation's carbon emissions.

Following a discussion about climate change impacts, members of the community involved with the stakeholder engagement process undertaken for this project presented two visions for the future. They provide a stark contrast to one another and represent two alternate views on the outcomes of choices the community makes about how it responds to the impacts and opportunities presented by climate change.

- *“Contracting communities, unsustainable towns and challenge in retaining essential services”*
- *“Educated, innovative and imaginative community with diversity as its strength”*

This plan presents a series of recommendations that can help build a resilient community, that is educated, innovative and with diversity as its strength. Taken as individual actions, the recommendations can build resilience in specific sectors like primary production or help grasp specific emerging opportunities. Taken as a whole, they provide the basis for a whole of region climate change adaptation strategy that will position the region for investment, building confidence in the future of the region

Primary production (Section 3) – As the major economic driver for the region adaptation of farming systems is essential for the continued prosperity of the region as a whole. Some farming systems will need to consider how to adapt to warming and drying conditions over periods of decades, others will contemplate more rapid changes in the face of opportunities to generate revenue from carbon farming. The private sector will lead future changes in farming systems and the aim of these recommendations is to support and facilitate this change rather than lead it.

It is recommended that the region:

- Invest in rural leaders through establishing a **Primary Producer Leadership Grant for Climate Change Adaptation**, to better equip the next generation of farmers with the skills needed to adapt their farming businesses to future climate and economic conditions;
- Communicating carbon farming opportunities to landholders through development of a **Land holder Information and action kit**, which will outline risk and opportunities of new carbon farming activities
- Inform the people who advise farmers through development of a **Primary Producer Support Network Communications Strategy**, which will focus on communicating messages about climate change adaptation to the trusted advisers and communities of practice that inform decisions farmers make about management of their businesses
- Create a vision for continued and adapting food production through development of a **Food Plan for the South Australian Murray-Darling Basin**, which will assess suitability of current and alternate crops to current and future climatic conditions overlaid with an assessment of future demand from domestic and international markets. This would also contribute to the development the Federal Government’s National Food Plan, which is currently being prepared.

Renewable energy (Section 4) – The SA MDB offers potential for the establishment of major energy projects like wind and solar, biofuel and biomass incorporated into traditional farming systems as well as smaller scale distributed energy. Renewable energy can offer news jobs and contribute to the local economy rather than paying to import over \$100 million of electricity from other regions. To further scope the potential energy future of the region a Local Energy Security Study was conducted as part of this project. The SA MDB region energy security was assessed as follows:

Dimension	Rating
Affordability	Low-Moderate
Adequacy	Moderate
Reliability	Low-Moderate

Drawing on the recommendations of the Local Energy Security Study and other work conducted for this Plan, it is recommended that the region:

- Ensure infrastructure matches growth aspirations by undertaking an **Electricity Reliability Enhancement Project** and **reviewing Natural Gas availability** in the SA MDB.
- Promote local energy supply, particularly renewables, for the benefit of the local economy through developing a **Bioenergy Roadmap** and further scoping **Mid Scale Wind and Solar Opportunities**;
- Deliver greater influence over the region's energy future by conducting a **Regional Energy Cooperative Feasibility Study** and analysing the potential for **Public Institution Demand Aggregation**.
- Engage in a coordinated and strategic way with the community regarding renewable energy developments through preparing and implementing a **Community Engagement Strategy for renewable energy in the SA MDB**, which would provide a common understanding amongst the community of how consultation will be conducted with respect to major renewable projects and provide a way to facilitate new and diversified investment in the region in a way that meets community standards and values.

- Support development of two large scale renewables demonstration projects called the **Murray Mallee Biofuel Trial** and **Establishing a wood biomass industry in the SA MDB**. These trials have been favoured because of the large potential for both activities to influence future land use change in the SA MDB but provide a new way for producing energy that engages with the primary production sector.

Tourism (Section 5) – Tourism is touted as holding major potential to help the region diversify its economy, which will become increasingly important if climate change reduces revenues from primary production. Yet the recent drought suggests that the region’s tourism sector is vulnerable to perceptions about whether the region’s major tourism drawcards – nature based tourism and food and wine – are worth visiting during extreme climatic conditions.

It is recommended that the region:

- Support development of a **Blueprint for Tourism in a Variable Climate** to develop forward thinking on how to build resilience in the region’s tourism industry so that it is better able to cope with periods of drought. This includes how to counter negative publicity, much of which is based on perceptions rather than reality, associated with low river levels. Learning how to cope with periods of drought will enable tourism operators and the region to consider how best to prepare for and manage future climate change.
- Develop a **Nature Based Tourism Action Plan** to determine how to best leverage off of future investment in natural assets across the SA MDB through programs like The Living Murray and the Federal Government’s new Biodiversity Fund. This would include specific analysis of how to progress regional authenticity developments combining food, wine and the environment.

The response of Local Government (Section 6) – Through stakeholder engagement Local Government has been seen as a potential enabler of climate change adaptation, through facilitating community wide projects that can access low carbon communities funding, through to an inhibitor of change because of the challenges faced by proponents in understanding planning guidelines.

It is recommended that the region:

- Invest in clearer communication of how planning guidelines will be applied to new energy projects or changes in land use through developing a **Planning for Climate Change Information Kit**. This will address requests by stakeholders that planners inform applicants as much as regulate their activities.
- Undertake a **Capacity and Skills Assessment for Local Government Planning** to understand the potential capacity and skill constraints presented by new applications for land use change (e.g. carbon farming, renewable energy) to Local Government planners and identify ways that these could be addressed.
- Develop a **Decision Support Tool for Land Use Change for Carbon Sequestration** to (a) provide guidance to landholders considering land use change to sequester carbon and (b) increase the knowledge of Council planners with respect the benefits and risks associated with commercial forestry.
- Further progress developing low carbon communities through a **Green Towns Concept Plan** which would build on the KESAB tidy towns model and seek to position the region to access

funding through the Federal Government's Low Carbon Communities, with a focus on energy security for towns, energy efficiency for low income households and water security.

Collaboration, coordination and leadership (Section 7) – The SA MDB will face increasing pressure in the future to adapt to climate change. It will also be presented with an increasing number of economic opportunities as there is a national and international shift toward low carbon economies. New projects will be required in response to both drivers that require skilled people with relevant, innovative ideas and an ability to weigh up business risk, to work together. Strong, continued collaboration, coordination and leadership across the region will create a climate for investment.

It is recommended that the region:

- Build on the existing consortium of Councils and the SA MDB NRM Board involved with this project and develop a formal climate change adaptation alliance for the purpose of:
 - presenting a coordinated vision of climate change adaptation for the SA MDB that encourages investment in the region;
 - reducing potential duplication of effort as various regional entities determine what role they should play in facilitating climate change adaptation in coming years;
 - acquire funding to that will support diversification of the region's economy.

Knowledge about the potential implications and impacts of climate change on systems is essential to the development of well informed responses to climate change in the SA MDB. There is a considerable storehouse of knowledge on adaptation already in the region. This provides a foundation for the development of a more systematic approach to generating new insights into climate change and how we might manage it. As we seek to adapt it is vital that we learn from experience by carefully evaluating what we do, to both improve outcomes in the future and demonstrate the value of our efforts. Fostering the development of adaptive communities that have access to the latest knowledge and embrace innovation will be crucial in the years ahead.

It is recommended that the region:

- Build on the existing consortium of Councils and the SA MDB NRM Board involved with this project and develop an ***Adaptive Communities Innovation and Communications Plan*** in collaboration with researchers. This could include:
 - Preparation of a climate change adaption action, monitoring and evaluation plan;
 - Preparation of an adaptive communities research and development priorities strategy;
 - Establishment of an Adaptive Communities web portal for knowledge sharing, skill development and networking.
 - Development of an Adaptive Communities capacity building program.

1 INTRODUCTION

1.1 CLIMATE CHANGE AND THE SOUTH AUSTRALIAN MURRAY-DARLING BASIN

The South Australian Murray-Darling Basin (SA MDB) Natural Resource Management region supports a population of approximately 126,000 people and extends over more than 5.6 million hectares. It is one of South Australia's most ecologically diverse regions and relies heavily on primary production to underpin the region's economy which is also supported by tourism and recreation and various manufacturing industries (notably food products, wine and beverages).

The landscape and its community has always experienced natural variability and people from traditional owners to dryland farmers and irrigators have adapted to these periodic climatic challenges. Indeed, the region has only just emerged from the grips of severe drought where warm and dry conditions throughout the Murray-Darling Basin resulted in low inflows and declining river and groundwater levels.

Climate change projections point to a future of warmer and drier conditions in a region where annual rainfall varies from 260 mm at Renmark in the northern part of the SA MDB, to 387 mm at Lameroo, near the south-eastern corner of the SA MDB, to 768 mm at Mount Barker near the western edge of the region. Projections also suggest reduced river flows, although not as low on average as experienced during the recent drought, which will ultimately impact allocation of water to irrigators.

1.2 THE PROJECT

The *Climate Change impact assessment, adaptation and emerging opportunities for the SA Murray-Darling region (CCAP)* project is the lead in a suite of 21 projects as part of the Strengthening Basin Communities (SBC) program funded by the Australian Government. The funding was provided to eleven councils¹ within the South Australian Murray-Darling Basin (MDB) Natural Resources Management Region.

Findings from the project will assist the region to plan for a climate changed future through addressing risk and its implications and identifying options for adaptation (including emerging industries and associated socio demographic patterns).

The key deliverables for the project are:

- 1) Climate Change Scenarios;
- 2) Climate Change Impact Assessment Report;
- 3) Horticultural/Rural Lands Review; and
- 4) Adaptation and Emerging Opportunities Plan.

A summary of the key findings for the project are provided in Attachment A. This Adaptation and Emerging Opportunities Plan is the final deliverable for the project.

¹ Berri Barmera Council, Regional Council of Goyder, District Council of Karoonda East Murray, District Council of Loxton Waikerie, Renmark Paringa Council, Southern Mallee District Council, Alexandrina Council, The Coorong District Council, Mid Murray Council, District Council of Mount Barker, Rural City of Murray Bridge

1.3 PURPOSE OF THIS PLAN AND THE APPROACH TO ITS DEVELOPMENT

The purpose of this Adaptation and Emerging Opportunities Plan is to identify opportunities for partner Councils and their communities to adapt to the impacts of climate change on the SA MDB and to embrace many of the opportunities that will arise as Government's implement policies that require industries to offset their emissions, which will drive investment in renewable energy, energy efficiency and land use change such as carbon farming.

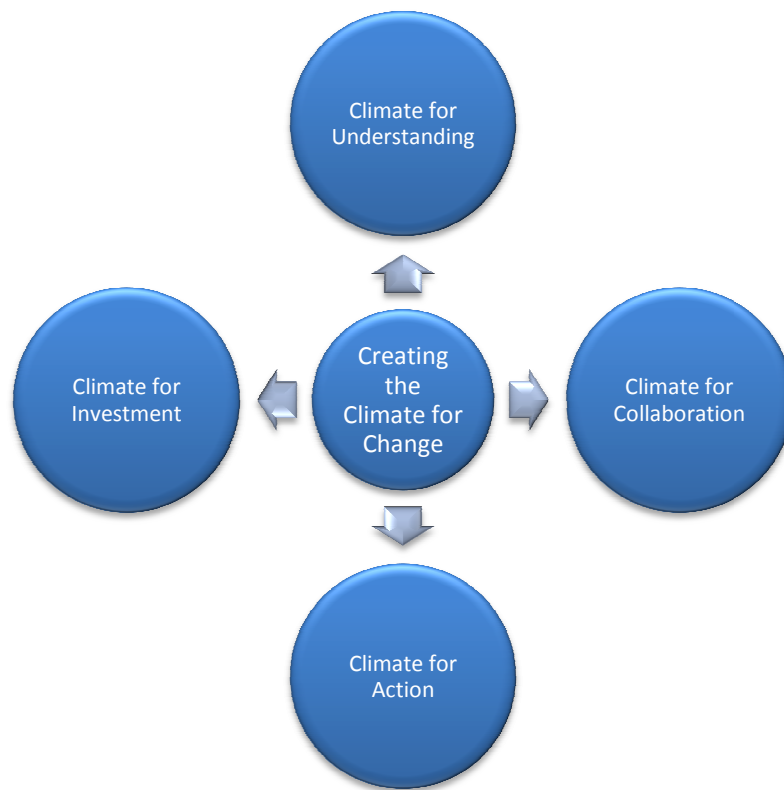
This Plan draws on a variety of information sources, such as the various reports already completed for this project (Key findings - Attachment A) and the outcomes of a stakeholder engagement process that was run earlier in the project that included a number of key stakeholders from across the region in a series of interviews, surveys and a workshop (see Siebentritt and Sharley (2010)). The University of Adelaide's Environment Institute project team also conducted two workshops to inform its development. The workshops focussed on two themes so as to separate out adaptation options and emerging opportunities across major economic drivers in the region: the first focused on adaptation measures and emerging opportunities for tourism, renewable energy and industry and manufacturing and the second on dryland farming and irrigation sector. A list of the questions posed at the workshops is provided in Attachment B.

The plan has been written in a way that identifies a series of specific recommendations that relate to the key adaptation themes that have emerged during this project:

- Primary production (Section 3)
- Renewable energy (Section 4)
- Tourism (Section 5)
- Role of Local Government (Section 6)
- Collaboration, coordination and leadership (Section 7)

The recommendations identify actions that can be taken to build resilience in the SA MDB community, either through adapting to future climate change or by grasping emerging opportunities. All told, they contribute to creating a climate for change in four ways (Figure 2). They create a climate for understanding by encouraging emphasis on communications and community engagement, especially in relation to carbon farming and renewable energy developments; a climate for collaboration through emphasis on partnership approaches to developing and implementing projects and by supporting the establishment of a formal climate change adaptation alliance; a climate for action by identifying specific projects that will lead to on-grounds works and connect to current or future funding opportunities; and a climate for investment, which is a consequence of having an action plan in place linked with a delivery mechanism and potential funding.

Figure 2. Four steps to creating a climate for change.



2 THE POLICY CONTEXT

There are a range of policy drivers operating at different scales that have influenced the development of this Adaptation and Emerging Opportunities Plan. At a Federal level, the Clean Energy Plan has been announced along with a number of other climate change related programs and initiatives, such as the Carbon Farming Initiative. Table 1 identifies a range of funding sources that could be of interest to stakeholders in emerging industries in the SA MDB including the significant funds available for renewable energy and energy efficiency programs and there is also investment in carbon farming through the Carbon Farming Initiative non-Kyoto carbon fund (\$250 million), Carbon Farming Futures program (\$429 million) and the Biodiversity Fund (\$946 million)².

There are also other current, funding opportunities that the region can access, including from the:

- Department of Sustainability, Environment, Water, Population and Communities, Water for the Future initiative, which still has support available for increasing water use efficiency of irrigation in rural Australia (i.e. Sustainable Rural Water Use and Infrastructure);
- Department of Regional Australia, Regional Development and Local Government, which administers the Regional Development Australia Fund;
- State Government's Riverland Sustainable Futures Fund.

At a state level, the South Australian Government has committed to addressing climate change through its Strategic Plan, the Draft Climate Change Adaptation Framework for South Australia and *Tackling Climate Change*, the Government of South Australia's Greenhouse Strategy.

The Adaptation Framework guides action by State Government agencies, Local Governments, non-government organisations, the research sector, business and the community to develop well-informed and timely adaptation responses. It will also inform and align with South Australia's policy on climate change and inform the development of forthcoming strategies and plans, such as the revised State Natural Resources Management Plan.

More broadly, the State Government economic priorities for the region include:

- Encouraging the development of renewable energy industries;
- Encouraging economic diversity to reduce the region's dependence on water resources; and
- Fostering development and diversification of primary industries and planning for sustainable adaptation to climate change and unpredictable river flows.

Local Governments in the SA MDB are also recognising the importance of addressing climate change, with many of their Strategic Plans containing strategies or objectives to address climate change. For example, the:

- District Council of Karoonda East Murray Strategic Plan states that the council will provide support for climate change strategies at state and local levels and look to identify renewable energy options; and
- Coorong District Council Strategic Plan sets out a strategy to assess the potential impacts of climate change on the environment, economy and community.

² <http://www.cleanenergyfuture.gov.au/clean-energy-future/our-plan/>

Regional Development Australia has laid out its direction in regard to climate change through the RDA road maps for the Murraylands and Riverland region and the Adelaide Hills, Fleurieu and Kangaroo Island region. For example, the latter identifies under the goal of “Infrastructure provision and maintenance” an action to identify energy programs that assist in delivering positive environmental outcomes by facilitating renewable energy supply as a theme for energy production from the region.

Priorities for the Regional Development Australia, Murraylands and Riverland

The RDA Murraylands and Riverland through its road mapping exercise has identified a range of climate change adaptation options in its Strategic Plan. These include:

1. Regional diversification and restructuring

1.3. Renewable energies and infrastructure

1.3.1. In collaboration with strategic partners, RDA M&R build demand aggregation studies that present compelling cases for all forms of infrastructure and alternative energy generation, including power, water, waste water, saline water, gas and sustainable technologies.

2. Innovation

2.1. Research and development

2.1.2. RDA M&R will undertake an R&D priorities study, identifying sector needs and opportunities and potential research partners and focusing on the innovative opportunities in industries such as inland saline water use, renewable energies and regional economic diversification.

3. Building community capability and resilience

3.2. Skilling for the future

3.2.2. RDA M&R will promote environmentally-sustainable energy, water, waste and carbon practices to position the region to attract sustainable investment.

Work is also progressing beyond the policy development and planning phase across the SA MDB, for example, the Local Government Association of South Australia (LGA) and the LGA Mutual Liability Scheme (LGAMLS) has conducted risk adaptation assessments with the majority of Councils in the SA MDB Region.

At a Federal level, the Clean Energy Plan has been announced along with a number of other climate change related programs and initiatives, such as the Carbon Farming Initiative. While the specific requirements are still to be developed for a number of programs areas, *Table 1* identifies a range of funding sources that could be of interest to stakeholders in emerging industries in the SA MDB including the significant funds available for renewable energy and energy efficiency programs.

Table 1. Summary of selected funding opportunities and programs under the Australian Government’s Clean Energy Plan.

Program / Measure	Description	Funding
Clean Energy Finance Corporation (CFEC)	The CEFC will invest in the commercialisation and deployment of renewable energy and enabling technologies, energy efficiency, low-emissions technologies.	\$10 billion over five years from 2013-14
Australian Renewable Energy Agency (ARENA)	ARENA will provide funding for projects through a range of competitive grants programs. \$3.2 billion in existing programs supporting research and development, demonstration and commercialisation of renewable energy technologies will be consolidated into ARENA	\$3.2 billion over nine years from 2011-12
Energy efficiency grants to SMEs and community organisations	Industry associations and NGOs will develop and deliver relevant and tailored information about the likely impacts of a carbon price on small businesses and community organisations, and practical steps they can take to manage these impacts.	\$40 million over the period to 2014-15
Clean Technology Program (CTP)	Competitive grants for manufacturing businesses to invest in energy efficient capital equipment and low-emissions technologies, processes and products. Includes <i>Food and Foundries Investment Program</i> for manufacturing businesses to invest in energy efficient capital equipment.	\$800 million over seven years from 2011-12
Low Carbon Communities	Competitive grants to local councils and community organisations to undertake energy efficient upgrades of buildings, facilities and street lights. The program will assist councils and community organisations reduce energy costs and promote energy efficiency behaviour change.	\$330 million over six years from 2010-11
Regional structural adjustment assistance	Funding for regions strongly affected by introduction of a carbon price. Assistance tailored to needs of individual communities and delivered through a combination of additional funding for existing programs, as well as the development of new or modified programs where appropriate.	\$200 million over seven years from 2012-13
Non-Kyoto carbon fund	The Government will purchase non-Kyoto compliant Carbon Farming Initiative credits, which cannot be purchased by liable entities under the carbon pricing mechanism.	\$250 million over six years from 2012-13
Carbon Farming Futures	The Carbon Farming Futures measure will support research, demonstration, extension and outreach and developing estimation methodologies.	\$429 million over six years from 2011-12
Biodiversity Fund	Support for the restoration and protection of biodiverse carbon stores and funding to, for example, establish biodiverse carbon plantings in areas of high conservation value such as wildlife corridors, riparian zones and wetlands.	\$946 million over six years from 2011-12
Regional NRM Planning and Climate Change Fund	The Regional NRM Planning and Climate Change Fund will help regional communities plan for the impacts of climate change, and maximise the benefits from carbon farming projects.	\$44 million over five years from 2011-12

3 PRIMARY PRODUCTION

3.1 CONTEXT

Agriculture in the SA MDB region has an average gross value of over \$1.2 billion, with approximately three quarters of this coming from dryland farming systems (ABS 2007). Current climate change projections indicate an increase in temperatures and a decrease in rainfall over the SA MDB and a higher frequency of extreme weather events (Suppiah *et al.* 2006, Suppiah *et al.* 2007). These conditions will have significant effects on dryland and irrigated production systems.

Without adaptation, warmer and drier conditions will reduce the yield of crops and quality of fodder in dryland farming regions (Summers *et al.* 2011). Animal husbandry may also be impacted by increased temperatures and heat stress reducing animal productivity. Less rainfall could reduce salinity risks on one hand, but increased rainfall intensity and wind during summer could increase the risk of soil erosion. In the short term adaptive responses could include growing different varieties or alternative crops (options for alternative crops are explored further in Section 3.5). However, if the country becomes more marginal there may be a shift to more pastoral activities.

For irrigators, a warmer and drier climate in upstream catchments of the River Murray will result in less water entering storages and ultimately lower water allocations. A reduction in the volume of water available for irrigation may lead to a decline in the irrigated agricultural footprint. Locally, higher maximum temperatures can negatively influence fruit set, taste, colour and the rate of ripening for fruit crops. Conversely, higher minimum temperatures can reduce the number of days that frost is experienced and hotter and drier conditions could reduce the spread of some diseases. In the short term responses in the irrigation sector may include changes to lower water use varieties or in the medium to longer term alternate crop types.

The community and the economy of the region have always been largely dependent on primary production and hence any threat to primary production systems must be a priority for action. Responses during the stakeholder reference panel process were unanimously in favour of the need for adaptation in primary production systems.

Community perspectives on climate change impacts on agriculture – Key findings from Siebentritt and Sharley (2011).

A stakeholder engagement process was run as part of the broader Strengthening Basin Communities in SA Climate Change Adaptation Project. This involved interviews and meetings with members of a Consultation Reference Panel. The findings of this process most relevant to the impacts of climate change on agriculture included the following:

- There is a consistent view that irrigation and dryland farming will be the industries impacted the most by warmer and drier conditions under future climate change. This will have flow on impacts to the SA MDB community and Councils.
- There is a sense of urgency to prepare for climate change and a sense of uncertainty in how to go about it. There is a strong indication that the current primary production mix across the region can adapt to a low emissions future, but not to a medium emissions future. Inability to adapt could be created by delayed action that makes the cost of adaptation unaffordable when

the circumstances arise.

- There is no guarantee that irrigators that stop farming will remain in the district. The capacity of irrigators to adapt not only involves changes in agronomic practices and crop selection, but will depend on general business conditions. Dryland farmers are less likely to leave the district indicating that long term adaptation to droughts and uncertainty have increased resilience to climate change, and given them greater capacity to adapt further.

There is a history of adaptation across the SA MDB, albeit to a variety of influences such as drought, market conditions, low commodity pricing, water pricing and water restrictions. This has led to adaptive measures such as the use of water markets to access water during the recent drought (albeit at high prices) and the transition toward minimal till farming, such that in some areas of the Murray-Mallee it is estimated that up to two thirds of dryland farmers have adopted this approach (personal communication. Leon Stasinowski). These responses represent incremental adaptive changes over a long period or reactions to short term risks. In contrast, climate change requires long term land use changes that in many ways may transform the landscape.

It should be noted that adaptation and mitigation are different yet interlinked concepts. Climate change adaptation for primary producers requires responses that will prepare farming systems for warmer and drier conditions. Mitigation relates to farming practices that will help to reduce climate change impacts, either through reducing emissions or sequestering carbon. Some activities for the purpose of mitigation, like tree planting, are also a form of adaptation as trees species like Mallee will be better suited to future warmer and drier conditions.

The following recommendations for primary production have been developed with a number of contextual matters in mind based on feedback from the project steering committee, Adaptation and Emerging Opportunity Workshops and the stakeholder engagement process. First, the private sector will lead decision making as individual farmers, with the help of independent advisors or support networks, determine what varieties they select, crops they choose or farming systems they adopt. Second, climate change is a “slow burner” issue on one hand in that warmer and drier conditions will take hold over a period of decades while on the other hand, the opportunities presented by the Carbon Farming Initiative and putting a price on carbon could lead to rapid change in land use. Third, there is increasing evidence that communicating climate change adaptation information must focus on trusted advisers and support networks as well as farmers themselves.

3.2 INVEST IN RURAL LEADERS

Recommendation: Invest in rural leaders by supporting the development of a *Primary Producer Leadership Grant for Climate Change Adaptation*.

Key issues

A strong message through this project has been that decisions on farm about future management practices will be driven by the private sector, involving individual farmers supported by their advisers. As suggested at one of the adaptation and emerging opportunities workshops, “you need

to invest in people". With respect to climate change adaptation, this will mean investing in the early adopters who are amongst the leaders in the community and who balance the risk and opportunity of new technologies, systems or approaches.

There are a variety of generic leadership training courses available for farmers including through Nuffield Australia Farming Scholars, Australian Rural Leadership Foundation, the South Australian Rural Leadership Program and then specific industry based leadership courses such as through Dairy Australia or the Australian Future Grain Leaders Program. However, there are few (if any) programs targeted at training future rural leaders who have a vision for how farming communities and farming systems can adapt to climate change and there is an absence of specific opportunities like this for the SA MDB. Yet in the coming decades, farmers in the region will need to balance the risk and opportunity of transitioning to alternative crops more suitable to warmer and drier conditions, consider how best to incorporate carbon farming in their mixed farming operations and assess the contribution of biofuel and biomass production to farm income and as a way to address energy needs.

Recommendations

It is recommended that a **Primary Producer Leadership Grant for Climate Change Adaptation** be made available to farmers in the SA MDB. The objective of the grant would be to build the leadership skills of farmers with a vision for climate change adaptation and develop a network of like minded farmers across the region that together will increase the capacity of their communities to adapt to climate change.

This Grant could take the form of money for a specific scholarship to be funded for a farmer to participate in an existing leadership training course (e.g. PIRSA's South Australian Rural Leadership Program) or for the development of a specific leadership training program in conjunction with an organisation like the Leaders Institute for South Australia.

Participants in such leadership training would be required to work in conjunction with their relevant industry association to inform that group of the results of their work and to build capacity in that industry's ability to adapt. There would also be merit in partnering them with an existing farming systems group to increase the chance of shared learnings across a broader network of people. Attention would need to be given on how to support and encourage an ongoing group of new leaders.

Key tasks to develop the Grant would be to identify suitable funding partners and determine which leadership training organisations have suitable skills and interests in primary production and climate change adaptation. There are numerous potential funding partners, from regionally based entities like the NRM Board, RDA and Councils, to state government agencies like PIRSA (which funds a leadership program) through to Federal skills based funding through organisations with an interest in climate change adaptation such as Department of Climate Change and Energy Efficiency or the Department of Agriculture, Fisheries and Forestry.

3.3 COMMUNICATING CARBON FARMING OPPORTUNITIES TO LANDHOLDERS

Recommendation: Communicate with farmers about carbon farming opportunities by supporting the development of a *Land Holder Information and Action Kit*.

Key issues

The Carbon Farming Initiative (CFI) was passed into Federal legislation in August 2011. The CFI identifies the types of activities that can be used to generate carbon offsets, the type of offsets that can be generated (Kyoto or non-Kyoto compliant) and the process for establishing agreed methodologies that must be followed to generate carbon offsets. The Clean Energy Legislation, which was agreed to by the Australian Senate in early November 2011, will provide a regulatory mandate for large emitters to pay for a price on carbon and thus create a market for offsets driven by companies seeking to offset their emissions. While the Coalition has threatened to repeal the Clean Energy Legislative Package if it wins Government at the next Federal election, the CFI has bipartisan political support.

The CFI states that abatement may be achieved by:

- Reducing or avoiding emissions, for example, through capture and destruction of methane emissions from landfill or livestock manure; or
- Removing carbon from the atmosphere and storing it in soil or trees, for example, by growing a forest, or farming in a way that increases soil carbon.

The types of activities covered by the CFI include:

- Reforestation
- Revegetation
- Native forest protection
- Avoided de-vegetation
- Improved management of forests
- Reduced forest degradation
- Forest restoration
- Rangeland restoration
- Improved vegetation management
- Enhanced or managed regrowth
- Enhanced soil carbon

At a regional scale the potential additional revenue that could be generated through carbon farming is likely to be significant. For example, (Bryan *et al.* 2008) found that biomass production in the South Australian River Murray corridor alone could reduce carbon emissions by over 1.7 million tonnes per annum in a market that will price carbon at \$23/tonne CO₂-equivalent as of 1 July 2012.

Many activities identified under the CFI are no stranger to farmers in the SA MDB. For example, no till (also called minimal till) has been in use for decades and is estimated to have been adopted on up to two thirds of farms in some areas of the Murray Mallee. Another prominent example of carbon farming is planting forests to sequester carbon i.e. farmers receive money to sequester carbon by

growing trees that offset carbon dioxide released into the atmosphere elsewhere. Recent studies suggest that with the introduction of a price on carbon there is significant potential for planting trees for carbon sequestration in South Australia and the SA MDB (Crossman *et al.* 2010). Such options are attractive where they can be applied to parts of a property that are currently not productive with traditional cropping. Carbon plantations also bring other benefits such as reduced risk of dryland salinity, less soil erosion and biodiversity benefits (Bryan *et al.* 2010b).

A number of carbon farming activities will also build adaptive capacity into the landscape meaning that farms are more able to cope with warmer and drier conditions e.g. increased soil carbon will improve the ability for many soils to retain higher moisture contents.

While various carbon farming options exist for the region, market forces will be a key driver in determining what activities are ultimately adopted. This is highlighted by the results of work like that of Bryan *et al.* (2010b) who concluded that while planting trees for carbon could generate some income and other environmental benefits it is likely to be much less profitable than using the same area of land for biofuels and biomass and will not provide additional energy or co-product benefits (Bryan *et al.* 2010b). Whether this is the same for other carbon farming activities will become clearer in the years to come as more options are trialled at a commercial scale.

Recommendations

It is recommended that a **Land Holder Information and Action Kit** be developed with the objective of providing clear and consistent advice on the opportunities, drawbacks and regulations that apply to future carbon farming activities across the SA MDB. It could be argued that it is a responsibility of regional entities to ensure that farmers are receiving accurate information about carbon farming. It is also an opportunity for a number of regional entities to establish themselves as knowledge brokers that support the private sector to make change.

The Information and Action Kit deliverables would be a series of web based and hard copy fact sheets addressing FAQs about opportunities and limitations, presenting case studies of where carbon farming activities are already occurring, diagrams of soil profiles and land use showing potential revenue with and without carbon farming activities.

The fact sheets would need to address some of the likely impediments or uncertainties (social, structural and institutional) that will limit uptake of carbon farming opportunities, such as:

- Price of Australian Carbon Credit Units from CFI compliant activities
- Changes to the value of land if planted to trees (either in part or whole)
- Effects of locking up land through establishment of land covenants
- The full suite of costs associated with carbon sequestration

The *Information and Action Kit* would benefit from being jointly supported and produced by Councils, the NRM Board, RDA and relevant outreach and extension groups. It is recommended that a working brief be developed to take advantage of periodic opportunities to obtain Federal funding, such as recently occurred under the Climate Change Grant Program administered by the Department for climate Change and Energy Efficiency.

3.4 BUILDING THE CAPACITY OF THE PRIMARY PRODUCER SUPPORT NETWORK

Recommendation: Build the capacity of the primary producer support network by developing and implementing a *Primary Producer Support Network Communications Strategy*.

Key issues

One of the most frequently cited examples of adaptation in the region was the response of irrigators to the impacts of salinity and drainage, a response that was supported through effective outreach and extension. In the 1970's there were a small number of irrigators in the region trying to adapt their irrigation systems to reduce the impacts of salinity and drainage on their crops. In general, irrigation in the region was inefficient and salinity problems were caused by over-irrigation. Irrigators had been conditioned by a lack of knowledge of soils and water holding capacity – and believed that more irrigation was beneficial to leach salts, whereas in fact it was creating water tables that mobilised salts into the crop root-zone which caused the problem.

In the 1980's an increase in irrigation research and extension efforts resulted in the awakening of the need to adopt improved irrigation practices — created by a massive effort to educate irrigators (research trials, field days, seminars, one on one extension, talks to industry groups, consultancy services) about the benefits of improved irrigation practices. As a result of irrigators, researchers and outreach providers working together, the region has become one of the most efficient irrigation regions in Australia.

While it has been lamented by many government funded outreach services have been gradually withdrawn from the region, there still remains a system of support, although it now takes a different shape. Farmers now seek advice from a network of formal or informal 'trusted' advisers that may include their accountant, financial planner, industry association, LAP officers, Landcare facilitators, agronomists, outreach officer, stock and station agent, insurer and/or bank manager. A recent study by the SA MDB NRM Board (2011) found that 71% of farmers they surveyed would contact a private advisor or agronomist when seeking farming or agricultural information followed next by PIRSA or Rural Solutions at 39%. Figures elsewhere suggest that farm consultants have a role in at least 50% of decisions made.

Arguably, the SA MDB is about to enter another period of major change in agricultural practices the success of which could be heavily influenced by the role that primary producer support networks play. These trusted advisers require information on the impacts of climate change on industry, future opportunities (e.g. the ability to earn revenue from producing carbon offsets), support available for industry (e.g. funding for energy efficiency upgrades) and how it will impact the provision of services to their clients (e.g. will there be demand for new insurance products to protect carbon or biomass plantings from bushfires?).

Recommendation

It is recommended that the Chambers of Commerce in the region, farm systems groups (e.g. Mallee Sustainable Farming) and the Murraylands and Riverland RDA commission a ***Primary Producer Support Network Communications Strategy***. The objective of the Strategy is to ensure that the advisers who inform the decisions of farmers have access to relevant information about the need for

climate change adaptation, the opportunities that carbon farming presents and the risks to be aware of.

This Strategy would:

- Identify the primary producer support network in the region;
- Determine what services they provide to primary producers;
- Assess how provision of these services may be impacted by climate change impacts and emerging opportunities;
- Identify information needs for different business types in the support network;
- Develop communications material for the network; and
- Conduct information sessions targeted at different parts of the support network (e.g. financial services such as accountants, financial planners, bankers).

The Strategy should consider the potential role of information technology systems in outreach and extension such as the use of smart phones to deliver information about research or what other farmers are doing or have done in the past, emerging opportunities for information transfer under the National Broadband Network and the potential using of online applications linked with tablets to receive, process and utilise information. These issues were all identified as priorities for supporting farmers to adapt to future climate change during the Adaptation and Emerging Opportunities workshops.

A key task in development of the Strategy is a review of the support network, which is an opportunity to determine the target audience, and would focus on identifying:

- what support networks exist;
- the strengths and potential vulnerabilities of information distribution systems;
- how well connected are the existing networks;
- how are they resourced;
- what skills do they possess;
- what industry segments do they cover; and
- what is the capacity of the network to provide information on impacts of climate change on current farming systems, opportunities to adapt current farming systems, emerging opportunities such as through carbon farming, biofuel and biomass production.

Funding opportunities may include the \$64 million Outreach and Extension component of the Carbon Farming Futures program which is part of the Land Sector Package under the Australian Governments' clean energy future plan. The first round of Outreach and Extension funding for Carbon Farming Futures will be early in 2012. If this recommendation is supported by the Steering Committee, a full project brief should be developed with this timeframe in mind.

3.5 PLANNING FOR FOOD PLAN FOR THE MURRAY-DARLING BASIN

Recommendation: Build the capacity of the primary producer support network by developing and implementing a *Primary Producer Support Network Communications Strategy*.

Key issues

A recurring theme when it came to building the resilience of primary production in the SA MDB was that long term viability came down to the ability for the region to maintain favourable business conditions on one hand and make informed business decisions about when to invest in new varieties, crops and/or animal breeds.

Maintaining favourable business conditions is beyond the remit of this project but it is clearly influenced by a range of factors such as the price of the Australian dollar, demand in domestic and international markets for produce, input costs including power, water and fertiliser. The latter will all be influenced by climate change: electricity through pricing carbon and increasing scarcity of fossil fuels; water through reduced allocations and hence upward pressure on price of annual allocations and entitlements; fertiliser because of the use of fossil fuels in much of its production which are becoming more expensive due to scarcity and carbon pricing.

Production planning, one aspect of making informed business decisions, was identified as an important action to build a resilient primary production sector to help region manage issues like oversupply of crops such as is currently occurring with oranges and wine grapes. Production planning was seen during the workshop as a way to ensure that there is “less wastage in the system” and that crop production is more targeted toward demand in domestic and international markets.

There has been substantial research into the viability of different crops under future climatic conditions. Much of this research examines the viability of different crops based on their ability to grow under projected future climate conditions (Table 2).

Potential responses from farmers to climate change in the SA MDB (Siebentritt and Sharley 2011).

A range of options were discussed by the consultation reference panel describing the types of changes farmers may make in the future as they adapt to climate change, including:

- Grapes to grapes (different varieties);
- Grapes to almonds (currently more profitable);
- Grapes to olives (hardier alternative);
- Grapes to dates (salt tolerant, low water use);
- Grapes to natives (naturally resilient, low water use, barriers to competition);
- Grapes to climate controlled crops (glasshouse);
- Wheat and sheep to wheat and sheep (different farming methods);
- Wheat and sheep to different cereals (hardier alternative);
- Cereals to agroforestry (emerging carbon market);
- Cropping to pastoralism (hardier alternative); and
- Sheep to kangaroos (naturally resilient, high protein alternative).

A recent report by the Rural Industries Research and Development Corporation (RIRDC) (Cullen *et al.* 2010) conducted a study into potential industries for rural communities under climate change. The report examined new opportunities in the Murray-Darling Basin for both irrigated and dryland

Table 2. Dryland and irrigated crops potentially suited to warmer and drier conditions. Adapted from Summers *et al.* (2011).

CROP	DESCRIPTION
Dryland	
Mustard (<i>Brassica juncea</i> and <i>Brassica carinata</i>) and Crambe (<i>Crambe abyssinica</i>)	Alternative oil seed crops suited to the dryland cropping conditions. Mustard has higher yields under low rainfall conditions than canola and is better able to tolerate water stress, pests and disease (Francis and Campbell 2004).
Quinoa (<i>Chenopodium quinoa</i>)	Pseudo cereal adapted to low rainfall (250-380 mm) with a short growing season and tolerant of drought, frost and salinity. Produces gluten free grain with high fibre and protein contents (Cullen <i>et al.</i> 2010).
Tepary bean (<i>Phaseolus acutifolius</i>)	Drought and heat tolerant food crop that can reach maturity on single sufficient rainfall or irrigation events (Debouck 1994).
Guayule (<i>Parthenium argentatum</i>)	Small perennial shrub well suited to semi-arid conditions that produces a natural rubber (Thompson 1990; Cullen <i>et al.</i> 2010). Unlike other natural rubbers the latex product does not cause allergies.
Lesquerella (<i>Lesquerella fendleri</i>)	Perennial plant well suited to temperate arid regions that produces vegetable oil well suited to lubricants and cosmetics (Dierig 1995; Cullen <i>et al.</i> 2010).
Irrigated	
Date palms (<i>Phoenix dactylifera</i>)	Edible dates with high tolerance to salinity, hot temperatures and can survive long periods of drought but they require high levels of irrigation for production (Cullen <i>et al.</i> 2010).
Olives (<i>Olea europaea</i>)	Irrigation may be required for suitable yields but the plants are able to survive relatively low rainfall (Cullen <i>et al.</i> 2010).
Jojoba (<i>Simmondsia chinensis</i>)	Drought tolerant perennial shrub from the Sonoran desert regions of North America (Cullen <i>et al.</i> 2010). It produces a liquid wax that is used in cosmetics and industrial applications. While it is suited to desert conditions, higher yields are achieved with at least 450 mm of rain or supplemental irrigation (Milthorpe 2004).
Pomegranates (<i>Punica granatum</i>)	Perennial fruit bearing tree that is suitable for Mediterranean climates. Requires chilling to break dormancy. Juice can be easily extracted with modified grape crushing equipment (DAFWA 2008).
Capers (<i>Capparis spinosa</i>)	Perennial plant that can be harvested for its edible flower buds, berries and leaves. tolerant of drought, salinity and high temperatures, although it is sensitive to frost during its growing season
Quandong (<i>Santalum acuminatum</i>)	Native Australian perennial fruit producing plant. The plant is highly drought and salinity tolerant and requires full sun and a dry humidity (Cullen <i>et al.</i> 2010)
Bush tomato (<i>Solanum centrale</i>)	Fruit producing perennial native to central Australia. They are very well adapted to growing dry and hot conditions with variable rainfall (Cullen <i>et al.</i> 2010).
Desert lime (<i>Citrus glauca</i>)	Native to the semi-arid regions of eastern Australia and is extremely tolerant of drought, heat and frost. It is well suited to heavy soils and responds well to irrigation and fertiliser (Cullen <i>et al.</i> 2010).

farming systems and suggested alternative crops for this region. The general selection criteria for these alternative crops was that they have high water use efficiency, heat and drought tolerance, frost tolerance and lower chilling requirements (Cullen *et al.* 2010). For irrigated systems under future climate change they identified two main strategies; farming high value irrigated crops and

farming resilient irrigated crops (Cullen *et al.* 2010). For dryland systems the same report identified three strategies that could make a contribution to the resilience and adaptation of farming systems in a warming and drying climate. These were: alternative crops in cereal systems, industrial crops (i.e. crops to produce goods for the production sector such as fibre, gums and resins) for arid environments and options for retired cereal country (Cullen *et al.* 2010).

The stakeholder engagement process suggested that there is limited discussion amongst primary producers and between primary producers and industry bodies regarding alternative industries, indicating that regional communities and industries are not fully engaged in how they can best adapt to climate change.

Recommendations

We recommend developing a **Food Plan for the SA MDB** to understand the suitability of current and alternative crops to current and future climate and how these can best service new and emerging domestic and international markets. In doing so it would tackle issues such as production planning and building the business case for transitioning to alternative crops, which were raised as major issues to be addressed in order to build a resilient primary production sector during the stakeholder engagement process and at the Adaptation and emerging Opportunities Workshops. Development of such a plan would provide an opportunity for discussion amongst primary producers and between primary producers and industry bodies about potential interest in alternative farming systems and how they can be developed to meet future market demand.

The scope of the Food Plan would include both irrigation and dryland, because both are important to future resilience of the primary production sector and it recognises that some farmers may choose to make a transition from irrigation to dryland farming as climate and market conditions change.

There is strategic significance to developing such a plan now. First, the Draft Murray-Darling Basin Plan has recently been released and it is possible that re-structuring of industries across the entire Basin will have a focus on how to maintain food production in Australia's major food bowl. Second, the Federal Government is currently developing a National Food Plan, the objectives of which include:

- Identifying and mitigating potential risks to Australia's food security
- Supporting the long-term economic, environmental and social sustainability of Australia's food supply chain
- Contributing to economic prosperity, employment and community wellbeing in regional Australia.

The key tasks in developing the Food Plan would include:

- Undertaking analysis of emerging international markets, especially in China and India, focussing on potential demand and capacity to pay for food produced in the region;
- Analysis of opportunities presented by annuals versus perennial crops and perishable and non-perishable items in meeting future market demand.

The Food Plan would aid farmers in making decisions about future crop plantings, crop removals and market trends. It would also assist Government's in helping direct support for adaptation of the

primary production sector. The Food Plan would clearly have strong links with the work of the Riverland and Murraylands RDA given its interest in regional economic activity (i.e. through food production in the region, which links with the National Food Plan) and the potential impact on economic activity as a result of the Basin Plan.

4 RENEWABLE ENERGY

4.1 CONTEXT

Renewable energy is energy from naturally replenishing processes and provides a low or no emission alternate to fossil fuel combustion as a way to generate electricity, produce heat and provide fuel for transport. There is growing support for investment in renewable energy across Australia driven by mandatory targets at a Federal (20 per cent of Australia's electricity supply will come from renewable sources by 2020) and state level (33% of South Australia's energy will come from renewable sources by 2020³) and significant new funding opportunities under the Clean Energy Plan such as through the \$10 billion Clean Energy Finance Corporation.

Renewable energy is promoted in most Council strategic plans and in Road Maps for both of the RDAs that cover the majority of the region. For example:

- The Draft Berri Barmera Council Strategic Plan says that the Council will promote alternate energy supplies to reduce our carbon footprint, noting that "the Riverland is ideally situated to develop solar power plants and the Council will investigate establishment of planning zones to assist in their development."
- The District Council of Karoonda East Murray Strategic Plan seeks to identify renewable energy options and potential implementation
- The Rural City of Murray Bridge Strategic Plan list as a strategic priority the need to explore alternative energy possibilities and opportunities with a view to creating a self sustaining community
- The Mid-Murray Council Strategic Plan which states that the Council will actively encourage the development of alternative energy sources and support the use of solar power in new developments.

There are various forms of renewable energy that may prove successful in the SA MDB, such as commercial solar and wind projects, large scale biofuel and biomass energy production on agricultural land, small scale, distributed solar, wind and bio-energy systems. Indeed, there are examples of these already that are proposed or already in use:

- Pacific Hydro's proposed Keyneton wind farm consisting of up to 57 turbines with installed capacity of 130MW. The site will be capable of providing enough electricity to power the equivalent of around 51,000 homes per year;
- Dairy farmers using solar water heaters to generate hot water rather than using mains electricity or gas hot water systems; and
- Using methane generated from piggery manure waste in anaerobic lagoons to produce power at Taylorville.

³ South Australia already produces 20% of its energy from renewable sources.

South Australian Renewable Energy Plan. Based on media release issued by the South Australian Government on 20 October 2011. <http://www.renewablessa.sa.gov.au/about-us/publications-and-reports>

On 19 October 2011, the South Australian Government released the Renewable Energy Plan for South Australia, providing an agenda for future growth of the state's renewable energy sector. The plan outlines \$1.8 billion in investment in wind farms, with the Local Government being given responsibility for assessing planning applications for wind farms.

The plan is built on five key strategies for supporting future investment in the renewable energy sector, including:

- Providing quality information to the industry
- Having the most efficient and certain regulatory environment
- Selectively intervening to address market failures
- Government leadership by example
- Positioning South Australia to take advantage of national policy settings, including the Commonwealth's proposed Clean Energy Future Package

Some of the key initiatives within the Plan include:

- Draft legislation to provide renewable energy investors with access to the 40 per cent of South Australia's land mass that is Crown Land subject to pastoral lease;
- Calling for expressions of interest in the design and implementation of a concept model for a community-owned solar project;
- Beginning consultations on setting a specified limit on carbon emissions for new electricity generation, which will effectively prevent investment in new coal-fired electricity generation; and
- Providing \$345,000 for the demonstration of concentrating solar power technology for heat and electricity at a horticultural greenhouse in Port Augusta.

4.2 LOCAL ENERGY SECURITY

Key issues

The business case for renewable energy is often viewed in terms of its cost of production compared with other energy sources that supply power to the grid. Another perspective, as presented at the first Adaptation and Emerging Opportunities Workshop, is that renewable energy provides additional benefits such as diversifying the regional economy by providing local jobs and can drive power production in the region rather than paying to import energy from other regions. The latter is significant given that the Murraylands and Riverland region is estimated to purchase around 5% of the state's electricity equating to approximately \$100 million.

To provide a more comprehensive perspective on the renewable energy future for the region, a Local Energy Security Study was conducted by The Energy Project Pty Ltd (full version of the study is

provided at Attachment C). This concept builds on a series of National Energy Security Assessments (NESA) conducted first in 2009 and then again in December 2011. The NESA forms a key input into Australia's Energy Policy.

The term local energy security is intended to convey a similar meaning to that of water security or food security. The spectrum of security in this context is considered to be from 'totally dependent' to 'totally self sufficient'.

Energy security is assessed in terms of the key objectives of access to adequate, affordable and reliable energy supplies. While there are environmental considerations that are relevant, especially in relation to renewable energy supply, the primary reason for considering energy security is an economic one.

A review of the various strategies and plans applicable to the region make repeated reference to energy – renewable energy and energy infrastructure in particular. Local Energy Security is put forward in this report as a way of organising these various strategic objectives and aspirations into a form that allows for priorities to be set and actions initiated.

The attached report has three main components: a Local Energy Security Assessment (LESA), a Local Energy Resource Assessment (LERA) and a subsequent Local Energy Security Strategy (LESS). The LESA represents a high-level assessment of the region's energy markets and infrastructure. The LERA provides an overview of the region's energy resource endowment. The LESS is the strategic planning framework that collates and prioritises the actions required to improve or even maintain a region's energy security.

The preparation of a LESS is predicated on an assumption that an appetite exists within the community for the region to become less of a passive 'price taker' in the energy markets, and a much more active and engaged participant in meeting its own energy needs.

Considerations of energy security and the potential to diversify energy production also raise questions about the possibility of community scale, distributed energy projects. While they have to date proven more popular in Europe and the United States models are starting to emerge in Australia such as Hepburn Wind, Bendigo and Ballarat Solar Parks, Island Energy (Kangaroo Island) and various subscriber and Bulk Purchase schemes. Community energy projects should consider potential for local aggregation of demand for electricity from Councils or fuel (diesel) from farmers.

Island Energy, Kangaroo Island – An example of a community energy project

[\(http://kangarooislandenergy.com/\)](http://kangarooislandenergy.com/)

Island Energy is an initiative of the Adelaide Hills, Fleurieu and Kangaroo Island RDA and is undertaking a feasibility study into the development of a community owned renewable energy company on Kangaroo Island. The project will study the technical, commercial and environmental feasibility of the development of a community owned Renewable Energy Company that will meet about one third of Kangaroo Island's energy needs.

Findings and Recommendations

A region's energy economy can be seen as a vital input into the broader regional economy. Energy security will be greater the more there is local economic benefit along the energy value chain. Energy security is lower when a region relies on simply importing energy in its final forms. An assessment of security is also influenced by the relative size of a region's energy economy. Heavily energy dependant regional economies are inherently less secure than more service-based economies that count energy as a much smaller input cost.

The SA MDB region energy security has been assessed as follows:

Dimension	Rating
Affordability	Low-Moderate
Adequacy	Moderate
Reliability	Low-Moderate

Energy consumers in the SA MDB region are estimated to spend over \$300 M p.a. on stationary and transport energy products and services in the creation of a Gross Regional Product of \$2,500M. This 12% compares to a state-wide average of around 8% and is considered to be a strategic vulnerability for the region in a climate of rising energy costs and challenging economic conditions.

Beyond an economic assessment is consideration of the region's energy infrastructure – in summary, the study sought to answer the question: Is infrastructure capacity a constraint or an opportunity for the local economy? The report provided a stocktake of energy supply, energy demand and energy infrastructure for the region. The reliability of electricity supplies was also seen a key consideration. The report found that existing infrastructure exhibits some available capacity in the key regional centres but is very limited beyond these locations. Electricity reliability is a limiting factor outside of the main centres. Access to reticulated natural gas is confined to a few major centres and results in limited energy supply diversity.

Consideration of potential measures to enhance energy security also requires an assessment of key energy resources in the region: solar, wind, biomass, and geothermal are the key renewable energy resources considered. The report found that the region exhibits a diversity of renewable energy resources, with commercial grade wind resources in a number of locations and strong solar resources that peak around the north-east corner of the region. However, the defining attribute of the region is probably its bio-energy potential – a largely undeveloped resource that has the potential to be the basis of an energy 'import replacement program' that can materially improve the region's energy self sufficiency and 'balance of trade'.

Consideration was also given to the potential for community driven energy projects. Successful local energy initiatives invariably require strong governance arrangements and a discussion of local organising capacity is provided. There is good anecdotal evidence of an appetite for community participation in local energy projects. It is recommended that key stakeholders meet to consider an appropriate organising 'vehicle' for advancing the region's energy interests. Some initiatives are

appropriately advanced by the local Regional Development Australia (RDA) offices and others by the region’s local governments. However, genuine ‘ownership’ of energy initiatives may require an entity more explicitly tied to the interests of the regions residential and business energy consumers.

Based on the Local Energy Security Assessment (LESA) and Local Energy Resource Assessment (LERA), an initial Local Energy Security Strategy (LESS) has been developed along with recommendations for 10 initial actions. These actions are detailed in Chapter 8 of the LESS report and summarised in Table 3.

Table 3. Summary of Recommended Initial Actions.

Strategic Theme		Objective	Recommended Initial Actions	
1	Energy Infrastructure and Assets	Ensure infrastructure matches growth aspirations	1.1	Electricity Reliability Enhancement Project
			1.2	Review of Natural Gas availability in the SA MDB
2	Energy Supply	Promote local energy supply, particularly renewables, for the benefit of the local economy	2.1	Bioenergy Roadmap
			2.2	Mid Scale Wind and Solar Opportunities
3	Energy Demand	Improve economic efficiency through energy efficiency	3.1	Community Energy Efficiency Projects
			3.2	Food Value Chain Energy Efficiency Best Practice Project
			3.3	Detailed Energy Demand Study
4	Community Participation and Leadership	Deliver greater influence over the region's energy future	4.1	Regional Energy Cooperative Feasibility Study
			4.2	Public Institution Demand Aggregation
			4.3	Set a target for value-add to the region-wide energy economy

4.3 BUILD SUPPORT AND UNDERSTANDING FOR RENEWABLE ENERGY IN THE SA MDB

Recommendation: Build support and understanding for renewable energy in the SA MDB by developing and implementing a *Community Engagement Strategy*.

Key issues

While renewable energy presents new opportunities for the SA MDB and the opportunity for economic diversification, it also engenders a range of responses from community – from staunch opposition to support for community energy projects. Much of the opposition is based on concerns about aesthetics and health impacts of major, commercial renewable projects, most notable wind power.

Recommendation

It is recommended that a ***Community Engagement Strategy for renewable energy in the SA MDB*** be developed to provide a common framework for how consultation will be conducted in the SA MDB with respect to major renewable projects such as wind and solar or other developments that may be of significant community interest, such as large scale biomass through Mallee plantings. The Strategy will provide a way to facilitate new and diversified investment in the region in a way that meets community standards and values.

Specific objectives of the strategy will be to:

- Demystify renewables in the region, both impacts and opportunities;
- Outline agreed or in principle engagement approaches to be used for major projects that will involve community at an early stage; and
- Identify stories of successful regional adoption of renewable energy.

The Community Engagement Strategy would be presented in a variety of forums and provide an opportunity to seek feedback on how the community will be engaged, but also demonstrate that Councils are proactively addressing the issues and opportunities presented by renewable energy. This is important given that community debate in many parts of Australia currently focuses on the problems associated with, for example, large scale wind power projects rather than the opportunities of distributed energy and the opportunities presented by community energy projects.

Through its development the Strategy should also seek to create a register of renewable energy projects in the region, accessible in a visual format (e.g. map) which serves as a communication tool to demonstrate progress toward greater local energy security. This could be maintained by Councils who will already be assessing applications for new renewable energy projects.

The project area should cover the entire SA Murray Darling Basin Natural Resources Management (SA MDB NRM) Board area, including all Councils that are located either entirely or partly within the SA MDB NRM region. Specific attention should be given to local differences across the region such as the potential for wind projects on the eastern side of the Mt Lofty Ranges, compared with biomass projects that are perhaps more likely in Mallee cropping regions.

Key tasks in undertaking this project would include developing principles for engagement regarding renewable with stakeholders through facilitated workshops and conducting surveys with Councils to identify current and proposed renewable projects.

4.4 FACILITATE THE ADOPTION OF RENEWABLES ON AGRICULTURAL LAND THROUGH DEMONSTRATION PROJECTS

Recommendation: The adoption of renewables on agricultural land can be facilitated by supporting a *Murray Mallee Biofuel Trial* and developing a Woody Biomass Concept Plan for the SA MDB.

Key issues

Production of biofuels and biomass are alternative land uses that may become increasingly viable with the introduction of a price on carbon emissions^{4, 5}. Biofuel is a liquid fuel such as biodiesel, often produced from canola and other oil seed crops, or ethanol, produced from wheat and corn. Biomass production is the growing of primarily trees which are used as a fuel source for the production of

⁴ Discussions of the broader impacts of biofuel and biomass production for the region is presented in Summers et al (2011).

⁵ Biomass and biofuels have been discussed under the Renewable Energy section of this plan but could also have been included under the Primary Production section.

electricity and, in some cases, includes the production of secondary products such as oils and activated carbon (Bryan *et al.* 2008).

Recent studies (Bryan *et al.* 2010a,b; Bryan *et al.* 2008) in the SA MDB have looked at the potential of biofuels and biomass agriculture under different climate change scenarios. The results indicate that a carbon price is the largest driver of economic viability and that increasing climate change has negative consequences on biofuel production (because climatic conditions become less favourable for growing oil seed crops).

Biomass production has the potential to be more resilient than traditional agriculture to climatic warming and drying because native tree species are better suited to warmer and drier conditions (Bryan *et al.* 2010b). There are also other environmental benefits from biomass production such as the mitigation of salinity and wind erosion as well as biodiversity conservation (Bryan *et al.* 2010b). Several authors have also found that biomass production for the generation of renewable energy is more efficient than biofuel production (Campbell *et al.* 2009, Ohlrogge *et al.* 2009).

The results of a recent survey from the dryland areas of the SA MDB as well as some neighbouring regions indicate that biomass production becomes more viable with increasingly severe climate change compared with traditional agriculture (Bryan *et al.* 2010b). This is because the productivity of traditional agriculture (e.g. cropping and grazing) decreases with warming and drying while the biomass crops (e.g. Mallee trees) are less affected. The introduction of a price on carbon would make biomass production ever more viable. Another of these studies (Bryan *et al.* 2008) examined the viability of growing woody species in the River Murray Corridor of the SA MDB NRM region. This study found that more than 350, 000 ha within the corridor are potentially viable with income generated from electricity generation, carbon markets and other by-products.

Biomass in the SA MDB is most likely to be produced using species of Mallee eucalypts because of their adaptation to the low rainfall and low fertility soils in the much of the region. Trees are coppiced (i.e. cut near the base) and allowed to re-grow on a 4-5 year production system⁶. Western Australia has the most experience of any Australian state with Mallee plantings currently having over 900 farmers as members of the Oil Mallee Association (OMA). The industry has evolved with a combination of research driven expertise, Government support that started in the mid 1990s (through CALM) and private sector investment.

Biomass differs dramatically though from biofuel production with respect to the time taken to generate revenue. Biofuel crops are mostly annuals and thus can generate revenue or offset fuel purchase for on-farm use within 12 months (generating profit may take longer depending on investment in infrastructure such as a biodiesel production unit).

Biofuels offer a ready to go opportunity for primary producers to reduce expenditure on fuel and possibly generate additional revenue from the sale of fuel to other farmers⁷. For example, estimates

⁶ <http://www.oilmallee.org.au/index.php/site/mallee-facts>

⁷ Farmers who produce and sell biofuel do not have to add excise but do have to meet the relevant fuel quality standard. Meeting the fuel standard is also required for on-farm use. <http://www.environment.gov.au/atmosphere/fuelquality/index.html>.

by SA Biofuels suggest that to produce 200,000 litres of biodiesel from canola would require 320 ha, or 10% of the area of a 3,300 ha cropping farm (Morgan Hunter, South Australian Biofuels, personal communication). To produce 200,000 litres of biodiesel from mustard would require 625 ha, or 19% of a 3,300 ha cropping property (noting that mustard is more suitable to lower rainfall regions than canola). This technology is now at a point where larger scale demonstration is required to facilitate its uptake.

Recommendation

It is recommended that a *Murray Mallee Biofuel Trial* be undertaken to demonstrate the use of existing technologies to produce biodiesel using oil seed, primarily canola, and identify its potential to meet the future fuel requirements for dryland farmers and opportunities for off-farm sales to generate income.

The deliverables for the project would include a series of information sheets, available for uploading on the SA MDB NRM Board and PIRSA's websites, and field days demonstrating the use of the technology. The project would be developed in collaboration between the RDA and farming systems groups throughout the region.

The project area would focus on those parts of the SA MDB that currently produce canola. Growers further north in the SA MDB should also be encouraged to run a mustard trial given the ability for this crop to withstand warmer and drier conditions than canola.

Key tasks for the project would include:

- Engaging with farming systems groups to deliver the project
- Running a tender to identify who would provide the biodiesel production technology, with the aim of achieving better costings if a group of growers was entering the trial compared with a single grower testing units on their own
- Based on the trials, assess barriers and opportunities for broader adoption
- Review of the role of biofuel production in local energy security

Recommendation

It is recommended that a *Woody Biomass Concept Plan for the SA MDB* be developed to assess the full scale commercial feasibility of woody biomass production in the SA MDB. The objective of the study would be to determine whether there is real, on-ground potential for establishment of a Mallee based biomass industry as has been developed in Western Australia with integrated processing at its core (e.g. energy, biochar, oil).

It would be essential to link development of such a project concept with the work being done by the RDA's (Murraylands and Riverland) Agroforestry Working Group.

The main deliverable from this project would be a feasibility study that can underpin a proposal to Federal and State Government (possibly through Renewables SA) to support the establishment of a biomass industry in the SA MDB (if a favourable business case emerges). While it is argued elsewhere in this Plan that the private sector should lead on-ground change, this approach is required for the biomass industry given the potentially long lead times for revenue generation for

farmers wanting to invest, and because of the strategic importance of such a change in land use, which may be more suited to future climate in the region.

The project area would include assessment of all parts of the SA MDB that currently have been considered for agroforestry. Consideration should also be given to the cost effectiveness of extending such a review into other dryland farming parts of South Australia.

Key tasks would include:

- Stakeholder surveys of the current and potential barriers to private sector establishment of a biomass industry;
- Modelling analysis of infrastructure and transport logistics, recognising capacity of existing transmission networks and prioritised location of processing facilities;
- Mapping study of areas of current low economic productivity on farms that may be suitable for biomass plantings;
- Economic analysis of the viability of an integrated wood processing system;
- Review of the lessons learned from the experience in establishing the Western Australian oil Mallee industry;
- Options for offsetting financial risk associated with biomass plantings through their potential role as carbon plantings that can generate Australian Carbon Credit Units; and
- Sensitivity analysis of the industry to fluctuations in future carbon price.

Specific consideration would be needed to determine what private investor or government support is required to establish the industry given the extended lead times before any revenue is generated. This project would benefit from drawing heavily on the experience of the Oil Mallee industry in Western Australia through organisations like the Oil Mallee Association and the CRC Future Farm Industries.

5 TOURISM

5.1 CONTEXT

Tourism is a significant industry in the Murray-Darling Basin, generating approximately \$10 billion in revenue per annum (Tourism Research Australia 2011b). There are 4 tourism regions overlaying the SA MDB, the Riverland, Murraylands, Fleurieu and Limestone Coast, of which the Riverland and Murraylands regions are entirely within the Basin.

Currently there are 2,000 tourism businesses in the SA MDB generating approximately \$250 million per annum (Tourism Research Australia 2011b). Tourism revenue in the Murraylands and Riverland comprises 4.1% of the total revenue generated by industries in the region (Tourism Research Australia 2011a). The two most popular reasons given by visitors to the regions include “food and wine” and “nature based” experiences (Tourism Research Australia 2010).

The potential impact of climate change on primary industries in the SA MDB means that the regional economy must diversify. Tourism will play an important role in regional economic diversification, as recognised through the stakeholder engagement process run for this project. This is consistent with plans already in place to build the region’s economy (e.g. Murrayland and Riverland Roadmap). Yet projected climate change and the current policy environment brings both challenges and opportunities for tourism.

Recommendations for tourism have already been produced as part of the broader Strengthening Basin Communities project in the SA MDB, in the report titled *Towards 2015 and Beyond, Working with Riverland businesses to grow the visitor economy*, and include:

- New governance structure and operating budget for the local tourism industry;
- Destination marketing of the Riverland region;
- Increased use of the internet by tourism operators to promote their businesses; and
- Increased use of on-line booking systems (e.g. WOTIF, Travel.com.au) by tourism operators.

Further, specific recommendations that also consider climate change impacts are outlined below.

5.2 TOURISM IN A VARIABLE CLIMATE

Recommendation: Prepare for future climate change by developing a *Blueprint for Tourism in a Variable Climate*.

Key issues

On the face of it, a warmer and drier climate *on average* may mean that while summer is less attractive to visitors, the cooler months of the year may become more appealing. However, it is the increased frequency of drought and conditions of extreme heat that pose the greatest challenge. Recent history indicates that tourism is highly susceptible to the impacts or perceived impacts of extreme climatic conditions. Periods of extreme temperatures, reduced river and lake levels below

Lock 1 and perceptions of low river levels further upstream had a major impact on tourism during the drought (Summers *et al.* 2011). This generated negative publicity such as:

- The widely publicised risk of acid sulphate soils developing in Lake Albert;
- River bank collapse from Lock 1 to Wellington;
- Visible deaths and decline in Red River Gum health along the entire river length and its floodplain;
- Photographs of exposed river sand bars published in daily newspapers creating the impression that the River Murray was dry.

One measure of the downturn in tourism was the occupancy of houseboats, the flagship tourism attraction for the region, which dropped from 62% in 2005 to 35% in 2009/10 (pers. comm. Peter Tucker, Houseboat Hirers Association). Such observations were not restricted to the SA MDB, with studies across the Basin by Tourism Research Australia (2010) indicating that overnight visits to the River Murray as a whole declined on average by 2.2 % per annum over the period 1999-2008. This compared to average declines of 1.3% for comparable regions and direct spending reductions of \$351.4 million over the same period.

It should not be forgotten that during the recent drought river flows were the worst on record, resulting in a reduction in end of system flow by more than 68%. This compares with the best estimate of climate change, which predicts a 23% decline in end of system flow on average. This means that end of system flows will not be *permanently* as severe as occurred in the recent drought

Recommendation

It is recommended that a ***Blueprint for Tourism in a Variable Climate*** be developed for the SA MDB. The objective of the Blueprint would be to develop forward thinking on how to build resilience in the region's tourism industry so that it is better able to cope with periods of drought. This includes how to counter negative publicity, much of which is based on perceptions rather than reality, associated with low river levels (as one example).

The main deliverable for this project would be a publically available Blueprint that enables tourism operators and the region to consider how best to manage future climate variability, especially extreme hot weather events.

Key tasks would be to involve tourism operators in scoping strategies to adapt to a range of hypothetical scenarios for future climate, that combine variations in river flow, river height, temperature and rainfall across seasons, assessing:

- impacts or benefits on the region's primary tourism attractions;
- impacts or benefits on visitor experience.

The Blueprint should also build on the interest in food and wine and explore what type of changes will occur in food production, such as an increased diversity of food to adapt to climate change, and determine how best to integrate experiences with food and wine production and natural assets.

5.3 LEVERAGE OFF OF INVESTMENT IN NATURAL ASSETS

Recommendation: Leverage off of the opportunities that will come from renewed investment in natural assets by developing a *Nature Based Tourism Action Plan*.

Key issues

While future climate change may be forecast to increase the incidence of extreme weather events and create a warmer and drier climate, it can be argued that the current policy environment also creates opportunities for tourism given that the two most popular reasons for the region are “food and wine” and “nature based” experiences. The Living Murray and the development of the Murray-Darling Basin Plan both aim to provide enough water to the river environment to maintain a healthy, working river. It can be argued that a “healthy working river” will also protect the long term viability of food and wine production in the region.

Critical in the Murray-Darling Basin Plan reforms will be a commitment to increasing the frequency of small (35,000 ML/d to 60,000 ML/d) and medium (65,000 ML/d to 90,000 ML/d) flood flows of suitable duration to maintain the biodiversity of flora and fauna that enhance nature based tourist experiences. These experiences include bird-watching, bushwalking, canoeing, photography, fishing, hunting and yabbing. It is not yet clear how the Murray-Darling Basin Plan will address this need, although the minimum quantum of water sought for the environment (3,000 GL) has the capacity to enhance the frequency of flood flows.

In addition, the focus on icon sites under The Living Murray program will continue to protect the highest biodiversity areas in the region such as the Chowilla Floodplain, where several environmental flow regulators are planned to enable managed flooding during low flow periods in the river. Hence, tourism development strategies can be built with some confidence that a reliable water level can be maintained along the entire length of the River Murray in South Australia, and biodiversity will be enhanced and maintained in the long term.

There are also other initiatives like the Federal Government’s Biodiversity Fund that is part of the Clean Energy Plan, which will create financial incentives to “support landholders to undertake projects that establish, restore, protect or manage biodiverse carbon stores.” This will provide further incentive to protect and maintain the natural assets of the region with potential for tourism upside.

Recommendation

It is recommended that the region develop a ***Nature Based Tourism Action Plan*** that will determine how to best leverage off of future investment in natural assets across the SA MDB. The region has an opportunity to capitalise on its natural assets before the full effect of climate change is felt given that there is investment currently occurring in the region’s natural assets while climate change impacts will be experienced in full for some decades.

Key tasks for the project will include:

- A review of where conservation and environmental management programs will be focussed. For example, The Living Murray has an emphasis on icon sites, which in South Australia includes the Lower Lakes and Coorong and the Chowilla Floodplain. This means that an area such as Chowilla could be a potential focus for future environmental watering events and will benefit from water management infrastructure such as the proposed Chowilla Weir.
- Assessment of what additional measures may be required to protect natural assets that have tourism potential in the face of climate change. For example, the Adaptation and Emerging Opportunities Workshops suggested that isolated parks such as Billiat have the potential for greater visitation but potential threats such as fire require greater control.
- Analysis of the potential for regional authenticity developments combining food, wine and the environment.

6 THE RESPONSE OF LOCAL GOVERNMENT

6.1 CONTEXT

There are many aspects of Local Government operations that can be impacted by climate change and various adaptation measures have been identified either at a broader national scale (summarised in Attachment D based on SMEC 2009) or for individual Councils through projects such as the Local Government Association Mutual Liability Scheme (LGA MLS) Climate Adaptation Program (CAP). The following five steps were found in the LGA MLS CAP project to be critical to Councils implementing a '*comprehensive climate-resilient strategy*' at local or state wide level -

- Create an inclusive local community effort.
- Recognise the different roles for each stakeholder, including all tiers of government, community, business and individuals.
- Define current and target priorities for adaptation measures.
- Address existing obstacles to implementing adaptation measures, such as, policy, organisational capabilities and legislative barriers.
- Encourage sufficient funding from State and/or Federal governments.

While the project examined climate change adaptation issues as they related to local government and sought the views of Local Government officers on the main climate change adaptation actions that needed to be taken, the dominant themes were in relation to planning and facilitating uptake of sustainability measures that in many ways contribute toward building a low carbon community.

Policy Direction Discussion Paper

The Horticultural and Rural Lands Review was one of the main deliverables of the Climate Change Adaptation component of the broader Strengthening Basin Communities project. Its aim was to:

- Undertake an analysis of statutory policy activities and gaps drawn from current Development Plan Amendments (DPAs), Section 30 Reviews and other planning processes;
- Determine where further statutory planning policy is required and where planning policy opportunities exist.

The Review produced a Policy Direction Discussion Paper that recommended that a number of issues be addressed including how to provide flexibility in land use planning and accommodate future land use trends under predicted climate change scenarios. The Paper also proposed guiding principles to shape the development of future policy relating to climate change Development Plan initiatives. The full Discussion Paper is not elaborated on further in this Plan and can be found at <http://www.samdbnrm.sa.gov.au/Water/StrengtheningBasinCommunities.aspx>.

6.2 PLANNING FOR RESILIENT COMMUNITIES

Recommendation: Local government can assist and guide proponents of new projects that emerge in response to the need for climate change adaptation by developing a *Planning for Climate Change Information Kit*.

Key issues

When asked at the workshops conducted to assess adaptation options “How can Local Government strategic and business plans support diversifying industries” many participants focussed on planning related responses, although these varied as to whether planning would help or hinder development. On one hand planning was seen as an opportunity to ensure that land use change is consistent with the values of the community, meets the legislated requirements of state government and facilitates innovation, while on the other hand planning regulations were seen as too complex, too stringent and acting as barriers to innovation.

The primary production workshop also specifically tackled people’s expectations of Local Government regarding land use change. It was put to the workshop that “*Carbon farming activities, like biomass production and tree planting constitute changes in the land use under the Development Act. If large scale land use changes generate significant numbers of development applications, what will the business and farming community be looking for from Local Government?*”. The responses indicated that people would be seeking:

- clarification of what constitutes a change of land use;
- interpretation of the Development Act and Development regulations;
- consistency of decisions from Local Government across the SA MDB;
- fast tracking of applications given the potentially competitive funding environment for activities like carbon farming. It was noted that a precedent had already been set for this regarding dredging practices during the recent drought.

Recommendation

It is recommended that a *Planning for Climate Change Information Kit* be developed to improve the ability for people lodging applications for a range of land uses (e.g. carbon plantings, renewable energy), to understand how planning guidelines will be applied to their proposed activity and the potential timeframes for review. A Kit such as this would address requests by stakeholders that planners inform applicants as well as regulating activities. This assistance was considered important to ensure that the region does not miss out on Federal Government funding (especially for carbon farming activities) because “red tape” slows down the approval process.

The deliverables for the communications kit would be a series of web based and hard copy fact sheets that would be made available in Council offices across the SA MDB, the NRM Board and the RDA. The fact sheets would identify the:

- types of activities that constitute a change in land use;
- steps and timeframes for an assessment;
- specific planning issues in relation to renewable energy projects such as solar and wind

- specific planning issues in relation to carbon and biodiversity plantings, including any exclusion zones for carbon forestry.

Key tasks to develop this project would be to:

- seek agreement on the common planning approaches that apply across the region, and identify what council specific issues exist;
- review all potential land use changes and map out the planning assessment processes that would apply to consider recent state government legislative changes regarding assessment requirements for wind farms; and
- determine how to best leverage off existing information for land capability, such as rainfall, temperatures and soil.

In addition to the 11 Councils of the SA MDB, this initiative would best be done as a joint project together with the Local Government Association, South Australian Department of Local Government and Planning and possibly the Planning Institute of Australia because of the broad applicability of the deliverables.

Recommendation

It is recommended that a *Capacity and Skills Assessment for Local Government Planning* be conducted for the region. This is prompted by concerns that there will be increasing pressure on Local Government planners to assess a variety of proposals relating to renewable energy (e.g. wind farms), land use change from cropping to carbon plantings and other requests to change zones. The objective of the assessment would be to understand the potential capacity and skill constraints faced by Local Government planners and identify ways that these could be addressed. This will become increasingly important if planning applications increase after 1 July 2012, when the carbon price takes effect.

The main deliverable of the project would be a report to the Councils of the SA MDB as well as other key stakeholders such as the Local Government Association, Murray Mallee LGA and the Planning Institute of South Australia. The report would need to identify funding opportunities and propose what new arrangements are required to address any potential capacity and skills constraints.

Key tasks would include:

- review of potential new developments in Local Government areas across the SA MDB, drawing on the *Local Energy Security Strategy* (Section 4.2) and the *Planning for Climate Change Information Kit* (Section 6.2);
- undertaking work flow mapping based on multiple forecasts of future potential development in the region, noting that significant new investment could be proposed for the region in the years following the initiation of carbon pricing in Australia;
- identifying the current capacity to process applications within targeted timeframes and identification of factors that may influence this;
- considering provision of support for enforcement of compliance to allow staff to direct more time to assessment of applications.

6.3 DECISION SUPPORT FOR ASSESSING LAND USE CHANGE

Recommendation: Provide decision support for local government planners and landholders by developing a *Decision Support Tool for Land Use Change for Carbon Sequestration*.

Key issues

With the Clean Energy Bill 2011 recently being passed by Federal Parliament, investment in carbon farming is expected to significantly increase in the latter half of 2012. Given restrictions on commercial forestry in the high rainfall areas of the Mount Lofty Ranges under the Natural Resources Act 2004 and associated Water Allocation Plans, (including draft EMLR WAP), the River Murray and Mallee regions may potentially attract a significant increase in investment in carbon farming enterprises.

The CSIRO has undertaken foundational work by modelling land use change under a range of prices on carbon for four climate change scenarios within the entire Murray-Darling Basin. The model predicts relative changes in agriculture (food production), biomass, biofuels and biodiversity plantings, when constrained by risks such as impacts on water resources, river salinity, dryland salinity, biodiversity (from a monoculture) and soil erosion; while also assessing benefits relating to economic returns, green house gas abatement, bio-energy generation potential and biodiversity (from environmental plantings).

Recommendation

It is recommended that a *Decision Support Tool for Land Use Change for Carbon Sequestration* be developed for landholders and Local Government Development Assessment. The objectives of the tool would be to:

- Provide guidance to landholders considering land use change to sequester carbon, including bio-mass (including commercial forestry under Development Act 1993), bio-fuels and biodiversity plantings with respect to risks and financial benefits under a carbon pricing scheme;
- Increase the knowledge of Council planners with respect the benefits and risks associated with commercial forestry, in particular for carbon farming purposes.
- Provide an interactive web-based tools and training in use of this resource to enhance the:
 - capability of farmers to assess the benefits and risks associated with land use change for carbon sequestration and
 - skills of Council planners in assess the risks associated with commercial forestry (in particular, carbon farming) development applications

The deliverables for the project would be:

- An interactive web based tool to assist land holders and Councils within the SA Murray-Darling Basin to assess the impacts and benefits of changes of land use associated with a price on carbon, building on the existing CSIRO modelling.
- Development and delivery of a training package (1/2 to full day workshop) for SA MDB landholders and Local Government/State Government planners to enable interpretation and application of the Decision Support Tool.

A pilot project would be established within the SA MDB NRM Board area, including all Councils that are located either entirely or partly within the SA MDB NRM region, with a view to extending the decision support tool across South Australia and interstate.

Key Tasks would be to:

- Identify all NRM and landscape issues that may be either negatively or positively impacted upon by land use change for carbon sequestration, including biomass (includes commercial forestry under Development Act 1993), biofuels, food production and biodiversity plantings.
- identify and collate all spatial data necessary:
- gain a suitable understanding of the identified NRM and landscape issues
- assess risks and other implications associated with land use change for carbon sequestration
- together with key stakeholders agree on climate change scenarios, land uses and indicators for input into the model;
- build upon the existing CSIRO model, updating and broadening data sets, to pre-calculate risks and benefits associated with land use change for carbon sequestration under a range of carbon prices, for each cadastral boundary within the project area. The model outputs will be represented as a series of graphs and dash boards as indicators of the relative risks and benefits associated with each land use.
- develop a framework for the assessment of the commercial forestry applications for local government that takes a risk management approach and provides options available within the statutory planning context to mitigate those risks. Where appropriate these options should be conveyed in wording suitable for inclusion as a condition of development consent.
- provide a worked example of the application of the Decision Support Tool for landholders and local government.
- develop and deliver four 1/2 to full day workshops at two locations within the SA MDB region to provide landholders and planners training on the application and interpretation of the Decision Support Tool.

Project Partners could include CSIRO, Local Government, SA Murray-Darling Basin NRM Board, Regional Development Australia, and Department of Environment and Natural Resources.

6.4 DEVELOPING A WORKABLE CONCEPT OF LOW CARBON COMMUNITIES FOR THE SA MDB

Recommendation: Develop a workable concept of low carbon communities for the SA MDB through development of a *Green Town Concept Plan*.

Key issues

The Opportunities Discussion Paper for this project (Kellett *et al.* 2011) raised the concept of low carbon economies, which have minimal output of greenhouse gases to the atmosphere. Elements of a low carbon economy include:

- waste minimisation by reducing, reusing and recycling;
- energy production using renewable sources;
- meeting local needs through local production where practical, including food, materials and energy; and

- industry, governments and individuals are environmentally and socially responsible.

There are examples around the world where communities have already headed down the path to a low carbon economy. For example, after learning that 69% of energy generated from coal was lost in transmission networks, the Local Government in Woking (a town of about 60,000 people in southern England) formed a partnership with energy companies to come up with a solution. This led to the development of a tri-generation power system in 1990 which burns gas to deliver heating, cooling and electricity achieving an efficiency of 85%. The electricity grid is no longer used, as gas burning units are installed in public and private buildings that instead make use of existing gas networks. Carbon emission cuts of 80% have been achieved.

Ideas on how to move toward a low carbon community are already available for the region (Kellett *et al.* 2011). For example, the Murraylands and Riverland RDA has previously identified numerous opportunities for investment and development for the region. Table 4 identifies these opportunities and then drawing on the work of Booz & Company (2009) and Newman *et al.* (2009) presents some low carbon approaches to these opportunities.

Local Government is well positioned to coordinate the development of a visionary concept for building low carbon communities in the SA MDB. The Federal government has already identified low carbon communities as a priority funding area, with \$330 million available over a 5 year period. The program will:

- provide funding through competitive grants to local councils and community organisations to undertake energy efficient upgrades of buildings, facilities and street lights;
- assist councils and community organisations to reduce their energy costs;
- use the outcomes of successful projects as demonstrations to promote long-term energy efficiency behaviour change in the community.

Recommendation

Drawing on the discussions of the Adaptation and Emerging Opportunities workshops, we recommend that the 11 Councils that supported this current Strengthening Basin Communities project develop a **Green Towns Concept Plan**. The objective of the Concept Plan would be to build on the well established KESAB tidy towns model to develop a strategy on how Green Towns can be established in a regional area like the SA MDB, which presents different opportunities and challenges than experienced in urban areas (e.g. in relation to transport).

The Green Towns Concept Plan would draw on a range of activities that could lead the community toward a low carbon future, such as:

- energy security for towns;
- water sensitive urban design in new sub divisions;
- home carbon rating compliance;
- housing related 'eco specifications' for extreme weather conditions;
- carbon footprinting of council operations as a way to demonstrate such initiatives to the broader community

Table 4. Investment opportunities identified by the Murraylands and Riverland RDA matched with low carbon approaches drawing on the work of Booz & Company (2009) and Newman *et al.* (2009).

Investment opportunity	Low carbon approaches
Education	<ul style="list-style-type: none"> • Train Local Government staff in low carbon concepts and applications. • Include low carbon solutions in environmental science courses in schools, TAFE and universities. • Offer certification courses in low carbon technology (e.g. solar installation) at technical colleges.
Housing and building	<ul style="list-style-type: none"> • Promote solar passive and energy efficient design to reduce energy demand. • Use locally sourced building materials. • Refurbish existing structures to increase energy efficiency. • Design and construct buildings to last for 100s not 10s of years. • Use energy efficient appliances. • Install devices inside houses so that people can easily monitor electricity use.
Food processing	<ul style="list-style-type: none"> • Give preference to locally produced foods. • Use food processing waste for energy production or compost or inputs to other industry. • Use packaging that can be reused or recycled.
Retail	<ul style="list-style-type: none"> • Sell and promote locally produced goods. • Use renewable energy and encouraging development of distributed energy in the region.
Recreation and retirement	<ul style="list-style-type: none"> • Provide local facilities for recreation activities. • In public parks reduce lawn and plant native species to reduce water use and fuel use for water pumping and mowing.
Transport & logistics	<ul style="list-style-type: none"> • Use renewable transportation fuels. • Use rail transport where possible. • Encourage transit oriented development in urban areas that are compact and walkable and serviced by public transport. • Give priority to pedestrians and cyclists in town centres. • Provide services and connectivity to guarantee frequent day and night access. • Provide bicycle paths in urban areas.
Water use and reuse	<ul style="list-style-type: none"> • Install rainwater tanks. • Recycle grey water on site. • Capture and use stormwater at the community scale. • Scale urban water prices to water availability.

The key deliverables for this project would be a paper on how to develop Green Towns in the region and a funding proposal aimed at the Federal Government's Low Carbon Communities program. Actions should be identified in the funding proposal that are capable of being funded as part of a single integrated program or as individual projects in their own right. The proposal should:

- address how the region could host a pilot project as part of the Low Income Energy Efficiency Program⁸;
- identify activities that could attract competitive grants to support business investment in low emissions research and development in the areas of renewable energy, low emissions technologies and energy efficiency;
- consider a broader array of funding sources, for example, the Federal Government's Water for the Future initiative includes the National Water Security Plan for Cities and Towns program, which supports communities with fewer than 50,000 people by funding practical projects that save water and reduce water loss.

While the Concept Plan should have broad applicability across the region, it is suggested that it be developed with a focus on two specific towns in the region. Energy efficiency should also be a strong emphasis not just because it is important to future adaptation, but because it's the only key focus area under the Clean Energy Plan that is not sufficiently targeted elsewhere in this Plan.

Specific tasks would include:

- Review of current sustainability measures already being adopted in Council areas across the region;
- Documentation of Council programs and funding sources;
- Barriers to adoption of sustainability measures observed to date;
- Assessment of whether sufficiently skilled professionals exist in the region to help with a transition toward greater energy efficiency in general, both in terms of energy efficiency assessors and skilled trades people with knowledge of how to source and install new technologies; and
- Stakeholder interviews to determine the most effective way of Council supporting low income households to access energy efficiency funding.

The Federal Government's Clean Energy Plan has identified the Australian Centre of Excellence for Local Government (ACELG) as convening the Local Government Climate Change Roundtable, which it states "plans to do further work to identify and disseminate new thinking and initiatives on climate change by Local Government." It is recommended that the 11 Councils consider partnering with the ACELG as well as the LGA in developing this concept.

⁸ The Low Income Energy Efficiency Program will provide grants to pilot approaches that assist low income households to reduce their energy costs.

7 COLLABORATION, COORDINATION AND LEADERSHIP

7.1 CONTEXT

There are many examples of where collaboration between various entities (government, business, community) is being used to develop and implement strategies to adapt to future climate change.

For example, the Eyre Peninsula Regional Sector Agreement has been established to:

- undertake integrated adaptive option assessments for the Eyre Peninsula
- assess and identify economic opportunities for the Eyre Peninsula relating to climate change
- develop knowledge through science and research
- develop and implement a broad-scale community education and behavioural change program
- develop and implement a climate change plan for the region.

The partners to the agreement are the Minister for Sustainability and Climate Change, the Eyre Peninsula Natural Resources Management Board, Regional Development Australia – Whyalla and Eyre Peninsula and the Eyre Peninsula Local Government Association. This is one of a number of Climate Change Sector Agreements that exist in South Australia, which encourage actions like:

- improving energy efficiency;
- promoting the use of renewable energy;
- supporting research, development and innovation in technologies or practices; and
- identifying opportunities to adapt to climate change.

Elsewhere in Australia there is evidence of other collaborative ventures such as the South East Councils Climate Change Alliance⁹ in Victoria, which is a partnership across 8 Councils. It has existed since 2004, implementing a variety of projects with aims such as reducing agricultural emissions and developing carbon sinks. There is also the Regional Climate Change Program developed by the 14 Councils across the Hunter, Central and Lower North Coast region of NSW¹⁰ which to date has conducted risk assessment, developed adaptation plans and facilitated information sharing.

7.2 COLLABORATING TO CREATE A CLIMATE FOR CHANGE

Recommendation: The region can collaborate to create a climate for change by developing a formal *Climate Change Adaptation Alliance* and an *Adaptive Communities Innovation and Communications Plan*.

The SA MDB will face increasing pressure in the future to adapt to climate change. It will also be presented with an increasing number of economic opportunities as there is a national and international shift toward low carbon economies. New projects will be required in response to both drivers that require skilled people with relevant, innovative ideas and an ability to weigh up business risk, to work together. Strong, continued collaboration, coordination and leadership across the region will create a climate for investment.

⁹ <http://www.seccca.org.au/>

¹⁰ <http://www.hccrems.com.au/Programs/Climate-Change/Climate-Change-Overview.aspx>

There is demand for continued collaboration, coordination and leadership in the region to facilitate adaptation to climate change. This was expressed during the project through the stakeholder engagement process and during the Adaptation and emerging Opportunity workshops. For example, the stakeholder engagement process found that:

- Whole of region adaptation - There is a widespread need for industries and communities to engage in planning and implementing an integrated approach to climate change across the region.
- Leadership - Adaptation can best be achieved by a leadership model with capacity to link all levels of Government and the ability to evaluate a wide range of existing and alternative industries. Leadership elements will include a long term commitment and presence in the region to assist the region to adapt with confidence.

Recommendation

It is recommended that major stakeholders across the region from government, industry and community consider the establishment of a formal *Climate Change Adaptation Alliance* for the SA MDB. This could be progressed by formalising the existing arrangement around the current project or by development of a Discussion Paper. The latter approach is recommended given the need for considered consultation in its development.

The objective of a formal alliance would be to:

- Present a coordinated vision of climate change adaptation that encourages investment in the region;
- Reduce duplication of effort as various regional entities determine what role they should play in facilitating climate change adaptation in coming years;
- Acquire funding to support climate change projects that seek to maintain revenue streams in the primary production sector but also diversify the regional economy into opportunities related to renewable energy;
- Provide credible information and raise awareness about all aspects of climate change, using local examples;
- Support research and evaluation of the suitability of existing and alternative industries;
- Facilitate skills and development training across Local Government and industry.

The key tasks required to develop an alliance would be to:

- analyse the learnings from operation of the existing consortium structure;
- identify potential additional partners in the alliance;
- explore potential working models, from loose to more formal collaborative agreements such as a sector agreement;
- analyse what climate change adaptation project partners want to pursue and what structure best supports these objectives;
- analyse resources required to sustain an effectively functioning alliance; and
- engage with community and extension networks (e.g. LAPs) that can provide further connections with on-ground action.

An alliance could be a standalone initiative seeking to coordinate activities across the region or be established for the specific purpose of continuing to support another major, strategic project that arises out of this current project.

Establishing a collaborative alliance for the region will provide greater chances for accessing current or future funding opportunities through Regional Development Australia, under the Clean Energy Plan or other government initiatives as well as provide a focal point for organisations wanting to invest or develop new projects in the region.

Recommendation

Knowledge about the potential implications and impacts of climate change on systems is essential to the development of well informed responses to climate change in the SA MDB. There is a considerable storehouse of knowledge on adaptation already in the region. This provides a foundation for the development of a more systematic approach to generating new insights into climate change and how we might manage it. As we seek to adapt it is vital that we learn from experience by carefully evaluating what we do, to both improve outcomes in the future and demonstrate the value of our efforts. Fostering the development of adaptive communities that have access to the latest knowledge and embrace innovation will be crucial in the years ahead.

It is recommended that the region:

- Build on the existing consortium of Councils and the SA MDB NRM Board involved with this project and develop an Adaptive Communities Innovation and Communications Plan in collaboration with researchers. This could include:
 - Preparation of a climate change adaption action, monitoring and evaluation plan;
 - Preparation of an adaptive communities research and development priorities strategy;
 - Establishment of an Adaptive Communities web portal for knowledge sharing, skill development and networking.
 - Development of an Adaptive Communities capacity building program.

8 DISCUSSION OF RECOMMENDATIONS

This plan identifies recommendations that can be implemented to help the region adapt to climate change. The recommendations cover a diverse range of actions focussed on:

- increasing the ability for the primary production sector to adapt to future climate change,
- help the region to diversify its economy through increased emphasis on renewable energy and tourism
- further describing the potential role of Local Government as a facilitator of climate change adaptation

A summary of the actions and potential partners and funding opportunities are provided in Table 5.

The highest priorities for action are for the projects that could access funding from the Carbon Farming Futures Fund and the multiple funding sources related to energy efficiency and low carbon communities.

There are two recommendations that could potentially access funding from the Outreach and Extension component of the Carbon Farming Futures Fund (CFF). Funding rounds have already opened for the first 2 rounds of CFF funding and the outreach and extension component is likely early in 2012. As such, further project scoping and confirmation of potential partners should commence in January 2012.

Preparing to access the multiple funding sources related to energy efficiency and low carbon communities requires some further scoping once the project partners are confirmed. While there may be opportunities for individual Councils to identify one off sources of funding, there is likely to be a greater chance of success if a larger integrated concept is developed for the region. This would benefit from consideration of state wide actions that the LGA itself may coordinate.

Consideration should also be given to joining project development processes that are already underway through other organisations. For example, the Local Government Association is currently considering the Low Carbon Communities program to fund retrofit activities in public lighting in South Australia and is exploring the potential for biodiversity funds to undertake a number of pilot projects on local government land.

Table 5. Summary of recommendations and potential partners and funding opportunities.

Recommendation	Potential partners	Funding
Primary Production		
Primary Producer Leadership Grant for Climate Change Adaptation	Leadership training organisation (e.g. Leadership Institute of South Australia, PIRSA's South Australian Rural Leadership Program); RDA; SA MDB NRM Board; PIRSA	May require proposal of a new initiative to PIRSA, DAFF or the SA Premier's Climate Change Council.
Land Holder Information and Action Kit	DENR, SA MDB NRM Board, RDA, AgExcellence Alliance, Farming systems groups, Environment Institute	Carbon Farming Futures - Outreach and Extension Funding. This funding is likely to be available early in 2012
Primary Producer Support Network Communications Strategy	DENR, SA MDB NRM Board, RDA, AgExcellence Alliance, Farming systems groups, Environment Institute, chambers of commerce	Carbon Farming Futures - Outreach and Extension Funding. This funding is likely to be available early in 2012
Food Plan for the South Australian Murray-Darling Basin	RDA, SAFF, PIRSA, SARDI	May require a proposal to be developed for consideration of either the Department for Sustainability, Environment, Water, Population and Communities (as part of Water for the Future reforms) or Department of Agriculture, Forests and Fisheries (under their mandate to develop the National Food Plan).
Renewable Energy		
Electricity Reliability Enhancement Project	Australian Energy Market Commission's Consumer Advocacy Panel and the LGA	No current funding opportunities identified but a proposal could be developed between the LGA and Local Government.
Review of Natural Gas availability in the SA MDB	11 Councils of the SA MDB, LGA, RDA	Regional Development Australia Fund
Bioenergy Roadmap	11 Councils of the SA MDB, LGA, RDA, Industry Associations	SA Renewable Energy Fund
Community Energy Efficiency Projects	11 Councils of the SA MDB	Community Energy Efficiency Program
Food Value Chain Energy Efficiency Best Practice Project	11 Councils of the SA MDB, LGA, RDA, Industry Associations	Energy Efficiency Information Grants program and the Clean Technology - Food and Foundries Investment Program
Community Engagement Strategy for renewable energy in the SA MDB	11 Councils of the SA MDB, LGA, Murray Mallee LGA, Renewables SA	No current funding opportunities identified, although it will require support from Local Government.

Recommendation	Potential partners	Funding
Murray Mallee Biofuel Trial	RDA, DENR, Renewables SA, ARENA	ARENA or Australian Centre for Renewable Energy. ARENA is still being established, however, the Department of Resources, Energy and Tourism can be contacted to determine status of current programs.
Establishing a wood biomass industry in the SA MDB	RDA, DENR, Renewables SA, ARENA	ARENA or Australian Centre for Renewable Energy. ARENA is still being established, however, the Department of Resources, Energy and Tourism can be contacted to determine status of current programs.
Tourism		
Blueprint for Tourism in a Variable Climate	RDA, South Australian Tourism Commission, tourism industry associations from across the region	Funding programs through the Department for Regional Australia, Regional Development and Local Government (e.g. Regional Development Australia Fund). Need to clarify funding opportunity between the South Australian Tourism Commission and Department for Regional Australia, Regional Development and Local Government
Nature Based Tourism Action Plan	RDA, South Australian Tourism Commission, tourism industry associations from across the region	Funding programs through the Department for Regional Australia, Regional Development and Local Government (e.g. Regional Development Australia Fund). Need to clarify funding opportunity between the South Australian Tourism Commission and Department for Regional Australia, Regional Development and Local Government.
Local Government		
Planning for Climate Change Information Kit	11 Councils in the SA MDB, LGA, MMLGA	This may require a proposal to be developed for consideration of the LGA or SA Department of Planning and Local Government
Capacity and Skills Assessment for Local Government Planning	11 Councils in the SA MDB, LGA, MMLGA	Opportunities may exist with the Department of Education, Employment and Workplace Relations (e.g. Skills for the Carbon Challenge initiative).
Decision Support Tool for Land Use Change for Carbon Sequestration	11 Councils in the SA MDB, LGA, MMLGA, SA MDB NRM Board, CSIRO, Environment Institute	Carbon Farming Futures - Outreach and Extension Funding. This funding is likely to be available early in 2012

Recommendation	Potential partners	Funding
Green Towns Concept Plan	11 Councils in the SA MDB, LGA, MMLGA, Australian Centre of Excellence for Local Government	Multiple possible funding sources (e.g. Energy efficiency grants to SMEs and community, Clean Technology Program organisations, Low Carbon Communities, Clean Energy and Other Skills Package). There are multiple possible funding sources that can mature the Green Towns Concept. It would be preferable to have an integrated plan upon which multiple funding applications are based.
Collaboration, coordination and leadership		
Formal climate change adaptation alliance	11 Councils of the SA MDB, SA MDB NRM Board, RDA	Would require commitment from potential partners to the alliance and then would be used as a governance vehicle to coordinate and manage various funding applications.
Adaptive Communities Innovation and Communications Plan	11 Councils of the SA MDB, SA MDB NRM Board, LGA, MMLGA, Environment Institute	Clean Energy Future funding available to NRM Boards for climate change sensitive NRM planning.

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ATTACHMENT A - KEY FINDINGS OF THE STRENGTHENING BASIN COMMUNITIES CLIMATE CHANGE ADAPTATION PROJECT

The Strengthening Basin Communities Climate Change Adaptation Project has been undertaken as a series of sub-projects progressing from an audit of current knowledge and literature, through to an impacts assessment, options analysis and finally this Adaptation and Emerging Opportunities Plan.

Key findings from the major sub-projects are as follows:

1. Climate Change Scenarios

- The study region like the rest of Southern Australia is expected to be warmer (high confidence) and drier (lower confidence). By 2030 the region shows a warming of between 0.5 to 1.3 degrees C with the mid range model showing 0.8 degrees. At 2030 the range in warming is due to different models and is not very sensitive to the emission scenarios. By 2070 there is a greater influence of emission scenarios (whether greenhouse gases are greatly increased or stabilised). Under medium emission scenarios the projected warming is 1.8 degrees with a range or 1.3 to 2.8 degrees.
- The most likely future is a drier future, but there is considerable uncertainty between models and considerable debate within the scientific community on the appropriate level of confidence to place on projected drying compared to the projected warming.

2. Outcomes of Stakeholder Engagement

- There is widespread awareness about the general concept of climate change, which is understood as a phenomenon that will drive warmer temperatures and lower rainfall across the SA MDB.
- There is recognition that extreme weather events are the most difficult to plan for and therefore provide the most difficult and most costly management challenges. This will be a key consideration of planning for climate change.
- There is a consistent view that irrigation and dryland farming will be the industries impacted the most by warmer and drier conditions under future climate change. This will have flow on impacts to the community and Councils.
- There is a widespread need for communities and industries to engage in planning and implementing an integrated approach to climate change across the whole region.
- Adaptation can best be achieved by a leadership model with capacity to foster connections between all levels of Government and the ability to evaluate a wide range of existing and alternative industries.
- Leadership elements will include a long term commitment and presence in the region, development of credible information resources and support to enable industries and communities to make decisions with confidence.

3. Opportunities Discussion Paper

- There is evidence that adaptation to climate change and seasonal variability is already happening in South Australian Murray-Darling Basin. Selecting new crop varieties and changes to road maintenance are two examples.

- One avenue for adaptation is to move toward a low carbon economy. There are some issues to consider with respect to low carbon economies such as: (1) Carbon pollution is increasingly taxed or traded across the world, (2) Fossil resources for agriculture and energy production, which are primary sources of carbon pollution, are becoming more scarce (3) Peak production of phosphorus is projected for 2040-2050, peak oil for between now and 2015, peak coal for between now and 2048, and peak natural gas for 2030, (4) beyond peak production, competition will drive resource prices higher until alternatives become feasible.
- In developing strategy and actions for adapting to the effects of climate change, Local Government can consider vulnerability and risk management frameworks, community perspectives and existing climate change adaptation initiatives including the Local Government Association Mutual Liability Scheme (LGAMLS).

4. Horticultural and Rural Lands Review Policy Direction - Discussion Paper

The high priority recommendations are:

- Promote one primary production zone (rather than a combination of horticulture, rural and primary production zones).
- Allow second dwellings in rural areas within existing homestead sites, while
- ensuring land division around the second dwelling is non-complying.
- List wind / solar farms (and other alternative energy sources) as envisaged uses in primary production zones.
- Ensure site management plans are required for intensive animal keeping and horticulture activities.
- Identify and map locations in Development Plans of key NRM relevance (Eg Ramsar and prescribed areas), Consider aligning map data/titles with Department of Environment and Natural Resources language and criteria (ie Areas of High Environmental Significance). An alternative position is to include this information in Regional NRM Plans and by way of Regulation 14 of the Development Plan and Section 29 of the Development Act, ensure Council's Development Plans refer to the regional NRM Plans.

5. Climate Change Impact Assessment Report for the SA Murray-Darling region

- Warmer and drier conditions will reduce yield of crops and quality of fodder in dryland farming regions across the SA MDB and increased temperatures and heat stress may reduce animal productivity.
- A warmer and drier climate in major catchments for the Murray will result in less water entering storages and ultimately lower allocations to irrigators.
- Higher maximum temperatures can negatively influence fruit set, taste, colour and the rate of ripening for fruit crops. Conversely, higher minimum temperatures can reduce the number of days that frost is experienced and hotter and drier conditions could reduce the spread of some diseases.
- Warming and drying (and reduced water allocations for irrigation) will reduce productivity from current agricultural practice. The size of this potential decrease can be significantly reduced and overcome with better adapted practices and varieties.
- Climate change may result in a change in the area of land under different production systems. For dryland farming, this could mean less cropping and increased grazing.

- The area of irrigated crops is likely to reduce as water is traded from lower to higher value production systems. The likely decrease in water allocation for irrigation will also reduce the area irrigated but total productivity from irrigated activities need not decline and could potentially increase with greater productivity from a smaller total area.
- Alternate land uses in the SA MDB are unlikely to threaten food security for the region, South Australia or Australia, but the region may see a shift in current agricultural practices.
- Biofuel and biomass agriculture can provide significant economic benefits. However, their economic viability is driven largely by whether there is a price on carbon emissions and how high this price is.
- While planting trees for carbon could generate some income and other environmental benefits it is likely to be much less profitable than biofuels and biomass.
- The impact of climate change on ecosystem services such as amenity values for tourism should not be underestimated as they can have a real impact on local economies beyond the bounds of traditional agriculture.
- Water trading has induced water savings on one hand but increased activation of existing licences on the other and reduced return flows. Based on experience during the recent drought, water trading stands to be an important tool for adapting to variable water supplies in the future.

ATTACHMENT B - WORKSHOP QUESTIONS

Workshop 1: Tourism, Renewable Energy, Industry and Manufacturing

Session 1 - How can the region build resilience and adapt to climate change?

1. The drought brought with it perceptions about the state of the region – whether that be low river levels or regional towns and food producing areas that were too hot to visit. How in the future can the region better prepare for drought and a changing climate?
2. How would you identify and promote new industries where alternative water resources exist or can be made available?
3. Stakeholder engagement for the project suggested that without adaptation, the region's most important industry, primary production, will be the most impacted by climate change. How can the establishment of other industries be supported to diversify the region's economy?
4. What is the support required for water dependant businesses wishing to stay in the industry during drought conditions and in the longer term?

Session 2 - Support for emerging industries

1. The Clean Energy Plan will provide billions in funding for renewable energy and energy efficiency projects. For example, the \$330 m low carbon communities program will provide funding to local councils and community organisations to undertake energy efficient upgrades of buildings, facilities and street lights. What type of renewable energy and energy efficiency initiatives generated from within the region can provide part of the response in the SA MDB?
2. How can Local Government strategic and business plans support diversifying industries e.g. tourism, alternative energy, local hi-tech and knowledge based businesses?
3. How could millions of dollars in Federal Government support help diversify the region's economy?
4. What processes or activities would be needed to establish the viability or support the expansion of emerging industries like renewable energy?

Session 3 - How can the region take advantage of emerging opportunities to adapt to climate change?

1. How can the region better prepare for the anticipated emerging industries and trends in land use change under predicted changing climatic conditions?
2. What support is required from State and Local Governments, Regional Development Boards etc to take advantage of these opportunities?
3. How can the region position itself to take advantage from emerging opportunities?

4. What attributes can the region promote to take advantage of the adaptive changes that will come from climate change responses?

Workshop 2: Primary Production – Sustaining Irrigated Horticulture and Dryland farming, including diversification

Session 1 - How can the region build resilience and adapt to climate change?

1. How can the region build on existing experience with responding to natural variability?
2. Potential alternative farming systems (e.g. crops, animal enterprises) have been identified for irrigated and non-irrigated areas. Is there interest in the region in exploring alternative farming systems? Is this a priority for industry, government or other stakeholders?
3. What processes would be needed to establish the viability of alternative farming systems?
4. What did primary producers learn during the recent drought (e.g. role of water markets, importance of alternative income streams) that will be of greatest benefit to adapting to future climate change?

Session 2 - Transforming the landscape - Options for land use change?

1. How could millions of dollars in Federal Government support, such as for carbon farming, change primary production in the region?
2. Activities like biomass production and tree planting to sequester carbon are increasingly being considered as complementary/alternative land uses in the region. What are the likely impediments (social, structural and institutional) that will limit uptake of carbon farming opportunities?
3. Carbon farming activities like biomass production and tree planting constitute changes in land use under the Development Act. If large scale land use change generates significant numbers of development applications, what will the business and farming community be looking for from Local Government?
4. How can Local Government strategic and business plans support diversification in farming systems?

Session 3 - How can the region take advantage of emerging opportunities to adapt to climate change?

1. How can the region better prepare for the anticipated emerging industries and trends in land use change in response to climate change policy?
2. What support is required from State and Local Governments, Regional Development Boards etc to take advantage of these opportunities?

3. What is the support required for water dependant businesses (both dryland and irrigated land uses) wishing to stay in the industry during drought conditions and in the longer term? This can include support required over and above on-farm solutions.
4. How can the region position itself to take advantage of emerging opportunities and funding programs?

ATTACHMENT C – LOCAL ENERGY SECURITY STUDY

Attached as a separate document.

ATTACHMENT D - CLIMATE CHANGE ADAPTATION MEASURES FOR COUNCILS (ADAPTED FROM (SMEC 2009)).

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS	IMPACT AND POSSIBLE ADAPTION ACTIONS
Infrastructure and property services		
<p>Infrastructure and property impacted by changing temperatures, rainfall intensity and greater bushfire risk</p>	<ul style="list-style-type: none"> • Changes in building heating/cooling costs (can be either negative or positive). • Increased risk of damage from bushfires. • Changes in frequency of wind, rain, hail, flood, storm events and damage, potentially resulting in destruction. • Higher rates of building deterioration and associated maintenance costs. 	<p><u>All climate change impacts:</u></p> <ul style="list-style-type: none"> • Showcase best practice in climate sensitive building design in public buildings. <p><u>Temperature increases:</u></p> <ul style="list-style-type: none"> • Design council buildings to allow for ease of future adaptation, e.g. have the ability for significant amounts of shade to be added or removed from a facade. <p><u>Increased temperatures – increased risk of bushfires:</u></p> <ul style="list-style-type: none"> • Risk assessment to ensure new infrastructure is not placed in fire-prone areas. • For those where location is not flexible, investigate standards of construction that reduce their sensitivity to bushfire. <p><u>Increased temperatures/hot spells – increased demand for comfort cooling in buildings, affecting energy consumption:</u></p> <ul style="list-style-type: none"> • Increase use of insulation in new buildings. • Retrofitting existing buildings with addition of insulation materials and effective and efficient cooling systems. • Reduce lighting and equipment loads to reduce overheating.
Recreational facilities		

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS	IMPACT AND POSSIBLE ADAPTION ACTIONS
<p>Provision and use of recreational facilities impacted by increased temperatures and decreased overall rainfall and resulting water scarcity</p>	<ul style="list-style-type: none"> • Reduced water quality and quantity resulting in less watering/irrigation of open space and sports grounds and closure of ovals. • Limited water for swimming pools, etc. 	<p><u>Increased temperatures - heat stress:</u></p> <ul style="list-style-type: none"> • Review/prepare design guidelines for street furniture, shelters and awnings, and infrastructure to provide protection, e.g. development of a shade and sun protection policy. • Conduct shade audits to determine the adequacy of existing shade, whether there is a need for more, if appropriately located and of appropriate size. • Include provision of shade structures in design of new council recreational facilities. <p><u>Decreased overall rainfall – impacts on watering requirements for turf sports ovals, open spaces, golf courses etc:</u></p> <ul style="list-style-type: none"> • Train staff on irrigation system auditing and scheduling. • Develop an irrigation plan to identify and reduce existing irrigation levels where possible. • Water controls and management be tailored for specific council areas.
<p>Healthy services</p>		
<p>Community/workplace health impacted by increasing temperature and extreme weather events</p>	<ul style="list-style-type: none"> • Milder winters improving communities’ comfort levels. • Increase in geographical range and seasonality of vector-borne diseases and the possibility for an expansion of receptive zones. • High temperatures increasing incidence of food and water-borne diseases. • Risk of increased cryptosporidium infections during open water swimming in summer. • Health impacts due to exposure to extreme weather, e.g. heatwaves. 	<p><u>All climate change related health impacts:</u></p> <ul style="list-style-type: none"> • Utilise demographic profile and social analysis of council area to assess health vulnerability. • Identify affected communities and needs. • Develop a Public Health Plan that looks at the current health and wellbeing of the communities within the council area and develop • Wellbeing Indicators so that the program can be assessed over future years.

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS	IMPACT AND POSSIBLE ADAPTION ACTIONS
	<ul style="list-style-type: none"> • Extreme rainfall events transporting contaminants into waterways and drinking water supplies. • Increased pressure on drinking water supplies. 	<p><u>Increased temperatures – possibility for increased sunburn/rise in heat stress:</u></p> <ul style="list-style-type: none"> • Shade audits/provision of more shade in public recreational areas. • Reduce the impact of thermal stress via advice on how to stay cool including the use of portable fans, improved ventilation of homes, public buildings, and other residential institutions and workplaces. • Development of community heat emergency management plans. <p><u>Extreme weather events:</u></p> <ul style="list-style-type: none"> • Review local disaster management plans. • Evaluate bushfire risks. • Improve community disaster preparedness and response systems.
Planning and Development Approval		
<p>Planning policy and developments impacted by increased temperatures and reduced rainfall , which influence land use demands</p>	<ul style="list-style-type: none"> • Inappropriate location of urban expansion areas. • Increased uncertainty in long-term land-use planning and infrastructure design, i.e. location of future developments, suitability of infrastructure designs to cope with changing climate, etc. • Cost of retrofitting of systems. • Loss of private property and community assets. • Increase in insurance costs. • Increased pressure on disaster management and response resources. • Early retirement of capital infrastructure. 	<p><u>Increased temperatures – increased risk of bushfire:</u></p> <ul style="list-style-type: none"> • Identify which areas will be more vulnerable to bushfire. • Encourage new developments, or changes to existing developments, to include improved protection and adaptations to increased bushfire risk (bushfire management strategies are largely available). <p><u>Increased temperatures and reduced rainfall – water a more valuable resource:</u></p> <ul style="list-style-type: none"> • Incorporate polices which ensure that the water resource implications of new developments are assessed. • Promote water sensitive urban design at the plan making and development assessment stages of the planning process.

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS	IMPACT AND POSSIBLE ADAPTION ACTIONS
Natural Resource Management		
<p>Biodiversity impacted by changed climatic conditions in general</p>	<ul style="list-style-type: none"> • Shifts in distributions of plant and animal species. • Increased risk of population and species extinctions. • Reduced ecosystem resilience to stress. • Increased ecosystem and species heat stress. • Increases in ecological disturbances. 	<p><u>Changed climatic conditions in general – adversely affecting ecological succession:</u></p> <ul style="list-style-type: none"> • Develop a Local Biodiversity Plan as a component of the Local Planning Strategy and Town Planning Scheme. • Implement conservation management plans for local reserves and other local government lands. • Encourage private land conservation, e.g. through incentives. <p><u>Increased risk of bushfires:</u></p> <ul style="list-style-type: none"> • Take into account the areas at increased risk of bushfire from climate change in the use of prescribed fire as a tool for managing fuel accumulation (recognising that inappropriate fire regimes can potentially threaten the conservation of biodiversity). • Use of fire adapted vegetation (much of Australian vegetation is fire adapted). • Ensure that ‘fire management zones’ have been identified.
Water and sewerage services		
<p>Water supply/provision and water conservation activities impacted by increased temperatures and reduced rainfall making water a more valuable resource.</p>	<ul style="list-style-type: none"> • Changes in mean and peak stream and river flows. • Uncertain water availability. • Insufficient water supply in some areas. • Increased potential for water contamination. • Salination of surface and groundwater supplies. • Changes in availability of groundwater available for 	<p><u>Increased temperatures and reduced rainfall – water a more valuable resource:</u></p> <ul style="list-style-type: none"> • Develop water strategies that incorporate greywater reuse. • Supplement existing supplies with recycled water where possible. • Community education on water efficient garden planting and watering.

ASSETS/SERVICE DELIVERY	POSSIBLE CLIMATE CHANGE IMPACTS	IMPACT AND POSSIBLE ADAPTION ACTIONS
	irrigation.	<p><u>Increased temperatures and reduced rainfall – water a more valuable resource:</u></p> <ul style="list-style-type: none"> • Promotion of use of Sustainable Urban Design Systems (SUDS) and water efficient installations into new developments. • Identification of opportunities to include Sustainable Urban Design Systems in existing developments/infrastructure.

ATTACHMENT E - ACRONYMS

ACELG - Australian Centre of Excellence for Local Government
ARENA - Australian Renewable Energy Agency
CAP - Climate Adaptation Program
CFEC - Clean Energy Finance Corporation
CFI - Carbon Farming Initiative
CTP - Clean Technology Program
DPAs - Development Plan Amendments
EMLR WAP – Eastern Mount Lofty Ranges Water Allocation Plan
LGA - Local Government Association of South Australia
MLS - Mutual Liability Scheme
PIRSA - Primary Industries and Resources South Australia
RDA - Regional Development Australia
RIRDC - Rural Industries Research and Development Corporation
SA MDB – South Australian Murray-Darling Basin