



Cooperative Research Centre
for
**Climate Variability and
Drought Risk Management**

Discussion paper No.2 – Prepared for the national meeting and workshop 18/19
December 2003, Toowoomba

Building Human Capacity and Resilience and Managing the Knowledge Base



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December 2003

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Executive summary

A proposal to establish a world-class centre of expertise in the area of climate variability and risk-management research in Australia by July 2005 is now underway.

This discussion paper is the second of two that have been written to assist workshops of prospective partners and supporters develop an application for a national Cooperative Research Centre (CRC) for Climate Risk Management to be considered in the 2004 round of CRC applications.

As a result of the consideration of the first discussion paper and the first national meeting and workshop held in Kilmore Victoria in November 2003, both dealing with the purpose and directions of the proposed CRC, the interim Steering Committee has made significant progress in articulating its vision and mission, identifying its key stakeholder base, and developing potential research themes into a sound structure. From this platform, the Committee and prospective partners can begin to flesh out its research, education and business strategies. This second discussion paper deals largely with these education and business matters.

The second workshop will be held at the Lords Function Centre, 2 Burnage Street, Toowoomba on the 18th and 19th of December. This discussion paper is intended as background material in support of this workshop.

Where are we at?

The following vision and mission statements have been developed and an outline of the proposed research programs established.

The vision that will inspire and guide the CRC is:

Australians better managing the risks and opportunities of our variable climate.

This vision defines what success will look like at the end of the CRC Programme contract in around 2012

In pursuing this vision, the CRC's mission will be:

To turn climate science into climate and drought risk management strategies to meet the range of needs of Australian industries, communities and ecosystems.

This is a succinct statement of what the CRC intends to do at a strategic level over the seven years of its CRC Programme contract in meeting the vision.

The first workshop identified key research themes and stakeholder clusters that have been aggregated into a structure with three core programs:

- climate risk management for farming, grazing and agribusiness
- climate risk management for natural resources and the environment
- climate risk management for resource/commodity markets.

In addition, three cross cutting programs:

- building human capacity and resilience
- improving social and institutional preparedness
- enhancing climate knowledge and prediction.

The final program would cover the business systems and corporate governance of the CRC.

What does this discussion paper cover?

This discussion paper covers issues that will influence the development of two of the CRC's programs, dealing with building human capacity and resilience (Program One) and the knowledge management aspects of the CRC's business systems (Program Seven) respectively (see section 2).

The first element outlines the dimensions of, and challenges presented to, the education functions of the CRC. The first discussion paper identified that an important role a CRC fulfils is one of fostering the next generation of researchers. This paper proposes options for how the CRC might deal with postgraduate education and training in a way meaningful to the long-term capacity needs of climate risk research. Another important role of the CRC will be to develop the capacity of diverse target audiences integrate the results of the CRC's research into their risk management strategies. Options are also presented in this paper on training strategies the CRC might pursue in the context of this very important role.

The second element deals with knowledge management issues that ensure the country maximises the benefits to be derived from supporting a CRC. The issues discussed in this paper cover potential intellectual property management and monitoring and evaluation strategies.

Initiatives to enable prospective partners to shape the proposed CRC

Participating partners and other stakeholders will be kept up-to-date with developments in the CRC proposal process through discussion papers, workshops, a website, and monthly e-newsletters.

A website is now in operation and will monitor the bid progress over the next year with regular information updates. The site can be found at www.crcclimaterisk.org.au

1. Introduction

If the CRC is to succeed, its education, training, communication, knowledge management and evaluation activities must succeed. For a start, strong strategies in these areas are a must for a business plan to be considered acceptable during the assessment of the CRC's bid. But having strong strategies for the purpose of making the bid successful is only the starting point.

All investors in the CRC will expect that the CRC will derive substantial benefits as a return on their investment. In the case of the CRC Secretariat, its members will be searching for elements of a CRC that will strengthen Australia's research capacity and competitiveness. Industry partners will not just be seeking the development of strategies to manage climate risk better, but will demand that tools flowing from these strategies will be placed in the hands of practitioners. Moreover, they will demand that these practitioners be trained to use these tools to make better decisions. Other investors will expect their research capability to be used to maximum effect, helping, through collaborative arrangements, to fulfil shared goals.

The challenges presented to the CRC's various human capacity building strategies are enormous. These challenges are as much contextualised by deep social, cultural and historical factors as they are by complex atmospheric, landscape, economic and policy considerations. In a land where it would seem axiomatic to manage climate variability as a normal part of everyday practice, we still see so many areas of industry and community coming to grips with dealing with the impacts and nuances of climatic extremes and normal variation.

For this reason, the CRC must build on the opportunities that arise from managing climate risk, as from these opportunities will arise individual, community and industry benefit.

Likewise, the challenges to the CRC's business systems strategies dealing with intellectual property, commercialisation and evaluation and monitoring are as enormous. Australian institutions have not been renowned for their flexibility or ability to learn and adapt quickly. Experience is often viewed as an individual trait, and when aggregated to institutional levels, is hard to make tangible. As such, learning from the collective experiences of many so as to handle future events better as communities, policy agencies, industries and businesses is difficult. Learning how to capture opportunities, how to become resilient by adapting to change, and how to monitor whether or not things are improving is a vital part of risk management.

In this sense, therefore, the business strategies of the CRC must abide by the principles upon which the CRC is founded, reflecting in its knowledge management and evaluation strategies the capacity to learn, trial and adapt.

This discussion paper builds on the first by outlining the context for the CRC and where the thinking has got to, and then following this with sections that outline options for how the CRC might pursue its capacity building and business system roles in light of this and the challenges outlined above.

2. The CRC to date

The time has arrived for climate variability and drought risk management R&D to be part of the national research agenda that falls under the CRC Program. Despite being a leader in climate research, Australia lacks an integrated national focus on climate variability and drought risk management research that has close connections to the market place of users of such research.

The CRC Program provides the opportunity to build on the outstanding research in climate science and its application that has taken place in Australia and to establish a CRC for Climate Variability and Drought Risk Management. Some 145 CRCs have been established since 1990 (71 currently supported), and the Program is an important element of the national research agenda, involving investment of \$1.15B of Commonwealth funds, \$680M from other levels of government and industry and \$2.73 B of in-kind resources.

It is intended that the CRC will play a central role in ensuring that Australia maintains its standing as a global leader in the application of climate science in management decisions in agriculture, natural resources management and in key industries such as insurance and banking where climate variability risk management is critical to profitability and sustainability.

Prospective partners are now being sought for establishing and funding the CRC for Climate Variability and Drought Risk Management. An interim Steering Committee has been established and is managing the development of the application. The initial members are Dr Roger Stone, Director, AFFS-Predictive, Precision Systems (Queensland DPI), Dr Brian Keating, Acting Deputy-Chief, CSIRO Sustainable Ecosystems and Professor Charlie Zammit of the Land Use Studies Centre of the University of Southern Queensland.

In November, the first national meeting and workshop of prospective partners and collaborators was held in Kilmore, Victoria. The workshop addressed the proposed vision, mission, research themes and possible programs and elements of the CRC's structure.

As a result of the contributions of participants, the following vision and mission statement has been developed and an outline of the proposed research programs established.

Vision

The vision that will inspire and guide the CRC is:

Australians better managing the risks and opportunities of our variable climate.

This vision defines what success will look like at the end of the CRC Programme contract in around 2012.

It is implicit in this statement that 'Australians' means all individual Australians living in both rural and urban areas; and our organizations of people associated with government, industries and communities.

The statement infers that Australians generally do not yet sufficiently understand our highly variable climate and are not able to adequately manage living in and producing from our continent in compatibility with such a climate. Through increasing knowledge and its application to the needs of Australians, the vision for the CRC is that in future, we will be able to better manage this variability.

The risks of the most variable continental climate on the planet are apparent in the enormous economic, social and environmental costs of extreme or uncertain climatic conditions that produces the onset of extended drought, excessive heat, floods, severe hailstorms or severe frosts in Australia.

The opportunities of a highly variable climate are less appreciated and they relate partly to managing much better than we have in the past during periods of extreme climatic conditions, or better anticipating these periods and, therefore, adequately planning for their onset.

In addition to this, with improved knowledge and decision support tools, there may be opportunities to actually prosper during periods of extreme climate conditions. This implies the development of production and management techniques that are distinctly Australian. These would be attuned to Australian conditions and provide for prosperity during conditions that in the past have resulted in misfortune, damage and the imposition of enormous costs.

In operational terms, this vision finds the balance between aspiration and practicality and captures the nature of a CRC dealing simultaneously with blue-sky research and risk management applications.

It lays down the foundation upon which all activities of the CRC will be built, and articulates the capacity and resolve of partners to come to a common view on the strategic directions of the CRC.

This vision is a guiding image of success in terms of a contribution of the CRC to Australian society. It is a description in words that conjures up a similar picture for each partner of the destination of their work together in the CRC.

The Mission

The CRC's mission will be:

To turn climate science into climate and drought risk management strategies to meet the range of needs of Australian industries, communities and ecosystems

This is a succinct statement of what the CRC intends to do at a strategic level over the seven years of its CRC Programme contract in meeting the vision.

The mission defines:

- the key markets for the CRCs products which will be designed to meet the economic, social and environmental needs of clients and stakeholders; namely Australian industries, communities and the ecosystems that make up our environment;
- the key contribution of the CRC which will be adoptable, market-focussed and integrated R&D outputs that will facilitate better management of the risks and opportunities of climate variability; and
- the distinctive element of the contribution which will be to turn climate science into climate and drought risk management strategies in a way that adds value to and does not duplicate the work of other Australian institutions and programs involved in climate research.

The 'how' of the mission statement is captured in the program structure and resulting programs of the CRC and in the management framework of the organization.

The 'why' of the mission statement relates to the CRC's purpose in making a contribution for present and future generations of Australians to benefit from improved understanding and management of climate variability and drought.

The mission of the CRC is directly linked to contributing to:

- Australia's economic growth, social well being and environmental outcomes;
- developing Australia's public and private research capacity in this area of national need and also global opportunity;
- producing applicable research that is of an excellent standard;
- adding to the nation's intellectual property and promoting its adoption, application, and use in industries, communities and public programs;

- producing graduates with skills, knowledge and experience in the application of research in a national, industry and business context;
- enhancing collaboration among public and private researchers; and
- upgrading the innovative capacities of Australian enterprises involved in climate-sensitive businesses.

Research Themes and Program Structure

The first national meeting and workshop identified key research themes and stakeholder clusters that were aggregated into potential programs and a program structure (see below). The next step will involve settling upon a program structure and to identify people able to develop a strong research portfolio around the programs.

To ensure ownership of the CRC's research portfolio by prospective partners and its relevance to the market place, it is important that it be developed by those who are likely to have a role in its implementation or who will use its products. Program development teams will be established and be responsible for refining who their target audience is, the key deliverables and research questions, and indicators of success.

The following draft program structure has been developed from the outcomes of the first workshop of prospective partners.

PROGRAM 1: Building human capacity and resilience

- Subprogram 1.1 Post-graduate education
- Subprogram 1.2 Applications training
- Sub-program 1.3 Extension and knowledge exchange
- Sub-program 1.4 Community lifelong learning

PROGRAM 2: Improving social and institutional preparedness

- Subprogram 2.1 Communities and risk
- Subprogram 2.2 Enhancing policy and institutional efficacy

PROGRAM 3: Enhancing climate knowledge and prediction

- Subprogram 3.1 Value adding to climate knowledge
- Subprogram 3.1 Value adding to statistical methods

- Subprogram 3.2 Value adding to stochastic / modelling methods
- PROGRAM 4: Climate risk management for farming, grazing and agribusiness**
- Subprogram 4.1 Risk strategies/applications for farming and grazing
- Subprogram 4.2 Risk strategies/applications for agribusiness
- Subprogram 4.3 Risk strategies/applications for rural communities
- PROGRAM 5: Climate risk management for natural resources and the environment**
- Subprogram 5.1 Understanding climate and landscape system integration
- Subprogram 5.2 Risk strategies/applications for the water industry
- Subprogram 5.3 Risk strategies/applications for biodiversity
- PROGRAM 6: Climate risk management resource and service markets**
- Subprogram 6.1 Risk strategies/applications for energy, mining and other sectors.
- Subprogram 6.2 Risk strategies/applications for the finance and insurance sectors
- PROGRAM 7: Business systems and governance**
- Sub-program 6.1 Intellectual property and commercialisation
- Sub-program 6.2 Performance evaluation and institutional learning
- Subprogram 6.3 Professional development for CRC board members, staff and partners

In functional form this can be represented by the diagram below:

CRC for Climate Variability and Drought Risk Management
DRAFT Program Structure

This structure envisages core programs relating to the climate risk management needs of three groups of stakeholders: farming and agribusiness; natural resources and the environment; and the resource/commodity market place.

In addition, the structure envisages three cross cutting programs relating to building human capacity and resilience; improving social and institutional preparedness and enhancing climate knowledge and prediction. The first would encompass the education, training and extension programs of the proposed CRC as discussed in this paper. The second would have an emphasis on extending knowledge of how Australian society, communities and institutions (defined broadly) understands, relates to and manages climate variability and drought. The third would focus on enhancing climate knowledge and its application in predictive systems for climate variability.

A fourth cross-cutting program relates to the business of managing the CRC and would cover management structures, corporate governance, systems for managing utilization of research results and commercialization, performance management within the CRC, and monitoring and evaluation of outputs and outcomes.

3. Market demand

The CRC has identified seven major stakeholder clusters:

- Rural industries
- Water and environment
- Community
- Major non-agricultural industries
- Finance and services
- Policy
- Cognate research groups

For each of these clusters, a demand profile has been developed which outlines the types of products and services that industry is calling for from a potential CRC dealing in climate risk management.

3.1 Rural industries

Australia's rural industries are at high risk to the exigencies of climate variability. Extreme events such as the drought of the past year have a dramatic impact on individual farmers, the health of rural industries and the contribution agriculture makes to the national economy. For example, in 2002-03 the volume of the production of the farm sector declined by 23 per cent, while the net value declined by 75 per cent from the previous year. Overall, ABARE estimates that the drought reduced Australia's economic growth by 1 per cent.

Nearly all of Australia's rural industries are affected by climate variability, including those buffered to some extent by access to irrigation water. Climate is a significant contributing factor as to why many farmers make upwards of 80 per cent of their income in only 30 per cent of years.

Discussions with agricultural industries have identified the following priorities with respect to the outputs of climate risk research:

Production systems

- Better information on ground water supplies to assist irrigation management decisions.
- Decision support systems for rapid adaptation of intensive / extensive farming systems.
- Information to allow managers to make use of insurance risk management products / services.
- Decision rules (risk management strategies) to respond to climate variability, including
 - sow or not to sow?
 - crop choice
 - stocking rates
 - silages / pastures
 - enterprise mix.
- Better climate forecasts, including interpretation of potential impacts and opportunities, packaged into decision support systems.
- Clarification of climate processes in ways meaningful to farmer decision processes.

Industry sector management

- Information to assist long-term strategic decisions at the enterprise / multi-enterprise level.
- Commodity quantity and quality forecasts.
- Alternative enterprise forecasts.
- Better assessment of competitors - bulk commodities / price.
- Advice to government for revenue / expenditure estimates (relating to exception circumstances)

Processing sector

- Information to assist food suppliers predict demand.
- Information to plan food quality management.

3.2 Water and Environment

Australian water resources are heavily modified and regulated, with much of it actively exploited and dammed for consumptive storage and re-distribution. Climate variability can significantly affect catchment water yield patterns and hence have serious implications for water management and allocation. These implications relate to water quantity, water quality and the relationship between the two. With increasing pressure to rethink how allocations can be managed for both productive and environmental outcomes, understanding the short to medium-term repercussions of climate variability, and the longer-term repercussions of climate change is critical intelligence for both rural and urban water authorities.

Other areas of the environmental management are also intricately tied to climate risk. In many landscapes, watertable rises are closely associated with episodic events, yet management strategies are often based on rainfall averages. Revegetation for landscape restoration and biodiversity outcomes faces the same inherent establishment and management problems as farmers sowing and managing crops, with success often dependent on decisions based on good climate forecasts.

Discussions with water authorities, catchment management groups and those concerned with the environmental have identified the following priorities with respect to the outputs of climate risk research:

Water industry

- Better short to medium term, 3 months to 1 year forecast which will improve system operation and allocation of both consumptive and environmental water.
- Assessing impact of climate change on water resources and demand.
- Systematically incorporate climate change into assessment and management of water allocation to sustain water dependent systems.
- Determine impact of climate change on water allocation to water dependent industries – rural and urban uses and environmental flow.
- Improve linkages between rainfall, evaporation, vegetation cover and runoff to better estimate impacts on end of system flows.
- Identify impact of climate change on groundwater.
- Couple down-scaled climate models to water planning to river health model to assess climate change impact.
- Better quantify water demand and supply.
- Long term water availability for planning infrastructure decisions.

Catchment and environmental management

- Improved understanding of movement of salt fluxes in stream flows.
- Information transfer to better inform catchment and regional natural resource management planning.

- Understanding of linkages between climate systems and landscape processes so as to understand the parameters of resilient systems at the landscape scale.
- Risk management strategies to underpin landscape revegetation, rehabilitation and biodiversity maintenance.
- Improved predictive systems to underpin flexible catchment management targets.

3.3 Community

The repercussions of managing for the extremes of climate variability are all pervasive, and extend far beyond the individuals immediately affected by the devastation that these extremes can lead to. Townships, businesses tied to the fortunes of agriculture and rural economic health, counselling services, peer support and other community groups and emergency services among others all feel the impact of climate-induced events.

For many of these stakeholders, managing risk is not an individual pursuit, but rather a collective one. Both prevention and response strategies often need to be coordinated. These strategies need to provide the appropriate triggers to enable different sectors of the community to make the right responses at the right time, so that risks are minimised if not altogether prevented. Learning to strategically manage in during non-event periods is the key to resilience.

Discussions with key national community groups have identified the following priorities with respect to the outputs of climate risk research:

- Shire level climate event preparedness and staged response planning principles, incorporating:
 - forecast signals for different stages of responses
 - impact assessments for different sectors of a shire's community
 - stage response options for different sectors
 - identification of roles, responsibilities, relationships and control mechanisms
 - integration of forecasts, impact scenarios and strategic response options.
- Recovery strategies that reduce the time, impact and costs of events.
- Improved access to and awareness of decision support tools that provide aggregated benefits (i.e. at community rather than individual level).
- Understanding of the sociological factors involved in impact and response to events (to underpin future strategies).
- Institutional research - models of inter-agency cooperation in responding to events.

3.4 Finance and related services

The financial sector, including its banking, insurance and general financial institutions are both affected by the exigencies of climate variability and maintain an important role in helping others manage the associated risks. During droughts, for example, banks are often called upon to make hard decisions in respect to customers in default of their loans. At the same time, however, they may be dealing in negotiations or renegotiations with new and existing customers attempting to deal with the financial uncertainty that comes with climate variability. Increasing the certainty of climate forecasts decreases the uncertainty involved in these negotiations.

The insurance industry is almost entirely dependent upon its capacity to deal with probabilities. It must deal with these in such a way that it can maintain the profitability of insurance companies, while still providing some level of assurance to risk managers using insurance as part of their risk management strategy. The balance here frequently hinges on a fine line, and so any information that decreases uncertainty (and hence increases knowledge of probabilities) is as much valued by the insurer as it is by the insured.

In recent years, various financial risk management strategies have begun to appear, such as the use of weather derivatives, that show promise of changing the way businesses view uncertainty and risk.

Discussions with key national community groups have identified the following priorities with respect to the outputs of climate risk research:

- Better tailoring of insurance products and premiums for specific purposes in advance of probable events;
- Better prediction of extreme events, and improved estimates of potential impacts and costs;
- Better prediction of less-extreme events that still have major costs and consequences (i.e. hail, dry-spells, frosts)
- Better information on trends in events and the changing risk profiles this may present for particular regions, industry sectors;
- Development of alternative financial risk management strategies.

3.5 Major non-agricultural industries

There are many industries affected by the exigencies of climate variability not just those related to agriculture and natural resource management. They include energy supply, mining and emergency services.

Outputs of proposed Program 3 (Enhanced climate knowledge and predictive systems) would support the energy supply sector in estimating future demand and variations in demand due to the periods of hot and mild/cold weather. In

addition, there may be a role for weather derivatives in hedging against the risks of climate variability and its impact on energy demand.

In relation to the developing renewable energy industry including wind and solar energy, Program 3 outputs could support the planning infrastructure and its location and, as in the case of the traditional energy sources, variations in demand.

Impacts of climate variability on energy demand flow through to demand for coal. However, the major impact of climate variability on the mining industry relates to water availability.

Program 3 outputs would also benefit the emergency services sector in planning for major weather events such as floods, extremes of heat and cold and bushfires.

3.6 Policy

With the development of the CRC Programme over the past decade, there has been a trend towards CRCs delivering national benefits particularly in relation to the conservation, repair and replenishment of Australia's natural capital. This reflects a demand pull of research users involved in the application of scientific knowledge for resource sustainability. Government agencies at all levels (national, state, regional and local) have been major clients and beneficiaries of this research (Howard Partners, Evaluation of the Cooperative Research Centres Programme, July 2003).

CRCs have had a major role to play in the delivery of research that informs policy making and implementation. In this role, the CRCs have added value to existing research institutions that have traditionally provided scientific advice to government including the government research agencies themselves.

There is a rapidly growing demand from policy makers not only in government, but also including industry groups, non-government organizations and community groups for science and research that can be used by these bodies to deliver evidence-based policy. This demand extends across a wide range of portfolios and not only the traditional rural industry, natural resource management and environmental areas.

It is envisaged that the proposed CRC for Climate Variability and Drought Risk Management will have a role in producing research outputs that will inform and can be used by policy and decision makers across a wide range of portfolios and by both government and non-government organizations operating at all scales. The CRC's work in this area will not duplicate existing agencies such as the Bureau of Meteorology or the Bureau of Rural Sciences which operate as an interface between science and policy in the federal government context.

3.7 Cognate research groups

Research agencies themselves are the biggest consumers of new knowledge. There are at present 23 CRCs that deal with agricultural and environmental issues where knowledge of climate systems and their interactions with landscape processes and associated human endeavours is important. Significantly, there are as many other CRCs dealing with manufacturing, energy and diverse fields of industrial and material science where such information can also play an important role. Some examples follow:

- Improved understanding of climate systems can:
 - underpin improved the catchment process models of the CRC for Catchment Hydrology;
 - provide useful information to inform plant breeders involved in the CRC for Plant-based Management of Dryland Salinity; and
- Development of risk management principles can:
 - inform the best management practice recommendations of the CRCs for Irrigation Futures, Weed Management and a range of commodity-based industries.

The nation does not, at present, have the research capacity to replicate climate science efforts within each of these CRCs, nether alone or through other research institutes. Here the CRC for Climate and Drought Risk Management can meet the CRC Secretariat's desire to see more productive relationships develop between existing and emerging CRCs.

4. Education

This sub-program falls under the *Building human capacity and resilience* cross-program theme. It includes the formal university-linked component. This includes post-graduate research scholarships/supervision and development of/links to post-graduate coursework programs. The aim of the sub-program is to build the pool of excellent researchers in areas related to climate variability and drought risk while progressing the research needs of the CRC.

4.1 Challenges

Post-graduate research

A key challenge is to ensure that post-graduate research is balanced between defined research priorities across programs in the CRC and the particular research interests that candidates may bring with them. Individual capacity building needs to be aligned with CRC objectives as much as possible – without stifling creative opportunity and collegial opportunity for learning.

Post-graduate research can be supported through full scholarships from the CRC, top-up scholarships and/or operational support. They can be funded through core CRC funds, partner funds or built into externally funded projects. There is also the matter of the mix between Masters and PhD research. The former is shorter term and can be focused on a project component. The latter provides opportunity for in-depth research, but takes a longer time period. Some planning and management is needed to ensure the best mix of allocated research.

The best supervision is also critical. It is expected that a number of universities will be partners of the CRC and enrolment and supervision would be expected to be spread across institutions – with supervisors also coming from agencies and industries.

In organisations that have cross institutional boundaries such as a CRC it is sometimes difficult to get post-graduate research students to feel a part of the CRC itself. Orientation and inclusive processes are needed.

Post-graduate course-work

A key issue is whether there are adequate post-graduate coursework opportunities in Australian Universities in the areas of climate variability and drought risk. The Cotton and Tropical Savannah CRCs are both involved in post-graduate course-work programs. The CRC will need to decide whether it needs to develop/establish courses/subjects and/or how work in with relevant existing courses across partner universities.

4.2 Principles

Some draft principles for this sub-program could include:

- Support post-graduate research activities that best align with CRC objectives;
- Provide effective orientation and inclusive processes to develop ownership by post-graduate students;
- Aim for equal distribution across partner universities;
- Seek to include funding as part of external project applications;
- Look to supervision across partner organisations;
- Work with partner universities to develop or support relevant post-graduate course work programs.

4.3 Possible activities

Possible activities in this sub-program include:

- Have a specified number and type of Post-graduate scholarships to be funded across programs out of core funds of the CRC.
- Have a policy of including funds for post-graduates position in appropriate external funding proposals.
- Have a nominated post-graduate coordinator and committee.
- Develop an orientation pack for all post-graduate students and their nominated supervisors.
- Include events each year that permit post-graduates to present and discuss their work and to see where it fits into the broader CRC objectives.

- Work in with partner universities to develop new (or further develop existing similar courses) post-graduate subjects/courses in climate variability and drought risk.

4.4 Desired Workshop Outcome

- Identify further challenges and issues
- Visit and finalise principles
- Modify possible activities to come up with a firmer set of proposed activities.
- Particularly look at the need for the CRC to develop/support a post-graduate course-work program.

5. Extension, training and lifelong-learning

This sub-program falls under the *Building human capacity and resilience cross-program theme* and includes the community capacity building components outside of formal university education, including on-going professional development. It does, however, include training that would link in with the Vocational and Educational Training (VET) Sector.

5.1 Challenges

The issue of integrating the results of research into practice is a critical one for the CRC. This is what will determine the success of the venture.

As pointed out in the introduction, this endeavour is characterised by deep social, cultural and historical factors which need to be understood and worked with to enable engagement and integration of science with practice.

Many modern research/extension projects involve stakeholders in the planning, operation, testing and evaluation of applications where it is relevant across the marketing chain. This also assists in making work more closely aligned to the needs of those not directly involved in such research and development.

The benefits of CRC research are relevant across sectors and across all states and territories with different tools and outputs of more interest to some sectors/areas than others. There is no single approach that will meet these needs.

The CRC itself will not have a direct extension service and so must be strategic in how it links in with existing public and private providers of training and extension. Such a link is not automatic.

Many new extension projects with training elements are linking in strongly to the VET sector, ensuring that relevant competencies are overt and there is a process for recognition within existing qualifications. It is unclear how the outputs of the CRC will tie in with existing competencies.

5.2 Principles

Principles that could guide extension and training activities in the CRC include:

- Stakeholders to be involved in the research and development work at all stages of a project as appropriate.
- A strategic approach is taken to engaging with extension and training agencies and organisations across Australia and in both the public and private sectors.
- Have social science projects included in the portfolio.
- Focus on training public and private service providers who work with key stakeholders.
- Look to life-long learning for staff and primary stakeholders.
- The CRC to work with the Vocational and Educational Training Sector to ensure training activities tie in with existing VET competencies.

5.3 Proposed activities

Potential activities to be undertaken by the CRC under this sub-program include:

- Appoint an extension/training coordinator as a core position (similar to the state Industry Development Officers - IDOs - in some industries) to ensure strategic linkages;
- Develop workshop packages in association with relevant Registered Training Providers (RTOs) and ensure that competencies are matched.
- Develop a training (and education) database of relevant workshops, courses and training material across Australia.
- Sponsor national workshops/conferences on climate variability and drought risk management.
- Develop case studies that go across program areas and involve individuals and communities in situ.

5.4 Desired Workshop Outcome

- Identify further challenges and issues.
- Visit and finalise principles.
- Modify possible activities to come up with a firmer set of proposed activities.
- Particularly look at the need for the CRC to include a national “IDO” position to manage strategic engagement with extension and training organizations.
- Consider potential closer relationships with particular public and/or private extension agencies.
- Suggest cross-program case studies that may help in having stakeholders work together in helping to integrate research outputs.

6. Knowledge exchange (communication)

This sub-program falls under the *Building human capacity and resilience cross-program theme* and includes on-going communication activities with stakeholders and potential beneficiaries of the CRC.

6.1 Challenges

The CRC has identified seven major stakeholder clusters and outlined their demand profiles. A challenge is to ensure that communication is targeted to each of these sectors needs and occurs across each cluster.

Organisations are swamped with information and it is easy for communication to become lost amongst this plethora of information available to them. The CRC needs to be able to grab the attention of key decision makers and provide timely information of immediate use to them.

Knowledge exchange is a two-way process. The challenge is to provide pathways to facilitate this exchange and feedback.

There are other individual and organisations engaged in research and development in areas related to those that will be undertaken by the CRC. Informed information exchange with these will be an important one to manage to ensure synergies rather than conflict.

International agencies and organisations are also important sources of complementary information and could benefit from the work of the CRC. Pathways will be needed to facilitate this exchange.

IP and confidentiality issues can inhibit the free flow of information. Strategies and policies will need to be in place to minimise this disruption.

6.2 Principles

Principles that could guide the Knowledge Management sub-program include:

- Where possible, tailor information presentation for the different stakeholder clusters.
- Ensure different information pathways are used to cover different cluster situations.
- Focus on information exchange and feedback rather than 'sending out' information.
- Proactively engage with research and development organisations in this area who are not direct partners of the CRC
- Actively seek information exchange with international agencies

6.3 Proposed activities

Potential activities in this subprogram include:

- Appoint a communications manager for the CRC.
- Develop and continually revise communication matrices to engage with identified stakeholder clusters.
- Develop and continually update an interactive web site catering for the needs of each stakeholder cluster – including capacity for specific topic list-serves.
- Send a monthly e-newsletter (with potentially different elements sent to different clusters).
- Sponsor scientific exchanges between national and international organizations and the CRC partners.
- Organise high-profile national summits on key facets of research coming out of the CRC.
- Provide all research project progress and outcomes on the website.

6.4 Desired Workshop Outcome

- Identify further challenges and issues.
- Visit and finalise principles.
- Modify possible activities to come up with a firmer set of proposed activities.
- Particularly look at the need and role for a Communications Manager.
- Fill in the Communication Matrix for the different stakeholder clusters.

Communication Matrix

	Rural Industries	Water & Environment	Community	Finance & services	Policy	Cognate Research Groups
Web-site						
Tailored e- newsletter						
Summits and forums						
Topical list-serves						
Exchanges						
News releases						
Etc						

(communication mechanisms to be rated according to effectiveness for cluster: X -> XXXX)

7. Intellectual property and commercialisation

This sub-program falls under the *Business systems and governance theme* and includes those activities designed to maximise the return on CRC investment by managing and protecting the intellectual property generated by CRC researchers while seeking opportunities to commercially exploit this property for the benefit of the nation.

7.1 Challenges

The management of intellectual property in a CRC such as the one proposed provides substantial challenges that will require a diverse range of strategies for managing the different kinds of intellectual property likely to be generated for different CRC investors and beneficiaries.

For example, many of the results of the CRC's research are likely to take the form of innovative risk management strategies for farmers and natural resource managers across Australia. For these groups, rapid adoption may take precedence over commercial gain. Indeed, such a position may be the directive of the R&D investors given past experience with bodies such as the Grains R&D Corporation and Meat & Livestock Australia.

On the other hand, investors such as insurance companies will want to ensure that they can capture the exclusive benefits of the results of their investment, as it will provide them with a commercial edge.

These two extremes, and variations in-between, are very likely scenarios for the CRC to face in respect to its management and commercialisation of intellectual property. It will mean that the CRC must adopt a flexible approach to intellectual property matters, possibly applying on a project-by-project basis.

7.2 Principles

Principles that could guide the Intellectual Property and Commercialisation Management sub-program include:

- Maximisation of the return on investment, whether in the form of widespread adoption or strategic commercialisation;
- Flexible approaches that take into account the nature of the intellectual property and the investors' requirements;
- Protection of sensitive intellectual property that offers the potential for overseas competitors to improve their competitiveness against Australian industries and businesses;
- Acknowledgment of the intellectual endeavours of Australian scientists, businesses and research investors;

- Sharing of certain intellectual property where it improves the capacity of other forms of scientific endeavour to take into account climate science, without compromising ownership considerations;
- Maximisation of the potential to demonstrate Australia's leadership in international climate applications research.

7.3 Proposed activities

Potential activities that could be undertaken through the CRC with respect to intellectual property and commercialisation include:

- Develop an inventory of the existing intellectual property brought into the CRC by partners;
- Develop a strategy for the management and protection of this intellectual property;
- Develop the principles and guidelines for managing new intellectual property, reflecting the different investment arrangements likely to arise;
- Identify where research question addressed by the CRC provide the potential for commercialisation of intellectual property;
- Develop a risk management strategy to prevent potential problems arising, and to provide response options should they arise.

7.4 Desired Workshop Outcome

- Identify further challenges and issues.
- Visit and finalise principles.
- Modify possible activities to come up with a firmer set of proposed activities.

8. Monitoring and evaluation

This sub-program falls under the *Business systems and governance theme* and includes those activities designed to provide feedback on the suitability, effectiveness and impact of the CRC activities.

8.1 Challenges

The introduction of this paper emphasises that the evaluation strategies must include the capacity for the CRC to learn, trial and reflect – consistent with its over-riding principles. Evaluation approaches used must therefore be able to provide clear insights to participants as well linking directly with management decision-making.

Much of the research has a medium term frame and the initial life of the CRC is effectively 6 years. As well, when some tools and management processes are integrated into practice then it may be some years before the actual benefits are evident to stakeholders. A strong emphasis will need to be on indicators of progress and outcomes rather than a focus.

There is a tendency for organisational staff to ‘leave evaluation up to the specified evaluators’ (internal or external) and hence not ‘own’ the evaluation process and lessons. There is a real challenge in involving everyone in the process so that lessons are taken on board as a collective understanding of result and their implications is gained.

8.2 Principles

Principles that could guide the monitoring and evaluation sub-program include:

- Evaluation processes should be transparent and involve all parties within the CRC.
- Involve program leaders in the planning, undertaking, analyzing and making conclusions with respect to evaluation activities within the CRC.
- A focus should be on looking at the effectiveness of processes and interim indicators of impact.
- A variety of approaches and techniques should be used to enable monitoring and evaluation outputs to “come alive”.
- Evaluation outputs should link directly with decision-making processes within the CRC
- Log-frames to be used to track progress against program objectives.
- Consider evaluation at three key levels – CRC process, immediate impact on stakeholders; and broader term impact on Australia.

8.3 Proposed activities

Potential activities that could be undertaken through the CRC with respect to monitoring and evaluation include:

- Develop and continually review an evaluation log-frame consistent with the objectives of each CRC program and theme.
- Develop and include an interactive evaluation component as part of the web-site.
- Implement an evaluation process which captures, records and analyses small case studies/vignettes of the impact of CRC activities and outputs at an individual and group level.
- Develop an evaluation data-base which matches the log frame needs.
- Have regular evaluation reporting and reaction sessions in CRC management meetings.

8.4 Desired Workshop Outcome

- Identify further challenges and issues.
- Visit and finalise principles.
- Modify possible activities to come up with a firmer set of proposed activities.
- Particularly look at the ‘Most Significant Change’ approach and its applicability or otherwise to the CRC.
- Develop the CRC Evaluation Log Frame.

Evaluation Log Frame

	Objectives	Indicators of progress to success	Methods of collecting information on indicators	Assumptions and issues
1. Building human capacity & resilience				
2. Improving social and inst. Preparedness				
Enhancing climate knowledge & prediction				
Climate Risk Mnt for farming and agribusiness				
Climate Risk Mnt for NRM				
Climate Risk Mnt for resource/ Commodity mkt				
Business systems and governance				

(Can break down to sub-programs as needed).

9. Next steps in the application process

9.1 Timetable and steps in the application process

The process to establish a CRC requires the development and submission of a Preliminary Business Case by 31 March 2004 and a Full Business Case by 2 July 2004. An interim Steering Committee is actively developing the proposal with the support of an independent research company engaged to coordinate the development of these documents. In November, the first national meeting and workshop of prospective partners and collaborators was held in Kilmore, Victoria. The workshop addressed the proposed vision, mission, research themes and possible programs and elements of the CRC's structure.

The next steps will involve:

- Continuation of briefings and discussions with prospective partners by members of the interim Steering Committee seeking support and partners.
- Expansion of the Steering Committee as core partners commit.
- Consideration of this second discussion paper addressing research utilization, adoption and commercialization; the education and training program; and evaluation arrangements to develop these elements of the Business Plan that needs to accompany the final application.
- The second workshop will be held at the Lords Function Centre, 2 Burnage Street, Toowoomba on the 18th and 19th of December. This discussion paper is intended as background material in support of this workshop.
- Finalisation of a CRC prospectus and negotiation of partnerships.
- Preparation and submission of a the Preliminary Business Case by 31 March 2004.
- If invited following a decision of the CRC selection panel, preparation of the Full Business Case by 2 July 2004
- If invited presentation to the CRC selection panel.
- If successful, establishment of an interim board to prepare for the establishment of the CRC.