

PART A: MAIN REPORT

April 2009



This report was prepared for the Namoi Catchment Management Authority by Steven Cork (EcoInsights and Delaney & Associates) and Kate Delaney (Delaney & Associates), April 2009, based on inputs from a range of stakeholders who participated in a series of workshops between 2007 and 2008.



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Executive summary

"We have still not lived long enough"

Tom Griffiths, Professor of History at the Australian National University, reflecting on the 2009 bushfires in Victoria. The quote harks back to Judge Leonard Stretton's report on the 1939 bushfires in which he bemoaned the fact that humans have not lived long enough to understand the natural environment. Griffiths concludes after the 2009 fires that "... there is one thing that we never seem to learn from history ... that nature can overwhelm culture".

The scenario planning reported in this publication explores how decision-makers in the Namoi might minimise the dangers of underestimating or under-understanding the forces of nature and/or overestimating the ability of humans to control those forces. The aim is to anticipate and take opportunities for sustainable land use and avoid disastrous economic, social and environmental outcomes.

Four scenarios were developed that explored the possible implications of combinations of:

- High climate warming or moderate climate warming (associated with high or moderate increases in variability of rainfall); and
- Orderly transition or disorderly transition from an oil-based energy economy to an alternative energy economy not based on fossil fuels.

Each scenario took the optimistic view that the Namoi's leaders would be effective at influencing government policies and developing productive linkages with industry, non-government organisations and community leaders to achieve the best possible outcomes under the climate and energy combination. Within each scenario, a sub-scenario explored what might happen if these leaders were not effective at helping the Namoi to shape its own future.

Table 1 The scenarios in brief

4 Hot weather, cool heads		1 Hot scramble	
			
Orderly energy transition	High warming	Disorderly energy transition	High warming
<p>Early recognition of problems associated with peak oil, drying and increased climate variability result in strong support for emissions reduction, investment in clean coal and renewables technology, and on-farm energy generation. Oil prices stabilise over time. Large energy producers come to the Namoi operating under favourable, environmentally constrained licences-to-operate with mining companies that result in greater local investment. More people work in mining as the fortunes of agriculture wax and wane. Agriculture struggles with less water and higher uncertainty but still does relatively well due to early investment in water-saving technologies, crop breeding and high demand from overseas markets. While regions have had some say in how energy profits are invested, there is no guarantee that this will continue as escalating needs to adapt to climate change impacts confront the State.</p>		<p>In this world of oil shortages and high climate variability, the rapid development of mining and 'big' agriculture is a political and economic godsend. While many regions in Australia suffer, the Namoi continues to grow against a broader backdrop of increasing unemployment and water supply failures in NSW, Australia and globally. Economically the Namoi thrives on mining - agriculture fluctuates with variability in climate and markets. There is strong competition for water between mining and agriculture, with innovative solutions for capture and storage during wet periods. While this 'bright spot' comes at the expense of agriculture decline, reduced GHG emissions and rising inequity, State and Australian governments do little. They are too overwhelmed by demands from those regions that are truly suffering. In the Namoi people are left to their own devices, to 'get on with it'. When authorities in the Namoi adopt cross-region, integrated planning approaches to meet local needs the sigh of relief from Sydney is loud.</p>	
3 Warm complacency		2 Warm scramble	
			
Orderly energy transition	Low warming	Disorderly energy transition	Low warming
<p>In this world better than anticipated conditions lull many people into a false sense of security. Dire warnings about climate change have proven exaggerated in the early decades of this century. People see that the economy is finally doing relatively well – agriculture exports, coal mining, gas exploration and a modest numbers inflow of lifestyle residents – are a testament that fears were unfounded. People are tired of thinking about the downside so continued warnings about what might happen next, including dramatic and sudden climate changes, are largely ignored. There is little appetite for hard trade-offs – carbon pollution reduction, regulation of water flow and adoption of alternate forms of energy are eschewed in favour of more modest schemes. The failure to notice subtle changes in underlying conditions is worrisome to few. In 20xx, when dramatic, sudden changes begin to hit the Namoi it is late in the game. There are fewer opportunities to turn drastic declines around.</p>		<p>In this future energy shortages override all other considerations. Although serious, climate change impacts are not severe. While the development of mining is not universally welcomed, Governments here and around the world are driven by the need to meet growing energy demands as it underpins massive efforts to kick start economic growth. Emissions controls are light handed. In the Namoi, there is a rapid, locally-directed development of coal and gas reserves. A strong local lobby and united planning approaches allow the region to use its influence within the State to obtain favourable licences-to-operate from mining companies, leading to increased local investment that is secured through regional financial institutions. Concerns about the future of communities within the catchment are rising as many new residents are temporary and have no history in the catchment, no loyalty to it and see no long term future in the Namoi.</p>	

While there were some unique challenges and opportunities in each scenario, and the importance of different challenges and opportunities varied, it was concluded that in all plausible futures the Namoi's administrators, industries, non-government organisations and community leaders need to work together with one another and other catchments to anticipate and influence changes in environmental, carbon-emissions, energy, and water policies in particular, and build resilience in social, economic and environmental processes to deal with some very uncertain years ahead.

The following strategies were identified as key to preparing the Namoi for a range of plausible futures.

Of greatest importance was the establishment of a leadership forum to enable the sort of cross-sectoral cooperation and visionary thinking described above to occur. Many of the other strategies rely on this forum. Without it the future is likely to be one of a region struggling, often with exceptionally good results but always with great effort, to deal with policies imposed from governments that might or might not take account of the values of the Namoi to Australia and Australians.

Table 2 Summary of strategies to help the Namoi prepare for a range of plausible futures

LEADERSHIP FORUM	
Strategy	Develop an appropriate leadership forum ('ginger' group) supported by high levels of local commitment and resourcing within the Namoi catchment.
Shaping actions	Establish a core group to start putting pressure on decision makers, industry, non-government organisations, and community leaders to work together for the good of the catchment, Australia and the planet.
BUILDING TRUST	
Strategy	Build trust and collaboration between the divergent and competing parts of the community.
Shaping actions	Public meetings, open sharing of information, structured approaches to get people thinking beyond entrenched viewpoints.
SOLUTIONS FOR POLITICIANS	
Strategy	Influence policy development and implementation by providing insightful possible solutions to governments.
Shaping actions	Develop well thought-through policy ideas and programs to address challenges facing regional Australia in ways that acknowledge political constraints and work with politicians to meet common goals.

RESEARCH ON COAL MINING IMPACTS

Strategy	Commission more research into the effect of mining on agricultural land.
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Shaping actions	Ensure there is independent objective research to address key questions being asked about impacts of mining on the environment, agriculture and other industries, the local economy, and social processes.
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INVIGORATE THE LOCAL ECONOMY

Strategy	Adopt mechanisms to retain the value of a strong local economy.
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Shaping actions	Reinvest resources to diversify the industrial and community base.
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	Negotiate controls and agreements between resource users to contribute cash/resources back to the regional economy
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	Work to have education, training and technology development adequately resourced
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	Develop community and social frameworks (i.e. education, housing, health) to provide community amenity.
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COMMUNICATION/ CULTURAL CHANGE

Strategy	Present feasible and alternative ways of living in the Naomi to the community and support these ideas via appropriate policy constructs.
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Shaping actions	Inform the community about the potential impacts of climate change via local peer networks.
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	Develop climate change adaptation strategies that look into best possible uses of changed landscapes, resources, social and environmental capital – these must include adjustment mechanisms.
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EMISSION AND ENERGY STRATEGIES

Strategy	Reduce carbon pollution, ensure energy security and affordability for the Namoi's residents and businesses without compromising environment or quality of life.
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Shaping actions	Assess possible demand for coal and gas under several future scenarios and consider impacts on economy, environment and society.
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	Assess opportunities for cooperative generation of energy to offset rising prices for externally generated energy.
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	Explore opportunities for alternative, environmentally friendly, energy sources (solar, wind, new generation biofuels etc) and work as a community to help establish these (perhaps through joint-venture funding).
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	Explore possibilities of capturing fossil fuel benefits to develop alternative industries.
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	Develop forward-looking strategies for including agriculture in emissions reduction and trading schemes to both help reduce the carbon footprint of the catchment and provide alternative sources of income.
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INTEGRATED PLANNING

Strategy	Continue to bring NRM and community development paradigms closer together.
Shaping actions	<p>Develop collaboratively prepared plans looking at the following and how they are linked together: infrastructure - physical and social; water sharing; economic development; settlement strategy.</p> <p>Take a lead in thinking about how environmental management might be integrated with economic and social objectives (e.g. ecosystem services markets), have a strong input to policy thinking, and be ready to get in early to reap financial, environmental and social benefits.</p>

DRAFT



Table of contents

Executive summary	III
Table of contents.....	VIII
1 Introduction	1
1.1 How to read this report	1
1.2 The Namoi CMA	2
1.3 The Namoi catchment	2
1.4 Project Summary	3
1.5 Integrating this project with other processes	3
2 Why scenarios?	5
2.1 What is scenario planning?	5
2.2 Principles	7
2.3 Scenario planning versus strategic planning	9
2.4 Why scenario planning in this project?	9
3 The process	11
3.1 Workshop participants	11
3.2 Focal question	12
3.3 Orientation and exploration	12
3.4 Synthesis	13
3.5 Acting and monitoring	13
4 The Namoi	14
4.1 Present	14
4.2 Recent changes	15
4.3 Looking further back	16
5 Assumptions.....	18
6 Drivers of change	21
6.1 Stakeholder consultation	21
6.2 Environmental scan and background paper	22
6.3 Expert input at the workshops	22
6.4 Commissioned expert commentaries	22
6.5 Drivers of change	23
6.6 Key issues for the catchment	23
6.7 Critical uncertainties	23
7 Key uncertainties	25
7.1 Climate and energy	25
7.2 Governance, leadership and influence	26
7.3 A comment on economic uncertainties	27
7.4 Three critical uncertainties	27

8 Energy futures.....	29
8.1 Future energy trajectories	30
8.2 The range of energy scenarios in the literature	31
8.3 Evolution of the current oil supply issues	34
8.4 Peak oil	36
8.5 The next energy sources	38
8.6 Policies, market forces and oil prices	43
8.7 Two energy trajectories of interest to the Namoi	44
9 Climate futures.....	48
9.1 The science behind climate change	49
9.2 The basis for concerns about climate change	51
9.3 Projections for the World and Australia	52
9.4 Potential impacts of climate change	53
9.5 Projections for the Namoi	55
9.6 Policy responses	58
9.7 Climate change trajectories to consider in the Namoi scenarios	62
10.. Governance	64
10.1 Adaptive governance	66
10.2 Congruence with Australia 2020	67
10.3 Anticipating and preparing	68
11.. Scenario logics	69
11.1 Focus	69
11.2 Logics	70
12.. The scenarios	77
12.1 The initial conditions for all scenarios	77
12.2 Scenario 1 - Hot scramble	79
12.3 Scenario 2 - Warm scramble	88
12.4 Scenario 3 - Warm complacency	100
12.5 Scenario 4 - Hot weather, cool heads	109
13.. Strategies.....	120
13.1 Challenges and opportunities	120
13.2 Actions to prepare the Namoi for a range of plausible futures	122
13.3 Next steps	132
14.. References	134
15.. Endnotes	139
Executive summary	III
Table of contents.....	VIII
1 Introduction	1
1.1 How to read this report	1
1.2 The Namoi CMA	2
1.3 The Namoi catchment	2
1.4 Project Summary	3
1.5 Integrating this project with other processes	3
2 Why scenarios?	5
2.1 What is scenario planning?	5
2.2 Principles	7
2.3 Scenario planning versus strategic planning	9

2.4	Why scenario planning in this project?	9
3	The process	11
3.1	Workshop participants	11
3.2	Focal question	12
3.3	Orientation and exploration	12
3.4	Synthesis	13
3.5	Acting and monitoring	13
4	The Namoi	14
4.1	Present	14
4.2	Recent changes	15
4.3	Looking further back	16
5	Assumptions	18
6	Drivers of change	21
6.1	Stakeholder consultation	21
6.2	Environmental scan and background paper	22
6.3	Expert input at the workshops	22
6.4	Commissioned expert commentaries	22
6.5	Drivers of change	23
6.6	Key issues for the catchment	23
6.7	Critical uncertainties	23
7	Key uncertainties	25
7.1	Climate and energy	25
7.2	Governance, leadership and influence	26
7.3	A comment on economic uncertainties	27
7.4	Three critical uncertainties	27
8	Energy futures	29
8.1	Future energy trajectories	30
8.2	The range of energy scenarios in the literature	31
8.3	Evolution of the current oil supply issues	34
8.4	Peak oil	36
8.5	The next energy sources	38
8.6	Policies, market forces and oil prices	43
8.7	Two energy trajectories of interest to the Namoi	44
9	Climate futures	48
9.1	The science behind climate change	49
9.2	The basis for concerns about climate change	51
9.3	Projections for the World and Australia	52
9.4	Potential impacts of climate change	53
9.5	Projections for the Namoi	55
9.6	Policy responses	58
9.7	Climate change trajectories to consider in the Namoi scenarios	62
10	Governance	64
10.1	Adaptive governance	66
10.2	Congruence with Australia 2020	67
10.3	Anticipating and preparing	68
11	Scenario logics	69
11.1	Focus	69
11.2	Logics	70
12	The scenarios	77
12.1	The initial conditions for all scenarios	77

12.2	Scenario 1 - Hot scramble	79
12.3	Scenario 2 - Warm scramble	88
12.4	Scenario 3 - Warm complacency	100
12.5	Scenario 4 - Hot weather, cool heads	109
13..	Strategies.....	120
13.1	Challenges and opportunities	120
13.2	Actions to prepare the Namoi for a range of plausible futures	122
13.3	Next steps	132
14..	References	134
15..	Endnotes	139

Boxes

Box 1	An example of scenarios bringing about major social change	6
Box 2	Three quotes summarising tensions likely to play out with respect to energy and carbon emissions in the coming decade	31
Box 3	The main conclusions from the CSIRO Energy Forum scenarios.	34
Box 4	Possible impacts of market forces on energy use and Australia's energy mix	43
Box 5	Summary of some of the potential implications of climate change for Australia, from the Draft Garnaut Review	54
Box 6	Potential benefits for agriculture of proposed climate change mitigation and adaptation policies (from the Draft Garnaut Review).	62
Box 7	Some key points made about governance issues for the Namoi by one of the expert commentators	68
Box 8	The Namoi has a strategic win despite chaotic water policy	83
Box 9	Avoiding an infrastructure nightmare	84
Box 10	Potential for disaster	92
Box 11	The Namoi is frustrated by chaotic water policy	93
Box 12	Avoiding an infrastructure nightmare	95
Box 13	Shocks and surprises	99
Box 14	Leadership against the odds	103
Box 15	Shocks and surprises	108
Box 16	Key challenges for leadership	112
Box 17	What if the regional leaders had not acted?	113
Box 18	Labour is a critical issue for this scenario	114
Box 19	A visionary water strategy	114
Box 20	Shocks and surprises	119

Tables

Table 1	The scenarios in brief	IV
Table 2	Summary of strategies to help the Namoi prepare for a range of plausible futures	V
Table 3	Comparison between strategic planning and scenario planning	9
Table 4:	Summary of the more detailed timeline documented by Cork & Delaney	16
Table 5	Assumptions about the future of the Namoi identified by workshop participants	19
Table 6	Key issues of concern identified by workshop participants	24
Table 7	The eight possible combinations of energy, climate and influence trajectories.	28
Table 8	Estimates of the time for which demand for fossil fuels could be met from known accessible reserves (that part of known deposits that can be accessed economically) assuming the rates of consumption	

	measured in 2007 or projected for 2050 (from the Garnaut Draft Report, 2008)	37
Table 9	Summary of the four scenarios considered in the CSIRO Sustainable Yield study.	55
Table 10	Summary of modelling of the Namoi's 2030 climate by CSIRO.	57
Table 11	Characteristics of Scenarios 1-4 with respect to key issue areas	71
Table 12	Key challenges that people in the Namoi might face in each scenario (as identified by the Scenarios Working Group)	121

Figures

Figure 1	Some parts of the future are more likely than others. Scenarios are the tool of choice for exploring those parts of the future about which certainty is low and we have little control over the way the future unfolds	6
Figure 2	The scenario planning process adapted from Searce et al.	7
Figure 3	The three types of thinking in scenario planning (divergent, emergent and convergent). It is important that all three are encouraged at the right time so that both new ideas and practical conclusions are generated.	8
Figure 4	Participants in the Namoi scenario planning process were encouraged to think beyond the immediate environment in which their issues sat	8
Figure 5	Four reasons why an organisation might invest in scenario planning	9
Figure 6	Namoi CMA catchment map.	15
Figure 7	Agricultural and resource management policy in the Murray–Darling Basin	17
Figure 8	Four broad class of scenarios for the future of energy globally	32
Figure 9	Recent oil production globally and three suggested future trajectories	36
Figure 10	Composition of the energy mix of the USA from 1800 to 2000.	38
Figure 11	Energy use data for 1970 to 2007, from the Garnaut report (2008).	39
Figure 12	Energy densities for various energy sources	39
Figure 13	The global flux of various energy sources compared with global consumption of fossil fuels	40
Figure 14	Energy return on investment (the ratio of energy obtained over energy used to obtain it) for various energy sources. The dotted line is an EROI of 1.	41
Figure 15:	The energy mix for Australia compared with the OECD in 2005.	42
Figure 16	The energy mix of the USA in 2005 compared with the anticipated mix in 2050.	42
Figure 17	Indices of oil, coal and gas prices relative to 1995 prices from the Draft Garnaut Report. The broken line added at the top right is an estimate of how prices have risen between February and July 2008.	44
Figure 18	Atmospheric concentrations of important long-lived green- house gases over the last 2,000 years. Increases since about 1750 are attributed to human activities in the industrial era. From the Fourth Assessment Report of the IPPC.	52
Figure 19	Timeline for emergence of issues	132
Figure 20	Organisational hurdles to strategic thinking	133



1 Introduction

"We have still not lived long enough"

Tom Griffiths, Professor of History at the Australian National University, reflecting on the 2009 bushfires in Victoria. The quote harks back to Judge Leonard Stretton's report on the 1939 bushfires in which he bemoaned the fact that humans have not lived long enough to understand the natural environment. Griffiths concludes after the 2009 fires that "... there is one thing that we never seem to learn from history ... that nature can overwhelm culture".

The "Scenario Planning for Sustainable Land Use in the Namoi Catchment" project commenced in mid 2007 with the objective of exploring the types of challenges and opportunities that those living and working in the Namoi catchment might face between then and 2030. It involved a large amount of time, hard thinking and good-will from a range of stakeholders. We acknowledge and thank them for their important contributions.

1.1 How to read this report

This report starts with a brief Executive Summary, which outlines the scenarios and the main actions recommended to prepare the Namoi for a range of plausible futures.

If readers want more detail about the recommended actions they can go directly to Chapter 13.

Chapters 2 to 10 explain why a scenario planning approach was taken, introduce the process, consider how the Namoi has changed, summarise the assumptions that many in the Namoi make about the future (and which plausible futures might challenge those assumptions), detail the factors that the project's participants thought would drive change in the future, and

discuss the factors that are most uncertain and likely to influence change. The material considered in these chapters was the foundation for the scenarios.


Chapters 11 and 12 present the scenarios, short and long forms.

The workshops, literature reviews and other surveys and discussions that contributed to this project generated a large amount of information that is extremely valuable but would have made this report very hard to read. For that reason, we have put most of the detailed information in an accompanying volume of appendices. Those appendices are referred to throughout this report so that readers can readily find the details that relate to particular issues.

1.2 The Namoi CMA

The Namoi CMA is a statutory body, established under the Catchment Management Authorities Act 2003 (CMA Act) charged with coordinating Natural Resource Management (NRM) in the Namoi Catchment. It is responsible for involving regional communities in management of the NRM issues facing the region, and is the primary means for the delivery of funding from the NSW and Australian Governments to help land and water managers improve and restore the natural resources of the Catchment.

Namoi CMA has set the future direction for natural resource management in the Catchment by identifying achievable targets and milestones for implementation of on-ground works and improved management of our natural resources. These are described in the Namoi Catchment Action Plan (CAP).

 The Namoi CMA has a philosophy of building committed partnerships with a wide range of stakeholders, including Local Government. This project was guided by that philosophy

1.3 The Namoi catchment

The Namoi Catchment covers approximately 42 000 km² and is located in the Murray-Darling Basin in north-west NSW. The Namoi catchment is the area bounded by the watershed of the Namoi River and includes the major tributaries of the Macdonald, Manilla, Peel and Mooki Rivers.

Seven Local Government Areas are partly or wholly located within the Namoi Catchment, (being Tamworth Regional Council and Gunnedah, Liverpool Plains, Narrabri, Walcha, Walgett and Warrumbungle Shire Councils).

Around 100,000 live in the Namoi Catchment. The main urban centres are Tamworth, Gunnedah, Narrabri, Walgett, Quirindi, Nundle, Manilla, Barraba and Wee Waa.

Further discussion about the Namoi, past and present, can be found in Chapter 4.

1.4 Project Summary

The project was commissioned by the Namoi CMA to inform regional strategic land use decisions and infrastructure investments in the medium term future (10 - 25 years). Regional decision makers face an increasingly complex and uncertain environment in determining the uses of, and impacts on, the region's natural and human resources. These major uncertainties are created by expansive mineral exploration, power and fuel generation options, changing and limited water supplies, inconsistent planning processes, undefined future economic drivers and climate change.

As explained in Chapter 2, scenario planning was the methodology chosen for the project.

The outcomes of this project will provide a framework for regional landuse planning which will ensure that northern inland NSW, focussing on the Namoi Catchment and surrounding Catchment areas, develops in a sustainable manner. This will provide a platform for future landscape planning and investments, including the next generation of the Catchment Action Plan, local government plans and strategies, increased certainty for industry and regional development, and meeting community aspirations. It will also improve the delivery of the outcomes sought from the National Action Plan for Salinity and Water Quality (NAPSWQ) and future Natural Resource Management (NRM) programs.


The key proponents of the project include the Namoi CMA, Local Councils and Regional Development Organisations. Other significant planning and industry stakeholders were invited to participate in the project (see Chapter 3).

1.5 Integrating this project with other processes

There have been numerous calls for the development of a Strategic Regional Landuse Plan in northern NSW, by both Local Government, CMA and the combined State agencies. These have been fuelled by the growth of regional cities due to movement from metropolitan areas, and especially now with the resources boom.

In 2006, as a result of these calls, the NSW Department of Planning provided seed funding to Gunnedah, Narrabri and Liverpool Plains Councils to develop a Sub-Regional Resource Economics Study, referred to as the Namoi 2030 project, covering these three shires. Throughout the scenario planning project we liaised with the Namoi 2030 team and drew on their assessments of key issues to be addressed in the future. Members of that project also were part of the Scenarios Working Group.

The Namoi Catchment Action Plan (CAP) developed by Namoi CMA, while looking out 10 years, is generally limited to natural resource management strategies without definite linkages into other statutory planning processes that impact on, or add to, the protection and use of these resources



The Namoi CMA's vision, articulated in the Namoi Catchment Action Plan (CAP) is "Vibrant Communities and Landscapes for the Future". This will only be achieved through visionary integrated regional planning

The scenario planning project seeks to provide some of that visionary thinking by involving stakeholders from across the Namoi catchment in a process that goes beyond the boundaries of day to day thinking and operational planning.

The final stage of this project includes a phase of discussions and negotiations with key government players to explore how integration and consistency between Local Government planning strategies and instruments, and State Planning processes and procedures can be achieved. In addition, it seeks recommendations to CMAs on options on how they can play a role in landuse planning and State Significant Development approvals and future direction for Catchment Action Plans. This would realise one of the aims of the NSW State Plan – that the CAP Targets are acknowledged and incorporated into agency programs. This project also provides the opportunity for inclusion of private sector aspirations and investment into planning for the future.

Finally, the project requires that the outcomes and lessons learnt from this pilot be extended to other Catchment Management Authorities in NSW.

2 Why scenarios?

"If you want to teach people a new way of thinking, don't bother to teach them. Instead, give them a tool, the use of which will lead to a new way of thinking."

Buckminster Fuller¹

There are a number of reasons for doing scenario planning, and there are a number of choices to make about which approach will suit particular objectives. This chapter outlines some of the theory and practice of scenario planning and explains the approach taken in the Namoi scenario planning project. Further detail has been presented in a discussion paper for participants in this project, which is available electronically.²

2.1 What is scenario planning?

Scenario planning arose as a way to deal with increasing complexity and uncertainty, which is the nature of our modern world. Scenarios have been described as: "stories about how the future might unfold for our organisations, our issues, our nations, and even our world".³

Scenarios are not predictions but thought-provoking and plausible stories about multiple ways that the future might unfold and the sorts of challenges and opportunities that it might pose (Box 1).

Scenarios are not primarily about those aspects of the future that are within our control or which are to a large degree predictable. They focus on those elements of the future that are important, uncertain and beyond our ability to control (Figure 1). The term "critical uncertainties" describes these elements.⁴ The relatively certain aspects of the future are not forgotten, however. They are included in the scenarios along with a range of other aspects, both certain and uncertain. The purpose of developing scenarios is not to pinpoint a single future but to experience multiple futures and to learn from all of them.

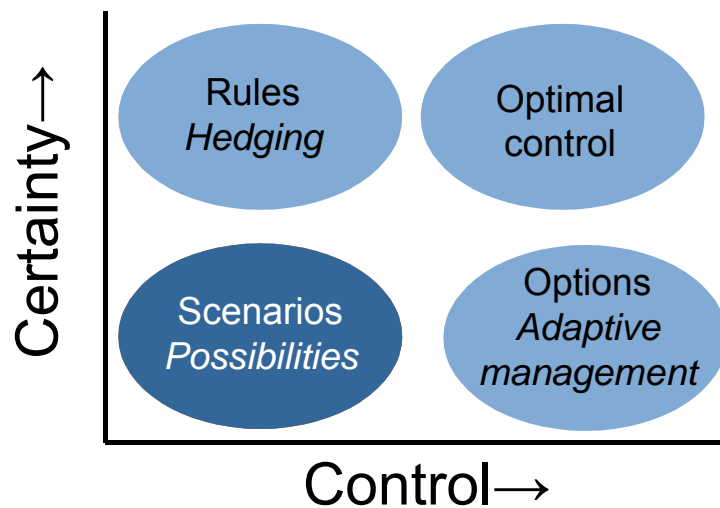


Figure 1 Some parts of the future are more likely than others. Scenarios are the tool of choice for exploring those parts of the future about which certainty is low and we have little control over the way the future unfolds

Box 1 An example of scenarios bringing about major social change⁵

Done well, scenarios are a medium through which great change can be envisioned and actualized. Perhaps the clearest illustration of the power of scenarios is the influential set of scenarios developed in South Africa in 1991, when a diverse group of South African leaders—community activists, politicians, unionists, academics, economists, and business leaders—used scenario thinking as a way to envision paths to democracy as the country transitioned out of apartheid. Each resulting scenario described a very different outcome of the political negotiations that were then underway. One scenario, which the group called Ostrich, told of what would happen if the negotiations were to break down between the apartheid government and Nelson Mandela's African National Congress. Another scenario, Lame Duck, foresaw a world in which a prolonged transition left the government weak and unable to satisfy all interests. A third scenario, Icarus, described a South Africa in which the ANC came to power and its massive public spending resulted in an economic crash. The fourth scenario, Flight of the Flamingos, described how the apartheid government, the ANC, and their respective constituencies might slowly and steadily rise together. These scenarios, known as the Mont Fleur scenarios, were subsequently shared widely throughout South Africa, and became an instrumental common language that helped facilitate public debate in the transition to democracy.

In a review of scenario planning around the World, Dr Peter O'Brien,⁶ previously Director of the Bureau of Rural Sciences in the Australian Government and now Managing Director of the Rural Industries Research and Development Corporation, wrote:

"Scenario planning takes users beyond the tactical and deterministic, to embrace the uncertainty of "what if". The future is unknowable, but we routinely take decisions now which will play out in an uncertain future. Approaches which systematically focus our thinking on that uncertainty improve our capacity to take decisions

now. Our plans are our intentions and our best intentions will take account of uncertainty, be flexible and will play out well in a range of possible futures."

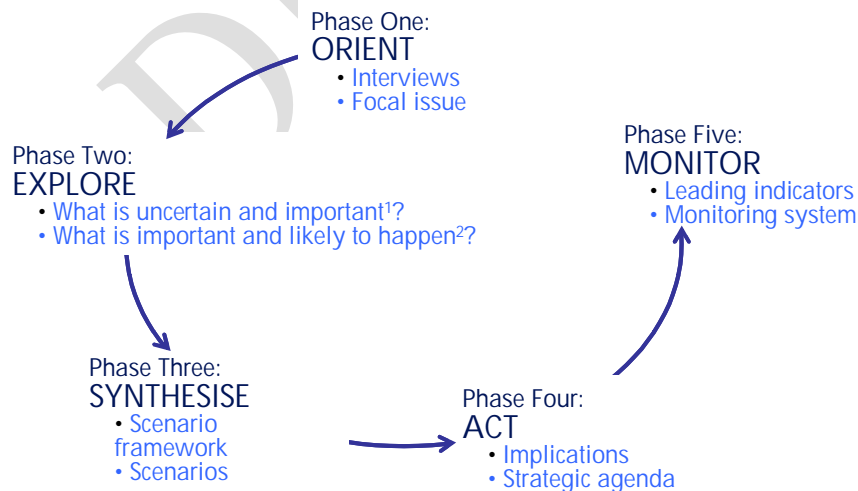
The time and resources devoted to scenario planning theory vary widely between practitioners, companies, and applications.⁷ For example, Royal Dutch Shell and the Global Business Network tend to adopt detailed and deliberate approaches to scenario planning, taking as much as 2 years for one iteration of the process. Similarly the Environment and Defence Departments in the United Kingdom have invested literally millions of dollars over the last decade in scanning for emerging trends and developing discussion papers and strategies to deal with them.⁸

2.2 Principles



Scenario thinking is both a process and an ongoing approach to strategic thinking.

The process begins by considering factors that might bring about change in the world, such as technology, social change, and environmental change (Figure 2). It then moves on to consider which of these factors are most critical and uncertain and explores the implications of these "critical uncertainties" as they combine in different plausible ways to create a range of possible futures.



¹ Often called "critical uncertainties"

² Often called "pre-determined elements"

Figure 2 The scenario planning process adapted from Searce et al.⁹

The process works best when the imagination of participants is stimulated early on so that divergent and new ideas are created. But it is also important

once these new ideas have emerged that the process is completed by bringing the thinking together with a focus on the real-world challenges that stakeholders will face here and now (Figure 3).

Ideally, scenario planning has its greatest impact when people become so involved that they experience, as far as is possible, the range of possible futures and, in so doing, can have important and powerful insights about the present.

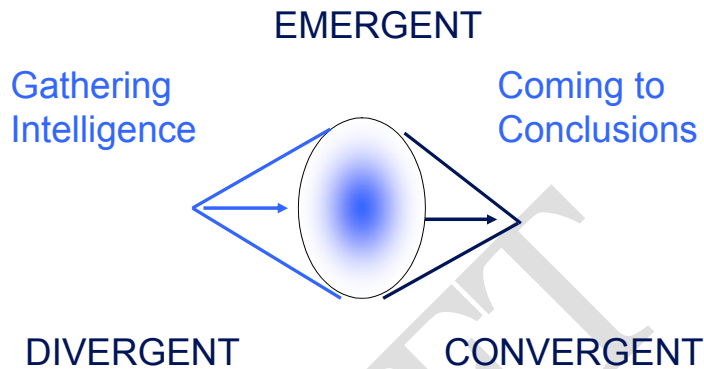


Figure 3 The three types of thinking in scenario planning (divergent, emergent and convergent). It is important that all three are encouraged at the right time so that both new ideas and practical conclusions are generated.

One device to encourage broader thinking is to ask people to work outwards from the immediate context of their issues to larger contexts (for example, regional, national, global) and to consider social, technological, economic, environmental, and political issues explicitly (Figure 4).



Figure 4 Participants in the Namoi scenario planning process were encouraged to think beyond the immediate environment in which their issues sat

2.3 Scenario planning versus strategic planning

In theory, scenario planning should mesh very comfortably with strategic planning. In practice, however, strategic planning tends to focus on a much narrower range of issues, concentrates on developing a plan more than exploring a range of possibilities, and usually assumes implicitly that there is a single predictable future that can be largely controlled (Table 3).

Table 3 Comparison between strategic planning and scenario planning¹⁰

STRATEGIC PLANNING/ POLICY	FUTURES THINKING/ SCENARIO PLANNING
Focus is 1-5 years into the future	Focus is 5-50+ years into the future
One policy/ future	Multiple plausible futures
One interpretation of reality	Multiple interpretations of reality
Goal oriented	Vision oriented
Future is under control	Prepare for many futures
Focus is plan	Focus is the process

2.4 Why scenario planning in this project?

There is a range of reasons why an organisation might invest in scenario planning, going beyond the production of strategic plans (Figure 5). Scenario planning can be a powerful way for groups of people to learn in a relatively non-threatening environment (because no one owns the future) and to build enthusiasm and support for major actions.



Figure 5 Four reasons why an organisation might invest in scenario planning¹¹

Some key requirements for successful scenario planning include:¹²

- Being open to hearing multiple perspectives and challenging commonly held assumptions
- Being positioned to change in a meaningful way
- Having a well-positioned leader for the process (and/or having active support from key organisational/ community leaders)
- Being willing to commit the necessary resources

- Including decision makers or “problem owners” in the process
- Having a clear and relevant focal question, decision or strategy to centre the process
- Communicating scenarios through a range of techniques, including experiential ones

DRAFT

3 The process

"Anyone can create scenarios. But it will be much easier if you are willing to encourage your own imagination, novelty, and even sense of the absurd—as well as your sense of realism."

Peter Schwartz, co-founder of the Global Business Network

Three core scenario workshops were run between October 2007 and December 2008, based on the framework shown in Figure 2. The processes used are described below.

3.1 Workshop participants

A Scenarios Working Group was established at the beginning of the study by inviting over 40 catchment stakeholders to take part in the workshops and/or the on-line survey. Around 30 people attended each of the first two workshops and about 20 attended the third. The Scenarios Working Group included representatives of:

- Agricultural and management consultants
- Coal mining industry
- Conservation managers
- Cotton industry
- Country Women's Association
- Development Corporation
- Farmer cooperatives
- Greening Australia
- Health agencies
- Indigenous people
- Local government (shire councils)
- Namoi CMA and Northern Rivers CMA
- Namoi Regional Organisation of Councils
- National Australia Bank
- Secondary school
- Small business
- Solicitors
- State government
- Tamworth Regional Council

In addition, members of the New England and North West Regional Coordination Management Group (RCMG) were consulted early in the process and they were invited to comment at stages throughout the process. There are 10 RCMG regions in NSW which were defined by the NSW Premier's Department as part of the Regional Coordination Program (RCP). RCMG regions are aggregates of Local Government Areas (LGAs). RCMG regions were implemented to help coordinate NSW government effort at a regional level to maximise benefits to local communities.

The process and the preliminary scenarios were presented to the Namoi Regional Organisation of Councils to obtain a perspective from Local Government and invite their participation in reviewing of the final report and its recommendations.

3.2 Focal question

To be successful, scenario planning needs to have a clearly defined focal question (Figure 2). In this study, the focal question was:

“What factors might aid or hinder the maintenance or improvement of quality of life for residents of the Namoi catchment in the future?”

3.3 Orientation and exploration

Scenario Workshop 1 (October 2007) covered the first two phases of Figure 2 (Orient and Explore).

Participants were encouraged to consider predictable or unpredictable trends or events, and not only factors that relate to their immediate working environments but also ones that lie outside those environments (Figure 4). To aid in this process, a scan of emerging and possible future trends was produced by the facilitators, a draft paper on emerging issues for the Namoi from the Namoi 2030 project was made available and discussed, a summary of interviews with a range of catchment residents and industry leaders was presented and the results of a limited Internet survey in which catchment stakeholders were invited to provide comments on factors that might influence the catchment's future were delivered (details are in Appendix 1).

On the second day of Scenario Workshop 1, participants identified the critical uncertainties among the drivers of change identified on Day 1 and developed outlines of a possible set of scenarios.

3.4 Synthesis

Scenario Workshop 2 (November 2007) dealt with the third phase (Synthesis). This allowed the workshop participants to both describe a set of clear scenarios and pose a set of questions to be addressed in the scenario testing through December 2007 and January-March 2008. Details of these scenarios can be found in Chapters 11 and 12.

3.5 Acting and monitoring

A final workshop was held in December 2008, to build links between the scenarios and the Namoi's strategic and operational planning.

During the time between Workshop 2 and Workshop 3, the facilitators worked with a sub-set of the Scenarios Working Group to revise and refine the scenarios based on comments commissioned from a set of experts in the following fields:¹³

- Overall assessment of scenarios
- Governance
- The Economy
- Agriculture
- Biodiversity
- Mining
- Energy
- Water
- Climate change
- Local Business and Labour
- Education
- Knowledge Economy
- Social issues generally
- Health

Representatives of the Namoi's Indigenous communities were invited to provide an expert assessment but were unable to do so. An assessment of Indigenous issues was obtained from previous reports by Indigenous people and from those Indigenous people who attended the workshops. In general, however, the scenarios did not go into the level of detail that would identify Indigenous people's challenges and opportunities separately from those of other parts of the Namoi's communities. Indigenous people attending the workshops said that the interests of Indigenous people would be served, in general, by a stable economy, high levels of employment and social cohesion that respects diverse cultural and spiritual beliefs and values. The scenario storylines and logics focus strongly on these issues.

The revised scenarios were circulated to the members of the Scenarios Working Group for comment and interpretation. These comments and thoughts about implications were fed into the final workshop, at which participants were asked to consider the strategic implications of what they have learned through the scenario planning process. These implications can be found in Chapter 13.

4 The Namoi

“This ‘locking-up’ of the lands by the squatters – for which they paid rents and assessments averaging less than a farthing per acre per annum – was typical of the situation in New South Wales as a whole, but in the Liverpool Plains it was perhaps more intense and complete than anywhere else in the colony.”

Recollections of early days in the Namoi by William Telfer Jr., in “The Wallabadah Manuscript”, University of New South Press, 1980

A key part of any futures-thinking process is to consider what has happened in the past and what lessons can be learned. The participants in the scenario planning workshops considered a range of material about the Namoi’s past, including observations of early European settlers, perspectives from Indigenous participants in the workshops, and analyses of past policy and legislative programs, as well as the experiences of all workshop participants.

4.1 Present

The Namoi Catchment is located in the North West of NSW and is bounded by the Great Dividing Range in the east, the Liverpool Ranges and the Warrumbungle Ranges in the south and the Nandewar Ranges and Mt Kaputar in the north. Major tributaries of the Namoi River include Cocks Creek and the Mooki, Peel, Cockburn, Manilla and McDonald rivers all of which join the Namoi upstream of Boggabri (Figure 6).

The catchment has an area of approximately 42,000 km² and stretches from Woolbrook (east of Bendemeer) in the east to Walgett in the west, a distance of over 350 kilometres. The catchment is home to approximately 100,000

people who live mainly along the Namoi River and its tributaries between Tamworth and Narrabri.

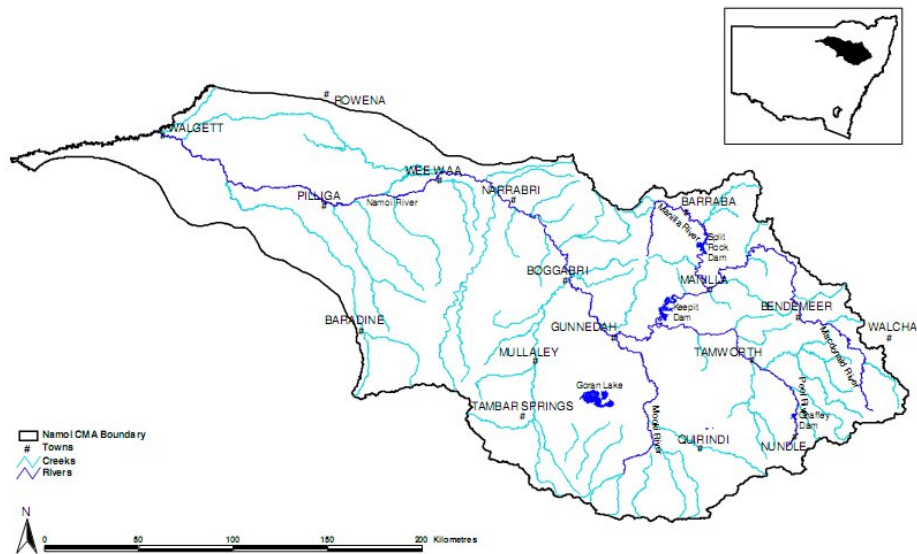


Figure 6 Namoi CMA catchment map.¹⁴

The Kamilaroi people inhabited the entire Namoi Catchment prior to colonisation. Today, there are 12 local land councils representing some 6,500 people. Namoi CMA consulted with Indigenous communities to establish the Namoi Aboriginal Advisory Committee in 2005 to incorporate local Aboriginal knowledge and cultural values into its natural resource management activities.

The Namoi Catchment is a wealthy agricultural area with summer dominant rainfall which allows for cropping and pasture growth all year round. Agricultural production was valued at more than \$860m in 1996 (Namoi CMA 2002) which was 11% of the State's on farm production from only 6.25% of the State's area. This includes cotton production (30% of the State — \$300m pa.), livestock production (\$150m pa.), grain and hay (\$176m pa), poultry (\$70m) and horticulture (\$20m). As well, retail trade in Tamworth alone exceeded \$310m pa.

Forty eight per cent of the gross value agricultural production comes from the catchment's irrigation industries.

4.2 Recent changes

This project drew heavily on the Background Paper for the Namoi 2030 project,¹⁵ which reviewed recent changes in the Namoi with respect to demography, economy and resource use.

4.3 Looking further back

Reviews of historical change in regional Australia can be found in various documents.¹⁶ We have not attempted a detailed review here.

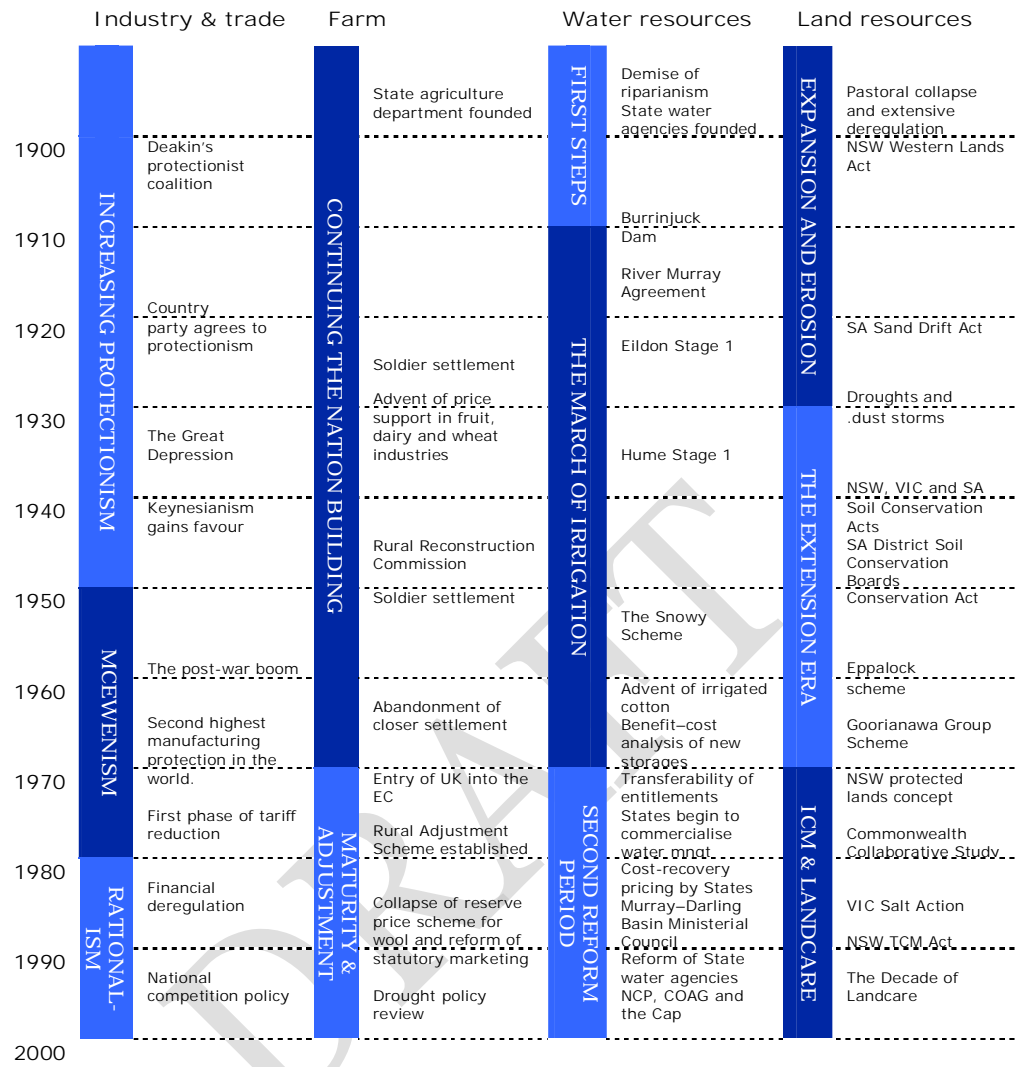
Cork et al. ¹⁷ give a detailed summary of key events in relation to natural resource management in Australia over the past 50 years (summarised with an emphasis on the role of science and technology in Table 4). This is not a detailed historical analysis but rather an approach called “macro-history”,¹⁸ which seeks to detect broad trends.

Table 4: Summary of the more detailed timeline documented by Cork & Delaney¹⁹

1950S	1960S	1970S	1980S	1990S	2000S
An age of possibility	The “Lucky Country”	Widespread emergence of ecological awareness	Natural resources management	Ecologically sustainable development	Complex Inter-dependencies
Science is authoritative voice		Science as knowledge (answers)	Science found wanting by some		Limits to science?
National development and ‘wise use’ of resources (1900–1960s) ²⁰		Modern environmentalism ²¹			
Suburban growth		Communities		Urban renewal	

Reeve et al. ²² provide another analysis of trends in Australian natural resources policy and management up to the turn of this century (Figure 7).

The 2000s have seen the rolling out of two phases of the Natural Heritage Trust, which sought to engage regional bodies and regional communities in natural resource management in a range of ways, the National Water Initiative, the National Land and Water Resources Audit, the ongoing coordination of research and development by the Australian Government’s Research and Development Corporations, and the efforts of the Murray Darling Basin Commission to achieve cross-state integrated management of water resources. As drought has dominated the climate for much of the 2000’s, the focus of policy has turned to water allocations for industry and providing adequate flows in waterways to support environmental processes and biodiversity. The use of economic instruments, especially reverse auctions, to achieve efficient investment of public funds has become widespread and markets for some aspects of environmental goods and services have begun to emerge. The possibility that farmers might manage land profitably for more than commodities has become a common discussion point and focus for lobbying of governments.

Figure 7 Agricultural and resource management policy in the Murray–Darling Basin²³

5 Assumptions

"We carve out order by leaving the disorderly bits out"

William James, cited by Jerome Groopman in his book "How Doctors Think" which deals with the perils of making hasty assumptions when diagnosing medical conditions

The importance of identifying assumptions about the future and questioning them has been emphasised by many strategists, including James Dewar of the RAND Corporation and the French Futurist Michel Godet.²⁴ Dewar's Assumption Based Planning approach identifies assumptions and then uses a process similar to scenario planning to explore the future conditions that might make these assumptions vulnerable. He then considers actions that could be taken to shape the future you want and actions that can be taken to hedge against failure. In Chapter 13 we consider shaping and hedging actions that the Namoi's leaders could take to prepare for a range of plausible futures. Godet's Cliché Hunting approach identifies assumptions and questions their basis rigorously to weed out assumptions that are accepted without good reason and identifies those that have a logical basis at present but might not continue to hold in the future.

In the first workshop of this project, participants were asked to identify the assumptions that they made about the future of the Namoi and those that they thought other stakeholders make. In Table 5 these assumptions are summarised. The table also indicates which assumptions are questioned by one or more of the scenarios (numbered 1-4); i.e. either the optimistic or pessimistic version of the scenario describes a world in which this assumption might not hold. Asterisks in the table indicate that an assumption is particularly relevant in one or both of the versions of the scenario. These assessments have been made by the facilitators. A reader might disagree with our assessment. As there is no right interpretation of any futures scenario, we encourage readers to ask their own questions about how assumptions might play out in the future and to draw their own conclusions.

Table 5 Assumptions about the future of the Namoi identified by workshop participants

TOPIC	ASSUMPTION	1	2	3	4
Agriculture	Agriculture costs will continue to rise			?	?
	Land use changes will be driven by changing markets				
	There will be new agricultural industries and more niche crops	?	?		
	There will be fewer, bigger farms	*	*		
	While agriculture will be a major land use intensive agriculture will increase	*	*		
	Commercial agriculture will continue to be under threat from pressures such as land fragmentation and water supply	*			*
Climate change	Climate change will change the current land use and be increasingly unpredictable	*			*
	Carbon trading will become a reality	?	?	?	
	Climate will continue to change	*			*
	Climate change is largely human induced we can do something about this	?	?	?	
Community services	Community health and well-being will be addressed at appropriate levels	?	?	?	
	Current levels of access to community health services will not be adequate (will need re-design)	*	*		
	We will have the capacity to successfully manage change	?	?	?	?
	Services to small centres will decrease			?	?
	It will be a challenge to maintain education quality	*	*		
Demography	More people will live in the catchment and economic growth will continue	*	*	?	
	Population will increasingly be concentrated in the larger centres (i.e. small towns will contract)	?	?	?	?
	Alternatively ...There will be urban to rural migration	?	?	?	?
	Farmers and communities will age	?	?		
	Labour shortage will continue	*	*		
	Young people will continue to leave the catchment	?	?	?	?
	Transport industries (especially rail and road) will find it harder to attract young workers due to better employment options outside the catchment	*	*		
Economy	Namoi will grow in importance as a region	*	*	*	
	People will be more materialistic				
Energy	Development will continue in the catchment	*	*	*	
	Demand for raw materials for biofuels will increase in Namoi			*	*
	Developments incorporating alternative energy production (wind, solar) will occur in Namoi			*	*
Environment	Natural gas industry will expand across the Namoi and will supply area outside the catchment	*	*		
	Conservation reserves will always be inadequate	*	*	*	?
	Endangered species and ecological communities will continue to be under threat	*	*	*	?
Globalisation	Feral animals and weeds will always be a problem	*	*	*	?
	The region will increasingly be connected to, and influenced by, the rest of the world				
Government and governance	Regulation (including compliance requirements) by government will increase	?	?	*	*
	Services west of the great divide will continue to decline due to reduced levels of government investment	?	?	?	?

TOPIC	ASSUMPTION	1	2	3	4
	There will be a greater financial burden on local governments to provide and deliver local services	?	?	?	?
	There will continue to be ineffective leadership at the regional level	?	?	?	?
	Regionalisation of services will continue	?	?	?	?
Physical infrastructure	Roads will be the major form of transportation				
	There will be investment in infrastructure including road, rail, air telecommunications, but it is unclear whether it will be public or private, ad hoc or planned	?	?	?	?
	New transport technologies will have a major impact on future possibilities for the catchment				
Mining	Mining will conflict with agriculture (especially with respect to water use and land availability)	*	*		?
	Mining will cause regional inflation	*	*		?
	Coal mining will continue and grow	*	*		
	Mining will impact negatively on the environment (e.g. pollution, aesthetic values)	*	*	?	?
Technology	The pace of technological change will continue to increase				
	With advances in biotechnology (capital intensive) our cropping will become less diverse				
	Technology will replace job demand				
	Genetic modification of plants and animals will become mainstream				
Water	Towns will have greatest water security (i.e. they will be given preference over agriculture and other industries)	?	?	?	?
	Rivers will be increasingly regulated	?	?		
	Water will be more scarce, more expensive, and a major environmental issue – surface and aquifer	*			*
	There will always be good quality water	?	?	?	?
	Water availability will be the major driver of economic investment within the catchment	*			*

6 Drivers of change

"Radio has no future ... X-rays will prove to be a hoax ...
Heavier than air flying machines are impossible"

Lord Kelvin, President of the Royal Society of London, 1890-95

The heart of futures thinking is the identification of trends and events that could plausibly affect trajectories of change that relate to your focal question. Good futures (strategic) thinking processes create the conditions in which participants can look behind (the past), ahead (where currently emerging trends might lead), above (big picture), below (details like those that might validate or invalidate an assumption about the future), beside (look over the fence at what insights about the future of your area of interest might be gained from trends and responses in another area, discipline, industry, sector, etc.) and beyond (using experience and informed imagination to consider how the medium or longer-term future might be different from an extension of the present).²⁵

We approached identification of drivers of change in several ways:

- Consultation with stakeholders
- Environmental (horizon) scanning
- Background paper from Namoi 2030
- Expert input at workshops
- Commissioned expert commentaries

6.1 Stakeholder consultation

The Namoi 2030 project conducted an initial Government Agency Workshop before the Scenario Planning project was initiated, which focussed on challenges potentially facing the catchment in the future, especially with respect to use of resources. Subsequently, the two projects collaborated on a

workshop with the Premier's Department Regional Coordination Management Group and a series of meetings with selected stakeholders in the Namoi Catchment involved in: forestry; water resources; cotton irrigation; other irrigation; coal extraction; other minerals extraction; natural gas extraction; urban growth and rural subdivision. In addition discussions were held with the Department of Primary Industries Minerals and NSW Forests. The results of this consultation are reported in the Namoi 2030 project's Background Paper²⁶ and they have been incorporated in Appendix 1.

The Scenario Planning projects also conducted a series of phone interviews and an internet-hosted survey that interested people could take part in. This was a very small sample but it enabled those who were interested to have input to the project (a summary is in Appendix 1).

6.2 Environmental scan and background paper

A scan of emerging trends that could influence the future of the Namoi catchment was prepared as an input to the first workshop in this project.²⁷ In addition, a background paper on issues facing the Namoi catchment in the past and near future was prepared as part of the Namoi 2030 project and made available to participants in the Scenario Planning project.²⁸

6.3 Expert input at the workshops

The stakeholders invited to be part of the Scenarios Working Group at to attend the three workshops not only had a range of connections with communities but they also had diverse skills and experience (see Section 3.1). Members of this group were invited to share their knowledge formally and informally during and between the workshops.

6.4 Commissioned expert commentaries

Once a first draft of the scenarios had been developed (i.e. after the second workshop), a set of experts was commissioned to consider the plausibility of the scenarios and whether we had considered drivers of change adequately (see Section 3.3).

A summary of these commentaries was provided to workshop participants for consideration. The summary is in Appendix 2. Detailed reports were provided to the Namoi CMA and to any workshop participants who wanted further information.

6.5 Drivers of change

Appendix 3 lists the results of discussions among participants in the first workshop. Once this list had been developed the participants discussed which of these drivers were most uncertain and critical to the Namoi's future. This is a critical part of any scenario planning process. Many drivers of change, such as global economic changes, environmental degradation, social tensions and advances in technology, are highly uncertain and important but we need to identify a small number that override the others to focus the scenarios around. In this project, the members of the Scenarios Working Group focussed on issues that they thought affected their ability to deal with a wide range of future uncertainties.

6.6 Key issues for the catchment

Table 6 lists a set of issues that participants in that workshop felt were of high concern for the catchment in the future. Others added since, via workshop participants and interviews with stakeholders in the catchment include:

- impacts of urbanisation, especially on water
- impacts of mining
- rail and road infrastructure
- impacts of commodity price increases or decreases

6.7 Critical uncertainties

In Workshop 2, scenarios were developed around two key uncertainties:

- The extent to which Australian governments in the future take a nation-building, strategic approach that considers the values from people and natural resources in regional Australia along with values from the rest of Australia; and
- The extent to which the Namoi is able to shape its own future

Subsequently, feedback from the commissioned experts supported these as important uncertainties but suggested that developments around energy supply and cost and climate change are threatening to drive change in most other areas of concern, such as those listed in Table 6, or even to overshadow them in the hearts and minds of Namoi residents. Thus, the scenarios were reframed around energy, climate and governance issues as explained in Chapters 7 and 12.

Table 6 Key issues of concern identified by workshop participants

ISSUE	DETAILS	
Identity, culture, image, community	Seeing ourselves as the world sees us vs seeing ourselves as we want to (always have, idealistic) Meaningful employment opportunities Image problems Decline in small rural populations	Cities don't consider rural communities Turnover of population Ageing population Brain drain Sense of community
Social equity and opportunity, values	Individual versus common good issues Cultural obligations Welfare patterns in catchment Quality of life, health services Lack of social awareness	Diminishing enthusiasm Access to opportunities to fulfil potential Sense of community Materialism, values
Challenges of being regional	Transport services to region (in and out) Short term focus of governments Infrastructure investment Marketing the Namoi more effectively Economic viability	State funding new capital flow Dead hand of government Coordination of regional governance Recognition of regional differences (location, size etc) Attitudes of urban Australians
Environmental, social, economic balance	Growth at all costs is not a viable strategy Balanced development/ balanced growth Food versus fuel Sustainability of coal, agriculture and environment, land management What should we monitor? How?	Understanding link between environment and human well-being Declining conservation values Will decisions made now about our rivers be right in 10 years? Planning based on today's water rather than future water
Ungrouped but very important	Climate change	Influence of the media
Added later		

7 Key uncertainties

“After identifying and exploring the driving forces, one must uncover the predetermined elements and the critical uncertainties. There is a temptation to assume that these are separate categories, painted in three distinct colours. That, alas, is not the case.”

Peter Schwartz in “The Art of the Long View”

The eminent futurist Peter Schwartz²⁹ calls critical uncertainties “the dwelling-places of our hopes and fears”. He points out that identifying a small number of critical uncertainties is not straightforward. Some scenario planners prefer to not categorise drivers under such headings but to weave a wider range of uncertainties together in a set of stories from which emerge the key issues. The latter approach works well in the hands of master story-tellers in an environment where those making the decisions can get intimately involved in exploring the stories. The benefit of identifying a small number of critical uncertainties is that discussion can be more strongly focussed and a clearer message can be conveyed to those who were not involved in the process. In this project not only was a clear message required but it also appeared to us that three issues were emerging above all others.

7.1 Climate and energy

The evolution of life on earth has been driven largely by climatic changes and the requirement for food. The growth of human populations, particularly over the past three centuries, has also been driven by the need for energy, water and other resources such as minerals and metals.

The world is currently at a critical stage in processes of climatic change and change in energy availability that will present major challenges and opportunities in the next few decades. These two processes stand out from all other drivers of change because decisions made on energy and climate in the

next few years and decades could change the nature of human societies around the world and especially in an affluent, energy dependent country like Australia.

Changes in climate and energy availability will in turn affect a range of other processes that underpin the welfare and prosperity of human populations, including food supply, exposure to adverse weather, commodity prices, exposure to diseases, political and social unrest, national security, and draw-down on the natural capital provided by the world's ecosystems that underpins all life.

All of the issues that the Namoi Scenarios Working Group identified as major drivers of change for the future of the Namoi are likely to be directly or indirectly affected by climatic changes and changes in energy supply and demand. For example, energy prices will influence the type of industries that are profitable in the Namoi and the ability to ship produce to markets nationally and internationally. Historically, global commodity prices tend to follow oil prices. Changing commodity prices can have beneficial or detrimental impacts on industries in the Namoi depending on policy settings, climate, global and national economies and a range of other factors. The ways in which governments respond to the transition from oil and other fossil fuels to new sources of energy will affect that other key issue for the Namoi - investment in infrastructure.

Similarly, water availability and patterns of rainfall will be major determinants of which industries succeed in the Namoi, what size of population the catchment can sustain, and where people live. The dual challenges of water and energy supply will, in turn, affect the way decision makers and land managers manage their natural environment and the ways in which people treat one another through informal social interactions and formal welfare support processes. Already there is evidence emerging in other parts of the world of land managers abandoning conservation programs to return land to agricultural production as demand for food and biofuels grows, but this is just one way in which people could react to the challenges of the next few decades.

7.2 Governance, leadership and influence

As the first round of scenarios revealed, the governance arrangements that evolve in regional Australia will affect the ways in which the assets of the regions are valued and nurtured nationally, as well as the ability of regions to tap into local talent and expertise, as well as external investment, to shape their own futures.

7.3 A comment on economic uncertainties

Some members of the Scenarios Working Group were keen to see economic uncertainties, such as commodity prices, included as critical uncertainties. There is no doubt about the impact of global and domestic economic drivers on social and environmental processes in the Namoi or any other region. Similarly, recent events have highlighted how uncertain the future trajectories of the global economic system are.

The majority view among the group, however, was that the impacts of energy and climate change uncertainties would themselves have major impacts on the Namoi's and Australia's economies and that governance and leadership issues would be critical in determining how well prepared the Namoi might be for future economic and other challenges. The importance of commodity prices and access to global markets has been built into the scenarios as a central component.

7.4 Three critical uncertainties

The revised scenarios are structured around these three major uncertainties:

- Whether changes in the supply and demand for oil drive an orderly or disorderly change in costs and availability of energy
- Whether climate change occurs slowly or rapidly
- Whether changes in governance allow the Namoi to have high or low levels of influence in national policies for dealing with future social and natural resource challenges in regional Australia and over the processes acting within regions that affect the future of those regions

Of particular interest are the possible interactions between these uncertainties. There are, in theory, 8 different combinations of these three uncertainties (Table 7). Clearly, the worst possible case would be extreme climate change combined with extreme energy costs and little ability of the Namoi to do anything about it. In Chapter 12 we explain which of these we have focussed on in the scenarios and why.

Table 7 The eight possible combinations of energy, climate and influence trajectories.

While the fourth line is clearly the best-case scenario and the fifth line is the worst, no other ranking is implied in the table as opinions will differ about which of the alternatives is more or less desirable or easier or harder to deal with.

ENERGY TRANSITIONS	CLIMATE CHANGE	INFLUENCE (GOVERNANCE)
Disorderly	High-warming	Effective
Disorderly	Low-warming	Effective
Orderly	High-warming	Effective
Orderly	Low-warming	Effective
Disorderly	High-warming	Ineffective
Disorderly	Low-warming	Ineffective
Orderly	High-warming	Ineffective
Orderly	Low-warming	Ineffective

We remind readers that our purpose in developing a set of scenarios about the future of the Namoi is to cut through some of the uncertainty and complexity around what the future could bring. We aim to provide some simple glimpses into possible futures to get people thinking about some key issues. Apart from the three major uncertainties listed above, there are many other uncertainties that could be discussed. To try and focus on all of them would defeat our purpose of simplifying complexity and would confuse readers. Some of these other uncertainties are drawn out in boxes within the coming sections of this report and some are discussed in the synthesis chapter. We encourage readers to use the scenario framework presented as a starting point for thinking about the implications of issues that we have not covered in this report.

In the next three chapters, we outline some of the issues surrounding energy, climate, and governance separately before considering them in combination in the revised scenarios.

8 Energy futures

"If concerns about climate change drive a transition to renewable sources, it will be the first time in human history that energetic imperatives, especially the economic advantages of higher-quality fuels, were not the principal impetus"

Cutler Cleveland (see Box 2)

This chapter summarises some of the issues surrounding peak oil and meeting the World's future energy demands. It makes the following key points:

- Oil reserves are probably approaching a peak of economic extractability
- Oil prices may continue to climb steeply or stabilise at a new high level
- A transition away from fossil fuels is underway, but how fast and orderly it happens is uncertain
- This transition may be the first in human history to not involve a shift to a higher-density power source, which could mean that humans need to adapt to living with less energy
- The transition is likely to be faster and less orderly the more acute climate change turns out to be and/or the less coordinated policy responses to climate change are
- In the short term there is likely to be a greater focus on gas and then coal while transitions to greater reliance on renewables and/or nuclear unfold
- Two future energy trajectories are of particular interest to the Namoi:
 - a slow transition from oil to coal, gas, and/or nuclear and renewable energy sources, characterised by orderly policy and market adjustments but still with highly variable implications for different parts of the world

- a more rapid decline in oil availability, sparking the need for governments to fast-track policies and interventions to bring about essential change while mitigating the negative sentiment from industries and voters (this trajectory is disorderly and requires diversion of investment from other sectors to the energy sector to speed the transition to alternative energy sources)

8.1 Future energy trajectories

There are many trajectories that the future of energy could take globally and in Australia. It seems unlikely, however, that "business as usual" will prevail. What conditions would need to hold for a continuation of current energy usage (i.e. a heavy reliance on oil and gas)? Richard Holmgren³⁰ suggests the following:

- Global extraction rates of important non-renewable commodities will continue to rise.
- There will be no peaks and declines other than through high energy substitution such as the historical transitions from wood to coal and from coal to oil.
- Economic activity, globalisation and increases in technological complexity will continue to grow.
- The geopolitical order that established the USA as the dominant superpower may evolve and change but will not be subject to any precipitous collapse such as happened to the Soviet Union.
- Climate change will be marginal or slow in its impacts on human systems, such that adaptation will not necessitate changes in the basic organisation of society.
- Household and community economies and social capacity will continue to shrink in both their scope and importance to society.

As explained in the following sections of this chapter, these assumptions are unlikely to all hold in coming decades. Below, we explore the range of energy scenarios in the literature, the origins of the current debate about energy scarcity, and the range of possible alternatives to the current energy mix, before identifying two future trajectories of particular interest to the Namoi: (1) A future in which an orderly transition to a new regime of energy demands and a new mix of energy sources; and, (2) a future in which this transition must be made urgently, as an emergency response because factors affecting energy supply accelerate its decline.

Box 2 Three quotes summarising tensions likely to play out with respect to energy and carbon emissions in the coming decade

"The challenge of preparing for high oil prices is a short to medium term concern for Australia. In the long run, given the abundance of energy sources in Australia, the transition to an alternative fuel, demand management and higher transport efficiency would mitigate most impacts." (CSIRO Energy Forum, 2006³¹).

"The debate about "peak oil" aside, there are relatively abundant remaining supplies of fossil fuels. Their quality is declining, but not yet to the extent that increasing scarcity will help trigger a major energy transition like wood scarcity did in the 19th century. The costs of wind, solar and biomass have declined due to steady technical advances, but in key areas of energy quality—density, net energy, intermittency, flexibility, and so on—they remain inferior to conventional fuels. Thus, alternative energy sources are not likely to supplant fossil fuels in the short term without substantial and concerted policy intervention. The need to restrain carbon emissions may provide the political and social pressure to accelerate the transition to wind, biomass and solar, as this is one area where they clearly trump fossil fuels. Electricity from wind and solar sources may face competition from nuclear power, the sole established low-carbon power source with significant potential for expansion. If concerns about climate change drive a transition to renewable sources, it will be the first time in human history that energetic imperatives, especially the economic advantages of higher-quality fuels, were not the principal impetus." (Cutler Cleveland, 2008)³²

"... conventional oil reserves may well come under pressure over the next several decades, but that there are ample supplies of coal. Some argue that conventional oil reserves are exaggerated But unconventional sources, including oil sands in Canada, extra-heavy oil in Venezuela and shale oil in the United States, Australia and several other countries ... are thought to amount to at least 1 trillion barrels, or almost 50 per cent of ultimately recoverable conventional oil resources." (Draft Garnaut Report, 2008)³³

8.2 The range of energy scenarios in the literature

A wide range of scenarios relating to supply and demand for oil, gas, coal and other energy sources exist in the literature. Uncertainty comes from lack of reliable information about reserves, misreporting of what information exists, marketing of different energy technologies by interest groups, questions about the stability of the global financial system, multiple possibilities for international power shifts and influence that could affect supply and/or demand, the extent to which oil, gas and coal prices will remain linked, the timeframe for new technologies such as clean coal, carbon sequestration, solar, nuclear and wind, the extent to which other energy sources can substitute for oil (especially in transportation), transport constraints (including congestion in Australian ports and availability of a new generation of vessels for relieving this congestion), responses of consumers to decreasing energy supply and increasing prices, and climate change.

Given the above uncertainties, a range of scenarios for the future of energy have been suggested (Figure 8), falling into four broad categories:

- Supremely optimistic scenarios hoping for discovery of a new energy source, perhaps through exploration of other planets (obviously a long-term scenario), and or major technological breakthroughs to allow energy consumption and economic growth to continue at current levels
- Pessimistic scenarios anticipating a collapse in societies due to inability to support economic growth and subsequent deterioration of the fabric of society as everyone fends for themselves
- Optimistic scenario about adjustments to current patterns of energy use to decrease demand and replace oil with alternative energy sources such as biofuels, wind and solar energy to allow economic growth to continue at similar levels to present ones
- Scenarios anticipating a need to adjust all aspects of societies and economies to live with less energy and lower economic growth

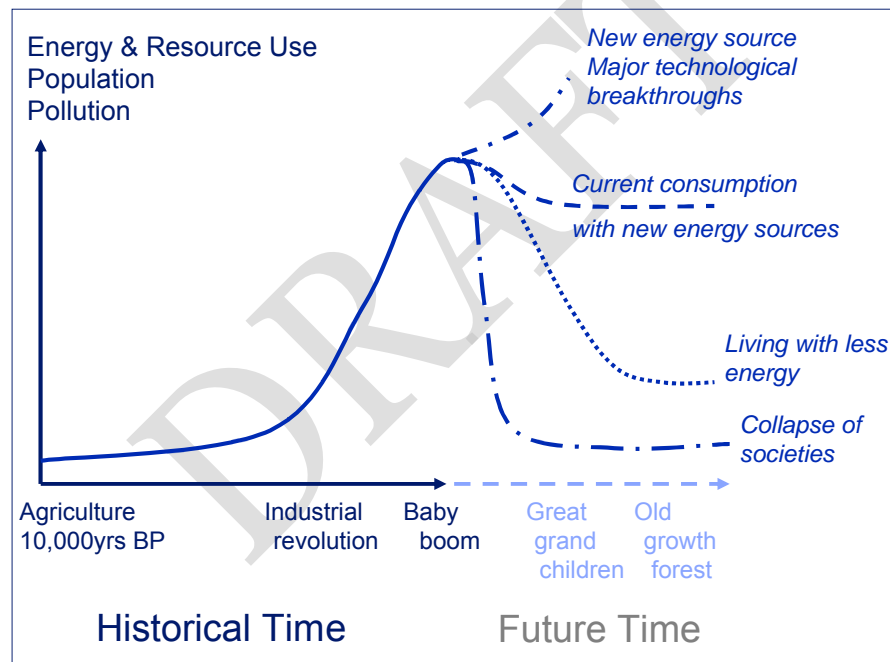


Figure 8 Four broad class of scenarios for the future of energy globally³⁴

While most of the world will hope for a new energy source to be discovered (some discussions, for example, have linked to this sort of scenario with travel to other planets to find alternative energy sources), there seems no realistic hope of this occurring before 2030. We have considered this possibility, therefore, as a possible future shock or surprise rather than a central focus for the scenarios.

Similarly, collapse scenarios are not the focus of our scenarios, but we should not overlook the possibility of such scenarios playing out. As Australia, like

other western countries, has pursued economic rationalism in recent decades, we have seen growing levels of private debt and declining numbers of institutions and individuals that hold and pass on specialised skills (e.g. engineers, scientists, doctors, nurses, teachers and the like). This leaves Australia and other western countries vulnerable to the sorts of economic shocks that could come from rising oil prices.

The most extreme collapse scenarios in the literature suggest that many countries and/or groups within societies could be forced out of energy markets by rising prices and declining supply, leading to economic contraction or collapse, collapsing public health and political turmoil³⁵.

At a less extreme level, some evidence showing declining levels of happiness and optimism about the future suggests that people's personal resilience (their ability to cope emotionally with economic and other stresses) has been declining. Throw in additional shocks, such as a disease pandemic, and one could imagine a major change in Australian society, even by 2030.

However, overly pessimistic scenarios are unlikely to motivate people to take positive action and might even encourage them to give up trying to fashion a desirable future.

The scenarios that offer hope and motivation are those that explore how societies might adjust their demands for resources. This sort of thinking has been going on the decades under the heading of "sustainable resource management". The Namoi scenarios have sustainable land use at their core. The steps needed to achieve sustainable management will, however, be different in different futures.

The most comprehensive scenarios developed for Australia's energy futures were those of the CSIRO Energy Forum in 2006.³⁶ These scenarios focussed on the interaction between energy availability and policy responses to climate change. Their assumptions about both climate change and oil prices have been superseded by recent faster than expected increases in oil prices, new modelling by the Intergovernmental Panel on Climate Change (IPCC)³⁷, the emergence of evidence that the IPCC models may have underestimated the rate of climate change,³⁸ and the Draft Garnaut Report to the Australian Government (2008).³⁹ Nevertheless the broad conclusions for the Energy Forum scenarios (Box 3) are similar to those subsequently drawn by the Draft Garnaut report.

Box 3 The main conclusions from the CSIRO Energy Forum scenarios.⁴⁰

- Energy can be expected to remain affordable for households (this conclusion is currently under question as oil prices rise rapidly, but some commentators say that prices will stabilise at an affordable level)
- Responding to climate change can be expected to have significant effects on some parts of Australian industry, over the next 44 years, particularly agriculture, iron and steel, and non-ferrous metals (aluminium production). If Australia acts in concert with the international community, agriculture and iron and steel output by 2050 might be reduced by a relatively small proportion, but if Australia makes unilateral deep cuts or acts as part of a smaller international coalition reductions could be much larger.
- As a result of responding to climate change some regions reliant on trade-exposed and carbon-intensive industries may be disproportionately impacted compared to the rest of Australia.
- Australia has a strong vested interest in finding solutions to climate change. It is a major energy exporter; the environment sits prominently in the Australian psyche; and as a nation it is vulnerable to the broad economic, social and environmental impacts of climate change.
- Addressing climate change will require an enormous transformation of infrastructure and society's use and relationship with, not just energy, but a broad range of products and services. A much greater level of government intervention is likely to be initially required to achieve the scale of transformation required to address climate change in a meaningful way.
- There are both advantages and disadvantages of adopting an emission reduction goal that begins early (e.g., 2010) versus later (e.g., 2030) .
- Climate change uncertainty affects investment.
- The cost of addressing climate change is lowest for Australia when it can choose from all available technologies, in partnership with energy efficiency improvements and demand management.
- Australia is vulnerable to changes in oil prices as a result of households and businesses being strongly geared to liquid fuel based transportation. A loss of affordability of transport fuels could be expected to have negative social and economic impacts. The volatility of oil prices tends to retard investment directed to preparatory action that would make Australia more resilient to future price variations.
- The challenge of preparing for high oil prices is a short to medium term concern for Australia. In the long run, given the abundance of energy sources in Australia, the transition to an alternative fuel, demand management and higher transport efficiency would mitigate most impacts.

8.3 Evolution of the current oil supply issues

The past 250 years has seen society transition from reliance on wood as a primary energy source to coal, which fuelled the industrial revolution, and then oil and, more recently gas.

Population growth in Europe in the 14th and 15th centuries led to exploration and conquest to provide new sources of wealth and food. The transition to coal fuelled the industrial revolution. The wealth generated allowed some societies to invest in education and research that then led to the advances in food production to meet the demands of growing populations.

The transition to oil as the major energy source supported the spread of industrialisation across the Americas and Russia and a huge increase in the human population of the planet.

The energy crises of the 1970's, brought about by OPEC countries restricting supply of oil, temporarily brought attention to the reliance of industrialised nations on oil. This led to a greater use of gas and nuclear energy and to increased attention on the efficiency with which oil was used, especially in transportation. The petrol excise, which is currently the focus of debate as petrol prices climb, was one of the measures taken at that time to reduce the reliance of Australians on oil.

Between then and the 1980's a combination of economic contraction and increasing abundance of oil took attention away from reliance on this commodity. Throughout this period both oil and commodity prices were low and energy and food costs in affluent countries were, relatively speaking, the lowest they had ever been.

Concern about reliance on oil resurfaced in the 1980's and 1990's as evidence of the possible impacts of consumption of fossil fuels on climate emerged. This concern has intensified since the 1990s as evidence has emerged suggesting that reporting by OPEC countries has overstated oil reserves and that the peak in oil availability globally is approaching or has been reached. This has been fuelled in the past year by the failure of Middle Eastern countries like Saudi Arabia to release more oil, even though it is their interests to do so, suggesting that they have no surplus capacity. Meanwhile food prices have been rising steadily with oil prices since the turn of the millennium.

While the debate over peak oil rages (some say the peak has been passed, some say it is being approached soon and others argue it is some way off) there is uncertainty about:

- what the world's reserves are;
- whether new fields can be found;
- what the cost will be of accessing low quality reserves;
- what tactics oil producers will adopt as oil prices climb to levels that threaten many industrialised economies;
- how much we can count on human ingenuity to find the next concentrated energy source;
- how long it will take to make the transition to whatever the new energy economy is.

8.4 Peak oil

The next 100 years could see huge growth in demand for resources. The Garnaut Report,⁴¹ suggested that Australia's real per capita income could be nearly four times what it is today and that today's developing countries could achieve higher levels of per capita expenditure than today's rich countries.

Concerns about limits the supply of valuable resources, including oil, started in the early seventies with the publication of reports such as *Limits to Growth*,⁴² but this was soon forgotten due to the abundance of oil in the 1980s and 1990s. As production of oil in the United States peaked in the late 1990s and started to fall, and global production plateau around 2004, talk about oil having reached a global peak intensified. Projections such as that shown in Figure 9 and Table 8 are based on measures of past production and data on existing and planned oilfield developments. These data suggest that known oil deposits cannot continue to meet the rising demands of the world's population.

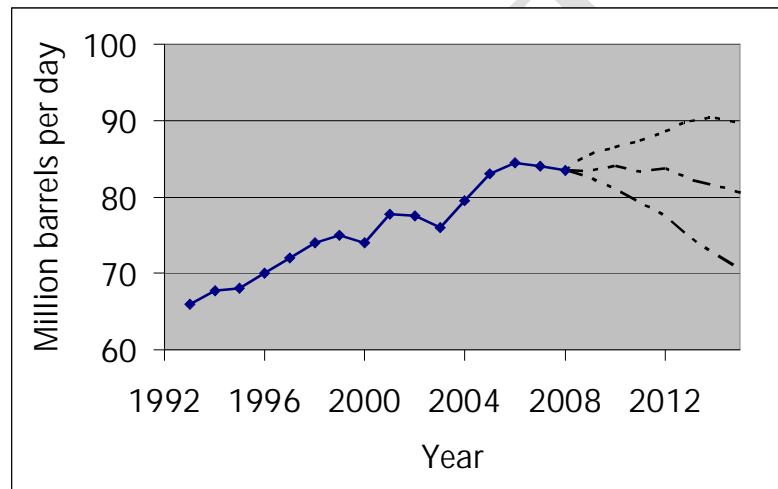


Figure 9 Recent oil production globally and three suggested future trajectories⁴³

Uncertainty comes into this debate because many countries report large oil reserves but many of these are thought to be of low quality and expensive and slow to extract oil from, meaning that they are unlikely to produce oil fast enough to meet demand.

Table 8 Estimates of the time for which demand for fossil fuels could be met from known accessible reserves (that part of known deposits that can be accessed economically) assuming the rates of consumption measured in 2007 or projected for 2050 (from the Garnaut Draft Report, 2008⁴⁴)

FUEL	CONSUMPTION RATES FOR YEAR:	
	2007	2050
Coal	139	66
Gas	60	32
Oil	40	23

Several recent reports suggest that both Middle Eastern and Western countries have been over-reporting their oil reserves.⁴⁵ The most recent evidence of this is the failure of Saudi Arabia to increase production in 2008 as oil prices rose rapidly, even though it was in Saudi Arabia's interest to do so and this country had played the role of price stabiliser in the past.

Of course, some oil companies continue to be optimistic that they will find new reserves of oil and gas, and/or other developed technology that will enable them to access lower quality reserves, but developing the infrastructure associated with new fields is most very expensive and can take a decade or more to put in place.

Tempering this optimism is the view that even if supplies are boosted in the next few decades, we will see a lot more oil used to support economic growth within oil-producing countries as well as the booming economies of China, India, Russia and Brazil.

Those who had read a little about the history of scenario planning will be aware of the story of Royal Dutch Shell's success in the late 1960's and early 1970's, when their scenario planners imagined a scenario of increasing oil prices at a time when conventional wisdom among oil companies and governments was that oil prices would remain low because of abundant supplies. While Shell did not "predict" a rise in oil prices (on the contrary, it was the other oil companies that were doing the predicting by only considering the one possibility - that oil prices would stay low), it had encouraged its managers to consider the possibility, which gave the company a major head start when oil prices rose due to the influence of OPEC in 1973 and again in 1979.

8.5 The next energy sources

The question of where the world will get energy from after oil is hotly contested and also clouded with hyperbole and advocacy.

Each of the energy transitions that humans have gone through in the past have involved moving to a denser energy source (i.e., a source that yielded more energy per unit of weight and/or mass than the previous energy source) (Figure 10, Figure 11 and Figure 12).

From Figure 12 it can be seen that none of the alternatives to oil, gas and coal that are currently available, except for nuclear energy, represent a lower-density energy source than oil.

Thus, it is highly likely that the world's attention will be, at least initially, focussed on gas and coal as oil declines.

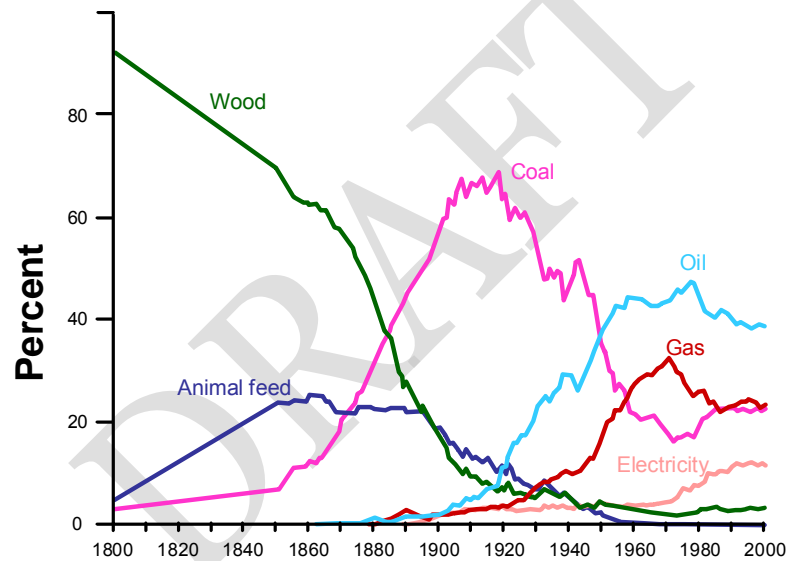
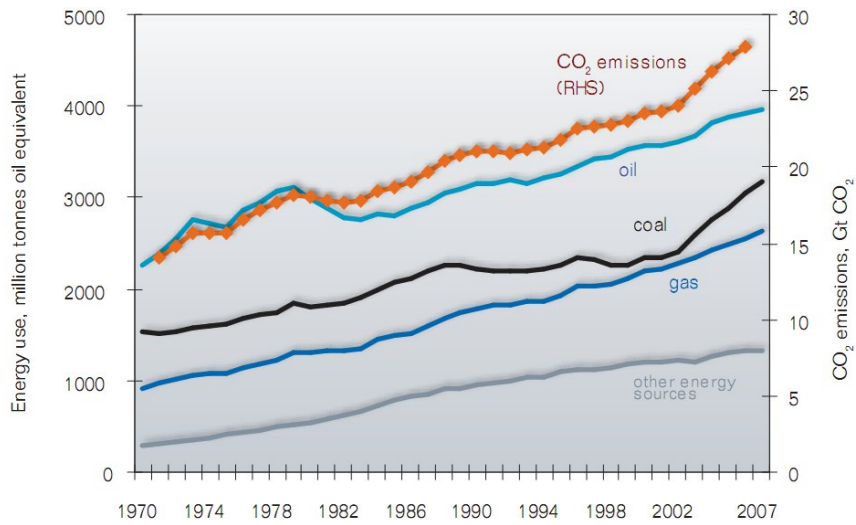


Figure 10 Composition of the energy mix of the USA from 1800 to 2000.⁴⁶

According to the Draft Garnaut Report (2008):⁴⁷

"Investment in coal-fired electricity generation remains strong, particularly in Asia but also other parts of the world. China is investing in coal-to-liquid plants and is expected to start operating the largest such facility outside South Africa later in 2008 Coal liquefaction is also being considered in the United States. It is also instructive to examine the oil price shocks in the 1970s and especially the 1980s In both episodes coal prices rose later than oil prices, and fell back to or below earlier prices more quickly than oil prices. In both cases, the drop in global oil consumption was more pronounced than that for other fuels Electricity generation from renewables and nuclear power in particular grew in the aftermath of

the oil price shocks, but by less than energy from coal in absolute terms."



Sources: Energy use from BP (2008); CO₂ emissions from IEA (2007b) and Carbon Dioxide Information and Analysis Centre (2008).

Figure 11 Energy use data for 1970 to 2007, from the Garnaut report (2008).⁴⁸

Doubts have, however, been raised about the extent of the world's gas reserves and the feasibility of substantially increasing current production of coal.⁴⁹

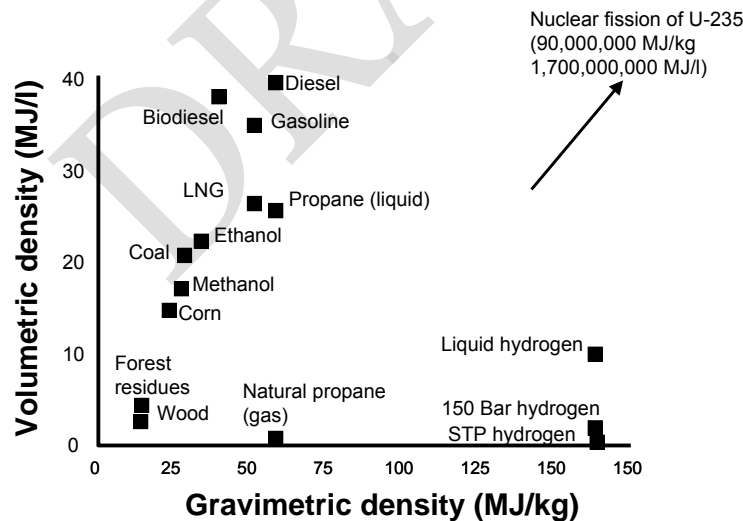


Figure 12 Energy densities for various energy sources⁵⁰

As attention turns to renewable energy supplies, more effort and/or space will be involved to yield an equivalent amount of energy. One of the issues to be considered in the often touted use of hydrogen as an energy source for transportation is that it has a very high energy yield per unit of weight but, a

low yield per unit of volume (meaning that a large amount of space is required to carry it in a vehicle).

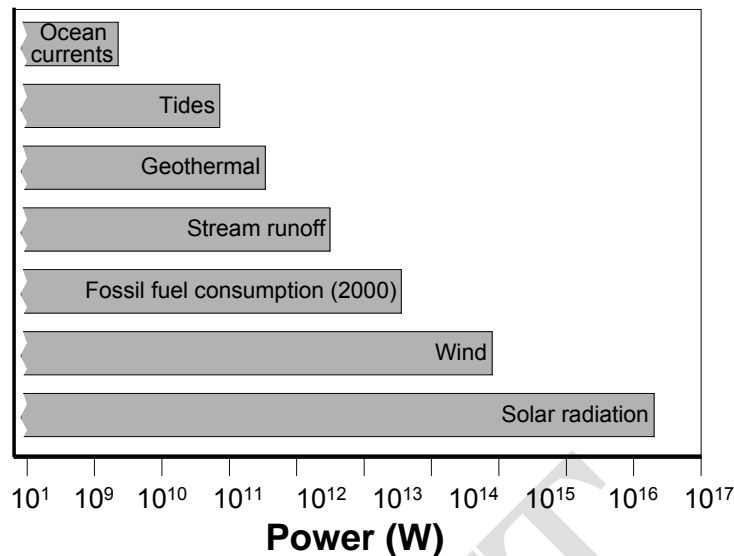


Figure 13 The global flux of various energy sources compared with global consumption of fossil fuels⁵¹

Apart from a debate about what the alternatives to fossil fuels might be (e.g., biofuels, wind, hydro, solar, geo-thermal, nuclear), there is disagreement about the true costs versus the benefits of these energy sources (including a balance between energy put in and energy coming out) and the proportion of the world's energy demands that can be met from each source. Figure 13, for example, shows estimates of the total amount of energy available globally from different sources compared with the amount of energy currently derived from consumption of fossil fuels. It can be seen that some of these energy sources are not capable of replacing fossil fuels while others, such as wind and solar radiation, could replace fossil fuels if a large proportion of their global supply was tapped.

A major factor affecting the use of biofuels is the competition between these and food crops for arable land. In 2007-2008 the world saw signs of this conflict as large areas of farmland in developing countries were converted to biofuel crops, contributing to a shortage of food in some countries.⁵² On a global scale, humans annually use 20 percent of the biomass produced by plants from sunlight's energy and carbon and nutrients from the air and soil. This level of appropriation already has had major impacts on the composition of the atmosphere, levels of biodiversity, energy flows within food webs, and the provision of important ecosystem services.⁵³ Replacing energy-dense liquid fuels from crude oil with less energy dense biomass fuels will require 1,000- to 10,000-fold increase in land area relative to the existing energy infrastructure, and thus place additional significant pressure on the planet's life support systems.⁵⁴

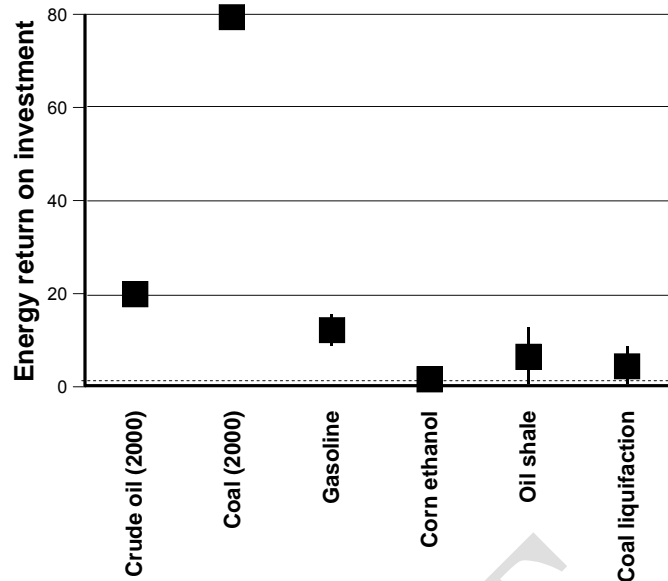


Figure 14 Energy return on investment (the ratio of energy obtained over energy used to obtain it) for various energy sources. The dotted line is an EROI of 1.

Energy "quality" refers to the ability of a unit of energy to produce goods and services for people. It includes gravimetric and volumetric energy density (Figure 12) but is also determined by a complex array of other variables, such as power density (energy per unit of the earth's surface), emissions, cost and efficiency of conversion, financial risk, amenability to storage, risk to human health, spatial distribution, intermittency (availability over all or part of the day or year), and ease of transport. For example, a joule of electricity can perform tasks such as illumination and spinning a CD-ROM that other forms of energy cannot do, or could do in a much more cumbersome and expensive fashion. Similarly, we need to ask how well electricity generated from renewable sources, or even biofuels, could substitute for oil derivatives when running farm machinery over 24 hour periods.

Considering energy quality has led some commentators to argue that current generations should reduce their use of oil for uses other than those requiring high-density sources (such as transportation) so that options for future generations are not reduced.

Perhaps the most important consideration when considering future energy sources is net energy - the ratio of energy yielded to energy invested in obtaining the energy source (also referred to as energy return on energy invested, or EROEI). Figure 14 illustrates the range on EROEI for different energy sources. It illustrates why there has been much debate about biofuels, especially ethanol, in recent years as the energy yield in relation to the cost is quite small. One consequence of moving to energy sources with a lower EROEI is that society will need to invest more in the energy sector and this

might mean reduced expenditure in other sectors (including health and education?).

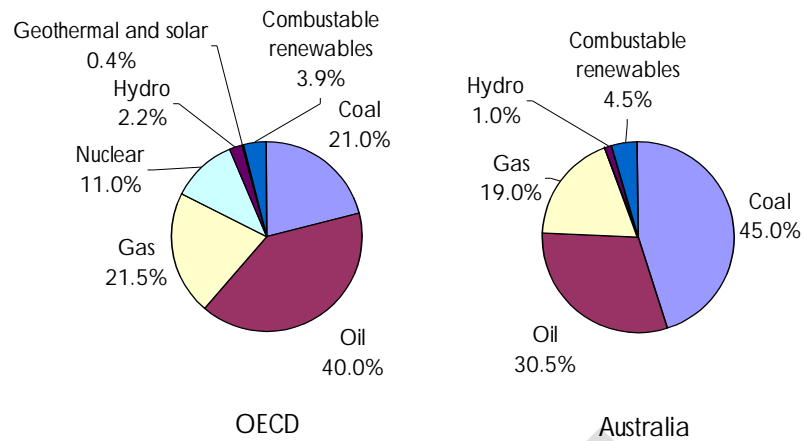


Figure 15: The energy mix for Australia compared with the OECD in 2005.⁵⁶

Figure 15 shows how heavily Australia relies on coal compared with other countries.

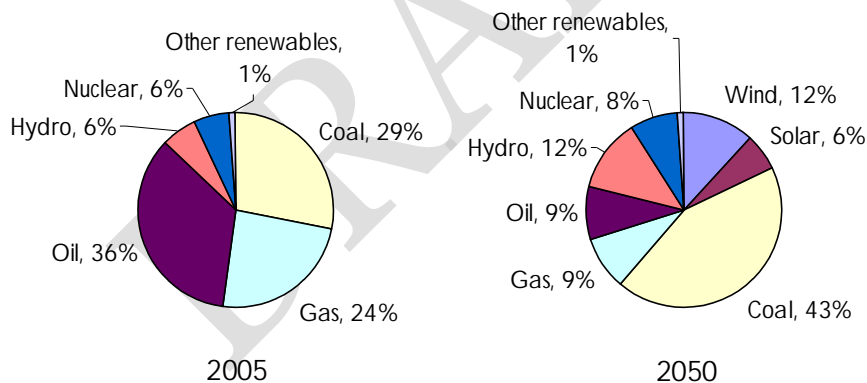


Figure 16 The energy mix of the USA in 2005 compared with the anticipated mix in 2050.⁵⁷

Figure 16 contrasts the energy mix in the USA in 2005 with the expected mix in 2050. A similar broad shift to less reliance on oil and more on renewable energy sources is plausible in Australia. In the interim we are likely to see greater reliance on gas and then coal globally and in Australia, depending on what restrictions and/or incentives are employed to encourage lower carbon emissions and what technologies emerge to reduce emissions, especially from coal.

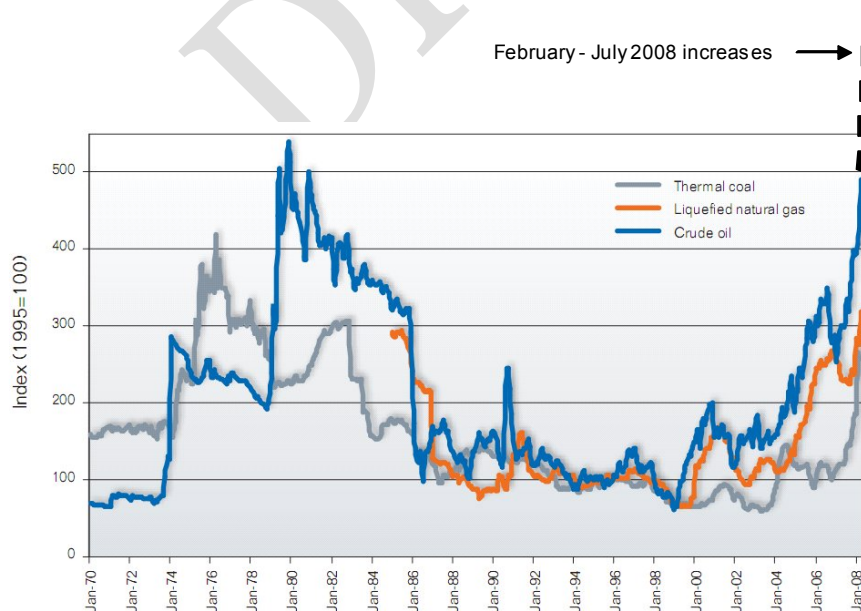
8.6 Policies, market forces and oil prices

Global market forces will be an important driving force behind the next energy transition. But, as explained in the Draft Garnaut report (Box 4), the direction of market forces is far from predictable.

Box 4 Possible impacts of market forces on energy use and Australia's energy mix

"Continued high fossil energy prices, if across the board, will cause reductions in energy consumption and a substitution towards non-fossil-fuel energy sources. These effects by themselves would dampen growth in carbon dioxide emissions. However, substitution away from oil and gas towards coal and synthetic liquid hydro-carbons (derived from coal, tar sands or natural gas) will increase growth in emissions. Making liquid fuels from coal can be cheaper than petroleum at oil prices reached in 2008, and for many countries is attractive because it represents a more secure supply. In the medium term, coal prices are expected to fall as supply capacity is increased in response to excess demand. This in turn will reduce incentives to shift into renewable energy sources and nuclear power, and to reduce energy use. The share of high-carbon fuels in the energy mix, and with it the carbon intensity of energy, will not necessarily fall as a result of high oil prices" (Draft Garnaut Report, 2008).⁵⁸

The rate of change in energy availability and prices will help to determine the urgency for policy intervention by governments, as might political and social unrest, including wars and terrorism. Intervention in markets by governments, using regulations and incentives such as encouragement of carbon emissions trading, is becoming increasingly popular globally and in Australia.



Note: Nominal prices converted to SDRs and deflated by the G7 CPI. Indexed to 1995.

Source: Table compiled by the Centre for International Economics based on IMF IFS Statistics, OECD Main Economic Indicators, *Financial Times*, and CIE estimates.

Figure 17 Indices of oil, coal and gas prices relative to 1995 prices from the Draft Garnaut Report. The broken line added at the top right is an estimate of how prices have risen between February and July 2008.⁵⁹

Government intervention is seen as desirable as current markets have failed to take account of the impacts of energy industries on climate as well as a range of other impacts on human welfare that could increase or decrease depending on the energy mix that evolves in coming decades. The political and social debate about the nature and degree of government energy policy will intensify when global crude oil supply visibly declines and as pressure mounts to act on climate change.

The ways in which the future for the Namoi, Australia and the world unfolds in coming decades will in part be determined by policy decisions within Australia and globally and their interaction with global markets. In turn, the future for the Namoi might be affected by the degree to which the Namoi's decision makers are able to influence policy decisions.

The year 2008 saw unprecedented rises in oil prices (Figure 17), due to supply falling short of demand and perhaps also to a degree of speculation about future limitations on supply.

Speculation about where this trend might be heading includes at least three broad possibilities:

- steady price rises, which would require the world to show resilience and adaptability to rising prices, with limited supply, strong demand, and geopolitical and economic stability continuing;
- a fall in oil prices due to "demand destruction" (i.e. large numbers of consumers opting out of the oil market or being forced out), possibly accompanied by a global economic recession, which also acts to reduce demand (there is already evidence of increasing demand destruction since around the turn of the millennium);⁶⁰
- a mixed scenario in which demand and oil prices drop temporarily followed by a resurgence in demand and a return to high prices (this scenario might come about, for example, if complacency generated by falling prices gives way to panic as it is realised that the end of cheap oil must be faced and that time is running out).

8.7 Two energy trajectories of interest to the Namoi

James R. Schlesinger, President Carter's first energy secretary, summarised the USA's approach to energy in 1977 by saying: "We have only two modes - complacency and panic."⁶¹

Thomas Homer-Dixon also recognised that humans adopt a two-stage strategy to preserve some semblance of the status quo in the face of change.⁶² First, we deny that change is happening or that problems exist. This has been the reaction of governments and much of the rest of the world's population with respect to declining availability of fossil fuels and climate change over the past several decades.

Second, we reluctantly turn to policy and management when we can no longer deny the challenges, but we often go through a phase of half-hearted responses will we hope the problem will go away. This has been especially true for governments as they have battled to deal with demands from voters and business interest groups who have demanded that any responses to energy and climate change issues do not affect standard of living or economic growth. Responses made in this "scramble" mode invariably involve increasing the complexity of technology and institutions, making them less resilient.⁶³

Thus, the two major uncertainties that emerge from the above review of issues surrounding oil and energy are how rapidly oil availability declines in the next few decades and how orderly the transition to new sources of energy is made. Two trajectories for these uncertainties that are likely to be particularly relevant to the Namoi between now and 2030 are:

- a slow transition from oil to coal, gas, and/or nuclear and renewable energy sources, characterised by orderly policy and market adjustments but still with highly variable implications for different parts of the world;
- a more rapid decline in oil availability, sparking the need for governments to fast-track policies and interventions to bring about essential change while mitigating the negative sentiment from industries and voters (this trajectory is disorderly and requires diversion of investment from other sectors to the energy sector to speed the transition to alternative energy sources).

8.7.1 The orderly transition trajectory

For the orderly transition trajectory to play out there would need to be some stabilisation of oil prices, and correction of the imbalance between supply and demand, probably by a combination of increasing supply, imposing policies to reduce demand, and attitudinal change among consumers either independent of policy stances or encouraged by them. Although many people in different parts of Australian and international society, including public service and politics, have been thinking about this transition for some time, little progress has been made on the infrastructural and institutional changes required, so it is highly unlikely that an orderly transition could be made unless there is time to make these preparations.

There would also need to be relatively low levels of geopolitical instability and policy responses to climate change would need to be integrated with responses to energy supply issues. Strong leadership would be required or else another decade could slip by before effective action is taken, which, according to the recent Garnaut report, would throw Australia and the world into a costly "scramble" response scenario.

There are many possible sub-trajectories within the orderly transition trajectory, including various combinations of increasing focus on gas and then coal, and development of a range of alternative energy sources, including wind, solar, geothermal, biofuels and possibly nuclear. The Namoi is well placed to contribute to all of these energy sources and would need to be watching developments closely and exploring investment opportunities actively to reap the potential benefits.⁶⁴

A potential focus for disagreement among catchment residents might come in the next decade as interest in the Namoi's coal reserves increases before technologies for environmentally-friendly extraction and processing are fully developed. This is a bigger risk in the emergency response scenario because Australia might have few options other than to rely heavily on coal for energy in the short term. In both scenarios, the rate of climate change and the urgency of policy responses to it will affect debate about coal extraction and processing in the Namoi.

Modern affluent societies have become used to high-consumption lifestyles. At the same time, it has been argued that many aspects of social resilience have declined and people have become more pressured to achieve financial success, have become bewildered by the pace of change and the growing amount of information to be understood, and often have become less inclined to support common-good causes in favour of looking after their own and their family's interests.⁶⁵ In a slow oil decline scenario there is a danger, therefore, that people could be both complacent, because they are not seeing strong signs of a crisis, and unwilling to reduce their consumption when they see little in it for them personally. Thus, a challenge for policy makers under slow energy decline scenarios, especially if climate change is also slow, is getting change in attitudes and behaviours to happen. The recent trend towards political parties reading and reacting to public opinion almost instantaneously will make changes in energy-use behaviour even harder to bring about.

8.7.2 The disorderly ("scramble") trajectory

A disorderly-transition scenario could come about if the current uncertainty and panic around oil supplies continues and parts of the world start to slip into a recession. Urgent action might then be taken by governments, including the Australian government, to protect industries, jobs and living standards. The most obvious response of the Australian government might be

to encourage a rapid transition to the use of gas and coal reserves for both domestic use and for strategic exports to shore up national security in a world where conflict over resources would be more likely than it currently is. Environmental considerations might be overlooked, at least temporarily, and the Namoi could find itself the focus for intense development of gas and coal industries without much control over how they developed.

Climate` change at the more dramatic end of the current projections would intensify the energy emergency, as energy would be needed to support water provision for food production and water might have to be pumped long distances.

It has been suggested that there is an intimate link between human capital (including level of education and ingenuity) and generation of wealth from fossil fuels.⁶⁶ By this argument, it was possible while energy was cheap and easily obtained for wealthy countries to invest in sectors other than the energy sector, including education and other social investments. This has created the ingenuity that has enabled the world to deal with energy challenges over the past 60 years. Some commentators, however, suggest that the human and social capital created in these ways is declining.⁶⁷ This is partly because of growth in dysfunctional lifestyles created by modern society and partly because of recent efforts to increase productivity and efficiency to enable economic growth to continue, which, it is argued, has reduced resilience in Western societies. Adding to this argument, it is suggested that as fossil fuels become harder and more expensive to find, investment in the energy sector will become a larger proportion of society's effort, reducing investment in other sectors such as education and health care.

9 Climate futures

"The most inappropriate response would be to delude ourselves, taking small actions that create an appearance of action, but which do not solve the problem. Such an approach would risk the integrity of our market economy and political processes to no good effect."

The Garnaut Review, 2008

This chapter summarises some of the issues surrounding climate change. It makes the following key points:

- The overwhelming balance of scientific opinion is that climate change is occurring and could affect the Namoi in a range of major ways between now and 2030.
- In addition to changes in the climate in Australia, economic, social and environmental implications of climate change in neighbouring countries and other parts of the world are likely to affect life and business in the Namoi in coming decades, through impacts on markets and changes in the way Australian's interact with the rest of our region and the world.
- As well as thinking about how they deal with the direct effects of climate change, the Namoi's people need to consider how they will be affected by government responses to the challenges and opportunities associated with climate changes, as well as broader societal responses, including changes in attitudes about the environment and regional Australia.
- Two broad trajectories that seem particularly appropriate to consider in the Namoi scenarios are:
 - a moderately low warming trajectory (equivalent to the mid-warming scenario in the CSIRO report, since there are indications that the low-warming trajectory is unlikely to unfold), involving only a small decrease in average rainfall

and a relatively small increase in climate variability within and between years compared with the present, and probably associated with the slowest and least radical response from governments, and;

- a high-warming trajectory (equivalent to the high-warming scenario of the CSIRO report but anticipating the possibility of an even higher warming trend), involving a moderate decrease in average rainfall but a major increases in climate variability within and between years, and probably associated with more rapid and radical responses from governments.

9.1 The science behind climate change

The scientific reasons for concern about future climate change, and the potential policy responses, were reviewed recently in the Draft Garnaut Report to the Australian government.⁶⁸ Readers should refer to that report for details. We will summarise key points from that report in this chapter, as well as drawing on other pertinent literature.

Only a small proportion of the Australian public understand the science behind climate change. The reason for uncertainty in projections is particularly difficult for the public to understand.

Part of the uncertainty comes from the complex interactions between many processes occurring on land, in the oceans and in the atmosphere, all of which have uncertainties surrounding them. Additional uncertainty comes from not being able to predict how governments, industries and the public might respond to climate change, including behavioural change that increases or decreases consumption of fossil fuels and emotional reactions to perceptions about climate change provided by the media. Public responses will be affected strongly by government policies that affect real or perceived levels of income and standard of living. Public perceptions will be affected by a mix of information based on sound research (which might or might not be easy to understand and will be received with differing levels of trust depending on perceptions about who it comes from) and partial-information provided by vested interests.

The Garnaut Review took a balance of probabilities view that Australia should plan as if climate change is happening because the overwhelming evidence and Australian and international scientific opinion suggests that it is. In terms of thinking about the forces that might influence the Namoi's futures, such a likely force must be taken seriously. Climate change qualifies as a critical

uncertainty as it potentially has major implications for the Namoi's future and it could take several very different trajectories.

The question of how much of this climate change is due to human actions is still hotly debated. This debate will continue to affect the policies adopted by governments, including the Australian government, to mitigate climate change. These policies will affect life and business in the Namoi.

The Garnaut Review, and the subsequent Green Paper by the Australian government on a possible carbon pollution reduction scheme,⁶⁹ took the view that action is needed urgently to reduce carbon emissions and that Australia should take a lead in such actions. In drawing these conclusions, it was recognised that this issue "might be too hard for rational policy making" because of its complexity and its impacts on numerous and powerful special interests, and because the impacts will only become apparent over long time frames but action is needed over a shorter time frame. The following quote from the Garnaut Review, illustrates one likely set of thinking that will influence policy development in the next few years to a decade or more:

"Australia has a larger interest in a strong mitigation outcome than other developed countries. Our location makes us already a hot and dry country; small variations in climate are more damaging to us than to other developed countries. We live in a region of developing countries, which are in weaker positions to adapt to climate change than wealthy countries with robust political and economic institutions. The problems of our neighbours would inevitably become our problems. And the structure of our economy suggests that our terms of trade would be damaged more by the effects of climate change than would those of any other developed country. However, Australia carries some major assets into this challenge. Australians are facing this new kind of challenge in the best of times. These are the times that earlier generations of Australians hoped for their country. Australia is fortunate that humanity is enjoying the harvest of modern economic development in Asia and beyond. More people are emerging from poverty more quickly than ever before in human history. Australia is enjoying a double harvest. The internationally oriented market reforms from the 1980s were put in place just in time. We are now riding the extension of the beneficent processes of modern economic growth into the heartlands of the populous countries of Asia."

The challenge for Australians, especially those living in regional Australia, will be to deal with both the direct impacts of climate change and the impacts of the policies and other responses made by decision makers.

Although policies might have a greater impact in the short term than climate change itself, adaptation to slow but substantial changes in the climate will be vital in the longer term. The following sections outline the origins of current

concern about climate change, current projections of how climate change might occur globally and in Australia, and implications for the Namoi.

9.2 The basis for concerns about climate change

The basis for life on earth is the carbon cycle, which captures the sun's energy via photosynthesis in algae and the leaves of plants and uses it to produce carbon-based ("organic") compounds from atmospheric carbon. ⁷⁰

Thus, carbon leaves the atmosphere by being incorporated into plants, the animals that eat them, and the fungi and bacteria that break down the dead bodies of plants and animals. These organisms live on land, in waterways and in oceans. Carbon is also deposited (stored) in soils and in waterways and oceans in various forms of decaying organic matter.

Carbon re-enters the atmosphere when organic material is broken down to gases like carbon-dioxide and methane in the processes of digestion and metabolism by plants, animals, fungi and bacteria, or when organic matter (including fossil; fuels) is burned.

The level of carbon-based gases in the atmosphere is determined by the balance between removal from the atmosphere and return to the atmosphere. As explained below, return of carbon to the atmosphere has exceeded its removal for some time, causing the concentration in the atmosphere to rise to higher levels and more rapidly than at any time since humans appeared on earth.

Increases in atmospheric concentrations of carbon-based compounds like carbon dioxide and methane is of concern because their so-called "greenhouse effect". Other contributors to this effect include nitrous oxide, ozone, halocarbon gases, water vapour and fine particles (aerosols), all of which are increased due to human activities, especially those associated with industrial processes, agriculture, mining, transport, heating and cooling.

Without the greenhouse effect, the earth's surface would be too cold for human life. But if the greenhouse effect becomes too pronounced the earth might become too hot and weather patterns too hostile for human life as we know it.

Taking a very long-term view of the world, we can see that conditions have only become suitable for life relatively recently and for human and other mammalian life only very recently. The atmosphere of the earth initially was made up of a range of gases that now are in very low concentrations. Gradually the gases that make up most of today's atmosphere (carbon-dioxide, nitrogen and oxygen) came to dominate. It was not until around 3.5 billion years ago that the first life-forms began to produce carbohydrates from

atmospheric carbon using the sun's energy, and this released oxygen into the atmosphere as a by-product. Oxygen is essential to the life of most of the plants and animals that people are aware of.

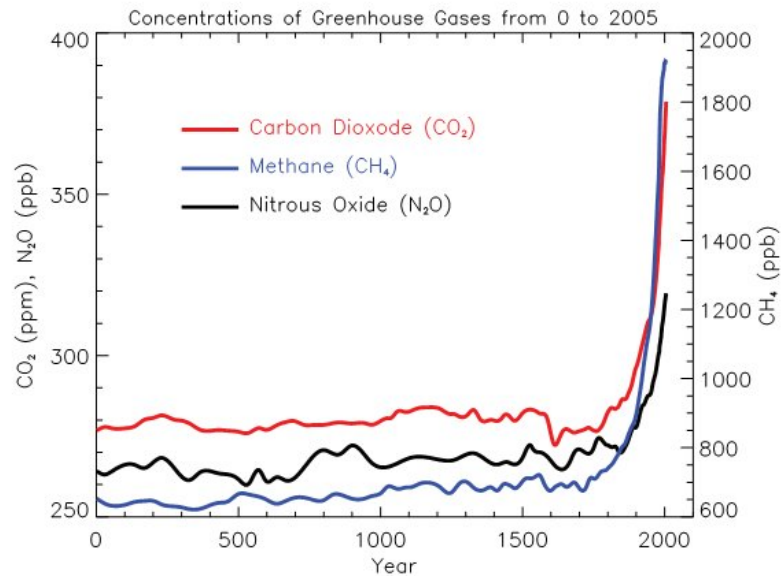


Figure 18 Atmospheric concentrations of important long-lived greenhouse gases over the last 2,000 years. Increases since about 1750 are attributed to human activities in the industrial era. From the Fourth Assessment Report of the IPCC.⁷¹

Greenhouse gases occur at very small concentrations in the atmosphere but they have major impacts. At times in the past 400 million years, it appears that concentrations of carbon dioxide reached levels many times those occurring at present. Levels during the time that humans and other mammals have been in existence have, however, been much lower. Concentrations of carbon dioxide in the atmosphere have risen dramatically over the past 250 years (Figure 18). Current concentrations are now higher and are rising more rapidly than they have for at least the last two million years.⁷²


9.3 Projections for the World and Australia

A large majority of climate scientists conclude that the rises in atmospheric carbon dioxide over the past 250 years have been generated largely by increasing use of fossil fuels since the industrial revolution. The growth of the world's population and increasing energy use per person have been major factors. If we accept this conclusion, then we should expect emissions of carbon to continue to increase for the next two decades at least. Apart from the growing use of energy in developed countries, development in countries like China, India, Russia and Brazil is already increasing energy use and emissions above previous predictions. China, for example, has recently

overtaken the United States as the world's largest emitter, and, in an unmitigated future, would account for about 35 per cent of global emissions in 2030.⁷³ High petroleum prices (see Chapter 8) are unlikely to slow emissions growth, both because of the ample availability of fossil fuel alternatives, notably coal and gas (Figure 11) illustrates that increases in oil prices over recent years have not reduced energy consumption overall.

There has been considerable debate about how much Australia's climate has changed over the past 250 years and to what extent any changes might have been caused by human-induced climate change. Australia's climate is drier than many other countries' and variation is high. Southeastern Australia has become increasingly concerned about water as it has been struck with some record droughts and a general reduction in streamflows in the second half of the 20th century.⁷⁴

It is difficult to make precise predictions about the effect of climate change in coming decades because of the many regional climate systems operating in Australia and interactions among them. Climate scientists have applied a range of models ("general circulation models") to explore the range of possibilities. While rainfall could increase or decrease in different regions, average expectations are for significant drying in southern Australia.

 Over the past few decades exceptionally hot conditions have affected an increasing area of Australia and have become more frequent. This trend is expected to continue.⁷⁵

Between 1968 and 2007, exceptionally hot years occurred over 10-12% of the area in each region of southern Australia (about twice the long-term average of 5%). By 2010-2040, this may increase to between 40 and 95%, with mean in the range 60-80%. On average, exceptionally high temperatures are likely to occur every one to two years. Variability of rainfall between and within years and decades is likely to be greater than at present. Forecasts of the extent and frequency of droughts vary, with some suggesting as little as a 20-40% and others suggesting that both area and frequency could double by 2030.⁷⁶

9.4 Potential impacts of climate change

Climate change itself is expected to have severe and costly impacts on agriculture, infrastructure, biodiversity and ecosystems in Australia.⁷⁷ The impacts of policy and other responses to the perceived risks, including inaction, are likely to have at least as great an impact in the short term.

In addition to impacts on economic activities, climate change is likely to have a range of impacts on non-market aspects of Australian life, including leisure activities, ease of movement around the country and the world, aesthetic and

cultural values from landscapes and impacts on other species that we value for their existence and for ethical reasons.

Box 5 Summary of some of the potential implications of climate change for Australia, from the Draft Garnaut Review⁷⁸

The joint Garnaut–Treasury reference case suggests that, in the absence of climate change or costs from its mitigation, from 2005 to 2100, the Australian population will more than double to nearly 47 million, per capita output will almost quadruple, and economic output will expand by over 700 per cent. Over the same period, the reference case sees global population increasing by about 40 per cent and stabilising, and then starting to decline late in the second half of the century. Global output increases by about 15 times, mostly in the developing world, led by the large Asian developing economies—China, India and Indonesia.

The median temperature and rainfall outcomes for Australia from climate change with unmitigated growth in global emissions—particularly from impacts on infrastructure, agriculture and international terms of trade—may see GDP fall from the reference case by around 4.8 per cent, household consumption by 5.4 per cent and real wages by 7.8 per cent by 2100. This would represent significant reduction of economic growth and welfare from what it would have been in the absence of climate change. These are not the total costs of climate change. Nor can these costs be avoided entirely by mitigation.

An examination of the range of impacts through market processes with median expectations of climate impacts suggests that the modelling covers 65 to 85 per cent of total market impacts. Non-market impacts of climate change would be valued highly by Australians, but are not quantified in the draft report.

The insurance value of some lower probability outcomes could be extremely costly. An assessment of more extreme low rainfall outcomes for Australia, near the 10th percentile of the distribution, suggests that GDP costs could be in the order of 8 per cent in 2100, with household consumption of around 9.1 per cent in 2100, and reduction in real wages of around 14.8 per cent relative to the reference case.

Impacts on other plants and animals will be largely due to changes in temperature and rainfall regimes combined with fragmentation of habitat, meaning that species will find the places they currently live in unsuitable but will not be able to move to a more suitable place because habitat has been cleared or the connections are not present to allow safe movement between remnants of habitat.

Impacts on agriculture could include decreased or increased productivity associated with less or more water and the growth-enhancing effects of higher levels of carbon-dioxide in the atmosphere.

Between now and 2030, the biggest challenges are likely to be dealing with changes in attitudes, policies and institutions to prepare for expected future climate change and the uncertainty that brings for people running businesses and supporting families. Considering the range of plausible developments, such as we are doing in the Namoi scenarios, is one way to help people deal with the uncertainties.

A suite of other, potentially major, implications arise from impacts of climate change on other parts of the world, especially neighbouring countries in Asia. Any impacts on the growing economies of China and India will have direct economic repercussions for Australia. In addition, the fortunes of food producers in Asia could either increase or decrease market opportunities for Australian producers or even require them to provide emergency aid in the worst cases. As mentioned earlier, the growing demand for energy in China, India and other growing Asian countries will provide pressure and incentives for Australia to export coal and gas in the short term, at the same time as we are considering how we manage our carbon emissions.

Extreme climatic impacts on Asian and South-Pacific nations could see Australia being asked to provide economic, social, and environmental advice and assistance and could require emergency migration strategies to be developed. Regional Australia could well be called on to consider its role in such strategies, which could have both benefits and challenges.

9.5 Projections for the Namoi

The most recent scenarios for climate change in the Namoi are those of the CSIRO Sustainable Yield Project,⁷⁹ which explored four scenarios (Table 9).

Table 9 Summary of the four scenarios considered in the CSIRO Sustainable Yield study.⁸⁰

SCENARIO	DESCRIPTION
A. Historical climate and current development	The baseline against which other scenarios are compared. Climate is the long-term average (1895-2006). Development is the average land-use and small farm dam conditions between 1975 and 2005, the 2005 data on dams, weirs and river water licence entitlements, and the 2004-2005 groundwater licence entitlements.
B. Recent climate and current development	This scenario has been run in other sustainable yield assessments when the recent climate was significantly different from the long-term average. This was not the case for the Namoi, because of high variability between years, so this scenario was not modelled.
C. Future climate and current development	This scenario assesses the range of likely climatic conditions around the year 2030 and assumes that levels of development will be similar to those in 2005. It considers uncertainties associated with models of global climate change and also models for the Murray Darling Basin in particular. "Dry", "mid" and "wet" climate variants are considered.
D. Future climate and future development	This scenario uses the same climatic possibilities as Scenario C, but considers likely expansions in farm dams and commercial forestry plantations and the changes in groundwater extractions anticipated under existing groundwater plans.

Key aspects of the current situation, outlined in Scenario A, included:

- The average annual rainfall for the entire Namoi region is 633 mm and modelled average annual runoff is 24 mm. Rainfall is generally higher in the summer half of the year and runoff is relatively uniform throughout the year.
- The region generates about 3.2 percent of the total runoff in the Murray Darling Basin.
- The level of water use in the Namoi is high (by 2010, of an average total surface water resource of 965 GL¹/year, 37 percent will be used, 27 percent as net surface water diversions and 10 percent as streamflow losses induced by groundwater use).
- Use of groundwater is high and is having impacts on surface water flows:
 - Current groundwater use represents 49 percent of current total water use in the Namoi region (up to 78 percent in years of minimum surface water diversions).
 - Groundwater extraction for 2004/05 is estimated to have been about 39 percent from the Upper Namoi Alluvium Groundwater Management Unit and 35 percent from the Lower Namoi Alluvium Groundwater Management Unit.
 - Current levels of extraction from the Lower Namoi Alluvium GMU are unsustainable (they exceed the long-term average extraction limit (LTAEL) due to supplementary licences with entitlements that decrease to zero by 2015 when the existing Water Sharing Plan ends).
 - If water is extracted at the long-term average extraction limit from the Upper Namoi Alluvium GMU, which represents 95 percent of recharge from all sources, it will impact strongly on stream flows.
 - Extraction at 2004/5 levels for the Miscellaneous Alluvium of the Barwon Region GMU exceeds rainfall recharge by 15 percent.
 - Extraction at 2004/05 levels from the Peel River Alluvium GMU represents about 55 percent of rainfall recharge.
- Water resource development to-date has changed flooding cycles:
 - The average period between flooding of the Namoi River billabongs and wetlands has increased from 3 months to 3.8 months.
 - The maximum period between flooding events has increased by around 50 percent.
 - The size of events has decreased and the average annual flood volume is now 28 percent lower.
 - This level of hydrologic change is likely to have had consequences for ecological processes and is likely to have altered aspects of the ecological character of these ecosystems.

¹ A gigalitre (GL) is one thousand million litres, which is roughly equivalent to 1000 Olympic-sized swimming pools.

Table 10 Summary of modelling of the Namoi's 2030 climate by CSIRO.⁸¹

Note that the greatest uncertainty (widest range of rainfall changes) occurred in the high global warming models, meaning that both the wettest and driest projections arose from the assumption of high global warming. The models also suggested that the extreme weather events would be more severe under high global warming. The best estimate is the median value from projections from 15 different general circulation models.

COMPONENT OF CLIMATE	POSSIBLE CHANGE COMPARED WITH 2006	
	FUTURE CLIMATE + CURRENT DEVELOPMENT	FUTURE CLIMATE FUTURE DEVELOPMENT
Development	Current	<p>Negligible extra forestry plantations</p> <p>Thirteen percent increase in farm dam storage volume</p> <p>Increased groundwater extraction by 77% (making groundwater 66% of water use or 94% in years of low diversions)</p> <p>Population increase in major centres was not considered</p>
Rainfall	Best estimate: 2% Low warming: -3 to +4 % High warming: -10 to +13%	Same (no impact of future development on rainfall)
Runoff	Best estimate: -6% Low warming: -11 to +10% High warming: -33 to +39%	Runoff reduction due to farm dam storage 1.5% Best estimate: -7% Wet extreme: +38% Dry extreme: -32%
Total inflows to main rivers	Best estimate: -6% Wet extreme: +40% Dry extreme: -31%	Best estimate: -9% Wet extreme: +36% Dry extreme: -34%
Water availability ¹	Best estimate: -5% Wet extreme: +38% Dry extreme: -30%	Best estimate: -5% Wet extreme: +38% Dry extreme: -30%
Total diversions	Best estimate: -1% Wet extreme: +10% Dry extreme: -17%	Best estimate: -1% Wet extreme: +10% Dry: -17%
End of system flows	Best estimate: -8% Wet extreme: +52% Dry extreme: -39%	Best estimate: -8% Wet extreme: +52% Dry extreme: -39%
Tamworth town water	Best estimate: + 1%	Best estimate: + 1%
High security stock and domestic use	Best estimate: -1%	Best estimate: -1%
Average period between	Best estimate: +6%	Best estimate: +14%

COMPONENT OF CLIMATE	POSSIBLE CHANGE COMPARED WITH 2006	
	FUTURE CLIMATE + CURRENT DEVELOPMENT	FUTURE CLIMATE FUTURE DEVELOPMENT
flooding	Wet extreme: -21% Dry extreme: +36%	Wet extreme: -15% Dry extreme: +50%
Maximum period between flooding	Best estimate: 0% Wet extreme: -31% Dry extreme: +5%	Best estimate: 0% Wet extreme: -31% Dry extreme: +29%
Average flooding volume per event	Best estimate: -3% Wet extreme: +31% Dry extreme: -28%	Best estimate: -2% Wet extreme: +35% Dry extreme: -25%

¹ = surface water available before diversions, storage, leakage and losses due to groundwater use

The CSIRO modelling indicated very high levels of water use in much of the Namoi. The authors indicate that several avenues of water use were not included due to lack of information. These include unregulated use and greater than reported extraction of groundwater. In addition, possible increases (or decreases) in the population of Tamworth and other major urban centres was not considered in the modelling. There are concerns among members of the Namoi Scenarios Working Group that Tamworth could be vulnerable to water shortages that could mean severe restrictions on all but essential uses in dry years. This was illustrated by the fact that Chaffey Dam came close to drying up in 2007-08. Urban development that does not consider this vulnerability could exacerbate the problem and leave some settlements in a precarious situation under some climate change scenarios.

The prospect of longer droughts under the worst (driest) future scenarios is reflected in the worst-case increases of up to 29% in time between floods (Table 10).

9.6 Policy responses

The overwhelming consensus among informed scientists is that some degree of climate change will occur between now and 2030. The degree of change might be slight or relatively major, but the impacts of government policy and public opinion and behaviour on the lives of all Australians, but especially those living in the Namoi, is likely to be at least as large as the changes in the weather in the next two decades.

Even the most optimistic projections for new technologies to reduce emissions of greenhouse gases do not suggest that technology will prevent or reverse climate change between now and 2030.⁸² Internationally and in Australia there is growing talk about policy interventions to both mitigate climate

change and adapt economies and lifestyles to change that cannot be mitigated. There is a strong likelihood that even the most radical and determined technological advances and policy responses will not meet the success criterion identified by the European Union and the United Kingdom government of a 90% chance of less than two degrees centigrade of warming above pre-industrial levels.⁸³

With global political will, we might see global emissions peak within the next 10-15 years, but there are many factors that could set that peak back by several decades. These include: ⁸⁴

- The extent to which governments commit to rethinking climate policy and learning from experiences of the Kyoto protocol and various emission trading schemes that have been implemented around the world will determine how quickly international cooperative action occurs
- Resolution of tensions between developed and developing countries will be essential for effective global action (this will probably require some form of wealth-transfer⁸⁵
- The strength of public opinion around the world will help to determine whether politicians develop and implement substantial and effective policies or posture without real action
- How much public opinion is influenced by when and where chance weather events occur (the latest scenarios anticipate a greater frequency of extreme events but periods in which no change is apparent are also possible)
- Whether oil and other energy prices continue to rise or stabilise at a new high level, or even fall temporarily (energy prices could affect the ability of markets to absorb carbon prices, investment in renewable energy and energy efficiency, or investment in extracting oil from unconventional sources, such as oil sands, oil shale and some biofuels, with possibly higher emissions)
- Whether or not the world's two biggest emitters, the US and China, can work constructively with one another and the rest of the world on emission control strategies

For some time, the Australian government has been investing in research and policy towards mitigation (reduction) of climate change and, more recently, adaptation to (preparing to cope with) inevitable changes. State government also have been including climate change in their planning for cities, towns and regions in both coastal and inland areas. In 2006, the CSIRO Energy Forum reported on a range of issues surrounding energy and climate change, without making specific policy recommendations (see Box 3).

The new the Australian government, elected in 2007, has accelerated policy initiatives by ratifying the international Kyoto agreement to reduce emissions, commissioning a review of what additional policy measures might be needed,⁸⁶ and by proposing a carbon pollution reduction program.⁸⁷ This

policy is at a discussion phase and already there is the full range of reactions from those who say it does not go far enough to those who say that it goes too far in its impacts on industries. How this new policy environment plays out in the next few years and decades is hard to predict. The government aims to introduce its scheme quickly (by 2010).

To enhance the chances of acceptance, the government has proposed to soften the impact by compensating various industries to varying degrees. The extent to which further softening of the program's processes is needed, or indeed whether addition of stronger requirements, incentives and penalties are included as advocated by some interest groups, will determine the rate at which people in regional and urban Australia will need to adapt to policy and market changes.

The Draft Garnaut Review summarises the main policy tendencies distilled from broad discussions around Australia (some of these have been adopted in the Australian government's green paper and others are likely to be advocated or discouraged in debate over the next decade or more):

- It is important to engage now in the international dialogue on a global mitigation regime as time will reduce the mitigation options that remain open to us
- The extraordinary growth in emissions from the major developing countries, first of all China, means that their early participation in a global agreement on mitigation is essential for success
- The international community, and Australia, can improve the odds of the major developing countries becoming part of an effective global regime
- Expanding the global research, development and commercialisation effort on low-emissions technologies is important, because of what it might do for the cost of mitigation everywhere, and for the encouragement that it would provide for developing countries to participate in the global mitigation effort
- In terms of Australia's mitigation regime, the following issues are raised in the Garnaut Review:
 - Until 2012, Australia's emissions reduction trajectory is defined by its commitments under the Kyoto Protocol
 - After 2012, Australia's first commitments should represent similar adjustment effort to that being made by other developed countries (a 60 per cent emissions reduction may fit this requirement)
 - Beyond that, Australia should be prepared to go further within a comprehensive global agreement, with appropriate commitments from major developing countries (details to be provided in later drafts of the Garnaut Review)

The review discusses the mechanisms that could be used to ease the transition into a carbon-constrained policy and trading environment for vulnerable

industries, some of which have been adopted and/or modified in the subsequent green paper. It appears that the Australian government has decided to develop an emissions reduction scheme by 2010 rather than leaving this until a later date. In terms of developing scenarios for 2008-2030, the time at which a fully functional emissions trading and reduction scheme is realised remains an uncertainty.

Of particular interest in the context of the Namoi's future is the argument advanced in the Garnaut Review for why it will benefit agriculture if Australia takes immediate steps towards mitigation of, and adaptation to, climate change (Box 6).

One of the central policy dilemmas for Australian governments at all levels is how to balance what needs to be done to protect all aspects of the quality of life of Australians with the harsh realities of managing national, state and local economies and dealing with expressed preferences of voters who might not be fully informed or might not always take a long term view or be prepared to tradeoff short-term personal hardship for longer-term national benefit. The following quote from the Draft Garnaut Review illustrates this dilemma:

"Damage from climate change, perhaps immense damage, is likely to be part of the Australian reality of the 21st century and beyond. [...] Adaptation to some of the possible consequences would test us and our values and preferences in profound ways. Contemplating the adaptation challenges of future Australians helps to focus our minds on the more difficult dimensions of mitigation choices. We are led to think about how we value future against current generations. We are forced to decide what we would be prepared to pay in terms of consumption of goods and services foregone, to avoid uncertain prospects of thinly defined but possibly immensely unhappy outcomes. We are forced to decide what current and early material consumption we would be prepared to pay to avoid loss of things that we value, but are not accustomed to valuing in monetary equivalents. In making their choices, Australians will have to decide whether and how much they value many aspects of the natural order and its social manifestations that have been part of their idea of their country. In the discussion of climate change, much is made of natural wonders—of the Great Barrier Reef, the wetlands of Kakadu, the karri forests. We know that we value them highly, and now we will need to think about whether we are prepared to pay for their preservation. As a changed future approaches, Australians will find themselves thinking about how much they care about other dimensions of our national life that have always been taken for granted. [...] with unmitigated climate change, the risks are high that there will be change beyond recognition in the heartlands of old, rural Australia, in Victoria, Western Australia, South Australia, and in the Murray-Darling Basin, which features prominently in our analysis of the possible

impacts of climate change. The loss of these heartlands of old Australian identity would be mourned.

Box 6 Potential benefits for agriculture of proposed climate change mitigation and adaptation policies (from the Draft Garnaut Review).⁸⁸

"The modifying impact of adaptation is exemplified by Australian agriculture. Better and earlier knowledge will allow farmers to make timely decisions on whether new money should continue to be invested in locations that seem to be severely damaged by climate change, or whether it is better to find new livelihoods in less challenging locations. Investment in plant and animal genetics may be able to diminish the loss of productivity associated with higher temperatures and changing rainfall patterns. Investment in water retention or storage will sometimes be an economically sensible response to more variable rainfall. Hardest of all, the most effective adaptive responses in agriculture to climate change will sometimes require fundamental changes in attitudes, policies and institutions. For example ... the loss in irrigated agricultural value under moderate warming and drying scenarios could be greatly reduced by shifting from established to free market allocation patterns of water allocation, so that limited water resources are directed without qualification to their most productive uses. Livestock industries in these same circumstances would suffer less, if established patterns of quarantine on feed imports were to be relaxed. We can presume that change of such a fundamental kind would not be achieved without rancour and disputation over policy, and would require public policy management of exceptional dexterity and quality."

In thinking about the future of the Namoi, we need to consider the various ways in which public pressure could push governments and industry leaders with respect to longer-term, intergenerational issues.

9.7 Climate change trajectories to consider in the Namoi scenarios

The previous discussion has highlighted several uncertainties that could have major impacts on the future of the Namoi and its people, including:

- Whether climate change tracks the lowest or highest warming trajectories suggested by climate models, or falls somewhere in the middle (or, indeed, moves to a warmer trajectory as the world appears to be tracking close to the IPCC's warmest scenarios already)
- How quickly policies for reducing carbon emissions and adapting Australia for climate change are implemented and take effect and how they impact on the industries and lifestyles of regional Australians
- How public opinion changes about short-term disadvantage to current generations versus longer-term benefits to future generations

While any combination of the alternative trajectories within these three uncertainties is theoretically possible, it is likely that faster and more radical policy change will accompany the more disruptive climatic changes because people will be more concerned and more willing to accept extreme action.

Therefore, we suggest that two alternative trajectories be considered in the scenarios with respect to climate change:

- A moderately low warming trajectory (equivalent to the mid-warming scenario in the CSIRO report, since there are indications that the low-warming trajectory is unlikely to unfold), involving only a small decrease in average rainfall and a relatively small increase in climate variability within and between years compared with the present, and probably associated with the slowest and least radical response from governments, and
- A high-warming trajectory (equivalent to the high-warming scenario of the CSIRO report but anticipating the possibility of an even higher warming trend), involving a moderate decrease in average rainfall but a major increases in climate variability within and between years, and probably associated with more rapid and radical responses from governments

It is highly likely that at times in the next few decades it will appear that the Namoi is in one of these trajectories and at other times the other trajectory will appear to be unfolding. Exploring the two trajectories separately will allow us to identify challenges and opportunities more clearly than focussing on the less extreme middle-ground.



10 Governance

"... in recent years the system has come under increasing criticism as being outdated and indeed harmful to Australia's future"

Scott Bennett and Richard Webb in their on-line chronology of Australian federalism for the Australian Parliamentary library
(<http://www.aph.gov.au/library/pubs/online/AustFederalism.htm>)

The Australian federal system, established in 1901, is one of the oldest functioning federal systems in the world. It was established at a time when separate colonies operated as independent units and was a major step towards achieving cooperation between those colonies.⁸⁹ The future of the Australian federal system is today a matter of debate. While the nature of federalism appropriately reflected the union of four powerful colonies in 1901, in recent years the system has come under increasing criticism (see quote above).

Much of this debate is concerned with how well we are served and governed by three tiers of government. In Australia we find the three tiers Commonwealth, State and local sometimes uncoordinated and contradictory. This can compound workplace and lifestyle choices if our work and commitments take us across State or territory and other borders, and it can mean that we have to deal with multiple different jurisdictions and administrative bodies. The inconsistencies of the Australian federal system are evident, for instance, in the poor results we have seen in management of the Murray-Darling River Basin which illustrates a lack of coordination between the States themselves and between the States and the Commonwealth.

A central concern raised in the scenario process as elsewhere is how people in Australia and in the Namoi will be governed in 2030. Indeed the scenarios take up the early signs that Australian politics are moving from an adversarial design to a more collaborative approach. However, there is a high degree of uncertainty about the extent to which changes will only be nominal or whether they will result in better quality of life in the region.

Recognising that Australian federalism is evolving, the scenarios draw out different possible answers to three questions about how we might be governed in 2030:

- Priorities for regional Australia (how do we decide what the priorities for regional Australia are and what vehicles can be used to deliver them?)
- Leadership and priority setting (what is an appropriate balance between bottom up and top down priority setting for regional development within Australia?)
- Collaboration and linkages (do we have effective connections between different players?)

The lack of strategic national approaches is a key area of concern drawn out in the scenarios. While shifting power towards the centre Canberra might make sense for efficient regulation of the national economy, it might not solve the problems in every area of public service delivery and localised regulation on which the day-to-day lives of communities depend. Most participants in the workshops believe we need strong state or regional government, but not what we have now. If we abolished the states tomorrow, we would have to replace them with something not unlike states in order for the governance of Australia to in any way remain manageable.

The scenarios indicate it is important that governance systems are sufficiently robust to assure that communities, rural and urban, are not left behind. There are futures within Namoi where the risk of this is high. In some instances this is a consequence of distance and the lack of access to infrastructure. But it might happen as a consequence of social disadvantage, at both an individual level and community level.

The question now is how we should fix our federal system. There is no clear or agreed blueprint of how we think the structures of the federal system should be changed. Rather, there are a spectrum of opinions and views about how the Australian Federation might evolve by 2030. Institutional changes, like the creation of the Council for Australian Federation (FN), and process changes, in settings like the Council for Australian Governments, (COAG) – the formal meeting of state premiers, the Commonwealth, and the Australian Local Government Association, do provide contradictory signals.

The former forum for all the state premiers allows State leaders to meet and caucus on short-term tactics for dealing with the Federal Government; it could move the system more towards a system of federalism “without Canberra”; the latter implies a move towards ‘collaborative’ federalism under a “national reform agenda” where the centre gains with cooperation from the other tiers of government. The reform agenda is dependent on a serious Commonwealth commitment to a cooperative approach. In addition, there are concerns being voiced about the role of local government; for example, the first meeting of the

new Australian Council of Local Government (ACLG) in Canberra on 18 November 2008 discussed possibilities strengthening the capacity of local government to share more of the governance burden is also crucial to a better Australian federal system in the long-term.

Another important message of the scenarios is that local and regional dimensions are more fundamental to the Namoi's future than currently realized; this increases the need for debate about how the functions of government are going to be re-allocated.

The scenarios indicated that the public sector can play an important role as a broker of collaboration to achieve investment by industries and other private interests in public good natural resource management and sustainable agriculture outcomes, such as climate change. However, solutions would need to manage any disconnection between communities and governance approaches and policies.

10.1 Adaptive governance

Australia is not alone in questioning its governance systems. This is part of a global trend. Increasingly, those researching institutional arrangements in societies are saying that some of our core beliefs about the way governance works need to be questioned deeply.⁹⁰

Throughout the early 20th century in Western societies, governance was based on the beliefs that logical (scientific) analysis could find a solution to all problems and that central governments were best placed to impose the "best" solution. This "administrative rationalism" came into question as the century unfolded, especially as consequences of actions regularly had unpredicted and unintended consequences. Increasingly, these side-effects caused problems that were beyond the scale that national governments could cope with.

By the 1970s, the public's trust in administrative rationalist governance was low and support from citizens to implement government decisions could not be relied on. To deal with these changes, governments began to heed calls for greater community participation in public decision-making. This became clearer from the 1980s onwards as Australian governments began decentralising responsibilities for a range of functions, including natural resource management, to community-based programs.

This decentralisation was accompanied by the rise of New Public Management, which sought to exert governments' authority by centralised manipulation of markets, based on the belief that people's preferences applied through markets would find optimal solutions to most problems. Thus, what appeared

like devolution of power and authority to the public was simply another form of top-down central control.

During the past decade or so, international research on how societies build and maintain the resilience they need to address environmental and other challenges has suggested that the assumptions on which centralised, top-down control by governments is based are not only unsupported but are likely to make us vulnerable to the sorts of shocks that climate change, for example, may bring. Resilient institutions require a diversity of ideas and solutions. They need to be close to where change is happening and responsive. There needs to be high levels of trust and cooperation among levels of governance and the recognition that change occurs through the actions of complex interactions between social and ecological processes and so can neither be predicted nor tightly controlled. A high degree of learning and review of approaches is required.

NHT and the "regional model" can be interpreted as a very weak movement towards the type of governance that is required to effectively deal with environmental challenges and mostly an application of traditional government approaches to governance. The Caring for our Country program appears to be pulling back even from the weak benefits of NHT and moving again towards central control. Ironically, while regions are questioning this decision, they are calling for the Australian government to show some leadership in developing truly national strategic thinking to deal with the future.

Unfortunately, this model also by-passed the States and Territories where much conservation and land management information and experience resides that has been accumulated over many decades. This contributed to the non-focused and inefficient conservation effort of the NHT program as reported by the Auditor – General.

Connell⁹¹ contemplates one way in which institutional change might come about in regional Australia - socio-ecological breakdown due to failure of current governance arrangements to deal with water and related environmental issues. He suggests that:

... "a pragmatic approach that avoids disruptive changes and continues with business as usual could mean that life as we know it will soon be only a memory".

10.2 Congruence with Australia 2020

Priority themes raised by participants in this scenario planning process echo governance concerns raised in the 2008 Australia 2020 Summit such as:

- Attraction, recruitment and retention of people, families and business to remote, rural and regional communities
- Broad parity of access to infrastructure and services for remote, rural and regional Australia
- Nationwide harmonisation of regulation, standards and enforcement
- The challenges posed by climate change with particular emphasis on its impacts on the food and mining industries
- Development of appropriate incentive schemes to promote environmentally sustainable behaviour and strategies

10.3 Anticipating and preparing

Given the uncertainties about governance raised above, it is important that the Namoi explore the range of governance trajectories that are possible and consider how to be ready to take maximum advantage of opportunities that arise while avoiding hazards (e.g. see Box 7). This is the reason why each scenario explore not only how effective leadership and influence might be achieved in that future but also the possible paths to, and consequences of, failing to achieve influence.

Box 7 Some key points made about governance issues for the Namoi by one of the expert commentators⁹²

- The Namoi region as part of the State of NSW is highly dependant on the State's governance and economic parameters. Local government remains one of the key institutions for delivering basic services. It is however, often limited by lack of resources and its own structural inefficiencies. In particular, Councils often lack the critical mass needed to access higher order services or facilities, particularly professional and leadership skills.
- Working towards the most efficient regional governance structures is absolutely critical to success. Local government reform and developing regional partnerships may be the most appropriate strategies to achieve this.
- There is also the Federal context that may, through recent shifts in emphasis, lead to opportunities for a region to directly interact with the Federal sphere. This is most likely to come about by way of programmes and funding arising from emerging national policy directions.
- Regions should be ready to take advantage of direct opportunities to transact with the Federal government. This may be by capitalising on federal/state tension and showing that bypassing the states improves outcomes or is more efficient.
- There is currently, NSW in particular, an emphasis on the coastal development belt. The west of the 'sandstone divide' areas are very much forgotten in Macquarie Street. Essentially, these areas are subject to 'benign neglect'.

11 Scenario logics

“Storylines are an efficient medium through which ideas across many disciplines can be linked in context.”

Kees van der Heijden in “The Art of Scenario Planning”

Human communicate through stories. The most sophisticated scientific paper or quantitative simulation model is just a way of telling a story in language that a particular audience can appreciate. As explained in Chapter 2, scenarios are types of stories that are particularly useful for exploring aspects of the future that are both highly uncertain and uncontrollable. To be useful for planning such as the Namoi’s decision makers will need to do, which is likely to be debated and contested, the scenarios need to be developed in a rigorous process that checks for internal consistency and logic and explains the assumptions and decisions about how the stories develop. The stories can never be “right”. They merely need to be plausible and transparent enough to get the right people thinking about the issues they might need to deal with and what they might need to do to prepare form those issues.

We will have achieved many of our objectives if you, the reader, find your thinking is sparked by reading the short or long versions of the scenarios – whether you agree or disagree with the way we and the Scenarios Working Group have developed the storylines.

11.1 Focus

The Namoi scenarios optimistically focus on how effective leadership and governance might lead to better management of the challenges and opportunities of a range of futures driven by energy-climate combinations.

Focusing on what can be accomplished through effective leadership is an important vehicle for strategic thinking

As explained in Table 7 (Chapter 7), there are eight possible combinations of the three critical uncertainties (energy transitions, climate change and influence/ governance). All eight provide valuable insights into future challenges and opportunities for the Namoi.

To capture these insights in a manageable number of scenarios, we have written four narratives that include the four possible combinations of energy and climate change trajectories. Each is relatively optimistic in that it explores how effective leadership and governance might deal with the challenges and opportunities of the energy-climate combinations.

To explore less optimistic views of how the energy-climate combinations might be dealt with, each scenario includes a summary of what might happen if leadership and governance were ineffective. In addition, the body of each narrative includes boxes exploring how ineffective governance might come about and its consequences in relation to specific issues.

This approach directs our attention to what might be required to make progress towards the best outcomes envisaged under the four energy and climate change trajectories. We can learn lessons from or ‘rehearse’ preparations for what might be done to achieve good outcomes and think about how to avoid or – at least – manage what might go wrong.

11.2 Logics

The characteristics of the four scenarios are outlined in relation to key issues in Table 11.

Table 11 Characteristics of Scenarios 1-4 with respect to key issue areas

A more detailed version of this table can be found in Appendix 4

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
INTERNATIONAL				
Oil, energy, carbon				
Oil supply	Decline/ uncertainty	Decline/ uncertainty	Stabilises	Stabilises
Oil prices	Rise, plateau, rise	Rise, plateau, rise	Stabilise/ demand declines	Stabilise/ demand declines
Energy response	Scramble for coal and gas	Scramble for coal and gas	Orderly transition to coal and gas then renewables	Orderly transition to coal and gas then renewables
Carbon policies	Slow progress	Very slow progress	Moderate progress	Rapid progress
Climate change	Major impacts on all counties but more on developing nations	Moderate impacts on all counties but more on developing nations	Moderate impacts on all counties but more on developing nations	Major impacts on all counties but more on developing nations
International political and social stability/ cooperation				
Tensions	Very high	High	Moderately high then low	Well managed
Cooperation	Very low	Low	Low then moderate	Poorly managed
Trade	Free trade talks fail Cut-throat competition, trading blocks among developing countries	Failure of free trade talks Competition through trading blocks among developing countries	Agreements take a decade Initial resentment and trade tensions but eventual cooperation	Agreement over free trade Wealth and technology transfer to developing countries
Economies				
US economy	Volatile	Volatile	Stabilises	Stabilises earlier

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
	Foreign investment declines dramatically	Foreign investment declines moderately	Foreign investors exert moderate influence	Foreign investors exert major influence
Chinese economy	Much slower growth	Moderately slower growth	Continued growth	Slightly slower growth
	Closer links with Europe	Closer links with Europe	Links with east and west	Links with east and west
	Decreased reliance on oil, very high demand for Australian coal	Decreased reliance on oil, high demand for Australian coal	Demand for Australian coal declines after two decades	Demand for Australian coal declines after a decade
	Major food supply pressures	Moderate food supply pressures	Moderate food supply pressures, eased because energy is affordable	Major food supply pressures, eased because energy is affordable
NATIONAL				
Emissions policies				
Implementation	Slow	Very slow	Slowly from 2012	On time (2010)
Industry concessions	Many	Very many	Some	Few
Extra social and environmental conditions	None	None	Some	Many
Public concern about energy/ climate	Very high/ high	Very high/ low	Low/ low	Low/ high
Renewables	Slow progress initially	Very slow progress initially	Moderate support	Strong support
Focus on regions				
Government focus	Global energy and climate main foci -	Global energy main focus	Regional governance but as low priority	Regional governance to leverage support

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
Government investment	Ad hoc, mainly related to energy	Ad hoc, strongly related to energy	Little focus	Strengthening regional governance
Potential for influence by regions	High if coordinated energy and climate solutions are offered - otherwise very low	High if coordinated solutions to energy problems are offered - otherwise low	High if confidence of governments can be gained, as they prefer to focus on other issues	High as governments looking for effective partnerships
Water	Very high and chaotic competition between agriculture and mining.	High and chaotic competition between agriculture and mining	Mild and orderly competition between agriculture and mining	Moderate but orderly competition between agriculture and mining
Environment/ biodiversity				
Climate impacts	Moderate ecosystem decline - land-use policies have greater impact	Minor ecosystem decline - land-use policies have greater impact	Minor ecosystem decline - land-use policies have greater impact	Moderate ecosystem decline - land-use policies have greater impact
Land-use impacts	Combined impacts of mining and climate change poorly considered	Environmental impacts of mining poorly considered	Little more consideration than at present	Combined impacts of mining and climate change well considered
Tensions	Concern about energy clashes with concern about climate change	Major concerns are about energy, so environment is neglected	Few concerns - risk of complacency	Orderly energy transition includes environmental and social issues
Human well-being/ lifestyle				
Mining wealth	Some wealth from coal and gas kept in catchment	Some wealth from coal and gas kept in catchment	Mining supports social welfare but public pressure only moderate	Mining supports social welfare issues under strong public pressure

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
Agriculture	Agriculture and associated industries suffer, due to climate change and governments' focus on energy issues	Agriculture profitable as climate change is mild and lessons have been learned from the early 2000s	Economy is not booming but is buoyant as both mining and agriculture are doing well and coexisting comfortably	Although the economy is not booming, it is stable despite the pressures that agriculture is under from climate change
Tensions	Mining benefits vs. emissions	Few tensions - environment off agendas?	Complacency is a risk	Environmental and other values are aligned
Services	Difficult to maintain health, education and welfare services	Difficult to maintain health, education and welfare services	Health, education and welfare services strong, but complacency is a risk	Strong support for health, education and welfare services
Indigenous people	Needs secondary to feeding the chaotic mining boom	Needs secondary to feeding the chaotic mining boom	Intent to focus on needs but complacency a risk	Strong focus on needs
Population				
General	Disorderly growth and unstable demographics	Disorderly growth (higher than Scenario 1) and unstable demographics	Similar to 2008 or slightly larger. Could decline if leadership poor.	Similar to 2008 or slightly larger with churn in agriculture. Could decline if leadership poor.
Agricultural workforce	Fluctuates with water availability, competition from mining, and farm amalgamations	Struggles with competition from mining and farm amalgamations	More stable than other scenarios but could decline due to complacency	Demand fluctuates due to climate variability and farm amalgamations
Tree-change	Very small	Small, except around Tamworth.	Sizable unless complacency rules	Small
Mining and energy				
General	Mining booms but faces competition for water with agriculture	Mining booms	Mining grows slowly	Mining grows but faces competition with agriculture for water
Renewables	Little attention for 5-10 years	Little attention for 5-10 years	Diversification but low public pressure	Diversification of energy production

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
Conditions for operation	Limited "licence to operate" agreements that mostly focus on water sharing between mining and agriculture and investment in water saving technologies	Limited "licence to operate" agreements (weaker than in Scenario 1 due to less public concern)	Mild "licence to operate" conditions (public concern about emissions and climate change are too weak to drive stronger conditions)	"Licence to operate" agreements, including environmental and social conditions, are central part of industry and community interactions
Agriculture				
Interactions with mining	Very many negotiations	Many negotiations	Mining considerate but public pressure is low	Mining strongly considers agriculture and water
Production	Lower than at present	Similar to present	Similar to present	Lower than at present
Markets	Potentially major growth but challenges for the Namoi to meet demand	Potentially moderate growth and opportunities for the Namoi	Potentially moderate growth and opportunities for the Namoi	Potentially major growth and opportunities for the Namoi
Small business				
Customer base	Population churning and challenge to get miners to spend in the catchment	Population churning and challenge to get miners to spend in the catchment	More stable than Scenarios 1-3 but economic growth is also likely to be slow	Stable mining sector but fluctuating agriculture - fluctuating demand for a wide range of services
Innovation	High - strong emphasis on mining-associated small businesses	High - mining and agricultural-associated small businesses	Lower - times are more stable and predictable	High - to deal with the fluctuating agriculture and stable mining
Infrastructure				
Road and rail	Mining companies and governments invest	Mining companies and governments invest	Modestly increased government investment (low urgency)	Increased government investment with input from industries

Issue area	1 – HOT SCRAMBLE Disorderly energy transition High warming Effective governance	2 – WARM SCRAMBLE Disorderly energy transition Low warming Effective governance	3 – WARM COMPLACENCY Orderly energy transition Low warming Effective governance	4 – HOT BUT COOL Orderly energy transition High warming Effective governance
Health and education	A challenge unless effective leadership can get people who work in the catchment to live there to justify spending on hospitals and schools	A challenge unless effective leadership can get people who work in the catchment to live there to justify spending on hospitals and schools	Attention to education and health as part of energy strategy but less urgency than in other scenarios	Government attention to education and health to ensure that this key energy generating region is socially stable and secure
Education	Innovative models based on mobile populations and electronic communication	Innovative models based on mobile populations and electronic communication	Little pressure to change the traditional models for secondary and tertiary education	Innovative models based on mobile populations and electronic communication ???
Technology				
Clean coal	Mining proceeds initially without waiting for clean technologies but there is strong public concern	Mining proceeds initially without waiting for clean technologies with weaker public concern	Mining proceeds slowly with some environmental regulations attached and weak public concern	Mining proceeds slowly with environmental regulations attached due to strong public concern
Renewables	Little attention for 5-10 years	Little attention for 5-10 years	Diversification but low public pressure	Diversification of energy production
Water saving	Fast-tracked for agriculture and urban use	Less urgency than Scenario 1 or 3	Less urgency than Scenario 1 or 3	Fast-tracked for agriculture and urban use
Research funding	Intense competition between energy and agriculture	Risk that the energy sector will capture the research funding agenda and water will be forgotten	Relatively even distribution of funding but less funding overall than the other three scenarios	Relatively even distribution of funding between mining and agriculture

12 The scenarios

"By presenting a positive future for South Africa as a possibility when all around were so utterly negative about the country's prospects, we helped change the direction of the national debate."

Clem Sunter, head of scenario planning at the Anglo American Corporation, on the scenarios the De Klerk government asked him to prepare for what might happen following Nelson Mandela's release from prison

12.1 The initial conditions for all scenarios

In 2007, members of several Namoi communities met to think about the catchment's possible future trajectories. At the time, the issue that weighed most heavily on their minds concerned the ways in which regional Australia was perceived and treated by urban and metropolitan Australia and the difficulties of influencing national or even local trends when located in a region.

It was thought that Australian governments of any political persuasion had failed to take a sufficiently strategic or "national building" approach to considering the human, natural and other assets available in Australia, and especially regional Australia, and that regional Australia needed to do more thinking about how it could shape its own future.

Initially, four scenarios were developed reflecting these governance concerns.

Behind these "headline" issues were others relating to economic drivers, like commodity prices, transport, health, education and welfare infrastructure, energy cost and supply, population structure, growth and distribution, water and climate change.

As 2008 unfolded, the threats and uncertainties of climate change became better known, a new Australian government proposed sweeping reform of emissions policies, oil prices climbed rapidly followed by food and a wide

range of other costs, and economies around the world, led by the USA, showed signs of faltering. It became apparent that, in addition to governance issues within Australia, international trends with respect to energy and climate change could go in several very different directions that could make enormous differences to the preparations the Namoi might need to make for the future.

The world of 2008 faced several stark dilemmas. As well as the long-existent dilemma of helping less developed countries develop without threatening lifestyles and well being of more developed countries, serious questions were asked about whether any economies could continue to grow for much longer on the back of consumption of fossil fuels. Plans to achieve more equitable use of the World's resources and to reduce carbon dioxide levels in the atmosphere ultimately required transfer of some wealth and power from developed to undeveloped countries at a time when developed countries found their own wealth and power to be insecure. This set the world up for a range of scenarios ranging from do-nothing paralysis, as decision makers argued over the best way forward, to bold initiatives that could fundamentally transform global resource use and geopolitical processes.

In 2008 it was impossible to tell which of these trajectories the World might take, but it was clear that we would not have long to wait to find out and those who had not prepared by at least considering their options could be left floundering.

12.2 Scenario 1 - Hot scramble

1	With effective governance (and strong regional influence)
 <p>Disorderly energy transition</p>  <p>High warming</p>	<p>There is a rapid movement to develop coal and gas reserves in the Namoi to meet energy needs of Australian society and industry and to meet overseas calls for energy sources.</p> <p>The combination of oil shortages and high climate variability (including frequent and severe droughts) throws policy into disarray. Public opinion is mixed about radical emissions reduction. People are concerned about the signs of climate change that they see but they are more worried about the economy and jobs. Emission control policies are watered down and staged over a longer period.</p> <p>The Namoi obtains influence by taking part in cross-region cooperative planning and lobbying. State and Australian governments welcome the support because they are overwhelmed by the dual challenges of energy and climate crises. Although times are tough, a strategic approach is taken that makes the most of a bad situation.</p>
	<p>Economically the Namoi thrives on mining. Agriculture waxes and wanes due to highly variable climatic impacts on production combined with international market demand for products that fluctuate from very strong to moderate, not necessarily at times when the Namoi has excess produce to export.</p> <p>There is strong competition for water between mining and agriculture, with innovative solutions to capture and storage during wet periods.</p> <p>Population grows to support a booming mining industry, but social problems arise due to constantly changing demographics.</p>
	With ineffective governance (and weak regional influence)
	<p>Strategic and coordinated management of water and human resources fails to eventuate because the scramble for energy divides the Namoi community into winners and losers. The Namoi is unable to speak as one voice and cooperation with other regions breaks down as everyone scrambles to look after their own interests.</p> <p>State and Australian governments are overwhelmed with the dual challenges of an energy crisis and high warming and rely on ineffective governance at regional levels. Those regions who cannot manage themselves tend to be abandoned as lost causes. Government agencies offer advice on how to manage decline.</p> <p>The Namoi is providing wealth to the Nation from coal and gas, so the welfare of the residents is overlooked; there is a view that economic growth will trickle down. Competition between agriculture and mining for land and water is poorly managed and resentment builds.</p> <p>Benefits from mining are not seen locally because leaders are not able to negotiate "licence to operate" conditions with mining companies.</p> <p>Strong social divisions emerge as those who prosper from disorderly expansion of mining are shunned by those who are concerned about the environmental impacts.</p> <p>Agriculture declines and is mainly practiced by large companies. Small operators miss opportunities to supply growing overseas markets.</p> <p>Population declines as Tamworth's water supply fails under dual impacts of drought and water demands for mining.</p>

12.2.1 Early signs

The 2008 oil price rise and the frequent reports of severe weather events, including the seemingly never-ending Australian drought, were harbingers of what was to come.

Although oil prices settled a little after the rapid rise in the middle of 2008, they remained higher than ever before and gradually climbed throughout the period 2009-2015. It was clear that availability of easily extractable oil was peaking (it peaked in 2014). Continued unrest in the Middle East, the efforts of Russia to secure its oil supplies by exerting its power in its region, overtures by various European countries and the USA to northern African oil states, and the movement of China to increase its alliances with Eastern Europe, all made the dominant industrialised countries nervous. They were increasingly caught in a dilemma between pressure from voters to provide secure and affordable energy and pressure to address the threat of climate change by reducing carbon emissions to the atmosphere.

This dilemma worsened as 2009, 2010 and 2011 confirmed that climate change was tracking the worst-case scenarios of the Intergovernmental Panel on Climate Change and public concern went through the roof on both climate and energy.

To make matters worse, OPEC, realising its oil supplies were dwindling but also observing that the West had managed to absorb several price rises, kept upward pressure on oil prices.

Governments globally were unable to act decisively or in an orderly way. The US economy continued to falter after the credit crisis of 2007-09 and as it became clear that a large proportion of its financial assets were owned by foreign countries who were re-thinking their investments or considering how to influence the USA for their own ends.

The long-held belief in continuous economic growth as the way to improve human welfare was being questioned, but national governments knew of no other alternative but to try and stimulate growth by any means available - and that usually meant consumption of fossil fuels.

Nations scrambled to secure oil through bilateral agreements (multi-lateral agreements were very difficult as each country was focussed on protecting its own interests and it was not clear which alliances would be beneficial in the long run). Countries that had coal and gas reserves rushed to develop them. Others went for first-generation biofuels (crops like sugar cane or maize that could be used to produce ethanol).

As in the past, aggression was resorted to when countries got desperate.

The fear of dampening economic growth, together with the lack of availability of clean energy technologies, led to policies to support energy generation that had few tough environmental conditions attached. Attempts to keep faith with those concerned about climate change by adding ad hoc environmental measures made policies chaotic and overly complex.

12.2.2 Leadership amidst chaos

Despite initial bipartisan political agreement that actions to address carbon emissions were necessary, neither of the major political parties in Australia was in a hurry to implement major emission reduction programs because conflict between energy and climate change concerns made it impossible to obtain a clear mandate to proceed.

Water reform also stalled as the growing urgency to develop coal and gas extraction for domestic use and to meet growing international demand conflicted with the also growing demand for food production. Water-sharing plans in many parts of Australia were re-thought. Water efficiency measures were expensive to implement due to rising costs of energy. Water policy was in chaos for much of the period 2010-2015.

Drying continued across Australia with occasional heavy rainfalls that caused damage and eroded topsoil. Food production in several Asian countries failed two to three times during 2009-2018, presenting Australian food producers with the conflicting challenges of meeting local demands, providing aid to Asia, and capitalising on temporary market opportunities.

As Australian and State governments struggled with international agendas and conflicting national pressures, the Namoi and surrounding regions saw a window of opportunity. For some time, progressive thinkers in these regions had been talking about the need for cooperative action to facilitate strategic approaches to major land use change and to more effectively influence government thinking and policy. Recognising that the governments could be receptive to well considered plans to address regional issues, regional leaders in agencies, industries and non-government organisations met and developed a blueprint for the cooperative development of coal and gas, alternative energy industries and agriculture.

The Australian government was eager to listen as it welcomed bottom-up solutions to the wicked policy challenges that it faced. Furthermore, regions like the Namoi were increasingly important in trade and security negotiations with other nations in the geo-political region.

Although there were few ideal solutions, the reality that Australia needed both energy and food and that both of these required water that was becoming scarcer demanded inspired compromises. The blueprint included plans to

restructure agriculture to use water more efficiently and to increase food production to take advantage of expected demand spikes in other countries, especially Asian nations. To facilitate these changes at a time when agriculture could easily struggle due to climate change, the regional leaders proposed that mining companies agree to integrate their water use with agriculture and to invest some of the wealth generated by booming demand for coal and gas in improving efficiency of agriculture. In exchange, the coal and gas companies would be assisted to select and develop new sites, would build strong social credentials, and would find a much more welcoming community for their workers to live in.

Eager to avoid the distractions of strong public opinion about carbon emissions, the mining companies also invested heavily in clean production technologies, although these were not fully operational until the early 2020's.

This scenario could have easily continued on a chaotic, confused path without the initiative taken by the Namoi and other regions. Faced with the huge international challenges of energy shortages and climate change negotiations, Australian governments could have continued to manage regional Australia with ad hoc partial-solution policies that would not only have made running businesses difficult but would have stifled innovation and allowed environmental problems to overcome most small and medium enterprises. The regions would have no ability to shape their own futures and would have had to put up with policies that they had little input to.

12.2.3 Water shortage brings about major changes

By 2015 water was of major concern in the Namoi. In parts of Australia, agriculture had all but disappeared. The strong and strategic leadership in the Namoi and surrounding regions had meant that the best was made of a bad situation. While mining, agriculture, other industries and urban development had cooperated to use available water as efficiently as possible, major changes had been necessary.

Large-scale farm amalgamation started during 2010-2015 and by 2020 very few small enterprises existed. It was a constant struggle to maintain production with irregular and declining water supplies as well as fluctuating international market demands. Small operators who were unprepared for market opportunities or water scarcity usually failed to survive.

Large investments of time were required by farmers and their representatives in negotiations with mining companies about water sharing and access to exploration sites. This could have been far worse, however, to the point of

crippling much of the region's agriculture, if not for the facilitation role played by an inter-regional negotiation body established jointly by the leaders in the Namoi and surrounding regions.

Box 8 The Namoi has a strategic win despite chaotic water policy

While the Australian Government struggled to stay focussed on regional issues while wrestling with large and wicked international and national challenges, it was more than ever receptive to well presented plans from regions who could deal with their own problems. Seeing the risks of inaction in the face of the dual climate and energy crises, leaders in agencies, business and NGOs in the Namoi combined forces to develop plans for water sharing in the Peel sub-catchment (treating it as one water source rather than 3) and for a water-reuse system for Tamworth. This was supported through grants from State and Australian governments. It enabled strategic planning for water across all uses in the catchment, almost certainly averting a major crisis that would have occurred in the mid 2010s if Tamworth's residents and small businesses had had to compete with mining and other industries for water in a competitive market. In all likelihood, this would have seen Tamworth run out of water for all but essential services.

All major urban centres had to live with severe water-use restrictions and major investments were made in water re-use technologies. From 2013 till 2018 there were major tensions between industries and urban centres. While the urban centres depended on mining and agriculture for wealth, they were also major competitors for water. It was a constant struggle for urban centres to attract new residents and this was made harder if water restrictions hindered people's lifestyles and basic amenities. The tree-change trend of the early 2000s weakened as temperatures rose and uncertainty about energy made travel to the cities a risky and expensive proposition.

12.2.4 Hard times for the environment

With the focus on energy and water shortages and surviving economically, Australian governments gave little attention to other environmental issues unless disasters appeared to be looming.

Environmental groups struggled to get the attention of politicians. There was little public support for measures to protect biodiversity until after climate, energy and the economy were under control.

Farmer's groups, on the other hand, successfully drew attention to the crisis for people working the land. This created enough concern for governments to implement ad hoc schemes to pay farmers for ecosystem services. These were partial solutions that risked raising objections from international trading partners. In the competitive and uncooperative global trading environment, these solutions were seen as thinly disguised income re-distribution schemes. Similar schemes, under the banner of "multi-functionality" had caused problems for European and Asian countries in the early 2000s. A patch-work

of policy fixes was applied to appease objectors. The result was that some areas of natural vegetation were protected but in non-strategic ways.

12.2.5 Population and infrastructure

By 2020 the Namoi and surrounding regions had come to grips with the new climate regime. The coal and gas industries had more than doubled since the early 2000s, but the signs were developing globally that supplies and demand for coal were declining. Demand for alternatives was growing.⁹³ Australian governments introduced policies to encourage development of solar, wind and second-generation biofuels⁹⁴ in regional Australia. Many land-owners who had been struggling to make agriculture pay now looked to energy generation as an additional source of income.

Unfortunately, integration of alternative sources into the national mix was slow as it required a new approach to energy storage and distribution and thinking about this had been neglected while the scramble for coal and gas was on.

Urban centres in the Namoi had become used to fluctuating and churning populations. The fortunes of agriculture waxed and waned with climate variations. Mining companies attracted new workers into the catchment, but moved them around depending on where the priorities were at different times. Many of these workers commuted from outside the catchment, especially coastal areas. A major challenge for the Namoi's planners was to entice mining workers to live in the catchment. The Namoi led the nation in developing new educational curricula to suit mobile populations, which established emotional links between young people and the catchment that resulted in a proportion returning to live there in the future. Similarly, hospitals and other welfare services developed new governance structures to deal with fluctuating demand. All of this was possible due to strong cooperative agreements between the Namoi's governing bodies and industries, especially mining companies and associated businesses, that ensured strategic investments in local infrastructure.

Box 9 Avoiding an infrastructure nightmare

The Namoi's leaders (governing agencies, business and NGOs working cooperatively) moved quickly in the early 2010's to establish cooperative agreements with big industries that they could see would grow wealthy on the scramble for coal and gas in the coming decade. Had this strategic move not been made, it is likely that governments, stretched to the limit dealing with the dual challenges of energy shortages and climate change, would have made some investments in infrastructure likes roads and rail to allow economic growth to proceed but would have health with education, health and welfare services in an ad hoc way due to the large uncertainties created by the volatile global social, economic and climatic environments.

The severity of climate change and the reality of energy shortages had meant that, eventually, Australians, like others in the World, learned to live with less energy and less water. The years 2010-2020 were painful for many due to the disorderly transition to this new lifestyle. Despite the hotter and drier climate of much of the Namoi compared with the past, a moderate number of previous city-dwellers opted to move there in the 2020s to avoid the greater uncertainty and chaos of city life with uncertain and expensive energy and water supplies. This movement could have been a lot larger if development of communication infrastructure had been more orderly, but it too was caught up in the uncertainty of the times.

In addition to the amalgamation of farms and sometimes cruel "survival of the fittest" among farmers, agriculture was especially innovative in finding efficient ways to deal with high inter-season variability in rainfall, through new storage processes, diversification of crops, and strategic planning with other water users to enable cropping to get priority at some times and other users to get priority at others.

12.2.6 The challenge for small businesses

Small businesses in the Namoi faced major challenges because of the fluctuating fortunes of agriculture and the disorderly boom in mining.

Small businesses servicing the agriculture industry and its people had to develop strategies to deal with the fact that many families left the land during the 2010s and agriculture moved from small to much larger enterprises. For associated small businesses, this initially a declining and unpredictable customer base. Later it meant a change in strategies for dealing with larger businesses.

For much of the 2010s businesses in the Namoi had to deal with drought and occasional flooding rains and their chaotic impacts on agricultural enterprises. Periodic surges in demand from overseas food markets also meant that agricultural businesses had to find ways to be able to anticipate these surges (through sophisticated market research and watching for signs of coming surges) and through streamlined procedures for obtaining credit and implementing new business models. Small businesses sprung up to service this need but only the best survived.

The coal and gas booms presented different challenges for small businesses. Populations of major and minor urban centres rose and fell as new mines were established and workers were moved around the catchment to meet demand. In the early 2010s, building companies struggled to keep pace with demand and speculation was rife as investors tried to predict when and where demand would peak. The disorderly nature of the boom made it hard for planners to meet accommodation demand while also avoiding problems with water supply

and other infrastructure. The uncertainty prevented many workers from moving their families to the Namoi, so they commuted from outside, placing large and unmanageable demands on temporary accommodation and increasing costs for local services that were not fully recovered through rents and rates.

Small businesses servicing mining companies and their workers took high risks to capitalise on the boom, providing employment opportunities and bringing new and ambitious young people into the catchment. However, many of these businesses failed and the turnover of new residents was high, preventing many of them from putting down roots in the catchment.

The business-agency-NGO governance coalition worked hard to develop ways to retain some of the new talent coming to the catchment, through flexible and innovative housing, education and healthcare options, but this was a constant challenge without coordinated and strategic approaches from governments to support regional Australia.

12.2.7 Technology

Times of tension and crisis usually encourage innovation. The 2010s in the Namoi were no exception. With nations around the World focussing strongly on national self-interest and rushing to secure energy and water supplies, this attitude was at risk of permeating Australian society as well. For a while it looked like the Namoi and other catchments would degenerate into the sort of winner-take-all cultures of early Victoria, California and Alaska.

The intercession of the industry-agency-NGO coalition across the Namoi and surrounding regions, however, managed to curb the worst of these potentially disastrous social trends, and achieve a degree of investment in technological innovation that might otherwise have taken another decade or more to eventuate.

Initially, governments allowed coal and gas miners to proceed without waiting for clean coal technology. The need to secure Australia's economic future was too great for governments to stand their ground on emission control policies. High levels of public concern about climate change, however, meant that governments and industry promised extra effort to fast-track clean coal and other emission-reduction technologies in exchange for public support to proceed.

This produced ongoing tensions for much of the 2010s, despite good will on all sides. Pressures from international energy markets causes coal and gas mining to grow in what appeared to be chaotic and uncontrolled ways. China's demand for coal grew steadily and it relaxed its earlier focus on clean technologies as so many other countries were doing the same. The result was

that clean technologies only started to emerge and be implemented in the early 2020s as global concern about climate change was rising to levels that equalled concern about energy supplies. A major factor in this rising concern was the realisation that combating climate change itself required energy and that dealing with the two threats in an uncoordinated way was making both problems worse.

In the Namoi, tensions between mining and agriculture hit breaking point by the mid 2010s as water shortages looked like making it impossible for both industries to survive. The industry-agency-NGO coalition across the Namoi and surrounding regions, however, convinced mining companies to invest in development of water-saving technologies not only for their own industry but also agriculture. By channelling this investment into innovative new energy and water research and training in institutions based in the catchment, the coalition strengthened its strategies to attract ambitious young people to the catchment. It was not all plain sailing as these investments were generated by an underlying panic about energy and climate, so progress came in bursts and required strong coordination and initiative from within the Namoi and surrounding catchments.

12.2.8 The social scene

The growing and churning population of many parts of the Namoi created social tensions. Disadvantaged groups were neglected by the bulk of the population and found themselves feeling alienated. Crime rates and homelessness rose in some parts of the catchment.

In the face of severe hardship and worsening social conditions, long term residents rallied to support each other, to prevent the neglect of rural values and to build a sense of identity. The catchment's leaders recognised that simply providing money for those who had little was not sufficient and that a sense of purpose and attachment to place was required. It soon became apparent that this was needed by all of the Namoi's residents, who needed to feel that their catchment was progressive and cultured rather than simply a place to generate energy and money. Without the programs developed to address these issues, the catchment could have declined into a social disaster area.

12.3 Scenario 2 - Warm scramble

2	With effective governance (and strong regional influence)
 <p>Disorderly energy transition</p>  <p>Low warming</p>	<p>Oil shortages force the government to scramble to find alternative ways to meet growing energy needs. There is a rapid movement to develop coal and gas reserves in the Namoi to meet energy needs of Australian society and industry and to meet overseas calls for energy sources.</p> <p>Climate change impacts are serious, not severe. A less variable climate means that public urgency for climate policy reform is low. Emission control policies are watered down and staged over a longer period.</p> <p>The Namoi obtains influence by taking part in cross-region cooperative planning and lobbying. Governments welcome the support because they are struggling with the energy crisis and don't want to have to think about climate issues as well. A strategic approach is taken that enables the Namoi to make the most of booming coal and gas markets as well as moderately good times for growing crops and stock and high demand from overseas markets.</p>
<p>Economically the Namoi thrives on mining as well as agriculture and the influence of regions with government see regional Australia's image improve nation-wide. The region uses its influence to secure favourable licences-to-operate with mining companies, leading to increased investment locally. This is one scenario where a regional investment bank might emerge.</p>	
	With ineffective governance (and weak regional influence)
	<p>Strategic and coordinated management of water and human resources fails to eventuate because the scramble for energy divides the Namoi community into winners and losers. The Namoi is unable to speak as one voice and cooperation with other regions breaks down as everyone scrambles to look after their own interests.</p> <p>The competition for land and water between agriculture and mining is not managed smoothly and resentment builds, although this does not reach the same catastrophic levels as in Scenario 1 where high warming adds another level of stress.</p> <p>Mining wealth is not invested locally because catchment leaders are not strong enough to negotiate "licence to operate" conditions.</p> <p>Social divisions emerge within the catchment between those who favour unrestrained expansion of mining and those concerned about the environment. Environment advocates are not able to muster the levels of public support in this Scenario that were possible in Scenario 1 because climate change is milder.</p> <p>With declining morale among small farmers and increasing transaction costs for dealing with conflicts without effective catchment-wide leadership, small operators gradually sell up leaving farming to large companies.</p> <p>Population churns but stays about the same size as many old farming families leave but new mining families replace them. The sense of place and community declines as new residents have no history in the catchment, no loyalty to it and no long term future in it.</p>

12.3.1 Good news and bad news

The bad news was that the 2008 oil price rise was a sign that availability of easily-extracted oil was peaking (it peaked in 2014). The good news was that climate change, which appeared to be heading towards a worse scenario than the worst considered by the Intergovernmental Panel on Climate Change in 2007, slowed down and started tracking the middle of the road IPCC trajectory. This meant that things got a bit drier and a bit hotter on average, and a bit more variable, but not as much as had been feared.

Although oil prices settled a little after the rapid rise in the middle of 2008, they remained higher on average than ever before and gradually climbed throughout the period 2009-2015. Continued unrest in the Middle East, the efforts of Russia to secure its oil supplies by exerting its power in its region, overtures by various European countries and the USA to northern African oil states, and the movement of China to increase its alliances with Eastern Europe, all made the dominant industrialised countries nervous. They were relieved, however, that public concern about climate change was levelling out as their worst fears were not realised.

Concern about climate was replaced with concern about energy. Governments had a clear mandate to get on with securing energy supplies and keeping economies growing.

To make matters worse, OPEC, realising its oil supplies were dwindling but also observing that the West had managed to absorb several price rises, kept upward pressure on oil prices.

For years, nations had been quietly, even secretly, developing and implementing plans to reduce reliance on oil. Between 2010 and 2012, one after another nation made these plans public. This started a scramble by nations to secure energy assets. They identified what assets they possessed in their own territories and sought agreements or ownership over overseas energy assets (especially coal, gas, remaining untapped traditional oil reserves, and non-traditional sources like coal shales that might be economically extractable in the future). This meant that all nations were focussed internally or on what they could secure from other nations and levels of cooperation were low.

The US economy continued to falter after the credit crisis of 2007-09 and as it became clear that a large proportion of its financial assets were owned by foreign countries that were re-thinking their investments or considering how to influence the USA for their own ends. This added to the mood of low cooperation sparked by energy concerns.

The long-held belief in continuous economic growth as the way to improve human welfare was being questioned, but national governments knew of no other alternative but to try and stimulate growth by any means available - and that usually meant consumption of fossil fuels.

Internationally, progress on global carbon emission reduction agreements slowed, with key nations being more concerned about their economies than climate change.

In Australia, the fear of dampening economic growth, the lack of availability of clean energy technologies, and the better than expected climate outcomes led to policies to support energy generation that had few tough environmental conditions attached. Those concerned about environmental degradation found it hard to be heard as a mood of complacency about the environment emerged and the fear of running out of cheap energy turned into panic. This was especially true among people in industrialised countries like Australia, the USA and Japan, whose lifestyles required five to ten times as much energy consumption per person than lifestyles in developing countries.

12.3.2 Thank God for visionary leadership

Despite initial bipartisan political agreement that actions to address carbon emissions were necessary, neither of the major political parties in Australia was in a hurry to implement major emission reduction programs because of opposition from businesses and the perceived risks of being the first country to move on emissions reductions. The Garnaut reports of 2008 likened this to the "prisoner's dilemma" of game theory, in which a prisoner can get a shorter sentence by informing on his accomplice, or he could get a much longer sentence if his accomplice informs on him, or he and his accomplice could be set free if both of them refuse to inform. The game-theory problem is that the two are kept separate, so they don't know what the other will do.

To move forward on emissions reductions, the Australian government adopted minimal reduction targets. As the rate of climate change slowed through the early 2010s, there was declining public pressure for emissions reduction and major pressure from industries for support to exploit coal and gas reserves as quickly as possible to meet Australia's needs and the increasing demands of China and other developing countries.

Both industries' and the government's focus was almost solely on coal and gas. There was slow progress on development of renewable energy industries as it was thought there would be time to develop these later once the oil crisis was dealt with.

Water reform also stalled as the growing urgency to develop coal and gas extraction conflicted with the also growing demand for food production.

While this conflict was not as great as it might have been if climate change had been more severe, water was still relatively rare and insufficient to support the full potential of both mining and agriculture. Water-sharing plans in many parts of Australia were re-thought. Water efficiency measures were expensive to implement due to rising costs of energy. Water policy was in chaos for much of the period 2010-2015.

Food production in several Asian countries fell short of targets several times during 2009-2018, due to competition for agricultural land from biofuel production, speculation on land sales and agricultural enterprises by investors, and economic problems brought on by costs of fuel. This presented Australian food producers with the conflicting challenges of meeting local demands, providing aid to Asia, and capitalising on temporary market opportunities.

As Australian and State governments struggled with international energy agendas, the Namoi and surrounding regions saw a window of opportunity. For some time, progressive thinkers in these regions had been talking about the need for cooperative action to facilitate strategic approaches to major land use change and to more effectively influence government thinking and policy. Recognising that the governments could be receptive to well considered plans to address regional issues, regional leaders in agencies, industries and non-government organisations met and developed a blueprint for the cooperative development of coal and gas, alternative energy industries and agriculture.

The Australian government was eager to listen as it welcomed bottom-up solutions to the wicked policy challenges that it faced. Furthermore, regions like the Namoi were increasingly important in trade and security negotiations with other nations in the Asia-Pacific region.

Although there were few ideal solutions, the reality that Australia needed both energy and food and that both of these required water that was in short supply demanded inspired compromises. The blueprint included plans to restructure agriculture to use water more efficiently and to increase food production to take advantage of expected demand spikes in other countries, especially Asian nations. To facilitate these changes, the regional leaders proposed that mining companies agree to integrate their water use with agriculture and to invest some of the wealth generated by booming demand for coal and gas in improving efficiency of agriculture. In exchange, the coal and gas companies would be assisted to select and develop new sites, would build strong social credentials, and would find a much more welcoming community for their workers to live in.

Negotiations were tough as there was considerable willingness among the public to give mining companies a free hand as climate change was no longer such a high-profile concern and energy was a major worry. Nevertheless, mining companies saw benefits to be gained and responsibilities to be met in agreeing in part to the regions' plans. They contributed in small ways to

agricultural research and invested moderately in clean energy production technologies. As the pressure to make the clean-energy transition was relatively small, these technologies not fully operational until the late 2020's.

Box 10 Potential for disaster

This scenario contains the seeds of a major disaster if some form of action is not taken early by the Namoi's leaders to influence regional, state and national policies and programs.

In a world driven to scrambling for energy, national and state governments are likely to be focussed primarily on dealing with major international political and economic issues. They will be trying to make sure Australia's trade relationships survive the tensions that emerge as nations move to look after their own self-interest. They will also be trying to make sure that Australia profits from the growing demand for its coal and gas without threatening relationships with old and new allies or threatening Australia's economic growth. With the false security that comes from climate change not being as bad as was thought, governments would very likely allow regional governance issues to fall down the political priority list, allowing markets to sort out the tensions between agriculture and mining and assuming that regions like the Namoi will take care of themselves because their economies will benefit from coal and gas extraction.

Without strong and innovative leadership by the leaders of the Namoi and surrounding regions, there is a risk that the wealth generated by mining would mostly leave the catchment. Furthermore, the wealth that enters the catchment via employment of locals and payments to local businesses associated with mining is likely to create winners and losers within the region, leading to growing social problems and unequal access to health, education and welfare services. A sense of belonging and optimism about the future is likely to decline under these conditions, leading to young people either developing heightened senses of disillusionment or leaving the region to find a better future elsewhere.

Another key role for strong leadership in this scenario is to keep environmental issues on people's agendas, even though climate change is not as bad as feared water will still be scarce and the danger of urban centres and small agricultural enterprises running short of water is high when industry use is not coordinated with other uses. Despite assumptions in 2007 that Tamworth's water supply looked secure under any climate change trajectory, it could easily fall to levels that support only essential services (e.g. if there were a run of dry years like those in the early 2000s again) if the Namoi's population becomes complacent and fails to plan strategically for how the Peel's and Namoi's water will be used.

12.3.3 Water shortage brings about major changes

Although the rate of climate change slowed down, the Namoi still faced a climate like that it experienced in the later 1990s and early 2000s. Thus, although rainfall was only a little less than the long-term average, it was still very possible to get a string of dry years long enough to severely reduce irrigation and town water storages to levels that curtailed normal operating and services. The mid 2010s saw such a dry run, exacerbated by the mining boom and its increasing use of water as well as the increasing demand for water from agriculture as it strove to take advantage of market opportunities in Asia.

The regional coalition of agencies, businesses and NGOs had some success in getting mining, agriculture, other industries and urban development to cooperate and to use available water as efficiently as possible. They had a constant battle against the disorderly nature of global and national markets, all of which were affected by energy prices. Some progress had been made towards coordination of water use across land-uses, but by the mid 2010s water sharing plans for the Peel River system were still under negotiation and the Peel was still considered for planning and management purposes as three separate water sources rather than one, which made integrated water management difficult. The challenges raised by this situation had, however, been discussed widely and this meant that agency staff and the public were not surprised when water levels in the Chaffey dam fell to problematic levels and reaction was rapid, if not efficient.

Luckily, some progress had also been made to increase efficiency of water use in Tamworth, although the step of introducing full water recycling had not been taken by this time. A potential disaster for Tamworth was averted, in that restrictions on water use for gardens and other non-essential purposes was sufficient to meet the challenges and no essential services were threatened.

The milder than expected climate change meant that small to medium agricultural enterprises survived better than has been feared. Farm amalgamation continued, however, at a faster rate than in the 1990's and early 2000s, as the disorderly, every-person-for-themselves culture of business promoted take-overs rather than cooperation.

Large investments of time were required by farmers and their representatives in negotiations with mining companies about water sharing and access to exploration sites. This could have been far worse, however, to the point of crippling much of the region's agriculture, if not for the facilitation role played by an inter-regional negotiation body established jointly by the leaders in the Namoi and surrounding regions.

Box 11 The Namoi is frustrated by chaotic water policy

While the Australian Government struggled to stay focussed on regional issues while wrestling with large and wicked international and national challenges, it was more than ever receptive to well presented plans from regions who could deal with their own problems. It was not, however as receptive as it had been in the early 2000s to proposals that involved large investments in water planning. It saw its water-sharing agreements of the 2000s as a sufficient investment to allow regions to move forward, especially as climate change concerns seemed to have been overstated back then. Leaders in agencies, business and NGOs in the Namoi combined forces to develop plans for water sharing in the Peel sub-catchment and for a water-reuse system for Tamworth. State and Australian governments provided some funds to start these processes, but these were not sufficient to get the job done until the late 2010s, especially given strongly divided opinion in the Namoi and surrounding regions about how water should be shared between urban, mining and agricultural uses.

All major urban centres had to live with ongoing water-use restrictions while negotiations continued. From 2013 till 2018 there were major tensions between industries and urban centres. While the urban centres depended on mining and agriculture for wealth, they were also major competitors for water. Urban centres that managed their water better were able to attract new residents. While the Namoi was, on paper, an attractive place to live because of the booming mining economy and favourable climate, the uncertainty of the national and global economies meant that most people living in cities were hesitant to make large lifestyle changes like the sea-changers and tree-changers of the 1990s and 2000s. Nevertheless, there was a steady stream of people disenchanted with life in cities with energy uncertainties who moved to the Namoi. The Namoi's leaders did their best to encourage good health, education, transport and communication infrastructure, but progress was limited by disinterest from governments whose focus was elsewhere.

12.3.4 Who remembers the environment?

With the focus on energy and surviving economically, Australian governments gave little attention to environmental issues unless disasters appeared to be looming.

Environmental groups struggled to get the attention of politicians. There was little public support for measures to protect biodiversity until after energy and the economy were under control.

Farmer's groups also had limited success at drawing attention to the challenges for people working the land. The dialogue that began in the early 2000s about schemes to pay farmers for ecosystem services initially saw some pilot schemes evolve but the momentum was lost as the 2010s unfolded and governments focussed on market-based schemes to encourage energy production. The result was that there were few economic drivers to protect the environment and loss of native vegetation proceeded with the help of neglect.

With these high levels of environmental complacency and low levels of international cooperation, the stage was set for rapid expansion of weeds, pests and diseases.

12.3.5 Disorderly population growth and unstable demography

By 2020 signs were developing globally that supplies and demand for coal and gas were declining. Demand for alternatives was growing.⁹⁵ Australian governments introduced policies to encourage development of solar, wind and

second-generation biofuels⁹⁶ in regional Australia. Many land-owners now looked to energy generation as an additional source of income.

Unfortunately, integration of alternative sources into the national mix was slow as it required a new approach to energy storage and distribution and thinking about this had been neglected while the scramble for coal and gas was on.

Urban centres in the Namoi had become used to fluctuating and churning populations. Mining companies attracted new workers into the catchment, but moved them around depending on where the priorities were at different times. Many of these workers commuted from outside the catchment, especially coastal areas. A major challenge for the Namoi's planners was to entice mining workers to live in the catchment.

The Namoi led the nation in developing new educational curricula to suit mobile populations, which established emotional links between young people and the catchment that resulted in a proportion returning to live there in the future. Similarly, hospitals and other welfare services developed new governance structures to deal with fluctuating demand. These processes were driven largely by the coalition of governing bodies, industry leaders and non-government organisations, drawing on what investment they could attract from mining companies and government. As time went by, mining companies invested more in social infrastructure as they realised this was necessary to attract and maintain a sufficient workforce.

Box 12 Avoiding an infrastructure nightmare

The Namoi's leaders (governing agencies, business and NGOs working cooperatively) moved quickly in the early 2010's to establish cooperative agreements with big industries that they could see would grow wealthy on the scramble for coal and gas in the coming decade. This was a difficult process as there was little pressure on mining companies to do anything other than meet the nation's energy needs, but had this strategic move not been made, it is likely that governments, stretched to the limit dealing with the challenge of energy shortages, would have made some investments in infrastructure like roads and rail to allow economic growth to proceed but would have dealt with education, health and welfare services in an ad hoc way due to the large uncertainties created by the volatile global social, economic and climatic environments.

The reality of energy shortages meant that Australians, like others in the World, learned to live with less energy and less water. The years 2010-2020 were painful for many due to the disorderly transition to this new lifestyle. The chaotic impacts of energy shortages on city life meant that many previous city-dwellers opted to move to regional areas in the 2020s. The Namoi was a good choice based on location and climate, but the numbers of new residents was limited because, despite the best efforts of the Namoi's leaders, road, education, health, welfare and communication infrastructure were less than world-class.

The challenge of competing with mining and urban development for water, as well as the sporadic but large opportunities to access Asian markets, made agriculture innovative in finding efficient ways to produce more on less land with less water.

12.3.6 The challenges for small businesses

Small businesses in the Namoi faced major challenges because of the disorderly boom in mining, which impacted on the already struggling agricultural industry.

Although climate change was not as bad as expected, water availability remained a major issue for agriculture. This was made worse by increasing demands for water by mining. Small businesses servicing the agriculture industry and its people had to develop strategies to deal with the fact that some farming families left the land during the 2010s but many more became very cautious with their spending due to the uncertainties they faced. For associated small businesses, this initially meant a declining and unpredictable customer base. Increasingly, it meant a change in strategies for dealing with larger businesses as farm amalgamations and take-overs by large enterprises proceeded. Many small businesses became captive suppliers to larger enterprises.

Climate variability was not as large as had been feared. For much of the 2010s businesses in the Namoi had to deal with drought and occasional flooding rains and their chaotic impacts on agricultural enterprises. Periodic surges in demand from overseas food markets also meant that agricultural businesses had to find ways to be able to anticipate these surges (through sophisticated market research and watching for signs of coming surges) and through streamlined procedures for obtaining credit and implementing new business models. Small businesses sprung up to service this need but only the best survived.

The coal and gas booms presented different challenges for small businesses. Populations of major and minor urban centres rose and fell as new mines were established and workers were moved around the catchment to meet demand. In the early 2010s, building companies struggled to keep pace with demand and speculation was rife as investors tried to predict when and where demand would peak. The disorderly nature of the boom made it hard for planners to meet accommodation demand while also avoiding problems with water supply and other infrastructure. The uncertainty prevented many workers from moving their families to the Namoi, so they commuted from outside, placing large and unmanageable demands on temporary accommodation and increasing costs for local services that were not fully recovered through rents and rates.

Small businesses servicing mining companies and their workers took high risks to capitalise on the boom, providing employment opportunities and bringing new and ambitious young people into the catchment. However, many of these businesses failed and the turnover of new residents was high, preventing many of them from putting down roots in the catchment.

The business-agency-NGO governance coalition worked hard to develop ways to retain some of the new talent coming to the catchment, through flexible and innovative housing, education and healthcare options, but this was a constant challenge without coordinated and strategic approaches from governments to support regional Australia.

12.3.7 Technology at the heart of many tensions

Times of tension and crisis usually encourage innovation. The 2010s in the Namoi were no exception. With nations around the World focussing strongly on national self-interest and rushing to secure energy and water supplies, this attitude was at risk of permeating Australian society as well. For a while it looked like the Namoi and other catchments would degenerate into the sort of winner-take-all cultures of early Victoria, California and Alaska.

The intercession of the industry-agency-NGO coalition across the Namoi and surrounding regions, however, managed to curb the worst of these potentially disastrous social trends, and achieve a degree of investment in technological innovation that might otherwise have taken another decade or more to eventuate.

Initially, governments allowed coal and gas miners to proceed without waiting for clean coal technology. The need to secure Australia's economic future was too great for governments to stand their ground on emission control policies. Low levels of public concern about climate change meant that progress towards clean coal and other emission-reduction technologies was slow. Constant effort was required by environment groups to keep these issues on local, regional and national agendas. The Namoi's leaders were powerless to influence national emissions policies, so they put their efforts into negotiating investment by mining companies in carbon-sequestration through tree planting in the catchment. This reignited concerns about water availability, which were allayed by the investment by mining companies in water-saving technologies, which they recognised was necessary to minimise conflict with other industries. In general the Namoi's residents were supportive of tree planting to balance the negative visual impacts of mining. It gave them comfort to know that environmental objectives were also being achieved, so long as they did not suffer higher costs or reduction in quality of life as a result.

Technology was at the heart of many tensions in the catchment for much of the 2010s, despite good will on all sides. Pressures from international energy

markets caused coal and gas mining to grow in what appeared to be chaotic and uncontrolled ways. China's demand for coal grew steadily and it relaxed its earlier focus on clean technologies as many other countries were doing the same. The result was that clean technologies only started to emerge and be implemented in the late 2020s as global concern about water availability was rising to levels that equalled concern about energy supplies. A major factor in this rising concern was the realisation that technologies for efficient use of water often required energy and that dealing with the two threats in an uncoordinated way was making both problems worse.

Efforts were made by the inter-regional agency-industry-NGO coalition to get investment from booming mining industries in education and research in the Namoi and surrounding regions. Only limited investment was secured both because of the low levels of public pressure on mining companies and because the mining companies saw themselves as having a restricted lifetime of 10-30 years in the regions.

12.3.8 The social scene

The growing and churning population of many parts of the Namoi created social tensions. Long-term residents resented the lack of commitment and loyalty to the Namoi shown by new workers, many of whom only resided in the catchment during the week.

Although mining companies contributed funds to support health, education and welfare infrastructure in the catchment, the prevailing culture became one of "everyone for themselves". Disadvantaged groups were neglected by the bulk of the population and found themselves feeling alienated. Crime rates and homelessness rose in some parts of the catchment.

The strong focus on the energy created by the modern world led to neglect of the values and historical significance of Indigenous people and early European settlers.

One up-side of this process was that it drew attention to the plight of disadvantaged groups and to unmet needs of all of the Namoi's residents. The catchment's leaders recognised that simply providing money for those who had little was not sufficient and that a sense of purpose and attachment to place was required. It soon became apparent that this was needed by all of the Namoi's residents, who needed to feel that their catchment was progressive and cultured rather than simply a place to generate energy and money. Without the programs developed to address these issues, the catchment could have declined into a social disaster area.

Box 13 Shocks and surprises

This scenario, as written, is economically optimistic. It is, however, vulnerable to a wide range of potential shocks and surprises, including:

- The global scramble for energy resources could see an escalation of national self-interest to the point of major aggression between countries.
- The fact that climate change has not been as bad as expected removes one major reason why nations might need to cooperate - it could also allow climate change (which would still be proceeding even though it is slower than expected) to grow out of hand and become an even larger problem than it was expected to be.
- There is the potential for major technological breakthroughs in mining technologies and water-saving technologies but there is also the potential for very slow progress on emissions reduction or alternative energy technologies.
- This scenario could be the worst in terms of social welfare, since wealthy individuals and nations are worried about losing their lifestyles and they no longer think they need to compromise to deal with climate change. There is high potential for disadvantaged groups in society to be forgotten, not just because the wealthy don't care but because decisions are being made in ad hoc, reactive ways so welfare issues will usually be patch-ups rather than long-term solutions.
- The World in this scenario is particularly vulnerable to the spread of pests and diseases of agriculture and to global or regional pandemics of organisms like influenza, bird flu or SARS, which require rapid and efficient global and local cooperative action if they are to be contained.

12.4 Scenario 3 - Warm complacency

3	With effective governance (and strong regional influence)
 <p>Orderly energy transition</p>  <p>Low warming</p>	<p>As climate change doesn't seem to be rushing upon us, public support for carbon pollution reduction is only moderate, so the scheme is introduced slowly and with major softening to avoid economic impacts.</p> <p>There is nevertheless growing interest in gas and coal and these industries grow in the Namoi. There is slower growth in renewables as those holding land still find agriculture profitable. The growth of energy and food markets in Asia leads to a booming economy in the Namoi and a growth in population.</p> <p>It is harder for the Namoi to have influence in this scenario as governments are not facing crises and so they don't need support from regions. Influence would need to be fought for - for example by organising cross-region cooperative actions the get governments to plan strategically for inevitable cycles in weather and markets.</p>
<p>Competition for water between agriculture, mining and towns is an important issue but not as strong as it would have been if climate change was faster. Cooperation both within the Namoi and with other regions means that water-sharing plans are developed and implemented, although there is little urgency for these.</p> <p>Population grows slowly as agriculture stabilises, mining grows and modest numbers of people come to the catchment for lifestyle reasons.</p>	
With ineffective governance (and weak regional influence)	
<p>It is harder for the Namoi to have influence as governments are not facing crises and they don't need support from regions. The Namoi does not fight for influence, so it is driven by the agendas of others.</p> <p>A mood of complacency spreads through the catchment as concerns about climate change have not been realised and people expect "business as usual". But the climate is still getting drier and more variable and mining will grow and affect life in the catchment. Residents they miss the chance to influence that growth.</p> <p>Innovative schemes allowing farmers to make money from wind and solar energy generation go elsewhere. The Namoi misses opportunities to negotiate favourable "licences to operate" with mining companies. As a result, economic returns to the local economy are low and environmental controls over mining development are weakened.</p> <p>Ineffective leadership means that opportunities for marketing the Namoi to overseas food markets are missed, and competition for water between agriculture, mining and towns is not managed well.</p> <p>Population declines as the Namoi is not seen as progressive, agriculture employs fewer people and miners commute from more desirable home bases. The catchment is vulnerable to future shocks.</p>	

12.4.1 Phew! Complacency rules

The worst fears about shortages of oil, brought on by the 2008 oil price spike, were not realised. The rise in 2008 was a temporary jump and the real peak in oil availability was still 15 years away. This gave the World's governments and companies the time to approach regulation of carbon emissions into the atmosphere with cool heads.

Even better, climate change slowed down. In 2008 it appeared to be heading towards the worst forecasts considered by the IPCC in 2007 but by 2010 it had moved back to follow the average IPCC trajectory and it stayed on that trajectory through to 2030, with a few minor deviations along the way. This meant that things got a bit drier and a bit hotter on average, and a bit more variable, but not as much as had been feared.

Government, businesses and the public breathed a sigh of relief.

Oil prices settled after the rapid rise in the middle of 2008. Pressure was put on OPEC to report oil reserves more transparently and this was done because most OPEC countries had invested heavily in the US economy and did not want it to collapse. The new reporting exposed that reserves were lower than previously revealed but still sufficient to meet demands for a decade or more. In addition, several new oil fields were found in the Arctic region that extended oil supplies for a further 5-10 years. Hopes ran high that this would see the World through until unconventional sources of oil, like coal liquification and extraction from oil shales, could be made economical.

Although some unrest continued in the Middle East, tensions between Russia and its oil-rich neighbours occasionally flared up, and the USA and Venezuela continued to have their differences over oil, the new attitude of the USA of rebuilding trust and respect with the rest of the World eased global conflict considerably.

All major industrialised countries moved to reduce their reliance on oil from other countries. Those that had fields within their jurisdiction maximised extraction while developing reserves of coal, gas, and biofuels and encouraging wind, solar and hydro-electric energy generation. Nuclear power was considered by many countries but serious development did not occur until the early 2020s and then in relatively few countries who could guarantee security and safe disposal of waste. Although this transition caused some dampening of the economies of many industrialised countries, it was tolerated as neither the public nor corporations wanted to return to the politically, socially and economically uncertain times of the early 2000s that were partly a result of an over-reliance on oil.

Australia introduced a watered down carbon pollution reduction scheme, with low emission reduction targets, in 2010 fearing the consequences of being an early mover. As fears of climate change gradually faded, public pressure for reduction of carbon emissions also declined. Voters were happy to hear that a scheme was in place even if, as claimed by many environmental groups and scientists, the reduction targets were too low to avoid major disasters later in the century. The momentum of public concern worldwide in the late 2000s pushed industrialised nations to continue post-Kyoto negotiations into the 2010s. Industrialised nations were reluctant to agree to targets that would dampen economic growth or curb lifestyles in their countries. Kyoto 2 was finally signed in 2014. Industrialised nations agreed to increased investment in emissions-reduction technologies, to be shared with developing nations, and gradual reduction of emissions at the same rate as the new technologies came on line. Developing nations agreed to some reductions in emissions, aided by transfer of new technologies as they became available and to limited financial investments from industrialised countries to compensate for lost production opportunities.

Agreements were developed to quarantine the use of oil and gasoline for aircraft and other transportation that could not be run on alternative fuels. Reliance on coal and gas increased initially to offset reduced use of oil, but this was accompanied by massive international investment in clean-energy technologies.

Government and businesses were faced with a quandary. They saw the need to reduce reliance on oil and gradually move away from fossil fuels. They also realised that climate change was still a major threat even though it was not as fast as first feared. Investors, however, still expected high returns and the public were not prepared to pay, directly or indirectly, for energy transitions or emissions reduction.

The absence of an obvious crisis made reform in energy and climate policy difficult and the few business heads who sought to provide leadership for the rest of society found themselves without strong public or private support. Complacency ruled!

12.4.2 Leadership against the flow

While 2008 saw bipartisan political agreement that actions to address carbon emissions were needed, this weakened as public concern about climate change declined. Opposition parties found it easy to question the wisdom of large investments in emissions control or overly tough targets that might dampen economic growth. Whichever party was in power in the 2010s saw the wisdom of lessening Australia's dependence on fossil fuels but they did it slowly and steadily while avoiding any hint that power supplies might be limited or that economic growth might falter.

Industries recognised that peak oil was approaching and that efficiencies had to be gained. This drove improvements in carbon-emission control, but not enough to prevent the rate of climate change from building up slowly through the 2010s and early 2020s.

Water reform proceeded very slowly as governments focussed more on energy transitions. Major advances were made in the late 2000s as the government bought back large amounts of water to return water to the environment in the Murray Darling Basin, but this sort of expenditure was not sustainable once public concern about climate change began to decline and concern about energy rose. In the Namoi, uncompleted water-sharing agreements, such as the Peel River system, took another decade to reach agreement, and only then due to the activities of a group of visionary thinkers and doers in the Namoi and surrounding regions.

Box 14 Leadership against the odds

In each of these scenarios, we have assumed, optimistically, that effective leadership emerges, and we have explored how that leadership might have come about and what challenges it might have faced. In this scenario, emergence of visionary leadership is more difficult to imagine than in any of the other scenarios because there are no major disasters to galvanise public opinion and people are inclined to not want change. The major challenges for visionary thinkers, therefore, are to be heard and to convince people that action is needed on water, energy, other environmental issues, and social issues because potentially undesirable change is likely occur "under the radar" if no-one is watching for it and preparing for it. Examples of the sort of undesirable change that could occur (and have occurred in other societies that were not watching or caring) include:

- gradual decline in the lifestyles of most residence with disadvantaged groups being more seriously affected;
- uncoordinated growth of water use by mining, agriculture, other industries and urban growth because there is a belief that there will be enough water to go around;
- gradual growth of resource use beyond supply (for example, failure to address water supply needs for Tamworth only to find that a dry spell leaves the town with insufficient water for anything other than essential services)⁹⁷;
- decline of native vegetation systems beyond the point of recovery, which then triggers declines in a range of ecosystem services that support both the economy and people's well being.

Leaders from the Namoi and surrounding regions met in the late 2000s to consider how they might cooperate to influence the direction and detail of energy and water policy coming from governments. They identified several key priorities for this cooperative influence (Box 16).

They recognised that the Australian and State governments were receptive to well thought out and broadly supported plans from regions for dealing with energy, water, population and welfare issues. But they also realised that they would be ineffective if they could not talk as one voice and that they faced a big challenge getting public support as people's levels of concern about the

future declined. Their immediate focus was on completion of water sharing plans, seeking integrated development of mining, agriculture, other industries and urban expansion at a regional scale, addressing the declining welfare of disadvantaged groups in the region, and seeking upgrading of communication, transport, education, and health infrastructure.

The challenge was huge as it required a change in thinking from a narrow focus on individual issues like mining and water to a broader commitment to integrated thinking and planning across all natural resources. Such a change in thinking could not be achieved quickly in the climate of complacency that prevailed, but it was possible to gradually change people's behaviour through subtle policy changes. The inter-regional leaders group coopted all the visionary thinkers and movers and shakers they could and developed a sophisticated plan to present governments with well thought-out, policy savvy, plans that both supported the objectives of central governments and prepared regions for the sorts of slowly emerging challenges that could emerge as major issues in the not too distant future.

For their part, governments realised that taking a strategic approach to addressing climate change required strategic use of the human and other resources available in regional Australia and encouraging industries in their reformation of business ethics and operating philosophies. Governments had, however, long been nervous about the variable capacity and skill base across regional Australia and the tyranny of inter-regional fragmentation of effort. They welcomed the initiative by the Namoi and surrounding regions but took some convincing that they had firm backing from the broader community.

12.4.3 Strategic management of water scarcity

People's concern about climate change declined in the early 2010s because rains fell and scientists reported that rates of global warming were not as high as had been feared. But the Namoi still faced a climate like that it experienced in the later 1990s and early 2000s. Thus, it was still very possible to get a string of dry years long enough to severely reduce irrigation and town water storages to levels that curtailed normal operating and services. The late 2010s saw such a dry run that caught many in the Namoi unprepared. Although mining had developed in an orderly way and its water use was nominally integrated with that of agriculture, there had been little urgency in developing detailed plans and urban development was only partly considered. As growing use of water by mining came together with increasing demand for water from agriculture as it strove to take advantage of market opportunities in Asia and urban expansion around major centres the dry spell saw water levels in the catchment's dams drop and towns had to impose severe restrictions on water use while mining and agriculture were drawn into a bitter fight over who should get priority for available water.

The inter-regional leaders group had some success in getting mining, agriculture, other industries and urban development to cooperate to use available water as efficiently as possible, but they had a constant battle as the trust, familiarity and processes for reaching consensus had not been well developed over the past decade.

The milder than expected climate change meant that small to medium agricultural enterprises survived better than had been feared. Farm amalgamation continued, however, at a faster rate than in the 1990's and early 2000s, as corporations saw profits to be made from agriculture through economies of scale and lack of support for the inter-regional leaders group limited their ability to influence agricultural development strategically.

While the Namoi was, on paper, an attractive place to live because of the orderly expansion of the mining economy and the favourable climate, the lack of urgency among the locals to promote the region limited the recruitment of new residents. The Namoi's leaders did their best to encourage good health, education, transport and communication infrastructure, but progress was limited by lack of inclination of governments to invest because the co-contributions from Namoi communities were inadequate.

12.4.4 Benign neglect of the environment

The cool-headed approach of government energy generation opened windows of opportunity for regions to propose strategic approaches to other issues, such as maintenance of biodiversity and ecosystem services other than carbon sequestration or hydrological regulation. The inter-regional leaders group encouraged the Namoi's communities to take this opportunity but most people were exhausted from the long and worrying debates about the economy and the environment in the 1990s and 2000s. They readily believed that the better than expected climate outcome means they could stop worrying and reforming for a while. The inter-regional leaders proposed integrated programs to manage the full range of natural resources, but it was difficult to enlist enough local support, so these plans had to be scaled down.

Farmer's groups worked closely with environmental groups to establish policies and programs that enabled farmers to receive payment for contributions to the social and economic good of Australians above and beyond the private gain that farmers receive from their land management. Australia proceeded slowly with such schemes, waiting for signs that other countries were developing them. Payments for ecosystem services became a small addition to the income of some farms, but in many cases it was more effort to get involved than it was worth and pressure to be seen to be "green" was no longer as strong as it had been.

12.4.5 Population and infrastructure

By 2020 the coal and gas industries had grown in the Namoi to around 150% of their size in 2000. Alternative energy industries had grown in other parts of Australia but few landowners in the Namoi showed enthusiasm to take up government incentives so the large scale solar and wind generation schemes went to other regions. As the 2020s dawned, many realised that they had missed important opportunities to diversity their income base.

Several urban centres in the Namoi had seen moderate population growth due to expansion of mining, but generally the catchment's population was fairly stable as young people left for more challenging opportunities in cities and few innovative schemes were developed to attract them back. The demand for labour in agriculture waxed and waned in minor ways with climate variations. Many mining workers commuted from outside the catchment, especially coastal areas, as there was little to attract them to move their families to the Namoi. Temporary migration schemes were used to fill labour gaps as these were effective short-term fixes when longer term planning to address the issues was not happening.

The mood of complacency permeated all aspects of the catchment. Education remained largely unchanged and failed to offer new approaches to suit potential migrants to the area. Disadvantaged groups were largely forgotten as the Namoi's residents spent the 2010s unwinding from the tension-filled 1990s and 2000s.

12.4.6 The challenge for small businesses

The environment for small business was relatively stable throughout the 2010s. The economy was solid, based on an expanding mining industry and an agricultural sector that, overall, was holding its own. It was not a dynamic environment requiring innovation among small businesses. Few new business people were attracted to the catchment so there was relatively little creative friction and competition. The dry spell of the later 2010's causes some slumps for some businesses, but nothing like the impacts that a less orderly energy transition or high climate warming might have caused.

Many small businesses failed during this period, however, due to complacency and failure to develop succession plans.

The Namoi's leaders developed various approaches to encourage small businesses to prepare for what they saw as inevitable downturns in the future, increased corporatisation of agriculture and other industries, and the possibility that rates of climate change would again rise. They had little success in the 2010s as business was satisfied with the status quo.

12.4.7 Technology

Times of tension and crisis usually encourage innovation. The 2010s in the Namoi were the opposite. For much of this decade, mining and agriculture got by on available water with relatively minor investments in water-saving technologies. Government policy encouraged the mining industry to reduce emissions. Companies produced 15 year plans to develop and implement clean energy technologies and this was 'good enough' given that climate change appeared to be less harmful than expected.

The inter-regional leaders group secured major investment by governments and industry in research and tertiary education institutions in the Namoi and surrounding regions to advance research on efficient water use in drier and more variable climates. However, community backing was judged to be greater in other regions and investments went there.

12.4.8 What, some people are disadvantaged?

The Namoi's people had been anticipating hard times and talking about the plight of disadvantaged groups in the catchment's communities for some years. Now that times did seem to be as bad as expected, most people drew a huge sigh of relief and felt thankful that good times were back. Everywhere they looked, they saw signs that people were happier and prospering, which reinforced their thinking that things were improving. They overlooked the continuing signs that some groups in the Namoi's communities were doing it tough and were not getting opportunities to do anything about it. In fact, while many saw stable incomes and employment during the 2010s, others saw a constant lack of employment opportunities, very slow progress on health, welfare and other infrastructures, and lack of availability of housing as mining workers took most available houses at premium prices and building of new houses was barely enough to keep pace with the mining expansion.

12.4.9 The turbulent twenties

By the early 2020s, what had been looking like an ideal scenario for the Namoi was losing its gloss. The lack of major challenges to bring communities together (the welfare challenge had been real but largely invisible) had meant that networks, trust and understanding of diverse viewpoints had declined. Agricultural enterprises and small businesses had been through a major dry spell and met some opportunities to service temporary booms in overseas markets, but overall times had been pretty stable and their spare capacity to deal with major shocks was low.

The mid 2020s saw a combination of shocks that hit the Namoi hard. The Chinese economy slowed for a few years before recovering, their economic

slump reduced their purchasing power. The Chinese had been focussing more and more attention on establishing markets in eastern Europe. At the same time that they were withdrawing some of their custom from Australia as their market focus changed. Another dry spell hit eastern Australia, lasting for 7 years. The Australian government had negotiated a deal with Pacific nations for large numbers of workers to come to Australia to fill labour shortages in regional areas and many had settled in the Namoi immediately prior to the downturn. Now tensions rose as people took out their frustrations on one another. To complete the "perfect storm", crops failed in several Asian countries and producers in the Namoi struggled to meet the demand. The inter-regional leader's group tried to get land-owners to work together to share resources, but this was not something they had been used to and negotiations were too slow to meet deadlines. Nevertheless, over the period 2025-2030 the Namoi's communities learned a lot about themselves and the way they needed to reorganise to face the future. They entered 2030 with confidence that they could take on the World. Some doubters suggested they had left it too late. Time will tell.

Box 15 Shocks and surprises

This scenario describes a benign economic and climatic Namoi. It would have been easy to write the scenario as a rosy one in which everyone capitalised on the orderly growth of mining and the less extreme climate change than expected. However, we considered that such a scenario would not enable us to learn lessons. Nor would it have been consistent with the optimistic views of the others scenarios, each of which contained major challenges that galvanised people into action. If it is true that challenges generate innovation and novel responses, then it also a risk that a future in which everything seems better than we feared could generate complacency. This is what we have portrayed in Scenario 4, even when governance and influence are as effective as can be expected.

This scenario could have been far worse, however. We have included some shocks in the 2020s to explore how a decade and a half of easy progress might weaken a region's resilience. It looks like the Namoi's communities survive those shocks (although there is some doubt). This can be attributed to the efforts of visionary thinkers and doers who kept pushing for integrated approaches to resource use. Without those efforts we might have seen the Namoi degenerate quickly into a collection of self-interested individual enterprises, ripe for taking over by major corporations, and the spirit and sense of community of the catchment could have all but disappeared. Under those circumstances, even minor environmental, social or economic shocks could have devastating impacts on the catchment.

12.5 Scenario 4 - Hot weather, cool heads

4	With effective governance (and strong regional influence)
 <p>Orderly energy transition</p>  <p>High warming</p>	<p>The drying and increased variability of the climate results in strong public support for emissions reduction. The government proceeds with emission control programs and also puts major investments into development of clean coal and renewables technology. Oil prices stabilise. Interest in coal and gas rises. Investment in wind and solar energy increases and many land owners look to supplement farm income as energy generators.</p> <p>The Namoi's influence allows it to negotiate favourable licences-to-operate with mining companies that result in greater local investment. Mining continues to grow but with strict environmental controls. Mining companies diversify their interest and portfolios, some to become energy producers. Agriculture struggles with less water and higher uncertainty. Early investment in water-saving technologies and crop breeding programs coupled with the collapse of several overseas food-growing areas means the industry does reasonably well.</p> <p>Competition for water between agriculture, mining and towns is strong; so too is cooperation both within the Namoi and with other regions. Effective water-sharing plans are developed and implemented.</p> <p>Population grows slowly and demographics change considerably. As some people leave agriculture and the catchment, others come and go as the fortunes of agriculture wax and wane, and new workers move to the catchment to work in mining.</p>
	With ineffective governance (and weak regional influence)
	<p>The Namoi's influence is low due to ineffective leadership, lack of vision, lack of cooperation across regions, and lack of government policies favouring inclusion of regions in decision-making.</p> <p>Innovative schemes allowing farmers to make money from wind and solar energy generation develop rapidly elsewhere. The Namoi misses opportunities to negotiate favourable "licences to operate" with mining companies. As a result, economic returns to the local economy are low and environmental controls over mining development are weakened.</p> <p>Ineffective leadership means that research centres for water-saving technologies and breeding programs are based less in the Namoi than in the past, opportunities for marketing the Namoi to overseas food markets are missed, and competition for water between agriculture, mining and towns is not smoothly managed.</p> <p>Population declines as the Namoi is not seen as a progressive place to live, agriculture employs fewer people and miners commute from more desirable home bases.</p>

12.5.1 A cool approach to warming

The worst fears about shortages of oil, brought on by the 2008 oil price spike, were not realised. The rise in 2008 was a temporary jump and the real peak in oil availability was still 15 years away. This gave the World's governments and companies the time to approach regulation of carbon emissions into the atmosphere with cool heads.

They could not relax too much, however, because climate change kept tracking the worst-case scenarios contemplated by the IPCC in 2007. As weather became noticeably more variable and severe weather events occurred more and more often, public concern about carbon pollution was driven to new heights. Australia was no exception, with many areas facing extended dry spells interspersed with flooding rains that eroded topsoil and damaged infrastructure.

Oil prices settled after the rapid rise in the middle of 2008. Pressure was put on OPEC to report oil reserves more transparently. OPEC complied because most of its members had invested heavily in the US, Chinese and Indian economies and did not want them to collapse and because they still needed to trade oil for food internationally. The new reporting revealed that reserves were lower than previously revealed but still sufficient to meet demands for a decade or more. In addition, several new oil fields were found Arctic that extended oil supplies for a further 5-10 years. Hopes ran high that this would see the World through until unconventional sources of oil, like coal liquification and extraction from oil shales, could be made economical.

Although unrest continued in the Middle East, tensions between Russia and its oil-rich neighbours occasionally flared up, and the USA and Venezuela continued to have their differences over oil, the new attitude of the USA of rebuilding trust and respect with the rest of the World eased global conflict considerably.

All major industrialised countries moved to reduce their reliance on oil from other countries. Those that had fields within their jurisdiction maximised extraction while developing reserves of coal, gas, and biofuels and encouraging wind, solar and hydro-electric energy generation. Nuclear power was considered by many countries but serious development did not occur until the early 2020s and then in relatively few countries who could guarantee security and safe disposal of waste. Although this transition caused some dampening of the economies of many industrialised countries, it was tolerated as neither the public nor corporations wanted to return to the politically, socially and economically uncertain times of the early 2000s that were partly a result of an over-reliance on oil.

Australia introduced a watered down carbon pollution reduction scheme, with low emission reduction targets, in 2010 amid fears of the consequences of being an early mover. As fears of climate change grew globally, however, international cooperation on emissions reduction grew. Agreements were developed to not only roll back carbon emissions gradually between 2012 and 2020 but also to quarantine the use of oil and gasoline for aircraft and other transportation that could not be run on alternative fuels. Reliance on coal and gas increased initially to offset reduced use of oil, but this was accompanied by massive investment in clean-energy technologies by joint-ventures across nations.

Despite some heated debates during 2008-2012, post-Kyoto agreements were developed that initially set carbon emission targets on a country by country basis, with wealth transfer from wealthy countries to poorer countries to compensate for the implicit limits imposed on their industrial development. By the late 2010s, per capita carbon emissions targets were set, although these were phased in so that industrialised countries were not expected to converge on the same targets as developing countries until 2030.

Although all countries still aimed for continuous economic growth, the fear of climate change and the dangers of seeking high economic returns at all costs, exposed by the mortgage market crisis in the USA in 2007-2009, meant that shareholders were prepared to accept lower growth in return for greater security and economic stability and lower environmental impact. The aging of many nations' populations also contributed to lowering of consumption simply because older people tend to live lower-consumption lifestyles than young people.

12.5.2 A time for leaders to shine

The growing climate crisis generated strong bipartisan political agreement that actions to address carbon emissions were needed urgently. Industry resisted initially, forcing governments around the world (including the Australian government) to set low targets. The outcry by environmental groups, scientists and the public, as well as rethinking by industries about the risks they faced if climate change was not ameliorated, led to an industry-led increase in carbon emission reduction targets during 2012-2018. Once this process started, competition between companies for access to markets drove ever-increasing efficiency of fossil fuel use and increasing use of renewable energy where possible.

Water reform accelerated as concerns about water availability in the decade 2010-2020 grew by the month. Uncompleted water-sharing agreements, such as the Peel in the Namoi, were fast-tracked and special attention was given to sharing of water between the increasingly important coal mining and gas industries, renewable energy and biofuels industries and production of food,

fiber and other agricultural commodities. This required a broader commitment to integrated thinking and planning across all natural resources rather than just water and associated resources. It also required careful consideration of human needs and the potential to either improve the ability to meet those needs by increasing efficiency of use of natural resources and/or moderation of those needs through alteration of lifestyles.

Box 16 Key challenges for leadership

The key challenges for the Namoi's leadership in this scenario are:

- restoring faith in government
- gaining a seat at the policy table to ensure that carbon emission reduction schemes are implemented to the benefit of all Australians;
- helping keep agriculture afloat so it can take the opportunities opening up as overseas food markets stagger; and
- ensuring that the orderly policy transitions that are made consider social welfare issues for regional Australians

Leaders from the Namoi and surrounding regions met in the late 2000s to consider how they might cooperate to influence the direction and detail of energy and water policy coming from governments. They identified several key priorities for this cooperative influence (Box 16).

Firstly, based on past experience, it was thought that refinement and implementation of carbon emission reduction policies could fail to consider the particular needs of regional Australia and, therefore, could either be inequitable or fail to make most efficient use of the human and other resources available in the regions.

Secondly, while accepting the need to change farming practices to suit the changing climate, the regional leaders recognised that opportunities of potentially great political and economic value to Australia would open up from time to time as other more populous nations struggled to cope with climate change and that a coordinated effort both among regions and between regions and governments would be needed to help agriculture adapt to an overall drier but much more variable climate.

Thirdly, while governments globally and nationally were acting cooperatively and focussing on human-welfare, the regions saw an opportunity to lobby for social welfare and social responsibility considerations to be built into policies for reforming industry operations, especially in both regional and urban Australia. While industries were initially wary of such suggestions, they realised that they were in the interests of smooth operation, especially in regional Australia. They were also consistent with trends in thinking among industries in the aftermath of the high profile industry collapses of the 1990s

and 2000s, which had eroded trust in both corporations themselves and the economic system more broadly.

For their part, governments realised that taking a strategic approach to addressing climate change required strategic use of the human and other resources available in regional Australia and encouraging industries in their reformation of business ethics and operating philosophies. Governments had, however, long been nervous about the variable capacity and skill base across regional Australia and the tyranny of inter-regional fragmentation of effort. They welcomed the initiative by the Namoi and surrounding regions once they saw that it was carefully thought through and was based on genuine commitments to cooperation and monitorable action.

Box 17 What if the regional leaders had not acted?

This scenario assumes that Australian governments take an orderly, and strategic, approach to energy and climate change challenges. Thus, they would be expected to look to regional leaders to show leadership and support national plans. However, history shows that it is difficult for central governments to fully recognise and understand the human and other resources available in regional areas, or to appreciate the particular needs of regional Australians. Being active and working in cooperation across regions is a powerful way to influence policy development by governments. If it had not been done, it is likely that water and energy policies would have been implemented in ways that did not suit many regional communities. Furthermore, it is likely that local administrators would have had to deal with less efficient and effective implementation procedures. Above all, the degree of authority of regions to direct their own futures, and the confidence of governments to give that authority, would likely have been much lower.

12.5.3 Strategic management of water scarcity

By 2015 water was of major concern in the Namoi. In parts of Australia, agriculture had all but disappeared. The strong and strategic leadership in the Namoi and surrounding regions had meant that the best was made of a bad climate situation. Mining, agriculture, other industries and urban development cooperated to use available water as efficiently as possible, allowing all to remain profitable in the long term, although there were still short term ups and downs due to variability in rainfall and markets.

Farm amalgamation increased during 2010-2020 but at the same time the emerging sense of importance of regional Australia was attracting young people seeking challenges and fulfilment back to run family farms. Strategic investment in communication and other infrastructure was making it possible for them to engage in other employment off-farm and to even commute frequently to cities to attend the business interests there. This new breed of farmers managed the fluctuating challenges and opportunities of farming by adopting a portfolio approach to work. They turned the propensity of their

generations to have multiple careers in a lifetime into a lifestyle of having several careers simultaneously.

Farm labour was a critical issue but technological developments coupled with strategic management of energy supplies to keep costs affordable and emissions low meant that three new opportunities emerged.

Firstly, major schemes were developed to not only increase employment opportunities for Aboriginal Australians in agricultural industries but to encourage them to take leadership roles in redefining the nature of agricultural employment to make it more fulfilling to both Indigenous and non-Indigenous people who want to live close to the land.

Secondly, young professionals who normally worked in offices in cities or the region could take "sabbaticals" to run sophisticated machinery in an outdoor setting. This was encouraged as part of the government's strategic approach to keeping the nation's food industries alive, so these sabbaticals were seen as opportunities for career advancement through skill diversification. New National Service schemes offered to young people who were still thinking about their career paths allow them to test the waters.

Thirdly, the older age distribution of the population was turned into an asset as retired people took on temporary low-effort, high-technology jobs on highly mechanised farms as part of a mix of activities that fulfilled their desire to continue to contribute to Australia's future. Both of these strategies enabled land managers to cope with fluctuating demand for commodities and supplies of water.

Box 18 Labour is a critical issue for this scenario

This scenario is optimistic about strategic approaches to managing energy and water issues. These approaches could easily come unstuck if there is insufficient labour to keep farms and mining going together. Already the Namoi and many other regions are suffering from labour shortages, made more acute by the attractiveness of wages in the mining industry. This is likely to be a continued problem in this scenario even though mining is expanding in a more orderly way than in other scenarios. Farm amalgamation and domination by large, mechanised, enterprises is one way that labour shortages could be addressed. We have also tried to imagine ways in which smaller enterprises might survive, but more thinking and imagination is required to find solutions to this challenge.

All major urban centres had to live with water-use restrictions and major investments were made in water re-use technologies. Visionary water strategies (Box 19) enabled urban centres to maintain desirable living environments and attract temporary and permanent residents.

Box 19 A visionary water strategy

Moving quickly in the late 2000s and early 2010s, the inter-regional leaders group lobbied governments for support to fast-track all outstanding water-sharing plans and secure investments to improve the efficiency and strategic use of water in urban centres. In the Namoi the two major steps forward in the early 2010s were completion of a water sharing plan for the Peel sub-catchment (treating it as one water source rather than 3 and enabling users to draw from different parts of the systems at different times for different purposes) and for a water-reuse system for Tamworth and several other major centres. This was supported through grants from State and Australian governments. It enabled strategic planning for water across all uses in the catchment, almost certainly averting a major crisis that would have occurred in the mid 2010s if there had been no forward thinking about the interactions between the water demands of Tamworth, other regional centres, agriculture, mining and other industries.

12.5.4 The environment is front and centre

The cool-headed approach of government to dealing with climate change and energy generation allowed productive dialogue about strategic approaches to other issues, such as maintenance of biodiversity and ecosystem services other than carbon sequestration or hydrological regulation. Active influence by the inter-regional leaders group saw the development of integrated programs to manage the full range of natural resources. These plans included strategic tree planting to achieve desired balances between infiltration of water into soils and ground water, run-off into water ways, water purification, regulation of waterway flow, erosion control, maintenance of soil fertility, pollination of crops, shade for stock and protection of soils and buildings from wind, natural pest and disease control, maintenance of genetic diversity in native ecosystems, habitat connectivity at landscape scales, and maintenance of cultural, spiritual and recreational values of the region's landscapes.

Farmer's groups worked closely with environmental groups to establish policies and programs that enabled farmers to receive payment for contributions to the social and economic good of Australians above and beyond the private gain that farmers receive from their land management. This took considerable thinking and novel policy design, as such schemes had run into trouble in the past as they were either seen as payments for what farmers were expected to do as part of their duty of care to the land or were seen as subsidies to agriculture and therefore anti-competitive internationally. Australia developed world-leading approaches to separating public and private good outcomes from land management and this transformed the role of farmers into stewards of the land as well as business people. The spirit of international cooperation that was emerging in the face of the World's climate change threat meant that other countries watched Australia's process with great interest and helped and encouraged it rather than discouraging it. The lessons learned were rapidly taken up by other countries eager to maximise the impacts of public and private expenditure on environmental change that would benefit industries and voters alike.

12.5.5 Population and infrastructure

By 2020 the Namoi and surrounding regions had come to grips with the new climate regime. The coal and gas industries had grown since the early 2000s, but so had alternative energy industries. Landowners now made their living from a combination of crops, stock, energy generation and maintenance of ecosystem services.

Integration of alternative sources into the national mix was proceeding rapidly through new approaches to energy storage and distribution.

Urban centres in the Namoi had become used to fluctuating and churning populations. The demand for labour in agriculture waxed and waned with climate variations, but the new employment strategies saw highly motivated temporary and permanent residents joining local communities. Mining companies attracted new workers into the catchment, but moved them around depending on where the priorities were at different times. Many of these workers commuted from outside the catchment, especially coastal areas. A major challenge for the Namoi's planners was to entice mining workers to live in the catchment.

The Namoi led the nation in contributing ideas to State and Australian Governments about new approaches to education to suit mobile populations, which established emotional links between young people and the catchment that resulted in a proportion returning to live there in the future. Similarly, hospitals and other welfare services developed new governance structures to deal with fluctuating demand. All of this was possible due to strong cooperative agreements between the Namoi's governing bodies and industries, especially mining companies and associated businesses, that ensured strategic investments in local infrastructure.

Australians, like others in the World, went through an orderly transition to living with less energy and less water. The years 2010-2020 were uncomfortable for many but the cool-headed and cooperative approach taken by leaders at all levels of Australian society eased the discomfort considerably. Despite the hotter and drier climate of much of the Namoi compared with the past, a moderate number of previous city-dwellers opted to move there throughout the 2010's and 2020s due in part to the high investment by governments in communication, transport, education, health and welfare infrastructure in regional Australia as part of their strategies to make energy use more efficient, reduce reliance on fossil fuels, and take advantage of alternative energy generated in regions. But the main attraction was the developing image of the Namoi and surrounding regions as go-ahead, cooperative communities, an image fostered by the inter-regional leadership group and its increasing activities funded by local businesses and multi-national corporations that were diversifying their interests in these regions.

12.5.6 Challenges for small businesses

Small businesses in the Namoi faced challenges because of the impacts of climate variability on the economic fortunes of agriculture, but there were many opportunities associated with the orderly expansion of mining and the new employment strategies adopted to attract people to the Namoi and surrounding regions.

Small businesses servicing the agriculture industry and its people had to develop strategies to deal with the fact that many families left the land during the 2010s and a large proportion of agriculture moved from small to much larger enterprises. On the other hand, many smaller enterprises survived under new management, often staying within the same family. For associated small businesses, this meant that their customers changed in terms of who they were and what their requirements were, but the amount of business to be done remained high.

For much of the 2010s businesses in the Namoi had to deal with drought and occasional flooding rains and their chaotic impacts on agricultural enterprises. Periodic surges in demand from overseas food markets also meant that agricultural businesses had to find ways to be able to anticipate these surges (through sophisticated market research and watching for signs of coming surges) and through streamlined procedures for obtaining credit and implementing new business models. Small businesses sprung up to service this need but only the best survived.

The orderly approach to decreasing reliance on oil and then transitioning from cleaner coal and gas to a greater reliance on renewable energies meant that wealth remained high in the Namoi and small businesses had a stable base on which to build the less predictable parts of their services. The spirit of cooperation in the Namoi and surrounding regions saw major investments in helping small businesses to develop strategies for surviving in an increasingly globalised world in which the fortunes of almost any other nation could affect those of a small business in regional Australia.

It was recognised by the Namoi's leaders that small business would be the lifeblood of the catchment in the future, both because it could respond faster to changes in local circumstances and because it had a greater stake in local affairs. But small businesses could not absorb the sorts of market fluctuations that emerged in the late 2000s and reappeared periodically throughout the 2010s as the US economy re-stabilised and the economies of China, Russia, India and Brazil had increasing impacts on global markets. Thus, the inter-regional leaders group established a regional business development cooperative. Its aims were partly to foster investment in local projects and partly to help small businesses anticipate and, if necessary, weather market shocks.

The combination of good strategic planning for development of mining and a catchment and the region-wide approach to town planning meant that mining companies worked closely with planners to get the balance between temporary and permanent accommodation (e.g. guesthouses versus houses) right. It also meant that measures were put in place to encourage workers to reside with their families in the catchment. These measures included education, health, and travel options tailored to the needs of mining families.

12.5.7 Technology

Times of tension and crisis usually encourage innovation. The 2010s in the Namoi were no exception. The public demanded strong public investment in emission-reduction and water-saving technologies. Faced with policies emerging in most countries requiring emission reductions, businesses also innovated, bring clean coal technologies on line by the mid 2010s and diversifying into solar and wind energy generation and distribution technologies throughout the 2010s.

Together with the fast-tracking of water-saving technologies for urban centres, the intercession of the inter-regional leaders group secured major investment by governments and industry in research and tertiary education institutions in the Namoi and surrounding regions to advance research on efficient water use in drier and more variables climates.

12.5.8 No-one is left behind

The Namoi's people had been anticipating hard times and talking about the plight of disadvantaged groups in the catchment's communities for some years. They were ready to act quickly as the 2010s unrolled. With the help of the inter-regional leaders group and supported by the Australian Government's strategic approach to dealing with energy and climate change issues, proposals were laid out for innovation in employment processes and assistance for people who fell victim of the uncertain times. These plans were integrated with industry development plans and environmental management plans so that businesses and government knew that investments in the region achieved balanced social, economic and environmental outcomes.

Box 20 Shocks and surprises

This scenario, as written, is very optimistic. It assumes that, with luck and good leadership, some of the best outcomes for the Namoi could come when people are forced to rally together to meet major challenges. Without that luck and good leadership, these challenges could see the region collapse into one of the other scenarios in which energy and climate change issue are dealt with in disorderly ways. Even with luck and good leadership, this scenario might have to deal with a range of potential shocks and surprises, including:

- Even with global commitment to addressing carbon emissions, negotiations could take too long and an even more rapid climate change scenario could emerge.
- Alternatively, the Australian government could be bolder than expected and impose higher emission-reduction targets from 2010, causing some economic instability for at least a few years while the rest of the world catches up. If this became too disruptive than we would move into one of the disorderly scenarios.
- Despite efforts to develop and implement water and energy-saving technologies, these might take longer to emerge and so the 2010s could be a very difficult decade to survive. If governments panic then we would move into a disorderly scenario. If they, and the public and industries, stay determined to make the transition to lower reliance on fossil fuels and lower impacts on climate, then we might see the optimistic aspects of this scenario delayed until the 2020s.
- There is always the chance of major disruption by industries to prevent the transition, or lack of commitment by politicians to follow through on the policies, or terrorist attacks aimed at disrupting industrialised nations while they are vulnerable (possibly abetted by states that fail due to the difficult times). All of these events would either be temporary glitches on the way to an eventually orderly transition, or would flip this scenario into one of the disorderly ones.
- The World in this scenario is vulnerable to the spread of pests and diseases of agriculture and to global or regional pandemics of organisms like influenza, bird flu or SARS, due to climate change, but it also has greater capacity to fight these threats as nations are used to working together to address global scale issues.

13 Strategies

"The objective of good scenarios is better decisions not better predictions."



Peter Schwartz, head of scenario planning at Royal Dutch Shell 1982-86, on one of the key lessons that Shell learned from their development of scenario planning



Members of the Scenarios Working Group met in December 2008 to discuss the implications of the scenarios. Their first task was to identify the key challenges and opportunities that people in the Namoi might face in each scenario (Table 12).



13.1 Challenges and opportunities



Table 12 is not an exhaustive list of challenges and opportunities – rather it highlights the strongest challenges brought to mind by contemplating the future depicted in each scenario. Although Table 12 presents challenges as problems, most of these problems can be turned into opportunities if they are anticipated, prepared for, and addressed early. The distinction between shaping actions (influencing the future) versus hedging actions (managing risks) in relation to these challenges is discussed in the following section.

Table 12 Key challenges that people in the Namoi might face in each scenario (as identified by the Scenarios Working Group)

1	 Disorderly energy transition	 High warming	HOT SCRAMBLE
Demography	Population planning must consider water availability		
Communities	High global warming (+3 deg.) will mean that in the western half of the catchment the current population will reduce, and current productivity will decline, forcing new land uses, and a need for whole community adjustment Society will have to accept losses of ecosystems, species, land uses, quality of life, and amenity options		
Infrastructure	Both wetter and drier climate scenarios create high risks for the catchment's assets		
Industries	Industries reliant on current land uses will need a transition plan Energy needs (mining for coal and gas) can have an irreversible impact on food and water availability		

2	 Disorderly energy transition	 Low warming	WARM SCRAMBLE
Communities	If coal and energy development happen too rapidly there will not be time to plan effectively for the impact on the economic, social and environmental issues		
Economy	If the economy is robust (coal, agriculture and non-resource reliant) there will be more opportunity for improved social and environmental outcomes		
Industries	Can coal and agriculture work in partnership? It needs meaningful data on the impacts, collaboration and discussion to have any chance. Current government policy supports coal mining and agriculture		
Strategic planning	Even if the impacts of climate change are not severe, there needs to be some new thinking about industries and lifestyles in the catchment because they are currently poorly aligned with climate In fast developing areas, natural resource management and social infrastructure are brushed aside by all levels of Government Regional and State expertise and funding needs to guide and inform local decision making Regional coordination needs to be driven from the bottom up, collaboratively		
Policy	Policies that cut funding and jobs will lead to less informed decision making as the advisors are not there or are afraid to provide the advice – Ill informed policy can lead to bad planning decisions		

3	 Orderly energy transition	 Low warming	WARM COMPLACENCY
Demography	Namoi, as a region, is very complacent about labour shortages associated with the demography		
Communities	Farmers are better in tune with variability than the communities reliant upon them		
Economy	Need local strategies to retain value of energy boom within Namoi region		
Industries	Namoi needs to invest in value adding of their livestock and cropping products (e.g., organic fertilizers or bio-chemicals).		
Science and Technology	Technology support for non-agricultural sectors is appalling, needs to improve		

4	 Orderly energy transition	 High warming	WARM WEATHER, COOL HEADS
Infrastructure	Improvements in current transport infrastructure are required to service the agricultural and mining industry		
Industries	Under current economic conditions where will investment funds be sourced? Successful negotiations between the mining and the agricultural sector are highly questionable		
Science and Technology	Continued disagreement within the scientific community will make it difficult for communities to get involved in bottom-up solutions		
Policy	Finding the balance between regulation and incentives Tensions created from varying water availability		

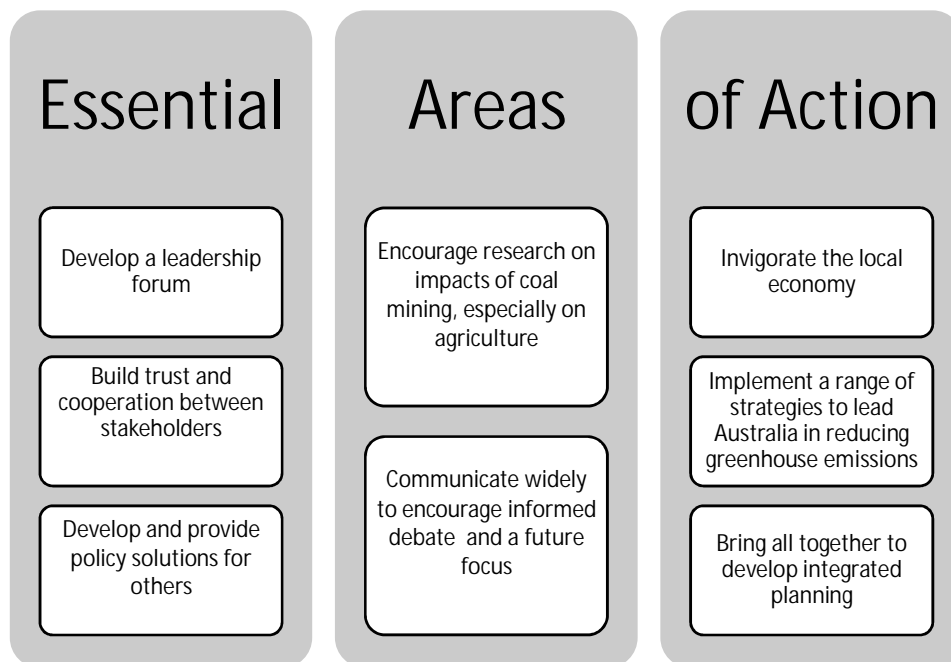
13.2 Actions to prepare the Namoi for a range of plausible futures

Although each scenario presents some unique challenges and opportunities, or emphasises different challenges over others, a number of common actions identified by the Scenarios Working Group were thought to be essential to build the resilience that the Namoi needs to face a range of plausible futures. These are discussed in detail in the following sections.

Two issues over shadowed all others. Firstly, it was clear that, in any of the futures explored in the scenarios, the Namoi could not take control over its own destiny unless some major advances were made towards administrators, industry, researchers, and communities working together towards common high-level goals (without ignoring different values, beliefs and specific objectives across sectors of society).

Without this ability, the future is likely to be one of a region struggling, often with exceptionally good results but always with great effort, to deal with policies imposed from governments that might or might not take account of the values of the Namoi to Australia and Australians.

Secondly, it will be very difficult to chart a commonly supported way forward without resolution of deep tensions surround coal mining. These tensions result largely from differences in interpretation of available information, which is inadequate for answering the many questions that people have about the potential social, economic and environmental impacts of coal mining.



When preparing for plausible future challenges, it is useful to distinguish between hedging and shaping:⁹⁸

- A shaping action aims to create the conditions you want
- A hedging action aims to prepare you for potential failure

Anticipating future challenges and taking shaping actions can turn problems into opportunities.

13.2.1 Develop a leadership forum

In all scenarios it was clear that to be able to shape its own future, the Namoi and regional Australia need to be able to speak with one voice so that they can have effective input to the tough policy decisions facing Australia in the next few years and decades. This situation can be likened to the plight of Asian, South American and, until recently, European countries who have failed to compete with the US economy due to their inability to speak and act as a single political and economic unit.⁹⁹

The Working Group members considered that two broad things need to happen:

- Public administrators, non-government organisations, industry and communities need to come together in a leadership forum in which they think and work strategically towards common goals
- Different parts of regional Australia need to be able to work cooperatively to present policy solutions to Australian governments and to play a constructive role in building national cohesion, socially, culturally, economically and environmentally

LEADERSHIP FORUM	
Strategy	Develop an appropriate leadership forum ('ginger' group) supported by high levels of local commitment and resourcing within the Namoi catchment
Shaping actions	<p>Establish a core group and put pressure on decision makers, industry, non-government organisations, and community leaders to work together</p> <p>Continue to model this style of leadership by building links with other catchments</p> <p>Develop potential solutions for climate change, water use, energy, social equity issues and infrastructure issues</p>
Hedging actions	<p>Develop risk management strategies in case it is not possible to develop a fully functional leadership forum (these might include, commissioning discussion papers and convening discussion forums to build as much strategic thinking as possible)</p> <p>Think about how the Namoi might deal with having no influence over government policy and having policies imposed on it that might not be region-friendly (which could include losing water and other resources to other catchments and losing the ability to influence development of coal and other extractive industries)</p>
0-5 years	<p>Form core group, develop a range of discussion and position papers, convene strategic conversations with stakeholders</p> <p>Develop terms of reference for larger group, begin building support and acceptance within government, non-government, industry and community sectors</p>
5-10 years	Aim to have a fully functional leadership forum in place
10+ years	Other catchments want to emulate it the Namoi's Leadership Forum

13.2.2 Build trust and cooperation between stakeholders with divergent interests and views

A key requirement for the Namoi to be able to build resilience for dealing with future change is that its people are able to work together to achieve common goals. This requires trust and understanding to be built, which require better communication and some cultural change in the catchment. Currently (and the Namoi is not unique in this regard) lack of social cohesion is driven by inequality between rich and poor and between advantaged and disadvantaged groups within communities. Lack of certainty about access to resources, especially water, and costs of essentials, such as energy, are exacerbating social tensions. While the same challenges are faced by regional and urban communities around Australia, the Namoi could develop a “competitive advantage” in terms of attracting business and residents if it were able to address these issues.

BUILDING TRUST	
Strategy	Build trust and collaboration between the divergent and competing parts of the community
Shaping actions	<p>Hold public meetings as well as Government department meetings with all players in the community and newcomers within industry</p> <p>Lead by example through open sharing of information to provide a basis for informed debate</p> <p>Use structured approaches to get people thinking beyond entrenched viewpoints to understand what forces are shaping the future and to appreciate why different people have different views and become aware of where their own beliefs and viewpoints come from</p>
Hedging actions	Develop arbitration processes to at least allow opposing viewpoints to be voiced and decisions to be made based on transparent rules
0-5 years	<p>Start the process by getting people together and being inclusive.</p> <p>Aim to generate a culture of open dialogue</p>
5-10 years	<p>Plan to have the approach accepted and routine by this time</p> <p>Explore ways to integrate outputs from this process (and perhaps key individuals) with the Leadership Forum</p>
10+ years	Review and improve

13.2.3 Develop and provide solutions for politicians that enable the Namoi to influence policy

One of the most direct and effective ways to influence policy is to provide well thought-through solutions for politicians and other decision makers. Regional Australia should not wait while academics try to convince governments about the need for new approaches to governance that engage people closest to change (e.g. in regional Australian communities when it comes to climatic change, environmental management, and food production). Regional Australia should take the front foot and become engaged by showing the way forward in the interests of all Australians.

SOLUTIONS FOR POLITICIANS	
Strategy	Influence policy development and implementation of policy by providing insightful possible solutions to governments.
Shaping actions	Develop well thought-through policy ideas and programs to address challenges facing regional Australia in ways that acknowledge political constraints and work with politicians to meet common goals.
Hedging actions	The biggest risk is that governments will impose policies that are only partial solutions based on incomplete understanding of the issues and not necessarily appreciating the values of regional Australia to the nation. Hedging is a poor strategy as it means being ready to make the most of a less than ideal situation. Rather, actions should involve anticipating the types of policies that might be imposed and thinking about how to adapt to them.
0-5 years	See "Leadership Forum" above for the sorts of documents that should be prepared. Identify a team of people to develop formal relationships with key government agencies and ministerial advisors to understand their needs and policy priorities and to develop approaches to help them. The priorities are to listen and build trust and confidence. Establish an environmental scanning process to give early warning of issues about to come onto government agendas (perhaps before they know it).
5-10 years	Fully functional team in place
10+ years	Review and improve functions and roles of forum

13.2.4 Encourage research on impacts of coal mining, especially on agriculture, to allow more informed debate

The most contentious debate among people in the Namoi is about the future development of coal mining and its potential impacts on lifestyles, the local economy and the environment. Coal mining will be driven directly by what happens with the oil economy and how quickly alternative energy resources come on line. The Scenarios Working group expressed concern about how little information is available to inform the major decisions that will need to be made in the near future, not just by the coal industry but also by other industries competing with coal for resources like water and labour, and by communities who will ultimately give coal miners formal and informal licences to operate in the future. Better information on effects of coal mining is also a key requirement for building trust among community groups and avoiding unnecessary tensions.

RESEARCH ON COAL MINING IMPACTS	
Strategy	Commission and/or encourage more research into the effect of mining on agricultural land
Shaping actions	Ensure independent objective research Conduct negotiations to protect individual productive assets
Hedging actions	
0-5 years	Scope, initiate and complete a 5 year research program
5-10 years	Implement research findings Identify need for any further research
10+ years	

13.2.5 Invigorate the local economy

The scenarios highlighted the future uncertainties surrounding markets for food, energy and other commodities that are produced, or might be produced, in the Namoi. They also highlight the challenges that could be faced by other industries that rely on commodity industries. The opinion was expressed that there has been insufficient focus on small businesses, which are particularly vulnerable to future economic, social and environmental uncertainties. Invigorating the local economy requires integrated thinking about issues as diverse as farmers helping non-farmers to be more aware and prepared for climatic variability, managing labour supply issues, providing accommodation, schooling, health, communication and other opportunities that encourage workers and their families to reside in the catchment rather than commuting, and managing transport and other issues that connect Namoi businesses to domestic and global markets.

INVIGORATE LOCAL ECONOMY	
Strategy	Mechanisms to retain and capture the value of a strong local economy
Shaping actions	<p>Reinvest resources to diversify the industrial and community base (e.g. new and diversified industries)</p> <p>Negotiate controls and agreements between resource users to contribute cash/resources back to the regional economy (e.g. negotiate royalties share, build local business capacity, minimise fly in fly out)</p> <p>Work to have education, training and technology development adequately resourced with integrated program support:</p> <ul style="list-style-type: none"> • Identify existing gaps in technology and knowledge and target support to these areas • Examine value chains to identify gaps and opportunities • Develop partnerships with Universities to facilitate knowledge and innovation <p>Develop community and social frameworks (i.e. education, housing, health) to provide community amenity:</p> <ul style="list-style-type: none"> • Inform schools and local firms about expanding business opportunities • Encourage broader-scale education about renewables and smart technologies • Save drop outs by providing alternative education streams to progress drop outs into higher education
Hedging actions	Consider strategies for dealing with a declining local economy, including social stress, crime, environmental degradation, decreasing community cohesion, decreasing rates base, and non-replacement of infrastructure
0-5 years	<p>Use leadership forum to convene a working group across government, industry and community to plan an economic recovery program</p> <p>Develop prospectus and build support</p> <p>Develop and implement an education and awareness-raising program</p> <p>Secure investment commitments</p>
5-10 years	Main implementation period for the next decade
10+ years	Continue implementation

13.2.6 Communicate information and ideas about current and future challenges and opportunities widely to encourage better informed debate and a culture that is future focused, values diversity of ideas, and is resilient

The Scenarios Working Group recognised that most of the Namoi's residents, like most Australians generally, have little opportunity to contemplate the types of change that might emerge and how they might need to prepare for alternative futures. They heeded the examples of businesses like Royal Dutch Shell, that have reaped the benefits of developing cultures in which workers are able to prepare themselves, emotionally and with knowledge and understanding, for change. There are likely to be similar benefits of developing such change-focused cultures in communities, including reduced stress and negative reactions to change and competitive advantages from being able to act sooner than others competing for resources like water, energy, tourists, labour, entertainment, or residents.

COMMUNICATION/ CULTURAL CHANGE	
Strategy	Present feasible and alternative ways of living in the Naomi to the community and support these ideas via appropriate policy constructs
Shaping actions	<p>Inform the community about the potential impacts of climate change via local peer networks - should be backed up by legislation to ensure that local energy and water consumption is enforced and happens - need to retrofit existing non-complying buildings</p> <p>Develop climate change adaptation strategies that look into best possible uses of changed landscapes, resources, social and environmental capital - must include adjustment mechanisms</p> <p>Ensure consistent message through local leadership</p> <p>Focus on collaboration at community level</p>
Hedging actions	<p>Consider social safety nets to catch communities who fail to transition successfully</p> <p>Legislation to encourage water and energy savings</p>
0-5 years	<p>Develop adaptation strategies</p> <p>Commence education campaign and put legislation in place - begin enforcement</p> <p>Identify effective communication tools to clarify the messages from the scientific community</p>
5-10 years	<p>Ensure social safety nets to catch communities who fail to transition successfully</p> <p>Monitor education campaign and enforcement and review if necessary</p>
10+ years	Continuous review and improvements throughout the program but review overall achievements and failures after 10 years and consider future of such programs

13.2.7 Implement a range of strategies to lead Australia to reduce greenhouse emissions

It is highly in all futures that some action will be taken to reduce greenhouse emissions in Australia and globally. In some scenarios these measures might be taken in an orderly way and in others they might be developed and implemented in disorderly, even chaotic and panicked, ways. It is highly likely that agriculture will be included in an emissions trading scheme in the next decade. The Namoi and other regions could wait for such developments and react along with all of their competitors. Alternatively, they could get active and not only ensure that future carbon management policies are friendly to regional Australia but also open up opportunities for better lifestyles and a stronger local economy based on new services that, for example, sequester carbon in vegetation and soil, or move Australia towards carbon-neutral commodity production.

EMISSION AND ENERGY STRATEGIES	
Strategy	Reduce carbon pollution, ensure energy security and affordability for the Namoi's residents and businesses without compromising environment or quality of life
Shaping actions	<p>Assess possible demand for coal and gas under several future scenarios and consider impacts on economy, environment and society</p> <p>Assess opportunities for cooperative generation of energy to offset rising prices for externally generated energy</p> <p>Explore opportunities for alternative, environmentally friendly, energy sources (solar, wind, new generation biofuels etc) and work as a community to help these to become established (perhaps through joint-venture funding)</p> <p>Explore possibilities of capturing fossil fuel benefits (assuming at least some coal and gas extraction continues) to develop alternative industries</p> <p>Develop forward-looking strategies for including agriculture in emissions reduction and trading schemes to both help reduce the carbon footprint of the catchment and provide alternative sources of income</p>
Hedging actions	Plan to ease pain for farmers if energy costs become too high and consider impacts of high energy costs on efficient use of water
0-5 years	<p>Use Leadership Forum to develop plans for joint ventures to reduce carbon emissions with minimal economic impact, coupled with presentation of ideas to governments to create new funding options</p> <p>Develop and advocate carbon-reduction plans for altruistic reasons but also to build credibility and influence with government and to avoid imposition of externally designed policies</p> <p>Get community and industry support for carbon reduction targets</p>
5-10 years	<p>Continue implementation of carbon-reduction and energy-wealth generation strategies</p> <p>Foster strong involvement in development and implementation of carbon-emission reduction schemes that are friendly to regional Australia</p>
10+ years	Continue involvement in policy development and implementation.

13.2.8 Bring all sectors of Namoi communities together to develop integrated planning that considers all values and views.

The coming decades will present many problems to be solved, but they will also offer opportunities. Both the problems and the opportunities will be more complex than ones that have arisen in the past, due to the increasing pace of social, environmental, economic and technological changes and the convergence of these. It is highly likely, for example, that environmental decline will start to undermine agricultural production and other economic growth at the same time as technological advances make it possible to address such problems either in the same regions where food has been produced traditionally or in other places (such as so-called “vertical factories” in cities).

The global economic crisis has shown how complex the world’s financial systems have become. That complexity, along with political and social unrest in many parts of the world, will likely make anticipation of markets opportunities much more difficult than it has been in the past.

There probably will be great opportunities to both profit from and help other nations if the Namoi can manage the interactions among climate, soils, vegetation, biodiversity, water, energy, economy and social change in ways that allow its people to be flexible and to respond rapidly to market opportunities. On the other hand, there are many ways in which disaster could strike if old approaches that address bits of these complex problems in isolation are continued.

I N T E G R A T E D P L A N N I N G	
Strategy	Continue to bring NRM and community development paradigms closer together.
Shaping actions	<p>Develop, apply and promote ways to integrate environmental management with economic and social objectives (e.g. ecosystem services, physical and social infrastructure, water sharing, economic development, and settlement strategies)</p> <p>Build linkages between planning, NRM and community development organisations</p> <p>Encourage debate about the role of economic growth in the well-being of people in the Namoi, keep a close eye on how ideas in this area are emerging as the global financial crisis plays out, and be prepared to shape national debate</p> <p>Explore how the Namoi could manage its growth and population</p>
Hedging	Be prepared for externally developed policy solutions that are not region-friendly
0-5 years	<p>Use Leadership Forum, other networks, and the communication and trust-building strategies described above to get support for integrated planning approaches, including engaging industry in catchment-scale planning</p> <p>Stay closely involved with discussion about changes to planning approaches in NSW and nationally, prepare submissions to governments on how better integration can be done, and develop exemplar plans that will influence others</p> <p>Explore possibilities of growth and population policies for the Namoi</p>
5-10 years	Develop a new generation of integrated plans considering all of the above
10+ years	Review plan implementation

13.3 Next steps

13.3.1 Ongoing horizon scanning

Now that the Namoi has a set of scenarios that can be used as a focus for anticipating future challenges and opportunities, the next step should be to identify signposts that would give early warning that aspects of one or other of the scenarios might be playing out. This should trigger preparatory actions, such as those identified in Chapter 13.

There is a variety of places to look for early warning, depending on how much warning is required (Figure 19). Analyses on strategic thinking on organisations and societies indicate that scanning such as this does not happen unless a deliberate effort is made and resources and people dedicated to the task.¹⁰⁰

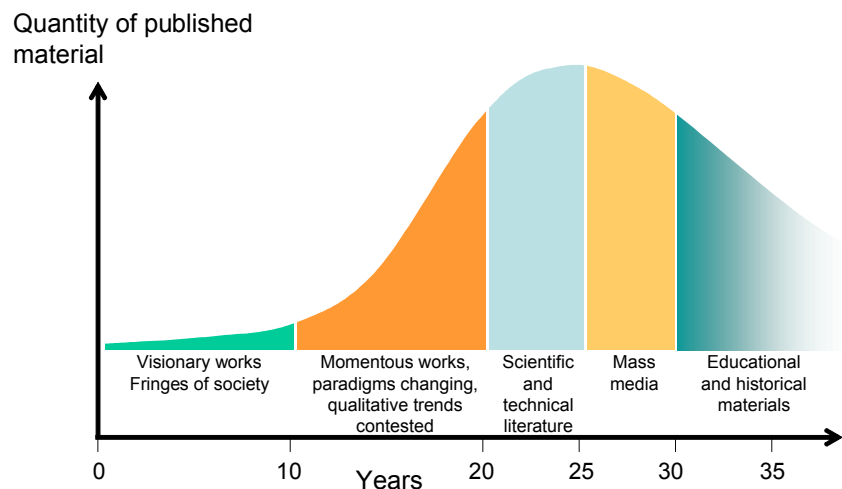


Figure 19 Timeline for emergence of issues¹⁰¹

13.3.2 Organisational and societal hurdles

Business strategies have identified a set of hurdles to strategic thinking in organisations (Figure 20). Similar hurdles exist for the Namoi, especially with respect to setting up a Leadership Forum. Many of the suggestions made by the Scenarios Working Group about how to set up that Forum (Appendix 5) address these hurdles. Developing a strategy that specifically addresses cognitive, political, motivational and resource hurdles is an important next

step for preparing the Namoi for challenges such as those revealed by the scenarios.

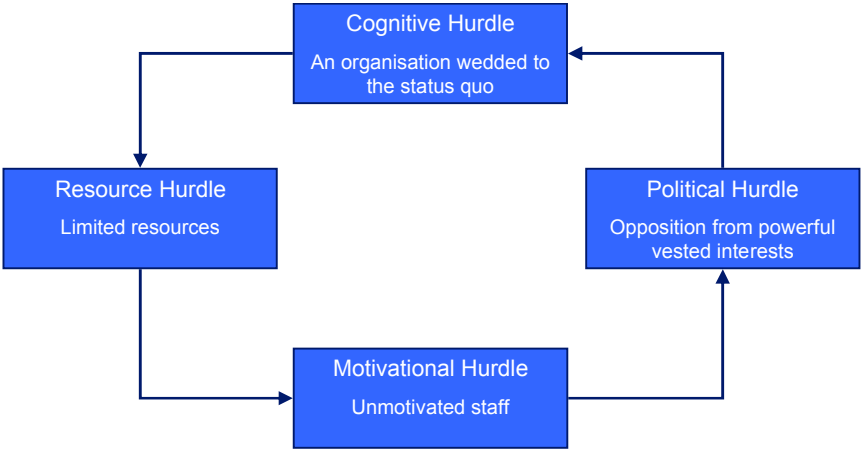


Figure 20 Organisational hurdles to strategic thinking¹⁰²les to strategic thinking¹⁰³

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¹⁶ For example: Dovers (1994); Dovers & Wild River (2003); Reeve et al. (2001).

¹⁷ Cork & Delaney (2005) present an incomplete listing of major events relating the natural resource management in Australia (in their Appendix 2).

¹⁸ Galtung & Inayatullah (1996). An essay based on this book, Macrohistory and the Future by Sohail Inayatullah, can be found at <http://www.metafuture.org/Articles/MacrohistoryandtheFuture>.

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²⁰ Frawley (1994).

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²⁴ Dewar (2002); Godet (2001).

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²⁶ Edge Land Planning and Parsons Brinckerhoff (2008).

²⁷ The Environmental Scan can be obtained electronically from the Namoi CMA web site

(www.namoi.cma.nsw.gov.au/asp_environmental_scan_namoi_09oct07.pdf) or at <http://grapevine.net.au/~anncork/Namoi.htm>

²⁸ Edge Land Planning and Parsons Brinckerhoff (2008). This report is available electronically at: <http://narrabri.cfm.predelegation.com/files/uploaded/file/Planning%20and>

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²⁹ Schwartz (1996).

³⁰ Holmgren (2008).

³¹ Energy Futures Forum (2006).

³² Cleveland & Saundry (2008).

³³ Garnaut Climate Change Review (2008).

³⁴ Modified from Holmgren (2008).

³⁵ Thought-provoking commentary can come from unexpected sources, as an article by John Michael Greer, the Grand Archdruid of the Ancient Order of Druids in America (AODA), illustrates. Greer's article "Briefing for the Descent" (The Archdruid Report Thursday, September 07, 2006 - http://thearchdruidreport.blogspot.com/2006_09_01_archive.html) is a well-argued case for the possibility of a major downturn in the US economy. Interestingly, Greer argues in other reports that this is not inevitable and that it can be avoided.

³⁶ Energy Futures Forum (2006).

³⁷ Solomon et al. (2007); Parry et al. (2007); Metz et al. (2007)

³⁸ Campbell & Laherrère (1998); Also see Holmgren (2008). This issue is also discussed in Chapter 4 of the Garnaut Report.

³⁹ Garnaut Climate Change Review (2008).

⁴⁰ Energy Futures Forum (2006).

⁴¹ Garnaut Climate Change Review (2008).

⁴² Meadows et al. 1972.

⁴³ This graph is taken from an opinion piece published by an unidentified actuary under a pseudonym on the internet site "The Oil Drum" (<http://www.theoil Drum.com/node/2693#more>). The article cites reliable literature and we have verified that it reflects the range of published opinions. A fourth scenario is also included in the original paper, which is one that assumes that production will continue to keep pace with demand. This has been shown already to be implausible, at least in the short term.

⁴⁴ Garnaut Climate Change Review (2008).

⁴⁵ See note 38

⁴⁶ See note 5

⁴⁷ See note 33

⁴⁸ See note 33

⁴⁹ See note 5.

⁵⁰ See note 32

⁵¹ See note 32.

⁵² Land info sheet, <ftp://ftp.fao.org/nr/HLCinfo/Land-Infosheet-En.pdf> or see <http://www.iied.org/pubs/pdfs/12551IIED.pdf> or OECD?FAO ag outlook to 2007-2016 <http://www.oecd.org/dataoecd/6/10/38893266.pdf>

⁵³ See Millennium Assessment website (www.MAweb.org) for a range of reports on the state of the World's ecosystems and their ecosystem services

⁵⁴ Cleveland & Saundry (2008).

⁵⁵ See note 32.

⁵⁶ See note 33

⁵⁷ Chefurka (2007). <http://canada.theoil Drum.com/node/3222>

⁵⁸ See note 33

⁵⁹ See note 33 (Garnaut report). Please note that data on oil prices and factors influencing them can be found at the web site of the US Energy Information Administration (http://tonto.eia.doe.gov/dnav/pet/pet_pri_spt_s1_m.htm and <http://www.eia.doe.gov/emeu/cabs/AOMC/Overview.html>). The data added to this figure as a broken line were derived by applying the ratio of the index for January 2008 from the Garnaut Report graph to the oil price taken from the first of the EIA sites above, assuming that the Garnaut Report used that same oil price in its calculations and that CPI did not change greatly between January and July 2008.

⁶⁰ The Oil Drum (2008). What is happening with oil prices? (<http://anz.theoil Drum.com/node/4260#more>)

⁶¹ Mouawad & Wald (2005)

<http://www.nytimes.com/2005/07/12/business/worldbusiness/12oil.ready.html>

⁶² Homer-Dixon (2006).

⁶³ Homer-Dixon (2006); Walker & Salt (2006).

⁶⁴ Report by Acil Tasman to Namoi CMA on Future Scenarios, 2008

⁶⁵ Eckersley (2006a and b); Eckersley (2005); Ipsos Mackay (2005a and b); Mackay (2001); Salt (2001).

⁶⁶ Holmgren (2008)

⁶⁷ See note 65

⁶⁸ See note 33

⁶⁹ Australian Government (2008). Carbon Pollution Reduction Scheme Green paper

<http://www.climatechange.gov.au/greenpaper/report/index.html>

⁷⁰ Solomon et al. (2007).

⁷¹ Solomon et al. (2007).

⁷² Metz et al. (2007).

⁷³ See note 33

⁷⁴ See note 33

⁷⁵ Hennessy et al. (2008); Mpelasoka et al. (2008).

⁷⁶ Hennessy et al. (2008); Mpelasoka et al. (2008).

⁷⁷ See note 33

⁷⁸ See note 33

⁷⁹ CSIRO Sustainable Yield Project:

http://www.csiro.au/resources/MurrayDarlingBasinSustainableYieldsProjectMethods--ci_pageNo-2.html

⁸⁰ See note 79

⁸¹ See note 79

⁸² See note 31

⁸³ See note 31

⁸⁴ See note 31

⁸⁵ Climate change has been largely generated by wealth-creation in developed countries but developing countries will bear more of the impacts of climate change. Developed countries have been responsible for the bulk of past emissions but developing countries will generate more in the future. See note 31

⁸⁶ See note 33

⁸⁷ See note 69

⁸⁸ See note 33

⁸⁹ Bennett & Webb (2009)

(<http://www.aph.gov.au/library/pubs/online/AustFederalism.htm>)

⁹⁰ Marshal (2005, 2008)

⁹¹ Connell (2007)

⁹² Chris Murray, Department of Planning NSW, in an invited commentary on the scenarios

⁹³ This is based on the latest energy scenarios from Shell (http://www.shell.com/home/content/aboutshell/our_strategy/shell_global_scenarios/shell_energy_scenarios_2050/shell_energy_scenarios_02042008.html)

⁹⁴ First generation biofuels (e.g. bioethanol) are produced by fermenting plant-derived sugars using a similar process to that used in beer and wine-making. This requires the use of 'food' crops such as sugar cane, corn, wheat, and sugar beet. Second generation biofuel technologies (e.g. lignocellulosic ethanol production) aim to use biomass comprised of the residual non-food parts of current crops, such as stems, leaves and husks that are left behind once the food crop has been extracted.

⁹⁵ This is based on the latest energy scenarios from Shell (http://www.shell.com/home/content/aboutshell/our_strategy/shell_global_

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⁹⁶ First generation biofuels (e.g. bioethanol) are produced by fermenting plant-derived sugars using a similar process to that used in beer and wine-making. This requires the use of 'food' crops such as sugar cane, corn, wheat, and sugar beet. Second generation biofuel technologies (e.g. lignocellulosic ethanol production) aim to use biomass comprised of the residual non-food parts of current crops, such as stems, leaves and husks that are left behind once the food crop has been extracted.

⁹⁷ Note that some commentators have questioned how a town could run out of water in an irrigation area. They suggest that water could be diverted from agricultural use to meet the needs of the town. Experienced managers in the Namoi point out, however, that the variability of rainfall and the limited capacity to store water over long dry spells means that it is quite possible (in fact it almost happened in 2006-2008) for water supplies to both irrigators and towns to fall temporarily to levels that seriously affect livelihoods and well being of farmers and urban-dwellers alike. Such a situation is a classic example of threshold change in that the early signs are easy to miss until it is too late to do anything about the problem as it escalates.

⁹⁸ Dewar (2002).

⁹⁹ Drahos & Braithwaite (2002) argue that the USA has maintained its global economic and political dominance largely due to its superior political and commercial intelligence and its ability to speak and act as a single economic unit while most competitors are unable to do either.

¹⁰⁰ Slaughter (1996)

¹⁰¹ Inayatullah (2005)

¹⁰² Chan Kim & Mauborgne (2005).

¹⁰³ Chan Kim & Mauborgne (2005).