

Climate Change Scenario Planning Workshops

Why undertake scenario planning? Scenario planning is a powerful way for groups of people to learn in a relatively non-threatening environment (no one owns the future) and build support for future actions.

In August 2014, four scenario planning workshops were held across the Burnett Mary region (Bundaberg, Maryborough, Gympie and Pomona) to consider the likely implications of Climate Change for the region. Participants came from a broad cross-section of our community including local and state governments, industry, agriculture, fire services and the conservation sector.

Together, they explored two futures based on a 2030 and 2090 planning horizon. The scenarios were based on the East Coast Cluster Projections Report (developed by the CSIRO) around two Representative Concentration Pathways or RCP's. Four RCPs have been defined and labelled by the CSIRO according to their radiative forcing (W/m²). The two considered were the RCP4.5 (*intermediate*) and RCP8.5 (high) emission scenarios.

The results from the workshops are summarised below. The results have been grouped into four main themes: people and the built environment, extreme climatic events (and our ability to respond), natural ecology and biodiversity and agriculture (including food security).

People and the Built Environment: This group chose to examine the urbanised implications of the scenarios on the built environment and the community covering a broad cross-section of issues from inundation to mental health. While the group considered that most implications for their topic could be managed by good planning, technological adaptation and integrated solutions under both scenarios with the 2030 planning horizon (and indeed the 2090 planning horizon under the RCP4.5 scenario), this was not the case for RCP8.5 2090 which would require considerable adjustment, planning and funding (with implications particularly for local government and community services).

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Coastal development (canals)	Technology (new) and thorough Natural Resource Management Planning Integrated solutions	Coastal inundation – relocation	Planned relocation Engineering works (?) – costs may be prohibitive
Flood mitigation		Population growth	Planning critical
Population growth		Food	Self-sufficiency / Community gardens / agricultural assistance

Transport		Transportation	Clean Transport
Energy supply		Energy use	Clean energy
Water supply		Water	Technologies – storage and use
Waste management		Community Mental health Aged Care Poverty management	Gradual adjustment – building design (e.g. verandas, covered walkways and elevated homes. Government funding / Taxes

People and the Built Environment (2): This group took a slightly different approach to the challenge, building and using a phased approach as the challenges posed by the scenarios worsened i.e. from RCP4.5 2030 to RCP8.5 2090. They did however discuss similar (and complementary) issues to group 1, with a focus on both built and natural area design, education and the opportunities to act now to provide greater community resilience in the future.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Social awareness and perceptions	Ongoing education – practical examples and participation		
Dependency on energy	Clean energy strategy (solar, wind etc). Availability of technology – need design of suitable Tertiary courses.		
Lack of intelligent planning and suitable building codes	More physically resilient design for the built environment with locally suitable materials and design (e.g. passive solar design)	Open space design	Tree planting program Resilient tree species Air quality Connectivity / multi-modal
		Connectivity of the Natural Landscape	Resilience of natural assets Enhance through plantings – increase participation through work for the dole and volunteer programs

		General Health consequences (sun cancers, aging population and increase in disease vectors)	Education More shade and cultural change in attitude Vector control strategy & Mosquito repelling trees Healthy Lifestyle program
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BBG

Community resilience to weather events (fire, storm, flood and cyclone): This group considered the built environment (homes / private property) from a disaster management perspective. Suggestions ranged from managing expectations i.e. there aren't enough resources to assist everyone to a focus on increasing community preparedness. Given the extreme risks posed by conditions under the RCP8.5 2090 scenario, approaches suggested under the moderate RCP4.5 scenario would need a complementary approach of legislative changes including the power to evacuate buildings and zoning to prevent people building or living in high risk areas.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Community reliance on assistance - Adjusting lifestyles i.e. "they live in the bush!" - Not enough resources to assist everyone - People's expectations and understanding of available assistance and what they can do for themselves - Community preparedness or lack thereof	Community actions – to be prepared for events prior to event affecting them Pre-event planning and multiple event planning Resource and coordination Changes to legislation – power for action to protect public and at what point power is to be activated - Forced mitigation plans - Benchmark or conditions i.e. when	Zoned response trigger for evacuation actions and locations Zoned areas compulsory fire management / Emergency Plans for approval to live and build Zoned areas compulsory "safe" houses with community developments Zoned developments - Access to be multi-functional - Safe and - Weather event resilient	Legislative power to evacuate buildings High-risk area no longer allowed to live / build etc. Use of new technology to: - Prepare for emergency events - Early warning - Forced actions

	<p>Community education regarding pre-event preparedness and services available.</p> <p>Multi-tiered and multi-variable i.e. from face-to-face to technology to target various groups.</p>		
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POM

Capacity to respond to increased emergency events (fires, floods and cyclones): While this group focussed on emergency event response, their discussions took into consideration not only the natural implications of climate change e.g. increasing fuel loads and changes to vegetation types but also the social aspects of changes in demography, volunteer age and employment and the implications of these in the ability to respond to an emergency event. Increasing the capacity of the broader community (including the unemployed) to respond by offering training in fire management was seen as a key initiative in disaster mitigation and preparedness.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		Priority	RCP 8.5 2090		Priority
Issue	Action		Issue	Action	
Emergency water availability	<p>Legislated Fire Management Plans down to a property level</p> <p>Individual Property Fire Management Plans - plans indicate watering points to tap into.</p> <p>Coordination with regional bodies & other NRM groups to develop individual property plans</p> <ul style="list-style-type: none"> - Important for ground cover management etc. - Weed management - Management of biodiversity impacts 	2		<p>Written in Chinese!</p> <p>Bigger properties in west incorporate fire planning as financial risk management</p>	

	- Firebreak construction and associated soil issues e.g. erosion				
Increase in people participating in off-farm income Increasing age of volunteers Decrease in people working on farms resulting in a decreased ability to manage fire as a tool	Introduce fire training modules into unemployment schemes leading to skilled unemployed and skilled trainers (paid) within the unemployment network Engaging with and providing free training to non-traditional community groups Better communication about flexibility to participate and volunteer	1	Further decrease in rural population resulting in even fewer volunteers	Specialised paid reduction burn teams for both wild fires and hazard reduction to address shorter time frames (climatic conditions) and impacts from volunteer availability - Who pays? - Who manages these teams? Career opportunities for the unemployed	
Increase in coastal peri-urban and associated fire risk Increased population and population shift towards larger towns and cities	Increase focus on Fire Management Plans for coastal peri-urban areas.		Increase in urban fires / fire risks in high density living areas Poor standard of living impacts on the ability of people to invest in fire resilient infrastructure (down to individual landholders)		
Increased diversity of fuel loads			Massive changes to vegetation types and woody weeds requiring new fire regimes Narrow window for controlled burns		
Increases in the number of bush fires			Increased in the number of uncontrollable wild fires		

GYM

Natural Ecology / Biodiversity – Native Vegetation: Accepting that vegetation and ecosystems would change (along with associated wildlife) this group focussed on the need for greater understanding and increasing the resilience of the landscape in their action planning to 2030. This knowledge included researching habitats to the north with similar condition to the region under the RCP8.5 2090 scenario and then a systematic exercise of collecting seed banks / translocation programs for our resources for use in areas to our south (where they were considered at threat) and introductions and release programs of species from the north. This approach also required more in-depth knowledge about soil biota and adaptation monitoring to ensure the best chance of translocation success.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Soil moisture - More weeds - More dry bushfire fuel	JCU predictive planning Refuge Areas model		
Change in vegetation (composition and structure)	Wildlife corridors Buffer zones to protect vulnerable vegetation from fire and clearing Maintain / improve condition of existing habitats Partnerships with landholders Biodiversity adaptation kit for land managers.	Vegetation and wildlife loss / new ecosystems	Collect seed banks and captive breeding programs. Replant and release. Link with seed banks (and breeding programs) from the north. Send our species south. Research on soil biota.
		Investigate Madagascar!	
		Vegetation adapted with emphasis on rain belts and dry belts – loss through droughts.	Identify and survey common species with NQ area and monitor adaptation (with respect to cyclone, temperature and salt tolerance). Protect vegetation resources from fire – pandanus, fox-tail palms, beach almonds, hibiscus, brachychiton.

BBG

Riparian Restoration: This group, identified the issues related to riparian restoration, itself a high priority activity both from a landscape and ecosystem processes perspective, but to mitigate for climate change providing corridors and habitat for wildlife migration. Interestingly, like several of the other groups that identified a modified approach to ‘business as usual’ as a priority under the moderate scenario (and RCP8.5 to 2030) i.e. through engaging landholders and offering incentives these activities became largely irrelevant under the more extreme RCP8.5 scenario with a focus on the need to build resilience through the design of projects, integration with other activities (at a district scale) and use of technologies to reduce the need / increase efficiency of ongoing maintenance.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		Priority	RCP 8.5 2090		Priority
Issue	Action		Issue	Action	
Methods will still be applicable in 2030 - methods of prioritisation			Resilience	Building resilience into design of current revegetation work / riparian restoration	1
Decreased survival rate of seedlings	New planting techniques e.g. water spear			Building resilience: Introduce different species (e.g. northern or western species more suitable for changing / emerging conditions) More maintenance = increased costs Using technology to make maintenance more efficient / include a water supply with projects	2
Higher risk from drought events	Techniques to reduce fuel load e.g. short-term grazing Incorporating fire breaks Incorporating fire into risk analysis			District level integrated restoration Implement Fire Management Plans working with local Rural Fire Brigades	1
Affordability for landholders	More and different ways of funding e.g. payments for ecosystem services, carbon credits, fencing only options	2	These priority actions become irrelevant as a result of changing		
Engaging landholders	Already doing - social benefits:	1			

	facilitating social activities More financial support and incentives		climatic, political and social conditions		
Viability of restoration projects	Low cost methods i.e. facilitate natural revegetation				
			Less frost	Potentially a longer planting season, but variable rainfall means more maintenance	
			More hot days	Winter becomes main planting period	

GYM

Mary River Koala Corridor Tiaro: This group took a single species (and its associated habitat) approach to their visioning and assessment, choosing to focus on the community group's current activities i.e. the revegetation and restoration of riparian vegetation / koala habitat and how these activities may need to be adapted to ensure the project's success under the climate change scenarios. The Koala was formerly common throughout the broad band of forests and woodlands dominated by *Eucalyptus* spp. extending from north Queensland to the south-eastern corner of mainland South Australia, Australia (Maxwell *et al.* 1996). It currently ranges from northeastern, central, and southeastern Queensland with patchy populations in western areas, to eastern New South Wales including the coastal strip and highlands of the Great Dividing Range, the western plains and related riparian environments where suitable habitat occurs, Victoria, and southeastern South Australia. The geographic range has contracted significantly due to loss of large areas of habitat since European settlement. In Queensland, extent of occurrence and area of occupancy have contracted by about 30% (Gordon *et al.* 2006). The species is listed on the IUCN Red List of Species (as of Least Concern) and Vulnerable under national environment law. The process identified opportunities to enhance resilience through changes to plantings and species selection, but identified fire as the greatest threat to koalas (particularly under RCT8.5).

RCP 4.5 2030 and 2090 /RCP 8.5 2030		Priority	RCP 8.5 2090		Priority
Issue	Action		Issue	Action	
Drought – impacting on survival of trees	Change species / planting style / time of year for planting	2			2
Floods – lost riparian vegetation / fauna	More revegetation / riparian fencing Bank erosion assessment Wider buffer	2			2
Weeds	Education – onground work Biocontrol	1			3

Connectivity and maintaining connectivity	Extend corridor	2			4
Lack formal protection corridor	Investigate options for protection (nature refuge) and conservation covenants	1			4
Community support	Awareness / public open days	1			4
Koala population decline	Ongoing research	3			
			Fire management	Cross fingers!	1

MBO

Landscapes – protected from fire: This group (represented by a conservationist and a Rural Fire Service Representative) took a fire services approach to servicing landscape values over the planning period (2015-2090). While there were a number of actions proposed for implementation to 2030, what was clear was that fire would become a greater risk with both time and exposure to climate change. Under the RCP8.5 scenario, unless legislation was introduced to provide a commitment to enforcement and reduction of risk (through planning initiatives) it was suggested that fire management would need to fall back to defence of major infrastructure and that the risks posed to fire officers would no longer be acceptable from a voluntary perspective (putting a greater pressure on paid staff). Ultimately peri-urban development or rural residential blocks would need to manage their own risks.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090		Priority
Issue	Action	Issue	Action	
Variable wet / dry will lead to increased fuel loads in both residential and conservation areas	Increased education of landholders and other stakeholders to encourage collaborative action.	Previous mitigation strategies become null and void (fuel reduction becomes too hazardous) due to air temperatures and soil moisture depletion.	1.For existing Rural Residential style, implement and maintain major fire breaks i.e. earth breaks.	3
	Increased accountability for Local Government (not just state)		2.Protect essential infrastructure in interface zone by implementing and maintaining fire breaks (as above).	2
	- Disaster management (preventative)		3.End of political games – bipartisan support between elected representative (MP’s) to provide commitment to legislation and enforcement.	1
	- NRM /Fire management staff		4.Rural Residential only occurs	
	Emergency response mitigation. Decrease the need for emergency response via mitigation (a new			

	innovation to the mitigation strategy i.e. through other NRM management not exclusive to Council.		larger than 50Ha. Reduces risk to lives, less condensed occupancy and “live at own risk.”	2
Extreme storm seasons (increased business need)	Increased education / understanding leading to more preparedness Planning: Introduce no Rural Residential blocks under 50Ha (to reduce future risk).		5. Legislation to enforce fire control measures and development of Fire Management Plan.	1
Under RCP8.5, as risks increase - narrower mitigation opportunities (too hot/dry/dangerous)	Reliance on voluntary services - Potential inadequacies - Labour availability Too risky for volunteers			

MBO

Agriculture – fire management and water security: This mixed group of fire / agricultural experts took a strategic look at the implications for agriculture focussing on fire management, water security and resilience. Interestingly, this was one of the few groups that could see a difference in the actions under RCP4.5 and 8.5 over the period to 2030. The group were able to identify a number of strategies to increase cropping resilience and water security but also drew attention to the issue of agricultural land squeeze from an increasingly coastal community being pushed inland by sea level rise and inland communities alienated by drought. Ultimately, the team acknowledged that there would need to be changes made to crop selections (choosing shorter season crops to take advantage of wet seasons and reduce financial risk exposure) as well as organic choices to reduce the reliance on nutrient application. It was believed however, that the higher value crops would always prevail.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Fire management	Education <ul style="list-style-type: none"> - Timing - Illegal - Legislation 	Fire management	Increase recruitment further Change to fire times – more autumn fires required

	Hazard Reduction burns Increased number of fire bans Recruitment of more fire fighters		
Under RCP 8.5. this would lead to increased fire intensity	No permitted fires Research		
Water security	Approve more dams Increase water storage capacity for both towns and rural areas Impact of floods on infrastructure Flood mitigation Improved Water Use Efficiency Improved application technology	Water security	Change to water storages to deal with increased run-off potential Loss of lower storages
Under RCP 8.5 this would lead to loss of water storages, increased salinity and tidal flows and loss of agricultural land through sea level rise and water availability (agricultural land squeeze).	Greater understanding (research) and education		
Resilience to feral animals, weeds and soil constraints	Research Education Financial assistance Succession Planning	Change to cropping	Different crops Quicker growth (100-day crop cycle) Crops for fibre / fuel / biomass Higher value crops prevail
		Loss of land – organics	Population limits on agricultural land. Sea rise on lower terraces build levees. Nutrient scarcity – organics and biofarming.

BBG

Grazing Lands: This group looked at the issues for grazing lands and graziers where the variability in weather patterns (from hot/wet to hot/dry) will cause some challenges not only for stock, but for the landscape with increased gully erosion and sediment runoff. Disease impacts from soil related diseases and ticks were also seen to be an issue. Increasing the capacity of graziers, proactive stock management / stocking levels, monitoring of groundcover and adaptive planning with investment in water efficiency and infrastructure to secure stock in drought times were seen as priorities for the industry.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		Priority	RCP 8.5 2090	
Issue	Action		Issue	Action
Less frost = less grass burn	Hopefully an opportunity to turn off Stocking rates			
Increase in tick impacts and diseases related to increased humidity	Disease and pathology research Funding Followed by extension to landholders	H		
Increase in soil related diseases	Citrus canker and cane smut case studies adaptive / resilience investment			
Hotter and wetter patterns	Plant breeding adaption options			
Hotter and drier patterns will impact on turn off times, infrastructure and markets				
Longer drying trends and better rainfall events	Decrease in stocking rates Decrease in bulk feed levels and ground cover / organic matter and soil carbon		Loss of winter rainfall Reduction in soil moisture	Decrease of dry matter yields annually Must be better knowledge of sequestration levels
Gully erosion in grazing lands	Prioritise investment in increasing cover and sediment traps Monitoring of sites and practices		Gully gushes will increase sediment runoff	Monitoring of sites and groundcover (preventative)
Water efficiency for stock in drought times	Adaptive planning Prioritise drought funds i.e. infrastructure over transport and feed	H		Movement from reactive subsidies to investment in preventative infrastructure Incentive funding
Capacity of grazing farmers	Opportunity to increase land management practices to be more conservative due to increased education levels and changing farm demographics (corporate funding and off-farm incomes) i.e. one adult in each family (seed investment funding programs still very	H		A rethink to ensure diversification of funding programs

	valid).			
More or less animal welfare issues in droughts			More animal welfare issues in droughts	
Climate adaptation	Tax efficient climate adaptation activities Proactive / drought assistance resilient approach to flood recovery	H		Re-engineering the landscape

GYM

Local Food Production: This group examined multiple issues relating to localised food production including climate and increased competition for land brought about by sea level rise. The team provided a number of adaption strategies from plant selection and water storage systems to trees to provide natural protection from high winds and shade, investment in alternative energy technology, aquaculture and aquaponics to the upskilling of the community and landholders. Ultimately as conditions worsened, this group, along with many others, felt that there would need to be more prescriptive legislation and multi-tiered food production to meet productivity needs by 2090.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		Priority	RCP 8.5 2090		Priority
Issue	Action		Issue	Action	
Frost – more, more pests, less crops lot and more grass	Plant selection – tropical plants Seed saving Laws to enable small local food production	H		Open pollinated non-hybrid Genetically modified (??)	
Hot days – evaporation, animal habitat, interrupted electricity and fires	Soil science Create microclimates Water storage systems Protection systems – trees Ways to reduce bare soil Alternative energy – solar / wind	H H			
Heavy rainfall – soil erosion and opportunity to collect water	Self-reliance / upskilling: 1 method – swales, keyline Cut-off – need food supply locally Education programs on soil, erosion management for small	H			

	and large landholders [For arid farming see Cuba – education trips – we will volunteer!].				
Increased winter wind – plant dehydration	Wind protection – tree planting Plant selection				
Evaporation – maintaining soil. Moisture	Organic matter Soil science				
Higher sea level – decreased fisheries and mangrove	Aquaculture and protein alternatives Aquaponics	H	Increased competition for land use	Multi-tiered food production Best management practice Planning Zone Changes (need to accelerate by 2030)	H

POM

Personal responsibility for food security – weeds as an asset: This was a permaculture approach (caring for the earth, caring for people and a return of surplus) to the challenges posed by climate change. Using permaculture as its basis, the broader community would be encouraged to take a greater responsibility for themselves – both from a food and water security perspective. Community gardens and ponds provide greater community connection and social cohesion, would be complemented by changing policy and building codes to increase green space, encourage plantings for shade / canopy and provide space for community / collective gardens. Note: weeds provide an opportunity to read the soil / landscape and plant accordingly. Aside from food security, added benefits include: health outcomes, experience of connecting to soil/ food (great for children), reduction of the family budget / shopping bill, fun - relaxing / reduces stress and personal freedom.

RCP 4.5 2030 and 2090 /RCP 8.5 2030		RCP 8.5 2090	
Issue	Action	Issue	Action
Getting past the impasse to get people to understand their role and personal responsibility.	Demonstrate the benefits of ‘taking responsibility’ and providing training in ‘how to’ <ul style="list-style-type: none"> - Healthier - Experience of connecting to soil/ food great for children - Reduce family budget / shopping bill - Fun – relaxing / reduces stress - Freedom 	Personal responsibility and personal impacts - what is it that motivates people to make a change?	Shared vision for the future What do we want? Empowerment – use your power Addressing personal impacts can lead to personal benefits Enable people to take responsibility to achieve personal freedom.

	This could also provide a good business opportunity.		
Lack of community connection on infrastructure (houses and roads)	Provide lots of and diverse opportunities for connection. Policy influence re: green space, and building codes e.g. retirement villages to encourage shade / canopy and community gardens.	Technology to enable community participation – design considerations <ul style="list-style-type: none"> - Water sensitive urban design - Shade - Aeration / ponds - Groundwater replenishment - Solar - Cooling – buildings to encourage air flows etc. 	Take up of new ways to encourage participation “change it up.”
Life is messy!	Change how people think / behave – lead by example / highlight champions. People are a resource that are underutilised.		
Weeds as an asset – being able to understand that where a ‘weed’ grows will provide information about soil condition and what will grow there or may provide lush fire mitigation vegetation.	Look at what, how and where we plant – no monocultures.		
By 2090, water will also be an issue and water security should also be a personal responsibility	Community and school “ponds” – water is very productive (storage, education, food, research). Policy change on water to move away from a culture of take to support environmental services / flows. Improve personal water use efficiency and grey water reuse. Riparian volunteers / educators. Design competitions for children to encourage creative thinking.		

MBO

A holistic approach: Instead of examining an individual issue or problem, this group chose to explore several issues under the scenarios providing a list of suggested actions although these were not put within the context of a single scenario or the time horizons of 2030 and 2090.

ALL CLIMATE CHANGE SCENARIOS (through time)	
Issue	Action
Vegetation (including weeds) More tropical species coming south	Monitoring, modelling, early detection and triage approach to \$\$
Increased urbanisation leading to fragmentation of "good bush."	Save what good vegetation we have now and protect (again triage approach with available funding). Maybe we cannot "save" all species
Prolonged drought and reduced water resources	Revegetate riparian zones, shade creeks – less evaporation, better habitat connectivity and benefits for wildlife
	Buffers around good vegetation i.e. rainforest Buffer around infrastructure and houses (fire) and plant species that reduce the fire threat
	Encourage/ incentives for private landholders rather than Federal / State / Local governments to directly do this work. Land For Wildlife and Voluntary Conservation Agreements and other mechanisms Different species to be considered
Community apathy	Awareness raising at ALL levels! - Simple examples - Appeal to individual reluctance
Water security	Rain water tanks. Reinstate 200Litres/day restriction in Brisbane. Reuse of water Local government / State / SEQ Water SunWater Appropriate plants to climate including crops. Should we grow rice (?)
Aquatic Weeds - Increasing aquatic weeds with increasing temperature	Early detection and rapid response. \$\$ spent early saves many \$\$ later on.... Or the problem becomes "non-fixable." Aquatic weeds multiply water loss via evapotranspiration.

POM