Decarbonising Queensland

Four pillars toward a resilient and inclusive
low-carbon economy

POLICY BRIEF

Decarbonising Queensland: Four pillars toward an inclusive and resilient low carbon economy

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About the Vice-Chancellor's and Directors General Working Group

The Queensland Vice-Chancellors meet quarterly with the Minister for the Environment and Science and Minister for Science and Youth Affairs, Meaghan Scanlon MP. At one of these meetings Minister Scanlon requested that the Vice-Chancellors work together to develop a Queensland Decarbonisation Forum and provide the government with advice on policy options for Decarbonisation.

Important disclaimer

Table of Contents

Glossary

Abbreviation	Description
ACCU	Australian Carbon Credit Unit (AU\$ tonne^{-1} $CO_{2\text{-}eq}$ abated)
Category X	Areas are areas not generally regulated by the vegetation management laws under the *Vegetation Management Act 1999 (Qld)*
CiT	Communities in Transition
CO_2e	Carbon dioxide equivalent of greenhouse gas emissions based on their global warming potential (GWP)
CM2BT	Critical minerals to battery tech
CSS	Carbon capture and storage
ERF	Emissions Reduction Fund (Commonwealth)
ETS	Emissions trading scheme
EU	European Union
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LRF	Land Restoration Fund (Queensland)
LULUCF	Land use, land use change and forestry
NEM	National Energy Market
NZE	Net zero emissions
NZE2050	Net zero emissions 2050
QCAP	Queensland Climate Action Plan
QREZ	Queensland Renewable Energy Zone
R&D	Research and development
RE	Renewable energy
RECoE	Rural Economies Centre of Excellence
RDRP	Regional Drought Resilience Plans
SEEA EA	System of Environmental Economic Accounting Ecosystem Accounts
UK	United Kingdom
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States

Executive Summary

This policy brief provides an assessment of key policy and technical issues, opportunities and options and provides recommendations to support Queensland Government in the design and delivery of the Queensland Climate Action Plan (QCAP) toward net-zero emissions.[1] The findings herein are based on presentations and discussions by leading experts from Queensland universities at the Vice Chancellor's Queensland Decarbonisation Forum, 29 June 2022.

Context

Queensland Government has pledged to achieve net zero emissions by 2050 with interim 2030 targets of 50% renewable energy and 30% emissions reduction below 2005 levels by 2030. This challenge coincides with other policy drivers related to climate adaptation, the need for more effective use of water and the need to protect the Great Barrier Reef. In this policy environment, to transform and diversify Queensland's economy and work toward its climate targets, Queensland Government has introduced a portfolio of policies, sectoral and regional roadmaps and plans, and committed to significant investments such as a $2 billion Renewable Energy and Hydrogen Jobs Fund, $500 million Land Restoration Fund, and New Economy Minerals initiative.

The challenge

Queensland's climate track record to date lags other Australian states. Queensland produces nearly one third of Australia's total annual net emissions (32%, 2020), nearly a third of agricultural net emissions (27.4%) and generates the lowest rate of energy from renewables (19.6%, 2022). In the land use, land use change and forestry (LULUCF) sector, while all states and the ACT are now net stores of carbon, Queensland's remains a significant source of net emissions.

These combined factors present a challenge for Queensland to achieve its 2030 interim targets and net zero emissions by 2050.

Achieving net zero means reducing greenhouse gas (GHG) emissions predominantly from fossil fuels, and increasing long-term carbon stores such as forests, vegetation, soils, and aquatic environments, such that the net sum is equal to zero. The three key challenges to decarbonisation for Queensland are:

1. Energy reliance on thermal coal, with eight aging coal-fired power stations generating 80% of power and nearly half (45%) of emissions;

2. Economic reliance on resource exports, predominantly from extracting coal, coal seam gas and natural gas. These fossil fuels account for the majority of the resource sector's contribution of 11.7% to GDP, employment of 60,000 workers, 81% of exports (2019-20), and around 30% of Queensland's scope 1 and 2 emissions from energy used in extraction, refinement and transport as well as fugitive emissions[2,3]; and

3. Broadscale land clearing of 2.4 million hectares total area between 2010-2018 that has reduced carbon stores, mostly due to a weakening of the *Vegetation Management Act 1999 (Qld)* in 2012.

Key takeaways and recommendations

In recognition of the strategy and actions being rolled out as part of QCAP, the following takeaways and recommendations are provided along four key pillars that are believed to be critical for a smoother, just, inclusive and in-time transition toward net zero (**Figure 1**).
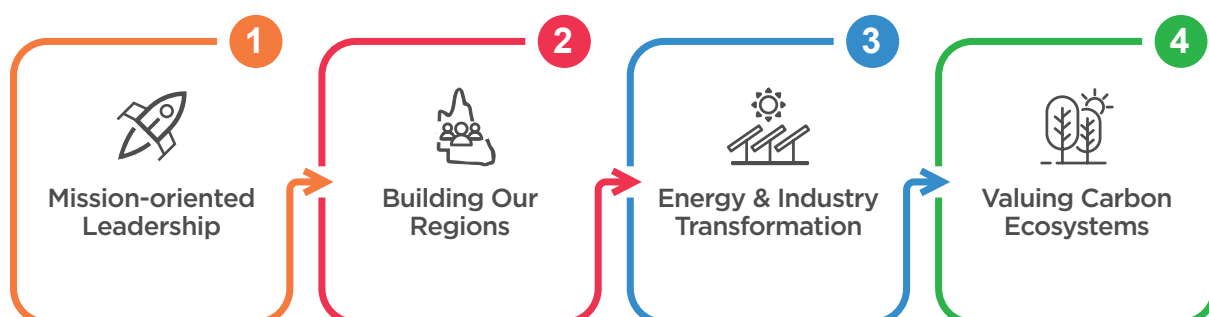

1	2	3	4
Mission-oriented Leadership	**Building Our Regions**	**Energy & Industry Transformation**	**Valuing Carbon Ecosystems**

Figure 1. Four pillars toward Net Zero 2050.

Pillar 1: Mission-oriented leadership is a pre-requisite to decarbonisation, enabling all other elements to succeed.

The scope and scale of transformation required to decarbonise Queensland can only be realised through sustained leadership that sets a clear and consistent direction and an overarching framework. A wide range of carbon emissions policies have been implemented in key economies over the last two decades which can help to inform a tailored solution for Queensland[4]. Other markets such as the EU are introducing carbon border adjustment mechanisms that will affect imported goods with a high carbon footprint. Without a clear plan for decarbonisation, investment will not be efficient. Building on the QCAP and other mechanisms in place, we recommend that Queensland Government:

1. Develop a mission-orientated, centrally coordinated and whole-of-government approach with an integrated policy framework that aligns social, environmental and economic policy across the climate, energy, water, resources, industry and regional development domains.

2. Enshrine net zero 2050 targets in legislation to send a clear signal to the market of Queensland's commitment.

3. Increase the risk appetite of government to invest in and support new and emerging low-carbon industries and infrastructure in lieu of subsidies to high-carbon legacy industries.

4. Prioritise deployment, scaling and R&D around evidence-based feasible, clean technologies such as energy storage and hydrogen, but be cautious of options such as carbon capture and storage (CSS) that provide a narrative for high-emitting industries to continue operating in a 'business as usual' manner until such technologies become affordable.

5. Establish a dedicated Decarbonisation Technology and Policy Innovation Hub to foster knowledge exchange and strong partnerships between research, government, industry and communities to ideate, develop, test, implement and evaluate policy and technology solutions.

6. Engage Queenslanders to play a part in the transition through community engagement, genuine consultation, co-design of place-based solutions and by encouraging communities to share their stories. Disengagement and communication voids may otherwise be filled by media and some lobbyist narratives that promote conflict and crisis and minimise the benefits associated with the transitions.

Pillar 2: Building and strengthening our regions – the backbone of Queensland's economy.

The regions are the backbone of the Queensland economy. Unlike other states, more than half of Queenslanders live and work in the regions. Here is also where most of the socio-economic impacts of decarbonisation will occur. Regional economies need to be strengthened and diversified to provide a smoother and just transition for workers, businesses and communities. Here, the Queensland Government should,

7. Develop long-term regional transition strategies and avoid ad hoc policy interventions which create "engagement fatigue" within regional communities and industries.

8. Fund place-based research that captures more granular spatial data to gain a deeper understanding of the diversity, uniqueness and vulnerabilities of Queensland's regions and their economies, workforce and community needs. This will strengthen the evidence base to support policy and strategies for inclusive and just transitions to low carbon economies, identifying threats, risks and opportunities. Essential, is to work with regional and rural communities and Traditional Owner groups to co-design solutions and support bottom-up programs with top-down leadership created through a consistent whole-of-government approach.

9. Establish more robust regional strategic and tenure planning for integrating sustainable land use, energy projects and water allocation. The certainty from providing such a stable platform is essential to attract significant private and public investment into Queensland's regions and emerging industries and will maximise value through integrated water development, energy, agriculture and manufacturing opportunities. This would be particularly important in catchments adjoining large regional centres.

10. Develop an integrated workforce strategy to ensure appropriate skills and knowledge for new and enhanced industries in a decarbonised economy.

Pillar 3: A rapid energy transformation to power a future-focused economy.

Economies and industries are built on energy, and renewables are now the cheapest form of energy available. A rapid transition to a mix of renewables with ample battery storage and gas for energy security will provide a clean, affordable, reliant and sovereign supply of abundant energy. This will enable the electrification of road transport, industry and households to decarbonise, and power new and emerging industries such as hydrogen production and critical minerals to battery technologies. Energy and industry are the key areas to transform for deep decarbonisation. Actions to fast-track net emissions reductions from these sectors are as follows:

11. Include as part of the Queensland Energy Plan a clear roadmap to phase-out state-owned and private coal-fired power stations as soon as feasible.

12. Build a critical minerals to battery tech (CM2BT) sector, including through the establishment of a Research Centre of Excellence that will support a state-wide environmentally and socially sustainable CM2BT extraction to manufacturing sector to enable the export of innovative, high quality, products required for decarbonisation.

13. Recognising the forthcoming review and reforms of the federal safeguard mechanism, Queensland Government should identify businesses whose emissions fall above emissions limits and lobby the Commonwealth Government to:

    • Stop allowing high-emitting entities to apply for an exemption to exceeding emissions caps under the safeguard mechanisms without penalty.

    • Establish an independent authority to report and audit net emissions of mining and industry organisations.

Pillar 4: Properly valuing the carbon storage and services that ecosystems provide

The land sector is not only a source of emissions from land use and agriculture, it also removes and stores carbon from the atmosphere through ecosystems and improved land management practices – the only proven carbon capture and storage process at scale.

The Emissions Reduction Fund (ERF) to date has largely focused on carbon credits to trade offsets of emissions released from one sector to carbon stored in another. The integrity of some approved ERF methods is questionable, and significant gaps have been found between estimated carbon abatement levels and carbon stored 'on the ground' once projects are implemented. Ideally, effective carbon markets should follow the mitigation hierarchy (*avoid; reduce; offset residuals*) by favouring methods that a) avoid and reduce emissions from the source, and, b) increase carbon removal and retention in forests, other ecosystems and soil. Offsets should be a last resort for residual emissions that are most challenging to abate.

Australian farmers need greater support to adopt more sustainable farming methods and to ensure food security and regional economic development. In general, Australian farmers receive low levels of producer and general services support compared to farmers in New Zealand, the EU, Canada, and the US. As a consequence, there are anecdotal reports of some farmers reducing food production in favour or passive income from carbon credits.

To improve carbon stores and sustainable use of the land sector, Queensland Government should:

14. Adopt 'smart regulation' to further reduce land clearing and deforestation. Environmental and planning law have been the only instruments to date, but a toolbox of regulatory and market-based instruments is needed to achieve improved outcomes. Such tools might include:

   • A tightening of regulations under the *Vegetation Management Act 1999 (Qld)* to reduce Category X[75] clearing, thinning and environmental clearing exemptions.

   • A Just Transition policy that explains the government's approach to fairness and inclusion in the transition to sustainable agriculture which aligns with the *Human Rights Act 2019 (Qld);* and

   • Due diligence supply chain reforms that increase the transparency of goods and enable consumers to make more informed choices, driving sustainability across supply chains.

15. Increase support and incentives for farmers to adopt more sustainable land management practices and to increase participation in the Land Restoration Fund. Examples might include encouragement of aggregated carbon projects facilitated by brokers to reduce the administration load to farmers for participating in LRF projects and streamlining regulatory approval processes for coastal wetland restoration and blue carbon projects.[5]

16. Review and act on the recommendations of the forthcoming independent review on the integrity of Australian Carbon Credit Units (ACCUs) under the Emissions Reductions Fund to increase the integrity of existing and future carbon and environmental markets such as the Reef Credit Scheme.

Commonwealth Government

Much of the decarbonisation activity requires federal action. Queensland Government should petition the Commonwealth Government to:

17. Incentivise carbon footprint product labelling and certification (including for imported products) that would enable consumers to make more informed choices and drive suppliers across the value chain to adopt more sustainable practices.

18. Inform and make exporters aware of the requirements and impacts to their market access if and prior to other markets introducing carbon border adjustment mechanisms.

19. Direct the Clean Energy Regulator to reform the carbon credit system to provide effective long-term carbon credits.

20. Consider Native Title reform that will provide First Nations peoples with greater access and use of Native Title lands so that they can apply traditional knowledge to manage and restore Country as well as increase their participation in ERF and LRF schemes. Reforms should be done in consultation, co-design and collaboration with First Nations groups.

21. Reform federal market mechanisms such as the ERF to favour projects that follow the mitigation hierarchy (*avoid; reduce; offset residuals*), ensuring that carbon offsets are only used for unavoidable emissions as a last resort.

22. Consider introducing a partial crediting multiplier in carbon offset project accounting rules whereby only some fraction of actual emissions reduced receive tradable credits in order to counter the risks of non-additionality, non-permanence, and leakage.

23. Use the UN carbon accounting framework, System of Environmental Economic Accounting Ecosystem Accounts (SEEA EA) to inform mitigation land-related carbon policy and programs.

Background and context

On 29 June 2022, more than 100 delegates from universities and research organisations, government and industry came together for the Vice Chancellor's Queensland Decarbonisation Forum at Queensland University of Technology, Brisbane. Over the forum, leading experts from Queensland universities across the natural, technical, social, regulatory and political sciences presented a number of challenges, opportunities, barriers and enablers toward Queensland's net zero 2050 goal with debate and discussion from delegates. This policy brief outlines a number of these policy and technical issues and the opportunities and options to support Queensland Government in the design and delivery of the Queensland Climate Action Plan (QCAP) and its targets.[6] The brief is intended to be the start of a dialogue between Queensland's science and research community and government to establish the foundations needed to put Queensland on a transformative path toward a just and timely net zero future. We note that it is not an all-encompassing assessment and recognise that some important topics are not covered in depth.

Policy issue

Current global emissions trajectories predict a vastly changed climate that poses tremendous risks (IPCC, 2022).[7] Australia is now experiencing the impacts from 1.1 °C of global warming above pre-industrial levels and another 0.4 °C of warming is already locked in. Observed impacts include both rising climate trends (warming, sea level) and an increase in the frequency and/or intensity and/or severity of extreme weather events – including heatwaves, droughts, bushfires and floods. If current global emissions trajectories eventuate, we face catastrophic climate risks with more systems reaching their limits of adaptation resulting in irreversible loss and damage. Failure to reduce emissions sufficiently to limit global warming to around 1.5 °C will result in levels of climatic disruption that threaten the integrity of human and natural systems and our socio-economic stability (IPCC, 2022).[8]

In response to IPPC recommendations for governments to work toward net zero before or no later than 2050[9], as well as Commonwealth commitments[10], Queensland Government has pledged to net zero emissions by 2050[11] with interim targets by 2030 of,

- 50% renewable energy (20% achieved to date)[12];
- 30% emissions reduction below 2005 levels (14% achieved to date).[13]

The challenge: energy, fossil exports and the land sector

Essentially, getting to net zero emissions means avoiding anthropogenic carbon emissions from sources and/or increasing long-term carbon storage in sinks (soil, vegetation, aquatic), such that the net sum is equal to zero.[14] Queensland has one of the most difficult paths to reach net zero targets.

On the emissions avoidance side, dependence on coal, coal seam gas and natural gas as export commodities and for the state's electricity is the largest elephant in a rapidly warming room. As resource commodities, fossil fuels are important contributors to the Queensland economy. Mining activities account for 11.7% GDP (2019-2020), employ over 60,000 workers and contribute 81% of Queensland's exports.[15] Mining of coal and extraction of oil and gas are responsible for approximately 30% of Queensland's scope 1 and 2 emissions because of the energy used in extraction, refinement and transport and fugitive emissions[16]. Since virtually all Queensland's metallurgical coal and around two-thirds of thermal coal are exported, Scope 3 emissions created when used in other countries, though significant, are excluded from domestic climate targets.

In terms of energy, Queensland is reliant on eight coal-fired power stations which generate approximately 80% of the state's stationery energy and produces nearly half (45%) of Queensland's total annual emissions (164.5 million tonne CO_{2-eq} at 2019). A further 13% of emissions are from the transportation sector[17].

Beside fossil fuels, the land sector is critically important as both a source of emissions and a sink for carbon removal. Queensland net annual emissions from the agriculture and land sectors were 32.4 MCO_2e (12%) in 2020. The main culprit is broadscale land clearing of more than 2.4 million hectares of total area between 2010-2018; a major factor being a weakening of the *Vegetation Management Act 1999 (Qld)* in 2012. Subsequently, Queensland is now the highest domestic net emitter from the land sector and is considered a global hotspot for biodiversity loss.[18]

Though strides by the Labor Government to re-introduce legislation have significantly reduced land emissions in recent years, all other jurisdictions with the exception of the Northern Territory have seen the land sector become net sinks rather than sources of carbon, pointing to what can be achieved.[19] In the land sector, native forest growth is the primary mechanism for carbon removal. Carbon trading schemes such as the Commonwealth's ERF which is supported by Queensland's Land Restoration Fund (LRF) couple the fossil fuel and land sectors by enabling some fossil fuel emissions to be offset by withdrawals in the land sector. The integrity of these schemes, however, is critical if they are to make a real contribution to emissions reductions and biodiversity conservation for a timely achievement of net zero.

The opportunity: Queensland's abundant assets make it well positioned to modernise to a global leading economy

Queensland is a leader in education, science and technological innovation, supported by government investment in programs such as Smart State and Advance Queensland. Australian science institutions rank in the top 1% including for computer science, genetics, medicine, space and a rapidly growing tech sector contributing 3% of GDP in 2021.[20] We have strong institutions and a stable political system by global standards, and an abundance of natural capital including the Great Barrier Reef and high biodiversity among our desert, temperate, coastal and rainforest landscapes to name a few. We have vast amounts of land, sunshine, and wind to provide more clean energy than we could need, as well as deposits of minerals and metals critical for battery storage technologies. We have all the ingredients at our fingertips to become a world leader of a low-carbon economy.

Queensland Government faces a challenging agenda including balancing a post-COVID budget amidst concerns including an economic slowdown, rising inflation, escalating energy prices and security risk, regional disadvantage, and exports vulnerable to global net zero emissions policies. At the same time, the government must seek to navigate the complex suite of issues involved in decarbonisation.

Yet, the path to net zero offers an unprecedented opportunity to overcome lock-in and status quo behaviours and legacy policies. This is an opportunity to take a systemic approach to create a modern and diverse economy.

> "Economists no longer talk of decarbonisation as a cost; climate action is now widely seen as an investment. Like any investment in new economic sectors, money spent is expected to be more than made back by the benefits it brings." (Ainscough, 2022)[21]

While we celebrate the industries that built the Queensland of today, we must look to the industries of tomorrow and ensure that Queensland is not left behind.

The path to net zero will require economic diversification, particularly for regional and rural Queensland, a mass reskilling of the workforce, infrastructure and investment, and new trade markets for products and services. Most of all it will require the social licence and support from the public and industry, and with that political will and sustained leadership. An overarching whole-of-government mission and phased transition plan are key. Essential are strong but flexible underpinnings that support behavioural, technological and policy innovation, and that bring all Queenslanders along for the journey in ways that are fair, equitable and just.

What is Queensland Government doing?

To transform and diversify Queensland's economy and work toward its climate targets, Queensland Government has recently introduced a portfolio of policies, sectoral and regional roadmaps and plans, and committed to significant investments (**Table 1**).

To drive innovation into industry, the $125 million Innovation for a Future Economy initiative seeks to accelerate economic growth opportunities for Queensland in the lead up to the Brisbane 2032 Climate Positive Games, while the $17 million Science into Industry program will foster partnerships between universities and industry to accelerate the commercial application of major research.

Table 1. Queensland Government policies by sector in support of climate and decarbonisation targets

Sector	Initiative
Technology & Innovation	Advance Queensland – Innovation For a Future Economy Roadmap 2022–2032
	$125.2 million investment to accelerate economic growth opportunities for Queensland in the lead up to the Brisbane 2032 Climate Positive Games.
	$17 million for Science into Industry to foster partnerships between universities and industry, and accelerate the commercial application of major research.
Energy and Transport	$2 billion Renewable Energy & Hydrogen Jobs Funds
	Queensland Energy Plan (to be released third quarter 2022).
	$145 million for three Queensland Renewable Energy Zones (QREZ)
	The Future is Electric: Queensland's Electric Vehicle Strategy and the Queensland Electric Super Highway (QESH) 2017.
Land and Agriculture	Draft Queensland Low Emissions Agriculture Roadmap 2022–2032
	$500 million Land Restoration Fund
	$35 million Queensland Natural Capital Fund
	$140 million for Agriculture and Fisheries to drive productivity and innovation in Queensland's livestock, aquaculture, cropping, horticulture, forestry, timber and food processing industries through world-class research, development and extension.
	$250m toward the Queensland Protected Area Strategy.
Resources and Mining	Queensland Resource Industry Development Plan 2022–2052.
	New Economy Minerals Initiative
	$68.5 million for Resources Industry Development to invest in the discovery, development and manufacturing of new economy minerals for renewable and advanced technology.
Industry, employment & workforce	$50 million for Advanced Manufacturing for the Made in Queensland and the Manufacturing Hubs Grant Programs to increase international competitiveness and help companies scale their business to take advantage of growth opportunities.
	Advanced Manufacturing 10-Year Roadmap and Action Plan (2016–2026)
	Queensland Biofutures 10-Year Roadmap and Action (2016–2026)
	Queensland Industry Roadmaps 2017/18–2027/28 (aerospace, biomedical, defence, mining equipment, technology and services, screen industry, agriculture and food)
	Six regional manufacturing hubs
	Building Acceleration Fund
	$3.34 billion Queensland Jobs Fund
Regional economies and communities	Eight regional economic recovery plans 2021-22
	Building Our Regions ($348 million infrastructure. Completed 2022)
Procurement	Buy Queensland Procurement Strategy (2021)

For energy transitions, investments include a $2 billion Renewable Energy and Hydrogen Jobs Fund, $145 million to establish three Queensland renewable energy zones (QREZ) and a further $40 million to upgrade transmission networks. The Queensland's Electric Vehicle Strategy and the Queensland Electric Super Highway (QESH) outlines a path to a low-carbon transport sector. The new Queensland Energy Plan is anticipated for release in the third quarter of 2022.

In the land and ag sectors, the $500 million Land Restoration Fund is the government's centrepiece – a market mechanism for farm- and land-based projects that deliver carbon abatement and co-benefits. More recently the government has made commitments of $35 million toward a natural capital fund and $250 million to the Queensland's Protected Area Strategy (2020–2030), a key focus of which is to protect south-east Queensland's koala populations. A $140 million investment into agriculture and fisheries will help to diversify Queensland's economy and secure food and biomaterial supply chains by driving productivity and innovation in livestock, aquaculture, cropping, horticulture, forestry, timber and food processing industries through world-class research, development and extension. A Draft Queensland Low Emissions Agriculture Roadmap (2022–2032) has been released for consultation.

For industry and the regions, the New Economy Minerals Initiative and a $68.5 million Resources Industry Development Fund will be invested in the discovery, development and manufacturing of new economy minerals for renewable and advanced technology. The Made in Queensland strategy seeks to build the state's manufacturing capacity and diversify and build industries, including in battery storage and low-carbon technologies, aerospace, biomedical, defence, mining equipment, technology and services, screen industry, and agriculture and food. These are supported by $3.4 billion for the Queensland Jobs program to upskill the state's workforce, $50 million for Advanced Manufacturing, including six manufacturing hubs across the state, a Building Acceleration Fund for construction, and the Buy Queensland public procurement strategy. These investments underpin the various roadmaps developed for manufacturing, biofutures and emerging industries as well as eight regional economic recovery plans.

Criteria to assess, prioritise and develop policy options

Guiding principles for a successful transition

The transition to a low carbon economy is underway in Australia with significant social, economic and employment challenges anticipated for carbon-exposed states and regions. For a transition to succeed it must, of course, reduce emissions. However, what it must also do is ensure that the benefits and burdens of any transition – its financial cost, its lifestyle sacrifices, monetary benefits, employment opportunities – are fairly shared. This dimension is crucial to ensuring that vulnerable individuals and regional communities are not made worse off by any transition strategies. Here we outline some of the guiding principles for successfully managing an inclusive transition and pathway to net-zero emissions.

Equity and social justice need to be at the heart of transitions to decarbonisation. Engaging and ensuring environmental and social justice for First Nation communities must be central in the decarbonisation process. If we do not make sure everyone benefits and feels as though they are getting a share of the benefits, they will be left behind. This dimension is crucial to ensuring vulnerable individuals and communities are not worse off because of decarbonisation strategies. Vulnerability assessments should be based on intersectional analysis including geographical location, race, gender and age. Adopting environmental and social justice goals as well as reducing emissions is a way of making a climate transition more acceptable to the public as well as fairer. Ignoring the importance of justice and equity reduces an ability to appropriately consider other benefits of a climate transition, as well as lessening the likelihood of a successful transition.

Promoting co-benefits. Carefully planned climate action can result in multiple positive non-climate benefits in addition to climate mitigation or adaptation, such as reduced air and water pollution, job creation, reduced inequality, First Nations peoples, enhanced biodiversity and improved public health. Designing policies that

tackle both climate change and other city or regional priorities can bolster support from local stakeholders, increasing the likelihood that the policy will be approved, which in turn accelerates climate action.

Placed-based solutions that incorporate diverse voices and perspectives in transition planning, and which meet the aspirations and expectations of local communities are considered vital to successfully managing regional and city-based transitions associated with a shift to non-carbon intensive energy forms. Having a holistic understanding based on the experiences of individuals and communities ensures that the impacts of proposed government policies and regional development plans are captured.

Just transitions. Transitioning to low carbon economies creates risks, threats and opportunities (Babacan, 2022). A 'just transition' as a central aspect of transitioning to a low carbon economy and renewable energy sector. The just transition concept, which originally emerged from labour unions seeking to balance both environmental and employment concerns for their members, sees energy transitions and regional economic transitions as intrinsically linked. Just transition maintains that the burdens of climate action should not be borne by one set of workers or communities, which encapsulates a geographical perspective on the social distribution of the costs and benefits of decarbonisation.

Diverse leadership and responsibility. It is important that government leaders, the research community and the media frame the pathway to decarbonisation in terms of a shared responsibility with clear accountability established for governments, corporations, communities, civil society organisations and individuals, avoiding binaries that divide shared interests, such as the jobs versus the environment debate. All levels of government, industry sectors and diverse communities of Queensland have a role to play in designing and implementing transition pathways.

Risk management. Climate change risk management needs to include a combination of policy responses from mitigation to adaptation and knowledge-based expansion, which involves learning and understanding about the climate system, cultural heritage and non-human species, which can help support proactive risk management.

Circular economy, sustainable procurement and resilient supply chains The circular economy is part of the decarbonisation story. By closing, slowing, and narrowing resource loops across supply chains, we can reduce energy, waste and virgin resource extraction that all contribution to our emissions footprint.

Approaches to policy development

Dominant styles of governance and policy making have tended to compartmentalise the low-carbon challenge. Financial sustainability, for example, frequently remains a question for economic policy, yet ecological sustainability falls under the remit of environmental policy and is detached from other policy fields. The limited nature of policy integration for low-carbon adaptation is now recognised by bodies such as the World Health Organisation (2019), which has warned that:

> "Climate change discourse – including the way mitigation and adaptation measures are designed and appraised – tends to emphasize environmental, economic or technological inputs and costs. The social dimensions of climate change are not well understood or addressed. As a result, current policy responses may not fully address the negative impacts nor do they take full advantage of potential opportunities to reach a number of Sustainable Development Goals."

These macro-level issues are reflected in specific urban planning policy domains within the cities and regions of Australia. In particular, transport and urban living in capital cities represents a sub-national microcosm of the larger disconnect between social policy, urban planning and environmental policy.

What is required in policy analysis and development is a more integrated approach so that social dimensions can be brought into the examination of the consequences of a carbon intensive economy. In addition, a more considered approach to incorporating the role of social institutions in developing viable transitions to a low-carbon future is needed. Without an integrated approach there is a risk that climate and environmental policies will have reduced impact due to low rates of engagement with the community.

Participatory and deliberative modes of policy making which give citizens a voice have a significant role to play in terms of the refining and legitimating transition planning and policy solutions. The contribution that such mechanisms can make in terms of a low-carbon transition goes well beyond the search for a cosmetic form of policy credibility. If institutionalised correctly, deliberative forums can have a meaningful role in terms of policy design and evaluation (Davidson and Stark 2011)[22]; can encourage preference transformation in ways that are sympathetic to environmental goals (Niemeyer 2011)[23]; and can act as an antidote to overly technocratic and rational-scientific modes of policy making. In these contexts, the characteristics of a deliberative process – equal participation, exchange of reason and preference transformation – can bring something new to the policy analysis process, including a deeper, more reflective strand of policy evidence, that comes from the 'citizen-philosopher' who is directly engaging with policymakers about 'real world' outcomes (Niemeyer 2014)[24].

Policy Options to Decarbonisation

Based on the presentations of leading experts and discussions held at the Vice-Chancellor's Queensland Decarbonisation Forum, a number of key themes emerged around four pillars essential to achieving decarbonisation. These are 1) mission-oriented leadership; 2) building our regions; 3) energy and industry transformation; and 4) valuing carbon ecosystems (**Figure 1**).

Pillar 1: Mission-oriented Leadership

1.1 Develop a whole-of-government "mission-orientated" approach and integrated policy framework

At the highest level, genuine and deep emissions cuts begin with a strong overarching vision toward a clearly defined goal to achieve cohesive and coordinated action. What Mariana Mazzucato defines as a "mission-orientated" approach, she references NASA's Apollo 11 "moonshot programs" as the archetype of what can be achieved at a grand scale through collective public and private impact.[25] Though it doesn't necessarily regulate and dictate what departments, industry or individuals "should" be doing; it is directed by the broader, shared goal at hand.

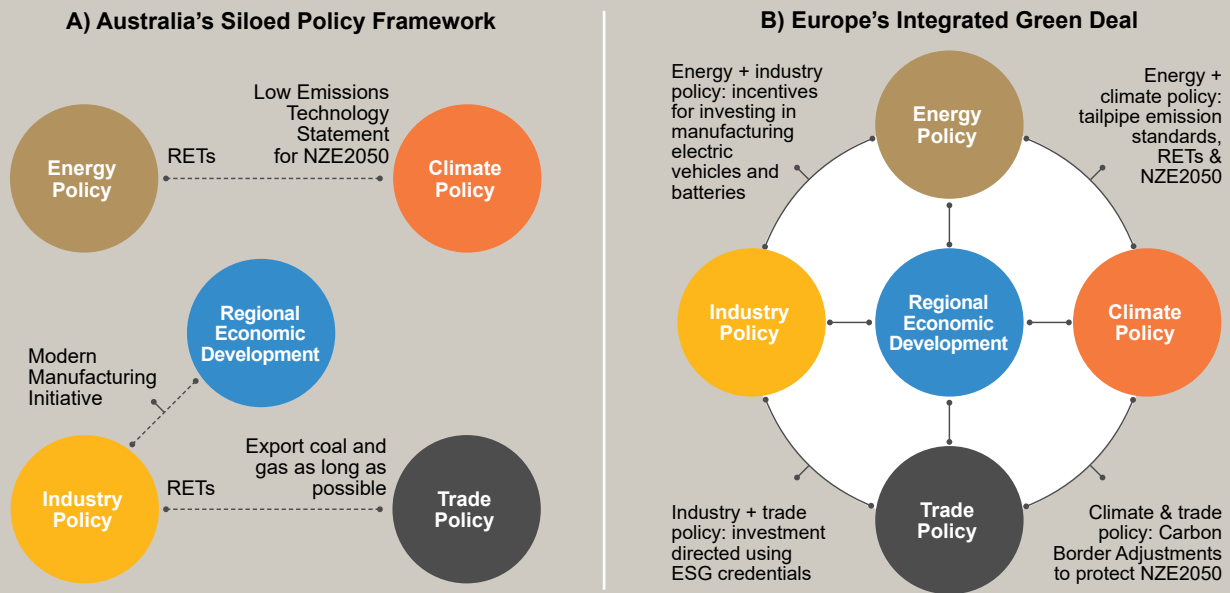The European Green Deal defines such clear climate and sustainability goals of,

> "…making the EU's economy sustainable by turning climate and environmental challenges into opportunities across all policy areas and making the transition just and inclusive for all. The European Green Deal aims to boost the efficient use of resources by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution. It outlines investments needed and financing tools available, and explains how to ensure a just and inclusive transition. The European Green Deal covers all sectors of the economy, notably transport, energy, agriculture, buildings, and industries such as steel, cement, ICT, textiles and chemicals." (European Commission, 2019).[26]

Australia and Queensland's current policy landscape, however, is based on decades of siloed policies created at a sectoral level and ad hoc policy interventions that have subsidised legacy sectors and struggled with effective industry policy (Molyneaux, 2022).[27] Instead of a framework to support innovation and commercialisation, policymakers have tended to subsidise favoured companies in legacy industries against cheaper imports (Conley & Van Ackert, 2011).[28]

For place-based initiatives such as the Clean Growth Choices Consortium's Communities in Transition (CiT) pilot to be scaled effectively, Dale (2022) argues that a bilateral and whole-of-government approach is essential to their success,

> "If [the Communities in Transition pilot] was our training wheels for decarbonisation, the next time we start do this for decarbonisation work, there needs to be a long-term, whole-of-government response and capability raised from the outset. I know there's a great desire to do that and there continues to be, but it is much more difficult to implement these in a more fragmented way from back within the community, then with a really cohesive bilateral response, to a certain extent, between state and Commonwealth governments. We've got to be able to lift up our ability to bilaterally respond to these types of strong community-based initiatives."[29]

Integrated policy frameworks that support regional economic development and new industries to play a role in decarbonization is critical. Once again, the European Green Deal provides a model for a holistic approach that aligns policy across key sectors. Here, industry policy is integrated with energy, climate and trade policy, for regional economic development (**Figure 2**). The Green Deal framework directs investment to the key pillars of carbon abatement: the shift of electricity supply to renewable energy,

A) Australia's Siloed Policy Framework

- Energy Policy
- Climate Policy
- Regional Economic Development
- Industry Policy
- Trade Policy

RETs

Low Emissions Technology Statement for NZE2050

Modern Manufacturing Initiative

RETs

Export coal and gas as long as possible

B) Europe's Integrated Green Deal

- Energy Policy
- Industry Policy
- Regional Economic Development
- Climate Policy
- Trade Policy

Energy + industry policy: incentives for investing in manufacturing electric vehicles and batteries

Energy + climate policy: tailpipe emission standards, RETs & NZE2050

Industry + trade policy: investment directed using ESG credentials

Climate & trade policy: Carbon Border Adjustments to protect NZE2050

Figure 2. Comparison of policy integration for key sectors to achieve decarbonisation between the Commonwealth of Australia and the European Union Green Deal (Molyneaux, 2022).

the electrification of transport, projects with acceptable environmental, social and governance (ESG) credentials, and to regional areas disaffected by a shift away from fossil fuel production. A hallmark of its trade policy is the carbon-border-adjustment (CBA) mechanism that will protect the EU economy against unfair competition from countries with weaker ESG and decarbonisation credentials. Importantly, the EU approach has created Just Transition policies for each sector impacted by the Green Deal (e.g. energy and agriculture just transition policies). The scaffolding for the Green Deal framework thus utilises energy policy, climate policy, trade policy and industry policy for regional development to achieve a just transition.

To send clear signals to citizens and markets about where the EU is heading, on 9 July 2021, the EU goal to become climate-neutral by 2050 and to reduce greenhouse gas (GHG) emissions by at least 55% by 2030 compared to 1990 levels was enshrined in the European Climate Law and entered into force on July 29.[30] Closer to home, Victoria has enshrined its targets in its *Climate Change Act 2017,* while at the Commonwealth level, the House of Representatives looks likely to passage Labor's bill enshrining a minimum 43% emissions reductions target by 2030 and net zero by 2050.

1.2 A governance model of distributed, well-connected nodes of decision making

Multi-dimensional perspectives are needed to address complex and/or wicked policy problems but coordination can be a challenge. In this regard, environmental issues have tended to shift from traditional top-down to more flexible governance arrangements. Polycentric governance is considered to be one of the most effective ways to achieve collective action for wicked problems by enabling multiple governing bodies to interact and make decisions about a specific and complex policy issue.[31] Polycentricity essentially provides multiple cross-cutting "nodes" of decision making – each node being self-governing and independent of each other – but that come together to achieve a common objective. For example, the Reef Restoration and Adaptation Program (RRAP) – a joint venture between multiple research institutes, the Commonwealth's Reef Trust Partnership and the Great Barrier Reef Foundation – has adopted a polycentric governance approach to deliver and execute its integrated 10-year R&D program. RRAP aims to provide a level of health security for the Reef by developing safe and effective new interventions before they become critically needed. A wide range of stakeholders from government, the private sector, science community, Traditional Owners and the media are considered, however, decisions about reef management remain centralised around a handful of players: federal and state governments and universities who inform a collective action managed through centralised nodes (**Figure 3,** Newlands, 2022).[32]
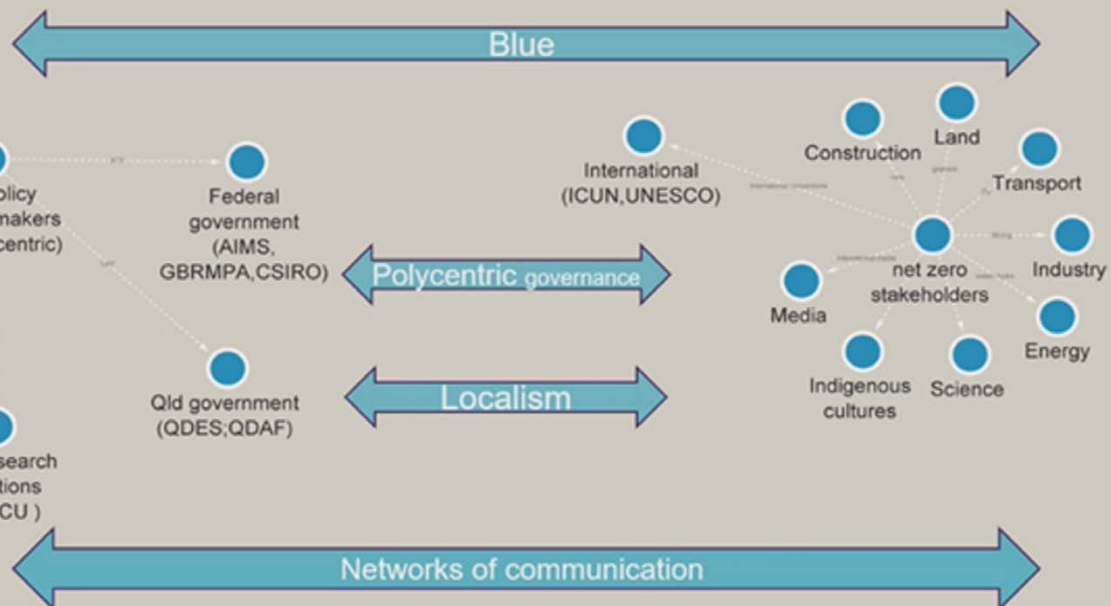
Figure 3. A polycentric governance model of the Reef Restoration & Adaptation Program (Newlands, 2022).

Germany's Ruhr region is another example of where a polycentric approach has been used to transition the region from coal through cooperation at multiple levels from the city, regional, and national governments and institutions to achieve climate goals (Oei et al. 2020)[33].

1.3 Governments must take appropriate risk

Australia's governments have a risk averse appetite. The fear of the political fallout of "picking losers", a belief that labour and therefore manufacturing is too expensive, and a perception that Australia cannot be globally competitive without mining, are some factors that have resulted in decades of ad hoc policy interventions and subsidising legacy industries (Molyneaux, 2022). For deep decarbonisation, Queensland Government needs a sound risk management framework to weigh the risks of continuing to subsidise an industry against the risks of not decarbonizing.[34] Mazzucato (2018)[35] explains that this is not about "picking the winners" but "picking the willing," – "those organizations across the economy (in different sectors, including both the public and private sphere) that are "willing" to engage with a societally relevant mission".

Countries like Japan, Taiwan, South Korea, China and Germany have been successful at developing new sectors. In all cases, there is a strong relationship between industry, government and research, and commitment to success. In order to address the barriers to decarbonisation associated with policy frameworks, Australian policy makers need to ensure a common theme of decarbonisation is interlocked through all policy areas. In addition, risk management of the policy agenda should seek to encourage policy mechanisms to address multiple paths to decarbonisation rather than a single 'optimal' path which is vulnerable to failure. Mazzucato states here that governments can learn from the portfolio strategies of venture capitalists about sharing risk and reward by,

> "Structuring investments across a risk space so that lower-risk investments can help to cover the higher-risk ones. In other words, if the public sector is expected to compensate for the lack of private venture capital money going to early-stage innovation, it should at least be able to benefit from the wins, as private venture capital does. Otherwise, the funding for such investments cannot be secured."[36]

This has not been the case in Australia so far outside of fossil fuel industries. In the land sector, private enterprise has largely carried the risk of abatement technologies due to a lack of cohesive climate policy, particularly at the federal level (Doran-Browne, 2022).[37]

1.4 Invest in deployment, scaling and R&D of evidenced based solutions; and caution unworkable solutions that allow business-as-usual to persist.

Though taking appropriate risk is needed, caution must be taken against policies in support of technologies that Quiggin (2022)[38] claims have "appealing narratives," but evidence suggests they are unlikely to work in Australia. Such examples include nuclear energy and geological carbon capture and sequestration (CSS) technologies which Quiggin describes as a "marginal technology,"

> "If all of the CSS projects under development came online e.g. fossil emissions from power stations for long-term storage underground in stable geological forms, it would reduce global emissions by just 0.4%."[39]

The high cost of these technologies, coupled with their limited carbon offset potential means that such options hold low mitigation value overall.

1.5 Establish a decarbonisation knowledge exchange and translation hub

The complex policy, technical and social nexus of decarbonisation requires strong collaboration. A dedicated knowledge and advisory hub that provides timely, rigorous evidenced-based advice can help decision-makers to define decarbonisation problems, identify various policy solutions and assess the policy outcomes (Haas, 1992).[40] Such a hub would provide a vital source of information for governments and industry groups to draw upon to help solve policy problems in real time. Such a hub could draw upon academic and practitioner expertise across a multitude of disciplines including the technical and natural sciences as well as social, economic, regulatory and political sciences to partner and work on cross cutting issues. In conjunction to a virtual network across state universities, a physical hub would provide a think tank and meeting point for policy labs, roundtables, consultation and engagement, collaborative research, and to test ideas and co-develop solutions with industry and government. The decarbonisation knowledge exchange hub would extend across multiple universities and include a network of specialised sub-groups working on specific issues which could feed into a central policy advisory committee, to act as a broker between industry, government and research.

A model of a research-policy hub that might help inform the design of the Decarbonisation Knowledge Exchange Hub was the case of the Queensland Centre for Social Science Innovation (QCSSI) which was supported by the Queensland Labor Government in 2011. The proposed model focused on a jointly funded social research and policy innovation hub, which was to be funded with a $5 million commitment from Queensland Government over five years and a collective $5 million commitment from Queensland universities over the same period. The research program was to be determined on a project by project basis governed through a Board of Directors involving node leaders from each of the universities and relevant Queensland Government Departments with an independent chair.

1.6 Suasion instruments as effective ways to overcome behavioural barriers

It is not enough for government and the research community to develop decarbonisation solutions. Queenslanders must be active participants, doing their bit to reduce consumption, energy, water and waste and sending signals to the market by purchasing more sustainable products and services. The government can help nudge Queenslanders' behaviours by introducing market-based and/or due diligence policies which target unsustainable production and consumption.

Deane (2022)[41] argues that a barrier to pro-environmental behaviour is the status quo. Often, failure for people to act more sustainably is not due to a lack of concern but rather is deep rooted in habits, norms and past behaviour. Though regulatory stick-type interventions are sometimes necessary, they can lead to a doubling down of behaviours when individuals or organizations perceive that their right to choose has been taken away. To avoid such reactance, it is important that a degree of autonomy is introduced into policies, whether the stakeholders be individuals, regional communities or organizations. Suasion instruments that inform and incentivise actors to modify behaviours without overt force are desired (Gunningham & Sinclair, 1999, Olive, 2017).

For example, locally-intensive public awareness campaigns such as the UK's Love Food, Hate Waste program led to a 15% reduction in avoidable household food waste (Yamakawa et al. 2017).[42] Nudging interventions are another way to incentivise good behaviour (or discourage undesirable behaviour) that allow individuals a degree of discretion, but that influence choices in such a way as to make the more sustainable choice more *convenient*, *attractive*, or *setting a new status quo*. Some examples of nudging interventions include placing general waste bins further away than sorting/recycling bins (convenience), setting the default for compulsory superannuation contributions into investment funds that have the highest ESG credentials (the latter example also acting as a signal to industry to lift their ESG rating), and framing options, for example a UK study revealed labelling vegetarian food as "meat-free" was only half as popular as the label "field-grown".[43]

Newlands (2021)[44] also emphasised that trust is another requisite to create pro-environmental behaviour change. For instance, a study that examined behavioural change to improve reef water quality found that politicised media discourse led to reduced trust in governments by citizens which led to poor public engagement and practices to improve reef water quality[7]. It found that the key factors to building trust were keeping stakeholders informed through consistent messaging and actions that aligned with those messages, as well as supporting stakeholders to tell their stories and help to shape the media discourse.

1.7 Support for bottom-up community-led projects

A key theme to overcome behavioural barriers that emerged during the Queensland Decarbonisation Forum was the need for governments to support grassroots, bottom up initiatives, such as community-led energy projects. These projects are gaining momentum across Australia, and there are now more than 100 community energy groups around the country that are in various stages of developing and operating community energy projects.[9] Typically, these projects involve bulk buys for household solar systems, small-scale community solar farms (<100kW), or community wind farms like Hepburn Wind (see **case study**), and are led by social enterprises, co-operatives and not-for-profit organisations. Appropriate and sustainable long-term funding and access to local government resources can support local transitions.

CASE STUDY

Hepburn Shire as a blueprint for place-based net-zero transitions

The Hepburn Shire Net Zero Community Transition Pilot in regional Victoria aims to become the first zero-net emission community in Australia. Its 10-year Community Transition Master-plan (2019-2029) provides a comprehensive blueprint of how communities with support from the government can work toward net zero emissions from all sectors including stationery energy, agriculture, waste, land use and transport. A flagship of the pilot is Hepburn Wind – Australia's first community owned and operated wind farm. The wind farm was co-funded by small local investors, Victorian Government grants and financed by Bendigo Bank. The 4.1 mega-watt wind farm produces enough energy to supply the shire's more than 2,000 homes. In terms of return on investment, it has been estimated that Victorian Government's funding of the pilot has achieved an estimated 35–1 leverage since the project began to 2021.

Pictured: Hepburn Wind 'Pioneering Communities'. Photo by Studio Aton, 2017. From *Policy Futures: A reform agenda* (2021).

Pillar 2: Building Our Regions

"The more resources — including time — invested thoughtfully into designing and implementing a locally-oriented, economic development-clean energy transition, the greater likelihood of it producing a Just Transition and, at the same time, at a much reduced overall financial cost. In particular, it is imperative to work to prevent and then counteract any potential negative socio-economic spiral that a major industry's decline can trigger. This is best achieved by expanding investment and jobs locally in other industries. The international and Australian evidence is again clear: economic diversification is crucial." (Sheldon et al. 2018)[45]

2.1 A regional lens and place-based approach is essential to a just transition

The energy, resources and land sectors are at the forefront of decarbonisation and as such, the associated impacts of transitions will occur most in Queensland's regions. The challenges and opportunities are therefore even more pronounced for a state like Queensland, where unlike other Australian states and territories beside Tasmania, more than half (51%) of its population live outside of the capital city.[46] In this context, decarbonisation in the face of climate change can be thought of as a threat multiplier – exacerbating existing stresses on rural industries and communities as well as adding new ones (Climate Council of Australia, 2021).[47]

While contemporary policy discussion generally focuses on sectoral issues and strategies, a regional approach captures the scale and diversity of issues at a more granular level. Most regions are specialised in key industries that are likely to be the focus of decarbonisation, such as agriculture, mining and energy generation. Impacts of decarbonisation policy will therefore be felt differently by different regions at different magnitudes, speed and intensities. A regional lens can help to identify what impacts of restructuring will likely occur under new policy settings and support communities that will undergo rapid change.

Regional analysis also provides a basis for negotiating and coordinating change by working directly with people and communities when negotiating new policy settings, as there are different ways of conceptualising the challenges that come with decarbonisation. Identifying, for example, regions with the largest potential changes in industry/activity, regions with the most options for diversification and change, and regions that will be least resilient.

Though data for GHG emissions by region is currently unavailable, using surrogate indicators, research presented by Rolfe (2022)[48] infers that emissions are highly heterogenous between the regions. Most coal emissions from energy generation occur in Central Queensland, Darling Downs and Wide Bay Burnett, while cattle and agricultural emissions estimated from livestock clearing rates show most emissions are from Outback Queensland and Darling Downs. Obviously, the more specialised a region is in a given sector makes it more vulnerable to any transition from that industry. Rolfe (2022) shows that in Queensland, these regions are Central Queensland (mining and energy), Mackay-Issac (mining) and the Outback (mining and agriculture). Even within sectors such as agriculture, different issues emerge. For example, for grazers, the key focus of emissions reduction is how to reduce methane from livestock, but there are also opportunities for carbon abatement through managing grazing land. In contrast, cropping and horticulture have little opportunity for carbon farming, but have high use of diesel which is their main source of emissions. And of course, employment by sector and by region varies depending on the economies. Thus, any significant changes to policy affecting these sectors will be most felt in these regions and should be adequately planned for. On the positive side, renewable energy projects underway or planned are more evenly distributed between the regions.

2.2 Working with communities in transition to embrace and manage decarbonisation

To provide a deeper examination of the needs of regional communities for a just transition and the social licence to do so, the 'Communities in Transition' (CiT) or 'Clean Growth Choices' pilot program was created by Queensland Department of Environment and Science (DES) out of the previous Climate Transition and Climate Adaptation Strategies program. The aim of the pilot sought to understand the views of six regional communities as to what a future transition should look like. Specific aims of the pilot sought to assess possible transition pathways; consult with communities to prioritise pathways; and develop business cases and roadmaps (investible agendas).

In line with the proposition that decarbonisation should be considered through a regional as well as a sectoral lens, interesting themes emerged through the CiT pilots highly specific to those regions. For instance, in Rockhampton, building flood resilience for the airport was critical to prevent supply chain disruptions; while reef regions with stringent nutrient runoff restrictions could add deep value to their region through circular economy and nutrient recycling. As a result, various policy implications and opportunities were identified as important for future work in regional transition planning and investment that apply equally as well to the related decarbonisation agenda:

- Regionalise emerging water and energy planning frameworks
- Support new agricultural development as circular economies
- Support for more resilient and value-rich supply chains
- New approaches to next-generation (transferable) workforce skills
- Stronger focus on establishing ecosystem services trading
- Major reform of the current governance system of floodplain planning
- Stronger and area-based focus on lifting digital connectivity
- New approaches to lifting social and economic disaster resilience
- Cluster based approaches to supporting new sector opportunities.

The CiT pilot identified the stages for a successful transition as:

- Concept development – developing actual business cases;
- Local capacity/planning to drive transformational investment – the need to focus on local leadership;
- Feasibility for key shared infrastructure – building private-public partnerships for delivery; and
- Transformation via private and public investment – to drive economic, social, environmental and governance change.

As a basis for more structured consideration of policy implications, the experience through the identified stages of transition (above) in the CiT program pilots, provided the following key observations:

Local governments have a key role to play. The CIT pilot was led by regional universities embedded in their communities in strong partnerships with local governments as they are recognised as having the core capability to pull together public policy necessary to drive investment.

A whole-of-government response is critical for success. Based on the Communities in Transition pilot experience, strong community-based initiatives within the regional decarbonisation agenda would require a long-term, whole-of-government (state and Commonwealth) engagement and commitment from the outset.

The need for planning and tenure certainty to attract investment. Coordinated planning and infrastructure development processes, together with tenure reform is central to driving investment attraction from governments and, more particularly, from the private sector. The capacity within regional local governments is typically lacking for this level of work required to underpin significant transition planning and investment.

"Planning and the translation of that into tenure and tenure reform – particularly in Northern Australia – and the coordination of infrastructure and infrastructure planning is absolutely central to driving investment attraction both from government, but much more particularly from the private sector. If we don't do that work, investment will be slow and dis-coordinated. If we do it well, it will drive transition much more effectively. The reality for these councils, … once we get out of Brisbane, the capacity to do this type of quality planning to attract investment is not strong. Highly strong desire within communities to get it right, but the capacity to do it is not strong. And so that's where we need to focus the attention if we're going to attract the investment in the transition required." (Dale, 2022).

Place-based and coordinated regional water and energy planning. Whilst regional water allocation plans are quite sound and Queensland Government is moving toward much more regional water assessment-based approaches, the process for developing major project proposals and investment remains uncoordinated. The numerous proposals within the Burdekin catchment, for example, would significantly over allocate the system if they were all to proceed,

"We have good water allocation plans and good history institutionally. [But] the business of investment and major project proposals is effectively a chook raffle. … effectively it's a race to the finish without any strategic regional coordination."

A more coordinated strategic regional approach to long-term investment framework for appropriate water development could focus on what water is available; what are the environmental, social and economic limits; what are the range of options to get the best economic value of water in that region; and how is that best assessed against multiple criteria.

"Queensland Government is moving very strongly toward much more regional water assessment-based approaches which is definitely a step in the right direction. But until recently, it was very much who comes, [who] runs through the impact assessment process. The risk of cumulative impact is massive." (Dale, 2022).

Similarly, on the energy front there are many proposals but a regionally place-based approach in terms of energy security, affordability and appropriate transition, is lacking.

"We've got lots of proposals. But we don't quite yet have a regionally place-based approach to what we are trying to achieve in terms of energy security, energy affordability, and energy transition and having all of those things together. And yes it may be a significant coordinated mix between gas, other products and various forms of battery storage and renewables. But we have to do that at a place-based level" (Dale, 2022).

Social licence: the importance of understanding place-based thinking. The loss of, or inability to secure social licence in, decarbonisation presents a significant risk in regional transition planning. Projects and proposals to develop significant wind and solar farms, for example, are encountering varying levels of community opposition across the state, largely due to perceived cultural, amenity and environmental risks (Dale, 2022). There is, therefore, a strong need for more strategic and coordinated place-based thinking in line with that recommended for water and energy planning more broadly, i.e. a focus on community benefits in terms of security, affordability and transition.

Local capacity and leadership. As reflected above in relation to regional local government planning capacity, local small business and workforce capability is critical for successful and just transitions, however, these issues remain significant challenges in regional areas.

2.3 Workforce challenges in regional areas

Queensland's regional workforce has seen structural economic adjustments over several decades, linked with increased exposure to global markets, deregulation, technological change, environmental concerns and changing consumer demands. There is considerable pressure in the regional areas linked with boom and bust economic cycles, ageing population, challenges of infrastructure and population shifts to coastal areas and decline in inland areas. Regional communities are making significant effort to revitalise their industries and innovate (Babacan 2022 ,[49] Babacan & McHugh, 2021[50]). Approximately 29% of Queensland's workforce is located in regional areas. Workforce concerns are a major consideration in resilience and economic development and planning (Babacan et al, 2020,[51] Babacan et al. 2019[52]).

In May 2022, 68% of recruiting employers reported difficulties in recruiting including lower number of applicants per vacancy, longer times to fill positions and fewer vacancies filled (Jobs Queensland). These difficulties were most prominent in higher skilled jobs. This trend is predicted to continue, with Jobs Queensland (2019) identifying that 66% of new jobs will require higher levels of skills. Workforce shortages are influenced by supply and demand factors. These include competition from other industries, ageing, liveability, lack of career pathways, unstable industry demand, boom and bust cycles, technological impacts and increasing contract-based work. Another factor impacting workforce planning in regional centres is lack of housing and other social infrastructure. The government must invest in these to support workers and local communities, rather than rely on a fly in, fly out (FIFO) workforce. These workforce shortages currently contribute to a loss of productivity, increased workloads on existing staff and an inability to offer products and services in many regions

The workforce is the major enabler for regional transitions and "inclusive economic development" in terms of both human capital as well as adaptive capacity for decarbonisation and regional development. Transition to low carbon economies will happen at different speeds, magnitudes and intensity across regional areas. Transitioning to low carbon industries can exacerbate existing stresses on rural and regional communities as well as adding new ones. The issues of equity and just transitions will be played out in the regions through labour market participation in the new and enhanced industries and access to education, training and re-training (Babacan 2022). Our research identifies concerns in the regions relating to access to education and training relevant for low carbon economy workforce; relevance of the education and training provision; challenges of digital connectivity as it impacts on future workforce developments; disruptions to the workforce due to technological advancement and policy frameworks for appropriate labour market transitions.

However current regional workforce planning is not generally connected to decarbonisation initiatives. Relevant industries are still in their infancy and there is a lack of clear transition pathways and potential investment strategies. Babacan (2022a)[53] states that linking decarbonisation with regional development would greatly aid the understanding of:

- coordination of the busy landscape of regional and economic development activities with specific linkages to decarbonisation initiatives;
- the changing nature of industry
- planning for education and training skills for regional workforce in emerging and low carbon industries;
- granular impacts and data at regional labour market level;
- regional vulnerabilities – especially workforce impacts related to transition from fossil fuels; and
- opportunities to embrace decarbonisation initiatives for specific regional development projects.

In this sense there are significant opportunities to support regional transition and enhanced regional development through appropriate and coordinated workforce planning that focusses on place-based mapping of emerging industries and associated needs. There needs to be greater research and data at local workforce level, integration of different agendas of environmental, social and economic issues in relation to low carbon footprint and the workforce; stakeholder and policy coordination.

First Nations people are an essential part of achieving a just transition in regional economies and addressing regional workforce challenges. As noted in the 2021 State of the Environment report (Janke et al. 2021)[54], First Nations people have some form of title over 57% of Australia's land area, mostly in regional Australia, yet only 49.1% of First Nations people aged 15-64 are employed, compared to 75% of non-Indigenous Australians (Australian Government, 2020). Indigenous employment has actually decreased since 2018-19 in every state and territory except NSW and NT. The situation is worse, and worsening, in regional Australia. To counteract these issues and unlock employment and self-determination opportunities for Indigenous people, governments must support sustainable, Indigenous-led agriculture, which promises to play a significant role in the transition to net-zero agriculture (see Mithaka Corp. Case Study, section 4.4).

2.4 The Regional Drought Resilience Plans: an engagement and planning template for Queensland regions

Under the leadership of the Queensland Department of Agriculture and with the support of the Commonwealth's Future Drought Fund, the Rural Economies Centre of Excellence (RECoE) has recently developed Regional Drought Resilience Plans (RDRP) for five regions (Cape York & Torres Strait, Burdekin & Charters Towers, Fitzroy & Capricornia, Darling Downs & South Burnett and South West) with eight other regions to follow (McVeigh, 2022).[55]

The RDRPs have been developed and produced through collaborative partnerships between local and state government, key regional stakeholders and local facilitators. All plans were "co-designed with local stakeholders, using an approach that emphasised trust-building, building on existing networks, local co-design and commitment, risk-informed processes, place-based and regional strategies, locally led and coordinated solutions and integrated multi-objective responses" (RDRP FC, 2022).

Proper place-based project co-design; a focus on shared and balanced benefits; in region facilitation; managing and avoiding consultation fatigue; recognition and coordination of prior and concurrent planning processes; avoiding reinvention and doubling up; an appreciation that no two regions are the same; and ensuring long term local ownership of developed plans, have been among the key conclusions and findings of the process thus far.

While the energy transition in Queensland is driven by global phenomena, the impacts for rural and regional communities are complex and highly context specific. Important factors influencing the experience of rural and regional communities, characterised by tensions or trade-offs include:

- impacts realised to date in the short-term versus potential future impacts over the long-term;
- visibility or tangibility of benefits;
- distribution of benefits between various stakeholders; and
- how the challenges of decarbonisation in terms of regional transition can be managed, mitigated and capitalised upon for the future.

It is strongly recommended that the RDRP method of regional analysis and planning, founded on high levels of stakeholder and community engagement, is an important template for decarbonisation efforts in regional Queensland.

Pillar 3: Energy and Industry Transformations

3.1 The march of renewables is picking up pace, but we need a plan to phase out coal-fired power plants

Renewables are now the world's cheapest source of energy, with nearly two-thirds (62%) of new renewable energy (RE) sources cheaper than the cheapest new fossil source in 2020 (International Renewable Energy Agency, 2020).[56] Politically, the transition to REs makes sense now more than ever to shore up affordable and secure energy for Queenslanders who are struggling with the cost of living and to avoid the price spikes from volatile international coal and gas markets.

With the imminent release of the Queensland Energy Plan, at the outset, signs are pointing in the right direction. Though Queensland's proportion of RE is the lowest of states and territories at present (~19.6%), it is apparent Queensland Government is taking great strides to fast-track RE capacity. Recent and emerging energy and infrastructure projects, policies, and investments (**Table 1**) are enabling state-owned energy corporations to develop or support new RE generation and storage capacity projects that demonstrate commercial value, employment and jobs. These are complemented by **four renewable projects in Southern Queensland connected to the National Electricity Market (NEM) from 2021-2022, five further projects in Northern, Central, and Southern Queensland to be developed by mid-2023, three planned Queensland Renewable Energy Zones (QREZ) in north, central and south Queensland, upgrades to transmission infrastructure, and a 'battery blitz' plan to roll out 13 large-scale batteries across the state** to allow for better management of RE supply.

Two questions, however, remain over whether new coal-fired power stations proposed will be developed and whether existing coal-fired power stations will close sooner than expected.

The two proposals for the development of new coal-fired plants include Clive Palmer's Waratah Coal plans to build a new $3.5 billion 1,400 megawatt power station in the Galilee Basin and a 1,000 megawatt power station in Collinsville, west of Airlie Beach. The latter was awarded several million by the former Coalition federal government to conduct feasibility studies. The Land Court is currently making a decision over Waratah Coal case which involves determining if Queensland Government has acted in accordance with the *Human Rights Act 2019 (Qld)* in granting the mining lease and environmental authority for the development.

In relation to the question of the future of coal-fired power stations, in May 2022, Energy Minister Mick de Brenni announced that no plants would close sooner than their official date of closure. "As part of our vision for the future, it does not include closing down any of our coal-fired power stations," Mr de Brenni said.

This means that all but one of Queensland's coal-fired power plants are expected to continue operations until at least 2035, with one scheduled to close in 2028.

Queensland Government-owned commercial businesses own and operate the majority of the state's energy generators, distributors and transmission/distribution infrastructure.[57] State-owned corporations CS Energy and Stanwell Corp are among the top 10 emitters in Australia.[58] Beside contributing half of Queensland's emissions, the Queensland Conservation Council forecast that the coal-fired power stations they operate will be unprofitable after 2023-24, claiming that "Queensland Government could have to prop up its coal fired government owned corporations (GOCs), CS Energy and Stanwell, by 2024-25 as more renewable energy continues to drive down wholesale and forward contract prices."[59]

In parallel to fast-tracking construction of renewables, Queensland Government should develop a plan to phase out aging coal-fired power stations by or before 2030 and prevent new ones being developed. At this stage of global and domestic climate action, new coal-fired power stations would not only be disastrous for realising net zero targets but would destroy any credibility of the state and federal government's future decarbonisation efforts.

Under Queensland's QREZ initiative, proposals for RE projects to date could potentially supply the state with 31,000 megawatt capacity – almost three-fold what currently exists. Energy is the backbone that industries and economies are built upon. Bringing these projects online would shore up an abundance of low-cost energy that could be used to advance the state's manufacturing capabilities, develop clean technologies such as hydrogen, and support existing industries to decarbonise. Critically, it would enable the Queensland's Zero Emission Vehicle Strategy 2022-2032 and the first Zero Emission Vehicle Action Plan 2022-2024 through the electrification of transport – the surest and fastest way to reduce transport emissions – and provide the business case for an early retirement of non-profitable power stations.

Other states are showing what can be done. Tasmania and South Australia already supply most of their energy needs from renewables. South Australia's suite of supportive policy mechanisms have been key to its success. These include subsidies, research and development funding, support for vocational and tertiary education, providing investors with access to government owned land, establishing a requirement for installation of solar panels on all new and refurbished government buildings, tax relief, tailoring regulatory frameworks and providing investment clarity and certainty (Government of South Australia, 2011, McCarthy, et al. 2017).[60]

In Victoria and New South Wales, recently introduced legislation and investment have seen these states picking up the pace and taking control of their transmission and generation system back from the NEM. In New South Wales , there are more than 50 large-scale renewable energy projects progressing through the state's planning system, which will deliver 16,000 megawatts of power into the grid. The government has announced it will close coal plants earlier than planned and committed $1.2 billion funding to fast-track critical transmission projects to deliver cheaper and more reliable power. The funding will be used to create a the Transmission Acceleration Facility to finance and underwrite the construction of transmission infrastructure to bring "the state's renewable energy zones to life." This is intended to provide revenue certainty for project developers which NSW Government estimates will drive at least $14 billion in private transmission infrastructure investment. The new authority will plan and contract $32 billion worth of new transmission, generation and storage facilities over the next 10 years.

The new Labor federal government formed in May 2022 has stated its commitment to accelerating the modernisation of the electricity grid. At a meeting of the nation's energy ministers in July, an announcement was made of a "new era of cooperation and collaboration … to set the vision for Australia's energy sector transition to net zero". This should provide the impetus for Queensland Government to plan a phase out of coal power.

3.2 Energy transition minerals: a potential win-win-win for decarbonisation, jobs and economic diversification. But there are caveats to consider.

According to Plint (2022),[61] there is "no doubt" within the resources sector that climate action is needed. He says the question within the sector, has moved from "can you make mining sustainable?" to "how can mining help address sustainability challenges?"

These sentiments echoed those by Resources Minister for Queensland Scott Stewart following the release of the 30-year Queensland Resources Industry Development Plan, with new economy minerals being a core focus, "Queensland has the minerals that will be needed for a decarbonised economy and for building renewable energy systems, which means more regional jobs," Mr Stewart said.[62]

New economy minerals (or critical minerals) such as copper, lithium, nickel, cobalt and rare earth elements are essential components of many clean energy technologies including solar and wind technology. Plint (2022) indicates that massive growth projected for lithium and copper means that while

the opportunities for Queensland are enormous, levels of mining will need to occur at a scale that has never been achieved before, and it must be done at speed. The question is, how will Queensland keep up with demand? Plint says issues that need to be considered are,

- Closing the skills gap: the processing of critical minerals requires a different skillset to the 'mine and ship' of resources such as coal.
- Approvals process: there will be a push to speed up the mining approvals process in the process of scaling up the transition. But here, caution must be taken to ensure the quality and integrity of these processes is not sacrificed, particularly in biodiversity sensitive areas. Legislation in this area must be strong and clear.
- Scale of critical mineral mine waste: there is enormous amounts of waste material from mining minerals that will need to be managed through circular economy principles; and
- Native Title: Mapping of critical mineral resources shows that some areas of high mineral deposits are on Native Title lands with implications for Traditional Owners.

3.3. Leveraging opportunities along the Critical Minerals to Battery Tech value chain

CM2BT requires a long value chain supported by an integrated policy framework. Research needs to seek efficiencies and eliminate waste across the value chain from exploration, extraction of critical minerals, to processing battery precursors and technologies for cell chemistries, not as independent segments of the value chain, but as a process that acknowledges upstream and downstream requirements. Equally important are the policy settings that integrate the requirements for environmental, societal and governance (ESG) requirements for extraction, with decarbonisation goals that create regional development. Queensland's universities have the research credentials in innovation in exploration, mining, beneficiation, metallurgy, nanotechnology, digitisation, data innovation and policy to build an integrated research value chain to support the development of a multi-chemistry, multi-segment CM2BT sector (Valenta, Willoughby, Molyneaux 2022).[63]

3.4 Mining companies must decarbonise operations and use more robust quantification techniques for mining emissions

Though there is a big focus on the mining sector looking to supply the new economy minerals required for energy transitions, Plint (2022) points out that the potential scale of these resources in Queensland pales in comparison to its coal and gas deposits, meaning they would not significantly fill any gap if there were a decision to phase out extraction of fossils.

In any case, the Resource Industry Development Plan (RDIP) states that "Queensland's coal and gas sectors will continue to be key strengths of the resources industry over coming decades". In fact, resource exports continue to grow, producing a record $77 billion worth of coal, gas and minerals in Queensland between March 2021 and March 2022, while nationally, the value of resources and energy exports increased by 30 percent in 2021 from the previous year, setting a new Australian record of $348.9 billion.[64]

Since the future of Queensland's coal and gas industries looks to remain for the foreseeable future, there must, first, be a greater onus to ramp up decarbonising coal and gas operations now, and second, there needs to be a review to the integrity of emissions reporting of the industry.

The RDIP, however, has come under criticism for dropping tangible targets for the sector's emissions reductions that were in the initial draft released for consultation in November 2021. Instead, the final Plan sets a target for resources companies to develop only a plan to decarbonise operations by 2027 (five years from the date of the report), with no specified dates or targets of actual emissions reductions set.

According to Plint (2022) there are huge opportunities for the sector to consider how it decarbonizes. Some mining corporations such as BHP and Rio Tinto have taken it on their own accord to start to decarbonise and have pledged interim 2030 emissions targets to address risks that mining corporations will face if they fail to decarbonise their operations sooner. These include increasing pressure from

governments, investors and society, assets at risk from physical impacts of severe climate and weather, and risk of shifts in demand of key minerals.[2]

Queensland Government should not rely on industry to lead, however. Policy and regulation must work in parallel to the sector's decarbonisation. A McKinsey Sustainability report assessed the various technologies that mining operations can utilise to reduce carbon emissions based on technology readiness, carbon abatement potential and capital requirements.

> "Mines theoretically can fully decarbonize (excluding fugitive methane) through operational efficiency, electrification, and renewable-energy use. Capital investments are required to achieve most of the decarbonization potential, but certain measures, such as the adoption of renewables, electrification, and operational efficiency, are economical today for many mines." (McKinsey Sustainability, 2021)[2]

Lessons from Germany's Ruhr region and its transition from coal stress that a faster and more pro-active hard coal mining phase-out in Germany would have been much less expensive and paved the way for new industries" However, according to The Australia Institute (2019),[66]

> "Australian governments have a long tradition of subsidising mining. State governments have often built mining infrastructure, costing billions. The Adani coal mine has courted numerous taxpayer subsidies, including cash grants, unlimited water licenses, waived rehabilitation requirements and subsidised loans (including deferred royalty payments). Australia's export credit agency has funded numerous fossil fuel project and its mandate was recently expanded to include funding infrastructure to assist Australia fossil fuel exports in current and new markets."

The former Coalition government's safeguard mechanism has been used to allow Queensland mining companies to exceed emissions estimates that environmental assessments and approvals were based upon without penalty or compensation (Australian Conservation Foundation, 2022). The federal safeguard mechanism sets an annual or multi-year pollution limit (or baseline) for industrial facilities that emit more than 100,000 tonnes a year. Companies that exceed this limit are obliged to surrender carbon credits, however many companies have been granted permission to increase their baselines without penalty. For example, in March 2022, the Clean Energy Regulator gave Anglo American the green light to more than double its annual emissions from its Grosvenor metallurgical coalmine in Queensland's Bowen Basin from 1.4 million tonnes to 3.3 million tonnes of $CO_{2\text{-eq}}$ a year. This means that the coalmine can emit six-fold more than the 542,470 tonnes the company estimated in its original environmental impact statement and 2.3 times what it could previously emit without having to pay to offset additional emissions. BHP, and Tomago Aluminium were among other companies given the green light to increase emissions by a combined 1.6 million tonnes of CO_2e a year in an announcement by the Clean Energy Regulator in late July 2020.[67]

> "The permitted increases are nearly equivalent to the 1.7 million tonnes of emissions reduction purchased by the government through its main climate policy, the $2.5 billion Emissions Reduction Fund, at an auction in March. Those cuts cost taxpayers $27.6 million and could have been used to support businesses to decarbonise operations." [68]

Additionally, recent studies using satellite data and airborne measurement techniques have found that actual fugitive emissions from coal mining and gas extraction, may be two- or three-fold higher than inventories using Australia's UNFCCC reporting workflow (Neininger et al. 2021).[69] For this reason, Queensland Government should mandate and/or provide a market instrument to have mining organisations decarbonise mining operations, for instance, by introducing a steadily reducing cap on emissions from coal mines.[70]
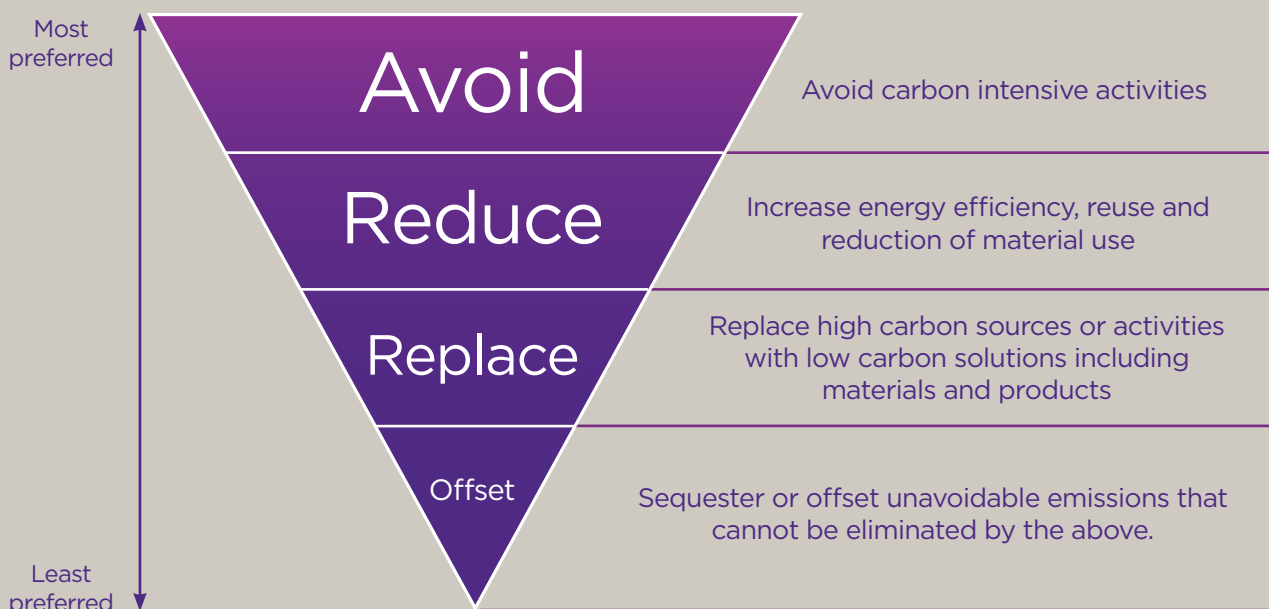
Pillar 4: Valuing Carbon Ecosystems

The agriculture and land use, land use change and forestry (LULUCF) sectors differ from the energy, manufacturing and transportation sectors in that ecosystems naturally both emit carbon to and remove carbon from the atmosphere. Human land use causes emissions, but land use can be changed to avoid and reduce emissions and also increase removals, up to a point. The natural growth of native forests in land managed for forestry is the main means by which carbon is removed, but natural ecosystems including wetlands, mangroves, and other blue carbon ecosystems also perform this function. Tasmania has shown that a negative net emissions economy is possible with more than 99% of Tasmania's energy being derived by renewable hydro. Major changes in forestry law have reduced logging and a wood chip facility was purchased by an environmentalist for the purpose of shutting it down.

4.1 Carbon markets are needed, but offsets should be a last resort

Because of their ability to remove carbon from the atmosphere, the agriculture and LULUCF sector are often seen as a way to offset fossil fuel emissions through carbon credit schemes (markets). Land-based carbon sequestration often occurs on agricultural lands, however, as a large emitter of GHGs, the ag sector requires these carbon credits to offset its own emissions. Additionally, Mackey (2022)[71] argues that offset schemes should be the last – not the first – port of call for mitigation action, following the mitigation hierarchy of *avoid, reduce, minimize, then offset residual emissions* (**Figure 4**).

Under the mitigation hierarchy, first is to avoid emissions, of which 84% of Australia's emissions come from activities related to burning fossil fuels from the energy sector. Here, renewables and electrification of industry and transport are key. Second, we should improve the capacity of ecosystems to remove carbon – not to offset other emissions but to increase carbon stores for its own sake. Third, emissions from agriculture, including land management practices and livestock emissions, can be reduced and in some cases minimised, but cannot be completely avoided. In this case, offsetting through increasing stores in ecosystems could be used as a last resort to compensate for these unavoidable emissions (but not for other land practices such as clearing and logging). The funds from offset carbon credits can be used for forest and ecosystem protection and restoration.

Figure 4. Carbon management heirarchy. Adapted from North London Waste Authority. 2021.

Most preferred

Avoid — Avoid carbon intensive activities

Reduce — Increase energy efficiency, reuse and reduction of material use

Replace — Replace high carbon sources or activities with low carbon solutions including materials and products

Offset — Sequester or offset unavoidable emissions that cannot be eliminated by the above.

Least preferred

4.2 The integrity of the Emissions Reduction Fund must be reviewed

The Commonwealth Emissions Reduction Fund (ERF) is Australia's key carbon market instrument and the basis of Queensland's Land Restoration Fund (LRF). Under the ERF, one Australian Carbon Credit Unit (ACCU) is issued for every tonne of carbon abated. ACCUs are sold by carbon abaters and purchased by carbon emitters. These carbon offsets, in essence, allow one party to pollute by purchasing from another party who sequesters carbon using various types of approved methods. At present, evidence suggests the ERF is fraught with problems which, at best, overestimate the net carbon abated, and at worst, may actually do more harm for overall emissions than good.

Though ERF guidelines are based on approved science methods, there is a gap between methods and how they are implemented on the ground. For instance, the method, 'even regrowth of a permanent forest' rarely plays out in the projects applying them because there is partial vegetation already there, and so increases in new carbon storage can be significantly overestimated – thus polluters are allowed to release more emissions (Butler, 2022)[72].

Permanence of carbon abatement is also a key issue that needs to be addressed. ACCUs are based on a carbon abatement residence time of 100 years or 25 years at a discounted rate. Quiggin (2022) argues, however, that methods such as soil carbon farming, can be wiped out by drought and farming practices are unlikely to lead to recalcitrant soils that are needed for long-term carbon abatement (Quiggin, 2022). Tidal restoration of blue carbon ecosystems may offer new opportunities for coastal land holders to restore coastal wetlands, but these are still in pilot phase.[73]

In summary, there are substantial integrity problems with the ERF primarily associated with non-additionality (credits are given to activities that would have occurred anyway), but also non-permanence (credited carbon is later released) and leakage (credited activities result in deforestation in areas outside the project boundary). A key element to addressing these issues will be establishing more rigorous additionality tests. It is impossible to eliminate all additionality, permanence, and leakage risks in carbon offset projects. Therefore, consideration should be given to change accounting rules in such a way that fewer credits are issued than that based on estimates of carbon abated. Such an approach, variously known as discounting, partial crediting, or credit multipliers, is intended to compensate for the inevitability of non-additional and non-permanent credits by allocating an atmospheric safety buffer. Partial crediting multipliers could be applied at different rates to different project types either to manage differences in additionality/permanency risk or to favour projects with higher co-benefits.

4.3 Governments should adopt a better carbon accounting method that accounts for the value of ecosystem services

Ecosystems are the only proven carbon capture and storage mechanism that works at scale. It is not enough to protect and preserve what is left – we also need to restore and rehabilitate (Mackey, 2022). The biodiversity of forests provides much more adaptive capacity to climate change than planted forests. The value of ecosystem services from forests, grasslands, wetlands and other natural ecosystems pertains to their shear size and the longevity of carbon storage, as well as habitat for biodiversity, flood mitigation, pollutant removal and so much more. We need to understand and value Queensland's natural capital as an asset, and as an important provider of ecosystem services.

The economic value that ecosystems provide is exemplified by the 2019 North Queensland floods that caused local damage to housing and infrastructure to a total cost of over $6 billion (City of Townsville, 2020; State of Queensland, 2019). A key study linked widespread deforestation of the Brigalow Belt Bioregion in Queensland to reduced levels of flood protection of 30% in urban regions, followed by rural communities (15%), and the food sector (14%, Villarreal-Rosas et al. 2022)[74].

Traditional accounting standards have not sufficiently valued carbon and ecosystem services from natural capital. The current UN accounting framework that our emissions inventory is based upon follows the IPCC guidelines. However, the accounting framework was the result of political negotiations. Accounts were created based on input-output models of fossil fuel emissions – they were not designed to factor

emissions avoidance or retention. The System of Ecosystem and Environmental Accounts (SEEA EA), in contrast was developed independently, and more thoroughly accounts for the value of ecosystem services. Government report on annual net emission with little information to inform decision makers on ecosystem stocks or the gross emissions from the many subcategories within agriculture and LULUCF.

Queensland Government should support the Commonwealth Government to adopt the SEEA EA which enables stock and flow-based accounting. SEEA EA also supports accounting for and evaluating the full range of ecosystem services for Payments for Ecosystem Services (PES).

4.4. A policy toolbox to stop land clearing and deforestation, support restoration and reduce livestock emissions

Queensland Government should be commended for its recent Koala Protection Regulations and investment toward the Queensland Protected Area Strategy. However, it needs to strengthen vegetation management laws in order for these policies to be effective. Historically, environmental law has been almost the only instrument to address land clearing and deforestation in Queensland. On its own, however, it has been bitterly contested and ineffective at avoiding land clearing. What is needed is "smart regulation" that provides a suite of tools to achieve a desired outcome. This toolbox should not only contain the command-and-control regulation but include market-based and suasion instruments such as voluntary, industry or community-based tools, some of these are detailed below.

Queensland will need to tighten and improve the *Vegetation Management Act 1999 (Qld)* regulations to reduce the large amount of land clearing on Category X[75] land across the State. This will require an amendment to the regulation in addition to looking at the thinning and necessary environmental clearing exemptions under s22 of the Act. To ensure a sense of fairness from introducing more stringent legislation, Queensland Government should look at creating an overarching Just Transition policy that explains the government's approach to fairness in the transition. This should be in addition to developing sector-specific policies or approaches to support just transitions (i.e. the LULUCF sector).

Due diligence reforms are needed to increase transparency across supply chains. This will enable consumers to be better informed of the choices they make and drive industry to adopt more sustainable practices. in other jurisdictions For instance, supply chain due diligence reforms in the EU have been designed to target unsustainable EU consumption of products that drive deforestation and/or violate human rights. Queensland Government should support farmers to prepare for increasing due diligence supply chain reforms which seek to ensure that agricultural products are sourced from both sustainable sources and produced in a socially ethical way. The government should consider exploring how due diligence processes can help support existing initiatives within Queensland agricultural producers aiming to produce carbon-neutral products. Here, certification and labelling of goods and services is key and may include a complete lifecycle analysis to quantify the total carbon emissions of products. This will encourage emissions reductions at all stages along the value chain and enable consumers to make more informed choices.

It is important to recognise that Australian farmers are much less subsidised than farmers in New Zealand, the EU, the US and Canada. Food security is a significant global issue, as are regional communities and farmer prosperity. Some Australian farmers have stopped using the land productively for agriculture in rural and remote Queensland as they can get more for doing less through the ERF. However, this can have flow on impacts such as people leaving rural communities, productivity loss and food insecurity.

Around 90% of agricultural emissions in Queensland come from livestock production. The carbon mitigation hierarchy avoids and reduces greenhouse gas emissions prior to offsetting, and this is especially important for livestock systems. Where methane from livestock emissions can be minimised, such as through improved farming efficiencies or the use of methane inhibiting technologies, then this reduction in emissions is permanent. By comparison, when carbon is sequestered in trees and soils it is sometimes reversed through natural events such as drought or forest fires. Additionally, soils will reach a point of equilibrium over time where carbon stocks start to stabilise and carbon in trees is maximised

in the first 20 years or so but beyond this the carbon sequestration rates in vegetation are drastically reduced. Both mitigation and offsets are important methods of reducing the total carbon balance from farms and farmers must be supported and incentivised to adopt more sustainable farm practices.

Carbon farming has many challenges in that it can reduce farm yields and increase administrative costs such as carbon auditing. It's also likely that farmers forward selling credits under contractual arrangements with offset aggregators face financial and delivery risk associated with the arrangement that may be underappreciated. Specifically, forward sales prices are low relative to the final market ACCU price, and the farmers carry the delivery risk that will occur in the future in LULUCF projects. Farmers must be supported and incentivised to adopt more sustainable farm practices. Maguire (2022)[76] says that due diligence frameworks across supply chains for products can lead to such outcomes. Here, certification and labelling of goods and services is key and may include a complete lifecycle analysis to quantify the total carbon emissions of products. This will encourage emissions reductions at all stages along the value chain, and enable consumers to make more informed choices.

Finally, we must also support Traditional Owners to lead land management and restoration of Country who lived sustainability on this continent for millennia. Australia's 2021 State of the Environment report (Janke et al. 2021)[77] rated the state of Country and Indigenous cultural and economic relationships to Country as "very poor". This can be achieved by granting more land transfers to Traditional Owners across all of Queensland and stronger access to Crown lands for economic development and opportunity through reforms to Native Title (**Mithaka Case Study**), investment and partnerships.

CASE STUDY

Mithaka Corp: empowering Traditional Owners with access and authority to Country to heal land, store carbon and grow native grain.

First Nations (Aboriginal and Torres Strait Islander) people have a crucial role to play in achieving Queensland decarbonisation goals. Through the Australian Native Grain Industry, First Nations people aspire to reintroduce deep-rooted perennial grasses to heal Country and store carbon while building regional economic growth through the development of a new food industry. Although First Nations people have Native Title to more than 44% of Australia's land area – mostly in regional and rural areas – traditional custodians of Country have very little say in how native title lands are managed and very little share in the benefits. This is due to a lack of control and meaningful access (Janke et al. 2021)[78] and government approaches that are reactive, rather than responsive. The Mithaka Aboriginal Corporation exemplifies these issues. Through a net-zero agriculture approach that combines Indigenous foods and medicines with managed grazing, the Mithaka seek to restore their country and preserve the carbon storage occurring on its floodplains (Tang, 2021)[79]. Although the Mithaka hold native title to more than 33,000 km^2 of Queensland's Channel Country, they can only make commercial use of and manage 97 hectares[80]. Governments could grant Traditional Owners, regardless of whether Native Title is held or not, a real role in the use and management of Crown lands, such as stock routes, and restore their sustainable economic use of land that is now locked up for conservation, following the example of the 160,000 hectares of conserved land that was handed back to the Eastern Kuku Yalanji people in 2021. The granting of meaningful parcels of freehold Aboriginal land to Traditional Owners across all of Queensland would enable First Nations participation and self-determination. Governments could also provide tax or other incentives to landholders to enter into meaningful Indigenous Land Use Agreements with Traditional Owners, as well as instruct government-owned entities, such as the North Australian Pastoral Company, to do so. Government must allow First Nations people to build their own capacity to govern by providing decision-making authority, with First Nations-led agriculture providing a perfect opportunity.

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