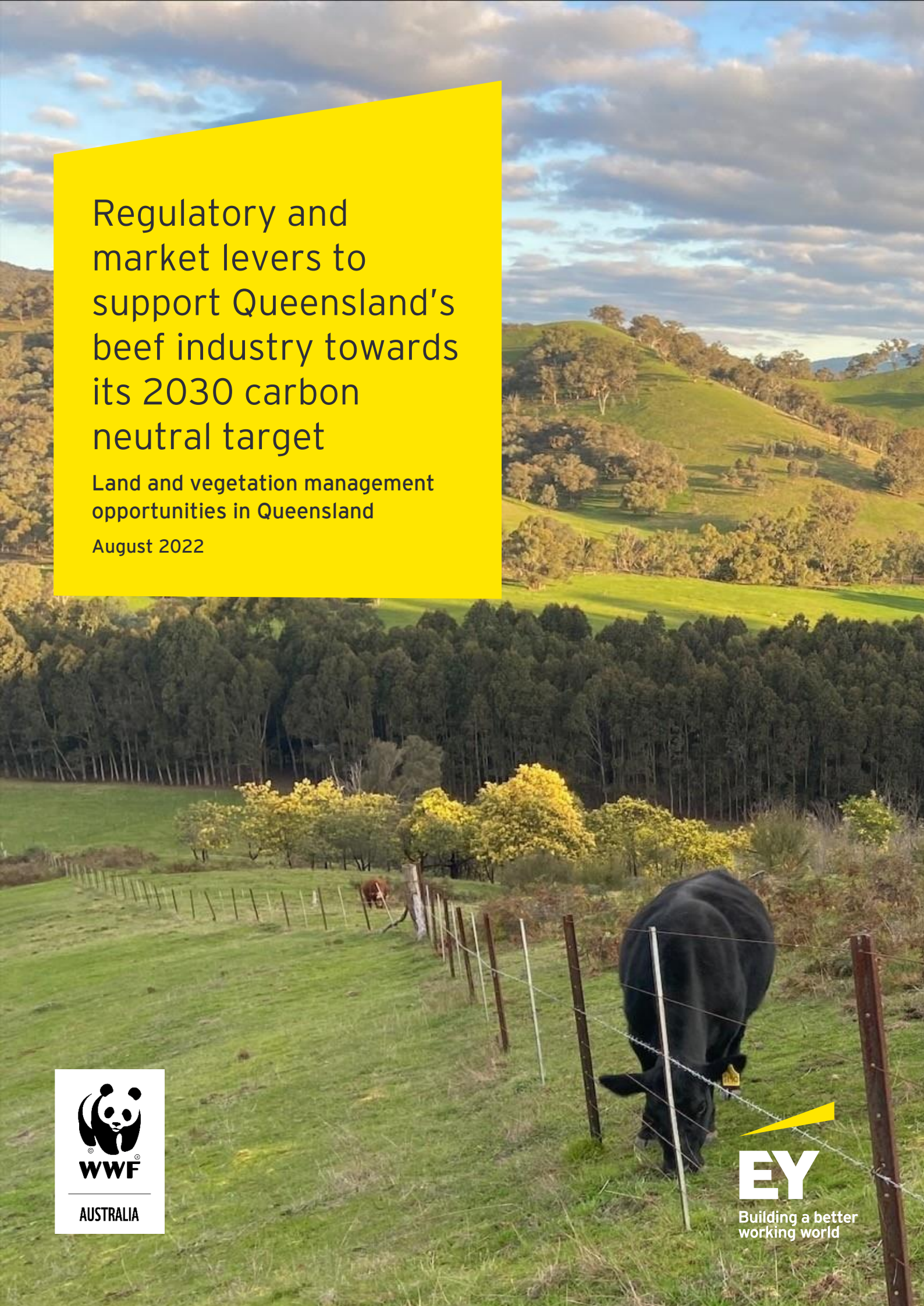

Regulatory and market levers to support Queensland's beef industry towards its 2030 carbon neutral target

Land and vegetation management opportunities in Queensland

August 2022

WWF AUSTRALIA

EY Building a better working world

Foreword

Australia is the only global deforestation hotspot among developed nations. Nearly half of the original forested land area of Eastern Australia has been cleared. Land clearing causes biodiversity loss, exacerbates soil erosion and salinity, reduces water quality, is a significant source of greenhouse gas emissions and worsens the impact of drought.

In Queensland, most land clearing has been attributed to the development of livestock pasture. Raising cattle has enabled economic growth and continues to provide livelihood for many Queenslanders. The beef cattle industry is a critical pillar of the state economy, as it provides the second largest export by value and supports significant direct and indirect employment in regional Queensland. For the sector to remain sustainable and profitable, the drivers of land clearing must be addressed. In addressing this challenge, the beef sector has the opportunity to progress towards achieving its own carbon neutral target by 2030, and more broadly contribute towards State and Federal government 2030 carbon abatement targets. Further it is critical to regional biodiversity that barriers to revegetation in Queensland are removed.

This report presents EY's analysis of decarbonisation pathways for the beef cattle industry in Queensland through the avoidance of deforestation within supply chains, and the creation of economic opportunities in reforestation. While strengthened vegetation management laws may be one lever by which to address land clearing, this report highlights that financial incentives, market mechanisms and emerging natural capital markets can play a key role.

The analysis and preparation of this report concluded in November 2021. A number of reports and announcements released post the completion of this report may have influenced our report had they been released at the time of our analysis, including:

- 2018-19 State-wide Landcover and Trees Study
- Independent review of the integrity of Australian Carbon Credit Units
- Australian Government intention to increase Australia's emission reduction target to 43% by 2030
- Native Vegetation Scientific Expert Group established by the Queensland government

These announcements and reports should be considered when reading this report.

We have seen firsthand in Queensland the impact of government policy through the banning of broadscale land clearing in 2007, resulting in a significant decrease in native vegetation loss. However, clearing rates have continued to fluctuate in the face of ongoing policy changes. The relaxation of laws in 2012 saw land clearing rates increase, before an expected decrease through tighter legislation introduced in 2018.[1] This highlights the need for a consistent government response to deforestation, yet the challenge remains: how to find mechanisms that promote protection and re-establishment of native vegetation, without unduly preventing graziers from profitably operating their businesses. Incentives to manage land for productive use and reforestation purposes can enable graziers to maximise both economic and environmental returns.

[1] Note that the analysis and preparation of this report were finalised in November 2021, which relies on historical carbon emissions associated with land clearing and land conversion up until 2019, including the 2018-19 State-wide Landcover and Trees Study.

The beef cattle industry itself recognises the challenge as well as the opportunity to support the broader emissions reduction efforts in Queensland. Participation in carbon markets through land management practices is recognised as a means to build resilience in the industry to the impacts of climate change on farm productivity. Collaboration between all stakeholders will be critical to validate methods, communicate approaches and embrace a framework for rewarding sequestration through the retention and re-generation of native vegetation.

I would like to acknowledge the significant contributions from industry, government, universities, and member associations who supported this study through shared research and extensive discussions. This combined knowledge has directly contributed to the insights and recommendations in this report.

It is our hope that this report supports a positive discussion on the role of the beef industry in responding to the dual challenges of climate change and deforestation.

Elizabeth Rose
Partner, Climate Change and Sustainability Services
Brisbane

RELEASE NOTICE

Ernst & Young (**"EY"**) was engaged on the instructions of World Wide Fund for Nature Australia (**"WWF"**) to prepare this report on Regulatory and market levers to support Queensland's beef industry towards its 2030 carbon neutral target (**"Report"**), in accordance with the engagement agreement dated 30 November 2020, including the General Terms and Conditions. This Report must not be relied upon by any party other than WWF. EY disclaims all responsibility to any other party for any loss or liability that the other party may suffer or incur arising from or relating to or in any way connected with the Report, the provision of the Report to the other party or the reliance upon the Report by the other party.

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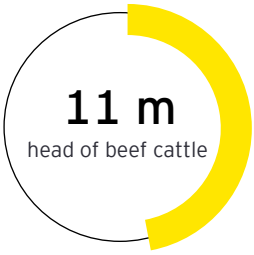
Table of acronyms

ACCU	Australian Carbon Credit Unit	LRF	Land Restoration Fund
BAU	Business-as-usual	LULUCF	Land Use, Land-Use Change and Forestry
BCT	Biodiversity Conservation Trust	MLA	Meat and Livestock Australia
C+B	Carbon + Biodiversity Pilot	MtCO2-e	Million tonnes of carbon dioxide equivalent
CN30	Carbon Neutral 2030	NGGI	National Greenhouse Gas Inventory
COP	Conference of the Parties	NGO	Non-governmental organisation
CSF	Climate Solutions Fund (also known as ERF)	NRM	Natural Resource Management
CSIRO	Commonwealth Scientific and Industrial Research Organisation	R&D	Research and development
DES	Department of Environment and Science	RF	Reforestation
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999	SLATS	State-wide Landcover and Trees Study (Queensland)
ERF	Emissions Reduction Fund (also known as CSF)	UNSW	University of New South Wales
GHG	Greenhouse gas	UQ	University of Queensland
HIR	Human-Induced Regeneration	VMA	Vegetation Management Act 1999 (Qld)
kha	Thousand hectares	WWF	World Wide Fund for Nature

Executive summary

Queensland's largest agricultural export
Department of Agriculture and Fisheries, 2019 (2016-17 figures)



Queensland accounts for over 45% of Australia's herd
Department of Agriculture and Fisheries, 2019 (2016-17 figures)
*Note: a recent study (Fordyce et al. 2021) suggests that beef cattle herd numbers have been significantly underestimated.

Eastern Australia is both a biodiversity and deforestation hotspot

Nearly half of the Eastern Australia deforestation front has been cleared.

WWF 2021

International pressures are likely to impact Australia's exports

e.g. the European Union (EU) Carbon Border Adjustment mechanism, growing market pressure to remove deforestation from supply chains

The Queensland beef industry is an important part of both Australia's economy and emissions profile, as Queensland's largest agricultural export and largest source of agricultural emissions. The beef industry has significant scope to contribute to Australia's emissions reduction targets and has access to a growing financial and consumer market looking to invest in sustainable products. The most promising pathway to decarbonise the beef industry in Queensland is through improved vegetation outcomes on farm,[2] which will contribute to the red meat sector's goal of carbon neutrality[3] by 2030.[4] Consumer preferences, trade regulations and market signals are and will continue to drive the transformation of the beef industry by demanding not only carbon neutral products but a carbon positive and nature positive beef industry.[5] Improving native vegetation through implementation of shelterbelts also benefits biodiversity and property, and cattle climate resilience.

The Australian Government has committed to a net zero emissions target by 2050 and to halt and reverse forest loss by 2030 during the 26th Conference of the Parties (COP26) to the UN Framework Convention on Climate Change.[6] Since COP21, where Australia became party to the Paris Agreement, Australia has been under increasing international and public pressure to reduce its emissions. Key mechanisms identified in this report will support Australia achieving these objectives.

The decarbonisation of the beef industry requires increased collaboration across the sector, tools that enhance awareness, and financial and market structures that recognise and reward beef producers for their role in environmental stewardship. The Australian and Queensland government play an important role in supporting the sector's sustainability by enabling and incentivising activities that increase productivity, improve biodiversity and reduce emissions.

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[2] Mayberry, Bartlett, Moss, Davison, Herrero, "Pathways to carbon-neutrality for the Australian red meat sector", 2019; Mayberry, Bartlett, Moss, Wiedemann, Herrero, "Greenhouse Gas mitigation potential of the Australian red meat production and processing sectors", CSIRO, 2018; Parliament of Australia, 'Declining biodiversity and unsustainable agricultural production-common cause, common solution?' https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp0102/02RP02#Queensland, 2020

[3] Carbon neutral products, services and organisations have ensured a balance of emissions released to, and emissions removed from, the atmosphere. This is achieved through reducing emissions where possible and offsetting remaining emissions through carbon credits, which withdraw or avoid ('sequester') emissions from the atmosphere.

[4] Meat & Livestock Australia, "CN30 Overview", https://www.mla.com.au/research-and-development/Environment-sustainability/carbon-neutral-2030-rd/cn30/, 2020

[5] Carbon positive indicates that an entity or organisation takes action beyond carbon neutrality by removing greenhouse gas emissions from the atmosphere or reducing emissions to the atmosphere such that the aggregated reductions and removals exceed the unabated emissions. Nature positive refers to halting and reversing nature loss measured from a 2020 baseline, through increasing the health, abundance, diversity and resilience of species, populations and ecosystems.

[6] Australian Government, "Australia's plan to reach our net zero target by 2050", https://www.minister.industry.gov.au/ministers/taylor/media-releases/australias-plan-reach-our-net-zero-target-2050, 2021; UN Climate Change Conference UK 2021, "Glasgow leaders' declaration on forest and land use", https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/, 2021; The analysis presented in this report was conducted prior to COP26 and COP15. Commitments and announcements have been incorporated in the report where relevant as a way of context and background; UNFCC, "Glasgow Climate Pact", https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf, 2021. The Glasgow Climate Pact is a legally binding instrument that emphasizes the importance of protecting, conserving and restoring nature and ecosystems, including forests and other terrestrial and marine ecosystems, to achieve the long-term global goal of the Convention by acting as sinks and reservoirs of greenhouse gases and protecting biodiversity, while ensuring social and environmental safeguards

> "Staying ahead of current and future consumer, customer and community expectations regarding environmental credentials allows red meat producers to stamp their mark in a competitive global protein market.
>
> Demonstrated commitment to environmental stewardship, through initiatives such as CN30, enables ongoing trust and support for the red meat and livestock industry. It underpins Australia's position as a responsible producer of high value, clean, safe and natural protein.
>
> Meat and Livestock Australia (MLA)

This report outlines potential and pragmatic government actions to enable the reduction and removal of greenhouse gas emissions (or carbon emissions) associated with the beef industry in Queensland in accordance with the Paris Climate Agreement. The beef industry is currently exploring technologies[7] and practices to reduce carbon emissions through feed supplements, selective breeding and an anti-methane vaccine. However, this report focuses on exploring carbon emission reductions through land management practices and implementation of carbon sequestration projects. EY acknowledges that carbon farming projects must demonstrate that emission reductions and carbon removals are real and additional in order to maintain the integrity and credibility of domestic carbon markets.

This report outlines two potential pathways to decarbonise the beef industry in Queensland through changing land management practices driven by policy and market levers. The analysis relies on vegetation modelling, estimation of potential carbon abatement across Queensland in line with methodologies set out by the Emissions Reduction Fund (ERF), and payments associated with carbon abatement and co-benefits. The scope of the analysis did not include any economic analysis.

Furthermore, this report explores the potential role of the Australian and Queensland governments in enabling the growth of carbon and environmental markets while encouraging sustainable grazing practices and native vegetation management. Consultation was undertaken on the potential government actions outlined in this report.

Decarbonisation pathways for the beef industry

There are multiple pathways for the beef industry to decarbonise its operations, including adopting new technologies, adjusting policy and legal settings, establishing climate change and biodiversity markets and changing consumer behaviour. The scenarios included in this report are mainly focused on potential policy levers and market-based approaches to improve land management practices in Queensland.

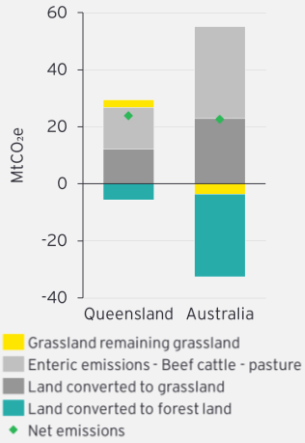
Based on analysis conducted by The University of Queensland (UQ), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the University of New South Wales (UNSW), EY identified three potential decarbonisation pathways for the beef industry:

- **Business as usual (BAU)** scenario considers current trends related to market mechanisms, policy settings and technology adoption; resulting in a heavy reliance on carbon offsets to achieve carbon neutrality.
- **Strong regulation ("Stick")** scenario assumes that land clearing rates would reduce through stronger land clearing regulations set out in the *Vegetation Management Act 1999 (Qld)* (VMA), and enforcement of these together with more incentives.
- **Incentivisation focus ("Carrot")** scenario considers financial incentives and market mechanisms (i.e. ERF, Land Restoration Fund (LRF) and Carbon + Biodiversity Pilot (C+B)) and other emerging natural capital markets as the primary mechanism to minimise carbon emissions from primary and secondary land conversion, together with some strengthening of regulation.

[7] Meat & Livestock Australia, "Greenhouse gas mitigation potential of the Australian red meat production and processing sectors", https://www.mla.com.au/contentassets/ec632a5c01ac44b6960fbb5abb038565/b.cch.7714_final_report.pdf, 2018

Both Stick and Carrot scenarios assume that carbon and environmental markets continue to be developed, including increased participation from the private sector due to climate change and biodiversity agenda, and consumer preferences (i.e. future willingness to pay for carbon neutral, carbon positive, nature positive or deforestation free beef products).

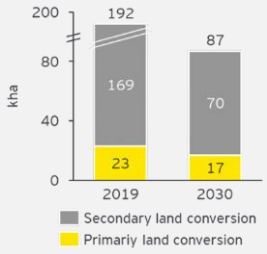
Emissions from the beef industry in Queensland and Australia, 2019



While carbon emissions and land clearing rates can be controlled through regulations (i.e. Stick pathway), there could be potential political costs and economic impacts to the beef industry. The implementation of stronger regulations on land management may represent a potential forgone opportunity for graziers to participate in carbon and biodiversity markets. This is estimated at ~$1.6 billion in lost revenue from carbon payments under the ERF and potential co-benefit payments under the LRF between 2022 and 2030.[8] This is because land that is subject to clearing restrictions under other State and Federal legislation is not eligible under the ERF. However, some land may be eligible for other natural capital payments such as private protected areas.

The Carrot pathway presents a more balanced option for the beef industry to reduce carbon emissions through land management practices, which could deliver significant economic, social and environmental benefits for graziers, government and society. Market mechanisms, accompanied by land management regulations, would allow graziers to be recognised and rewarded for environmental stewardship. Political costs and opportunity forgone for graziers are expected to be significantly less under the Carrot pathway compared to the Stick pathway.

Land clearing rates under the Stick and Carrot pathway



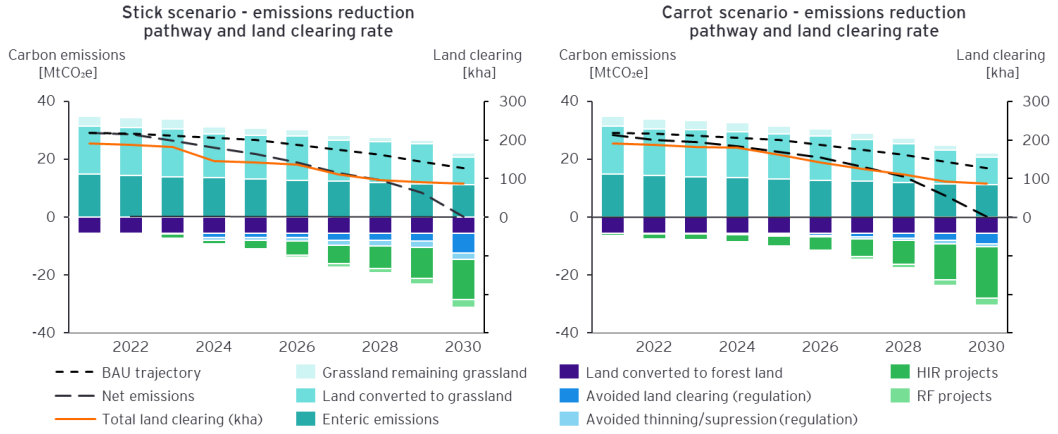


Figure 1 Stick and Carrot scenario emissions reduction pathway and land clearing rate.[9] Cumulative emissions reductions from both Stick and Carrot pathways include 88 $MtCO_2$-e (2021-30). Carbon removals through market mechanism include undertaking Human-Induced Regeneration and Reforestation projects

[8] Assuming average $34/$tCO_2$-e by 2030 and average $31 for co-benefit payments based on results from the LRF Investment Round 1

[9] This graph is based upon the National Greenhouse Gas Inventory data, where relative changes in vegetation are the focus rather than absolute figures. This data may differ from the State-wide Landcover and Trees Study; Australian Government, 'National Greenhouse Accounts 2019', https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-data-tables-and-methodology, 2021. 2021 greenhouse gas emissions are estimated based on the National Greenhouse Accounts 2019.
Enteric emissions are methane production as a by-product from digestive process in ruminant animals, such as cattle, sheep, goats and buffalo. The BAU scenarios assume that enteric emissions will reduce by 15% in 2030 compared to 2019 emissions through feed supplements, selective breeding, reduced time to market and anti-methane vaccines. The Stick and Carrot scenario will reduce enteric emissions by 25% in 2030 compared to 2019 data. Enteric emissions are offset through additional revegetation.

Carbon farming projects would have positive impacts on regional economies through supporting jobs and economic flow-on effects as well as reputational benefits for the Queensland beef industry in domestic and international markets. However, key participation barriers for graziers to undertake carbon farming projects must be addressed. These may include reaching adequate economies of scale, complex and costly administrative processes, and low carbon and co-benefit payments. Government actions outlined in this report would support the beef industry to overcome these barriers.

The potential role of government to support the beef industry

Through commitment to biodiversity and positive land use outcomes, Queensland's beef industry can be recognised as the most sustainable red meat protein in the world. This would address global trends towards supply chains that can demonstrate progress towards being both carbon neutral and nature positive. The Australian government can support this by empowering the beef industry and markets through building awareness and transparency, supported by data and frameworks to monitor and drive change. The Australian government will play a fundamental role through holding ongoing negotiations with the Queensland government to maintain the current regulatory baseline provided in the Vegetation Management Act.

The Australian and Queensland governments have established programs to support landowners with restoring land, reducing greenhouse gas emissions and improving biodiversity. These programs include the Agriculture Stewardship Package[10] and the LRF[11], respectively. However, further strong and cohesive action from Federal and State governments is required to achieve these common goals.

EY identified a suite of actions that the Australian and Queensland government could consider in supporting the beef industry to reduce Land Use, Land-Use Change and Forestry (LULUCF) emissions and adopt further sustainable practices. Recommended actions are relevant to the Carrot decarbonisation pathway and consist of exploring new initiatives, as well as amending or enhancing existing initiatives.

Estimated implementation and operating costs related to these actions, which are indicative and based on proxies from similar government-led programs or private initiatives, range from ~$260 million to ~$420 million by 2030. Estimated implementation costs consider resources required to establish and undertake each action as opposed to indicating total funding required over the period. EY recognises that the Australian and Queensland governments are currently exploring some of the actions outlined in this report, which could result in synergies and cost efficiencies. Hence, further analysis is required to identify total costs and benefits from each action.

> "The fundamental rights and value of Nature must represent a step-change in our 'future of industry' and 'future of economy' approach.
>
> HRH The Prince of Wales
> Terra Carta – For Nature, People & Planet

[10] Department of Agriculture, Water and the Environment, "Agriculture Stewardship Package", https://www.agriculture.gov.au/ag-farm-food/natural-resources/landcare/sustaining-future-australian-farming, 2021

[11] Queensland government, "The Land Restoration Fund", https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund, 2021

1 Empowering the beef industry to effect positive change

through biodiversity and carbon opportunities, being recognised and rewarded for positive contributions to environmental stewardship

- **Investing in building capacity and awareness** within the beef industry, including supporting collaboration across the beef industry (Action 1), extension officers to provide guidance related to carbon and environmental markets (Action 2) and develop a simple-to-use digital tool with streamlined information related to potential costs and benefits associated with carbon and environmental markets (Action 3).
- Expand payments for biodiversity and ecosystem services through existing market mechanisms:
  - C+B: rapid expansion of this program and alignment with existing schemes led by State governments (e.g. LRF) to avoid complexities related to application processes, requirements and valuation methodologies (Action 4)
  - LRF: exploring options to allow participation from the private sector in the scheme (e.g. blended finance options), including philanthropists, institutional investors and corporates (Action 4)
- **ERF: reducing administrative and cost barriers** by streamlining application processes and leveraging technology to reduce audit-related costs, and rapid adoption of new methods that allow more landowners to participate (Action 6)
- **Expand the Private Protected Area Program** to support the NatureAssist funding program for protection and conservation of private land, which could be through a similar funding program as the Biodiversity Conservation Trust in New South Wales (Action 5)

2 Transform beef markets to drive growth of sustainable and deforestation-free products

- **Build consumer awareness through** encrypted supply chain using blockchain technologies (Action 7) and labelling initiatives (i.e. develop independent deforestation-free certification) (Action 8)
- **Explore sustainable finance options** to mobilise capital towards carbon- and nature-positive projects. These options may include establishing partnerships with the private sector to de-risk investments through blended finance solutions and explore mechanisms that allow smaller investment opportunities to be aggregated to attract capital investors. (Action 9)

3 Establishing robust data and frameworks to monitor and report outcomes over time and enable action

- **Centrally amalgamate and leverage existing data** relating to vegetation, carbon and biodiversity to track performance over time and conduct benchmark analysis (Action 10)
- **Harmonise vegetation-related definitions** across industry and Australian governments such as 'forests', 're-clearing', 'deforestation', and 'remnant vegetation' (Action 11)
- **Utilise enhanced technology for monitoring and compliance** of vegetation management and biodiversity to reduce reporting timeframes (i.e. satellite imagery, (SLATS reports), drones, remote sensing and farm management software) (Action 12)
- **Develop a centralised biodiversity reporting framework** and accounting standards for consistent measurement and reporting (i.e. amalgamating existing and emerging natural capital-related methods to measure and report biodiversity values) (Action 13)

4 **Safeguarding outcomes** through regulation to prevent leakage (the displacement of forest conversion from one place to another)

- **Improve effectiveness of legislative frameworks** which govern vegetation management and land use
  - VMA: review Category X definitions and allowances, clearing codes and Property Maps of Assessable Vegetation, caps on clearing for certain allowable clearing purposes (Action 14)
  - EPBC Act: work with the Queensland government to improve consistency and diligence in enforcement of existing vegetation and conservation laws through the implementation of recommendations and structural reforms to the EPBC Act set out in the Independent Review conducted by Professor Graeme Samuel AC (Action 14 and 15)

The implementation of these actions could be focused on Local Government Areas (LGAs) with highest potential of carbon sequestration when designing or implementing financial incentives within existing programs (i.e. Banana, Central Highlands, North Burnett, Maranoa and Charters Towers). A similar approach could be adopted when reviewing land management regulations. LGAs with potential high land clearing rates and LULUCF emissions may include Cook, Maranoa, Murweh, Central Highlands, Charters Towers, Isaac, Blackall Tambo, Balonne.

No single action will be the 'silver bullet' for decarbonising the beef industry over the next decade. Rather, government must consider a suite of actions and the significant dependencies of certain actions on others.

In implementing any actions, it is essential for governments to adopt a consultative approach and bring landholders along the journey by engaging with them in the process of designing and implementing policies and initiatives that are likely to impact them, positively or negatively. Stakeholder engagement and insights from prior successful and unsuccessful government and private programs in the grazing sector have highlighted a multi-stakeholder approach as key.

The next steps may include undertaking detailed analysis to estimate total costs and benefits for determining the final suite of actions that the Australian and Queensland government would support. This may also include identifying appropriate public or private funding structures, engaging with key LGAs and industry peak bodies, defining detailed implementation timelines, estimating supported jobs and preparing policy recommendations to achieve Australian commitments. Figure 2 provides a summary of the analysis commissioned by WWF to date in relation to land management practices in Queensland, changes in policy settings, recent targets and announcements, and potential next steps.

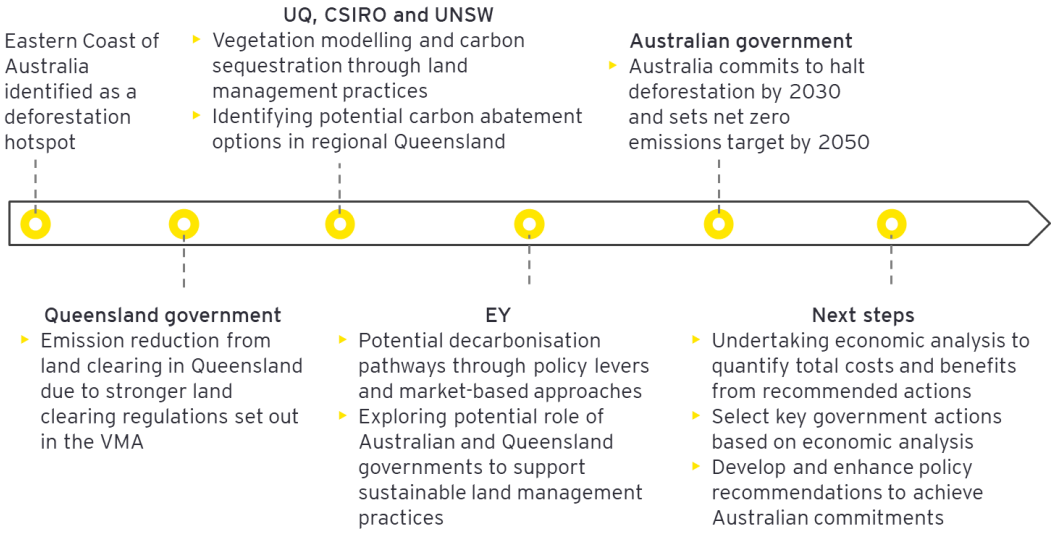


Figure 2: Overview of the scope of work commissioned by WWF-Australia, government announcements and next steps

Introduction

Queensland beef industry context

>11 million
head of beef cattle (47% of Australia's herd)*

$5.7 bn
in gross economic value annually

$4.9 billion
exported annually

11,600+
specialist beef enterprises

28,300
cattle farming employment in Australia

*A recent study suggests that beef cattle herd numbers have been significantly underestimated: Fordyce et. al. "Australian cattle herd: a new perspective on structure, performance and production." Animal Production Science, 2021.

The forests of Eastern Australia are a global deforestation and biodiversity hotspot[12] with nearly half of the original forested area of the Eastern Australia deforestation front having been cleared.[13] Land clearing causes biodiversity loss, exacerbates erosion and salinity, reduces water quality, worsens impacts of drought,[14] and contributes significantly to greenhouse gas emissions. [15]

The majority of Queensland land clearing in recent decades has been attributed to development of livestock pasture,[16] which has enabled economic growth and continues to provide livelihoods for many Queenslanders. Addressing drivers of clearing and barriers to revegetation in Queensland is essential for the sustainability and profitability of the sector, regional biodiversity and to reach emissions reduction goals of Australia and the sector.

This report is one of a series of research projects commissioned by WWF-Australia to drive understanding of vegetation and land management opportunities in Queensland.

These opportunities will contribute significantly to Australia's emissions reduction commitments under the Paris Agreement and shaping of future commitments in line with COP26 UN Climate Change Conference and COP15 UN Biodiversity Conference. Revegetation opportunities will also be key to achieving the red meat sector's ambitious target to be a carbon neutral[17] industry by 2030.

Queensland beef industry context

The beef industry in Queensland is economically significant, representing a key export industry and source of jobs in rural, regional and urban areas in the State. Broadly, the beef industry includes the entire supply chain from beef cattle breeders, backgrounders, finishers, and feedlots, through to meat processors, retailers and exporters. This report focuses predominantly on activities grazing properties. prior to the farmgate.

Trends and disruption

Future policy or market levers and their associated costs and benefits must be considered in the context of other disruption in the sector.

[12] Williams et. al., "Forests of East Australia: the 35th biodiversity hotspot", *Biodiversity Hotspots*, 2011.
[13] Pacheco, Mo, Dudley, Shapiro, Aguilar-Amuchastegui, Ling, Anderson, and Marx, "Deforestation fronts: Drivers and responses in a changing world", WWF, 2021.
[14] McAlpine et. al., "Modelling the impact of historical land cover change on Australia's regional climate", *Geophys. Res. Lett.*, 2007.
[15] IPCC, "Agriculture Forestry and Other Land Use (AFOLU) accessed 17 March 2021. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
[16] Evans, Megan. "Deforestation in Australia: Drivers, trends and policy responses", *Pacific Conservation Biology,* 2016; Reside et. al., "Ecological consequences of land clearing and policy reform in Queensland", *Pacific Conservation Biology,* 2017; Wilderness Society, "Drivers of deforestation and land clearing in Queensland", https://www.wilderness.org.au//images/resources/The_Drivers_of_Deforestation_Land-clearing_Qld_Report.pdf, accessed 16 March 2021.
[17] Carbon neutral products, services and organisations have ensured a balance of emissions released to, and emissions removed from, the atmosphere. This is achieved through reducing emissions where possible and offsetting remaining emissions through carbon credits, which withdraw or avoid ('sequester') emissions from the atmosphere.

Climate-related disruption

- **Transition risks** from the global transition to a low carbon economy: e.g. social licence to operate risk, inability to access beef and finance markets, shifts in consumer preferences and public expectations. [18]

- **Physical risks** from a changing climate: e.g. heat and water stress to beef cattle due to changes in rainfall patterns, temperatures and drought, and increasing severe weather event risk impacting supply chains and production.[19]

- **Opportunities** related to a changing climate and net zero carbon economy: e.g. reputational benefits for those undertaking sustainable farming practices, growth in demand and value of carbon neutral meat, increased resilience and efficiency, emerging markets that value natural capital and biodiversity.[20]

> "We're seeing climate change campaigners shift focus from fossil fuels to meat...
> Former Chief Executive of the Australian Livestock Exporters' Council

Other market trends

- **Increasing demand for substitute products** including plant-based alternatives and synthetic meat. In 2019-20, the plant-based protein sector in Australia doubled its jobs, manufacturing revenue and range of products compared to 2018-19.[21] The Australian plant-based protein market is projected to continue its rapid increase from $185 million in 2020 to $3 billion by 2030.[22]

- **Changing stakeholder preferences consumer and shareholder preferences** towards sustainable and ethical products. Stakeholders are increasingly interested in understanding non-financial value delivered by companies through recognised frameworks and goals (e.g. tracking performance against the Sustainable Development Goals). EY's most recent Future Consumer Index[23], conducted in July 2021, found that most consumers consider the sustainability of their purchasing decisions, with this being most pronounced in food purchasing decisions. Sixty-nine percent of consumers consider sustainability some or all of the time when purchasing fresh meat, fish and poultry.

- **Social awareness of environmental impacts associated with unsustainable beef production** driven by media coverage, health concerns, climate action and activists. e.g. McDonald's has become a signatory to the New York Declaration on Forests (NYDF), committing to eliminating deforestation from their global supply chains by 2030.[24]

[18] EY, "Capitalising on Queensland's opportunities in a zero net emissions future", https://www.qld.gov.au/__data/assets/pdf_file/0010/101701/ernst-young-qld-zero-net-emissions-future-exec-summary.pdf

[19] ibid

[20] ibid

[21] Food Frontier 2020 State of the Industry report, available from https://www.foodfrontier.org/reports/

[22] Ibid

[23] EY, Future Consumer Index, 'EY Future Consumer Index | EY – Global | EY Australia', 2021

[24] "Conserving Forests", *McDonalds,* https://corporate.mcdonalds.com/corpmcd/our-purpose-and-impact/our-planet/conserving-forests.html, accessed 22 March 2021.

- **Evolving international climate change policy and regulatory frameworks impacting Australian beef,** such as carbon taxes, cap-and-trade schemes, carbon tariffs on emissions intensive imports (e.g. European Union Carbon Border Adjustment Mechanism),[25] and removing illegal deforestation from supply chains (e.g. increasing pressure in international markets such as the EU, the UK and the US).[26]

- **Growing political influence** from China has seen a ban on beef imports from several Australian abattoirs (Australia's export market to China valued at $3 billion), resulting in job cuts and a 30% year-on-year decrease in sales.[27]

- **Disruption during COVID-19** including economic volatility in the international export market,[28] and increasingly fragile logistics and supply chains. Grain supply has been heavily impacted by a changing climate, as well as COVID-19 exacerbating port bottlenecks and disrupting airfreight and labour availability.[29]

- **Ageing agricultural workforce** in Australia, with the average age of a farmer being 57 years, and their average years of farming experience is 37 years.[30] This should be considered in the context of the sector's agility to innovate and adopt new technologies moving forward.

- **Growth in regenerative agriculture** including holistic management, cell grazing and innovation in emissions-reducing pasture grasses and forage legumes. Furthermore, this includes the carbon drawdown potential of regenerative grazing in temperate and subtropical areas.

> "Every farmer I've spoken to wants to give their kids a property that's as productive and healthy as it can be."
> Natural resource management stakeholder

Emissions context

During COP26, the Australian Government committed to a net zero emissions target by 2050[31], which includes emission reduction opportunities from LULUCF activities. However, there is still international pressure to set a more ambitious interim target by the end of the decade in line with commitments from other countries and regions such as the UK, the USA, Japan and the EU.

Australia can capitalise on growing voluntary markets such as carbon and biodiversity markets, and innovation in emissions reducing technologies and practices.

[25] ABC News, "Australian exporters could face millions of dollars in European tariffs as EU seeks to punish polluters", https://www.abc.net.au/news/2021-03-11/australia-to-face-huge-tariffs-in-europe-over-climate-emissions/13233360, 11 March 2021.

[26] European Parliament Working Group on Responsible Business Conduct, 'European Commission promises mandatory due diligence legislation in 2021', https://responsiblebusinessconduct.eu/wp/2020/04/30/european-commission-promises-mandatory-due-diligence-legislation-in-2021/, 2020; BBC News, 'Climate change: New UK law to curb deforestation in supply chains', https://www.bbc.com/news/science-environment-53891421, 2020; World Economic Forum, 'Deforestation can't be stopped by voluntary action alone', https://www.weforum.org/agenda/2020/01/deforestation-voluntary-action-regulation/, 2020

[27] ABC News, "China's ban on Australian beef costing hundreds of millions and putting people out of work", https://www.abc.net.au/news/2020-12-09/china-bans-cost-meat-industry-hundreds-of-millions/12961538, 9 December 2020.

[28] Meat & Livestock Australia, "Industry projections 2021 – Australian cattle report", 2011.

[29] Meat & Livestock Australia, "State of the Industry Report– The Australian red meat and livestock industry 2020", 2020.

[30] CSIRO, "The Future of Australia's Agricultural Workforce", https://data61.csiro.au/en/Our-Research/Our-Work/Future-Cities/Planning-sustainable-infrastructure/Future-of-Australias-agricultural-workforce

[31] Australian Government, "Australia's plan to reach our net zero target by 2050", https://www.minister.industry.gov.au/ministers/taylor/media-releases/australias-plan-reach-our-net-zero-target-2050, 2021

Australia's emissions profile

Australia is in the top 5% of greenhouse gas emissions (GHG) emitters per capita globally, emitting more GHG emissions per capita than the United States.[32] In 2019, over 80% of Australia's GHG emissions came from the energy sector, with agriculture second (~13%).[33]

Australia's LULUCF activities are an overall net carbon sink, meaning these activities sequester[34] more carbon than they emit. However, this is not the case in Queensland, where LULUCF activities are a net GHG emitter, due to levels of land clearing activity mainly linked to the beef industry (see Figure 3 below).

~14% of Queensland's total emissions come from beef cattle farming in Queensland, equating to **~4.5%** of Australia's total emissions

NGGI – 2019 figures, including enteric fermentation (Beef Cattle – Pasture) and a portion of vegetation emissions (equating to approximately 60% of the sector's total emissions)

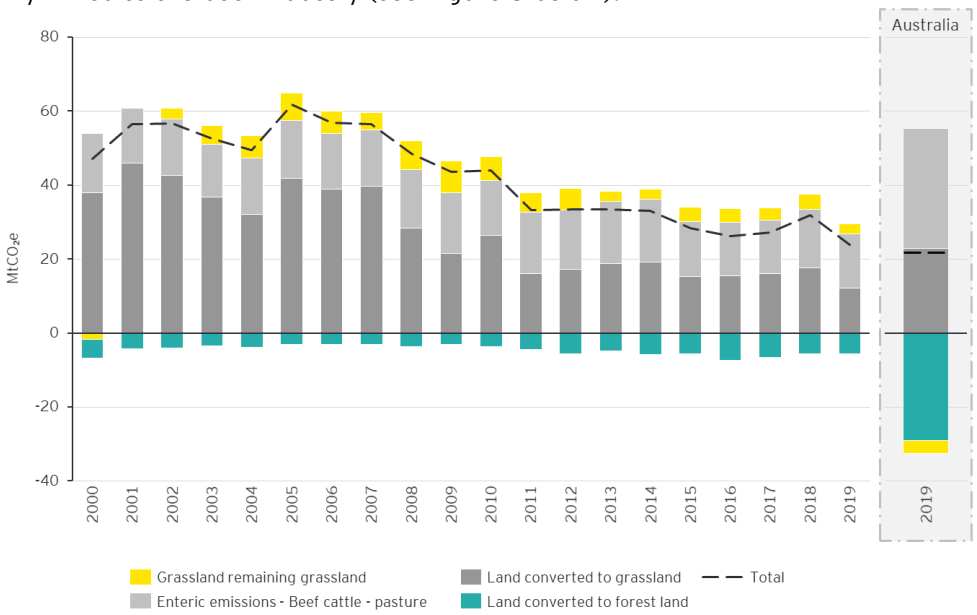


Figure 3 Historical emissions from the beef industry in Queensland (2000-2019, on left) and Australia (2019, on right) from various sources: enteric emissions from beef cattle, re-clearing (grassland remaining grassland), primary conversion of forest to grassland, and reforestation (land converted to forest land).[35] Emissions above the horizontal axis represent emissions generated (greenhouse gases released into the atmosphere), while below the line represents sequestration (greenhouse gases withdrawn from the atmosphere through vegetation growth).

Vegetation context

Over the last century, Queensland's land managers have experienced various cycles of tightening and relaxation of vegetation management laws, directly impacting deforestation levels on pastoral land.

[32] Crippa et. al., "Fossil CO_2 and GHG emissions of all world countries – 2019 Report", *Publications Office of the European Union*, 2019.
[33] Australian Government - Department of Industry, Science, Energy and Resources, "National Greenhouse Gas Inventory", https://ageis.climatechange.gov.au/
[34] Carbon sequestration is a process by which greenhouse gases are removed from the atmosphere and stored, e.g. in vegetation and soils.
[35] National Greenhouse Gas Inventory – Paris Agreement Inventory, Department of Industry, Science, Energy and Resources, 2021; Grassland remaining grassland and land converted to grassland data has been adjusted to reflect emissions attributed to the red meat industry. EY has adopted a 73% assumption based on analysis available, in accordance with the Wilderness Society report, "What's driving deforestation & land clearing in QLD?", https://www.wilderness.org.au/qlddeforestation#:~:text=Our%202019%20analysis%20found%20that,as%20the%20primary%20land%20use

Queensland had minimal land clearing regulatory controls prior to 1990[36]. In fact, land holders were incentivised to clear land through the *Brigalow and Other Lands Development Act 1962* (QLD)[37], resulting in ongoing expenses associated with regrowth management particularly where vegetation often returns thicker and denser compared to remnant regional ecosystems. However, these characteristics mean that Queensland has broader opportunities to preserve and increase carbon storage and biodiversity to a greater extent compared to land in New South Wales, which has experienced only marginal regrowth since historical clearing.

In more recent years, the strengthening of vegetation protection laws enabled Australia to meet its Kyoto Protocol target for emissions reductions. Figure 4 provides an overview of the impact on land clearing rates and associated emissions as a result of vegetation management regulation in Queensland.

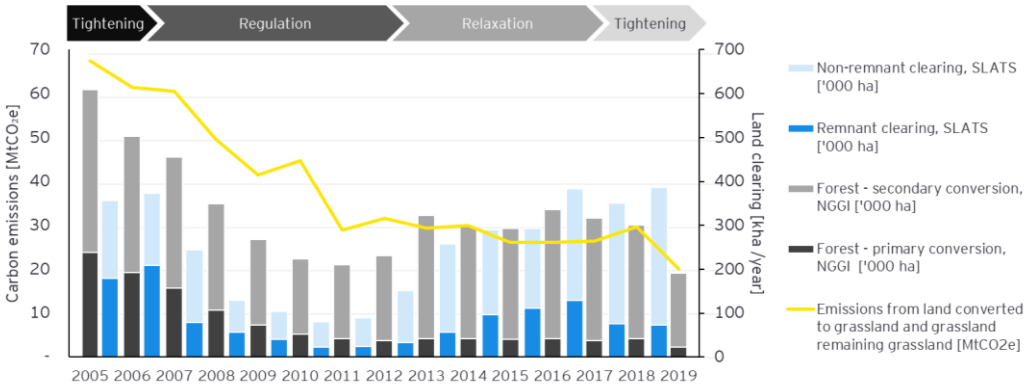


Figure 4: Historical LULUCF emissions and land clearing rates in Queensland, 2000-19.[38] Labels show the various regulatory phases in vegetation management in Queensland. No available data in relation to remnant and non-remnant vegetation in 2019 from SLATS

> "We need more education on the benefits of vegetation, like shading and cooling, particularly with additional warming from climate change."
> Stakeholder

Australia is the only developed country containing a global deforestation hotspot.[39] Approximately 75% of deforestation in Australia occurs in Queensland[40], where beef cattle grazing is a key driver of land clearing. As per Figure 3, emissions from vegetation thinning and clearing are a significant proportion of the beef industry's emissions.

[36] Some land clearing controls were available pre 1990s, these included: s 231 of the *Land Act 1897* (Qld), then s 198 of the *Land Act 1910* (Qld), and then s 250 of the *Land Act 1962* (Qld) which prohibited ringbarking or destruction of timber on leasehold land without a permit.

[37] Department of Natural Resources and Mines, "A guide to Land Tenure – Under the *Land Act 1994*", 2013

[38] Estimated land clearing in 2019 based on the proportion of GHG emissions and cleared land in 2018

[39] WWF International, "Deforestation fronts, drivers and responses in a changing world", 2021. https://WWFAint.awsassets.panda.org/downloads/deforestation_fronts___drivers_and_responses_in_a_changing_world___full_report_1.pdf

[40] Corey J. A. Bradshaw, "Little left to lose: deforestation and forest degradation in Australia since European colonization", *Journal of Plant Ecology*, Volume 5, Issue 1, March 2012, Pages 109-120, https://doi.org/10.1093/jpe/rtr038, 2012

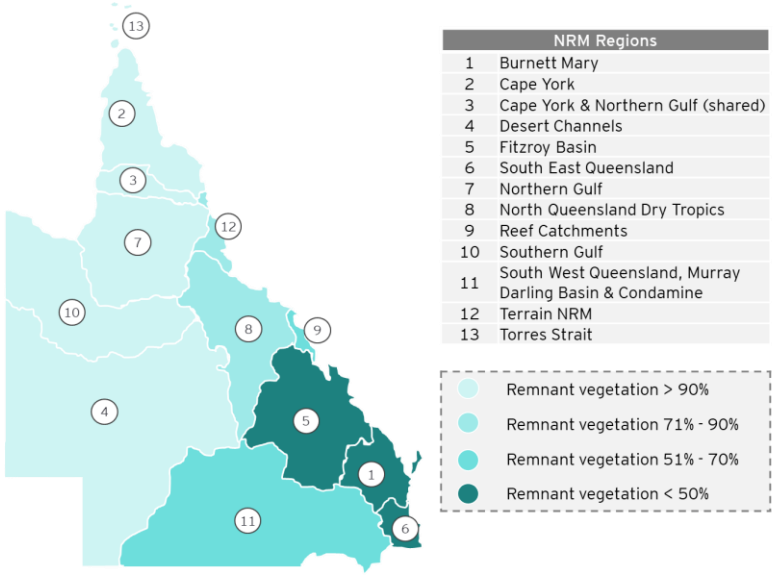


Figure 5: Remnant vegetation remaining in Queensland by Natural Resource Management Regions, 2019 [41]

Drivers of land clearing in the beef industry

Beef cattle farming in Queensland uses a large amount of productive land, with 83% of Queensland's area being managed by graziers[42]. Historically, graziers have conducted primary clearing in Queensland and in the rest of Australia to develop pasture. However, most contemporary clearing in Queensland is regrowth management (non-remnant or secondary conversion as shown above in Figure 4).

The relationship between tree cover and pasture quality is not straightforward, and the exact impacts and benefits of clearing and thinning are continuously being studied. Drivers for clearing vary by region based on their unique characteristics.[43] However, stakeholder feedback and reports from the beef cattle industry suggest that the desire to improve pasture quality and availability is a key driver for clearing and thinning. The pastures that beef cattle feed on require water (e.g. rainfall and groundwater) and nutrients to maintain. It is commonly understood that trees on this land compete with pasture for water, which can impact pasture yield and carrying capacity for cattle.[44] In resource constrained environments, where pressures such as drought and market factors place stress on businesses, this can drive land clearing and thinning on the ground. For example, using vegetation to provide fodder for cattle or removing trees to improve pasture quality during a drought.

[41] Queensland Department of Environment and Science, "Remnant regional ecosystem vegetation in Queensland", 2019

[42] Department of Agriculture "Land management practice trends in Queensland's grazing (beef cattle/sheep) industries" https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/natural-resources/soils/trends-factsheets/qld-practices-grazing.pdf

[43] Simmons, Law, Marcos-Martinez, Bryan, McAlpine, Wilson, "Spatial and temporal patterns of land clearing during policy change", Land Use Policy, 2018.

[44] Hall, Silcock, and Mayer, "Grazing pressure and tree competition affect cattle performance and native pastures in Eucalypt woodlands of Queensland, north-eastern Australia." Animal Production Science, 2020; Futurebeef, https://futurebeef.com.au/wp-content/uploads/GSW_3e-clearing.pdf; Meat & Livestock Australia; "Grazing land management Sustainable and productive natural resource management" http://www.makingmorefromsheep.com.au/Grazing_land_management_Sustainable_productive_natural_resource_managtc3a8.pdf?ID=160207

Vegetation poses both a challenge and an opportunity to the beef industry

The Australian government, alongside 123 other countries, recently committed to stop deforestation by 2030 during COP26, which will require significant adjustments in local and international policy settings as well as market drivers related to land management and grazing practices in the coming years.[45]

While land clearing, thinning and deforestation present a challenge for the beef industry in terms of its emissions and public perception, vegetation management provides a promising pathway to reduce carbon emissions and sequester carbon, which will contribute to the beef industry CN30 target and meet Australian international commitments regarding deforestation by 2030.

The opportunities related to GHG emissions sequestration across Queensland vary depending on historical clearing rates and current grazing activities. Research undertaken by UNSW[46] identified the average maximum potential annual emissions abatement from 2020 to 2030 by region, which comprises avoided clearing, avoided thinning/suppression and grazing land that would have retained forest cover (i.e. regeneration that would have occurred anyway).

As per Figure 6, over two thirds of emission reductions across Queensland are related to avoided clearing (68%), followed by avoided thinning and suppression (16%). Nearly 80% of emission reduction potential are concentrated in four Natural Resource Management (NRM) regions:

1. South West Queensland, Murray Darling Basin & Condamine (31 $MtCO_2$-e/yr)
2. Desert Channels (31 $MtCO_2$-e/yr)
3. Fitzroy Basin (30 $MtCO_2$-e/yr)
4. Southern Gulf NRM (23 $MtCO_2$-e/yr)

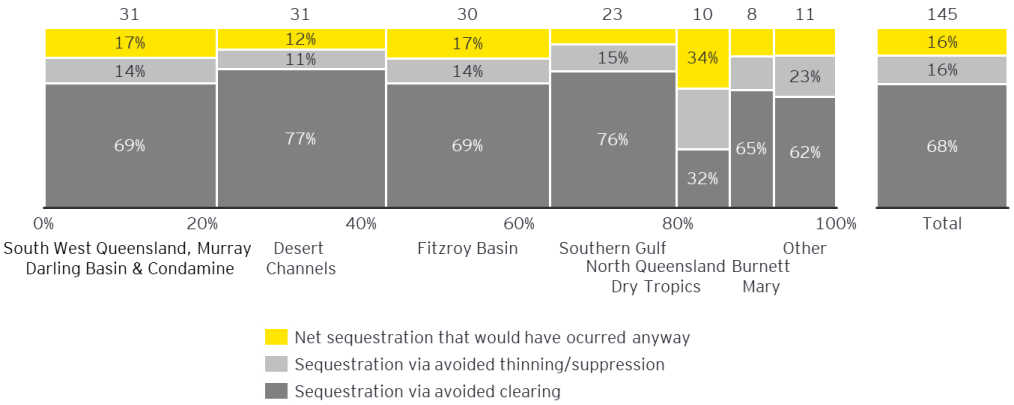


Figure 6: Estimated maximum abatement ($MtCO_2$-e/yr, 2020-30) for three types of sequestration in key beef producing NRM regions, and total (at right).[47] Numbers at the top of the graph show the average maximum emission abatement which could be achieved in each region per year, and percentages show the proportion of this which could be achieved through different vegetation actions.

[45] UN Climate Change Conference UK 2021, "Glasgow leaders' declaration on forest and land use", https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/, 2021

[46] Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

[47] Ibid. UNSW analysis included LGAs that recorded >0.7 Mha of grazed native vegetation linked to beef production (i.e. 32 LGAs out of 78 LGAs), which represents 95% of total area of grazed native vegetation in Queensland

Approach

Scope of work

WWF-Australia commissioned EY to develop decarbonisation pathways that can assist the Queensland beef industry to achieve its carbon neutrality target by 2030 through enhanced land management practices. The explored pathways are based on a set of assumptions around policy and regulatory settings, market-based approaches and technology.

Through stakeholder engagement and analysis of costs and impacts, EY identified actions through which the Australian and Queensland Governments can help address barriers and create opportunities for improved beef sustainability and productivity in Queensland. The significant emissions reductions and biodiversity improvements gained through retaining and restoring vegetation will also enable Australia to achieve ambitious future emissions targets as well as biodiversity commitments for both Queensland's terrestrial landscapes and the Great Barrier Reef.

Approach

EY's analysis was primarily based on desktop research and consultations with key stakeholders, including government, advocacy groups, non-for-profit organisations, industry leaders and peak bodies.

The analysis builds on the findings of emissions and vegetation modelling and analysis commissioned by WWF-Australia, conducted by:

- The University of Queensland[48]
- The Commonwealth Scientific and Industrial Research Organisation[49]
- University of New South Wales[50]

These reports demonstrate the abatement potential of Queensland's beef producing regions through vegetation modelling, identifying vegetation management practices as the most promising pathway to reduce carbon emissions and sequester carbon. UNSW's scenario modelling finds that strengthened government policy settings relating to vegetation significantly reduce the quantity of emissions required to be offset by the beef industry to fully decarbonise its operations (i.e. the 'abatement task').[51]

[48] Roderick J Fensham and Don Butler, "Consequences for Australian emissions of land clearing in Queensland", University of Queensland, 2020

[49] Keryn Paul and Stephen Roxburgh, "Predicting abatement potential in Queensland beef producing regions." Final Report to The University of New South Wales, CSIRO, 2021.

[50] Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

[51] Under current policy settings, 33 $MtCO_2$-e per year would need to be avoided or sequestered via changed vegetation management practices to fully decarbonise beef industry's operations. Under relaxed policy settings, the abatement task would increase to 41 Mt CO2-e per year. Under strengthened policy settings: the abatement task would be 13 Mt CO2-e per year. See Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

EY's methodology consisted of three key steps:

Scenario definition, assumptions and limitations

- Defining action scenarios: business as usual (BAU), regulation (i.e. "Stick") and incentivisation (i.e. "Carrot")
- Validating assumptions and narratives of each pathway with stakeholders

Scenario analysis

- Modelling BAU, Stick and Carrot decarbonisation pathways towards carbon neutral beef industry aligned with UNSW and UQ clearing and emissions scenarios
- Identifying the most feasible pathway based on potential implications to different stakeholders, and stakeholder feedback

Supportive actions under the most feasible pathway

- Developing a longlist of potential actions under the identified pathway
- Conducting a qualitative multicriteria analysis for each action based on estimated implementation costs, and positive social, economic and environmental impacts
- Prioritising key actions based on stakeholder input relating to feasibility and effectiveness, and the multicriteria analysis
- Validating key actions with stakeholders

Decarbonisation pathways for the beef industry

The Queensland beef industry can become carbon neutral by 2030 through practices that support land use and land use change activities to sequester more emissions from the atmosphere than they emit.

There are multiple pathways for the beef industry to decarbonise its operations, including adopting new technologies, adapting to new policy and legal settings, consumer demand, and taking part in carbon and biodiversity markets. The scenarios included in this report represent different 'policy mixes' of regulatory levers and market-based approaches to improve land management practices in Queensland:

- The BAU scenario: the reference scenario where climate policies, market forces and technology adoption follow current trends.
- The Stick scenario: assumes that land clearing rates would reduce through stronger land clearing regulations set out in the *Vegetation Management Act 1999 (Qld)* VMA, and enforcement of these together with more incentives
- The Carrot scenario: considers financial incentives and market mechanisms (i.e. Emissions Reduction Fund (ERF), Land Restoration Fund (LRF) and Carbon + Biodiversity Pilot (C+B)) and other emerging natural capital markets as the primary mechanism to minimise carbon emissions from primary and secondary land conversion, together with some strengthening of regulation

The following tables provide a summary of the key considerations under each scenario.

Table 1: Key assumptions under each scenario

Scenario	Description
BAU scenario - reference case or baseline	► Only policies already supported by specific implementation measures in place as of July 2021 ► Market continuing its current trajectory: domestic demand for beef declines due to shifting consumer preference, however this is offset by the increasing demand in international markets such as China and India[52] ► Current trend of emission reduction technologies with limited funding available for R&D. The private sector, limited to market leaders and early adopters, continue to invest in emission reduction technologies at current rates ► Enteric emissions decrease by 15% through feed supplements, selective breeding, anti-methane vaccine and reduced time to market.
Stick scenario – strong action, regulation	► Strengthening State and Federal regulation and enforcement, including the VMA and the EPBC Act[53] ► Growth and uptake of commercially viable emission reduction technologies through law enforcement and legislation ► Continuation of policies and initiatives that support voluntary markets such as the Emission Reduction Fund (ERF, also known as Climate Solutions Fund, CSF) and Land Restoration Fund (LRF) as per BAU scenario

[52] Beef2Live, "*World Beef consumption per Capita – Ranking of countries*", https://beef2live.com/story-world-beef-consumption-per-capita-ranking-countries-0-111634#:~:text=The%20world%20consumed%20129.5%20billion,in%20the%20world%20in%202016

[53] This is based on the "Strengthened policy settings" scenario set out in the Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

Table 1: Key assumptions under each scenario	
Scenario	Description
Carrot scenario – strong action, incentivisation	► Continuation of tightening Federal and State regulation and legislation related to land clearing. Noting that the regulations are not as restrictive as in the Stick scenario [54] ► Significant growth and uptake of commercially viable emissions reduction technologies through public and private investment in R&D and collaboration in designing and establishing policy and market signals ► Significant growth of the ERF and LRF, and support to emerging programs (e.g. Carbon + Biodiversity Pilot Project under the Agriculture Biodiversity Stewardship Package) ► Establishment of publicly funded programs or initiatives related to private protected land (e.g. adjustments to the NatureAssist program with ongoing annual stewardship payments) ► Increasing accessibility to sustainable finance from financial institutions (i.e. development of financial products with the objective of fostering sustainability performance)

The following assumptions are included under both the Stick and Carrot scenarios:

Table 2: Key assumptions under both Stick and Carrot scenarios	
Scenario	Description
Stick scenario – strong action, regulation & Carrot scenario – strong action, incentivisation	► Increasing participation in carbon markets due to increased demand and price of carbon credit units, and willingness to pay for carbon neutral and deforestation free beef ► Social licence to operate and environmental, social and governance (ESG) factors being vital for access to finance, with uptake of innovative sustainable financial products such as conservation finance and natural capital investing ► Enteric emissions decrease by 25% through feed supplements, selective breeding, anti-methane vaccine and reduced time to market. ► Potential carbon sequestration through regulations includes Avoided clearing (68%), Avoided thinning/suppression (16%) and Sequestration that would have occurred anyway (16%)[55] ► Contribution of possible ERF projects to the maximum abatement potential include Human-Induced Regeneration (HIR) (76%) and Reforestation (RF) (14%) [56] ► Average Australian Carbon Credit Unit (ACCU) price $34 per tonne of carbon dioxide equivalent (tCO_2-e) between 2022 and 2030 ► Average co-benefit payments under the LRF $31/$tCO_2$-e between 2022 and 2030 based on average ACCU and co-benefit payment from the LRF Round 1 (i.e. $49/ tCO_2-e)

[54] For the purposes of this analysis, only HIR and RF methods were used in the model in line with detailed analysis undertaken by UNSW: Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

[55] Ibid

[56] Ibid

Regulations ('Stick') pathway

In terms of land clearing, the Stick pathway estimates that the following can be achieved, primarily through regulation:

- Queensland's total land clearing would reduce nearly 50% in 2030 compared to 2019 rates (from over 190 thousand hectares (kha) to 90 kha)
- Primary land conversion to grassland would reduce by 25% in 2030 (reducing from ~23 kha in 2019 to ~17 kha in 2030)
- Secondary land conversion would make up for almost 60% of the reduction in clearing by 2030 (reducing from ~169 kha to ~70 kha).

In terms of emissions:

- Stronger regulations contribute to LULUCF emission reductions by ~35% (~26 $MtCO_2$-e) via avoided clearing and thinning/suppression activities, whereas carbon sequestration projects provide ~65% (~58 $MtCO_2$-e) of emission removals that can be used towards CN30 target
- Cumulative emissions from avoided clearing and thinning / suppression activities accounts for ~26 $MtCO_2$-e, with ~16 $MtCO_2$-e from avoided clearing and ~10 $MtCO_2$-e from avoided thinning or suppression.
- The beef industry would need to undertake additional carbon sequestration projects to offset enteric (livestock) emissions (e.g. ERF, LRF and potentially in the emerging C+B)
- Approximately 58 $MtCO_2$-e would be removed through carbon farming projects from 2021 to 2030, where HIR and RF projects would sequester 49 $MtCO_2$-e and 9 $MtCO_2$-e, respectively.[57]

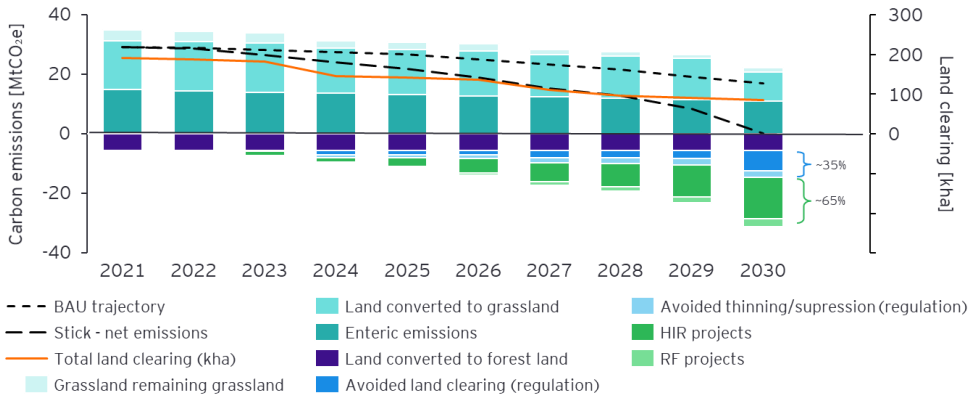


Figure 7: Stick scenario emissions reduction pathway and land clearing rate.[58]

[57] Maximum potential abatement percentages per method have been applied to determine the amount of $MtCO_2$-e that HIR and RF methods can sequester

[58] 2021 greenhouse gas emissions are estimated based on the National Greenhouse Accounts 2019. Australian Government, "National Greenhouse Accounts 2019", https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-data-tables-and-methodology, 2021

Market incentivisation ('Carrot') pathway

The Carrot pathway considers that the key driver to reduce land clearing rates and carbon emissions associated with beef industry's operations is through market and financial mechanisms. Under this pathway:

- Total clearing in Queensland would decrease from ~190 kha in 2019 to ~90 kha in 2030 (i.e. ~17 kha and ~70 kha from primary and secondary land conversion by 2030, respectively).
- Over 80% of total emissions would be sequestered through undertaking carbon farming projects, which would be equivalent to over 68 $MtCO_2$-e from 2021 to 2030 (~59 $MtCO_2$-e from HIR projects and ~9 $MtCO_2$-e from RF). Continuation of tightening land regulations would result in LULUCF emission reductions by ~20% (16 $MtCO_2$-e) through avoided clearing and thinning / suppression activities during this period.

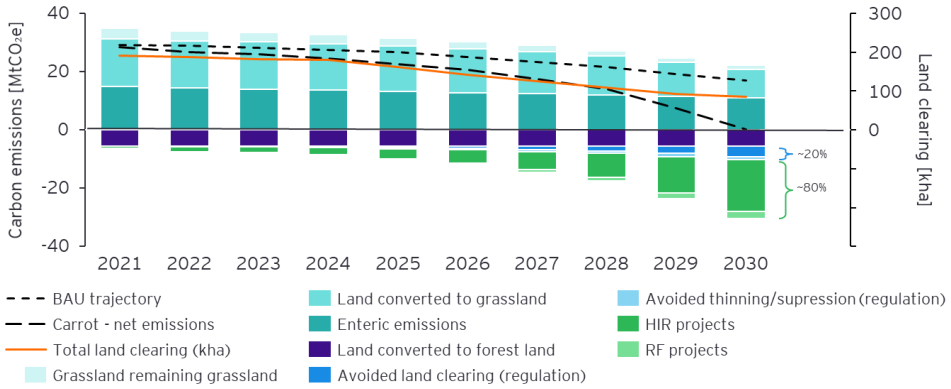


Figure 8: Carrot scenario - emissions reduction pathway and land clearing rate. [59]

Scenario comparison

EY's decarbonisation pathway analysis and stakeholder engagement indicate that the Carrot pathway is the most mutually beneficial pathway to reduce carbon emissions from land management practices associated with the beef industry in Queensland. This is due to the flow-on effect from carbon farming projects, particularly on regional jobs, potential additional revenue streams[60] and restoration and rehabilitation of ecosystem services. A Stick pathway would require significant compensation to landholders through mechanisms such as public-funded protected areas or fetching higher beef prices for sustainable beef unless significant productivity gains and greater land use efficiencies can be achieved.

Table 3 provides a summary of the potential implications for multiple stakeholders under each pathway, including cost and benefits, risks and opportunities.

[59] 2021 greenhouse gas emissions are estimated based on the National Greenhouse Accounts 2019. Australian Government, "National Greenhouse Accounts 2019", https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-data-tables-and-methodology, 2021

[60] Access to additional income streams depend on graziers' carbon footprint, graziers' decarbonisation strategy, climate policy settings and carbon offset price in domestic and international markets.

Table 3 Potential positive and negative implications of the Stick and Carrot pathways		
Pathway	Potential positive implications	Potential negative implications
Stick pathway Emission reductions through regulation: ~35% Emission reduction through carbon projects: ~65% Total avoided land clearing and thinning / suppression (2021-30): 26 $MtCO_2$-e Total carbon removals (2021-30): 58 $MtCO_2$-e	► Compared to incentives, tightening regulation has lower ongoing costs to government ► Proven track record of significantly reducing LULUCF emissions ► Estimated market value from carbon farming projects and co-benefit payments (2021-30): ~$3.7 billion[61]	► Political costs and resistance from landholders ► Opportunity cost to graziers associated with reforesting grazing land if this impacts production and potential reduction in land value/access to finance based on carrying capacity ► Potential to price Queensland beef out of domestic and global markets if additional costs of compliance are passed downstream to customers ► Potential opportunity forgone for graziers to participate in carbon and biodiversity markets due to land regulations (2021-30): ~$1.6 billion
Carrot pathway Emission reductions through regulation: ~20% Emission reduction through carbon projects: ~80% Total avoided land clearing and thinning / suppression (2021-30): 16 $MtCO_2$-e Total carbon removals (2021-30): 68 $MtCO_2$-e	► Attracting investor and private sector participation in carbon and environmental markets ► Additional revenue streams through access to markets ► Reward graziers for delivering social and environmental co-benefits ► Reputational and social licence benefits for the Queensland beef industry in domestic and international markets ► Creation of economic flow-on effects within regional communities due to income effect ► Supporting jobs in regional communities ► Estimated market value from carbon farming projects and co-benefit payments (2021-30): ~ $4.4 billion[62] ► Diversification of income stream through carbon and environmental markets[63]	► Increased costs to government for providing incentives and supporting the market ► Potential for land restoration and carbon projects to become more profitable than beef production, impacting the supply of Australian beef, increasing prices for consumers and reducing Queensland's beef export revenue ► Potential opportunity forgone for graziers to participate in carbon and biodiversity markets due to land regulations (2021-30): ~$860 million

[61] The estimated market value provides an indication of the significant opportunity of undertaking carbon farming projects in Queensland. Importantly, beef producers would not be able to claim carbon neutrality if the total estimated carbon credit units in the Stick and Carrot scenarios are surrendered to the government or sold to other industry sectors. To achieve CN30 target and create additional revenue streams, beef producers would need to generate more carbon credit units than estimated in the Stick and Carrot scenarios (i.e. more than 58 $MtCO_2$-e and 68 $MtCO_2$-e from carbon sequestration projects between 2021-30, respectively).

[62] Ibid

[63] While additional revenue streams will be attractive for beef producers, EY recognises existing barriers around economies of scale that make the implementation of ERF projects challenging for small and medium enterprises. Detailed analysis is required to estimate additional revenue streams based on location, biophysical condition, productivity, operating costs and carrying capacity. Access to additional income streams depend on graziers' carbon footprint, graziers' decarbonisation strategy, climate policy settings and carbon offset price in domestic and international markets.

Overall, the Carrot pathway presents a more balanced decarbonisation pathway, which would provide the beef industry sector the support to achieve its CN30 target and the flexibility to develop decarbonisation strategies that deliver economic, social and environmental benefits for multiple stakeholders.

It is important to note that the Carrot pathway would still require maintaining and strengthening policy settings to provide certainty for the beef industry's investment in emissions reduction activities. This would lead to a rapid expansion and maturity of existing and emerging carbon and natural capital markets, moving away from taxpayer mechanisms to market-based approaches in which graziers can manage their businesses in response to market demand.

The following chapter of the report outlines a set of actions that would support the implementation of the Carrot decarbonisation pathway, which focus on maintaining regulation while incentivising and rewarding landholders for sustainable land practices and conservation.

Government actions to support the beef industry

Improvements in environmental outcomes and biodiversity will support Queensland beef to be internationally recognised as a leader in environmental innovation and stewardship.

There are already a number of initiatives seeking to improve beef cattle farming sustainability. However, stronger cohesive action is required to achieve ambitious emissions reduction goals, improve land management practices and protect ecosystems. Through desktop review, analysis and stakeholder engagement, EY identified four core objectives to support the Carrot decarbonisation pathway.

1 Empower the beef industry to effect positive change through biodiversity and carbon opportunities, being recognised and rewarded for positive contributions to environmental stewardship

2 Transform beef markets including consumers and the finance sector to make informed decisions based on enhanced transparency of environmental credentials for beef products and enterprises

3 Establish robust data and frameworks to monitor and report outcomes over time and enable action

4 Safeguarding outcomes through regulation to prevent leakage (the displacement of forest conversion from one place to another)

EY developed a list of actions based on multicriteria analysis of environmental and socio-economic impacts outlined in Appendix A. Table 4 outlines the set of shortlisted actions that Federal and State government could consider to unlock economic, environmental and social outcomes through beef markets.

Table 4: Key actions to achieve objectives

Objective		Government action	Primary government involved
Empower the beef industry	1	**Enhance industry-led collaboration and coordination** on adopting sustainable practices, increasing productivity and identifying financial mechanisms associated with environmental credentials	Federal, QLD
	2	**Extension officers working with producers on a regional basis**, engaging one-on-one and facilitating peer-to-peer engagement (i.e. provision of guidance to participate in carbon and environmental markets)	Federal, QLD
	3	**Develop a simple-to-use digital tool for comparison of carbon and biodiversity opportunities**, practices and programs (i.e. streamlined information related to potential cost and benefits, and key considerations to participate in carbon and environmental markets)	Federal
	4	**Expand payments for biodiversity and ecosystem services** through the LRF and C+B (i.e. adjustment to current structures to allow private sector participation)	Federal, QLD

Table 4: Key actions to achieve objectives			
Objective	Government action		Primary government involved
	5	**Expand the Private Protected Area Program** to support the NatureAssist funding program (i.e. adoption of a similar funding program as the Biodiversity Conservation Trust in New South Wales)	QLD
	6	**Reduce administrative and cost barriers to uptake of Emission Reduction Fund projects** (i.e. streamlining application process, leveraging technology to reduce audit-related costs, and enable 'method stacking' under the ERF)	Federal
Transform beef markets	7	**Build consumer awareness through enhanced market transparency** (i.e. development of an encrypted supply chain using blockchain technologies)	Federal
	8	**Promote market access through environmental credentials** and labelling initiatives (i.e. develop independent deforestation-free certification)	Federal
	9	**Explore sustainable finance options** to mobilise capital towards carbon- and nature-positive projects (i.e. establish partnerships with the private sector to de-risk investments through blended finance solutions; explore mechanisms that allow smaller investment opportunities to be aggregated to attract capital investors)	Federal QLD
Robust data and frameworks	10	**Centrally amalgamate and leverage existing data** relating to vegetation, carbon and biodiversity (i.e. central and independent database to track performance over time and conduct benchmark analysis)	Federal
	11	**Utilise enhanced technology for monitoring and compliance** of vegetation management and biodiversity projects (i.e. improved satellite monitoring to reduce reporting timeframes (SLATS reports), drones, remote sensing and farm management software)	Federal QLD
	12	**Harmonise vegetation-related definitions** across industry and Australian governments (e.g. 'forests', 're-clearing', 'deforestation', and 'remnant vegetation')	Federal QLD
	13	**Develop a centralised biodiversity reporting framework** and accounting standards for consistent measurement and reporting (i.e. amalgamating existing and emerging natural capital-related methods to measure and report biodiversity values)	Federal
Safeguarding outcomes	14	**Improve effectiveness of legislative frameworks** which govern vegetation management and land use (i.e. independent review of the VMA including Category X definitions and allowances, clearing codes and Property Maps of Assessable Vegetation; and implementation of recommendations and structural reforms to the EPBC Act)	Federal QLD
	15	**Improve consistency and diligence in enforcement** of existing vegetation and conservation laws	Federal QLD

EY estimated potential implementation costs based on proxies from similar government-led programs, initiatives from the private sector, stakeholder input and/or potential staff required. Indicative estimated implementation costs for supporting actions under the Carrot pathway range from ~$260 million to ~$420 million by 2030.

The estimated implementation costs consider resources required to establish or undertake each action, as opposed to indicating total funding required over the period. For example, implementation costs associated with Action 5 (provision of financial support to protect and conserve private land) only considers expenses to establish the program, similar to the Biodiversity Conservation Trust established by the New South Wales government. The implementation cost does not include any funding commitments to deliver conservation values (i.e. the NSW government committed more than $350 million over the next five years commencing in 2019-20).[64]

Figure 9 shows the relative scale of estimated implementation costs, implementation timeframe and potential environmental, social and economic benefits associated with each action. Two thirds of the proposed actions can be fully implemented within the next two years. Other actions require additional technology advancements and maturity in environmental markets. However, all actions can be started now to support in the decarbonisation of the beef industry by 2030 in a productive way.

EY conducted a series of validation meetings and workshops to test the feasibility, completeness and practicality of implementing each action.

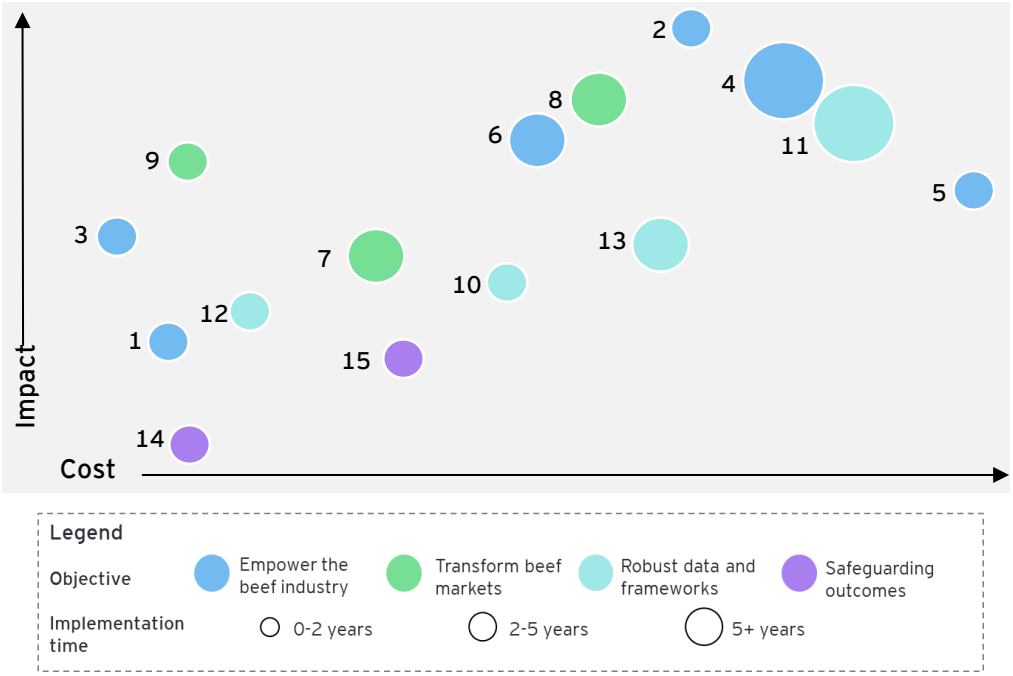


Figure 9: Estimated costs and positive impacts associated with the key actions in Table 4 modelled through the Carrot scenario. Implementation costs represent costs to government and are shown on a non-linear scale. Impacts are the weighted sum of environmental, social and economic positive and negative impacts. The size of the bubble represents the time to implementation, with larger bubbles taking longer before having impact. Implementation time refers to when each action would reach its maturity and would have the most impact.

No single action will be the 'silver bullet' for the beef industry to significantly reduce carbon emissions over the next decade. Rather, government must consider a suite of actions and the significant dependencies of certain actions on others.

[64] New South Wales government, "Biodiversity Conservation Trust", https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/about-the-biodiversity-offsets-scheme/biodiversity-conservation-trust, 2021

While the Australian and Queensland governments might be already considering some of the actions outlined in this report, further analysis is required to estimate total costs and benefits associated with selected actions.[65]

In implementing any actions, it is essential for government to adopt a multi-stakeholder approach to ensure that programs consider landholders' perspectives and identify risks and opportunities for all stakeholder groups. Stakeholder engagement and insights from prior successful and unsuccessful government and private programs in the grazing sector have highlighted a multi-stakeholder approach as key.

The following section provides further details on the suite of actions required to achieve the objectives, including government's role, anticipated impact and timing.

Empowering the beef industry to effect positive change

Action 1 Enhance industry-led collaboration and coordination on adopting sustainable practices, increasing productivity and identifying financial mechanisms associated with environmental credentials

To transform the beef cattle industry, each player in the value chain, from graziers, to processors and supermarkets must work together for the same goal. Different stakeholder groups from industry through to NGOs expressed mutual objectives, including sustainable food production, and protecting and restoring natural assets such as the Great Barrier Reef and native plants and animals. However, greater collaboration towards these common goals by focusing on mutual benefits and co-developing solutions with industry is required.

Building capacity and connections across the beef value chain and with other stakeholders would enable the beef industry to accelerate the adoption of sustainable practices and identify potential financial mechanisms to monetise the delivery of environmental and social benefits.

Stronger and more sustainable supply chains could be established through increased collaboration and knowledge sharing whereby producers, distributors and retailers align strategies to meet changing consumer preferences in domestic and international markets.

> In the UK, the Retail Soy Group sent an open letter to the UK Secretary of State on behalf of 22 major businesss in the food sector, including Sainsbury, Nestlé, and McDonald's UK and Ireland, stating:
>
> *"The Government's proposal to introduce a due diligence requirement on business is welcome as we recognise that the private sector has a critical role in addressing global deforestation. We are fully supportive of the government's intention to develop a coordinated strategy to set a level playing field where sustainable commodities are the norm throughout the UK and beyond."*[66]

Action 1

Potential impacts:
Environmental - medium
Economic – medium
Social – medium

Average estimated implementation costs: ~$16 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

The **Global Roundtable for Sustainable Beef** has over 70 members across the value chain. Constituents include MLA, Cattle Council of Australia, Cargill, JBS, Tyson, and McDonald's. The Global Sustainability Goals are:

1. **Climate:** Reduce the net global warming impact of beef by 30%
2. **Land Use:** Ensure the beef value chain is a net positive contributor to nature
3. **Animal Health & Welfare:** Provide cattle with an environment in which they can thrive through best practices

https://grsbeef.org/

[65] Detailed economic analysis was not included in the scope of work. Further engagement with the Australian and Queensland governments is required to obtain robust underlying data, define parameters, understand work undertaken to date by government agencies, and validate assumptions to estimate total costs and benefits derived from individual or a group of actions.

[66] UK Department for Environment Food & Rural Affairs, "Consultation on the introduction of due diligence on forest risk commodities", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/933985/due-diligence-forest-risk-commodities-government-response.pdf, 2020

The Federal and State government could support the beef industry through funding for regional hubs, conferences and marketing campaigns (e.g. grassfed beef producers demonstrating sustainability practices through a platform developed by MLA in collaboration with the University of Queensland and WWF-Australia).[67] Enhanced collaboration among graziers will foster connection and understanding between stakeholder groups and congruity to expedite outcomes.

Action 2

Potential impacts:
Environmental - high
Economic – high
Social – high

Average estimated implementation costs: ~$25 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 2 Extension officers working with producers on a regional basis, engaging one-on-one and facilitating peer-to-peer engagement

Landowners and graziers must navigate a complex landscape to ensure compliance with regulation while identifying emerging opportunities such as evolving sustainability frameworks and voluntary markets. Stakeholders stated that the variety of options can be overwhelming.

Suitability of various opportunities vary by region, depending on vegetation profiles and beef production systems. Enabled through government funding, regional hubs with extension officers raise awareness of government schemes and market initiatives that graziers can participate in. They support implementation of suitable, beneficial and profitable actions on farm. Landowners and graziers would benefit from workshops, training seminars, one-on-one extension and peer-to-peer learning related to carbon, vegetation and biodiversity opportunities.

Officers would support landholders through the requirements, application process and potential costs and benefits. Federal and State government funding could be strategically allocated to the NRM regions with highest clearing rates and those with highest sequestration potential (as outlined in Figure 6 and summarised to the left).

Efforts focused on the following regions would have the greatest impact:

- Banana
- Central Highlands
- North Burnett
- Maranoa
- Charters Towers

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

Action 3

Potential impacts:
Environmental - medium
Economic – medium
Social – medium

Average estimated implementation costs: ~$4 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 3 Develop a simple-to-use digital tool for comparison of carbon and biodiversity opportunities, practices and programs

The current and ongoing COVID-19 operating environment has pushed businesses towards digital and remote working tools. To address issues which stakeholders identified around understanding various requirements and opportunities, a web-based platform could provide streamlined information. This could be demonstrated by extension officers (Action 2) and shared through regional hubs, summits or conference (Action 1), for example during Beef Week.

The information on the website could provide guidance on both financial incentive and market opportunities, and inform graziers changes in legislation and emerging frameworks. Through interactive design, the tool could allow input of information to identify suitable opportunities and potential costs and benefits.

[67] Meat & Livestock Australia, "Call for grassfed beef producers with a passion for demonstrating environmental performance", https://www.mla.com.au/news-and-events/industry-news/call-for-grassfed-beef-producers-with-a-passion-for-demonstrating-environmental-performance/#, 2021

While telecommunications access is improving in many regional and remote areas, lack of internet connectivity may be a barrier to accessing information. As such, any web-based tool should have options to download information packages which can be taken to properties for offline access.

Action 4

Potential impacts:
Environmental - high
Economic – high
Social – high

Average estimated implementation costs:
~$21 million

Estimated implementation timeframe: 5+ years

See appendices for results of action analysis.

Action 4 Expand payments for biodiversity and ecosystem services through the LRF and C+B programs

Graziers should be compensated and rewarded for implementing sustainable land management practices through financial incentives from the public and private sector. Global momentum is driving institutional investors, corporates, and governments to participate in carbon and environmental markets. Many land-based carbon projects also deliver broader ecosystem and biodiversity benefits, driving opportunities to monetise co-benefits.

The National Farmers Federation (NFF) has identified payment for ecosystem services as a key opportunity to recognise and reward farmers (including beef producers) for adopting sustainable farming methods. NFF has set a 5% target of farm revenue from ecosystem services as part of the $100 billion farmgate output target by 2030.[68]

Box 1: European Union Common Agricultural Policy[69]

The EU's Common Agricultural Policy (CAP) provides all European countries with a shared framework for managing farm productivity and profitability, whilst protecting food security and landscapes. In 2019, the CAP supported farmers through direct payments (over €40 billion) that remunerated farmers for 'environmentally friendly' farming and developing public goods that are not usually paid for by the markets (e.g. environmental stewardship).[70]

The EU has recently started exploring opportunities for "eco-schemes" and farm advisory services designed to reward farmers that choose to take additional activities to support climate goals and environmental protection. These are aligned to broader EU Green Deal targets, and specific objectives of the CAP.

> "Restoration funded by carbon farming has not occurred in areas of high biodiversity. This opportunity still exists because progress in aligning carbon and biodiversity benefits has been limited.
> Professor Graeme Samuel AC, Final Report of the EPBC Act Review

Both Federal and State governments have introduced flagship programs for supporting carbon and biodiversity, namely the Agriculture Stewardship Package, and Land Restoration Fund, as summarised in Table 5.

[68] National Farmers Federation, "2030 Roadmap, Australian Agriculture's Plan for a $100 Billion Industry", https://nff.org.au/wp-content/uploads/2020/02/NFF_Roadmap_2030_FINAL.pdf, 2020)

[69] European Commission, "List of potential agricultural practices that eco-schemes could support", https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/factsheet-agri-practices-under-ecoscheme_en.pdf, 2021

[70] European Commission, "The common agricultural policy at a glance", https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en, 2020

Table 5: Agriculture Stewardship Package and Land Restoration Fund	
Federal government	Agriculture Biodiversity Stewardship Package was established by the Australian Government to build on the ongoing Agriculture Stewardship Package. The package is worth $34 million and includes:[71] ► **Carbon + Biodiversity Pilot (C+B):** market-based mechanism to reward farmers for increasing biodiversity. The C+B program only considers planting a mix of species and managing vegetation within the six eligible NRM regions ► **Enhancing Remnant Vegetation Pilot**: payments to protect, manage and enhance high conservation value remnant native vegetation on-farm, including installing fencing, carrying out weeding, pest control and replanting ► **Australian Farm Biodiversity Certification Scheme**: showcasing best practice natural resource management which will support farmers to access markets and create price premiums for their products ► **Biodiversity Trading Platform**: adding transparency and credibility to the market by connecting farmers with buyers of biodiversity outcomes ► **Sustainability framework for Australian agriculture** ► **Agriculture Biodiversity Policy Statement**
Queensland government	**Land Restoration Fund (LRF)**: investing $500 million in carbon projects that deliver environmental and socio-economic co-benefits. The LRF enables landholders, farmers and first Nations peoples to identify alternative revenue streams. In 2020, the LRF first round invested over $90 million in carbon farming projects across Queensland followed by a recent announcement of the second round ($25 million) and the establishment of the **Natural Capital Fund** (seed funding) in 2021.[72] [73] [74]

Efforts focused on the following regions would have the greatest impact:

- Banana
- Central Highlands
- North Burnett
- Maranoa
- Charters Towers

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

As outlined in the Pathways chapter, the uptake of carbon farming projects would depend on minimum carbon and co-benefit payments, which vary across the State based on opportunity costs, economies of scale and administrative costs.

Corporates, financial institutions and investors are also increasingly interested in participating in programs that deliver environmental and social benefits in line with their commitments. The Federal and State governments can further support the expansion of these programs through additional public and private funding. This could include exploring adjustments to current scheme structures that allow impact investors, philanthropists, institutional investors and corporates to participate in these schemes (i.e. blended finance structures).

Importantly, the Federal government could support the standardisation of valuation methods related to co-benefits across different government-led programs (i.e. C+B and LRF). This will assist in establishing fair and consistent payments for ecosystem services, which is key for graziers to participate in these programs.

[71] Department of Agriculture, Water and the Environment, "Agriculture Stewardship Package", https://www.agriculture.gov.au/ag-farm-food/natural-resources/landcare/sustaining-future-australian-farming, 2021

[72] Queensland Government, "Investment Round 1 projects", https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund/funded-projects/projects-2020, 2021

[73] Queensland Government, "The Land Restoration Fund, 2021 Investment Round", http://www.kalagro.com.au/wp-content/uploads/2021/06/2021-Investment-Round-2.pdf, 2021

[74] Queensland Government, "21/22 Budget to regenerate reef, land and create QLD jobs" https://statements.qld.gov.au/statements/92335, 2021

Action 5

Potential impacts:
Environmental - high
Economic – medium
Social – low

Average estimated implementation costs:
~$156 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 5 Expand the Private Protected Area Program to support the NatureAssist funding program

Graziers who implement sustainable land management practices and have not significantly cleared or thinned vegetation on their land have not been significantly financially compensated for delivering conservation outcomes, and also cannot access many incentive programs focused on revegetation or degraded land.

In 2015, the Queensland Government adopted a long-term target of increasing protected areas to 17% of the State's total land mass under Queensland's Protected Area Strategy 2020-2030.[75] As of July 2021, Queensland has the lowest levels of protected land of any state or territory at just 8.26%, well below the State's targets and international ambitions.[76]

The Queensland Government recognises that landholders have an important role in safeguarding biological diversity through protecting nature refuges on their properties. The Private Protected Area Program targets suitable properties and works with landholders with a mutual conservation interest to enter into a conservation agreement, with some financial incentives available through the NatureAssist program.[77]

However, the NatureAssist program only supports funding (in the form of grants) for suitable properties selected for their significant conservation values, connectivity, and their predicted resilience to climate change. Other landholders who are undertaking conservation activities or contributing to sustainable production outcomes are not eligible for financial assistance or recognised for their contributions.

A model like NSW's Biodiversity Conservation Trust (BCT) would support biodiversity conservation outcomes through financial support for private land conservation activities. Around two-thirds of the BCT's investment in funded conservation agreements is flowing to graziers, farmers or mixed farming enterprises to manage parts of their properties for conservation. Eighty-seven percent of BCT agreements are in perpetuity, providing ongoing protection for the environment and stability and continuity for landholders.[78]

Efforts focused on the following regions would have the greatest impact:

- Cook
- Murweh
- Maranoa
- Balonne
- Central Highlands

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

Box 2: NSW Biodiversity Conservation Trust[79]

Supporting the commencement of the Biodiversity Conservation Act 2016, the NSW Biodiversity Conservation Trust (BCT) was constituted as a statuary body in 2017. The BCT's mission is to maximise the biodiversity conservation outcomes achieved with the public and private resources entrusted in the BCT. The BCT supports several programs centred around conservation management, private land conservation, biodiversity offsets, landholder support and educational initiatives.

[75] QLD Department of Environment and Science, "Queensland's Protected Area Strategy 2020-2030: Protecting our world-class natural and cultural values", 2020.

[76] QLD Government, Queensland's protected areas expanded', 2021; The Guardian, "Governments achieve target of protecting 17% of land globally", https://www.theguardian.com/environment/2021/may/19/governments-achieve-10-year-target-of-protecting-17-percent-land-aoe, 2021.

[77] QLD Government, 'The Private Protected Area Program', https://www.qld.gov.au/environment/parks/protected-areas/private/program, 2021.

[78] NSW Government, "BCT Business Plan 2021-22 to 2024-25' report", 2021

[79] NSW Government, "Biodiversity Conservation Trust 2017-18 to 2020-21 Business Plan", 2018; NSW Government, "What we do", https://www.bct.nsw.gov.au/what-we-do, 2018; NSW Government, "BCT Business Plan 2021-22 to 2024-25' report", 2021

The NSW government has committed more than $350 million over a five-year period from 2019-2020 onwards to enable the BCT to deliver its private land conservation programs. The BCT is funded through several sources, including developers making payments to the Biodiversity Conservation Fund (BCF) to transfer their offset obligations to the BCT (i.e. 212 developers have made payments worth more than $48 million in 2019-20).

Subject to eligibility, landholders can receive conservation grants for existing private land conservation agreements, funds for managing part of their property for conservation, funding through generating and selling biodiversity credits or fulfilling offset obligations by paying into the BCF.

The success of the program has been seen through the following outcomes:

- Since its inception, 285 landholders have signed a conservation agreement with the BCT creating over 129,000 hectares of conservation area under the program
- In 2019, BCT sampled 30 NSW landscapes and formed agreements with landholders which have contributed to protecting 148 different threatened species and 27 unique threatened ecological communities
- As of 30 June 2021, the BCT is managing 2,085 private land conservation agreements with landholders across 2.245 million hectares, which represents over 2.8% of the landmass of NSW
- The BCT grants program has seen $4.4 million flow to holders of partnership conservation agreements. Importantly, 87% of BCT agreements are in perpetuity, providing ongoing protection for the environment and stability and continuity for landholders

Queensland Government could expand the existing Private Protected Area Program to support the NatureAssist funding program, utilising a similar model to BCT. Providing graziers with perpetual payments would increase participation in biodiversity conservation activities through enhanced land management practices on private properties.

Action 6 Reduce administrative and cost barriers to uptake of ERF projects

Action 6

Potential impacts:
Environmental - high
Economic – high
Social – high

Average estimated implementation costs:
~$28 million

Estimated implementation timeframe: 2-5 years

See appendices for results of action analysis.

Current methodologies under the ERF require significant upfront investment costs and complex administrative processes to access carbon market opportunities. While the C+B and LRF provide upfront payments associated with biodiversity and co-benefits, respectively, there are multiple ERF methodologies that are not captured within these programs.

In line with the recommendations of the 'King Review',[80] a proposed new carbon farming method has been developed by the Carbon Market Institute, Climate Friendly and Green Collar that proposes combining multiple ERF methodologies into a single method (i.e. 'method stacking'). The Federal government has announced the development of five new ERF methods in 2022, including the integrated farm method.[81] This would allow landowners and graziers to undertake multiple carbon farming activities in the same property, resulting in more attractive revenue streams in the short term.

[80] Department of Industry, Science, Energy and Resources, "Report of Expert Panel examining additional sources of low-cost abatement", https://www.industry.gov.au/sites/default/files/2020-05/expert-panel-report-examining-additional-sources-of-low-cost-abatement.pdf, 2020

[81] Australian government, "New ERF method and 2022 priorities announced", https://www.minister.industry.gov.au/ministers/taylor/media-releases/new-erf-method-and-2022-priorities-announced#:~:text=%20Following%20a%20period%20of%20public%20consultation%2C%20the,and%20storage%20%28CCUS%20or%20carbon%20recycling%29...%20More%20, 2021

Box 3: Active Land Management & Agricultural Production (AL-MAP) Method[82] - Carbon Market Institute, Climate Friendly and Green Collar

An alliance of leading carbon, agriculture, finance, resource, and non-profit organisations have worked together to develop a proposal for a new AL-MAP method. This method would enable and incentivise carbon abatement of an estimated 2.5 billion tCO_2-e over the next ten years, providing opportunities for thousands of landholders to participate in carbon farming and for participating landholders to increase and diversify their income.

The landscape carbon method combines proven scientific approaches to monitoring and calculating carbon stored in both vegetation and soils, and emissions avoided in the process, into a single method, enabling multiple carbon management activities to be conducted on a single property. This is a step change from existing methods, which typically only measure emissions avoided, carbon stored in vegetation *or* stored in soil, and focus on one specific management activity, not multiple activities.

This single change would allow thousands of land managers and traditional owners, who are currently ineligible to participate in the carbon industry, to be more aligned with their land management aspirations and activities. Importantly, it could deliver tens of billions of dollars of economic benefit to their communities, and a range of environmental benefits to their regions and the nation. A range of co-benefits are expected to be realised from implementation of this method, including enhanced agricultural sustainability, biodiversity benefits, regional employment, and further development of emerging technologies.

> "Bring farmers into the process early rather than late. There is an awful lot of agricultural research and work that's done and never used for this reason."
> Industry stakeholder

Recognising that ERF methodologies are regularly updated, there is an opportunity for the Federal government to focus on streamlining application processes for project proponents and leveraging technology to reduce administrative costs including monitoring, reporting, auditing or verification. This will increase participation in the carbon reduction projects, enhance land management practices and deliver socio-economic benefits in regional communities.

Transform beef markets to drive growth of sustainable and deforestation-free products

Stakeholders stated that a key barrier to market drivers are the lack of transparency and comparability of product environmental credentials (i.e. biodiversity and carbon impacts or other resource consumption in the value chain). Transparency and disclosure of environmental credentials of products will allow consumers to make informed decisions to purchase products aligned with their values and increase market access for sustainable producers.

[82] Carbon Market Institute, "ERF Method Development Priorities for 2022", https://carbonmarketinstitute.org/app/uploads/2021/08/ERF-Method-Development-Priorities-for-2022-Carbon-Industry-Views-FINAL-.pdf, 2021

Action 7

Potential impacts:
Environmental - high
Economic – high
Social – low

Average estimated implementation costs:
~$14 million

Estimated implementation timeframe: 2-5 years

See appendices for results of action analysis.

Action 7 Build consumer awareness through enhanced market transparency

Customers cannot value sustainable products without accurate information, which could result in a missed opportunity for graziers to monetise sustainable performance. In 2019, The Wilderness Society identified that two thirds of Queensland's beef production were deforestation free for five years (prior to 2018) without any market recognition.[83]

Customers are increasingly seeking to understand how their food is produced and trace it from paddock to plate. Blockchain technology (i.e. distributed ledger technology) is an emerging opportunity for agribusinesses to provide traceable and transparent information and demonstrate environmental credentials throughout the supply chain. Improved data collection to support transparency would also allow graziers to track performance over time to understand changes in their land management and for accreditation purposes.

Data can be collected along the entire supply chain to track anything from farm conditions, breeding, animal welfare to sustainable production insights.[84] For example, organisations including Food Agility, BeefLedger, Queensland University of Technology and Ultimo Digital Technologies have partnered to research the viability of introducing blockchain technologies into the beef export markets to fight counterfeit Australian beef.[85]

There is an opportunity for the Federal government to provide further investment into blockchain research and implementation to boost the value of the beef supply chain through a unique value offering for both consumers and graziers. This research would see the government expanding on the National Livestock Identification System (NLIS) scheme by integrating blockchain technologies to improve the traceability and transparency of beef products across the entire supply chain.

Action 8

Potential impacts:
Environmental - high
Economic – high
Social – medium

Average estimated implementation costs:
~$18 million

Estimated implementation timeframe: 2-5 years

See appendices for results of action analysis.

Action 8 Promote market access through environmental credentials and labelling initiatives

Recognised environmental credentials aligned with global standards and definitions would allow graziers and others along the value chain to meet and demonstrate their sustainability commitments. Some organisations have started to leverage environmental credentials to access new markets. For example, North Australian Pastoral Company (NAPCo) launched an accredited premium carbon neutral beef product ('Five Founders') in 2018 under Australia's carbon neutral certification schemes.[86]

[83] The Wilderness Society, "Beyond the Amazon: Assessment of supply chain deforestation risks in Australia", https://www.wilderness.org.au/news-events/beyond-the-amazon-assessment-of-supply-chain-deforestation-risks-in-australia, 2019

[84] "How Blockchain benefits agriculture and food industry in the future?", https://appinventiv.com/blog/blockchain-in-agriculture-and-food-sector/, 2021.

[85] Food Agility CRC, "Blockchain in Beef Export", https://www.foodagility.com/research/beefledger-export-smart-contracts, 2020.

[86] Five Founders, "Our difference", https://fivefounders.com.au/our-difference, 2021

> "Our graziers' philosophy is 'forest friendly' and as a result, we do not clear trees, with all our properties grazed in a responsible, sustainable approach."
> NAPCo

Box 4: Driving supply chain transparency through eco-labelling

Eco-labelling is one of the key mechanisms used to communicate information about provenance and supply chain sustainability, with existing labels used in Australia, including Australian Certified Organic, Climate Active Carbon Neutral, Fairtrade, Forest Stewardship Council and Bonsucro.

Eco-labelling has been identified as a key mechanism to reduce deforestation through establishing a label for deforestation-free beef. The only voluntary initiative available at a global level is the Accountability Framework initiative (AFi) which is a consensus-based guide for achieving and monitoring ethical supply chains, established in 2019.[87] The EU is currently considering mandatory labelling to eliminate "imported deforestation"[88], (deforestation within the supply chains of imported products such as beef).

The Federal government could develop a deforestation-free certification for products, which can be recognised in domestic and international markets. This action is directly linked to blockchain technology and emerging online tools that aim to demonstrate sustainability performance to customers and the market. For example, environmental credentials and sustainability performance can be demonstrated through a platform that MLA and WWF (with support from the Australian National University) are currently designing.[89]

Action 9

Potential impacts:
Environmental - high
Economic – high
Social – high

Average estimated implementation costs:
~$10 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 9 Explore sustainable finance options to mobilise capital towards projects that reduce carbon emissions and deforestation

Financial institutions and investors are increasingly interested in ESG performance metrics to meet their objectives and investment mandates. Recently, the Commonwealth Bank entered into a sustainability-linked loan with the Stockyard Group, a Queensland-based beef producer. [90] The loan structure provides Stockyard with savings on its loan costs if sustainability performance targets are met, including reducing Scope 1 and Scope 2 GHG emissions, improved animal welfare outcomes, and workplace health and safety innovations.

Investments made with the intention to generate positive and measurable co-benefits are known as 'impact investments'. The impact investment market in Australia has substantially increased from $6 billion in 2017 to $20 billion in 2019.[91] Responsible Investment Association Australasia estimates that Australian investors are anticipated to increase allocation of capital towards impact investing to $100 billion by 2025.[92]

[87] Accountability Framework, "About the Accountability Framework initiative", https://accountability-framework.org/about/about-the-initiative/, 2020.
[88] Simon L. Bager, U. Martin Persson, Tiago N.P. dos Reis, "Eighty-six EU policy options for reducing imported deforestation", https://www.sciencedirect.com/science/article/pii/S2590332221000579, 2021
[89] Meat and Livestock Australia, "SMART FARMS Interim National Coordination", https://www.mla.com.au/research-and-development/reports/2020/smart-farms-interim-national-coordination/#, 2020
[90] Commonwealth Bank, "Australia's first sustainability-linked loan for Agriculture", https://www.commbank.com.au/articles/newsroom/2021/07/sustainability-linked-loan-for-agriculture.html, 2021.
[91] Responsible Investment Association Australasia, 'Media releases', https://responsibleinvestment.org/resources/media-releases/, 2020
[92] Ibid

Efforts focused on the following regions would have the greatest impact:

- Cook
- Murweh
- Maranoa
- Balonne
- Central Highlands

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

The number of Australian 'labelled loans' has nearly quadrupled from 2016 to the first half of 2020, including sustainability-linked loans, social bonds, sustainability bonds, green loans and green bonds.[93] The Climate Bond Taxonomy sets out potential options aligned to sustainable farming practices under the Land use & Marine resources taxonomy, which include agriculture, commercial forestry, and ecosystem conservation & restoration projects.[94] The government could explore green bonds as a financial instrument to support projects that aim to increase sustainability performance, including reducing carbon emissions and deforestation.

Impact investing, labelled loans and bonds pose significant opportunities for enterprises and graziers that demonstrate delivery of environmental and social impacts in line with investment objectives and criteria, respectively.

Due to challenges related to scalability (e.g. high transaction costs for small projects or one-off projects) and investment risk exposure, the Federal and State governments could explore opportunities around establishing a more formal partnership with the private sector to de-risk investments through blended finance solutions. Additionally, the government could explore mechanisms that allow smaller investment opportunities to be aggregated to attract capital from investors.

Box 5: Blended finance for agribusinesses[95]

The US Agency for International Development and Rabobank established a first-loss guarantee that supports two financial institutions in India to facilitate financing options to small and medium private enterprises, cooperatives, producer companies in agriculture, forestry and other land uses sector. The blended finance structure allows Indian financial institutions to take acceptable risks associated with offering loans, while promoting the adoption of sustainable farming practices (e.g. improving land management, reduction of GHG emissions and increasing carbon sequestration).

> "We need guides and appropriate data for property valuation. There are concerns that the finance sector doesn't factor in carbon revenue streams appropriately and drop land value or lending potential of land undertaking carbon and vegetation projects."
> Natural resource management stakeholder

Ongoing and active collaboration with stakeholders is key to enabling the uptake of sustainable finance options. Key stakeholders involved may include government (Federal and State), financial institutions, investors (e.g. Packhorse[96]), philanthropists, NGOs, corporates and agribusinesses.

[93] Climate Bonds Initiative, "Green Loans Australia & New Zealand", https://www.climatebonds.net/files/reports/cbi-green-loans-aus-nz-final-14102020.pdf, 2020

[94] Climate Bonds Initiative, "Climate Bonds Taxonomy", https://www.climatebonds.net/standard/taxonomy, 2021

[95] US Agency for International Development, "USAID, Rabobank Foundation, Ananya and Sumunnati make credit available to small and medium enterprises groups engaged in India's sustainable landscapes sector", https://www.usaid.gov/india/press-releases/oct-10-2018-usaid-rabobank-foundation-ananya-and-samunnati-make-credit, 2018

[96] Packhorse, https://packhorse.net.au/

Establishing robust data and frameworks to monitor and report outcomes

Action 10

Potential impacts:
Environmental - medium
Economic – medium
Social – medium

Average estimated implementation costs: ~$4 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 10 Centrally amalgamate and leverage existing data relating to vegetation, carbon and biodiversity

Improved and centralised data would enable key stakeholders to make informed decisions, design effective policies, track progress over time, and make purchase decisions based on environmental credentials.

Data is key for change. Graziers could benefit from benchmark data related to potential costs, benefits, profitability and payback periods. Stakeholders stated that information about biodiversity value in different regions of Queensland and the types of vegetation or carbon projects that could be undertaken for greatest impact would be invaluable for farmers. Financial institutions want data on evidence-based productivity impacts to build into their financial models. Data is also key to measuring and reporting on the effectiveness of actions, however it needs to be accessible.

There is an enormous amount of data relating to biodiversity, carbon and vegetation being collected both by government entities and the private sector. Data from government-led programs and ERF projects could be used to guide actions and support the finance sector and government in decision making.

The creation of a centralised database, where stakeholders can upload information and data from their own projects and initiatives, will enable multiple organisations to build a better understanding of biodiversity, vegetation and carbon (e.g. soil carbon) in Queensland. Stakeholders could use this database to understand what others have done in their region, the impact, and potential future opportunities.

The Federal government could support by allocating human resources to amalgamate data into one public database, which could be linked to the proposed web-based tool (Action 3).

Action 11

Potential impacts:
Environmental - high
Economic – high
Social – medium

Average estimated implementation costs: ~$38 million

Estimated implementation timeframe: 5+ years

See appendices for results of action analysis.

Action 11 Utilise enhanced technology for monitoring and compliance of vegetation management and biodiversity projects

Technological advancements present a significant opportunity to the market to utilise remote sensing, enhanced satellite imagery and real time data. Technologies such as remote sensing could enable measurement of biomass and estimating the condition of biodiversity, which would provide improved accuracy on ecosystem and forest cover conditions when compared to canopy cover measures (linked to Action 12).

Technology can be leveraged for regulatory purposes such as monitoring land management activities and conducting auditing procedures related to carbon abatement or sequestration projects. Real time data would also assist in designing and updating policies related to land use and land use change. For example, the latest publicly available SLATS report was released in 2018, presenting a barrier to timely decision-making relating to efficacy of policies or market-based interventions.[97]

[97] Noting that the Queensland Government is planning to release a SLATS report in December 2021. The analysis and preparation of this report were finalised in November 2021, which relies on historical carbon emissions associated with land clearing and land conversion up until 2019, including the 2018-19 State-wide Landcover and Trees Study

Efforts focused on the following regions would have the greatest impact:

- Cook
- Murweh
- Maranoa
- Balonne
- Central Highlands

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

Graziers will also benefit from benchmarking analysis around productivity, carbon footprint, energy consumption, water usage, waste streams and biodiversity indicators compared to similar producers in the region.

Through funding R&D projects, the Federal Government can support the uptake of emerging technologies and assist start-ups in achieving commercialisation and reaching the scale required. Government funding could be directed towards organisations that provide transformative and digital approaches that link cattle to abattoirs and support value chain transparency. For example, Unilever has invested in a platform to track any potential activities linked to deforestation, primarily in South East Asia.

Box 6: Unilever – leveraging technology to help end deforestation [98]

Unilever recently partnered with Orbital Insights to monitor deforestation in their supply chain in alignment with their commitment to be deforestation free by 2023. This project uses geospatial data from satellites, drones and the Internet of Things to map deforestation patterns related to palm oil and soy, which are then linked to downstream activities in the supply chain – from farm to mill. The project uses satellite technology to monitor land use change in detail, drawing a 50km radius around mills to assess if additional farms or plantations in the catchment areas are also supplying the mills.

Additionally, further funding from the Federal and State government is required to develop and adopt technological enablers, which may include remote sensing, monitoring of biodiversity, soil carbon measurement and farm management software.

Action 12

Potential impacts:
Environmental - medium
Economic – medium
Social – low

Average estimated implementation costs: ~$4 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 12 Harmonise vegetation-related definitions across industry and Australian governments

Stakeholders stated that uncertainty and distrust in data on clearing and vegetation is a key issue for understanding progress and environmental credentials of the beef sector. Stakeholders highlighted that key forest metrics (e.g. % canopy cover, height and area) are not consistent with international standards. This creates difficulties for markets to measure progress against their own deforestation free targets in Australia.[99]

> "NGGI [National Greenhouse Gas Inventory] is our only national dataset and doesn't measure changes within forests, like thinning. The definition of a forest within NGGI is disputed."
> Stakeholder

Currently, data within Queensland's State-wide Landcover and Trees Study[100] is inconsistent with the National Greenhouse Gas Inventory (NGGI), which leverages a different carbon accounting methodology (FullCAM[101]) for land use emissions (e.g. NGGI does not capture impact of thinning on a forest structure). Additionally, both datasets use different language for measures, such as 'remnant vegetation', 'primary' or 'secondary' forests, and 're-clearing'. A common language will support consistent messaging and enhance the credibility and trust in the market, regulation and reported outcomes.

In developing consistent vegetation-related definitions and measures across Federal and State governments, government should seek to align with international standards. The High Conservation Value Resource Network (HCV) and Forest Stewardship Council (FSC) Principles and Criteria are key examples that these definitions in regulatory frameworks should align to. The methodologies used for measurement should also be transparent to build trust. This will enable a consistent comparison between programs over time, tracking land use and land use change over time, and support the beef value chain to demonstrate environmental credentials.

[98] Unilever, "How we're using technology to help end deforestation", https://www.unilever.com/news/news-and-features/Feature-article/2020/how-were-using-technology-to-help-end-deforestation.html, 2020
[99] Nason (Beef Central), "'Deforestation' in focus as 2020 deadlines near', https://www.beefcentral.com/news/deforestation-in-focus-as-2020-deadlines-near/
[100] Queensland Government, "2018-19 Statewide Landcover and Trees Study", https://www.qld.gov.au/environment/land/management/mapping/statewide-monitoring/slats, 2021
[101] Australian Government, "Full Carbon Accounting Model", https://www.industry.gov.au/data-and-publications/full-carbon-accounting-model-fullcam, 2021

Action 13

Potential impacts:
Environmental - high
Economic – medium
Social – medium

Average estimated implementation costs: ~$9 million

Estimated implementation timeframe: 2-5 years

See appendices for results of action analysis.

> The lack of consistency between Queensland and Federal laws grossly undermines [Australia's biodiversity and emissions] commitments, and highlights the regulatory dissonance in Australia's environmental policy agenda.
>
> ...Many more trees are lost through Queensland's land clearing than are planted nationally by the Federal Government revegetation programs.
>
> Reside et al. 2017

Action 13 Develop a centralised biodiversity reporting framework and accounting standards for consistent measurement and reporting

Similar to clear datasets and harmonised definitions, a consistent and comparable biodiversity framework is integral to valuing natural capital. Financial institutions, markets, consumers and investors want to better understand and financially quantify their biodiversity impacts throughout the value chain.

Similar to ACCUs, which are supported by robust frameworks including the National Greenhouse and Energy Reporting (NGER) Measurement Determination, biodiversity requires a robust framework to unlock the opportunities that carbon markets are tapping into.

There are multiple existing and emerging frameworks such as the Global Biodiversity Framework to be released during the COP15[102], the Taskforce on Nature-related Financial Disclosures (TNFD)[103] expected to come online in 2023, the Australian Beef Sustainability Framework[104], and the Australian Agricultural Sustainability Framework.[105]

The TNFD framework is expected to follow a similar structure to the Task Force on Climate-related Financial Disclosures (TCFD), including Governance, Strategy, Risk Management and Metrics and Targets, which will provide a global framework to report financial and economic nature-related risks and opportunities. The incorporation of the TNFD framework into existing frameworks would provide further confidence in the market, which would allow financial institutions and corporates to understand risk exposure and opportunities associated with sustainable practices and products.

Accounting for Nature has also developed an environmental accounting standard to value natural capital around soil condition, native vegetation, fauna and marine ecosystems.[106] This accounting standard could be considered and adopted to measure and value healthy ecosystems.

The Federal government could support by amalgamating existing and emerging natural capital-related frameworks to create a centralised guide for stakeholders to easily value and report on biodiversity and the associated environmental co-benefits. Key stakeholders include graziers, farmers, landholders, think tanks, research organisations, investors, financial institutions, corporations and government agencies.

[102] Convention on Biological Diversity, "A new global framework for managing nature through 2030: 1st detailed draft agreement debuts", https://www.un.org/sustainabledevelopment/blog/2021/07/a-new-global-framework-for-managing-nature-through-2030-1st-detailed-draft-agreement-debuts/, 2021

[103] Taskforce on Nature-related Financial Disclosures, https://tnfd.info/, 2020

[104] "Australian Beef Sustainability Framework", https://www.sustainableaustralianbeef.com.au/, 2020

[105] Department of Agriculture, Water and the Environment, "Agriculture Stewardship Package", https://www.agriculture.gov.au/ag-farm-food/natural-resources/landcare/sustaining-future-australian-farming, 2021

[106] Accounting for Nature, "The Accounting for Nature Framework", https://www.accountingfornature.org/overview, 2021

Safeguarding outcomes through regulation to prevent leakage

Regulatory frameworks are an essential part of the policy mix required to manage and reduce clearing and deforestation.[107] Regulation is important to prevent 'leakage' from initiatives such as incentive payments, that is, the displacement of forest conversion from one place to another.[108] Leakage would weaken the impact of government and market efforts to curb deforestation, as clearing would increase in other areas in the absence of adequate monitoring and regulation.

Action 14

Potential impacts:
Environmental - high
Economic - low
Social –low

Average estimated implementation costs: ~$4 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Efforts focused on the following regions would have the greatest impact:

- Murweh
- Central Highlands
- Charters Towers
- Isaac
- Blackall Tambo

Based on UNSW and CSIRO analysis. See appendix for results of the analysis

"An alternative approach is a 'target-based' regulation that would set a cap on overall land clearing, alongside regional retention targets for each vegetation type. Such a regime could operate alongside tradeable clearing rights. The use of explicit targets allows for an open and concrete representation of objectives"
Reside et al. (2017)

Action 14 Improve effectiveness of legislative frameworks which govern vegetation management and land use

As outlined in the Introduction, the VMA has undergone several periods of tightening and relaxation, which correlate to levels of observed clearing in Queensland (as per Figure 4). Amendments to the VMA have been developed or implemented almost every year since its inception in 1999. Similarly, the EPBC Act has also undergone over 25 changes since its inception in 1999, notably amendments to reduce "red tape" and the opening (and subsequent reclosing) of National Parks to cattle grazing.

Improving effectiveness of the VMA

Frequent changes to Queensland's vegetation management legislation have disrupted business planning for landholders and created uncertainty. According to AgForce, this has driven pre-emptive clearing "for fear their legal rights would be lost".[109]

Several stakeholders have called for review and revision of the VMA or finding new ways to regulate and manage landscapes and clearing in Queensland. Key aspects of the VMA which stakeholders have identified for review include:

- Reviewing how 'usable' the VMA is and how well it is understood by affected stakeholders
- Demonstrating alignment with science and evidence-based approaches, [110] which could be supported by an independent taskforce
- Reviewing Category X definitions and allowances (clearing Category X vegetation on freehold land is exempt from approvals)
- Reviewing clearing codes to ensure they are fit for purpose for different types of vegetation with unique characteristics, e.g. mulga, or whether separate management plans or codes are required
- Adding tests of "necessity" for clearing codes (e.g. drought declaration for the fodder code)[111]

[107] Megan Evans, *"Deforestation in Australia: drivers, trends and policy responses."* Pacific Conservation Biology, 2016.
[108] WWF, *Deforestation* https://wwfint.awsassets.panda.org/downloads/deforestation_fronts_drivers_and_responses_in_a_changing_world___full_report_1.pdf
[109] AgForce, *"AgForce Landscape Management Policy and Priorities"*, https://www.agforceqld.org.au/knowledgebase/article/AGF-01120/, 2020
[110] Ibid.
[111] *"Submission to the Vegetation Management and Other Legislation Amendment Bill 2018"*, 2018

- Setting caps on clearing for certain allowable clearing purposes (e.g. % coverage of a property up to a maximum number of ha over a certain time)[112]
- Amending to ensure that Property Maps of Assessable Vegetation (PMAVs) are used only to correct genuine inaccuracies in regulatory maps and to require annual review and amendment of vegetation maps to identify high conservation value vegetation[113]
- Considering requirements for a consolidated central spatial database open to the public showing all areas of native vegetation subject to clearing under different authorities[114]

The Queensland government may also consider 'target-based' vegetation regulation, where vegetation targets drive regulation, and progress is monitored against established objectives.[115]

Strengthening the EPBC Act

"The EPBC Act is ineffective. It does not enable the Commonwealth to effectively protect environmental matters that are important for the nation. It is not fit to address current or future environmental challenges."
Professor Graeme Samuel AC

Key findings from the review of the EPBC Act in 2020,[116] which aligned to stakeholder feedback EY received in preparing this report, included:

- The community and industry do not trust the EPBC Act and there is merit in their concerns
- The EPBC Act, including compliance and enforcement of the Act, is ineffective
- The EPBC Act is complex, its construction is dated, and it does not meet best practice for modern regulation
- Indigenous knowledge and views are not fully valued in decision-making and the EPBC Act does not meet the aspirations of Traditional Owners for managing their land
- Australia's natural environment and iconic places are in an overall state of decline and are under increasing threat. The current environmental trajectory is unsustainable

[112] Ibid.
[113] Ibid.
[114] Dr Martin Taylor, "*Submission to the inquiry into the Vegetation Management and other Legislation Amendment Bill 2018*", 2018.
[115] Reside April E., Beher Jutta, Cosgrove Anita J., Evans Megan C., Seabrook Leonie, Silcock Jennifer L., Wenger Amelia S., Maron Martine, "*Ecological consequences of land clearing and policy reform in Queensland.*" Pacific Conservation Biology, 2017
[116] Professor Graeme Samuel AC, "*EPBC Act Final Report*", https://epbcactreview.environment.gov.au/resources/final-report/key-messages, 2020

Action 15

Potential impacts:
Environmental - high
Economic – low
Social – low

Average estimated implementation costs: ~$8 million

Estimated implementation timeframe: 0-2 years

See appendices for results of action analysis.

Action 15 Improve consistency and diligence in enforcement of existing vegetation and conservation laws

It is crucial that the recommendations and structural reforms to the EPBC Act are implemented with the view of achieving long term outcomes. Recommendations address issues with compliance and enforcement of the Act, consistent with stakeholder feedback obtained in this report.

Recommendations of the EPBC Review also include establishing National Environmental Standards to focus on Matters of National Environmental Significance, which would include land clearing activities and other threatening processes, and disclosure of emissions associated with projects (including emissions from land clearing) as part of assessments and approvals.[117]

Through the Australian Government's implementation of EPBC Act recommendations, including developing a nationally coordinated approach outlined above, there is significant opportunity to work together with the Queensland government to improve national consistency in decision-making processes.

To support regulation, the Australian and Queensland governments could consider leveraging enhanced technologies to monitor land clearing activities and track beef industry's performance over time (Action 11).

Engaging with graziers in reviews and through development of policy would improve the likelihood of acceptance and effectiveness. A consultative approach would allow graziers to provide input throughout the process, minimising the risk of unintended consequences, leakage or negative economic impacts to agribusinesses, the economy and the environment.

[117] Australian Government, 'Independent review of the EPBC Act', https://epbcactreview.environment.gov.au, 2021

Conclusion

Recent LULUCF emissions and land clearing data suggests that recent adjustments to the VMA have reduced Queensland's clearing rates and emissions in 2019.[118] However, primary and secondary land conversion rates, linked to the beef industry, are still significant compared to other states. This has been highlighted through reports and media on deforestation and emissions which can impact the beef industry's social licence to operate and impact Australia's environmental credentials.

Analysis undertaken by UQ, CSIRO and UNSW indicate that there are extensive opportunities for Queensland's beef industry to significantly reduce its carbon emissions by 2030 through land management and revegetation activities. While government and private sector-led initiatives have been established, announced or are currently under development, there is a need to further support graziers in the adoption of sustainable farming practices.

EY's decarbonisation pathway analysis found that a combination of continued vegetation management regulation and increased market incentivisation provides a balanced approach. Recognising and rewarding positive contributions to biodiversity and emissions reductions on private land could deliver significant economic, social and environmental benefits for multiple stakeholders, including graziers, government and society.

Government actions explored in this report would support the beef industry to overcome existing barriers to increase uptake of carbon farming projects, including valuing biodiversity, providing improved access to information on opportunities, and providing payments for private land conservation.

Importantly, key government actions to reduce land clearing should be targeted to supporting NRM regions with significant potential of LULUCF emissions reductions through avoided clearing and thinning. These NRM regions include South West Queensland, Murray Darling Basin & Condamine; Desert Channels; Fitzroy Basin; and Southern Gulf NRM regions. Key actions targeted to these regions may include extension officers (Action 2), payments for biodiversity and ecosystem services (Action 4), uptake of private land conservation (Action 5), exploring sustainable finance solutions (Action 9), and improving the effectiveness of land management regulations (Action 14).

Additionally, graziers would be able to access emerging domestic and international markets by demonstrating their environmental credentials (Action 8) through market transparency and blockchain technologies (Action 7). However, there are current challenges for graziers to measure and report environmental outcomes, which can be resolved through a common language and definitions (Action 12), independent and central database (Action 10), utilising technology for monitoring and compliance (Action 11), and robust frameworks (Action 13).

Other market mechanisms outlined in this report, including valuing natural capital and payment for ecosystem services, offer collaborative approaches which reward landholders for stewardship and positive vegetation outcomes. There is an opportunity for Australian and Queensland government to enhance existing and emerging market mechanisms, including:

[118] Note that the analysis and preparation of this report were finalised in November 2021, which relies on historical carbon emissions associated with land clearing and land conversion up until 2019, including the 2018-19 State-wide Landcover and Trees Study.

- ERF: reducing administrative and cost barriers, and rapid adoption of new methods that allow more landowners to participate (e.g. method stacking)
- LRF: exploring options to allow participation from the private sector in the scheme (e.g. blended finance options), including philanthropists, institutional investors and corporates
- C+B: rapid expansion of this program and alignment with existing schemes (e.g. LRF) to avoid complexities related to application processes, requirements and valuation methodologies.

Improved consistency across Federal and State policy settings would provide certainty and confidence to the market, attracting investment and participation in environmental markets (i.e. payments for carbon and biodiversity outcomes). Future reviews and amendments to vegetation and biodiversity-related regulation must ensure alignment to international commitments related to emission reduction target under the Paris Agreement[119] and protection of at least 30% of land and ocean under the High Ambition Coalition by 2030.[120] This will be fundamental in reassessing Australia's commitments around setting fair and appropriate emission reduction targets in line with international expectations.

Supporting the decarbonisation of the beef industry and its value chain could create significant socio-economic benefits for regional communities through employment opportunities and diversifying local economies.

Domestic and international demand for beef products with environmental credentials is rapidly expanding. Through the adoption of sustainable practices related to land management and restoration, Queensland's beef products could secure improved access to global markets for sustainable beef.

[119] The United Nations, "The Paris Agreement", https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement, 2021

[120] Prime Minister of Australia, "Australia joins international alliance to conserve planet's biodiversity", https://www.pm.gov.au/media/australia-joins-international-alliance-conserve-planet%E2%80%99s-biodiversity, 2021

Appendix A Multi-criteria analysis and implementation costs

EY developed a longlist of potential actions, relevant to the Carrot pathway, that would contribute to reduce beef industry's emissions, improve land management practices and retain or restore native vegetation in Queensland. Over 25 actions were assessed through a multicriteria analysis to estimate potential implementation costs, implementation timeframes, and potential environmental and socio-economic impacts.

Environmental impacts:

- Reduction and/or avoidance of greenhouse gas emissions
- Improvement of biodiversity

Socio-economic impacts:

- Profitability of beef enterprise and/or industry
- Employment
- Capability (i.e. upskilling and re-skilling)

Estimated environmental, economic and social impact per action

Action	Impact		
	Environmental	Economic	Social
1. Enhance industry-led collaboration and coordination on adopting sustainable practices, increasing productivity and identifying financial mechanisms associated with environmental credentials	Medium	Medium	Medium
	Increased awareness of industry and consumer targets and developing practical solutions supported by players across the value chain	Increased awareness and impact of initiatives with economic benefit, increased access to markets with deforestation free/carbon targets	Awareness of what peers are doing and what consumers are demanding, and increased engagement with other stakeholders (e.g. industry bodies and government)
2. Extension officers working with producers on a regional basis	High	High	High
	Increased awareness and uptake of existing programs and initiatives, tailoring implementation to properties (e.g. appropriate species selections)	Supporting the most cost-effective and beneficial actions, enhancing on-farm, government and broader economic benefits	Facilitating conversations and peer-to-peer learning, creating a sense of community involvement and upskilling
3. Develop a simple-to-use digital tool for comparison of carbon and biodiversity opportunities	Medium	Medium	Medium
	An enabler of all actions, as it will increase uptake of opportunities, programs and initiatives through increased awareness and confidence to implement action. This will in turn could increase biodiversity, profits and create jobs.		
4. Expand payments for biodiversity and ecosystem services through the LRF and C+B	High	High	High
	Increased delivery of GHG emission reductions, carbon sequestration as well as improved biodiversity	Additional income streams for graziers due to carbon farming projects and co-benefit payments	Increased job and upskilling opportunities due to implementation of carbon projects
5. Expand the Private Protected Area Program to support the NatureAssist funding program	High	Medium	Medium
	Increased biodiversity and healthy ecosystems in protected areas	Compensation to landowners for conservation and protection of environmental values	Moderate job opportunities to monitor and report environmental benefits and ecosystem condition

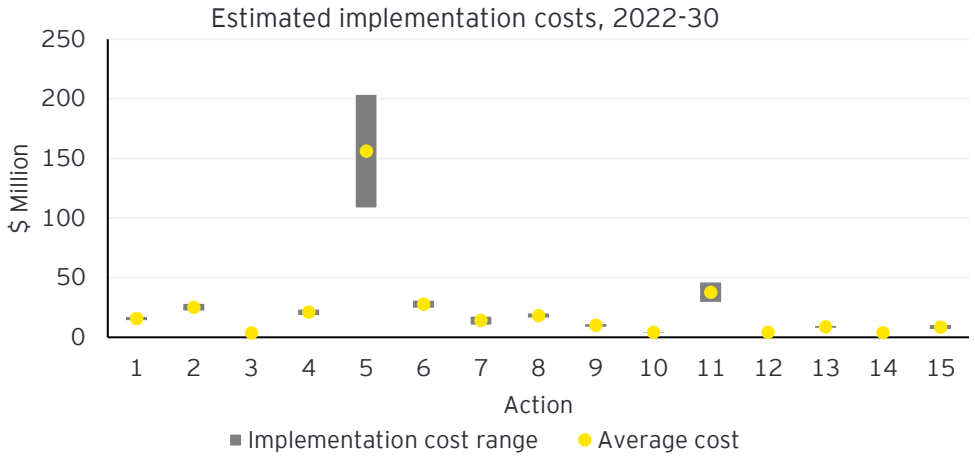
Action	Impact		
	Environmental	Economic	Social
6. Reduce administrative and cost barriers to uptake of ERF projects	High	High	High
	Increased participation in carbon and environmental markets would increase the delivery of environmental outcomes (i.e. GHG emission reduction, carbon sequestration and biodiversity)	Additional income streams for graziers due to carbon farming projects and co-benefit payments	Increased job and upskilling opportunities due to implementation of carbon projects
7. Build consumer awareness through enhanced market transparency	High	High	Medium
	Information will build awareness of sustainability performance. The ability to trace products through the supply chain is integral to calculating the biodiversity and carbon footprint	Driver of consumer and market demand, and increased market access for producers with credentials who may also be able to charge premiums for their products	Significant knowledge created over the sustainability of individual products. Some jobs may be created through management of credentials and labelling
8. Promote market access through environmental credentials and labelling initiatives	High	High	Medium
	Increased environmental benefits due to the need for demonstrating environmental credentials (e.g. deforestation-free, carbon neutral, organic products)	Income based on market diversification (i.e. adapting to consumer preferences)	Upskilling beef producers to estimate, monitor and report environmental credentials in line with certification requirements
9. Explore sustainable finance options to mobilise capital towards projects that reduce carbon emissions and deforestation	High	High	High
	Increased environmental benefits due to compliance requirements associated with sustainable finance instruments	Increased access to capital markets through sustainable finance instruments	Upskilling beef producers to estimate, monitor and report environmental outcomes in line with requirements associated with sustainable finance instruments
10. Centrally amalgamate and leverage existing data relating to vegetation, carbon and biodiversity	Medium	Medium	Low
	An enabler of all actions, as it will increase productivity and operational efficiencies due to disclosure of environmental metrics. This will in turn could increase biodiversity, inform the market and provide access to finance		
11. Utilise enhanced technology for monitoring and compliance of vegetation management and biodiversity projects	High	High	Medium
	Increased environmental outcomes through technology adoption for regulatory compliance and disclosure to the market	Increased revenue due to on-farm operational and management efficiencies, including monitoring and reporting carbon and biodiversity metrics	Upskilling graziers and the beef industry to utilise new technology for monitoring and reporting
12. Harmonise vegetation-related definitions across industry and Australian governments	Medium	Medium	Low
	An enabler of all actions, as it will increase uptake of opportunities, programs and initiatives through enhanced ability to understand actual trends, trustworthiness of information and improved consistency and comparability. This will in turn could increase biodiversity, social awareness, profits and create jobs		

Action	Impact		
	Environmental	Economic	Social
13. Develop a centralised biodiversity reporting framework and accounting standards for consistent measurement and reporting	High	Medium	Medium
	Consistent measurement frameworks to value biodiversity are key to unlocking several actions for environmental benefit	Support valuing natural capital: enabler for payments and access to markets and financial products (e.g. criteria requirements for sustainable finance, access to premium markets based on standards)	Create significant knowledge in terms of different practices and their impacts. Employment opportunities e.g. experts to prepare and assure biodiversity inventories
14. Improve effectiveness of legislative frameworks which govern vegetation management and land use	High	Low	Low
	Increased environmental outcomes due to land management and vegetation regulations	Marginal economic benefits for graziers due to the inability use the land	Marginal opportunities to support local jobs or upskill local workforce
15. Improve consistency and diligence in enforcement of existing laws	High	Low	Low
	Increased environmental outcomes due to consistent regulations across Federal and State government	Marginal economic benefits for graziers due to the inability use the land	Marginal opportunities to support local jobs or upskill local workforce

Assessment criteria related to environmental and socio-economic impacts

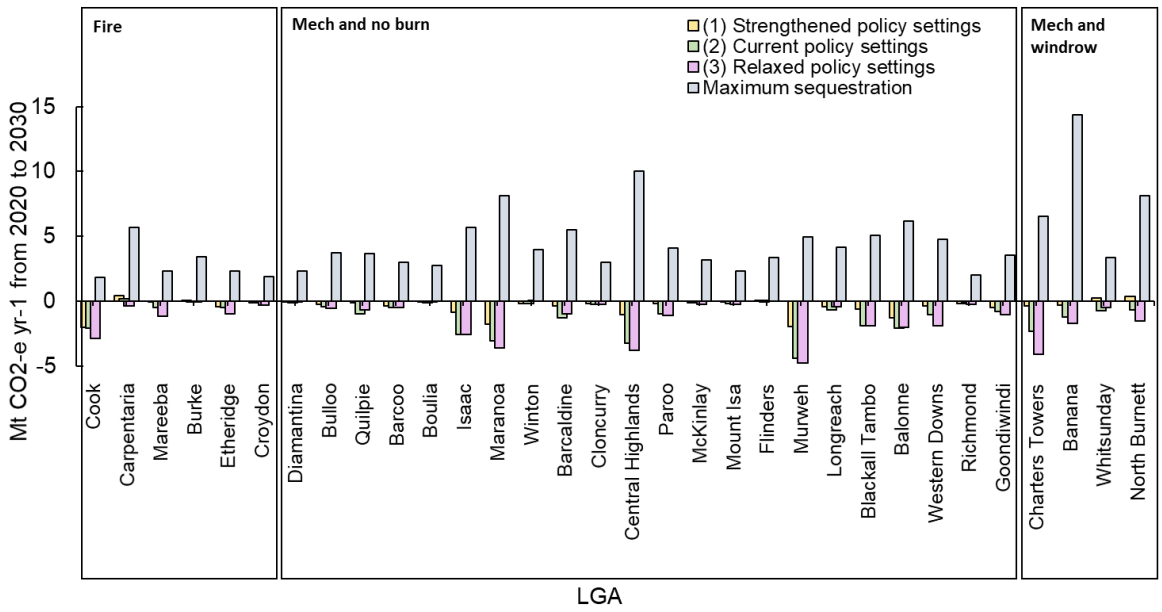
Environmental impacts			
Impact	Low	Medium	High
Potential GHG emission reduction and/or avoidance	Unlikely to achieve emission reductions	Significant opportunity and unlikely (or moderate opportunity and unlikely) to reduce GHG emissions	Significant opportunity and likely to achieve emissions reductions
Potential improvement on biodiversity	Relatively small improvement on biodiversity	Moderate improvements on biodiversity	Significant improvements on biodiversity
Socio-economic impacts			
Impact	Low	Medium	High
Profitability of beef enterprise and/or industry	Unlikely to create additional revenue stream	Significant opportunity and unlikely (or moderate opportunity and unlikely) for graziers to create additional revenue stream	Significant opportunity and likely for graziers to create additional revenue stream
Employment opportunities (including direct and indirect jobs)	Unlikely to support local employment	Significant impact and unlikely (or moderate impact and likely) to support local employment	Significant impact and likely to support local employment
Capability (upskilling/re-skilling)	Unlikely to build capacity/knowledge	Significant impact and unlikely (or moderate impact and likely) to build capacity / knowledge	Significant impact and likely to build capacity / knowledge

Estimated implementation costs for each action represented in ranges to reflect a broad number of assumptions, variables and level of sophistication



Appendix B Results from CSIRO[121] and UNSW[122] reports

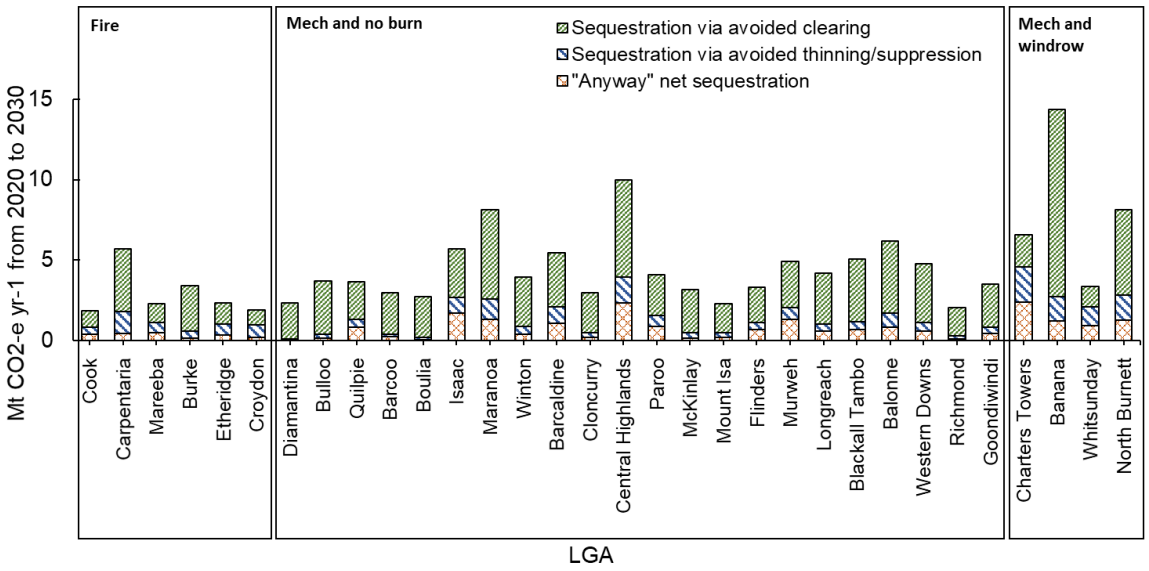
Average annual net carbon sequestration between 2020 and 2030 for all 32 Local Government Areas (LGA) across beef producing areas in Queensland, under three scenarios, and the maximum abatement scenario.



[121] Keryn Paul and Stephen Roxburgh, "Predicting abatement potential in Queensland beef producing regions." Final Report to The University of New South Wales, CSIRO, 2021.

[122] Megan C Evans and Anna Lewis, "Modelling pathways to a carbon neutral Queensland beef sector through policy and investment to drive transition from deforestation to reforestation", Final Report to WWF-Australia, Public Service Research Group, UNSW Canberra, 2021.

Average maximum abatement (Mt CO2-e yr-1, 2020-2030) within three types of sequestration for all 32 LGAs across beef producing areas in Queensland.



Appendix C Stakeholder list

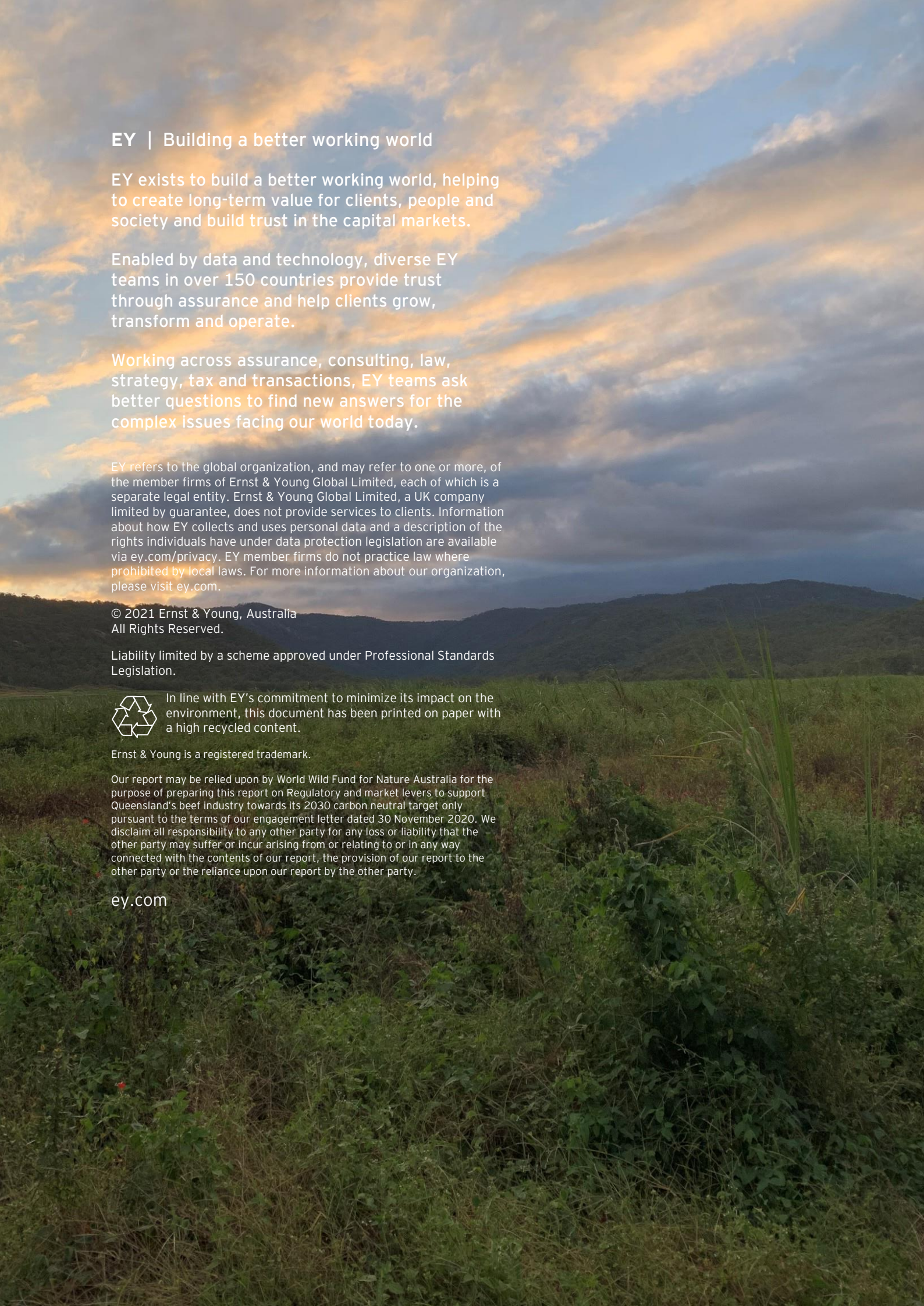
EY engaged with over 20 stakeholders to obtain inputs into the report in relation to scenario development, assumptions, and provision of feedback on government actions.

Stakeholders consulted included:

1. GreenCollar
2. Meat & Livestock Australia
3. Department of Environment and Science (Qld)
4. Food Frontier
5. Australian Beef Sustainability Framework
6. Carbon Market Institute
7. Farmers for Climate Action
8. Mara Bun
9. World Wide Fund for Nature Australia (WWF-Australia)
10. The Wilderness Society

Several stakeholders contributed anonymously, from the following stakeholder groups:

1. Graziers and landholders
2. Industry bodies
3. Meat processors
4. Financial institutions
5. Public servants in Australian Government and Parliament



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