Carbon Essentials for Agribusiness

Horticulture

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Murraylands & Riverland Landscape Board

Delivered with funding support from the Commonwealth of Australia through the Department of Climate Change, Energy, the Environment and Water

As part of the Carbon Farming Outreach Program

Acknowledgement of Country

I would like to acknowledge the Traditional Owners of the land on which we meet today. I pay my respects to their Elders past, present and emerging, and acknowledge and respect their deep spiritual and cultural connection to Country. I also pay my respects to other Aboriginal and Torres Strait Islander people who are here today.

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Aims of the training package & our role

- This training session is designed to provide fundamental background to horticulturalists to understand the drivers and magnitude of change that will require them likely to report their emissions. The training also touches on the Australian Carbon Credit Unit (ACCU) and methods of carbon sequestration
- This presentation represents an overview of a larger Commonwealth training package with this one being adapted to suit horticulture in the Riverland, South Australia
- The larger training package is available at:

  https://www.dcceew.gov.au/climate-change/emissions-reduction/agricultural-land-sectors/carbon-farming-outreach-program/training-package

- The Murraylands and Riverland Landscape Board (MRLB) is working with all industry groups to determine the best possible pathways forward that have industry support and resourcing, to enable you as the producer to adopt the easiest to use product to suit reporting requirements as they become clearer
- **Should you have an enquiries or require assistance please contact the Carbon Farming Outreach Officer (Jeremy Nelson) – 0439 591 826 or at jeremy.nelson@sa.gov.au**

Overview of this training

1 – The climate, atmosphere and green house gases (GHG's)

Breakout session 1 – Discussion and evaluation/feedback ~ 30 mins

2 – Agreements, Policies and Supply Chain Drivers

Breakout session 2 – Discussion and evaluation/feedback ~ 30 mins

3 – Emissions Fundamentals

Breakout session 3 – Discussion and evaluation/feedback ~30 mins

4 – The Carbon Footprint

Breakout session 4 – Discussion and evaluation/feedback ~40 mins

5 – The Clean Energy Regulator, carbon credits and sequestration

Workshop wrap up & questions ~40 mins

LANDSCAPE SOUTH AUSTRALIA MURRAYLANDS AND RIVERLAND

Carbon Farming Outreach Program - Presurvey

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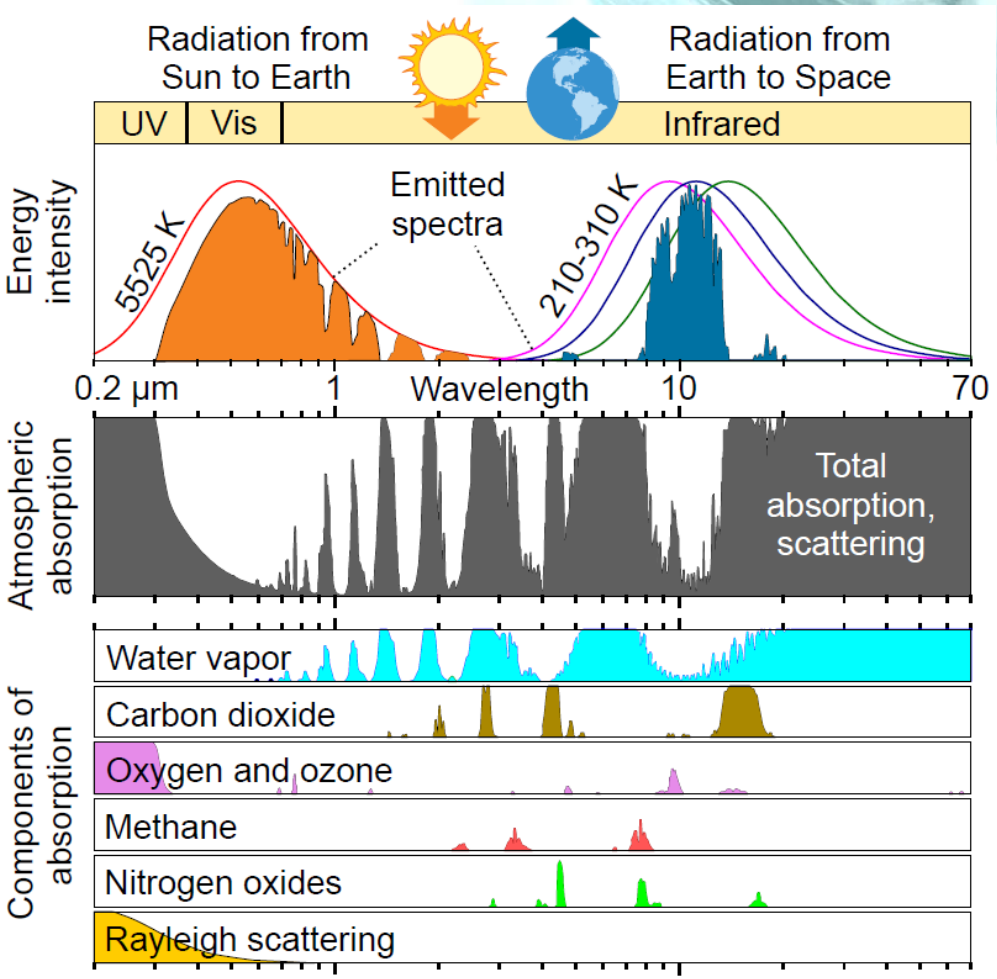
1 – The climate, atmosphere and GHG’s

Green house gases and warming potential

Greenhouse gas	Chemical formula	Global Warming Potential (100 year time horizon)	Atmospheric Lifetime (years)
Carbon Dioxide (56.4%)	CO_2	1	100*
Methane (16.3%)	CH_4	28	12
Nitrous Oxide (5.4%)	N_2O	265	121
Chlorofluorocarbon-12 (CFC-12)	CCl_2F_2	10,200	100
Hydrofluorocarbon-23 (HFC-23)	CHF_3	12,400	222
Sulfur Hexafluoride	SF_6	23,500	3200
Nitrogen Trifluoride	NF_3	16,100	500



Other gases – Ozone 10.2%, others including halocarbons 11.6%

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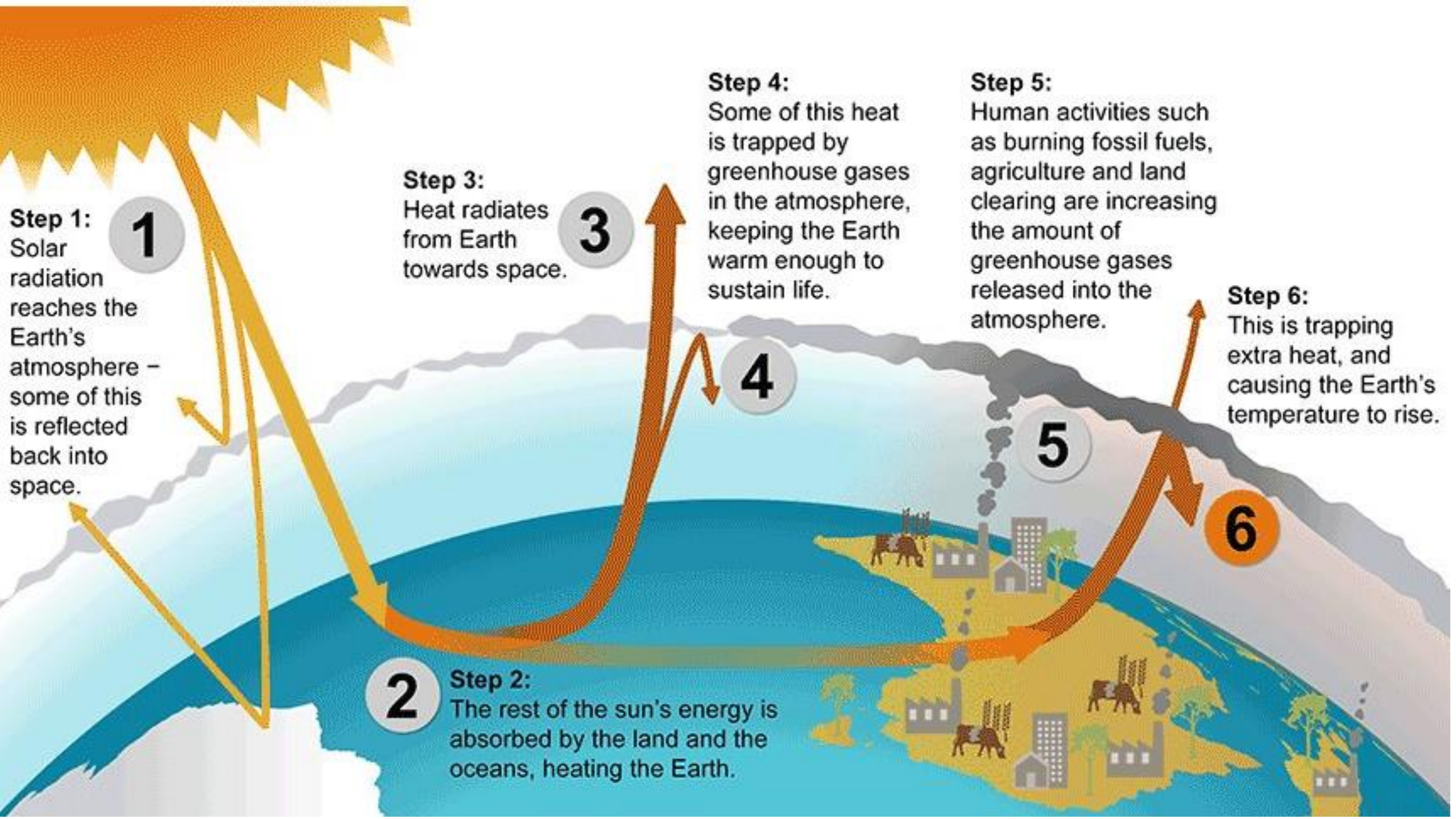
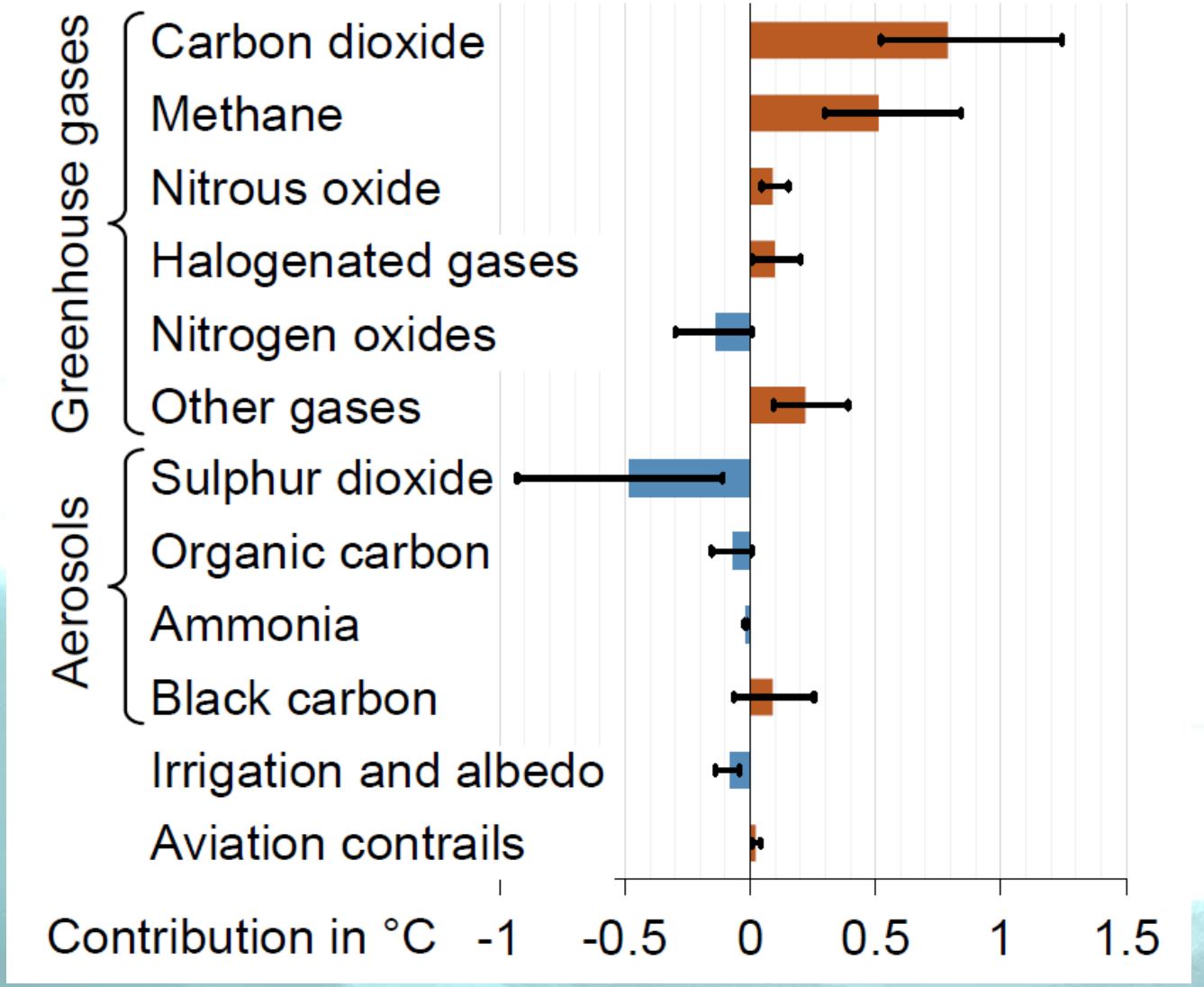

Step 1:
Solar radiation reaches the Earth's atmosphere – some of this is reflected back into space.
1
Step 2:
The rest of the sun's energy is absorbed by the land and the oceans, heating the Earth.
2
Step 3:
Heat radiates from Earth towards space.
3
Step 4:
Some of this heat is trapped by greenhouse gases in the atmosphere, keeping the Earth warm enough to sustain life.
4
Step 5:
Human activities such as burning fossil fuels, agriculture and land clearing are increasing the amount of greenhouse gases released into the atmosphere.
5
Step 6:
This is trapping extra heat, and causing the Earth's temperature to rise.
6

Green house gasses/aerosols and their warming/cooling potentials in the atmosphere



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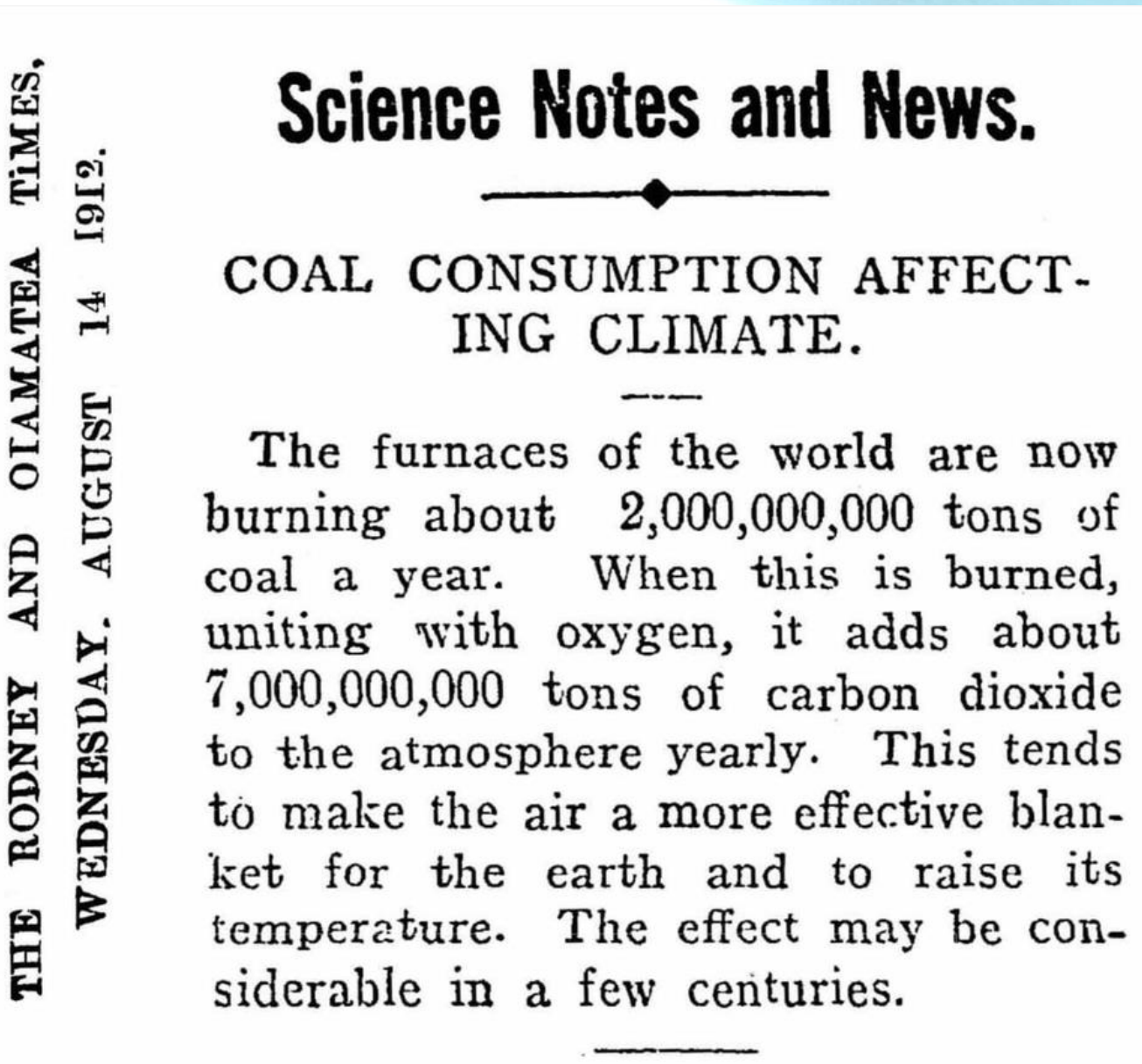


THE RODNEY AND OTAMATEA TIMES, WEDNESDAY, AUGUST 14 1912.

Science Notes and News.

COAL CONSUMPTION AFFECTING CLIMATE.

The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries.

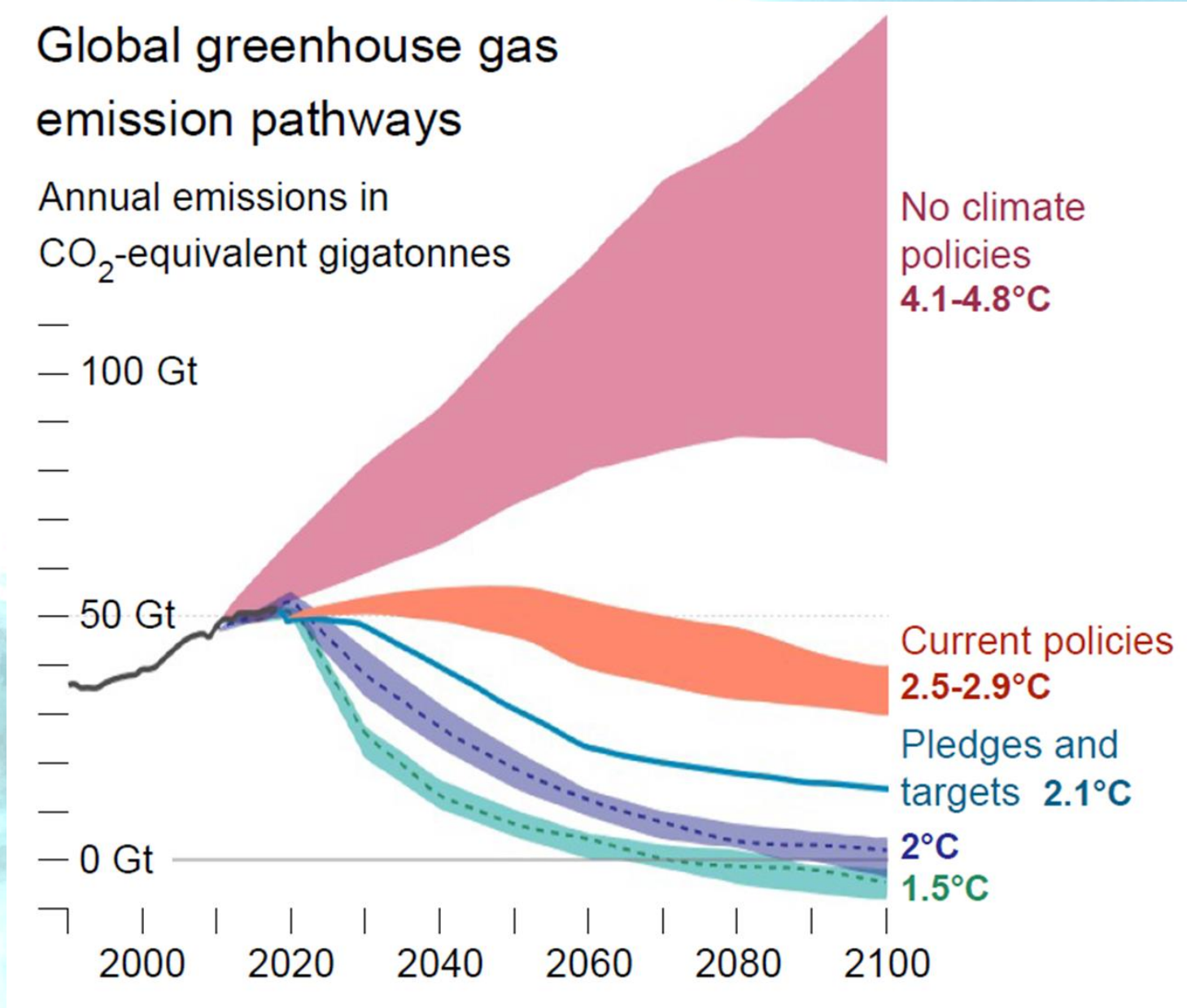
1912

Global CO2 ~300 ppm

- In the year that the 'Titanic' sank the world was embarking on more intensification of manufacturing and global development
- This was the era of unfettered development and there was little if any effort being put into environmental management and the impacts of the then 'today's' impacts on a future world….

2024

Global CO2 ~420 ppm



- 112 years later the world is in stark recognition that green-house gas levels that are being driven largely by emissions associated with global energy generation and other changes to land systems and increased demand for agricultural and manufactured products are reaching new highs – as this is new territory it is difficult to foreshadow the real impacts on climate
- Regardless of your position or philosophy on emissions, pollution, global warming and climate change this situation is triggering a large change in world politics, corporate business & investment, global policy and consumer activism – these factors are driving their own change agenda

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GLOBAL CARBON BUDGET 2023

Global Carbon Project

TOTAL EMISSIONS

40.7 (±3.4)

ATMOSPHERIC CO_2 GROWTH RATE

16.9 (±0.7)

TOTAL SINKS

23.8 (±3.2)

36.3 (±1.8)

4.4 (±2.6)

13.5 (±2.9)

10.3 (±1.5)

Fossil fuels and industry

Land Use Change

Land sink

Ocean sink

EMISSIONS AND SINKS

In billion-tons CO_2 per year (Pg CO_2 / yr), in 2023

Anthropogenic emissions

Sinks of anthropogenic emissions

GLOBAL CARBON PROJECT

FONDATION BNP PARIBAS

Source - globalcarbonatlas.org/

GLOBAL METHANE CYCLE

ATMOSPHERIC INCREASE IN CH4
10
(9,4-10,6)

TOTAL EMISSIONS
558
(540-568)

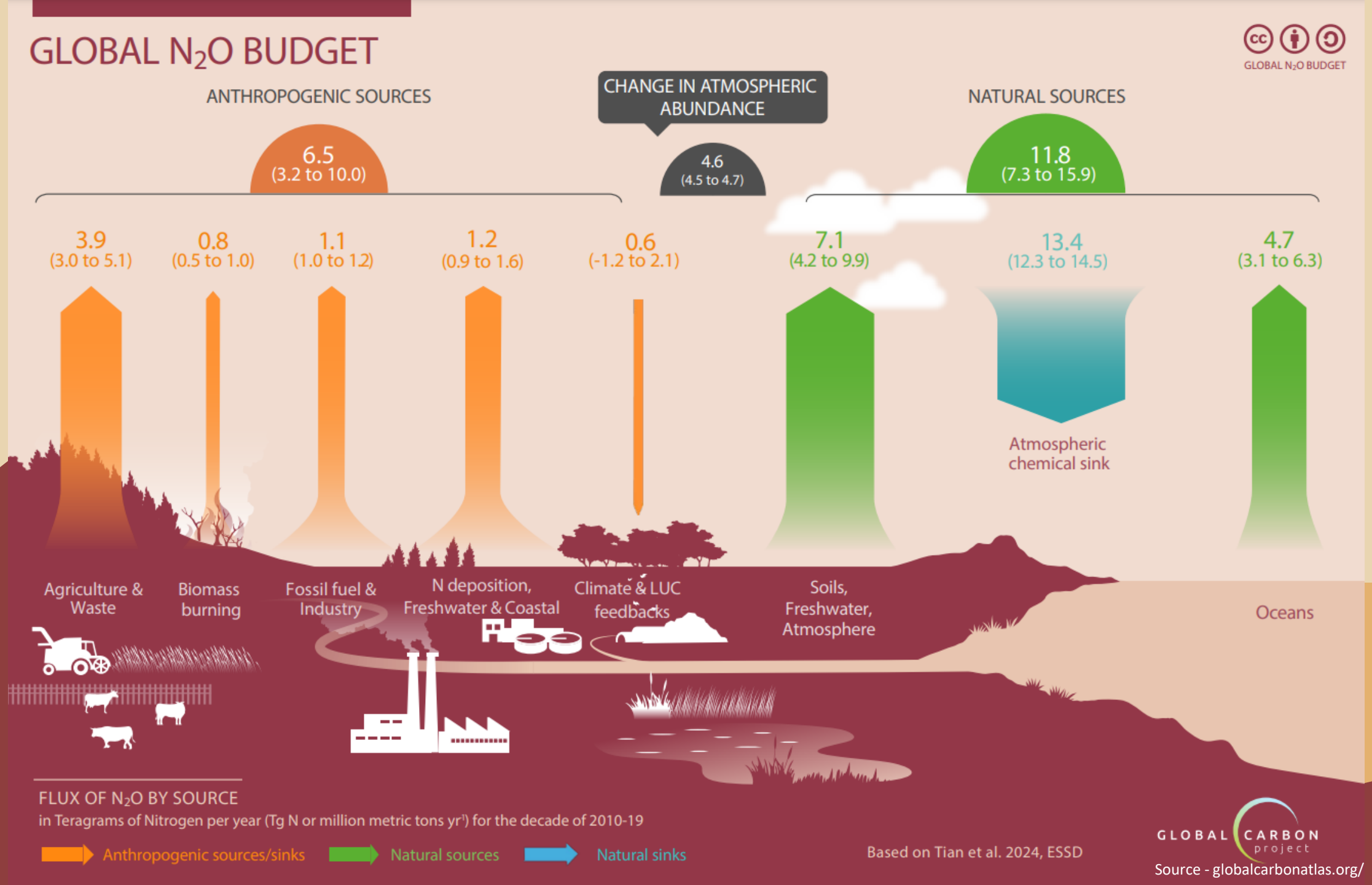
TOTAL SINKS
548
(529-555)

Production and use of fossil fuels	Agriculture and waste	Biomass combustion	Wetlands	Other natural emissions Geological, lakes, termites, oceans, permafrost	Sinks resulting from reactions in the atmosphere	Groundwater wells
105 (77-133)	188 (115-243)	34 (15-53)	167 (127-202)	64 (21-132)	515 (510-583)	33 (28-38)

EMISSIONS BY SOURCE

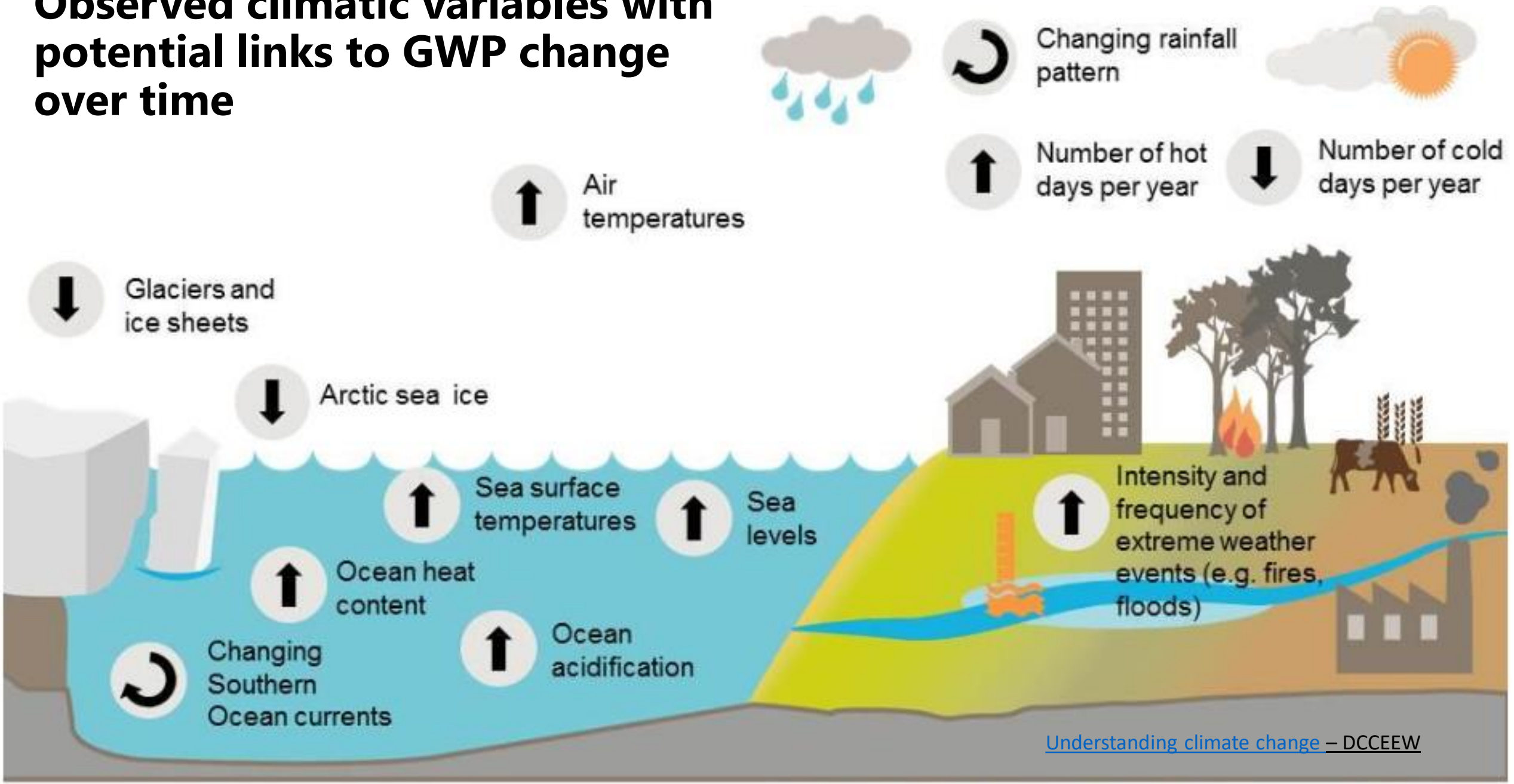
In millions of tons per year

Anthropogenic | Natural | Anthropogenic & natural



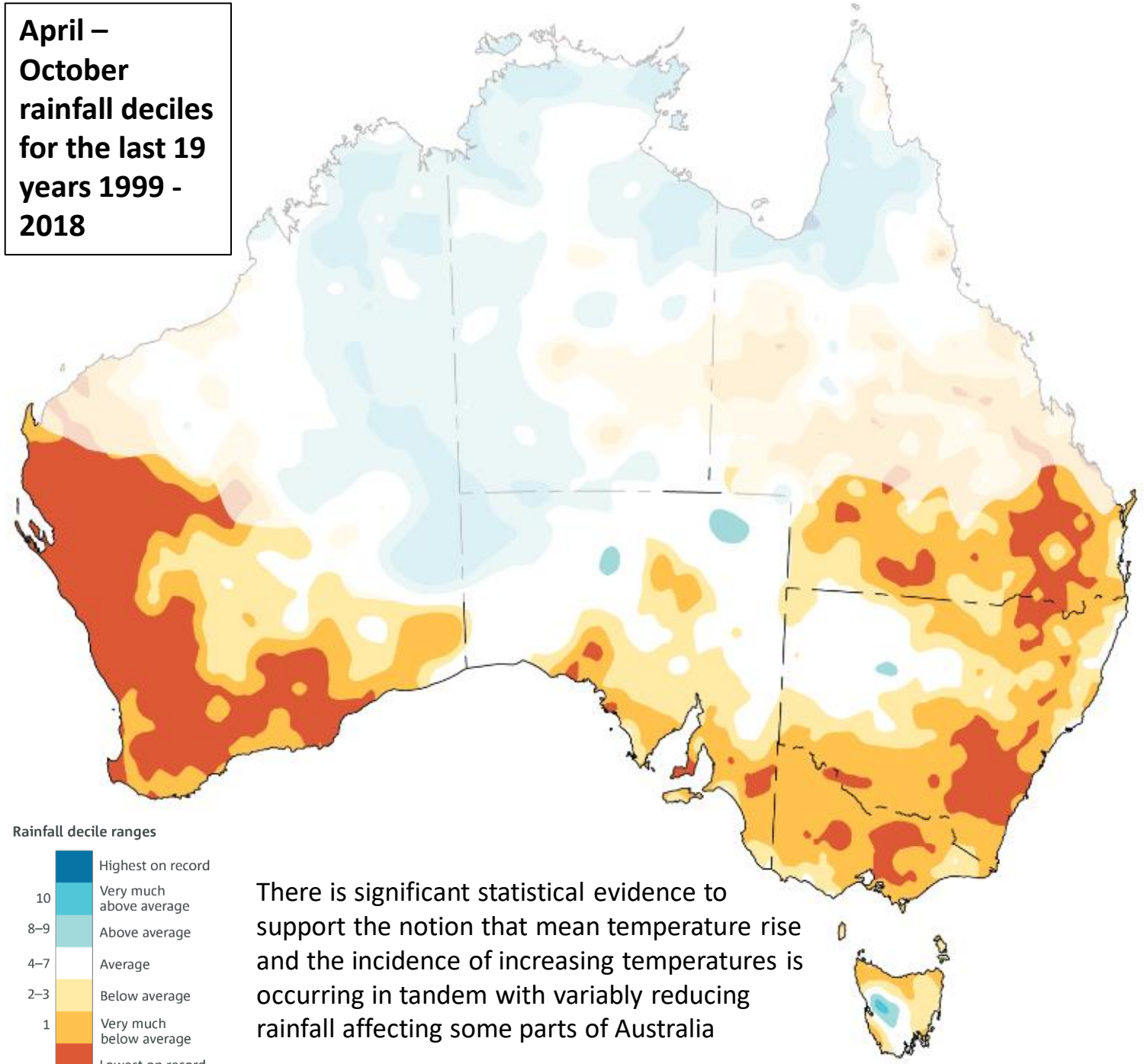
Source - globalcarbonatlas.org/

Observed climatic variables with potential links to GWP change over time

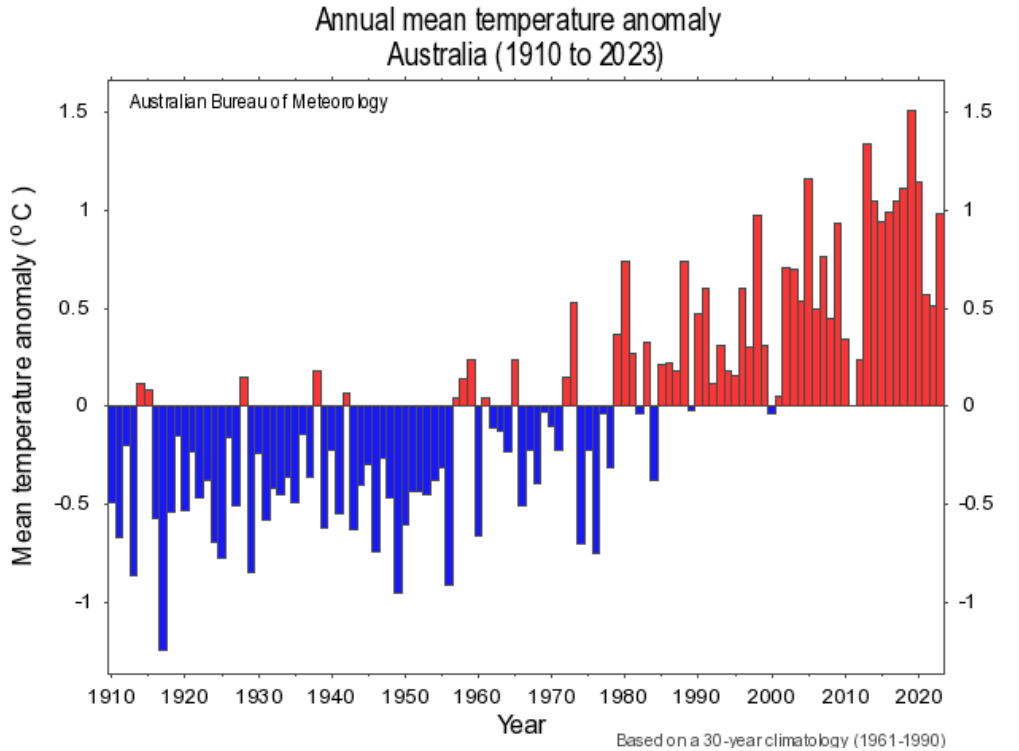


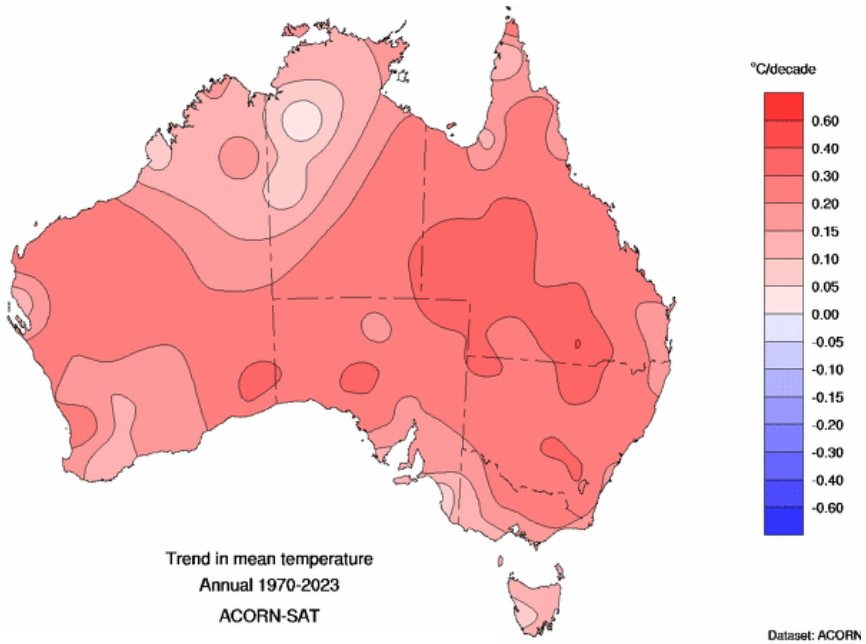
Understanding climate change – DCCEEW

April – October rainfall deciles for the last 19 years 1999 - 2018



There is significant statistical evidence to support the notion that mean temperature rise and the incidence of increasing temperatures is occurring in tandem with variably reducing rainfall affecting some parts of Australia





http://www.bom.gov.au/climate/change

Breakout Session 1

- Do you believe that increased green house gas content in the atmosphere is a serious threat to global climate stability?
- By your account – has climate altered based on your perception during your lifetime to this point – and in what ways?
- What would you rate as the climate variables that have the biggest impact on your business?

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2 - Agreements, Policies and Supply Chain Drivers

Agreements, Policies and Supply Chain Drivers

Paris Agreement

The Paris Agreement of Paris Climate Accords is an international treaty on climate change that was signed on November 4, 2016

Signatories to the treaty, which include Australia are now committed to realising national change by sector in terms of climate change mitigation, adaptation and commensurate improvements to the financial sector – this relates specifically to the carbon intensity of lending and financing portfolios

The Net Zero Banking Alliance

Correspondingly the Net Zero Banking Alliance is now a recognised group of global banks that are 'committed to aligning their lending, investment and capital markets activities' with net-zero green-house gas emissions by 2050'

The banks that this covers in Australia include – ANZ, Commonwealth Bank, Macquarie Group, NAB, Westpac (BankSA)

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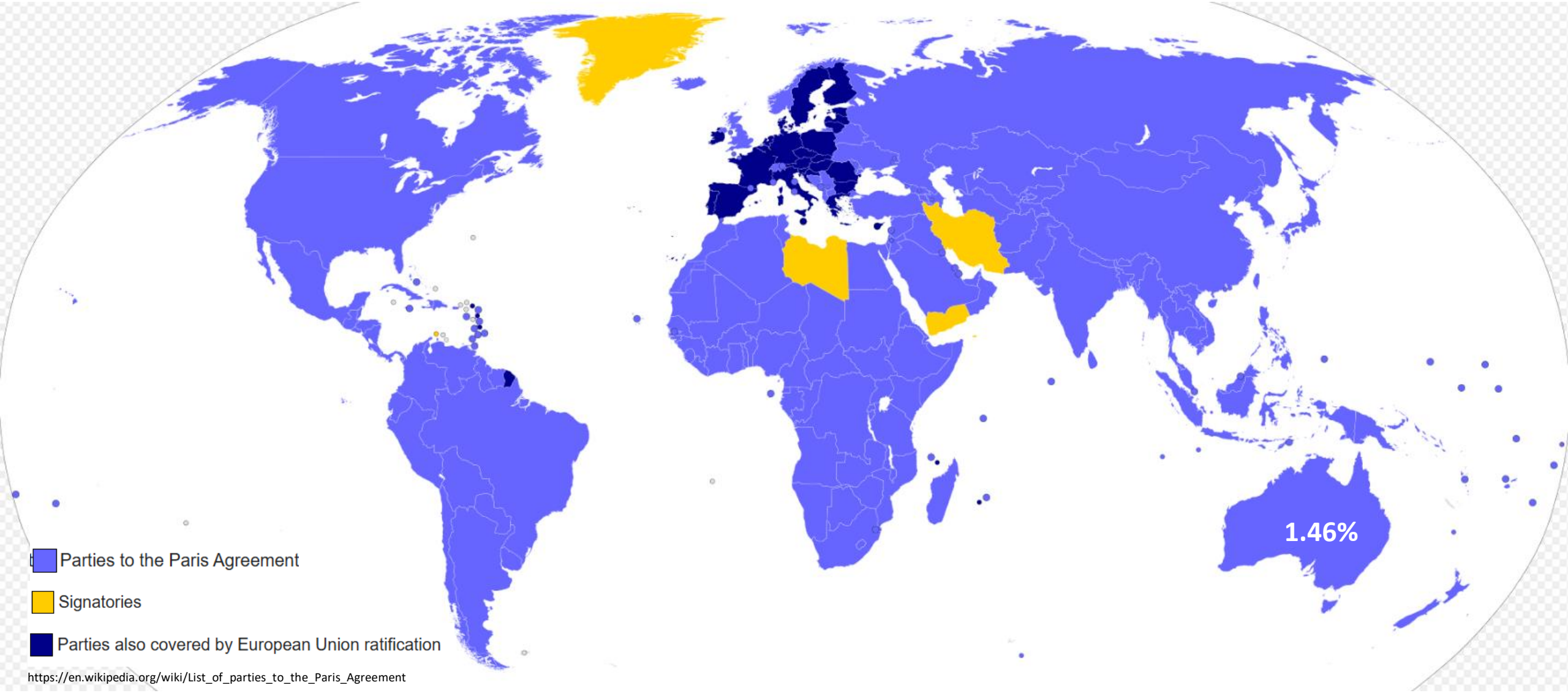
Countries that are signatories to the Paris Accord



https://en.wikipedia.org/wiki/List_of_parties_to_the_Paris_Agreement

ISSB ‘Harmonises’ Global Sustainability Standards

- The International Standards & Sustainability Board (ISSB) has strengthened its working partnership with the EU’s Transition Plan Taskforce (TPT), the Greenhouse Gas Protocol, CDP, Taskforce on Nature Related Financial Disclosures (TNFD) and the Global Reporting Initiative (GRI)
- This amalgamation which includes ISSB’s increased role in the mandating the reporting standards for businesses in the EU will likely provide a considerable new benchmark internationally
- As of January 2024 it was estimated that ‘thousands’ of businesses (probably mostly in the EU) were preparing their inaugural sustainability reports to the European Sustainability Reporting Standard (ESRS)
- **For those looking to market into the EU this is a new bar raising event that will likely have far reaching implications for corporate business’s reporting, methods and data accumulation protocols**

Source: ESG News – Linked in – January 2024

Strategies/Policies and Agreements

- **The Safeguard Mechanism** – Australian policy requiring large emitters to reduce their net emissions to 43% of 2005 levels by 2030 and achieve 'Net Zero' by 2050……
- **Glasgow breakthrough agenda on agriculture** – Intergovernmental agreement on investment in tech, assistance and metrics standardisation across ag in differing countries
- **Global methane pledge** – Aiming to reduce global methane to 30% of 2020 levels by 2030 – Voluntary participation by Australia – linked to UNEP
- **Ag 2030** and **Ag Sectoral Plan** – The sectoral plan for Australia Ag will set new targets for a range of strategies that are aimed at improving Australian Ag productivity, meeting market opportunities and challenges and assisting the Ag sector to transform further through innovation
- **Science Based Targets Initiative** – a driver of corporate conformity which assists corporate business to develop and implement emissions reduction targets to meet global reduction targets

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Australia's targets……

A commitment to reduce greenhouse gas emissions to 43% below 2005 levels by 2030, implemented as a single-year point target. A multi-year emissions budget for the period 2021 to 2030, with an indicative value of 4381 million tonnes CO2-e, corresponding to the 43% target. Achieving net zero emissions by 2050

Source: https://www.climatechangeauthority.gov.au/2035-emissions-reduction-targets#:~:text=A%20commitment%20to%20reduce%20greenhouse,net%20zero%20emissions%20by%202050.

https://asic.gov.au/about-asic/news-centre/find-a-media-release/2024-releases/24-205mr-asic-urges-businesses-to-prepare-for-mandatory-climate-reporting/

ASIC urges businesses to prepare for mandatory climate reporting

From 1 January 2025, many large Australian businesses and financial institutions will need to prepare annual sustainability reports containing mandatory climate-related financial disclosures, following the passage of a major bill through Parliament.

The Treasury Laws Amendment (Financial Market Infrastructure and Other Measures) Bill 2024 (Cth) passed Parliament on 9 September 2024 and received Royal Assent on 17 September 2024.

The mandatory climate reporting requirements will be phased in over the next three years across three groups of reporting entities, with the first reporting cohort required to prepare annual sustainability reports for the financial year commencing on or after 1 January 2025. The second and third reporting cohorts are required to prepare annual sustainability reports for the financial years commencing on or after 1 July 2026 and 1 July 2027 respectively.

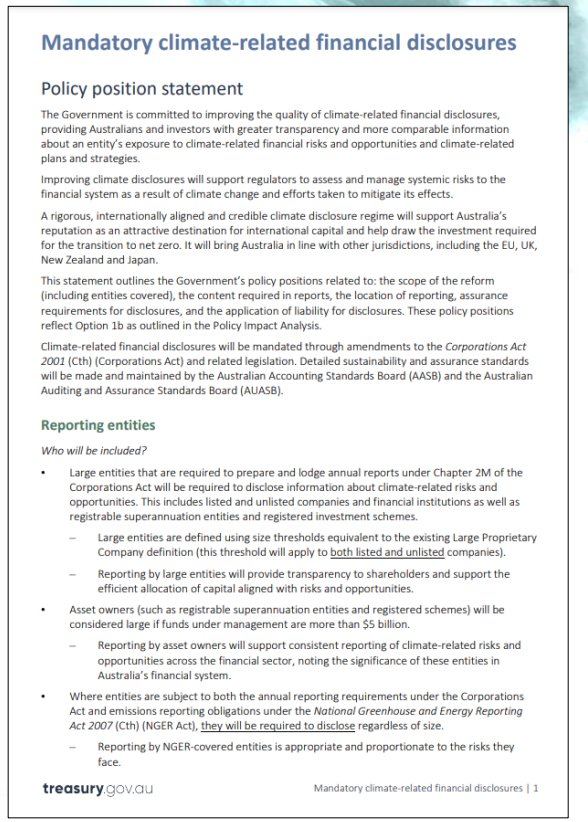
This legislation has received some attention within the media from Ag recently but should be viewed correctly in that it is applying to large businesses in a sequential roll out

Large enterprises will probably take 1-2 years to square up their own enterprise reporting

Strategies/Policies and Agreements

- **Mandatory climate-related financial disclosures** – will require the reporting by larger businesses of essentially the impacts associated with their scope emissions
- Small to medium business will be exempt but of course the larger umbrella organisations in the supply chain **MAY** require their scope 3 emissions data (from suppliers) to enable them to report – **that will require smaller to medium enterprises to collect and manage their carbon footprint data……..**

First annual reporting periods starting on or after	Large entities and their controlled entities meeting at least two of three criteria:			National Greenhouse and Energy Reporting (NGER) Reporters	Asset Owners
	Consolidated revenue	EOFY consolidated gross assets	EOFY employees		
1 Jan 2025 Group 1	$500 million or more	$1 billion or more	500 or more	Above NGER publication threshold	N/A
1 July 2026 Group 2	$200 million or more	$500 million or more	250 or more	All other NGER reporters	$5 billion assets under management or more
1 July 2027 Group 3	$50 million or more	$25 million or more	100 or more	N/A	N/A



Mandatory climate-related financial disclosures

Policy position statement

The Government is committed to improving the quality of climate-related financial disclosures, providing Australians and investors with greater transparency and more comparable information about an entity's exposure to climate-related financial risks and opportunities and climate-related plans and strategies.

Improving climate disclosures will support regulators to assess and manage systemic risks to the financial system as a result of climate change and efforts taken to mitigate its effects.

A rigorous, internationally aligned and credible climate disclosure regime will support Australia's reputation as an attractive destination for international capital and help draw the investment required for the transition to net zero. It will bring Australia in line with other jurisdictions, including the EU, UK, New Zealand and Japan.

This statement outlines the Government's policy positions related to: the scope of the reform (including entities covered), the content required in reports, the location of reporting, assurance requirements for disclosures, and the application of liability for disclosures. These policy positions reflect Option 1b as outlined in the Policy Impact Analysis.

Climate-related financial disclosures will be mandated through amendments to the *Corporations Act 2001* (Cth) (Corporations Act) and related legislation. Detailed sustainability and assurance standards will be made and maintained by the Australian Accounting Standards Board (AASB) and the Australian Auditing and Assurance Standards Board (AUASB).

Reporting entities

Who will be included?

- Large entities that are required to prepare and lodge annual reports under Chapter 2M of the Corporations Act will be required to disclose information about climate-related risks and opportunities. This includes listed and unlisted companies and financial institutions as well as registrable superannuation entities and registered investment schemes.
  - Large entities are defined using size thresholds equivalent to the existing Large Proprietary Company definition (this threshold will apply to both listed and unlisted companies).
  - Reporting by large entities will provide transparency to shareholders and support the efficient allocation of capital aligned with risks and opportunities.
- Asset owners (such as registrable superannuation entities and registered schemes) will be considered large if funds under management are more than $5 billion.
  - Reporting by asset owners will support consistent reporting of climate-related risks and opportunities across the financial sector, noting the significance of these entities in Australia's financial system.
- Where entities are subject to both the annual reporting requirements under the Corporations Act and emissions reporting obligations under the *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act), they will be required to disclose regardless of size.
  - Reporting by NGER-covered entities is appropriate and proportionate to the risks they face.

treasury.gov.au Mandatory climate-related financial disclosures | 1

NGER = National Greenhouse Gas Emissions Reporting – a reporting requirement for larger entities on annual GHG emissions to the Clean Energy Regulator

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Supply chain responses to Paris Agreement

- Unilever, Nestle, Danone, Mars
  - 50% by 2030 & net zero by 2050
- Fonterra
  - 30% EI by 2030 (from a 2018 baseline)
- Mondelez
  - Net zero by 2050 and SBTI by 2030
- Heineken
  - Net zero by 2030
  - Carbon neutral barley-malt
- Rabobank & NAB
  - Net zero financed emissions by 2050
  - Hold 50% of Australia agri-debt market
- Pfizer, Goodman Fielder, Wilmar, JBS
  - Net Zero by 2040
- Kellogg Company
  - 50% reduction by 2050
- Inghams
  - 43% by 2030, net zero 2050
- Olam, SunRice
  - Net zero by 2050
- Cargil
  - 30% by 2030, net zero by 2050

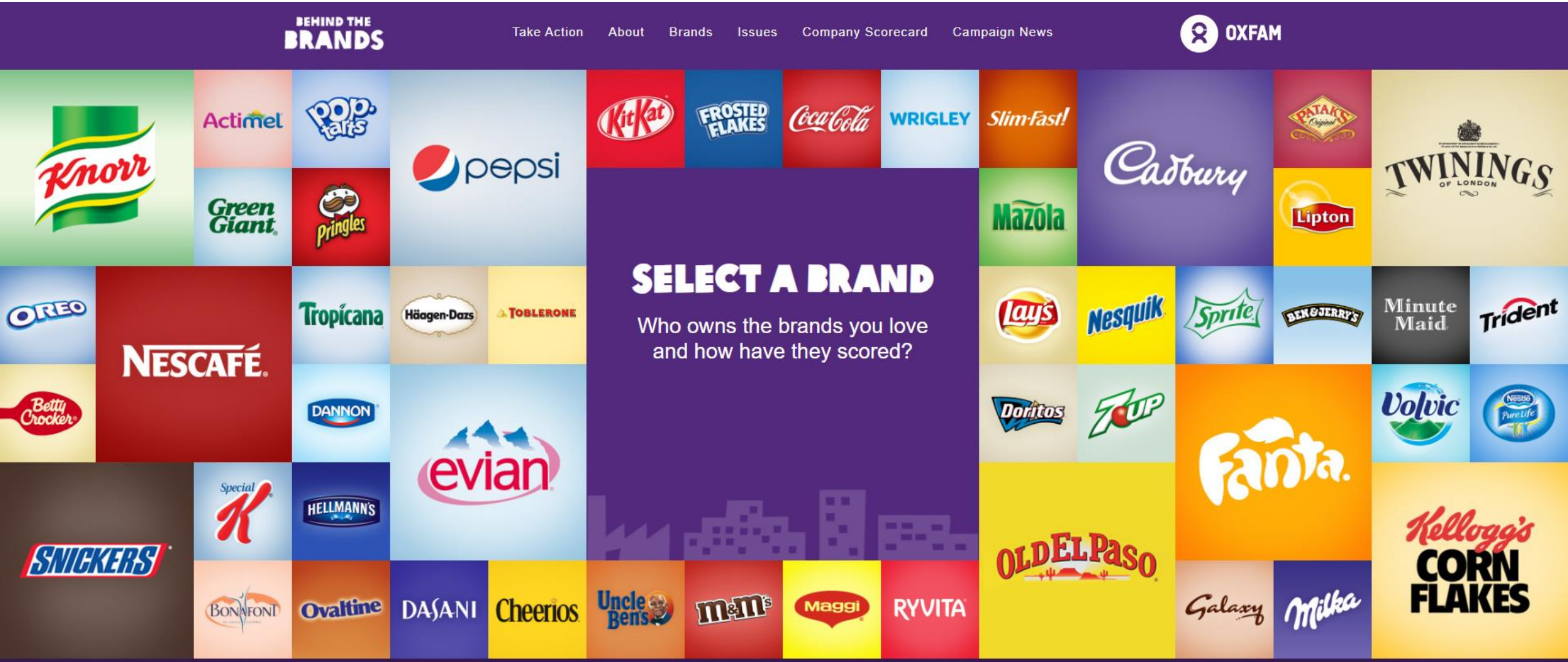
Of the 100 largest economies 69 are companies and 31 are countries
Government policy may now be less influential than market forces

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Source: Company sustainability reports https://oxfamapps.org/fp2p/the-worlds-top-100-economies-31-countries-69-corporations/

Slide courtesy of Richard Eckhard/University of Melbourne 2024

Consumer choice platforms are also generating…….



Source: https://www.behindthebrands.org/brands/

ACCIONA S.A. ★ Spain, Europe	1.5°C	1.5°C	2040	Company
Accolade Wines ★ Australia, Oceania	COMMITTED	-	COMMITTED	Company

Date published/updated
2023

Sector
Food and Beverage Processing

Target summary

Near term: Committed

Net zero: Committed

★ Business Ambition for 1.5°C campaign member

Accor S.A. ★ France, Europe	1.5°C	-	COMMITMENT REMOVED	Company

SBTI Members – Setting organisational targets that will drive local action

- The Science Based Targets Initiative (SBTI) is a voluntary signing up and setting of corporate targets for emissions reduction in line with global targets
- Participants will seek to improve their supply chain emissions in line with producing their own evidenced based reporting
- https://sciencebasedtargets.org/companies-taking-action#dashboard

Breakout Session 2

- What is your opinion on Australia's carbon targets?
- Do you think your business/organisation has a requirement to change given you have market access currently?
- What arrangements do you believe could change in the supply chain?

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3 – Emissions Fundamentals

Understanding GHG emissions – On farm & processing/storage

- **GHG emissions are all gases** – they are generally by products resulting from the release of energy or the process conversion of chemical elements into differing forms of chemical compound – so utilizing solid, liquid and gas resources can end up releasing either by-product gases or the actual gas itself (in the case of refrigerant gases) as gas emissions to the atmosphere

- **Carbon dioxide** - is by far the most abundant greenhouse gas emission – it is generated naturally but its release chiefly through burning of fossil fuels either for energy generation, motive power or for industrial processes is significant – it is not the only emission associated with these processes but it is the GHG warming potential of CO_2 particularly that is driving emissions reduction strategies

- **Methane, Nitrous Oxide and refrigerant gas emissions** are also significant in agriculture/processing and have significantly higher Global Warming Potentials (GWP's) than CO_2, even though they are less abundant in the atmosphere

- The total number of GHG's is staggering but many of them are industrial variants of synthetic gases that have been developed for industry or refrigeration

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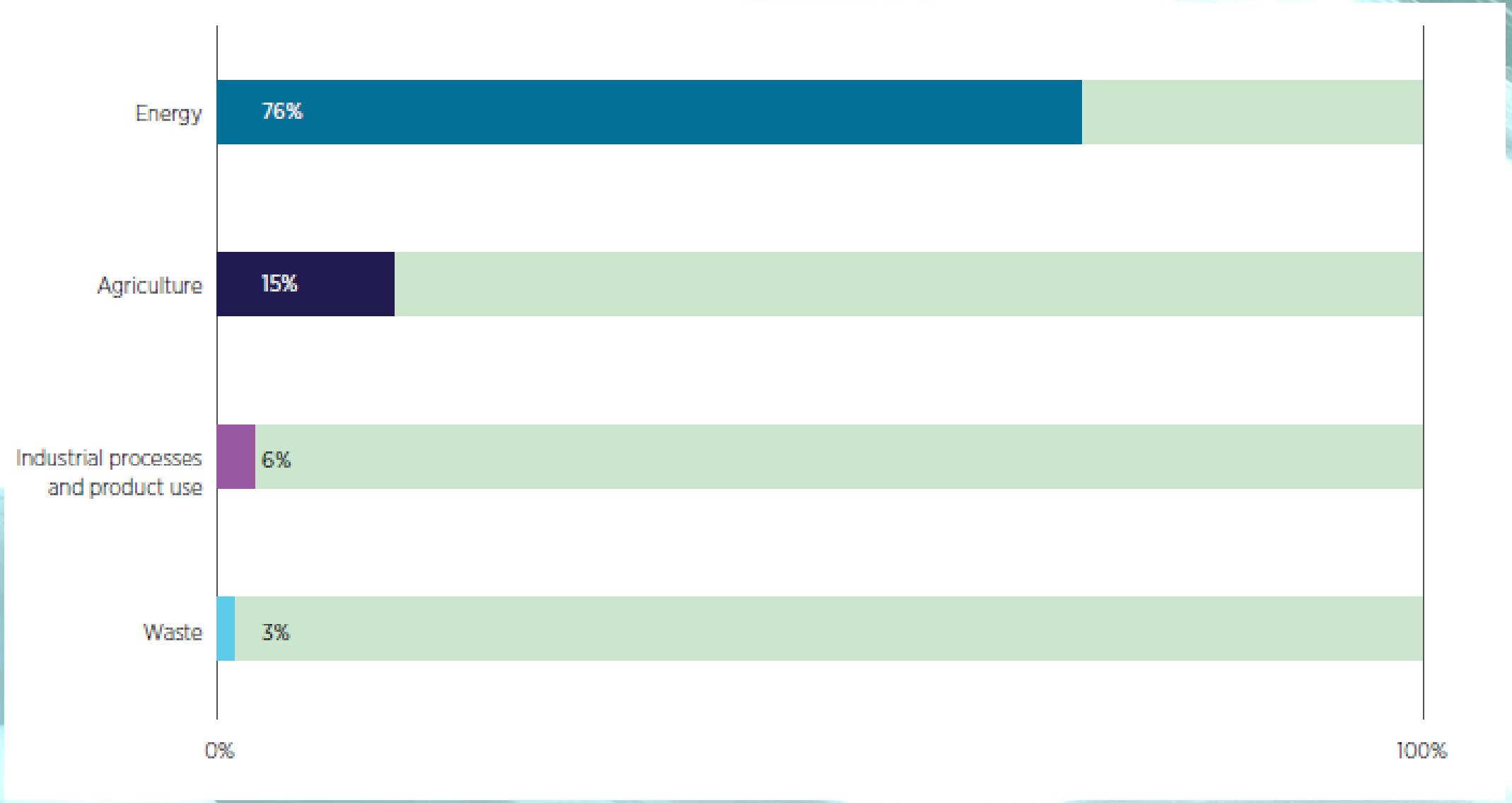
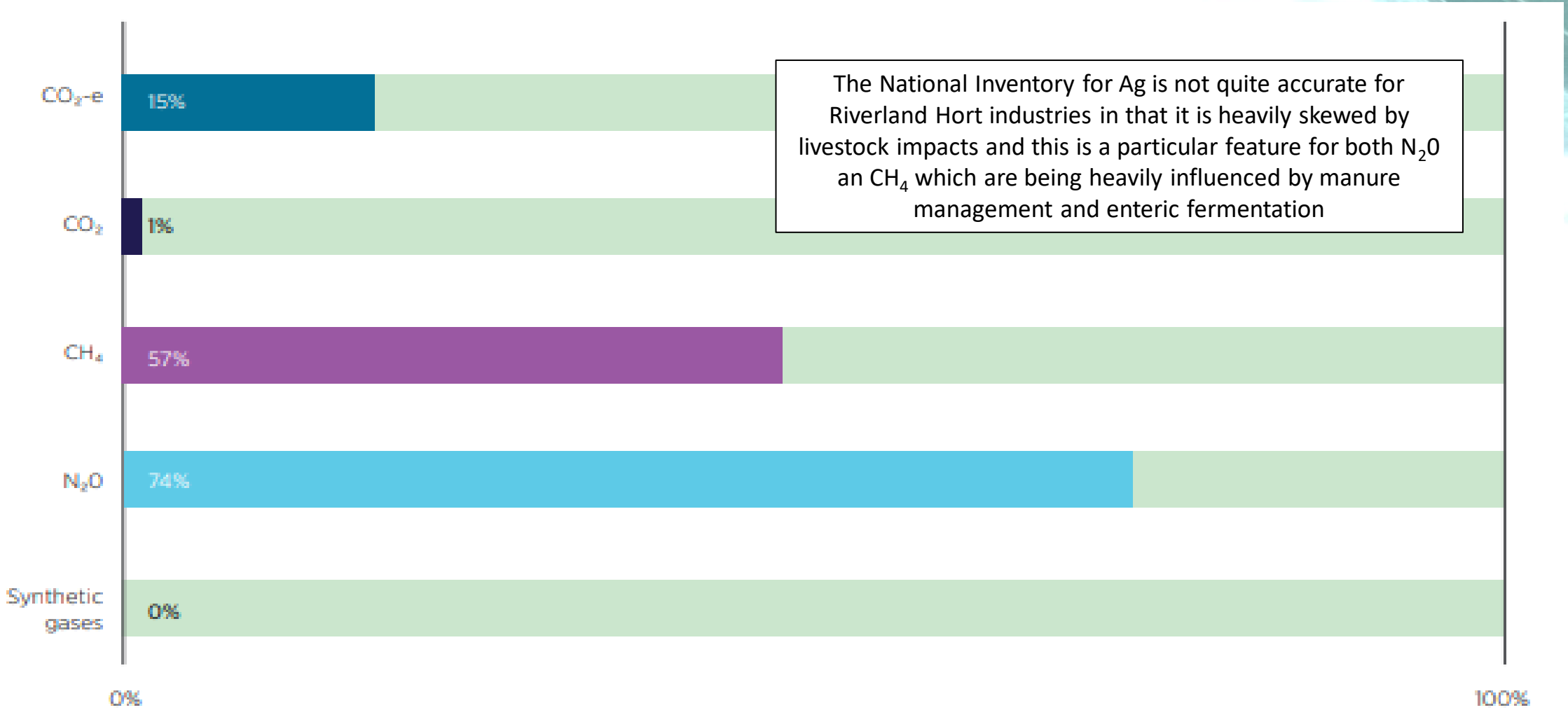
Share of national emissions by sector – 2021/22



Source: national-inventory-report-2022-volume-1, excludes LULUCF

Australian Ag (non-processing) share of National emissions 21/22



The National Inventory for Ag is not quite accurate for Riverland Hort industries in that it is heavily skewed by livestock impacts and this is a particular feature for both N_20 an CH_4 which are being heavily influenced by manure management and enteric fermentation

Source: national-inventory-report-2022-volume-1

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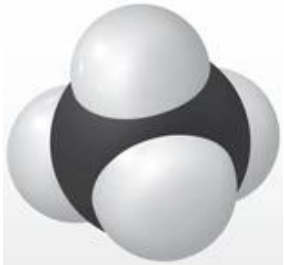
GHG Emissions 101

Carbon Dioxide

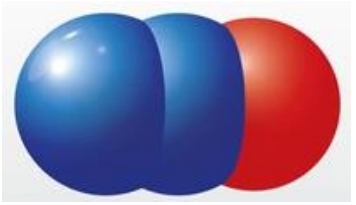
Covalent bonds between 1 carbon and 2 oxygen atoms	Chemical Formula	Global Warming Potential (GWP)
	CO_2	1

Methane



Covalent bonds between 1 carbon and 4 hydrogen atoms	Chemical Formula	Global Warming Potential (GWP)
	CH_4	28

Nitrous Oxide



Covalent bonds between 2 nitrogen atoms and 1 oxygen atom	Chemical Formula	Global Warming Potential (GWP)
	N_2O	265

- To standardise a systemic approach to calculating both impacts and also abatements (or reductions to atmospheric green-house gas contributions) the consideration of emissions firstly starts with carbon dioxide
- Carbon dioxide has a Global Warming Potential (GWP) of '1' (over 100 year period) and from this reference point each GHG is rated for its intensity relative to this threshold
- The annual surplus of CO2 emissions (2023) globally constituted around 40% of the total estimated CO2 emissions for that year period

GWP's change from year to year – refer: https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/about-emissions-and-energy-data/global-warming-potential#:~:text=We%20use%20carbon%20dioxide%20as,more%20potent%20than%20carbon%20dioxide.

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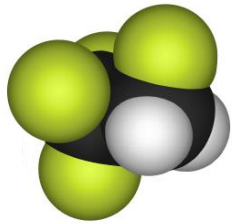
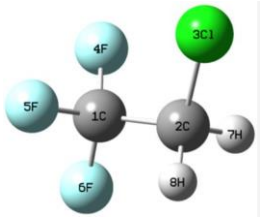
GHG Emissions 101

Hydrofluorocarbon - various



Various depending on synthesis process	Chemical Formula	Global Warming Potential (GWP)
	CHF_3	12,400

Hydrochlorfluorocarbons - various



Various depending on synthesis process	Chemical Formula	Global Warming Potential (GWP)
	$CHFClCF_3$ (R124)	>10,000

Other synthetic gases

The reality is that refrigeration gases are a specialist field – it would be best practice to know your refrigerants and their GWP's against possible cost-effective alternatives

- **Hydrofluorocarbons** (HFC's) - replaced the more potent ozone depleting Chlorofluorcarbons in the mid 1990's. Whilst this uptake relieved ozone depletion pressures HFC's are a potent GHG whose atmospheric concentration is rising
- **Hydrochloroflurocarbons** – HCFC's (R21) should be largely phased out by now in favour of HFC's but it is difficult to ascertain across differing scales and ages of refrigeration systems
- There are references to **Sulphur Hexafluoride** (SF_6) and **Nitrogen Trifluoride** (NF_3) in the wine industry but it has not been possible to identify what part of the winemaking process these occur in, if anywhere – they are both potent GHG's

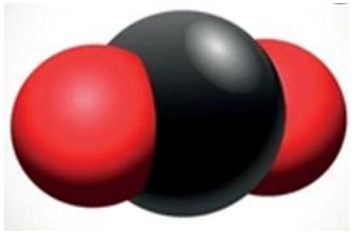
GWP's change from year to year – refer: https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/about-emissions-and-energy-data/global-warming-potential#:~:text=We%20use%20carbon%20dioxide%20as,more%20potent%20than%20carbon%20dioxide.

LANDSCAPE SOUTH AUSTRALIA MURRAYLANDS AND RIVERLAND

GHG Emissions 101 – C and CO_2-e

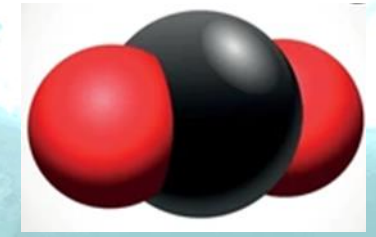
So….. a carbon atom has 12 amu

After catalysing a change in state through combustion or oxidation



A carbon dioxide atom has 1 x carbon atom with 12 amu and 2 x oxygen (16 amu x 2) = 12+32 = 44 amu

So if 1 ton of elemental carbon is subjected to a catalysing change (like combustion) then it splices with oxygen to form CO_2 = 44 amu/12 amu = 3.67 CO2-equivalents or just CO2-e – crudely speaking you now have an emission that has 3.67 times the carbon equivalents because 2 x oxygen atoms are now attached and the gas formed now has GHG qualities……



Therefore a 1 ton of carbon dioxide emission (CO2-e) has an equivalent elemental carbon of 1 ton x 12 amu/44 amu = 0.27 tons of C

ACCU

1 ton CO2-e = 1 Australian Carbon Credit Unit (ACCU) = ~$35/unit (October 2024)

- **Carbon dioxide** or CO_2 has a Global Warming Potential (GWP) of '1' (over 100 year period) and from this reference point each GHG is rated for its intensity relative to this threshold – CO_2 emissions are also the highest impacting by volume and scale at >80% of the atmospheric emissions component globally

amu = atomic mass unit

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Defining the scope emissions base – 1, 2 and 3

Vineyard/orchard

Upstream
Pre-farm emissions

Scope 3 emissions

Emissions from the production of

- Herbicides
- Pesticides
- Fungicides

Emissions from the transport/supply of fuels

Emissions from the production of lime/gypsum

These are described as embedded emissions and they will have standardized factors applied in a calculator/GAF

On farm

Scope 1 emissions

Fertiliser emissions – atmospheric deposition of N_2O

Liming emissions – CO_2

Diesel emissions

Petrol emissions

Crop residues/burning

Refrigerant leakage

Contract harvesting[1]

Contract spraying[1]

Contract pruning[1]

Scope 2 emissions

Grid supplied electricity

Downstream
Post-farm emissions

Scope 3 emissions

Transport of product to processor/shipping;

Contract transport product[1]

Contract transport machinery[1]

Off site refrigeration/storage[2]

The determination of real scope 3 emissions between production and processor in the wine industry remains a little hazy – most platforms are really focusing on the S1 & 2 emissions base – this needs to be remembered

[1]Technically whether on or off farm contract services need to be accounted for [2]Stone/Pome/Citrus will require this

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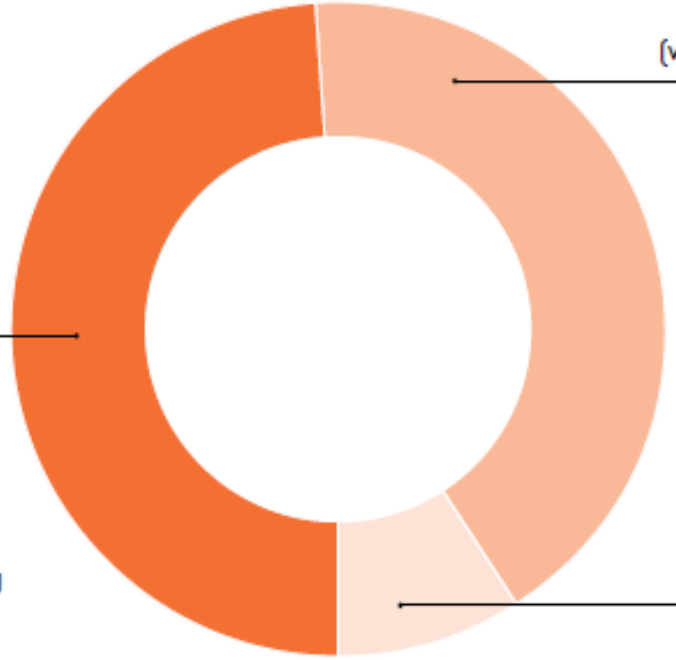
Vineyard direct emissions and electricity emissions sources



Fuel sources (vehicles and stationary sources)

42%

of all vineyard emissions

Use of tractors, diesel irrigation systems and other fuel-based machinery burns fossil fuels, creating emissions.

Purchased electricity

49%

of all vineyard emissions

Electricity is primarily utilised for shed lighting and pumping water to irrigate grapevines.

Fertiliser use

9%

of all vineyard emissions

The application of nitrogen-based fertilisers, which are energy intensive to make and release emissions as they break down.

Other major emissions sources sit outside of the direct control of the vineyard manager and include the production of goods and services used in vineyard operations and the transportation of grapes to the winery.

Source: Wine Australia

National average emissions from vineyard's

Electricity - For S.A. growers significant gains have been made in recent years with S.A.'s increased access To renewable electricity sources – for private diverters and trust irrigators much will still depend (in terms of price paid) on the power of scale negotiation – growers should know their renewable profile for electricity moving forward as it reduces the carbon footprint significantly

Fuel – reductions in this footprint will rely very much on the affordability of newer machinery – multi-row and low emissions

Fertilisers – green urea is on the horizon and more attention to natural N mineralisations, and other options for controlled N release in horticulture should be the focus.

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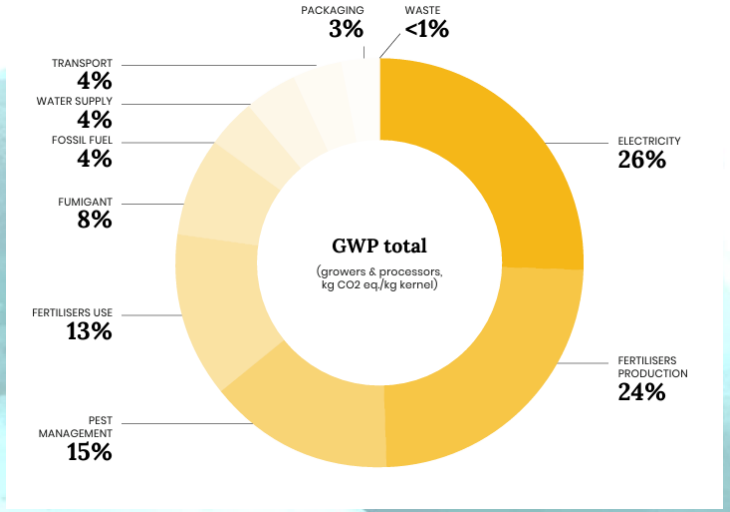
Emissions breakdown of almond production

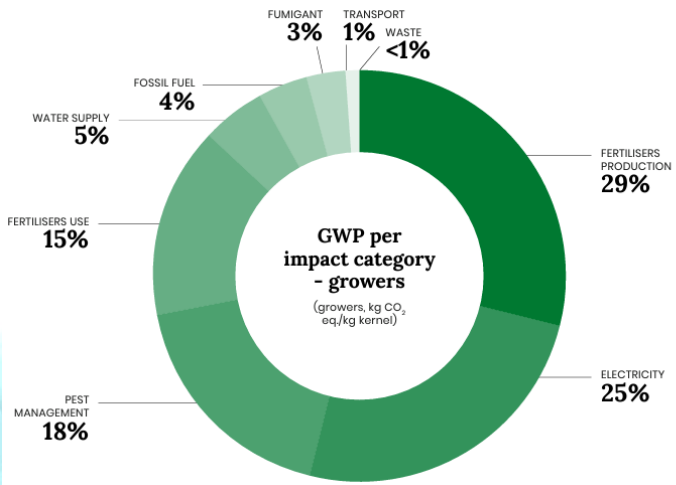
Emissions hotspots for almond growers were identified:

- Nitrogen-based fertiliser use
- Electricity and water use
- Chemical use for pest and disease control

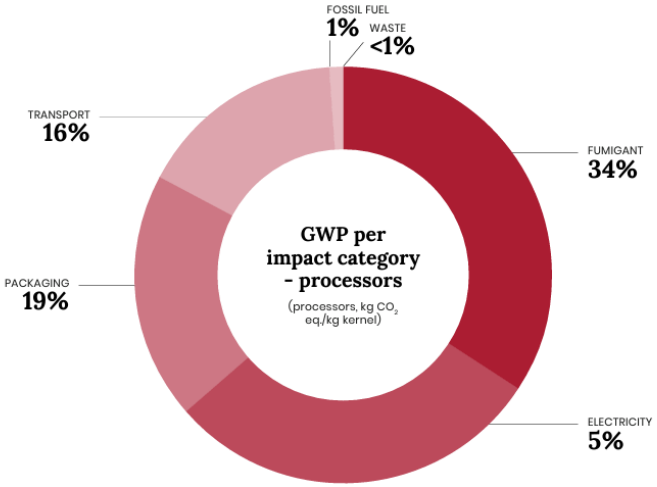
Mitigation strategies were workshopped by industry and an action plan was developed



Combined

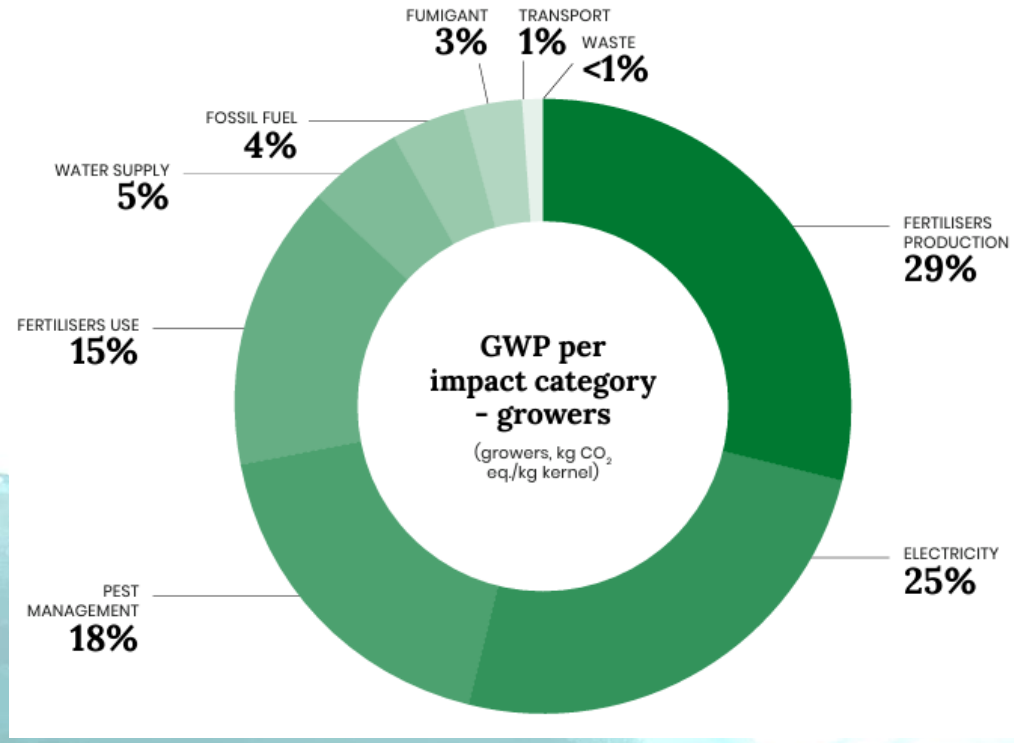


Growers



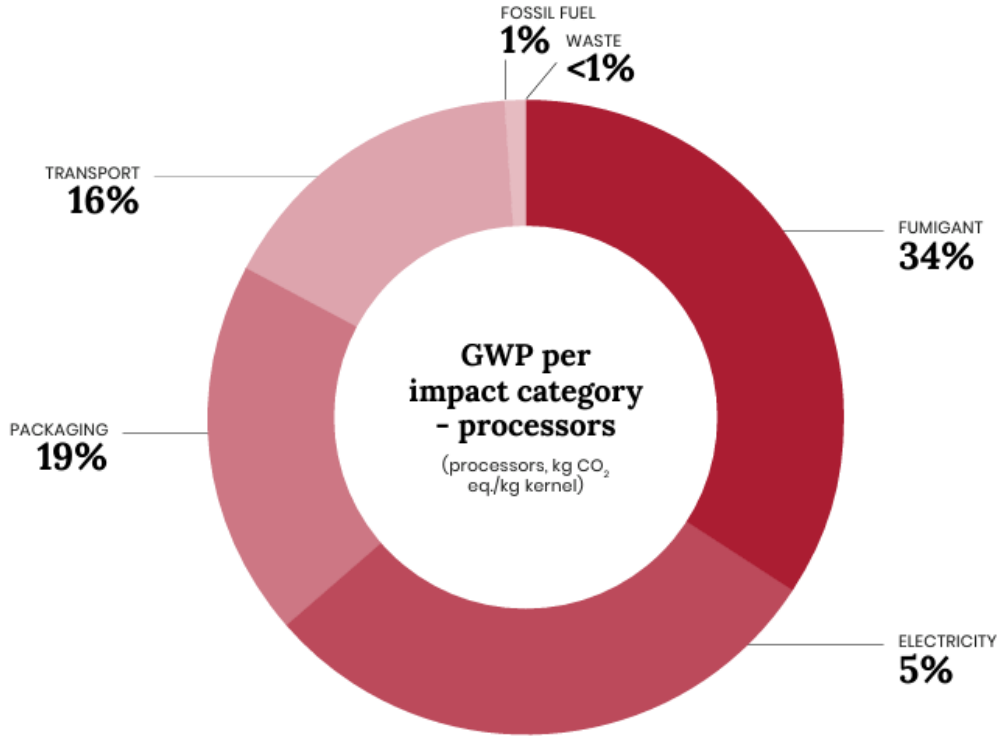
Processors

Emissions breakdown of almond production



Growers

Processors



Power use for processors is offset by solar and potentially co-gen – default profile is more in 30% range

Reconciling on farm emissions to type and scope emissions basis

Excludes refrigeration

	Herbicides = t/CO_2-e Pesticides = t/CO_2-e Fungicides = t/CO_2-e Crop residues = N_2O	Scope 3 (Embed) Scope 3 (Embed) Scope 3 (Embed) Scope 1 (On Farm)		Irrig Elect = t/CO_2-e^2 Irrig Leaching = N_2O	Scope 2 (Embed) Scope 1 (On Farm)
	Fuel = t/CO_2-e Fuel = CO_2 Fuel = CH_4 Fuel = N_2O	Scope 3 (Embed) Scope 1 (On Farm) Scope 1 (On Farm) Scope 1 (On Farm)		Burn offs = CH_4 Burn offs = N_20	Scope 1 (On Farm) Scope 1 (On Farm)
	Fertiliser = t/CO_2-e Lime/Gyp = t/CO_2-e Urea = CO_2 Lime = CO_2 N Fert = N_2O	Scope 3 (Embed) Scope 3 (Embed) Scope 1 (On Farm) Scope 1 (On Farm) Scope 1 (On Farm)		Atmos deposition – N_20[1] Anaereobic breakdown – CH_4[1]	Scope 1 (On Farm) Scope 1 (On Farm)

[1]Combined nitrification and de-nitrification from ammoniacal wastes in sludges, manures and wastes in wastewaters

[2]irrigation electricity in S.A. will have a significant renewables component that should be clarified with your energy or water provider

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Some quick thoughts on emissions reductions by type (on farm)

Excludes refrigeration – (S) = Seasonal

	Herbicides = t/CO_2-e Pesticides = t/CO_2-e Fungicides = t/CO_2-e Crop residues = N_2O	U/C cover crops Bio's/U/C cover (S) More research Pyrolisis bio-char		Irrig Elect = t/CO_2-e Irrig Leaching = N_2O	Irrig DU/flow/renewable electricity U/C cover crops
	Fuel = t/CO_2-e Fuel = CO_2 Fuel = CH_4 Fuel = N_2O	(S) & Multi row and vehicle type		Burn offs = CH_4 Burn offs = N_20	Pyrolisis bio-char Pyrolisis bio-char
	Fertiliser = t/CO_2-e Lime/Gyp = t/CO_2-e Urea = CO_2 Lime = CO_2 N Fert = N_2O	(S) & Soil N min U/C cover crops (S) & Soil N min U/C cover crops (S) & Soil N min		Atmos deposition – N_20[1] Anaereobic breakdown – CH_4	Aeration/re-use Aeration/co-gen /Digesters

This is a very quick brain dump of ideas – for some of the suggestion MRLB/Industry has some fairly good data, for other things like multi-row that is already advancing. Targeted N and real N budgets against mineralisation potential relies on supplementary organic C enrichment ($), pyrolysis bio-char would require a processing plant – most of the ideas would require a careful cost/benefit to derive the truer benefit + there will be emissions with the solutions as well as costs

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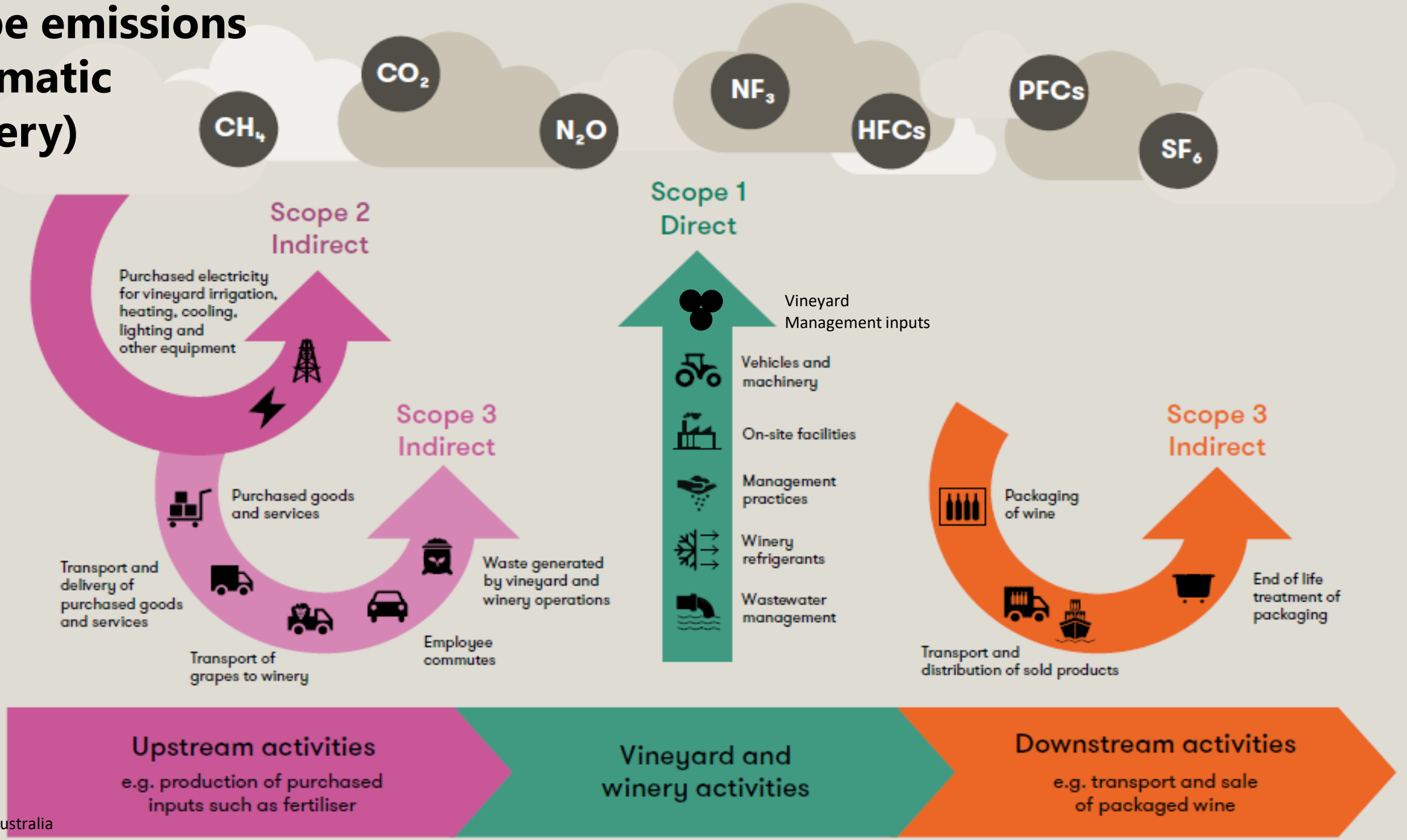
Scope emissions schematic (winery)



Source: Wine Australia

Contributing to the Life Cycle Assessment (LCA)

- Improved on farm data will assist the grower and the industry body/supply chain to understand the fuller dimension of the Life Cycle of the product
- The LCA examines the entire journey of the product and the emissions intensity of the product as it is spread across inputs, cultivation, harvesting, transport, processing, packaging, shipping, consumption and even disposal of associated packaging of the end product
- Its important to remember that every step has an energy input or loss associated with it (and an emission) that is accountable, in many cases energy has been used to get it to that point – so this needs to be understood
- A regular accounting for scope emissions will enable your carbon footprint and this will 'define' your position in the overall LCA

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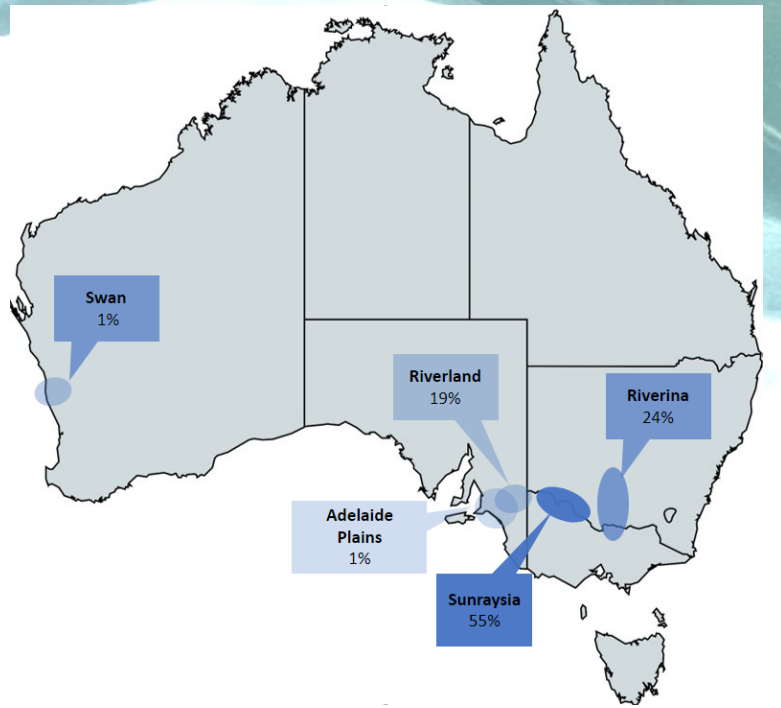
Almond industry life cycle assessment

- A life cycle assessment (LCA) was conducted by Edge Impact to assess the global warming potential (GWP) of almond production.
- The LCA looked at almond production from 'cradle' to 'gate'.
- Data was collected from a sample of Australian almond growers and processors.
- LCA looked at a snapshot of growers in ***4 different growing regions*** (Adelaide Plains, Riverland, Sunraysia, Riverina) and across different-sized enterprises.
- Process-based LCA approach.

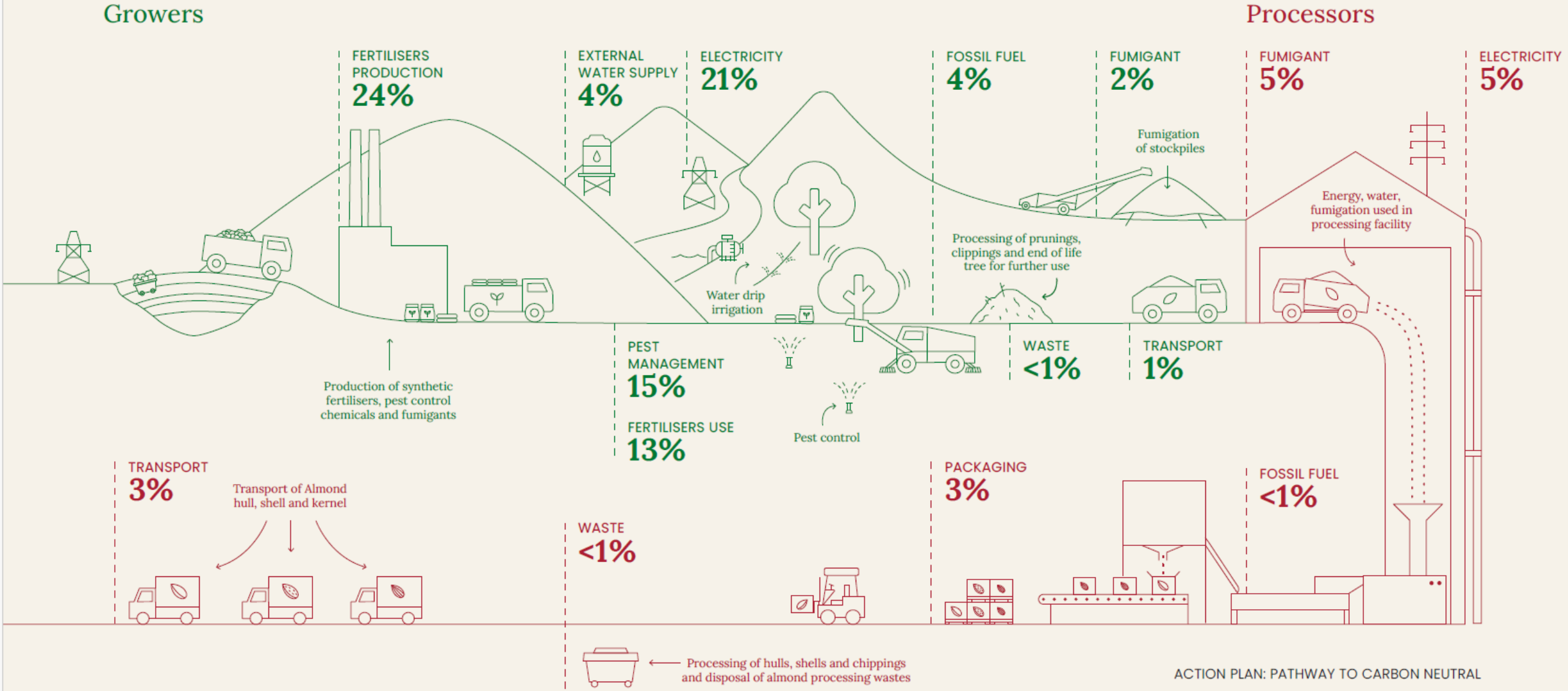
Australian almond-growing regions



Global Warming Potential (GWP) of Californian and Australian almond production

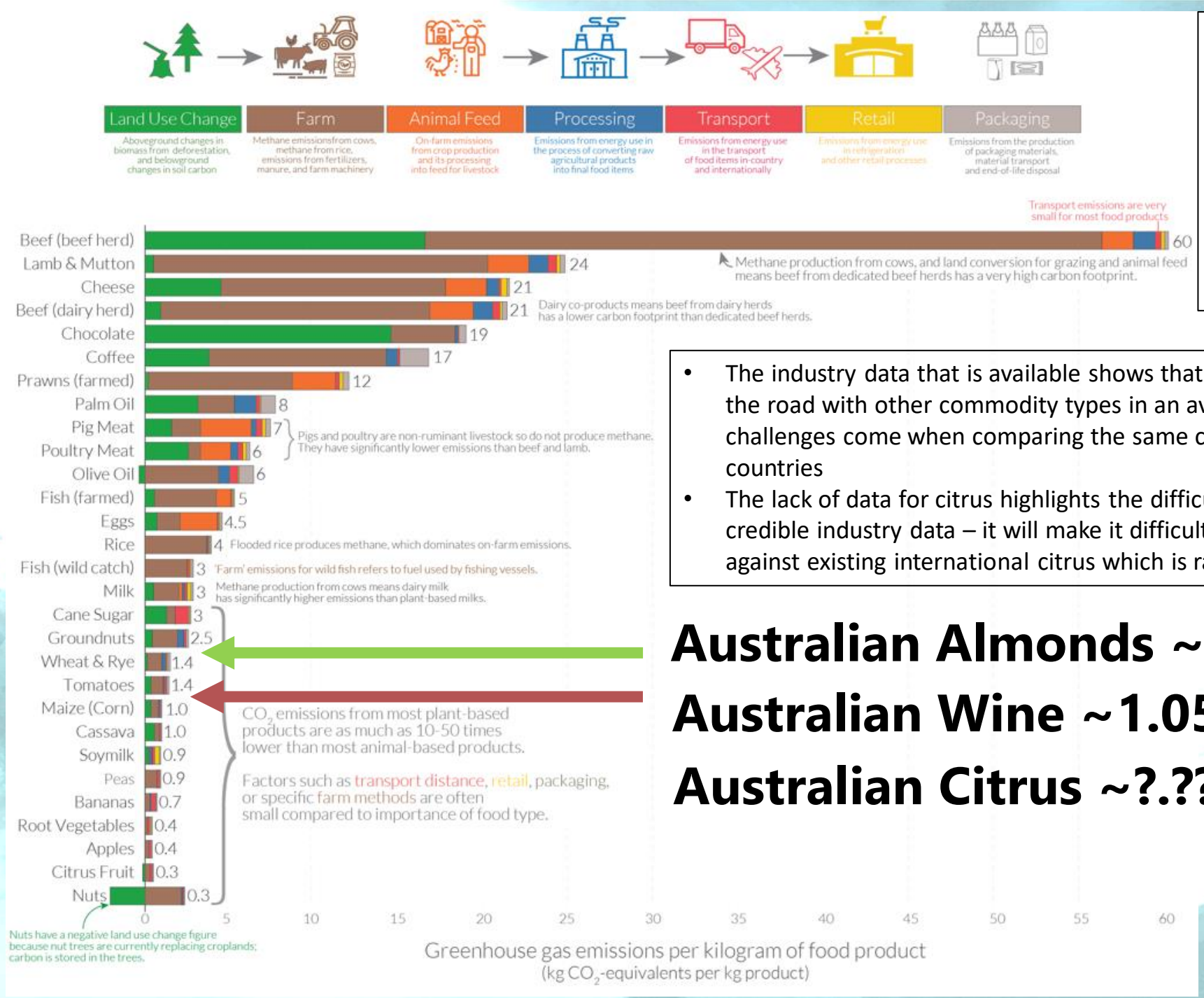
Lifecycle Assessment

The scope of the LCA is cradle to (processing) gate and it considers the farming and processing related emissions.



ACTION PLAN: PATHWAY TO CARBON NEUTRAL

A globally derived LCA results comparison against some Australian statistics – Wine is Australian average – Almonds is Riverland/Sunraysia average – Riverland Citrus does not currently derive any metrics……



- The industry data that is available shows that our products rank fairly well in the middle of the road with other commodity types in an averaged cross commodity comparison – the challenges come when comparing the same commodity type between regions and countries
- The lack of data for citrus highlights the difficulties posed by not currently having any credible industry data – it will make it difficult for observers to rate Australian citrus against existing international citrus which is rated at 0.3 kg/CO2-e/kg currently

Australian Almonds ~2.12 kg/CO2-e/kg

Australian Wine ~1.05 kg/CO2-e/kg

Australian Citrus ~?.?? kg/CO2-e/kg

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Breakout Session 3

- What production and processing activities do you see as being the biggest emitters by scale in your industry?
- What emissions in your enterprise would you target first in an ideal world scenario….?
- Have you ever considered changing product usages or equipment to reduce emissions in your production system?

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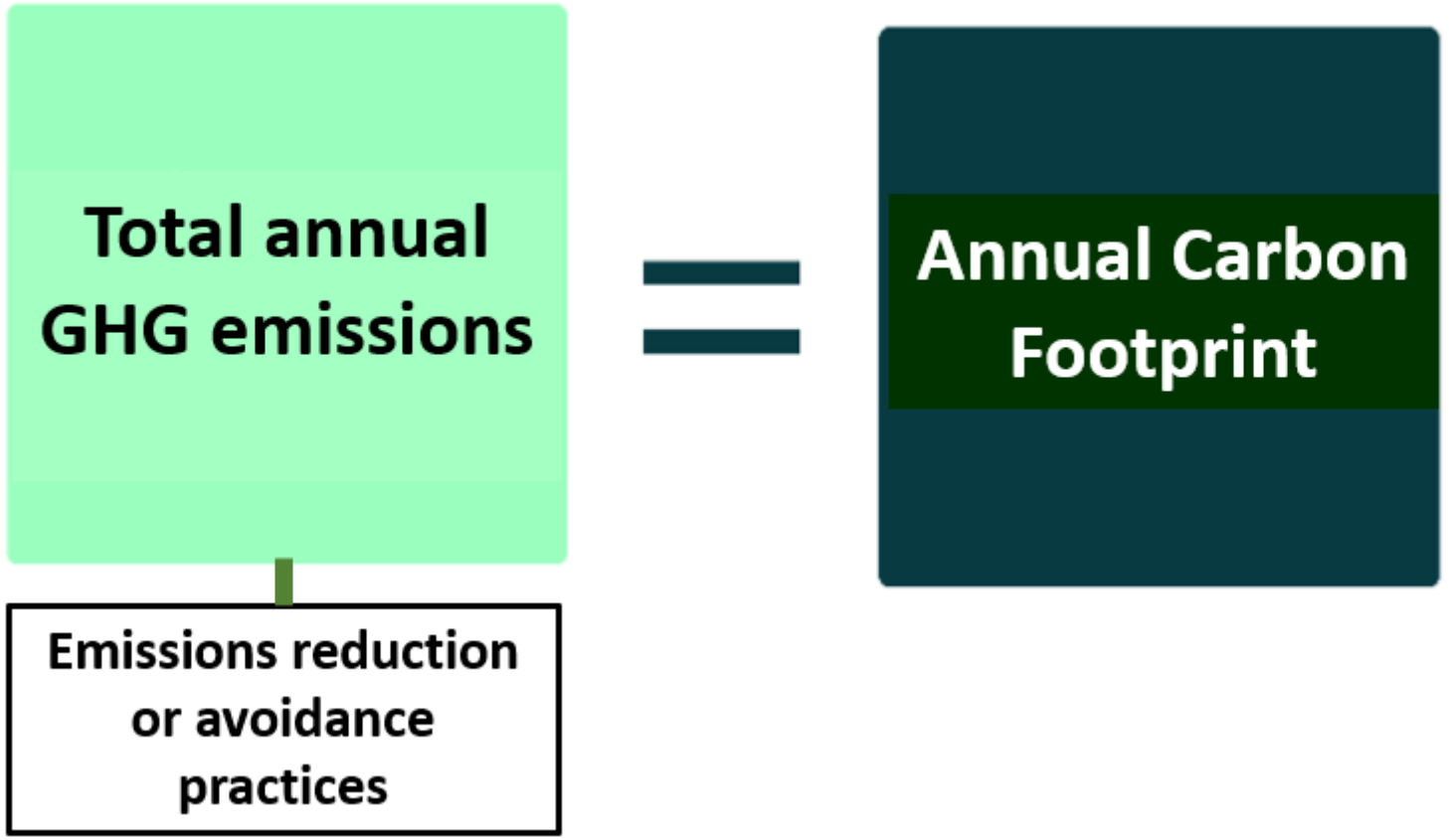
4 – The Carbon Footprint

Emissions Reduction and Carbon Sequestration



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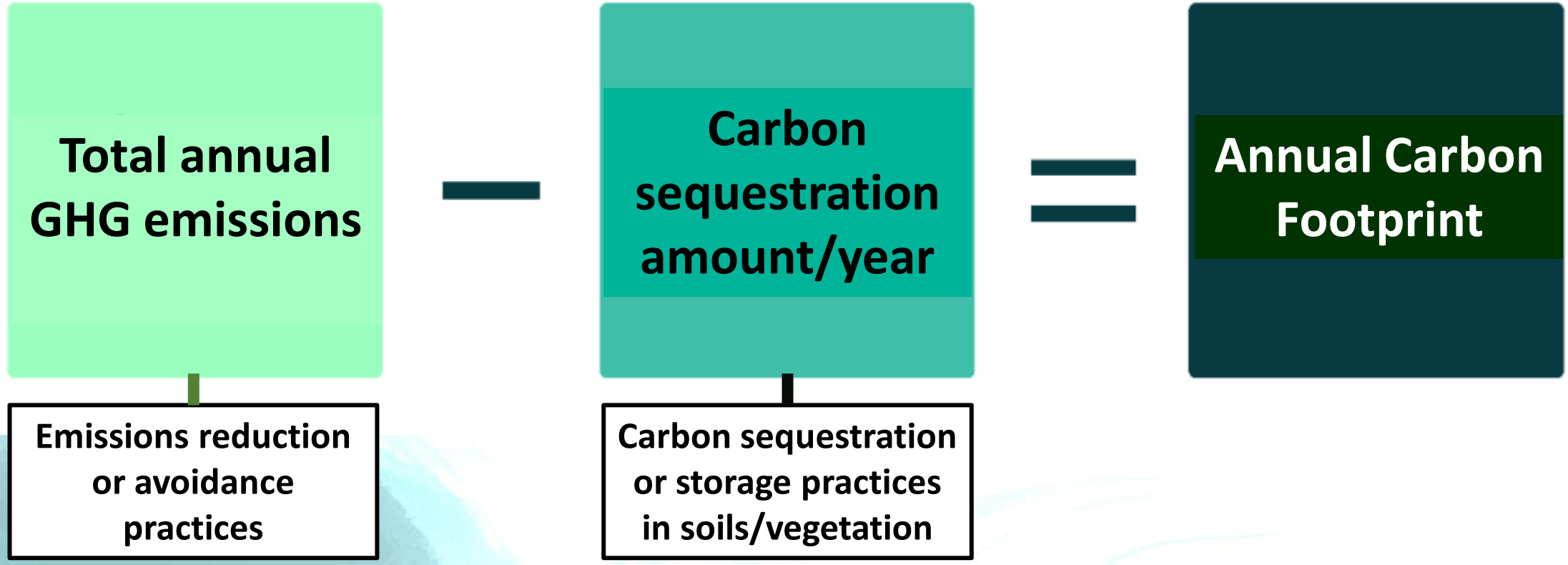
Definition of the carbon footprint…..



Emissions reduction and avoidance are pathways to reducing the footprint – Carbon sequestration and storage present options for reducing the net annual output of on farm emissions

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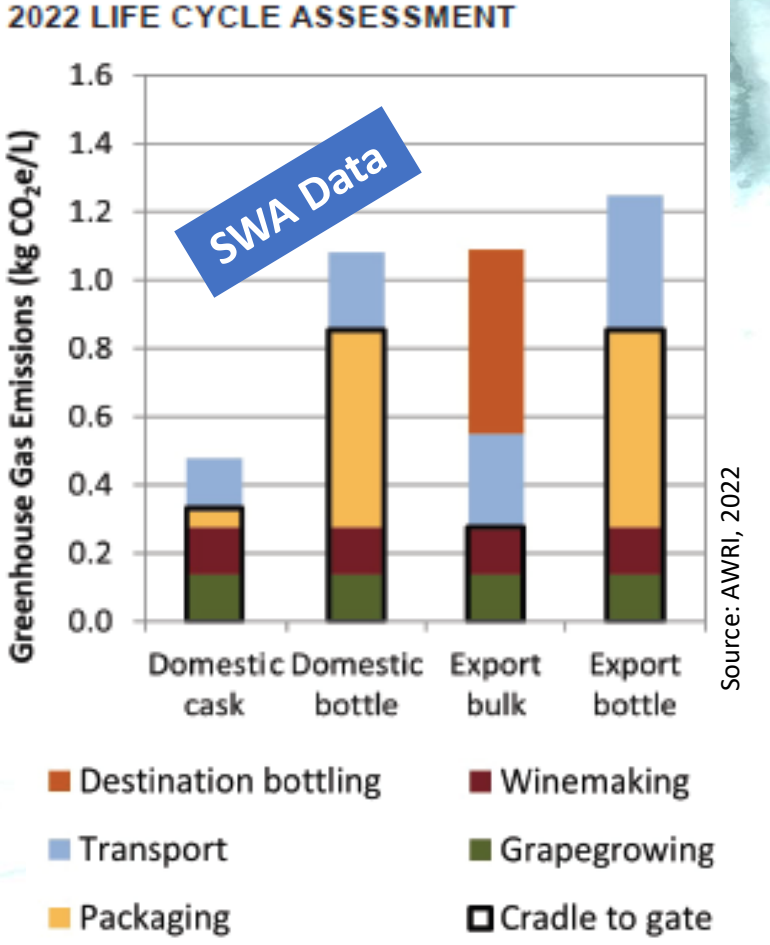
So – do I need a carbon footprint and why?

- Whilst your system of marketing through the supply chain may remain covered by existing certifications inevitably pressure for extra data will likely 'cascade' back down the supply chain and via the finance sector
- Bearing in mind that banks are not connected directly to the supply chain in the literal sense they are not going to be connected to mandates in the supply chain which may or may not continue to remain satisfied with industry arrangements

At the end of the day the footprint really just needs to provide you with a kg/CO2-e per kg/product – if you can derive that that will be significant

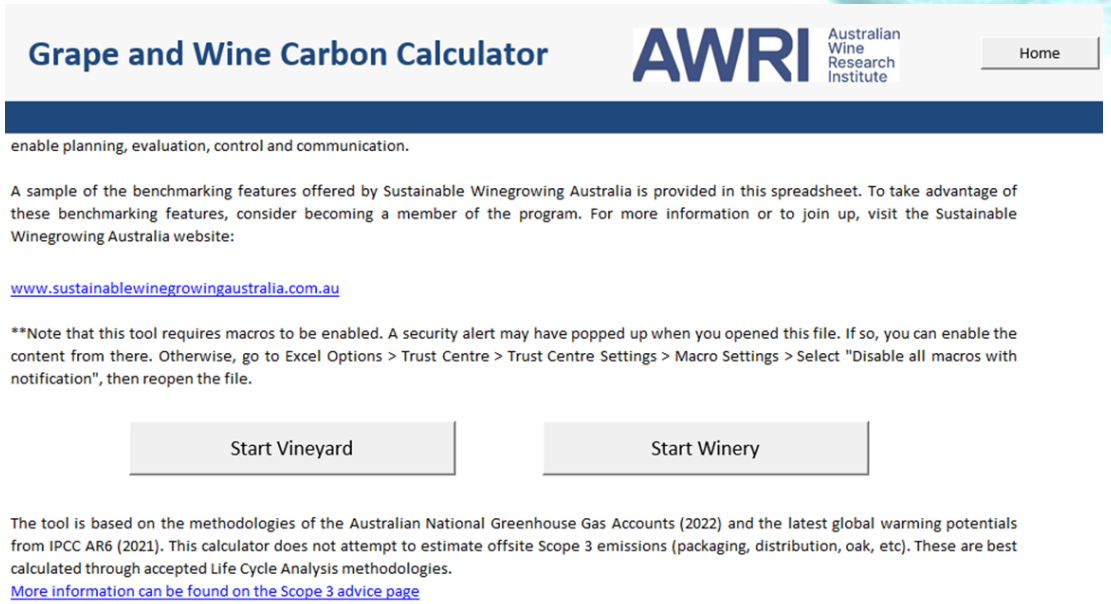
	Herbicides = t/CO_2-e Pesticides = t/CO_2-e Fungicides = t/CO_2-e Crop residues = N_2O	Scope 3 (Embed) Scope 3 (Embed) Scope 3 (Embed) Scope 1 (On Farm)		Irrig Elect = t/CO_2-e^2 Irrig Leaching = N_2O	Scope 3 (Embed) Scope 1 (On Farm)
	Fuel = t/CO_2-e Fuel = CO_2 Fuel = CH_4 Fuel = N_2O	Scope 3 (Embed) Scope 1 (On Farm) Scope 1 (On Farm) Scope 1 (On Farm)		Burn offs = CH_4 Burn offs = N_20	Scope 1 (On Farm) Scope 1 (On Farm)
	Fertiliser = t/CO_2-e Lime/Gyp = t/CO_2-e Urea = CO_2 Lime = CO_2 N Fert = N_2O	Scope 3 (Embed) Scope 3 (Embed) Scope 1 (On Farm) Scope 1 (On Farm) Scope 1 (On Farm)		Atmos deposition – N_20^1 Anaereobic breakdown – CH_4^1	Scope 1 (On Farm) Scope 1 (On Farm)



Source: AWRI, 2022

Remember – the more growers that produce a carbon footprint the easier it is for industry to define the emissions intensity of a product and to market it……

Scope 1, 2 & 3 emissions calculators v environmental accreditation platforms



- **SWA is more of an environmental management platform that develops a wide range of outputs including environmental metrics**
- **A calculator such as the AWRI Grape & Wine Calculator is an interface platform for Scope 1, 2 and 3 emissions calculation**
- **The H-GAF is really the raw spreadsheet based approach to developing Scope 1, 2 & 3 emissions assessments**

Horticulture Greenhouse Accounting Tool

Crop	Perennial Hort	Perennial Hort	Hops	Pulses	Total
Outputs	t CO_2e/farm	t CO_2e/farm	t CO_2e/farm	t CO_2e/farm	t CO2e/farm
Scope 1 Emissions (on-farm)					
CO_2 - Fuel	1.85	2.08	2.00	2.00	7.94
CO_2 - Lime			0.00	0.00	27.72
CO_2 - Urea			7.98	20.06	34.42
CH_4 - Field burning			0.00	0.00	0.00
CH_4 - Fuel			0.00	0.00	0.01
N_2O - Fertiliser			23.99	71.30	159.51
N_2O - Atmospheric Deposition	5.28	1.79	2.64	7.84	17.55
N_2O - Field Burning	0.00	0.00	0.00	0.00	0.00

H-GAF

Some common accreditations & standards and where they may or may not place you on the footprint journey

Freshcare

Freshcare is really widespread and relates to the processes of agricultural production and the auditing of food safety as well as environmental management aspects. The focus of Freshcare is fairly broad ranging from soils to water to farm inputs and on farm personnel and property access. There is however no real definition of the footprint, more of an audited assessment of agricultural and environmental best practice around food quality assurance for producers and the supply chain.

SUSTAINABLE WINEGROWING AUSTRALIA · CERTIFIED ·

Sustainable Winegrowing Australia is for both vineyards and wineries and expands the understanding from just the impacts of viticulture and winemaking to encompass environmental, social and business sustainability metrics, forming a benchmarking tool for the grower/processor. It is likely that SWA will be increasingly mandated within the supply chain over time as it is well developed. SWA will enable the development of carbon footprint metrics as well as a wider range of data making is suitable for reporting more broadly in the supply chain.

GLOBALG.A.P.

Global G.A.P. is known of at least in SA Potato production. It is a South African standard system that has similarities to Freshcare. There are two levels of accreditation, and the upper level affords participants a Global Gap Number (GGN). Global G.A.P. offers a transition pathway from ISO standards to its platform. The use of Global G.A.P. is seen as similar to Freshcare in that it is a food safety and QMS style approach. There is no apparent capacity for an emissions intensity output.

International Organization for Standardization ISO

There are a gazillion ISO standards – As an example a locally used ISO standard is ISO 22000 which identifies requirements for a food safety management system. Food & Beverage companies can be certified in this ISO standard. Having an ISO standard accreditation may (dependent on the ISO standard) provide longer term conformity to a larger parent company's requirements to report up the chain. To sell into an ISO compliant company will in turn require likely some ISO accreditation and this may morph over time around sustainability requirements

CERTIFIED HACCP FOOD SAFETY Hazard Analysis Critical Control Point

Good old HACCP continues to be a mainstay of food marketability from its food safety systems auditing basis. The HACCP system is however just that – highly specialized in just food and reliant processing systems evaluation through audit and improvement. The HACCP system is vital for many for sale and marketing of produce as a product standard – HACCP obviously fills a critical niche – so for producers it will be vary much whether additional emissions intensity data will be required from within the market place and supply chain

Climate Active

Climate Active is an independent Australian Government for businesses to participate in where there is a strong focus on business emissions reduction and particularly reaching an auditable 'net-zero'. Beef businesses that are certified are marketing heavily to Coles on this basis but in reality not all producers will have the capacity to be net –zero.

Some others: SQF and BRCGS, the list goes on…..

NRM LANDSCAPE SOUTH AUSTRALIA MURRAYLANDS AND RIVERLAND

Sectoral responses – Wine Industry

Refer - https://www.wineaustralia.com/getmedia/c0097f58-7b92-4763-88ef-57ee499c85b7/Wine-Aust-ESG-Investment-Plan.pdf

In response to these market pressures, grape and wine **sector organisations have sought to develop sustainability certification schemes** to provide a platform for communicating their ESG credentials.

Table 1.

Scheme	Location	Owner
Haue Valeur Environmentale	France	French Ministry of Agriculture
Equalitas	Italy	Federdoc and Unione Italiana Vini
Sustainability Code of Chilean Wine Industry	Chile	Consorcio I+D Vinos de Chile
California Sustainable Winegrowing	United States	Californian Sustainable Winegrowing Alliance
Sustainable Winegrowing New Zealand	New Zealand	New Zealand Winegrowers
Sustainable Winegrowing Australia	Australia	Wine Australia, AGW, AWRI

- These certification schemes have proliferated in leading grape and wine regions globally (**Table 1**).
- Existing program have a heavy weighting towards environmental sustainability, with limited focus on 'S' and 'G'.
- These schemes primarily managed and developed by grape and wine industry bodies and demonstrate a high-level of regional specificity.
- Very few of these certification schemes are used to support whole-of industry sustainability reporting or demonstrate interoperability with global sustainability standards and frameworks.

Takeaways for Sustainable Winegrowing Australia

Australia has an opportunity to establish a world-leading and all encompassing certification scheme to proactively address emerging requirements for continued and expanded market access.

The Sustainable Winegrowing Australia program provides a good platform for further investment and development. The program is recognised in global and domestic markets as a trusted program that addresses emerging ESG market requirements. There are opportunities to expand the focus of the program to position the Australian grape and wine sector as global leaders.

Wine Australia

- Sustainable Winegrowing Australia (SWA) has copped a bit of heat locally……
- The importance of SWA however has not yet been fully recognized
- Recommendation – if you aren't doing it – investigate what it would take to do….
- https://sustainablewinegrowing.com.au/

Sectoral responses – Wine Industry

- What has happened relatively recently is a merging of the participation of Freshcare with SWA into one auditable approach
- This means that the same kinds of rigour currently applied in Freshcare accreditation will be applied at audited stages in conjunction with a SWA accreditation

Realistically SWA is the endorsed platform that will enable both a grower or a winery to record critical aspects of their business's profile that are relatable in Scope Emissions terms
SWA has a broader focus to environmental management which takes the user beyond just the foundational carbon footprint derived from emissions intensity to having environmental credentials which are increasingly valuable

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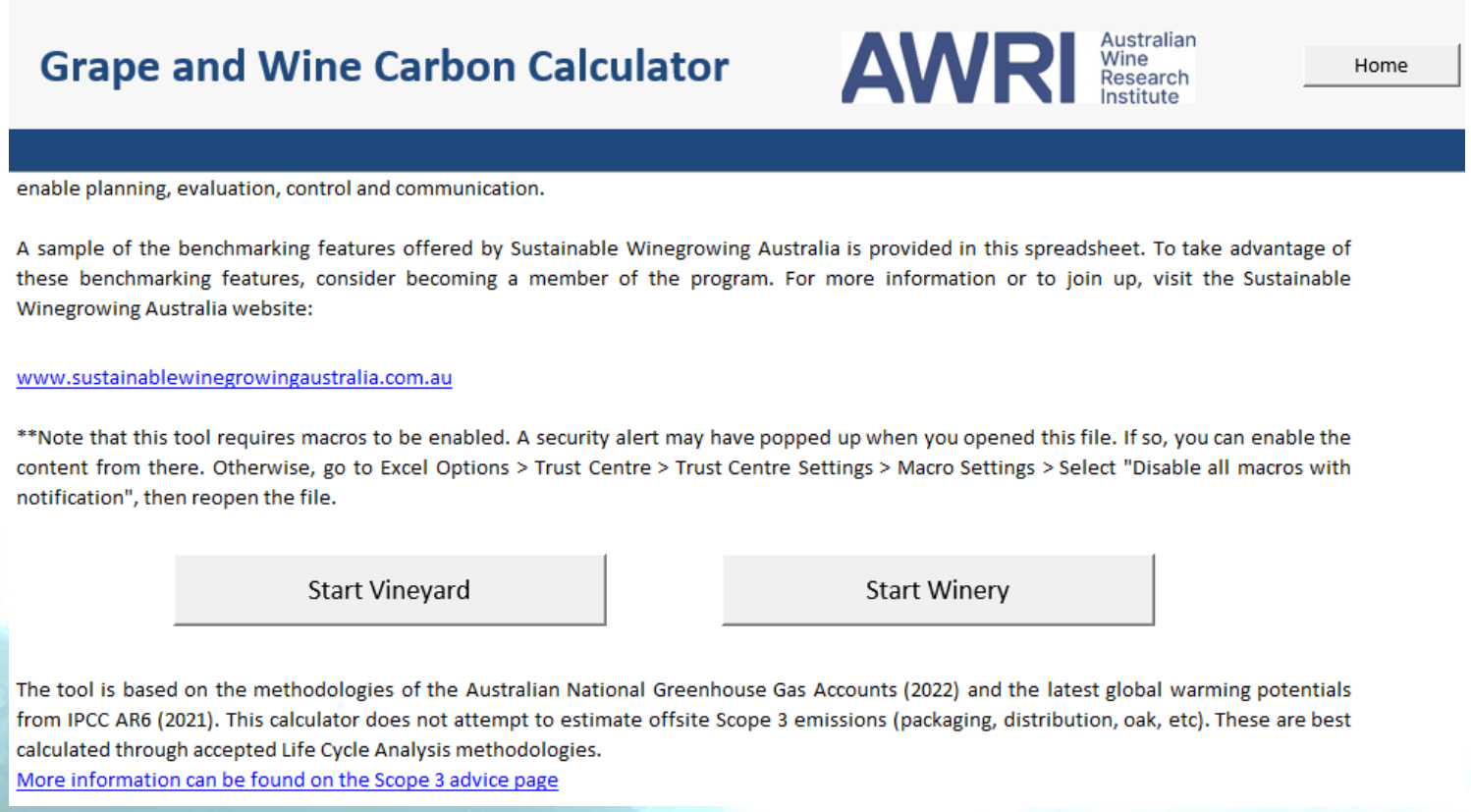
Sectoral responses – Wine Industry

For growers/wineries that just want a carbon footprint



Grape and Wine Carbon Calculator

AWRI Australian Wine Research Institute

Home

enable planning, evaluation, control and communication.

A sample of the benchmarking features offered by Sustainable Winegrowing Australia is provided in this spreadsheet. To take advantage of these benchmarking features, consider becoming a member of the program. For more information or to join up, visit the Sustainable Winegrowing Australia website:

www.sustainablewinegrowingaustralia.com.au

**Note that this tool requires macros to be enabled. A security alert may have popped up when you opened this file. If so, you can enable the content from there. Otherwise, go to Excel Options > Trust Centre > Trust Centre Settings > Macro Settings > Select "Disable all macros with notification", then reopen the file.

Start Vineyard

Start Winery

The tool is based on the methodologies of the Australian National Greenhouse Gas Accounts (2022) and the latest global warming potentials from IPCC AR6 (2021). This calculator does not attempt to estimate offsite Scope 3 emissions (packaging, distribution, oak, etc). These are best calculated through accepted Life Cycle Analysis methodologies.

More information can be found on the Scope 3 advice page

The Grape and Wine Carbon Calculator is suitable for vineyard or winery use. It is predominantly focused on Scope 1 and 2 emissions outputs and has internal calculators to assist with some chemical budgets – note there is advice on estimating scope 3 emissions but it would be advisable to seek advice from the supply chain to clarify any future real scenarios

- If you are a vineyard or winery that just wants a readily accessible platform for critical daily and annual data inputs to produce emission's intensity outputs this calculator is ideal
- It is a free product available at: https://www.awri.com.au/industry_support/sustainable-winegrowing-australia/carbon-calculator/

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almond hort360

- Almond industry-specific adaption of Growcom's Hort360 program
- Online sustainability self-assessment portal for almond growers
- Made up of a series of modules containing questions that help growers to describe their current practice across a range of topics
- The questions are principles-based and focus on what growers do on the farm rather than collecting hard data on water use, emissions, etc.
- Voluntary program designed to help growers

Available now:

- Pollination
- Irrigation
- Workplace health and safety
- Pesticide
- Managing waste
- Energy and emissions

To be developed:

- Nutrient
- Soil
- Integrated Pest and Disease Management
- Biosecurity
- Biodiversity
- Climate
- Better Business
- Off-site Impacts

Sectoral responses – Citrus Industry

Refer: https://citrusaustralia.com.au/about/advocacy/climate/

'The citrus industry exports over 260,000 tonnes per annum. The Australian citrus industry is the highest cost producer in the world, our product must achieve premium prices in export markets to make the industry sustainable. Adding costs to the citrus industry, a low emission industry, when our growers compete with other countries daily will mean our citrus will not be competitive within international markets – policy must recognise these impacts and provide primary producers opportunities to offset costs or efficiently participate in the carbon economy.'

Extract from Citrus Australia's climate policy position and report

- The position of the citrus industry is currently stable as far as terms of trade and Freshcare is meeting the overall requirement according to industry spokespersons
- There are randomized requests for environmental information beginning to trickle through to packers and processors and these are representing emerging changes in the supply chain
- It is likely that the umbrella organisations in this equation – the packing sheds and processors particularly will need to field these kinds of enquiries and put effort into resolving them
- For the individual grower however the pressure may come left field from the financial sector that is looking for on farm environmental data to support a loan application or general banking terms
- For this reason it is recommended that Citrus growers use the Horticulture Green House Accounting Tool at: https://piccc.org.au/resources/Tools.html

The H-GAF – Horticulture Green House Gas Accounting Framework v1.47

An option for non wine grape/almond hort growers needing to report

Horticulture Greenhouse Accounting Tool

Crop	Perennial Hort	Perennial Hort	Hops	Pulses	Total
Outputs	**t CO_2e/farm**	**t CO_2e/farm**	**t CO_2e/farm**	**t CO_2e/farm**	**t CO2e/farm**
Scope 1 Emissions (on-farm)					
CO_2 - Fuel	1.85	2.08	2.00	2.00	7.94
CO_2 - Lime	15.84	11.88	0.00	0.00	27.72
CO_2 - Urea	0.00	6.38	7.98	20.06	34.42
CH_4 - Field burning	0.00	0.00	0.00	0.00	0.00
CH_4 - Fuel	0.00	0.00	0.00	0.00	0.01
N_2O - Fertiliser	47.97	16.26	23.99	71.30	159.51
N_2O - Atmospheric Deposition	5.28	1.79	2.64	7.84	17.55
N_2O - Field Burning	0.00	0.00	0.00	0.00	0.00
N_2O - Crop Residues	51.28	8.55	16.59	139.85	216.26
N_2O - Leaching and Runoff	46.70	11.19	18.60	102.81	179.30
N_2O - Fuel	0.01	0.01	0.01	0.01	0.03
HFCs - Refrigerant Leakage	3.39	148.80	2.62	0.00	154.81
Scope 1 Total	**172**	**207**	**74**	**344**	**798**
Scope 2 Emissions (off-farm)					
Electricity	0.17	0.21	0.47	0.09	0.95
Scope 2 Total	0.17	0.21	0.47	0.09	0.95
Scope 3 Emissions (pre-farm)					
Fertiliser	29.08	15.55	18.09	59.31	122.03
Herbicides/pesticides	0.27	0.24	0.12	0.30	0.93
Electricity	0.02	0.02	0.04	0.01	0.08
Fuel	0.48	0.53	0.51	0.51	2.03
Lime	1.4292	1.07	0.00	0.00	2.50
Scope 3 Total	**31**	**17**	**19**	**60**	**128**
Carbon Sequestration					
Carbon sequestration in trees	-103.34	-68.89	0.00	0.00	-172.23
Net Farm Emissions	**100**	**156**	**94**	**404**	**754**
Emissions intensity	**0.03**	**0.31**	**0.09**	**0.08**	**t CO2-e/t crop**

H-GAF Recommendations

- The H-GAF is a free to use spreadsheet based approach to Scope 1, 2 & 3 emissions calculation in horticulture
- However it is recommended to undertake a one-day basic training exercise with MRLB staff, ideal but not essential
- The outputs would be Scope 1, 2 and 3 emissions and this can extend to refrigerants
- There is also the capacity for **on farm forestry** but the categories are very low in complexity and really not likely to produce a result of any great accuracy for offsetting purposes related to forestry

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Key data needed to populate H-GAF

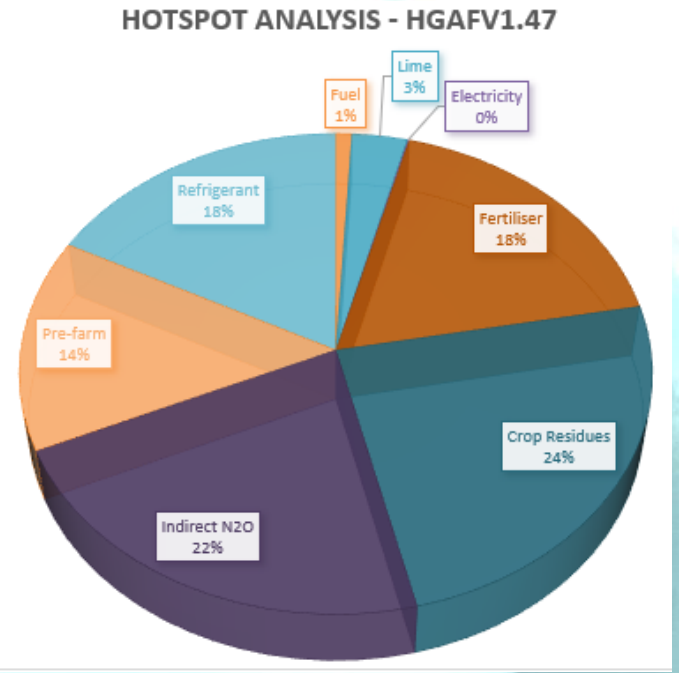
Crops		**Fuel & Electricity**	
Average yield	t/ha	Ann Diesel	Total litres
Area	Ha	Ann petrol	Total litres
Fertilisers		Ann LPG	Total litres
Non Urea N	kg/ha	Ann electricity	Total kW/h
Phosphorous	kg/ha	Renewable elect	% of consumption
Potassium	kg/ha	% of meter elec for crop	%
Sulfur	kg/ha	**Refrigerants**	
Urea	kg/ha	Type of refrigerant	Type
Lime	t/ha	Ann recharge	Total kg
Lime/Dolomite frac	%	**Herbicides**	
Crop residue burn	%	Ann herb use/type	kg a.i./ha x total ha
Fungicides[1]		**Pesticides**	
Ann fung use/type	kg a.i./ha x total ha	Ann pesti use/type	kg a.i./ha x total ha

[1]Clarification is being sought on exact fungicide requirements

Reporting outputs – what's in it for me?

The main priority is to achieve an emissions intensity estimation for your enterprise – a summation of the total tons of carbon and tons of carbon dioxide equivalent – CO2-e split preferably between scope 1, 2 and 3 emissions. This information will be usable for a bank or the supply chain……
Remember: you are doing this for your business and to make it easier for your business in the supply chain/market place……..

Emissions Intensity	**Total GHG emissions**	**Total tons CO2-e**



Newer production metrics for the marketplace will be:

- **t/CO2-e/t of product**
- **Kg/CO2-e/kg of product**

This will be followed by a definition of Scope 1, 2 and 3 emissions

SWA style outputs go beyond just carbon into other categories that will provide 'envirionmental credentials' – these enable deeper comparisons……

Your supply chain, your market-place(s)

- Whilst there are drivers for change it is likely that change will filter down to the enterprise level from the higher corporate level or from mandates extending out of the overall supply chain back down to the processors and the grower business
- **Importantly** - if you currently have market access and you are meeting industry requirements through your existing certifications – then it is probably more of a case now of preparing for change, accessing the tools that are available and at least asking the question of how confident you would be to undertake your own **Scope 1 and 2 emissions assessment**
- **Scope 3** emissions assessments should fall out of a standard platform and not require a direct information capture from the business owner
- No matter which way you peel this topic there seems to be a consistent likely enduring requirement that growers will be well placed to know their emissions intensity in terms of **kg/CO2-e/kg product**
- Eyeballing new marketplaces will likely validate the above point…..

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What is in it for me…?

- **Supply chain stabilisation** – umbrella organisations that need to report a 'Life Cycle Assessment' of the entire carbon footprint will likely need to drill down to the on-farm level to understand the fuller emission intensity
- **Market recognition** – the rating of t/CO2-e for your product (across your scope emissions) will become a significant representation of your business to marketplaces, larger organisations and the financial sector
- **Business management** – Using a GAF or equivalent industry endorsed accounting tool will enable an enterprise to both monitor business inputs whilst deriving a carbon footprint in the process – this will trigger efficiencies
- **Finance sector recognition** – Banks like the supply chain will need to justify the environmental impacts stemming from their lending and investment portfolios – your carbon footprint will go a long way with a bank in terms of lending and investment potential in the future….

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Breakout session 4

- Do you currently use any form of industry platform that can capture your emissions data with your other annual input data?
- How do you feel about developing a carbon footprint? Do you believe that you are too busy to develop a carbon footprint?
- Do you think that having a carbon footprint and the environmental credential will be valuable to your business or your enterprise in the future?

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5 – The Clean Energy Regulator, carbon credits & sequestration

The Clean Energy Regulator's Role

Australian Government
Clean Energy Regulator

- The Clean Energy Regulator (CER) exists through an Act of Parliament. Its purpose as a Government office is as an economic regulator to 'accelerate carbon abatement for Australia'
- This is done practically through administrating a range of 'schemes' that measure, manage, reduce or offset carbon based emissions in Australia
- To enable this to happen the Department for Climate Change, Energy, the Environment and Water (DCEEW) has developed Sectoral transformation strategies – the strategy for Agriculture is still in development
- **The Ag sectoral plan however will continue to rely on the uptake by primary producers of one of various 'methods' of emission reduction or carbon sequestration as a business through a CER endorsed method**

https://cer.gov.au/

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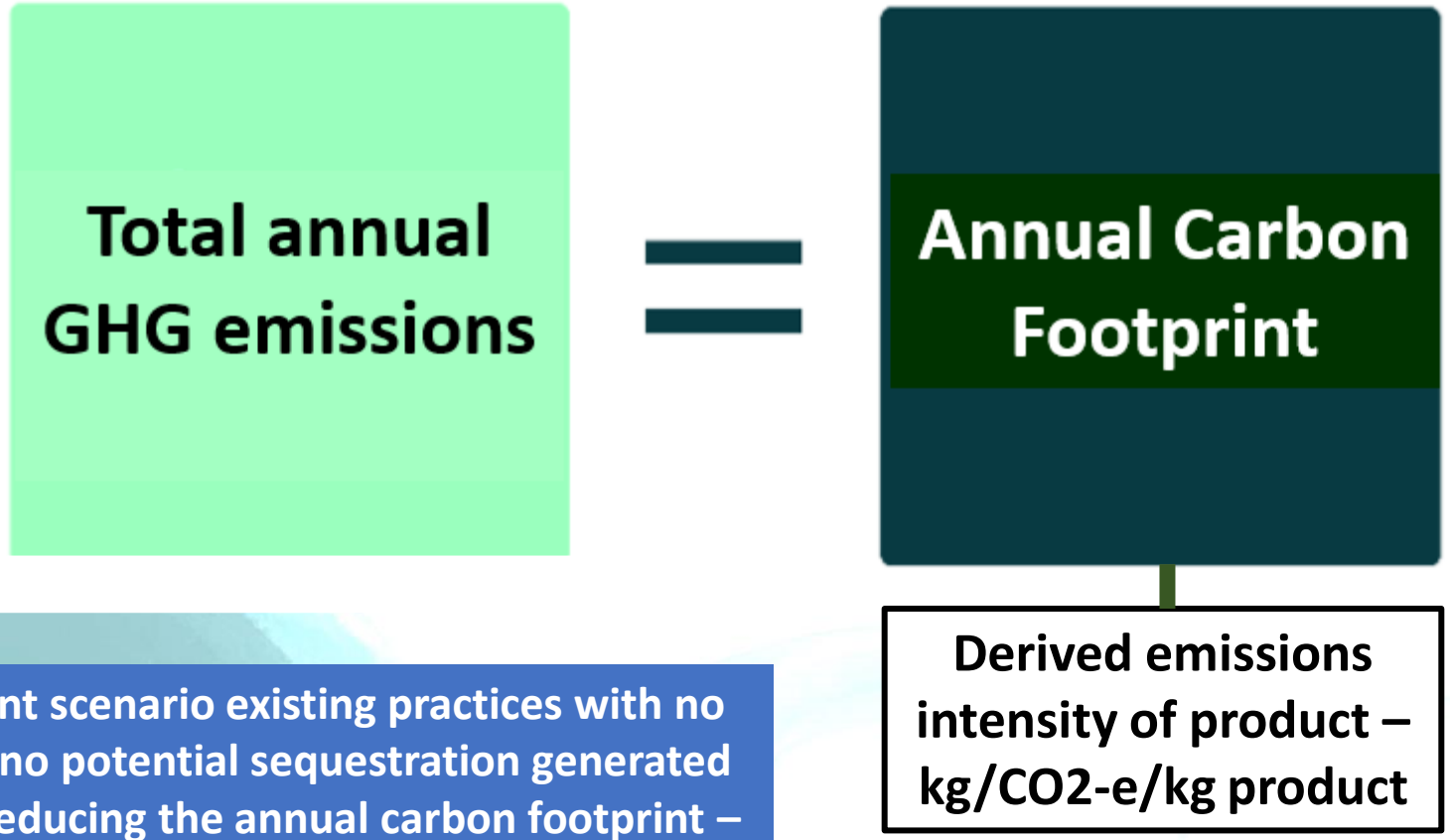
Emissions Reduction and Carbon Sequestration

Current and default scenario



In the current scenario existing practices with no change and no potential sequestration generated changes to reducing the annual carbon footprint – it should be noted that this emissions intensity could be required by the supply chain

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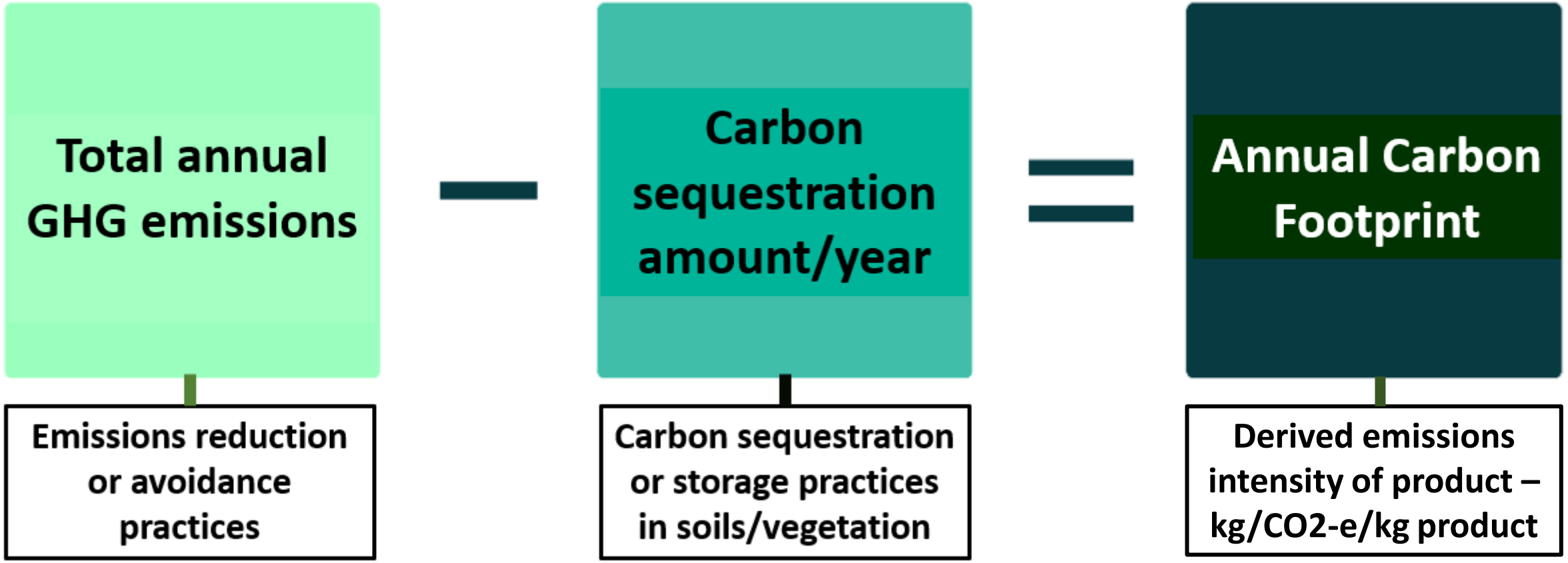
Emissions Reduction and Carbon Sequestration

Potential scenario with viable emissions reduction & sequestration options



Emissions, sequestration and the annual carbon footprint are all stated in t/CO2-e
Remember 1 ton CO2-e = 1 Australian Carbon Credit Unit (ACCU)

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Emissions Reduction & Carbon Sequestration

Emissions Reduction

Accounts for a significant amount of activities that will be undertaken including understanding, accounting for and adjusting practices to manage emissions – accounting & practices

Carbon Sequestration

Activities that capture atmospheric carbon within the agricultural landscape system cycles in either vegetation or soils – carbon sequestered can become recognized as a valid C gain that could be 'inset'

Emissions reduction activities – can be done as un-credited and as credited (ACCU & method) approach

Carbon sequestration – can really only be done as a credited (ACCU & method) approach

IMPORTANT: You only need to invest in ACCU's if you want to inset or trade with 'ACCU's'

Understanding the difference between un-credited and credited activities

Path 1 (Un-credited) – Self managed emissions reductions with annual carbon footprint

- Un-credited emissions reduction activities will be easier to achieve tangibly than sequestration activities
- Whilst it is possible to generate sequestration activities outside of CER methods – it would depend on what alternatives may be deemed acceptable[1] – and to stipulate an accepted means of auditing to achieve a reduction in emissions intensity
- The cost of your improvements will be borne by the business and will only be discernable if there is reliable and auditable evidence that can back up your annual carbon footprint estimations – the evidence base for this could range from invoices through to auditing dependent on complexity
- You will likely avoid some of the costs of ACCU method/scheme setup, baselining, repeat auditing, permanence and could save considerable time related to scheme establishment
- You will not be able to generate a potential ACCU income stream from sold credits
- You will however by using industry accredited reporting platforms likey be able to capture some of the change journey and show reductions in the annual footprint through annual report returns that capture change in your business through the accredited portal approach

Assess new investments in equipment and activities to include an evaluation of how significantly they can affect your carbon footprint around general assessments of ROI

[1]GAF's may offer carbon offset calcs for woody biomass as inbuilt features…. etc

Understanding the difference between un-credited and credited activities

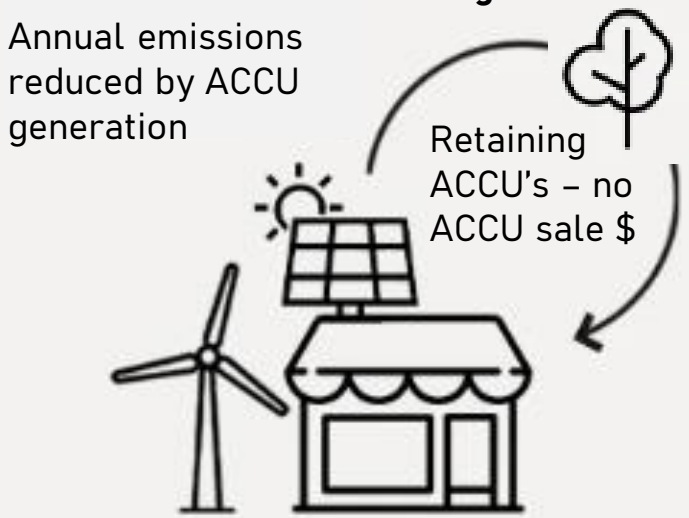
- **Path 2 (Credited) – Developing methods based approach and ACCU's for emissions reduction or carbon sequestration**
- If you undertake a methods based project you will need to align your activities with an eligible CER method – so conceptually your ideas will need to align
- Each method has a scientific backbone to ensure continuity – this backbone is the basis of the way the project is assessed and the way in which any credits may be issued – the final calculations may vary from your original estimations of overall benefit…..
- You will need to establish the scale and nature of your activity into an application – this will then be assessed and ultimately you will develop an agreement with the Australian Government
- You will need to put business time into proposal development and you will need to invest $ in baselining and repeat auditing for the duration of the project
- There will be permanence considerations for some method's based projects such as soil carbon and vegetation that range from 25-100 years - there will be costs to maintain this
- You will be in a position to either retain generated credits in your own business ('insetting') or market your credits for income generation to enable another enterprise to 'offset' their own emissions

Absolutely essential to develop a business case on the ROI of undertaking scheme activities by method to assess the 'real' costs of undertaking activities against any potential ACCU returns – insetting by method would need to be cost analyzed against un-credited insetting to determine the net $ difference benefit of reducing the footprint between the approaches utilized

Carbon sequestration and ACCU trading – key terms

Insetting

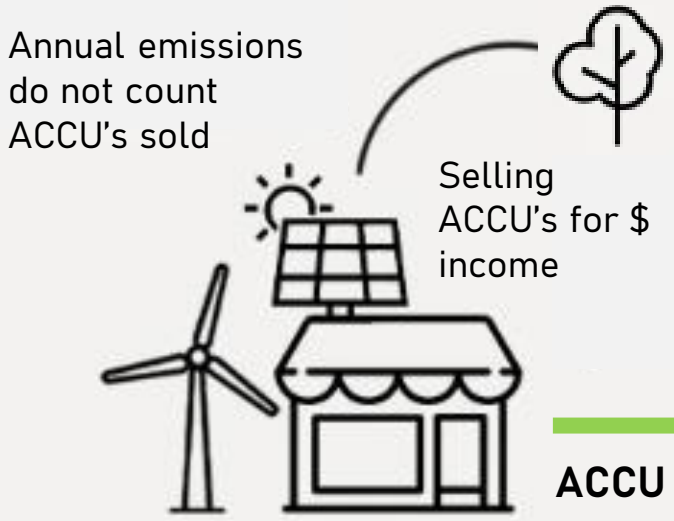
Business 1 – ACCU Insetting scenario



ACCU's that are generated by a methods based project are retained by the business and reduce the annual carbon footprint – costs are borne by the business

Carbon Market

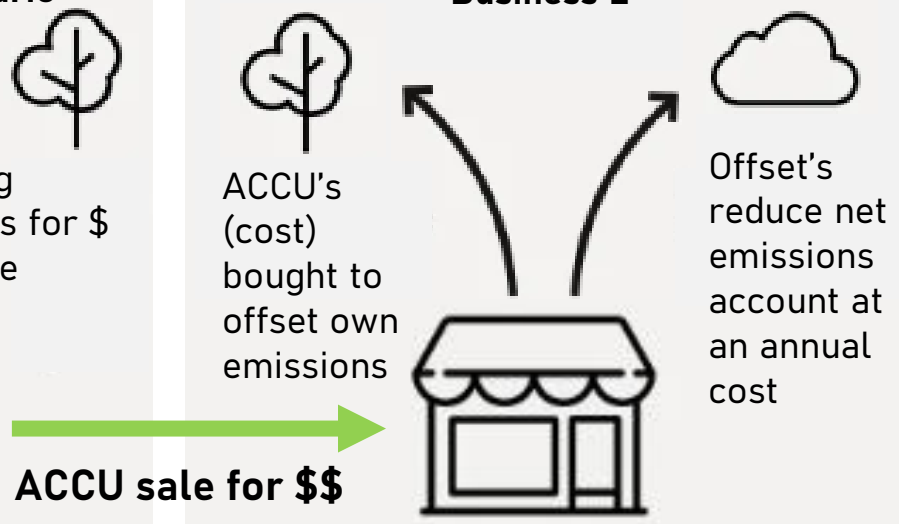
Business 1 – ACCU sale scenario



ACCU's that are generated by a methods based project are sold by the business and $$ income generated (1 off) for the credits – the costs are borne by the business and CF remains static

Offsetting

Business 2



ACCU's that are purchased by business 2 help to reduce their annual emissions (1 off) for that year period - $$ spent = reduced emissions profile but no actual change to practices for business 2

https://cer.gov.au/ CF= Carbon Footprint

Recommendations & essential points

If you are interested in developing a methods based project and the issuing of ACCU's for either income generation or insetting it is imperative that you:

- **A:** Have clear science or case study data or own site data to validate your approach and its cost effectiveness – budget for baseline and audit costs
- **B:** That you use the CER method approaches and standards to develop a business case assessments – not back of envelope calculation approaches
- **C:** Are aware that an **ACCU is a financial instrument**
- **D:** Seek independent advice from CER and not necessarily from entities that may have or develop a financial interest in your project in the first instance
- **E:** You are willing to commit to a legal agreement (contract) with the Australian Government to maintain the scheme's integrity (by method) for the agreed permanence period

CER methods – Agriculture - selected

The key methods most suited to the region:

- **Soil carbon methods**
- Animal effluent management
- Beef Cattle Herd Management

- Applying synthetic or non-synthetic fertilizers to address a material deficiency – includes composts

- Applying new or additional irrigation to your cropped areas where the irrigation is linked to a system efficiency gain, i.e. the saving

Recommendation for trialling: U/V or tree cover crops combined with composts/waste stream products from processing + pyrolysis biochar… etc

https://cer.gov.au/document/understanding-your-soil-carbon-project-simple-method-guide

CER methods – Vegetation - selected

The key methods most suited to the region:

- **Re-forestation and afforestation method**

There are some big caveats with this method in that irrigation is not highlighted as being neither ineligible or eligible as an activity around the development of what essentially would constitute re-forestation in the Riverland hort districts

The likely reason for this is the carbon footprint of irrigation relative to the carbon biomass sequestered over time. Handwatering or additives[1] likely required. Harvesting is also prohibited.

Recommendation for trialling: comparison of irrigated v un-irrigated preferential species and determination of residual footprint/growth rates over time

https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-scheme-methods/reforestation-and-afforestation-method

[1]E.g. polyacylamides

CER methods – Energy Efficiency

The key methods most suited to the region:

1. **High efficiency commercial appliances**
2. **Industrial and commercial emissions reduction**
3. **Industrial equipment upgrade**
4. **Refrigeration and ventilation fans upgrade**

There are a range of method options suitable to the processing in the region

1 = New A/C, refrigeration or chillers for industrial settings
2 = Reduce emissions intensity of production processes in industry
3 = Suited to business upgrades of comp air/boilers/heaters or reticulation pumps
4 = Upgrades to refrigeration fans and associated ventilation fans

https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-scheme-methods#energy-efficiency-methods

CER methods – Landfill & Waste

The key methods most suited to the region:

- **Source separated organic waste method**
- **Domestic, commercial and industrial wastewater method – Exp March 2025**

These methods cover both solid organic waste generation and liquid waste streams. The source separated organic waste method aims to support efforts to remove organic waste streams from prospective landfills/reduce methane emissions – this would suit processors that may have fractional organic waste going to landfill
The wastewater method is largely about capturing methane expressions from wastewaters through moving away from lagoons to digesters then biogas generation
Do not apply for this method now - wait

https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-scheme-methods#energy-efficiency-methods

CER methods – Transport

The key methods most suited to the region:

Land & sea transport method – Exp Mar 25

It is hoped that this method is replaced by an equivalent progressed method or parallel program. Key outcomes sought are:

- Switching fuel type
- Adopting more energy efficient transport practices

Key criteria – vehicle must use taxable fuel

The method is/was suitable for proponents considering:

- Replacing vehicles
- Modifying vehicles
- Changing the source or the mix of energy sources used by the vehicle
- Improved operational practices used by the vehicle(s)

Do not apply for this method now - wait

https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-scheme-methods#energy-efficiency-methods

CER methods – Checklist and due diligence…..

To apply for a method follow the relevant guidelines detailed for each method. Each method has its on documentation, scientific background and references. It is a very lengthy process to review these, but it would be essential if you are considering entering into a contract to generate ACCU's…….

Remember: the methods all have specific and set guidelines in relation to achieving outcomes……..

About ACCU methods

A methodology determination (method) is a set of requirements and rules for running a project under the Australian Carbon Credit Unit (ACCU) Scheme. Projects under methods reduce emissions or store carbon in soils and vegetation.

Each method specifies:

- the activities you can conduct
- how you need to measure carbon abatement
- your monitoring, record keeping and reporting requirements.

You must run your project in accordance with the method you've chosen.

Workshop wrap up and questions

- It is hoped that this workshop has given you some degree of improved understanding of the carbon economy, drivers for change and opportunities/risks for agriculture
- The reality is that it is hard to encapsulate so much complexity in a presentation this size and for this reason additional workshops that may break out into specific topic areas are proposed
- First cab off the rank will be using GHG accounting frameworks – for those of you that do not currently use any frameworks the MRLB is evaluating running dedicated workshops to use the H-GAF (i.e. where you are not already using an industry platform)
- Other topics can be covered on demand, please let us know – remember at this point you just need to be able to derive your emissions intensity in kg/CO2-e/kg of product to meet likely supply chain requirements
- **Thankyou for attending and please ensure that you complete your close of workshop survey!**
- **Contact - 0439 591 826 or jeremy.nelson@sa.gov.au**

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Carbon Farming Outreach Program - Post survey

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