Harvesting Sustainability

Empowering Australian farmers with ESG performance tracking and benchmarking

National Farmers Federation

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Framing the problem: *How do we explore ESG issues given the vast datasets?*

1

What is the volume of crop commodities and level of water usage for each state?

2

What are the key ESG issues that arise from the relationship between the above two variables?

3

How much waste is being produced in agriculture, relative to other industries, and what is the cost of managing that waste?

Challenge 1
Complex Data Structures

Challenge 2
Comprehending Limited Metadata

Effects of Climate Change

From Questions 1 and 2, we can gather how climate change events – including water scarcity and agricultural activities are interdependent and how agricultural productivity changes as a result.

This contributes to ESG performance tracking because farmers can understand how production patterns change and thereafter remain resilient and adapt decisions to determine which crops are best planted according to environmental conditions.

Cost of Waste Management

From Question 3, farmers can gain insights into the volume of waste they produce and how their funds are currently allocated towards waste management compared to other industries (benchmarking).

This is important for ESG reputation, resource allocation, financial planning and complying to regulations.

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Our Approach: *Harmonising data and design*

CRISP-DM

The Cross-Industry Standard Process for Data Mining (CRISP-DM) provides a framework that is used to structure, plan, and control the process of developing an analytics solution.
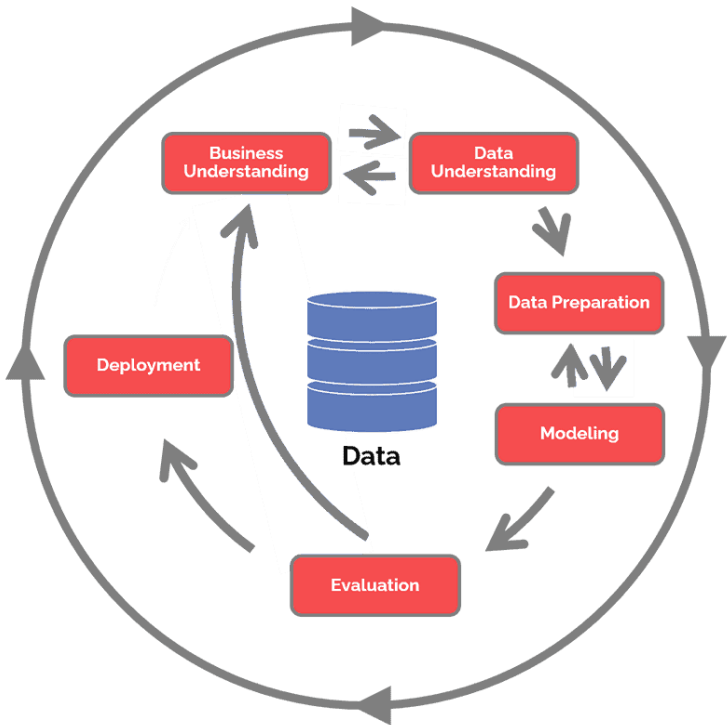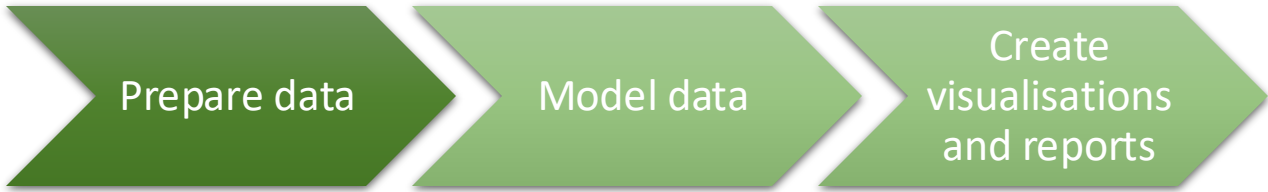
Prepare data → **Model data** → **Create visualisations and reports**

Figure X – Phases of the CRISP-DM reference model

The "Feeling Behind Our Eyes"

By comprehending the relationship between design thinking and storytelling, we were able to implement fundamental principles for creating impactful data visualisations that prioritise **affordances, accessibility and aesthetics**.
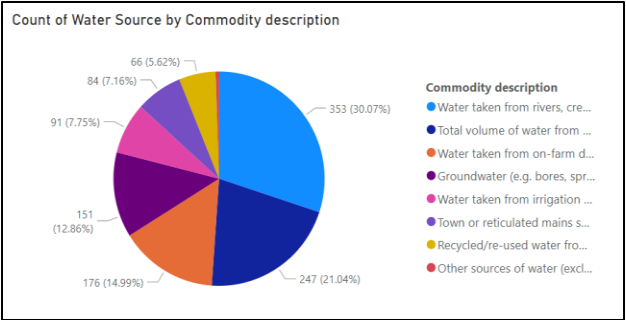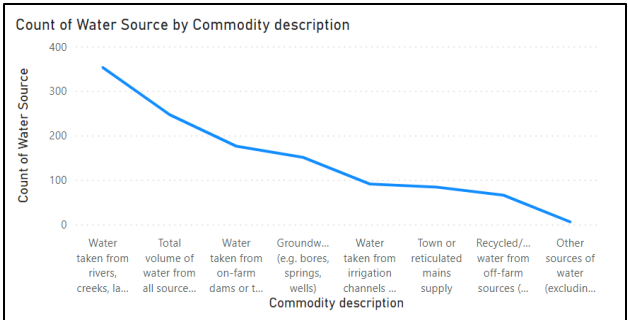

Figure X – Ineffective data visualisation

Figure X – Effective data visualisation

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Framing the Problem: *Water Scarcity & the Agricultural Industry*

Australia is on the brink of a significant water crisis…

WATER SCARCITY
- The vast majority of Australia is a hot and dry desert
- As a result, the country's average annual rainfall (470mm) is well below the global average (990mm)
- Farming, and the agricultural industry, is currently the biggest contributor to water scarcity in Australia – attributing to around 70% of the water footprint (National Geographic, 2023)

IMPACT ON CROPS & FARMING
- Growing crops and maintaining pastures are the greatest uses of water in the global agriculture industry (OECD, 2019)
- Determining which areas of crop commodities consume the most water in Australia is essential to ideating a solution to mitigate the impact of water scarcity

OUR AIM
1. Examine which states are consuming the greatest amount of water
2. Identify which crop commodities were most grown in these states to determine the extent of consumption
3. Explore efficiency of current water sources across the states

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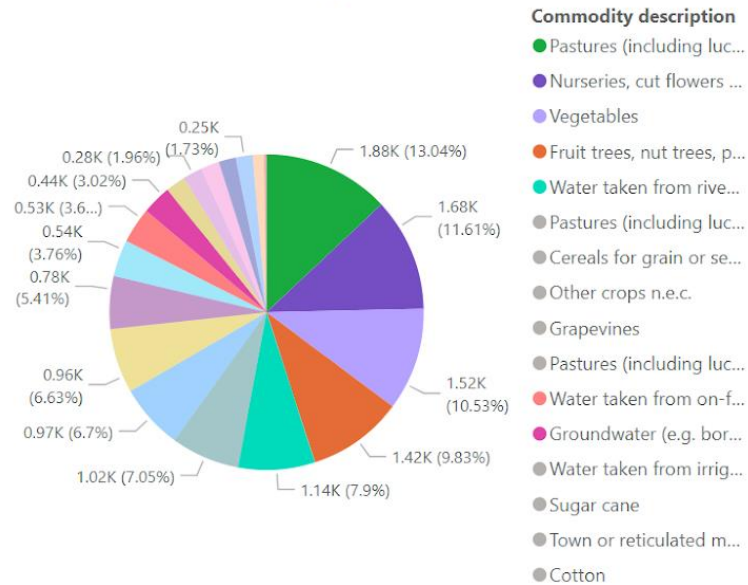# High water usage detected across NSW, QLD and VIC: *Visualisations*

Volume of Commodities Produced by Category, 2020-21

In the agricultural landscape of Australia in 2019-20, **Nurseries, Pastures, Fruit Trees and Vegetables** emerged as the dominant crop commodities that use the most water across all states. These four categories collectively accounted for a significant portion of Australia's water usage. While Pastures, Fruit Trees and Vegetables are necessary crops, we have flagged **Nurseries, cut flowers and cultivated turf**, which make up 11.61%.

Water Consumption by Top 3 States and Top 4 Crops 2020-21

NSW, QLD, and VIC emerged as the top three states consuming the highest levels of water. With a considerable share of water going into these top 5 commodities, it is important to note that water consumption should be managed sustainably.

Count of Estimate by Commodity description

Count of Estimate by Region label

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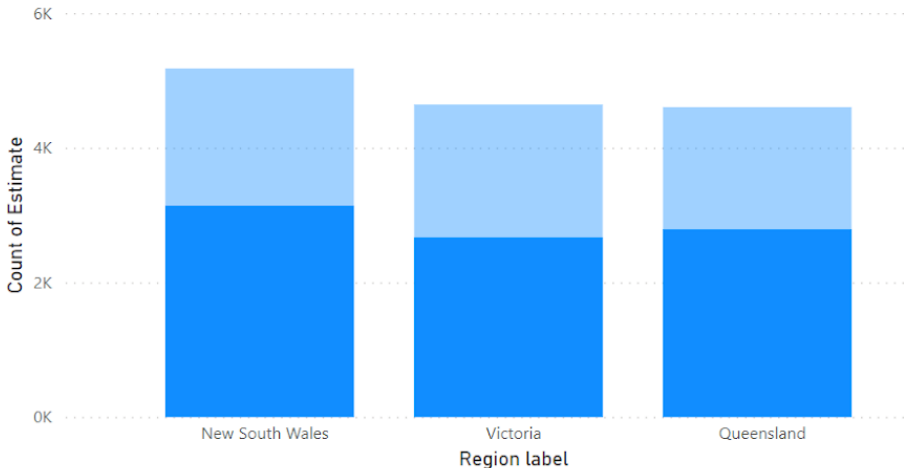
Similar trends in 2019-20: *Visualisations*

With a consistent trend beginning to form as we interpolate using historical data, it seems that the same top four crop commodities use the most amount of water in Australia. With Nurseries, instead, dominating over Fruits and nuts in 2019-20, this reinforces the notion.

In 2019-20, QLD dominated with water usage likely due to the state recording its driest year on record (Bureau of Meteorology, 2020), thus strengthening the fact that Australia needs a solution to build robust water infrastructure to ensure food security is not compromised.

Count of Estimate by Commodity description

Count of Estimate by Region label
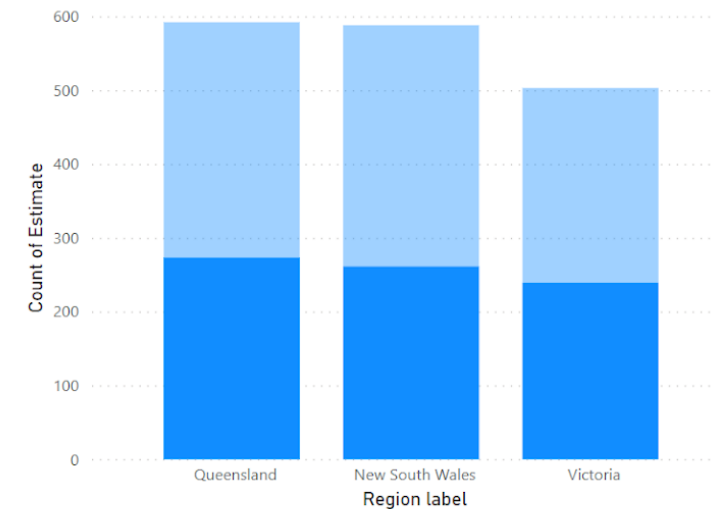
Similar trends in 2018-19: *Visualisations*

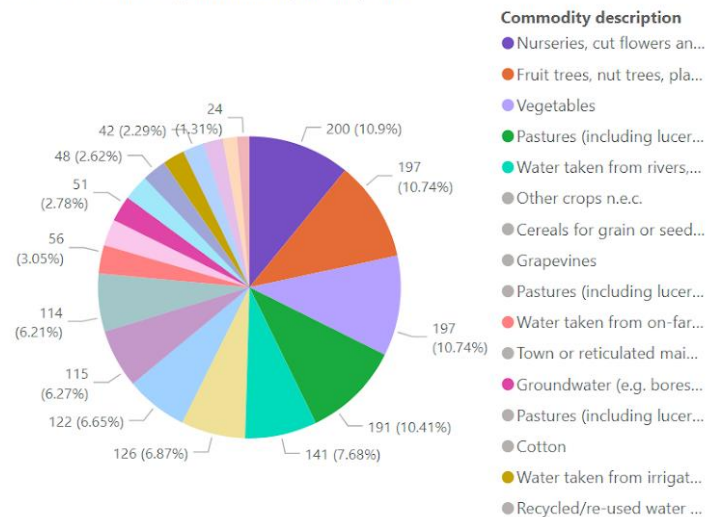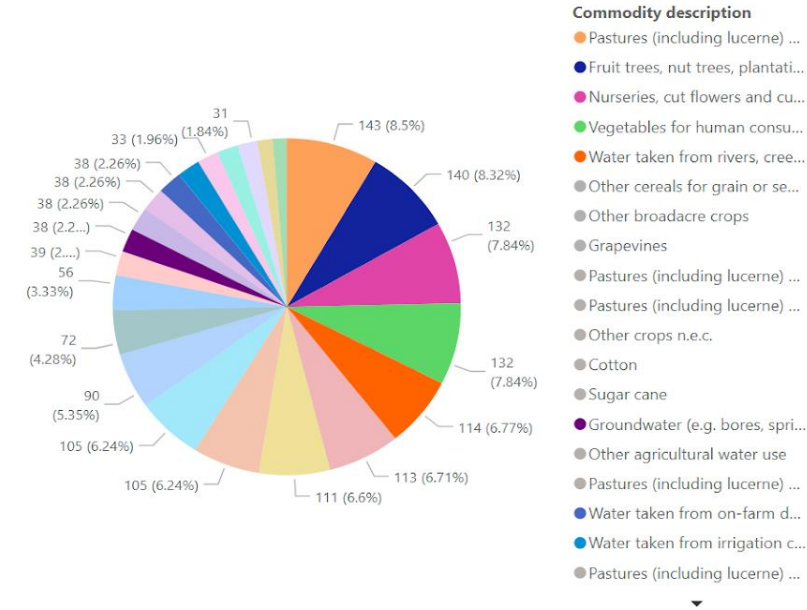A strong pattern over the years indicates that Australia consistently uses vast volumes of water for Pastures, Fruits and nuts, Nurseries and Vegetables. The most water-consuming commodities are Pastures at 10.4% water usage, Fruits and nuts at 8.32%, Nurseries at 10.9% and Vegetables at 10.74% in 2018-19.
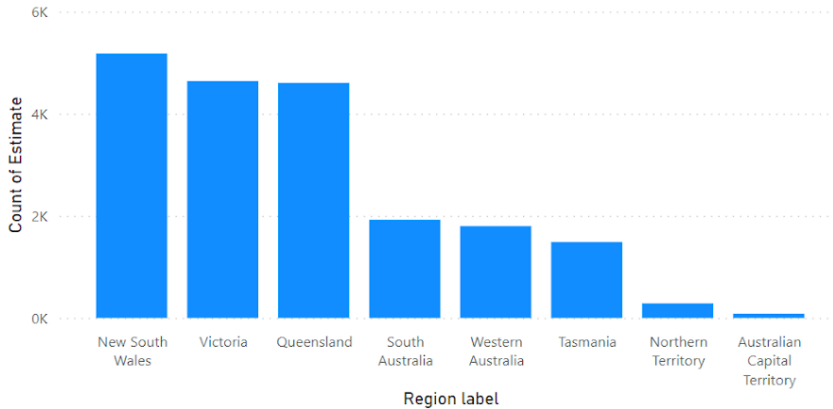
Water Consumption by Top 3 States and Top 4 Crops 2018-19

Persistent dry conditions and drought permeated Australia in 2018 (Bureau of Meteorology 2019). When less rainfall is available, the flow of rivers and lakes declines and thus leading to greater costs and reliance on agricultural irrigation and drinking water supply. Because these weather events are uncontrollable, it is necessary to ensure that the existing water infrastructure can handle demand.

Count of Estimate by Commodity description

Commodity description
- Pastures (including lucerne) ...
- Fruit trees, nut trees, plantati...
- Nurseries, cut flowers and cu...
- Vegetables for human consu...
- Water taken from rivers, cree...
- Other cereals for grain or se...
- Other broadacre crops
- Grapevines
- Pastures (including lucerne) ...
- Pastures (including lucerne) ...
- Other crops n.e.c.
- Cotton
- Sugar cane
- Groundwater (e.g. bores, spri...
- Other agricultural water use
- Pastures (including lucerne) ...
- Water taken from on-farm d...
- Water taken from irrigation c...
- Pastures (including lucerne) ...

Count of Estimate by Region label
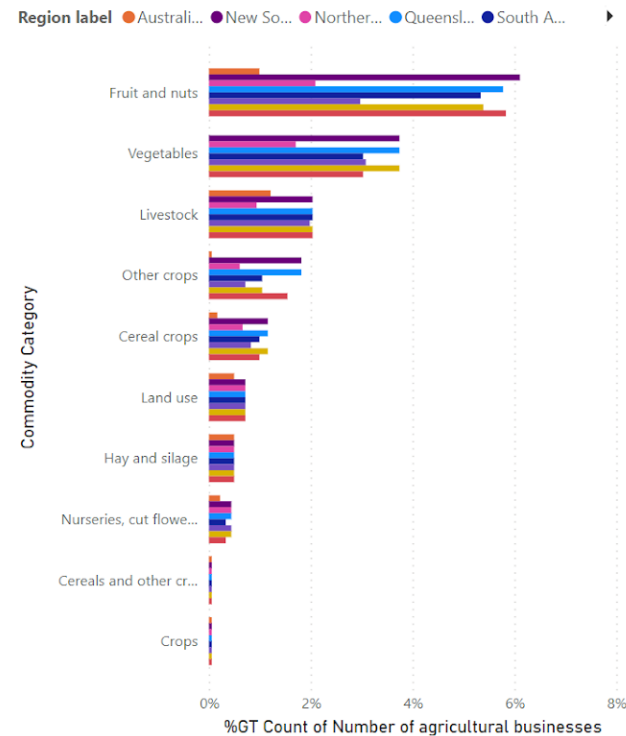
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Agribusiness Composition in Australia: *Visualisations*

Agribusinesses that specialise in Commodities

Most states in Australia have agribusinesses that specialise in growing Fruits and nuts, Vegetables, and Livestock. With food security being an emerging problem for Australia, it is important to ensure that robust supply chains and informed crop selection are in place to reduce flow-on costs for consumers and maintain steady food production in Australia (Cole, 2023) . With this approach, Australia can become self-sufficient and dampen food security issues whilst adjusting to climate change events.

In the last 12 months, flooding has wiped out many agricultural crops specifically Fruits and nuts and Vegetables. Leading to the inflation of lettuce to $11 each and blueberries to up to $10 per punnet (Cole, 2023). With this knowledge, Australia must ensure that its water infrastructure and crop selection is optimised and divert some resources to more necessary crops.


%GT Count of Number of agricultural businesses by Commodity Category and Region label

Count of Number of agricultural businesses by Region label and Commodity

Region label
- Australian Capital Territory
- New South Wales
- Northern Territory
- Queensland
- South Australia
- Tasmania
- Victoria
- Western Australia

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Insights: *Visualisations*

Waste Supplied by Agri Industry (%) 2016-17

Waste Supplied by Agri Industry (%) 2017-18
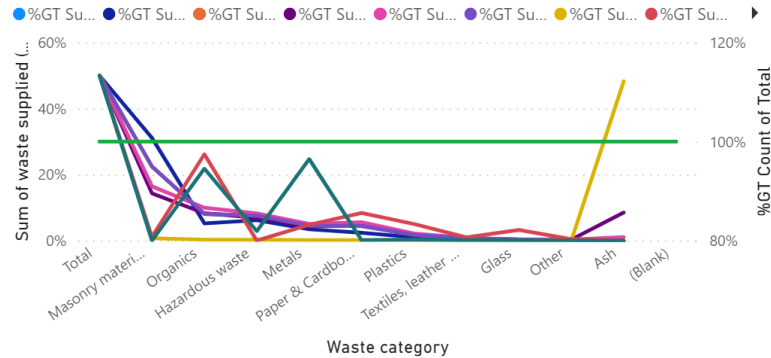
Waste Supplied by Agri Industry (%) 2018-19
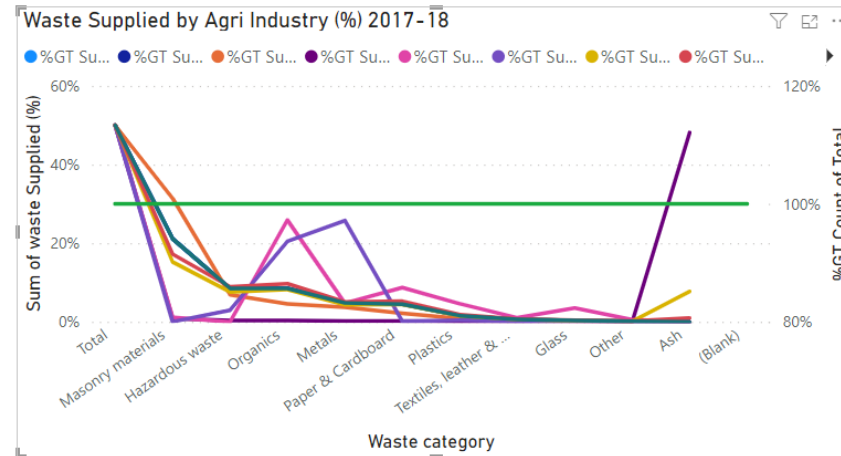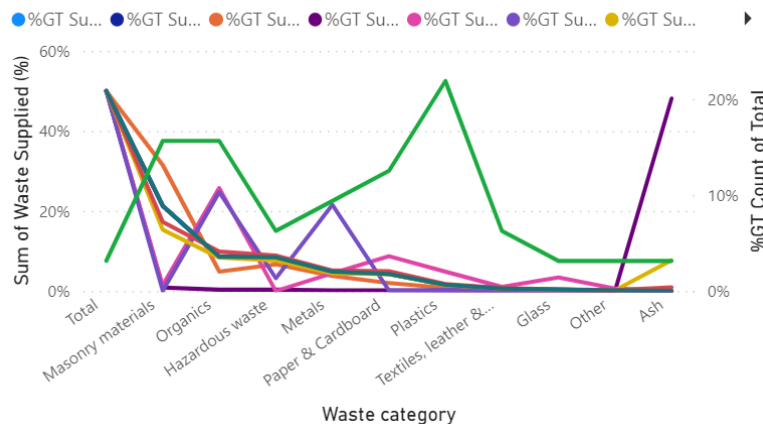
Waste Production by Agri-Industry

We discovered that Hazardous wastes, Paper and Cardboard, Organics, and Masonry Materials were the most often produced trash categories after analysing waste data from the National Farmers Federation from 2016 to 2019.

Masonry materials have continuously made-up majority of waste over time, with small increases in organic and hazardous waste.
It should be noted that the agricultural sector was the main source of these waste categories, highlighting the necessity for specific waste management methods within this area to reduce its environmental impact.

Organic and hazardous wastes were typically around 8.5% of the garbage, whereas masonry materials made up about 21% of it on average. The statistics emphasise the importance of developing specific waste management plans for the agriculture industry to lessen its negative environmental effects.

Overview   ESG Issues   Our Approach   **Data Insights**   Recommendation

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Framing the Problem: *Waste Management in Agriculture*

Problem Domain

WASTE PRODUCTION

- Australia generates 48 million tonnes of waste on average each year within its material intensive economy (DCCEEW, 2023), with
- Certain waste has a high potential for recovery, meaning it can be recycled or converted into energy (ABS, 2019). But majority of Australia's waste disposal methods are unsustainable and only a short-term solution

WASTE MANAGEMENT

- The current large-scale waste management market is dominated by the use of landfills which cover over 75% of Australia's waste disposal methodology (DCCEEW, 2023)
- Determining which categories consume the most waste Australia is essential to ideating a solution to determine how best to decrease the reliance on landfills in favour of sustainable waste management

OUR AIM

1. Identify the different sources of waste across different industry
2. Examine the trends in relation to the levels of waste production across different industries
3. Use benchmarking to determine changes in waste production levels over time across different industries

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Considerations: *Risks Associated with the Analytics Solution*

Risk	Description	Risk Rating
1 **Data security and privacy**	• The solution relies heavily on data – **the greater the volume of data, the higher the risk of breaches** and unauthorised access. • They must ensure that robust security measures are in place to protect sensitive information and that there is compliance with data protection regulations such as the *Privacy Act 1988*.	
2 **Skill gap and training**	• To effectively realise the benefits of the solution, the **necessary talent and skills** must exist to interpret, determine and communicate data insights. • Entities part of the National Farmers Federation (NFF) should ensure that they **train employees and hire skilled** data analysts and data scientists.	
3 **Scalability and performance**	• As the volume of data grows over time, the solution must be able to **handle large volumes without exhibiting performance issues**. • Additional resources may be required to fund and upgrade the solution's data capacity to ensure that the NFF can continuously benchmark, make decisions and track performance.	

While there are risks with implementing and maintaining the analytics solution, there are transformative, long-term impacts to be realised in the long run.

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Recommendation: *Future direction*

Key Issues	The agricultural industry is the greatest contributor to Australia's water scarcity crisis	Lack of access to high-quality water due to its excessive use for agriculture	Landfills are the favored waste disposal methodology, even for categories with a high recovery rate
Solution	**ESG Performance Tracking** Increase funding for groundwater infrastructure	**Benchmarking** Researching and applying greener infrastructure and green material in constructions.	**Decision-Making** Invest in resource recovery technology initiatives
Impact	**Water Scarcity** More sustainable water sources decrease the effects of water scarcity	**Water Scarcity** Improving water retention rate by capturing rain where it falls to promote better water quality	**Waste Management** Decreased reliance on landfills to promote sustainable waste management methodologies
Investment	Collaborate with water & financial management experts to conduct cost-benefit analyses	Invest in green R&D project and develop standards in using green material for building constructions	Consult with sustainability experts to create a NFF budget for resource recovery technology

Overview   ESG Issues   Our Approach   Data Insights   **Recommendation**

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References

ABC Rural. (2023). Food security facing threats from climate change, farmers say - ABC News. ABC News. Available at: https://www.abc.net.au/news/rural/2023-03-29/food-security-facing-threats-from-climate-change-farmers-say/102158222 (Accessed: 18 July 2023).

Australian Bureau of Statistics. (2023). Waste Account, Australia, Experimental Estimates, Latest Release. Australian Bureau of Statistics. Available at: https://www.abs.gov.au/statistics/environment/environmental-management/waste-account-australia-experimental-estimates/latest-release (Accessed: 25 July 2023).

Bureau of Meteorology. (2019). Annual Climate Summary - Queensland 2019. Bureau of Meteorology. Available at: http://www.bom.gov.au/climate/current/annual/qld/archive/2019.summary.shtml (Accessed: 18 July 2023).

Bureau of Meteorology. (2018). Australia's 2018 in Weather: Drought, Heat and Fire - Bureau of Meteorology Blog. Bureau of Meteorology. Available at: https://media.bom.gov.au/social/blog/1997/australias-2018-in-weather-drought-heat-and-fire/ (Accessed: 20 July 2023).

Department of Climate Change and Energy Efficiency. (2013). National Waste Reports - Infrastructure. Department of Climate Change and Energy Efficiency. Available at: https://www.dcceew.gov.au/environment/protection/waste/publications/national-waste-reports/2013/infrastructure (Accessed: 20 July 2023).

National Geographic. (n.d.). Australia's Water Problem - National Geographic. National Geographic. Available at: https://www.nationalgeographic.com/environment/article/partner-content-australia-water-problem (Accessed: 13 July 2023).

Organisation for Economic Co-operation and Development (OECD). (n.d.). Water and agriculture - OECD. OECD. Available at: https://www.oecd.org/agriculture/topics/water-and-agriculture/documents/oecd-water-policies-country-note-australia.pdf (Accessed:18 July 2023).