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Understanding the carbon footprint of the wine industry

Kieran Hirlam

Senior Project Engineer – The Australian Wine Research Institute (AWRI)

Carbon Footprint of wine



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- The estimated Australian wine industry carbon footprint in 2017 was 1.6 million tonnes of CO₂e.
 - For reference, civil aviation in Australia was estimated at 22 million tonnes CO₂e.
- On average, the carbon footprint per litre of wine is 0.6 – 1.4kg CO₂e/L.

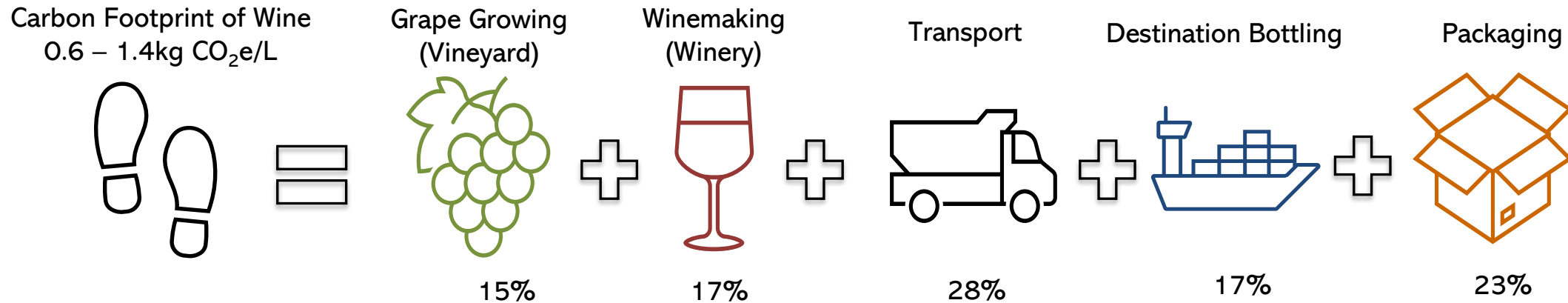
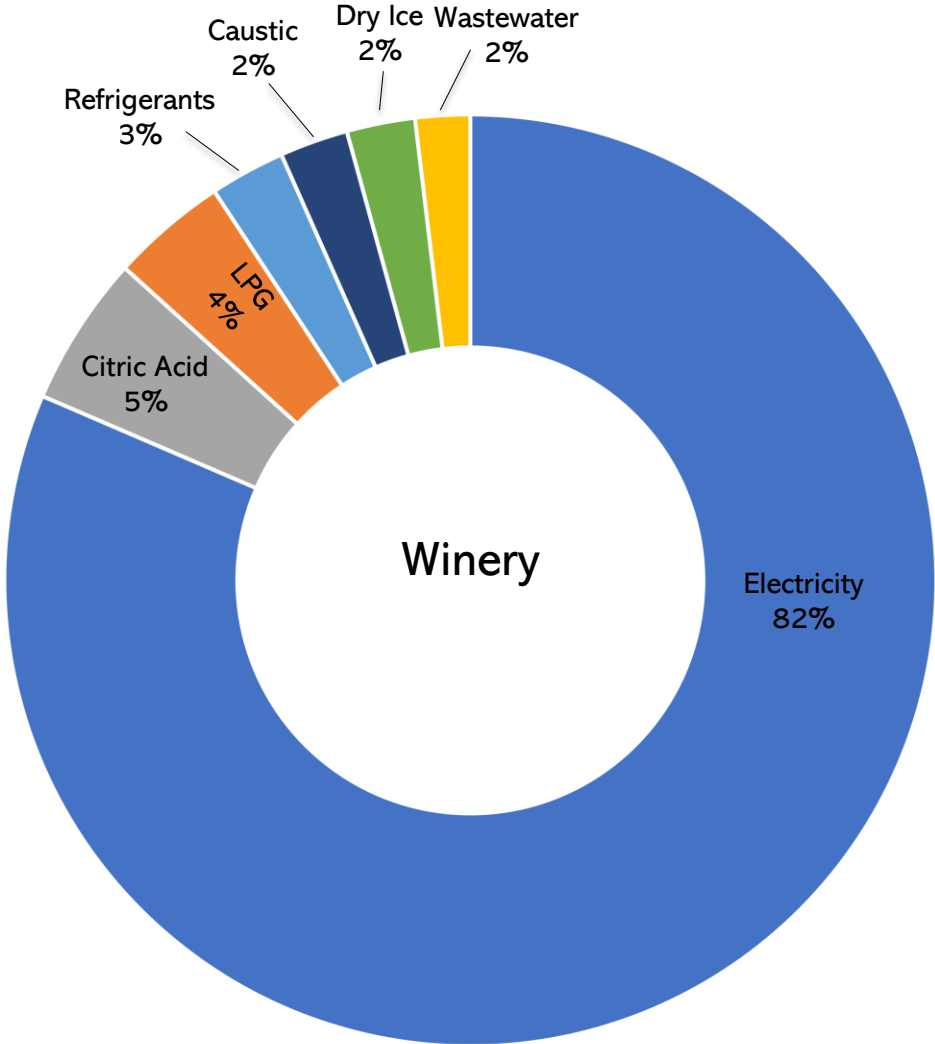
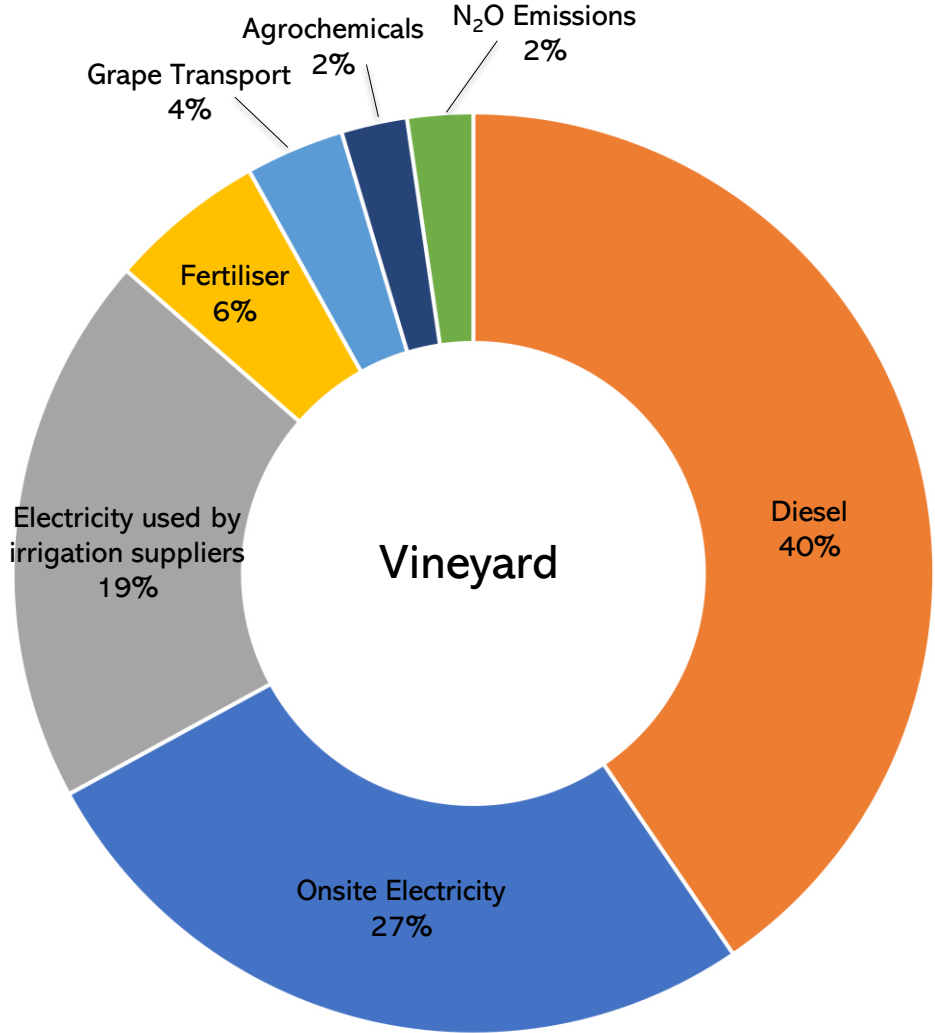


Figure 1. Elements making up the carbon footprint of wine



Vineyard and Winery Emission Sources



Abbott, T. Longbottom, M. Wilkes, E. Johnson, D. (2016), *Assessing the environmental credentials of Australian wine*, Wine & Viticulture Journal, Vol. 31, No. 1

Vineyard Mitigation Strategies



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Electric Tractors



Figure: Fendt e100 tractor prototype as presented at Agritechnica 2017 (50 kW, 100 kWh battery)



Improving management practices

- Multi-purpose passes.
 - Front-end and back-end operations
- Multi-layer spraying operations

Renewable Energy from Biomass



Figure: CAEB Baler at work in the vineyard. Creates bales of prunings.

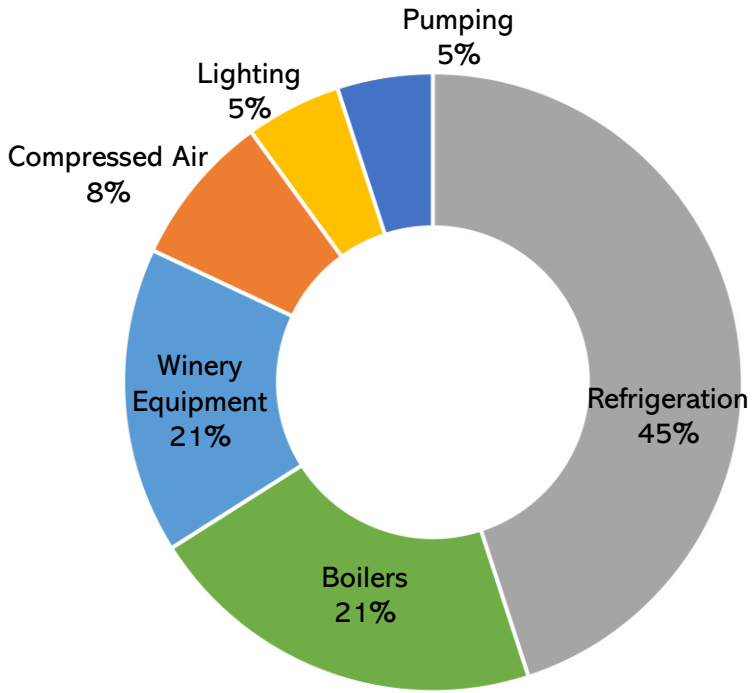
Biochar and Soil Amendment



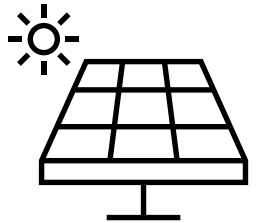


Winery Mitigation Strategies

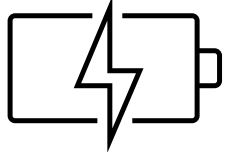
Winery Energy Audit Outcomes



- Higher-cost improvement opportunities
 - Involve more significant refrigeration plant and/or winery modifications

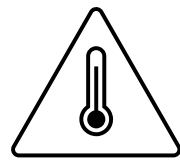


Solar for Power Supply

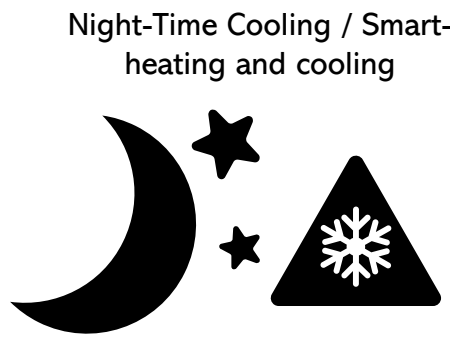


Battery Storage

- Low-cost improvement opportunities
 - Generally associated with changes in operating practices



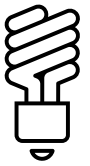
Refrigeration and Boiler Efficiencies



Juice clarification using Flotation



Cold Stabilisation Practices



Converting to LED Lights



Packaging and the impact of Glass

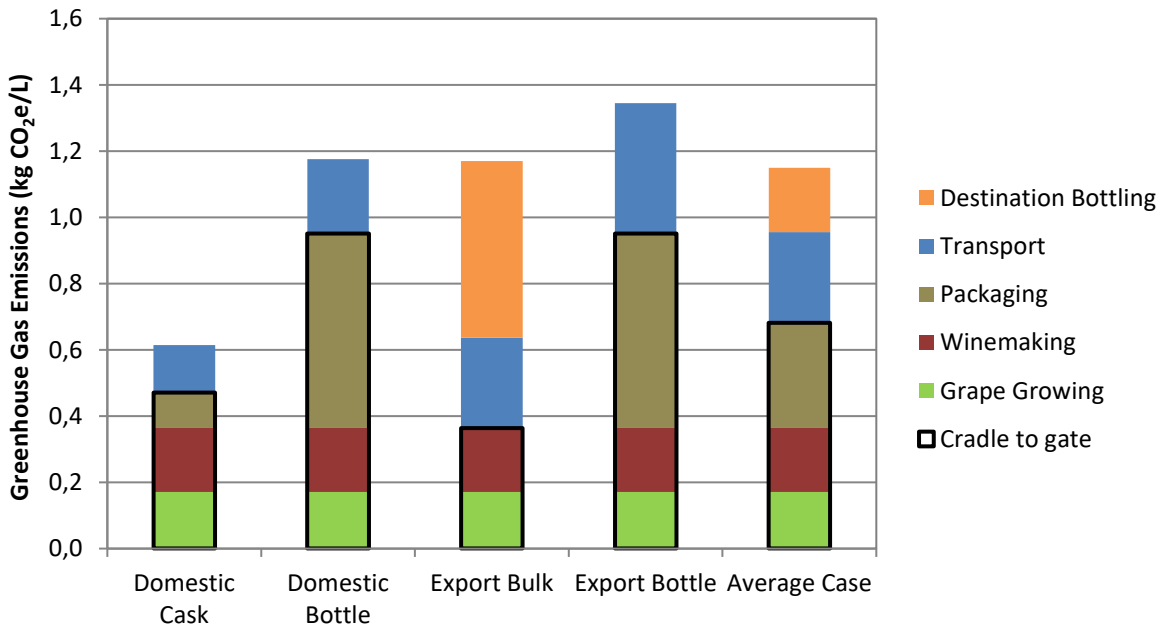


Figure: Greenhouse gas emissions of Australian wine delivered to domestic and export markets in different formats, showing both cradle to grave and cradle to gate emissions.

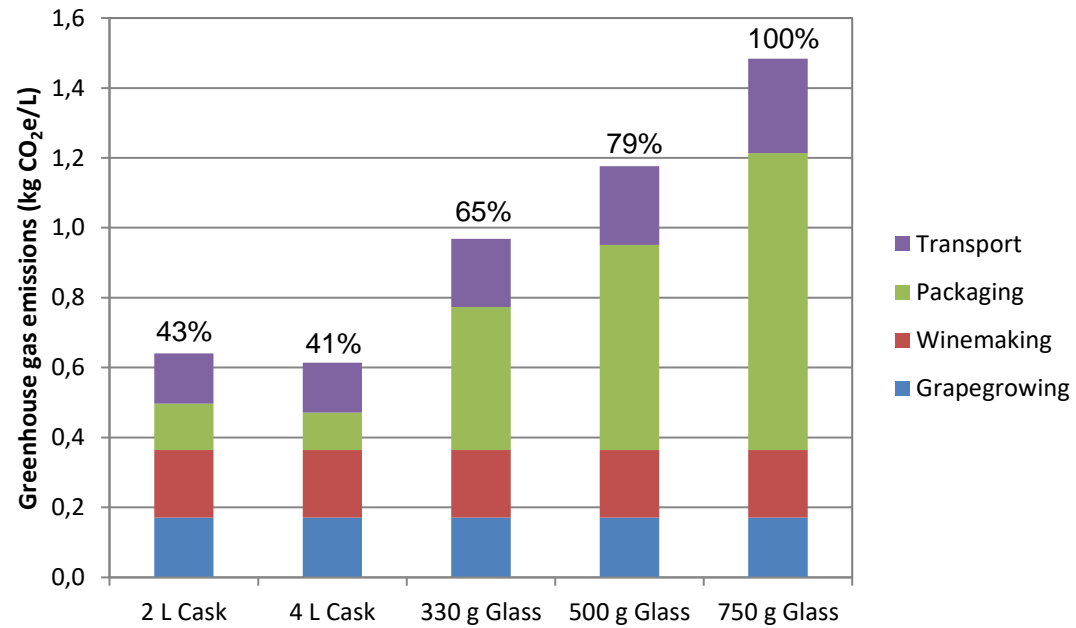


Figure: Effect of different packaging formats on greenhouse gas emissions

Abbott, T. Longbottom, M. Wilkes, E. Johnson, D. (2016), *Assessing the environmental credentials of Australian wine*, Wine & Viticulture Journal, Vol. 31, No. 1



Why worry about ferment CO₂?

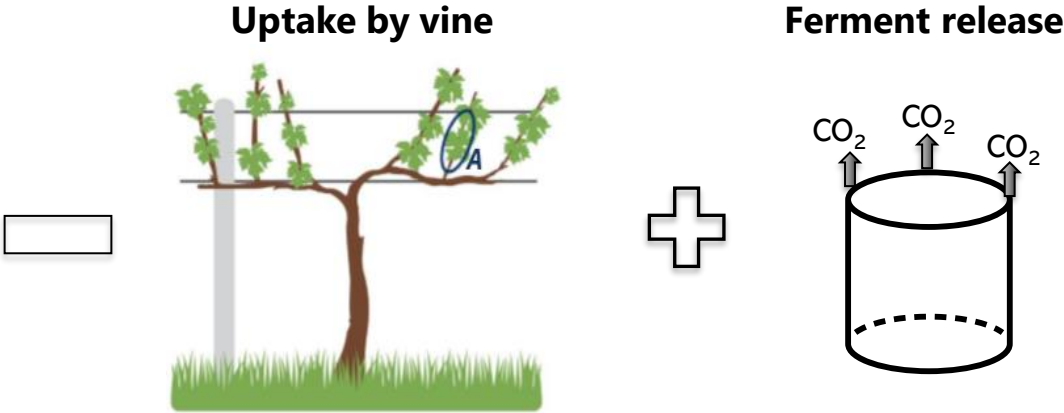


Figure. Elements making up the carbon footprint of wine

Biogenic carbon

- Emissions relating to the natural carbon cycle
- CO₂ released from fermentation is part of the short-term carbon cycle.
- Results in a net neutral cycle and is the same for all plant-based food products.

- The Paris Agreement is in place to reduce the amount of carbon input into the atmosphere with the goal of limiting global warming to 1.5°C.
- Fermentation exhaust is a much more concentrated source of CO₂ (up to 95% CO₂) than combustion exhaust from fossil fuels (~15%).

This provides an opportunity to reduce wine industry emissions.

Options for capturing CO₂ during wine production



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- It is important that any focus on carbon capture does not limit efforts to reduce CO₂ emissions from other aspects of wine production that could provide more significant emission reductions.

Current Limitations:

- Tank Distribution
- Infrastructure used seasonally
- Technology advancements required
- Multiple companies have developed CO₂ capture and reuse systems for the wine industry.
- Long history of CO₂ capture and reuse for internal operations in brewing.
- Initiatives include:
 - Pulse air agitation for red ferments
 - Conversion to solid form for storage or reuse



Opportunities for mitigating GHG emissions in vineyard and winery practices



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□ Life Cycle Assessments:

What are they good for?

- Design stage elements
- Identifying hot spots to drive improvement
- Broad range of environmental factor contribution assessments.
- Tell stories about a product
- Great for conscientious businesses

Limitations?

- Important to note they are not designed for product comparison.
- Do not model social and ethical issues.

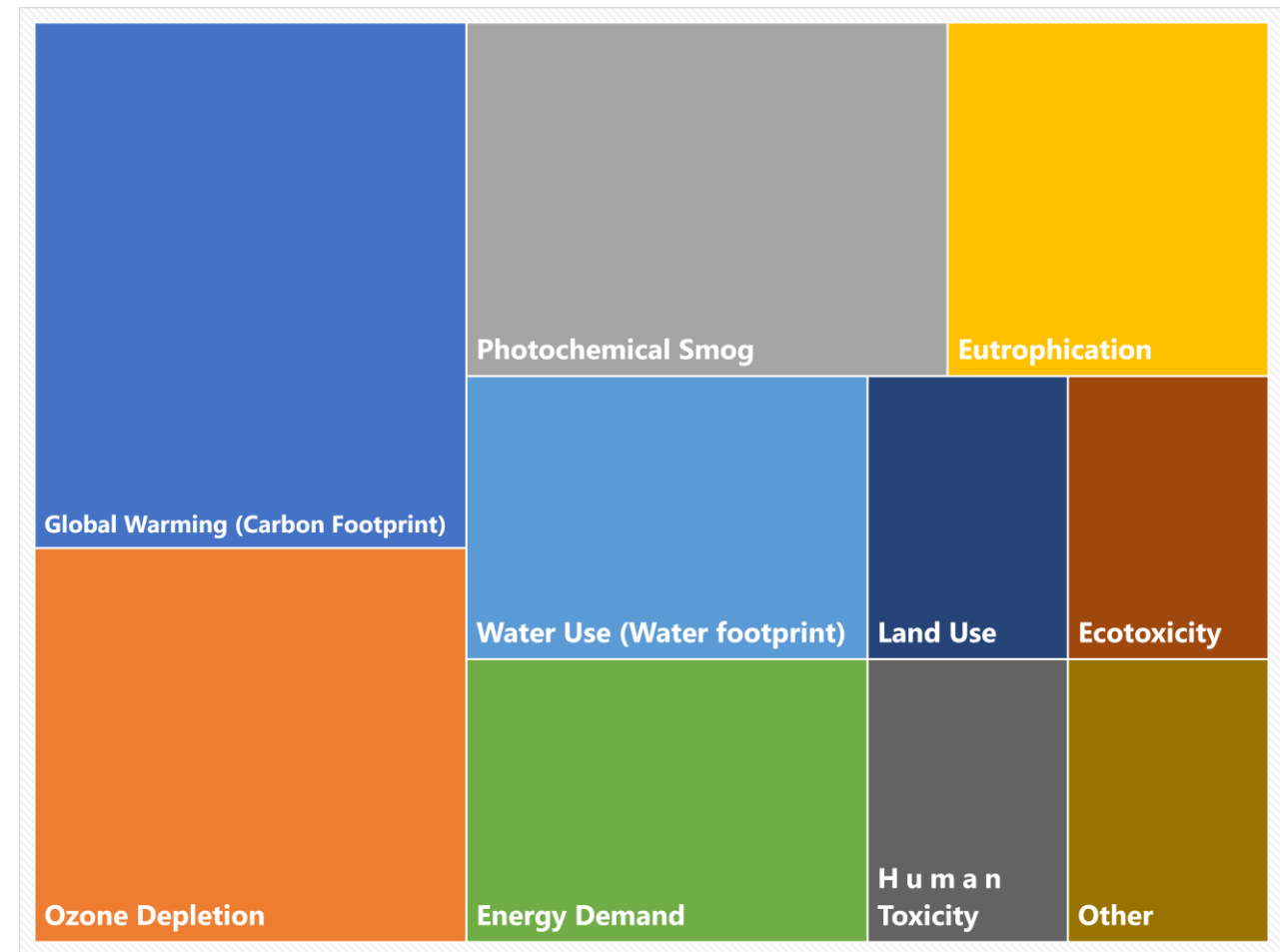


Figure: Life Cycle Assessment environmental impact factors.

Acknowledgements



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And finally, thank you all for listening.



**Australia's National Program for Grapegrowers
and Winemakers Committed to Making
Sustainable Wine**

Contact the AWRI helpdesk on
helpdesk@awri.com.au or 08 8313 6600 for
assistance.