LIFE CYCLE ASSESSMENT SUMMARY

KEY RESULTS

UNDERTAKEN BY LIFECYCLES FOR WOSUP AUSTRALIA PTY LTD

6TH OCTOBER 2022

EXECUTIVE SUMMARY

WOSUP (War On Single Use Plastic) Australia Pty Ltd is aiming to reduce single-use plastic consumption by providing reusable cup solutions for public and private events.
A reusable 425mL aluminium cup has been developed by WOSUP as an alternative to the single use beverage containers used for the delivery of open drinks at large scale public events.

WOSUP commissioned Lifecycles to undertake a life cycle assessment (LCA), exploring the environmental advantages and disadvantages of using the reusable aluminium cup developed by WOSUP.

The **reusable aluminium cup** is compared to **4 alternatives**:

» three single use products – polyethylene terephthalate PET cup, polylactic acid PLA cup, and an aluminium can;

» one alternative reusable system based on a polypropylene cup.

GOAL AND SCOPE

KEY ASSUMPTIONS

The functional unit for the study was defined as the “delivery of one 375 to 425ml drink at a public event”.

1) One cup/can represents one drink for the single use containers.

2) For reusable containers, one drink also incorporates the wash and reuse cycle and the material factors in the expected rate of reuse. Material life assumptions made - PP has 4 uses, aluminium 5 uses.

WOSUP has a carbon offset program which plants 1 tree per 209 cups used.

In line with the requirements of the ISO 14040 standard, the effects associated with planting trees are reported separately.

REASON FOR THE STUDY

The goal of this LCA is to compare the environmental impacts of using:

1) reusable aluminium cups from WOSUP;

2) reusable PP cup;

3) single-use PET/PLA cups; and

4) single-use aluminium cans.

WOSUP is actively considering future green manufacturing options in Australia and hence wanted to explore renewable aluminium sourcing alternatives.

The results of this LCA will be useful to organisers of large scale events and public venues regarding the provision of drinking cups, and for WOSUP to understand the impacts of its cup and make supply chain decisions.

01.

LIFECYCLE INVENTORY

01. LIFE CYCLE INVENTORY

Beverage container weight data is summarised in Table 5.

All containers except the PLA cup were physically collected and weighed on scales to a resolution of 1g. The PLA cup was unable to be physically sourced so the declared weight for the 420mL cup on the BioPak website was utilised.

Further data was provided by WOSUP regarding transport legs and factory locations.

Google Maps was used to estimate transportation distances across land, and sea-distances.org was used for international shipping distances.

Table 6 summarises the transport journeys and distances of the WOSUP reusable aluminium cups.

Note that the WOSUP warehouse (in Brookvale NSW) is also the cleaning facility for used WOSUP cups.

TABLE 5 WEIGHT OF BEVERAGE CONTAINERS

Container	Weight (g)	Volume (mL)
WOSUP aluminium cup, reusable	33	425
PP cup, reusable	41	425
PET cup, single use	11	425
PLA cup, single use	10.1	420
Aluminium can, single use	13	375

TABLE 6 BREAKDOWN OF WOSUP TRANSPORT LEGS FOR REUSABLE ALUMINIUM CUPS

Transport Leg	Distance (km)
Cup manufacture (Xiaolan, China) to shipping port (Guangzhou)	65
Guangzhou port (China) to Sydney port (Australia)	8484
Sydney port to WOSUP warehouse	10.8

02.

THE CLIMATE CHANGE PER CUP

IMPACT RESULTS FOR 1 DRINK

02. THE IMPACT RESULTS FOR 1 DRINK

The WOSUP cup results in the lowest impacts on climate change, fossil fuel depletion, water scarcity and soil quality, while the aluminium can performs the worst.

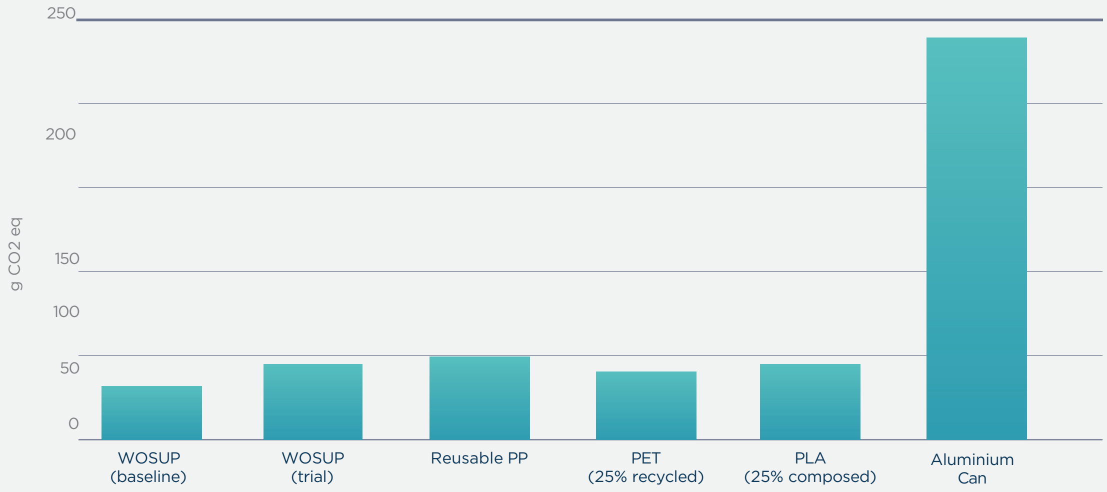
Impact	Unit	WOSUP	Reusable PP	PET	PLA	Al. Can
Climate change	g CO_2e	32	50	43	47	244
Mineral depletion	mg Sbe	4.2	1.37	0.74	1.1	8.02
Fossil fuel depletion	MJ NCV	0.34	1.03	0.78	0.58	2.46
Water Scarcity	L H_2Oe	0.27	0.26	0.20	1.06	0.72
Land use soil quality	kg C deficit	0.07	0.13	0.09	0.11	0.43

Source: Grant, T., Jiang, C. & Wagner, L., (2022) Life Cycle Assessment of the beverage delivery at public events, Lifecycles, 06th October 2022, Melbourne.

02. THE IMPACT RESULTS FOR 1 DRINK

THE CARBON IMPACT RESULTS FOR 1 DRINK

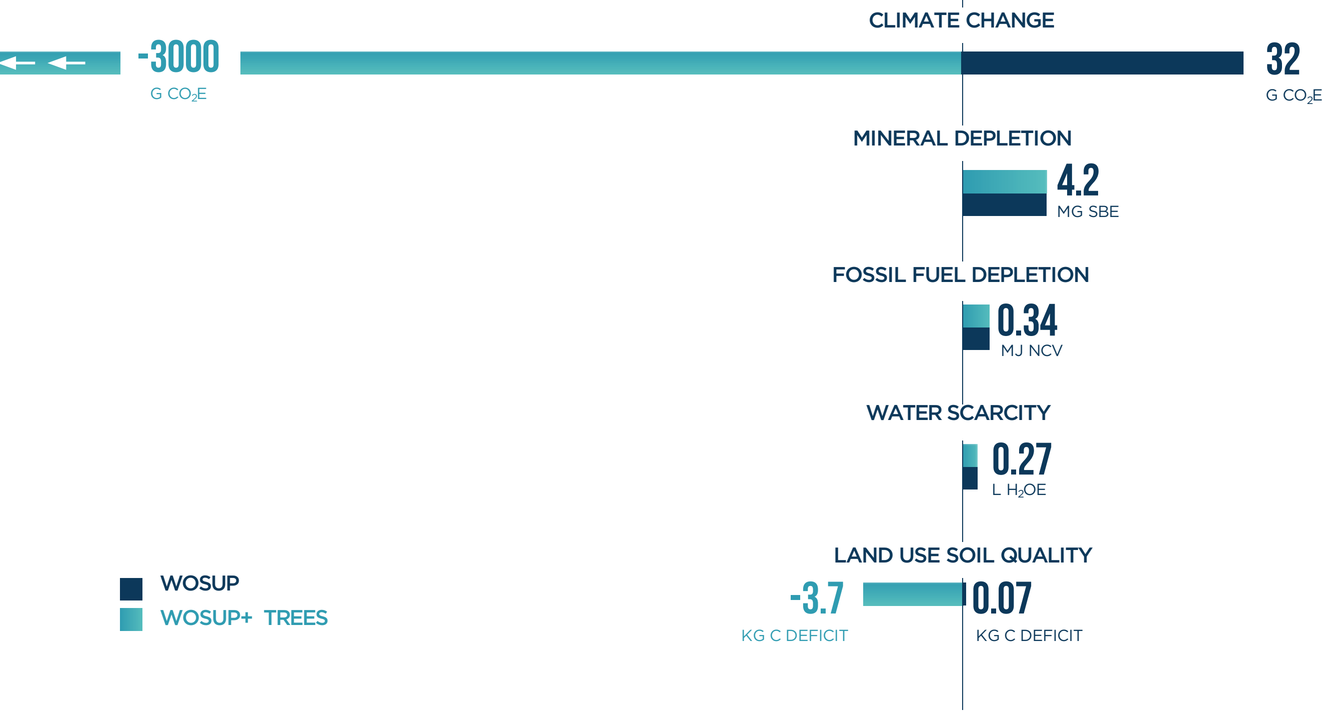
Figure 3 presents three specific recycling/reuse scenario, which are compared against the alternative options. The first scenario is the baseline model and the results of a trial conducted by WOSUP.



Source: Grant, T., Jiang, C. & Wagner, L., (2022) Life Cycle Assessment of the beverage delivery at public events, Lifecycles, 06th October 2022, Melbourne.

02. THE IMPACT RESULTS FOR 1 DRINK

In the charts below we see the effect of accounting for tree planting, which creates a net carbon abatement of approximately 3 kg CO_2e per drink use as well as positive soil quality outcomes.



02. THE IMPACT RESULTS FOR 1 DRINK

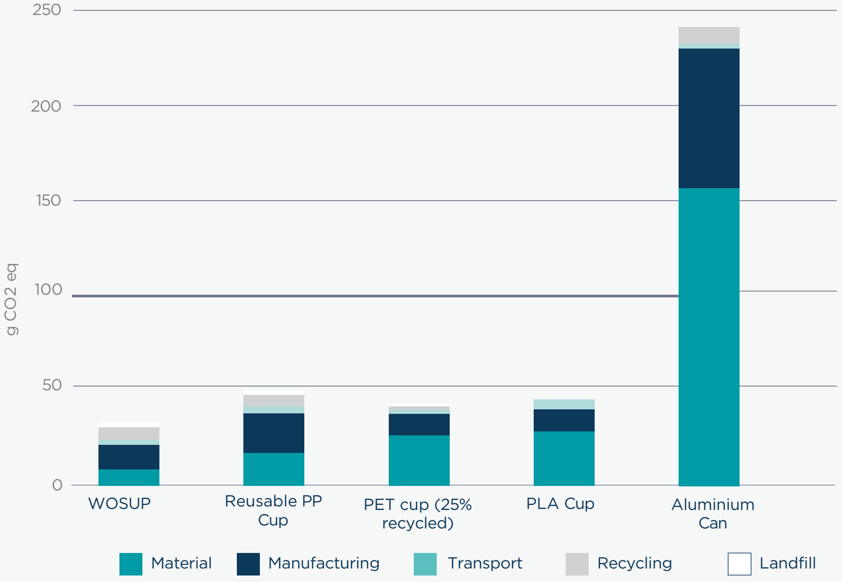
CONTRIBUTION ANALYSIS - CLIMATE CHANGE, PER DRINK

This figure shows the relative significance of each life cycle stage considered on climate change, for climate change for four of the five options modelled. Aluminium can was excluded as impacts are so much larger that they reduce visibility of all other options.

Overall, the material inputs for the cups are most important for all options, with manufacturing being second most important contributor. Transport is marginal in every case, apart from the PLA cup where it represents 11% of the total impacts.

The recycling inputs for WOSUP are the net impacts associated with the recycling process – while recovered material is subtracted off the overall material impact.

CONTRIBUTION ANALYSIS - CLIMATE CHANGE, PER DRINK



Source: Grant, T., Jiang, C. & Wagner, L., (2022) Life Cycle Assessment of the beverage delivery at public events, Lifecycles, 06th October 2022, Melbourne.

03.

MANUFACTURING SOURCE

03. MANUFACTURING SOURCE OF ALUMINIUM FOR THE WOSUP CUP

Table 18 presents the environmental impacts of changing the source of aluminium for the WOSUP cup, holding all other parameters constant. New Zealand aluminium is based primarily on hydro power and there is a proposal by Rio Tinto to produce aluminium at Gladstone Aluminium Smelter using 100% renewable energy.

SENSITIVITY ANALYSIS, VARYING WOSUP ALUMINIUM SOURCE, PER DRINK

IMPACT CATEGORY	UNIT	WOSUP (CHINA)	WOSUP (NEW ZEALAND)	WOSUP (AUSTRALIA RENEWABLE)
Climate change	g CO_2eq	32	23	**24**
Mineral depletion	mg Sb eq	4.22	4.20	**4.35**
Fossil fuel depletion	MJ NCV	0.34	0.27	**0.28**
Water Scarcity	L H_2O eq	0.274	0.272	**0.277**
Land use soil quality	kg C deficit	0.068	0.063	**0.065**

Source: Grant, T., Jiang, C. & Wagner, L., (2022) Life Cycle Assessment of the beverage delivery at public events, Lifecycles, 06th October 2022, Melbourne.

04.

LIFE CYCLE ASSESSMENT CONCLUSION

04. LCA CONCLUSION

> **Never tasted better… never tasted better.**
>
> A Suncorp Stadium patron

WOSUP HAS A NUMBER OF ENVIRONMENTAL ADVANTAGES

The results of the LCA show that using a reusable aluminium WOSUP cup has a number of environmental advantages over using other assessed vessels, provided the recycling is above 90% and reuse rate of the WOSUP cup is above 75%.

WASHING AND LOGISTICS HAVE MINIMAL IMPACT

The washing and reuse logistic add very little to the overall impacts of WOSUP reusable and infinitely recyclable cups.

CARBON OFFSET / TREE PLANTING

The incorporation of tree planting as proposed offsets climate impacts of the very worst-case scenario where an individual WOSUP cup is lost without any recycling or reuse, by more than 3 times (0.85 kg CO_2e compared with 3kg CO_2e offset).

ALUMINIUM CANS

Aluminium cans despite a recycled rate of 95% represent the worst option in almost all indicators.

05.

GOAL AND SCOPE REFERENCES

GOAL AND SCOPE

CALCULATION APPROACH

In the independent and third party reviewed LCA, (conducted by Lifecycles) the environmental impacts of each beverage container assessed are calculated according to a singular serving. Volumes of each container range from 375mL for an aluminium can, 420mL for PLA, and 425mL for PET, the PP cup, and the WOSUP cup. These containers are all assumed to be perfect substitutes despite volume disparities. The environmental impacts are calculated by considering the emissions from actions relating to the production, transport, use, and disposal of each cup. Any impacts created by the production of beverage contained in each respective cup is excluded, as well as any reuse of the single-use cups by consumers, and any labelling/branding designs of the containers.

The results of the study will be used by WOSUP to make supply-chain decisions regarding its reusable aluminium cup and may be used to describe to consumers and event organisers the environmental outcomes of choosing a reusable cup from WOSUP over single-use cups. All activities are therefore modelled from the production or extraction of raw materials to the end-of-life stage of each cup, including washing activities during reuse for the WOSUP cup and PP reusable cup.

The environmental advantages of using the reusable aluminium WOSUP cup are calculated by determining the impacts of the production, transport, use, and end-of-life of the WOSUP cup, and subtracting the impacts of the production, transport, and end-of-life of each of the other cup options. Similarly, the environmental impacts of switching aluminium sources in the WOSUP aluminium cup supply chain are calculated by determining the impacts of the current production of WOSUP aluminium cups and subtracting the impacts of producing the cups from other respective renewable aluminium sources.

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WE WANT TO PARTNER WITH YOU TO LEAD THE CHANGE.

THANK YOU

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