mycotech lab

decorum GROUP

GHG Measurement

Period March 2019 – February 2020

Reported on 18 May 2020

Greenhouse Gases (GHG)

GHG are gases that trap heat in the atmosphere(1). Since the industrial revolution around 1750, the atmospheric concentrations of some GHG have been affected significantly and directly by human activities namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and synthetic gases, such as chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs). This additional GHG in the atmosphere are contributing to global warming and to associated climatic changes(2). It is therefore important to measure our activities and take actions to avoid and reduce GHG emissions. The overriding goal of measuring GHG will be to provide PT Miko Bahtera Nusantara (MYCL) with its full-cycle baseline emission profile and scenarios to improve its operations.

15 June 2020

Project ID036
Adi Reza Nugroho
CEO PT Miko Bahtera Nusantara (Mycotech)

This report is a continuation of the previous report we provided for your company. This report covers GHG measurement period from March 2019 to February 2020. GHG are gases that trap heat in the atmosphere(1). Since the industrial revolution around 1750, the atmospheric concentrations of some GHG have been affected significantly and directly by human activities namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and synthetic gases, such as chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs). This additional GHG in the atmosphere are contributing to global warming and to associated climatic changes(2). It is therefore important to measure our activities and take actions to avoid and reduce GHG emissions.

The overriding goal of this effort will be to provide PT Miko Bahtera Nusantara (MYCL) with its full- cycle baseline emission profile and scenarios to improve its operations.

For further information, please contact amalia@decorumgroup.com.au

Sincerely,

Amalia Sosrodiredjo
Managing Director
DECORUM

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A. Executive Summary

This GHG measurement is based on MYCL period 1 March 2019 – 29 February 2020. The GHG Protocol, A Corporate Accounting and Reporting Standard published by the World Resources Institute (WRI) and the World of Business Council for Sustainable Development (WBCSD) is used for this purpose. We use best available Emissions Factors from IPCC 2006
Guidelines for National Greenhouse Gas Emissions Inventories for Indonesia and other references for Indonesia. The company has two operational sites: eco factory and shared office which we determined as MYCL organizational boundary.

In this report, operational activities of MYCL are limited to manufacturing Mylea (mycelium leather) and Biobo (Mycellium board).

The GHG emissions are categorised by its sources whether it is directly emitted (known as Scope 1) or indirectly (Scope 2 and 3). Based on available data, GHG emissions of MYCL are estimated around 34.20 tonnes of carbon dioxide equivalent (tCO2-e) excluding Scope 3 emissions.

In total (Scope 1 and Scope 2), electricity contributes most of the emission (88.02%) followed by claimed fuels for company cars (10.45%), LPG (0.97%) and refrigerants (0.56%). Scope 3 GHG emissions (such as waste, wastewater and business travel) is separately reported from Scope 1 and Scope 2 in Section E. The total of Scope 3 is 7,190.97 tonnes CO2-e where business travel contributes 95.46% of the total followed by wastewater 4.54% and waste 0.01%.

An emission projection is calculated in accordance with MYCL target production. MYCL emission projection in 2022 is expected to reach 842 times compared to the baseline period, March 2019 – February 2020.

B. Introduction

MYCL is a bio-technology laboratory company starting as a gourmet mushrooms producer is 2012. Through this stage, MYCL discovered that mushroom possess lots of potentials that can be explored which then bring MYCL to innovate various products from synthetic leather (Mylea) to composite board (Biobo). The company is registered in Singapore (virtual office) with an office site and EcoFactory based in Bandung. They also have another virtual office set in London, United Kingdom, with the plan to utilise this as a representative office in the future. To assist their production, MYCL utilises two vendors to help in creating end products for Mylea and Biobo.

With sustainability as part of the vision and philosophy, MYCL ensures that they have GHG management strategy in place. GHG management strategy is a comprehensive series of steps assembled into a continuous improvement cycle. The strategy should assist MYCL to prioritise actions to optimise environmental and business outcomes including reducing costs, becoming more efficient in operation, improving market opportunity and reducing business risks.

This report will focus on two areas: 1) develop full-cycle GHG emission baseline; 2) research on a plausible emissions reduction scenario. We use a 12-month activity data of MYCL from 1 March 2019 – 29 February 2020 period.

C. Boundaries

Setting organisational and operational boundaries are essential to keep the consistency of GHG emissions calculation. The GHG Protocol, A Corporate Accounting and Reporting Standard is used as a guidance to define these boundaries.

Organisational Boundary

MYCL is wholly owned business operations. There are two operational sites of MYCL: Eco-Factory for production and shared office for administration works, detailed boundaries is shown in figure 1. Both sites are used for the same purpose of the company and under one legal and organisational structure. We use operational approach for MYCL for this study. The study focusses on operational activities of MYCL for manufacturing Mylea and Biobo.

Figure 1. MYCL Organisational Boundary

Operational Boundary

Operational boundary is used to determine all GHG emitted from activities or operations within MYCL organisational boundary (Eco-Factory and shared office) categorised as direct or indirect emissions.

- Scope 1: direct emissions from sources owned or controlled by MYCL(fuel and LPG consumption and leakage from refrigerants)
- Scope 2: indirect emissions from consumed electricity generated by other party (purchased electricity from PLN)
- Scope 3: indirect emissions from activities or services related to third party which affected from MYCL main operation (In this study, measurement of Scope 3 focuses on wastewater; waste generated and business travel) – reported separately in Section E.

D. GHG Inventory

GHG inventory is a list of measured GHG emissions of MYCL within the reporting period. Factors and energy contents for the calculation of these emissions are based on data collected, as well as the best available IPCC Emissions Factors for Indonesia and some other references (see Appendix).

GHG Standard

The GHG emissions data is collected and generated following The GHG Protocol, A Corporate Accounting and Reporting Standard published by the World Research Institute (WRI) and the World of Business Council for Sustainable Development (WBCSD). The GHG calculations includes direct and indirect emissions mentioned in Boundaries (Section C) in this report. All GHG emissions in this report reported in unit of metric tonnes of CO2 equivalent (tCO2e). The collection of activity data is shown in table 1.

Table 1. Activity Data Collection

Emission Sources	Scope of Emission	Data Sources
Petrol	Scope 1	Claimed fuels of FTE
Diesel	Scope 1	Claimed fuels of FTE
Refrigerants	Scope 1	HVAC units
LPG	Scope 1	Purchased natural gas for cooking etc
Electricity	Scope 2	Usage within Eco-Factory Site & Shared Office
Wastewater	Scope 3	Usage within Eco-Factory Site and averaged at Shared Office
Waste	Scope 3	Byproducts from Eco-Factory activities and averaged at Shared Office
Business Travel	Scope 3	International and interstate FTE business travels

E. Detailed Result

Proportion of MYCL emission by scope

Total GHG emissions MYCL emits during this reporting period is 34.20 tCO2-e with proportions of scope 1 and 2 are showed in figure 2 and detailed proportions per category is showed in figure 3.

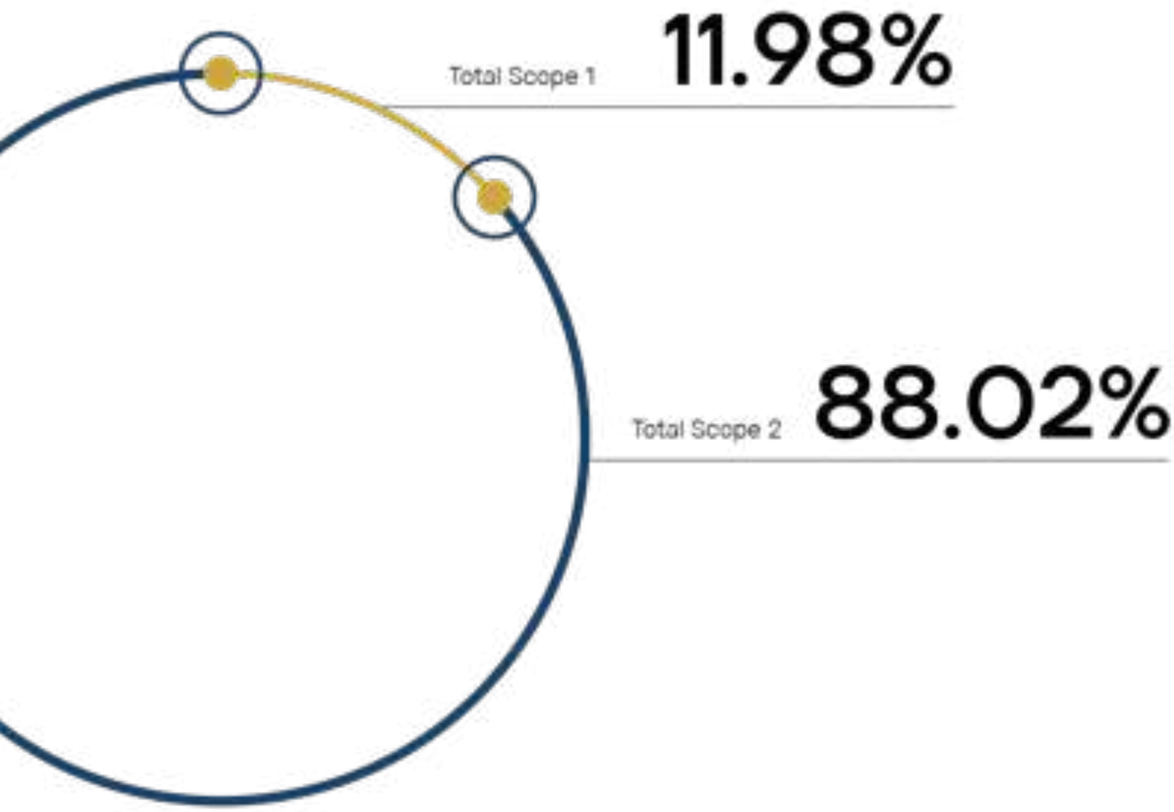

Figure 2.. Proportion of GHG Emissions of MYCL during reporting period

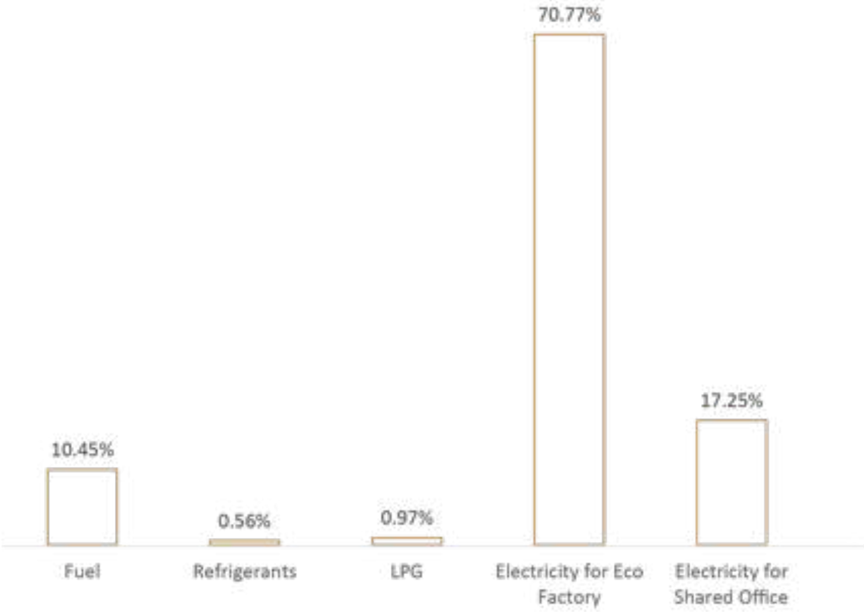

Figure 3. Proportion of MYCL emissions during this period based on its sources (Scope 1 and Scope 2).

MYCL highest GHG outputs (CO2, N2O, and CH4) come from Scope 2 electricity. The details of the three GHG outputs from Scope 1 and Scope 2 are as follow:

- CO2
  The highest CO2 output is generated from scope 2 i.e. the total usage of electricity is 30.10 tCO2e which Eco-Factory (24.2 tCO2e) and Shared Office contributes (5.90 tCO2e). The second contributor of CO2 output comes from scope 1 (4.10 tCO2e) which fuel combustion (3.57 tCO2e), fugitive emissions from refrigerants leakage (0.19 tCO2e) and combustion of LPG (0.33 tCO2e) generates.

- CH4
  The highest CH4 output comes from combustion of fuels and LPG (0.000259 tCO2e and 0.000297 tCO2e respectively).

- N2O
  The highest Nitrous Oxide (N2O) output comes from combustion of fuels and LPG (0.000031 tCO2e and 0.000001 tCO2e respectively).

Overall, CO2 is the highest GHG output resulted from MYCL Scope 1 and Scope 2 activities, attributed to 99.998%. Detailed sources of Emissions is shown in figure 4 below.

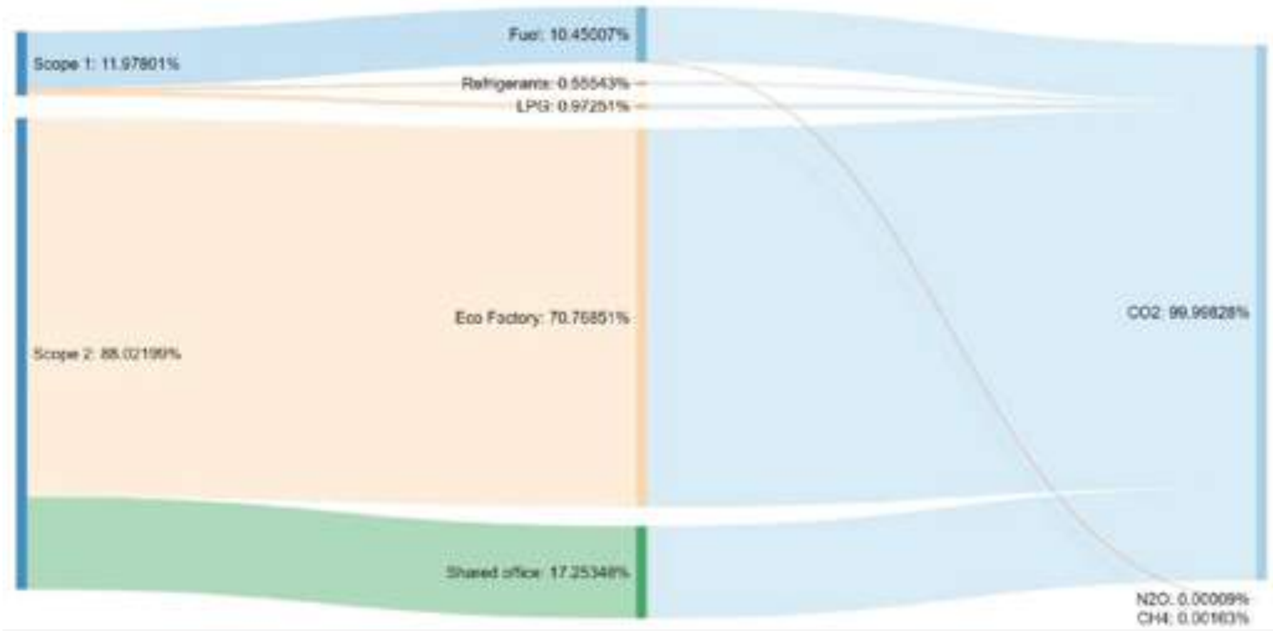

Figure 4. Scope 1 and 2 Sources of Emissions and The Three GHG Outputs (CO2, N20, and CH4)

Scope 3

GHG emissions inventory for Scope 3 of MYCL is shown in figure 5. The total emissions during this reporting period is 7,190.97 tCO2-e where:

- Solid waste contributes to 0.01% of total Scope 3 emission.
- Wastewater contributes to 4.54% of total Scope 3 emission.
- Business travel contributes to 95.46% of total Scope 3 emission.

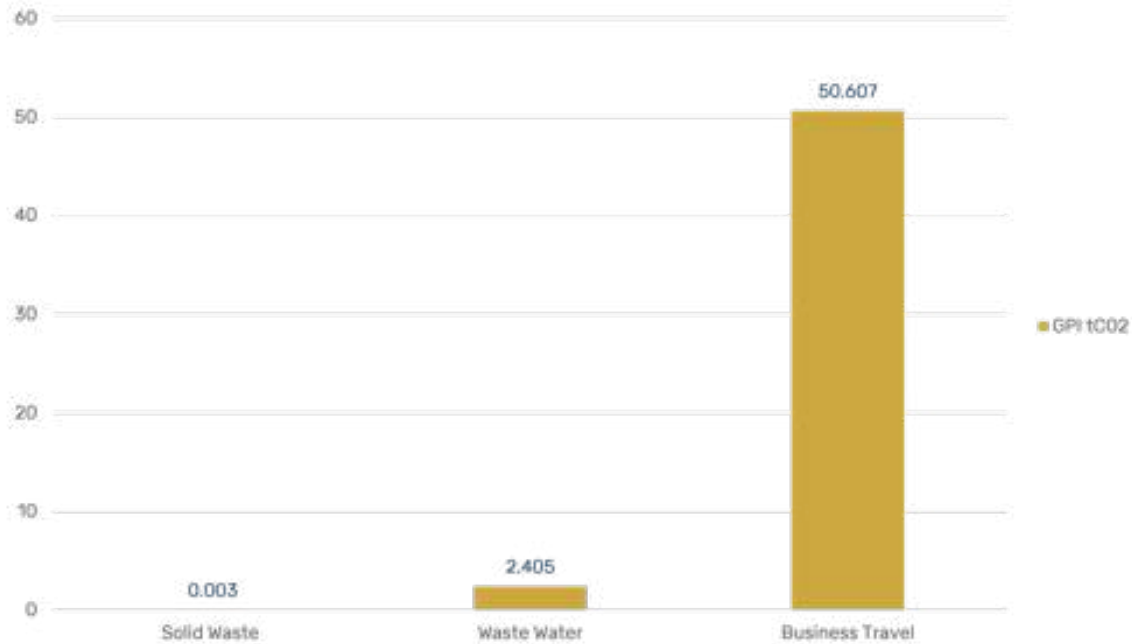

Figure 5. GHG Emissions Inventory of MYCL: Scope 3

MYCL highest Scope 3 GHG outputs (CO_2, N_2O, and CH_4) comes from business travel. The details of the three GHG outputs from Scope 3 are as follow:

- CO_2
  The highest CO_2 output is generated from business travel accounts for 6,864 tCO_2e.
- CH_4
  The highest CH_4 output comes from wastewater 325.8918 tCO_2e followed by waste 0.286252 tCO_2e.
- N_2O
  The highest Nitrous Oxide (N_2O) output comes from wastewater 0.31 tCO_2e.

Overall, CO_2 is the highest GHG output resulted from MYCL Scope 3 activities, attributed to 95.45858%.

Figure 6 below shows linkage of Scope 3 sources of emissions and the three GHG outputs (CO_2, N_2O, and CH_4) resulted from MYCL operational activities.

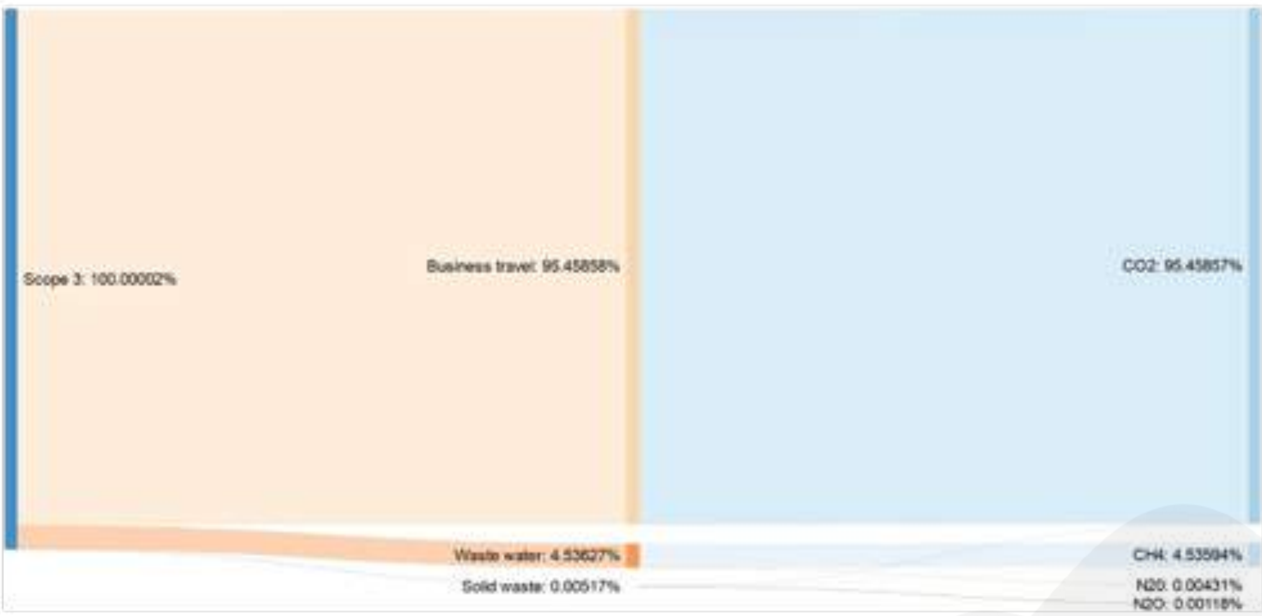

Figure 6. Scope 3 Sources of Emissions and The Three GHG Outputs (CO_2, N_2O, and CH_4

F. GHG Performance Indicators

GHG Performance Indicators (GPI) measures the quantity of GHG emitted (excluding Scope 3) for each m2 of production based on the reporting period. The GPI reflects on Eco-factory site for production processes (operational activities). Figure 7 shows the proportions of GPI of MYCL in tonnes of CO2e/m2

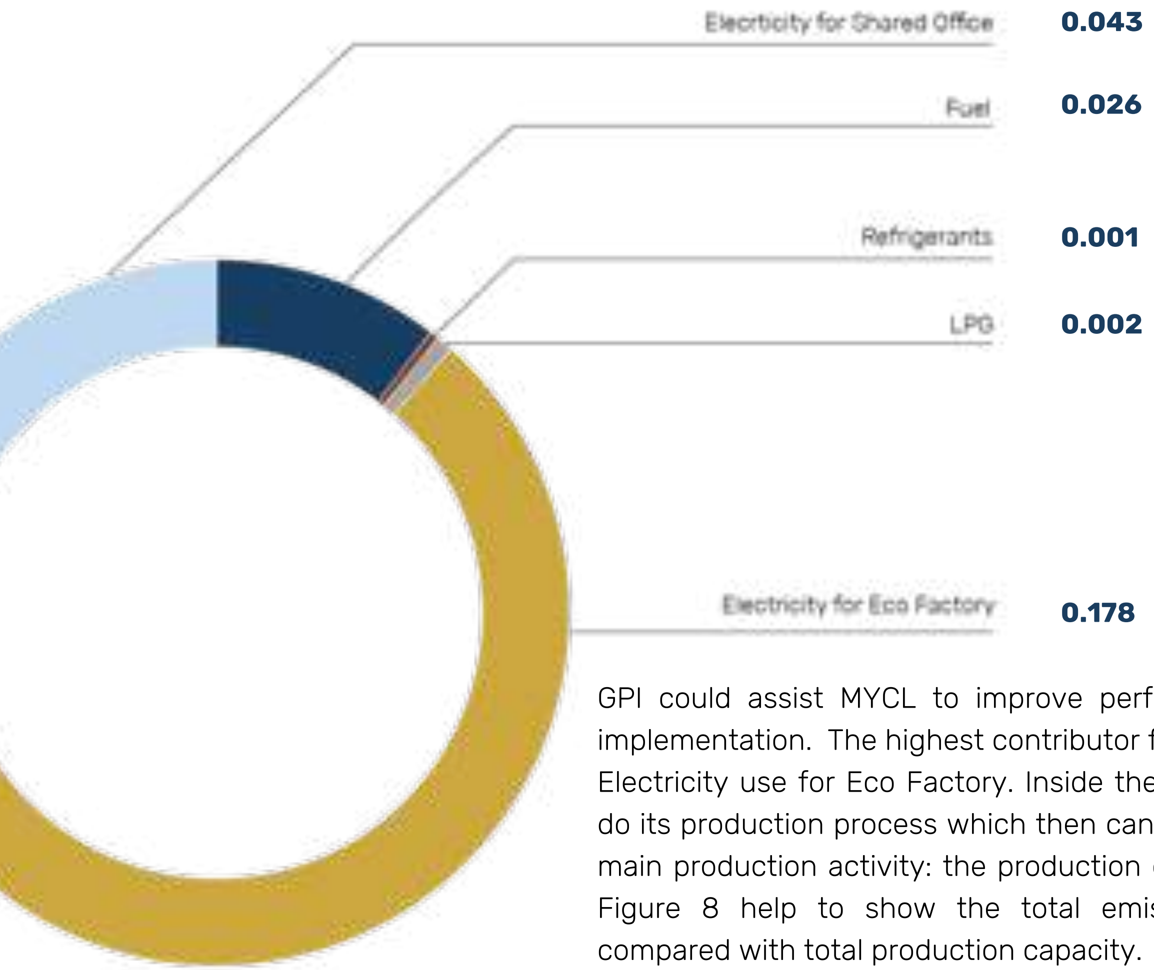

Figure 7. GPI of MYCL in Tonnes of CO2e/m2

GPI could assist MYCL to improve performance for future implementation. The highest contributor for the total of GPI is Electricity use for Eco Factory. Inside the eco-factory, MYCL do its production process which then can be divided into two main production activity: the production of Mylea and Biobo. Figure 8 help to show the total emissions per product compared with total production capacity.

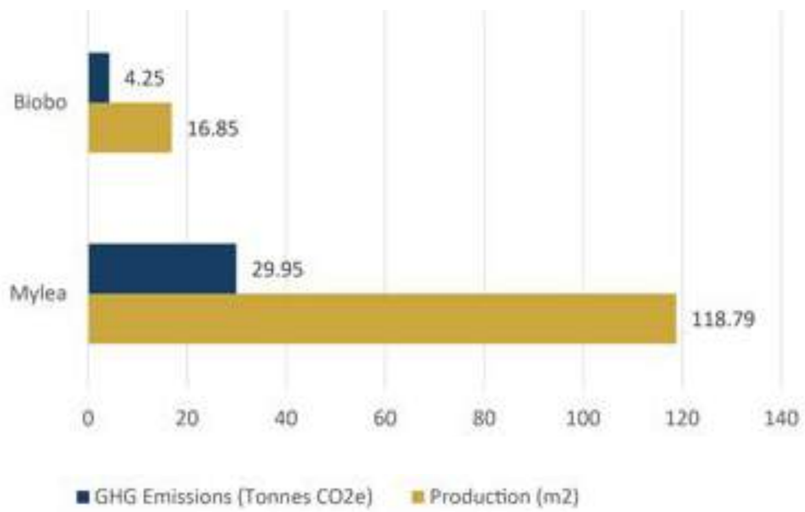

Figure 8. GHG Emissions per Product Compared to Production Capacity

G. Emission Projection

Emission Projection (Scope 2 - Electricity in Eco-Factory)

Emission projection estimates potential growth of MYCL's emissions. This report focuses only on emission resulted from consumption of electricity in Eco-Factory for Mylea and Biobo productions. The baseline measurement is electricity usage of Eco-Factory March 2019 – February 2020 (27,194 kWh) with the assumption that Mylea and Biobo consumed the same amount of electricity. Table 2 shows potential increase in scope 2, purchased electricity, up to 842 times higher than in 2019.

Table 2. Emission Projection

Emission Projection				
Year	Production (m2)		Scope 2 Emission Purchased electricity-Ecofactory (tCO2e)	Increase from 2019
	Mylea	Biobo		
2019	118.79	16.89	24.2	
2020	1.351	1.021	870.89	35.98
2021	4.449	2.425	2.194	90.68
2022	41.35	22.365	20.397	842.77

H. QA/QC, Uncertainty and Verification

Quality control and assurance is conducted through internal checking and review of the GHG measurement inventory spreadsheet calculations and report. No external verification/auditing of results by an independent third party is conducted for this reporting.

I. Appendix and Resources

Appendix

Fuel:
Emission Factor Fuel(3) is based on Energy Sector GHG Emission Inventory Data 2015 by Ministry of Energy and Mineral Resources. Energy content factor from the calorific value research by Geological Survey Center, Geology Agency, Bandung(4) - translated to Fuel Energy Density(5).

Gas:
Energy content factor is based on the calorific value Ministry of Energy and Mineral Resource(6)- translated to Fuel Energy Density. Emission Factor for gas(7) is based on Energy Sector GHG Emission Inventory Data 2015 by Ministry of Energy and Mineral Resources.

Electricity:
Emission Factor for purchased electricity is based on on-grid electricity grid GHG emission factor values in 2017, Jamali CM ex-post(8).

Solid waste:
Waste formulae is based on Municipal Solid Waste Management in Depok model(9) and Category 5: Waste Generated in Operations Scope 3(10).

Wastewater:
Wastewater formulae is based on City Inventory Reporting and Information System (CIRIS) (11).Business TravelBusiness travel formulae is based on various sources(12,13,14,15,16) and Category 6: Business Travel Scope 3(17).

Resource

(1) https://www.epa.gov/ghgemissions/overview-greenhouse-gases
(2) https://www.climatechangeinaustralia.gov.au/en/climate-campus/climate-system/greenhouse-gases/
(3) https://www.esdm.go.id/assets/media/content/KEI-Data_Inventory_Emisi_GRK_Sektor_Energi.pdf
(4) https://pdfs.semanticscholar.org/0dc0/3bb63feca012d17295ffcf9cf42f7b7b6e79.pdf
(5) http://w.astro.berkeley.edu/~wright/fuel_energy.html
(6) https://migas.esdm.go.id/uploads/Konversi-Mitan-GAS.pdf
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(12) https://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_5_Aircraft.pdf
(13) EF for line-haul locomotive EFDB IPCC 2006 database
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