



Climate Stewards



# Calculation of Savings in CO<sub>2</sub> Resulting from Closed - Loop Recycling of PET Plastic Project Assessment Report

## Summary

Using data supplied by Eco Brixs, Climate Stewards has calculated the avoided emissions from replacing PET plastic produced from virgin materials with recycled PET produced at Eco Brixs' recycling centre in Masaka, Uganda.

The comparison is based on the carbon emissions resulting from the production of one tonne of virgin PET (vPET) granulate, compared with the production of one tonne of recycled PET (rPET) by Eco Brixs.<sup>1</sup>

Eco Brixs provided data for three scenarios:<sup>2</sup>

1. Current production.
2. Anticipated production in six months.
3. Anticipated production in 2023 and onwards.

The results for the three scenarios are as follows:

	Emissions in tCO <sub>2</sub> e		
	Current	In 6 months	2023 onwards
<b>Avoided emissions per tonne of bottles recycled</b>	2.19	1.99	2.07
<b>Avoided emissions per tonne of rPET produced</b>	2.60	2.39	2.48

**Table 1 – Avoided Emissions**

The differences between the first scenario, and the second and third scenarios are due to energy usage currently being much lower than it will be in six months. In six months new machinery will be brought online increasing overall electricity consumption at the recycling centre. Although electricity consumption will increase by more than a factor of ten, the total carbon emissions due to that

<sup>1</sup> Climate Stewards has developed a Seal of Approval methodology for calculating the savings in CO<sub>2</sub> emissions resulting from closed-loop recycling of PET plastics. This methodology follows the UNFCCC methodology given in AMS-III.A.J.: Recovery and recycling of materials from solid wastes – Version 08.0.

<https://cdm.unfccc.int/methodologies/DB/ML2R31TXDR1YL6JEWVVGNLMHKX52YS> <sup>2</sup> The full analysis can be

found in the accompanying spreadsheet: Project Assessment - Avoided Emissions Calculation.xlsx

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consumption are still relatively low – hence only a modest change in avoided emissions.<sup>3</sup>The avoided emissions will fluctuate over time and the assessment should be updated annually to reflect the previous year’s operational activity.

### Avoided Emissions Calculation

On average, globally, the production of vPET granulate gives rise to average emissions of 2.66 tCO<sub>2</sub>e per tonne of vPET.<sup>4</sup>These emissions result from the extraction of natural resources and the energy used to turn those resources into PET granulate available to buyers at “the factory gate”. Onward processing is not considered.

In order to make a like-for-like comparison with the recycled PET produced by Eco Brixs the boundary of this assessment was also drawn at the factory gate i.e. the rPET flakes ready to sell and transport to clients.<sup>5</sup>[Note that as well as being the producer of rPET flakes, Eco Brixs is also a consumer of a proportion of its own output, using rPET flakes to produce new products. The carbon emissions associated with the production of those new products has not been considered, in the same way that the production of products using vPET granulate has not been included.]

Using the “Current production” scenario as an example, the result of the calculation above is based on Eco Brixs collecting 28.4 tonnes of bottles in an average month. Once the bottles have been sorted, cleaned and processed the result is 24 tonnes of recycled PET. The losses amount to 4.4 tonnes of material – mostly dirt and other contaminants that are removed during processing and which are not an additional source of carbon emissions.

This means that the only carbon emissions which need to be accounted for in rPET processing/production are those from transporting the bottles to the recycling centre, electricity from processing, disposal of waste etc. These carbon emissions amount to 1.61 tCO<sub>2</sub>e.

By comparison, producing 24 tonnes of virgin/new PET has associated emissions of 63.94 tCO<sub>2</sub>e. If those 24 tonnes of vPET were to be replaced with 24 tonnes of Eco Brixs’ rPET, the avoided emissions are the difference between 63.94 tCO<sub>2</sub>e and 1.61 tCO<sub>2</sub>e = 62.33 tCO<sub>2</sub>e.

The avoided emissions can be expressed as “Avoided emissions per tonne of collected bottles” and “Avoided emissions per tonne of recycled PET” – as shown in the table on page 1.

The difference between the two rows occurs because 24 tonnes of rPET requires inputs of 28.4 tonnes of plastic waste.

The emissions savings from using rPET compared to vPET are significant:

	<b>Current</b>	<b>In 6 months</b>	<b>2023 onwards</b>
<b>CO<sub>2</sub> savings of using rPET over using vPET</b>	97.5%	89.6%	93.2%

*Table 2 – CO<sub>2</sub> savings*

<sup>3</sup> Current average monthly electricity consumption is 4,200 kWh, this is projected to rise to 46,000 kWh in six months. The third scenario assumes equipment running at the full capacity of the on-site transformer. <sup>4</sup>This figure is an average based on reviewing a number of lifecycle analyses for PET granulate from publicly available databases.

<sup>5</sup>See the project methodology for the complete definition of the boundaries used for the analysis.

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These results compare favourably with estimates given elsewhere for the emissions savings from using recycled PET instead of virgin PET.<sup>6</sup>

For the three scenarios, annual quantities of bottles collected and processed, quantities of rPET produced, and total avoided emissions are as follows:

	<b>Current</b>	<b>In 6 months</b>	<b>2023 onwards</b>
<b>Annual tonnes of bottles collected and processed</b>	341	691	1,440
<b>Annual tonnes of rPET produced</b>	288	576	1,200
<b>Projected annual avoided emissions (tCO<sub>2</sub>e)</b>	748	1,375	2,981

**Table 3**

### Reporting

The Eco Brixs website shows that since 2017, 442 tonnes of plastic waste have been recycled in the Masaka recycling centre. Using the emissions saving from current production scenario indicates a total emissions saving of 970 tonnes of CO<sub>2</sub>e to date.

This amount of avoided CO<sub>2</sub> can be adjusted monthly using cumulative waste collection figures and the avoided emissions figures of 2.19 and 2.60 tCO<sub>2</sub>e from the “Current” column of Table 1. Once the new machinery is in place and in use in six months, the figures from the “In 6 months” column of Table 1 should be used for emissions calculations from that time forward.

As already mentioned, these figures should be reviewed on an annual basis, in particular with reference to transport mileage and energy consumption. To make those calculations simpler, it would be to Eco Brixs’ benefit to record actual mileage and electricity consumption on a monthly basis with the figures for energy consumption being taken in kWh from either a meter or energy bills as provided by the supplier.

<sup>6</sup> <https://plasticsrecycling.org/news-and-media/january-28-2019-apr-press-release> – gives an estimated reduction of 67% for rPET vs. vPET, and <https://www.alpla.com/en/pressrelease/2017/08/study-confirms-excellent-carbon-footprint-recycled-pet> gives an estimated emissions reduction of 79%.

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