WALKER'S RECYCLING

Verification of the avoided greenhouse gas emissions due to recycling activities at Walker's Recycling between July 2019 and June 2021.

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EXECUTIVE SUMMARY

The Green House conducted an independent verification of the avoided greenhouse gas (GHG) emissions due to the recovery and recycling activities at Walker's Recycling (C and E Logistics T/A Walker's Recycling).

Reporting period: 1 July 2019 - 30 June 2021

Methodology: GHG emissions avoided were estimated using the "closed loop approximation method" presented in the Greenhouse Gas Product Life Cycle Accounting and Reporting Standard, adhering to the project boundaries as discussed in the CDM Small-scale Methodologies AMS-III.AJ. and using DEFRA 2021 conversion factors.

Emission reductions achieved: 1,967 tonnes CO_2e (1 July – 31 December 2019: 541 tonnes CO_2e; 2020: 831 tonnes CO_2e; 1 January - 30 June 2021: 595 tonnes CO_2e).

Material	Life cycle emission savings (kg CO_2e / tonne material)	Emissions avoided 2019 (tonnes CO_2e)	Emissions avoided 2020 (tonnes CO_2e)	Emissions avoided 2021 (tonnes CO_2e)	Emissions avoided since last audit (tonnes CO_2e)
Glass	567	73	263	144	480
Aluminium cans	8,111	256	173	62	492
Steel cans	1,348	7	46	17	69
Carboard	1,123	23	46	126	195
Paper	1,201		14	21	35
PET	895	136	157	173	467
LDPE	791		11	9	18
HDPE	907	29	77	33	138
Polypropylene	551	6	30	12	48
Mixed plastics	777	13	13	0.2	26
TOTAL		541	831	595	1,967

Is the project real?

The project is real and operational.

Is the described technology in place and functioning in accordance with its design specification?

The Green House witnessed that recyclable material is collected and transported to the site in numerous vehicles. Here it is sorted, processed and stockpiled for sale using on-site equipment where required, before the processed material is transported and sold to numerous buyers. These operations divert waste that would otherwise have ended up on landfill.

Are the estimates of greenhouse gas emissions reduction reasonable in terms of accepted international standards and unbiased towards buyer or seller?

The estimates presented in this report are based on a life cycle view consistent with the appropriate internationally accepted standards and thus are a reasonable representation of the emissions avoided due to Walker's Recycling operations. The estimates are conservative with respect to the calculation of the avoided emissions achieved by the project.

Is there a discernible impact on poverty alleviation?

The project provides numerous jobs and is an accessible income opportunity in an impoverished area. It therefore has a discernible impact on poverty alleviation.

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1 INTRODUCTION

Walker's Recycling (C and E Logistics T/A Walker's Recycling) is a small family run business now located at 19 Steenbras Road, Sand Industria, Athlone, following a recent move from their Epping 2 premises. Eddie Walker started the business from his house in 2005, with a primary focus on recovering high value recyclables. The business has grown over the years and is now located in a mixed commercial and industrial area. The new premises have a large collection and sorting area, along with space for recycler skips, which allows for the effective sorting and storing of a range of materials for recycling. The ability to have recycler skips onsite allows Walker's to stockpile a greater volume of material, reducing delivery trips to recyclers. Material is collected through an extensive collection network, spanning restaurants, nightclubs, and other commercial sources throughout the greater Cape Town area.

The collected waste is sorted, processed if necessary and then sold to recycling companies for further processing and manufacturing of recycled goods. Through this process Walker's Recycling generates income for their employees and waste-pickers, reduces waste to landfill and avoids the need for production of virgin materials. Walker's currently has 10 permanent employees, along with a number of sorters who are employed part-time during peak periods or when Walker's are sub-contracted to sort household mixed recycling for an independent recycler. These actions uplift the community through income generation and result in avoided GHG emissions in the lifecycle of the processed materials.

The avoided GHG emissions have allowed the project to be registered under the Credible Carbon voluntary-market carbon registry, which trades certified African carbon projects that make a direct impact on poverty.

This report documents the verification process, conducted by The Green House, to confirm the avoided emissions and the eligibility of the project in terms of the Credible Carbon registration requirements. These requirements include answering the following questions:

- Is the project real?
- Is the described technology in place and functioning in accordance with its design specification?
- Are the estimates of greenhouse gas emission reductions reasonable in terms of accepted international standards and unbiased towards buyer or seller?
- Is there a discernible impact on poverty?

The report follows on from the previous verification conducted in October 2019, for the period January 2017 to June 2019, and covers the 24-month period from the start of July 2019 to the end of June 2021. The methodology for the independent assessment is described in Section 2, followed by the assessment findings in Section 3. Section 4 presents a set of recommendations.

2 VERIFICATION METHODOLOGY

Verification of Walker's Recycling ongoing activities and the avoided GHG emissions through recycling activities was undertaken through a site visit, data collection from available records and calculations based on the data. These steps are described below.

2.1 Site Visit

The Green House conducted a site visit on 14 June 2021 to meet with Eddie and Christopher Walker and numerous staff members at their new premises. The site, current operations and company assets were inspected and data records were obtained.

2.2 Data collection

The key data required to assess emissions savings is the tonnage of material recovered, disaggregated by material type. Although there is a scale located on site, it is not consistently used to measure the tonnages of waste material handled by Walker's Recycling. The tonnages of sorted material purchased by downstream processors are, however, available from their delivery dockets, and were used as the primary data source for the verification. The original paper or electronic versions of these dockets are stored on-site at Walker's Recycling. At present the data is not aggregated (either manually or on computer) and so the data contained in the original documents was used directly.

It is noted that this record keeping system is ineffective, as certain dockets may have been lost and therefore the tonnages logged in this study could be an underestimate of the tonnages processed by Walker's Recycling. Furthermore, the lack of any form of data back up or off-site data management could lead to issues with such verifications in the future.

Original paper versions of all company related fuel purchases for 2019, 2020 and 2021 were also obtained to test the hypothesis that fuel related emissions were negligible in comparison to the emissions avoided through recovery and recycling.

2.3 Calculation of GHG emissions avoided

The avoided GHG emissions from the recovery and recycling of material were estimated according to the "closed loop approximation method" as described in the Product Life Cycle Accounting and Reporting Standard[1] of the Greenhouse Gas Protocol (GGP), adhering to the project boundaries discussed in the Clean Development Mechanism (CDM) Small-scale Methodology: Recovery and recycling of materials from solid waste AMS-III.AJ[2]. The CDM methodology prescribes equations and values to calculate the emissions avoided due to recycling operations. The glass methodology, however, only includes the electricity saving corresponding to the preparation and mixing of raw materials prior to melting and encourages the submission of proposals to revise the glass methodology to include emissions avoided associated with raw material extraction and avoided process emissions from reduced use of

[1] Greenhouse Gas Protocol (undated), *Product Life Cycle Accounting and Reporting Standard,* World Resource Institute. Available from: http://www.ghgprotocol.org/product-standard#supporting-documents [Accessed July 2021]
[2] Clean Development Mechanism (2017), *Small-scale Methodologies: Recovery and recycling of materials from solid waste version 7.0,* UNFCCC. Available from https://cdm.unfccc.int/methodologies/DB/R22750M155F84YR0D4YVYOS0CLSCII [Accessed July 2021]

carbonated materials. As glass is one of the major materials recovered and recycled by Walker's Recycling (estimated to account for the second highest tonnes of avoided emissions after aluminium), the use of this methodology would underestimate their emissions avoided and as such the DEFRA 2021[3] emission conversion factors were applied to calculate all avoided emissions associated with glass recycling.

The avoided emissions were calculated by comparing the life cycle emissions of the relevant materials in a base case versus the recycled project case, as is required in both the GGP and CDM methodologies. The life cycle assessment considers the material's entire value chain, including raw material extraction, manufacturing processes, use and disposal. This ensures that all emissions produced in the recycling processes and downstream processing are accounted for.

The system boundary for both the base and project case is shown in Figure 1. The base case involves virgin material production, manufacturing, use and subsequent disposal to landfill. The assumption that all waste is sent to landfill (rather than, for example, incineration) is appropriate as the City of Cape Town, under which the Walker's Recycling collection area falls, disposes of all non-recycled waste to landfill. The project case consists of closed loop recycling, which occurs when recycled material substitutes for virgin material in a similar quality application. Over half (62% in 2019, 58% in 2020 and 38% in 2021, with an overall share of 53%) of emission savings relate to glass and metal, which when recycled substitutes directly for virgin material as in the closed loop recycling assumption. The recycled cardboard, paper and plastic materials may directly replace virgin material or be recycled to a lower-value product; however, it would still substitute for virgin material that would otherwise be used. Open-loop recycling results in greater emission savings per tonne of material recycled, as the processing requirements are lower and consequently the emissions associated with recyclate production are decreased. The application of the closed loop calculation method is therefore applicable and conservative.

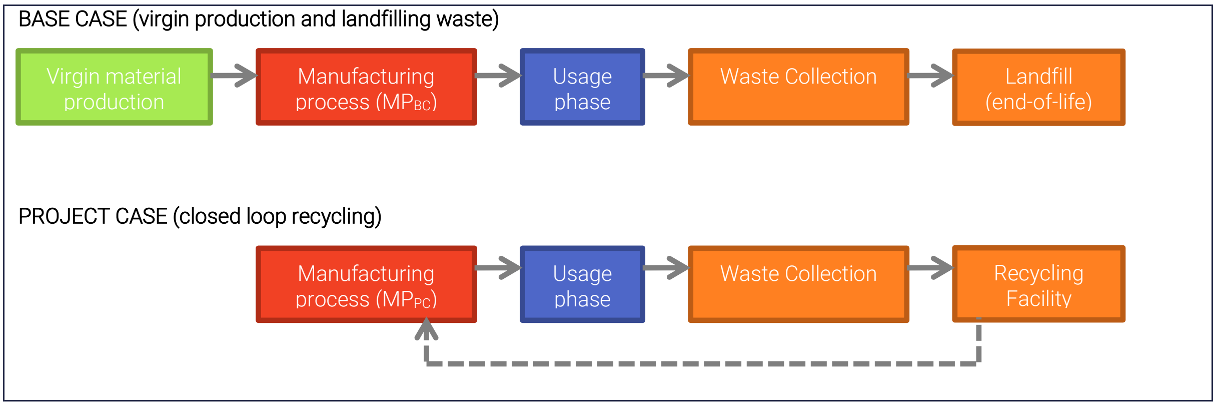

Figure 1: Process Map illustrating Base case vs. Project case

The DEFRA emission conversion factor database includes factors for "material use" and "material disposal". The material use factor includes extraction, primary processing, manufacture and transportation of material to the point of sale. The material disposal factor includes waste collection, transport and emissions associated with landfilling or recycling of the material. The usage phase emissions are common to both the base and project case and are consequently excluded. The avoided emissions factors were calculated using the following equation. Overall

[3] DEFRA (2018), *Government emission conversion factors for greenhouse gas company reporting - Conversion factors 2021*, United Kingdom. Available from: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021 [Accessed July 2021]

emissions avoided could then be calculated by multiplying the material's avoided emissions factor by the mass of material sold to the various downstream processors.

$$Avoided\ emissions\ factor = Base\ case\ emissions\ factor - Project\ case\ emissions\ factor$$

$$= (Virgin\ material\ production + Landfilling\ emissions) - (Closed\ loop\ source\ production + Closed\ loop\ recycling\ emissions)$$

DEFRA conversion factors were used to calculate the emissions associated with Walker's Recycling fuel use.

2.4 Limitations

It is acknowledged that the use of the UK emission conversion factors for calculations is not necessarily representative of the South African context, but at present there are no South African specific factors available and the data that is available does not allow for calculation of these factors. The UK factors are, however, expected to be conservative and underestimate the avoided emissions due to a number of factors, including:

- Electricity from the South African grid is produced mainly from coal and the South African electricity emissions intensity (0.93 kg CO_2e/kWh[4]) is therefore higher than the UK grid emissions intensity (0.21 kg CO_2e/kWh). As such, any electricity savings achieved by South African recycling operations would be associated with higher GHG emission savings than those achieved from the same electricity savings in the UK. The emission conversion factors presented by DEFRA present the life cycle emissions as a whole and therefore the emissions associated with electricity usage cannot be disaggregated and updated using the South African electricity emissions intensity factor.
- Landfill gas is widely captured and flared or utilised in the UK, reducing the GHG emissions from landfilling of material such as cardboard. Landfill gas capture is not widely used in South Africa and consequently avoided disposal would be associated with higher avoided emissions.

The Greenhouse Gas Protocol states that avoided landfill emissions are accounted for upstream, by the generator of the waste, and the reduced emissions from the use of recycled over virgin material are accounted for downstream, by the user of the recycled material. The emission reductions therefore do not form part of Walker's Recycling carbon footprint, meaning that there is a risk of double-counting the avoided emissions if upstream or downstream companies are claiming their associated emission reductions. For carbon credit projects such as this one it is important that the boundaries are clearly defined and that it is communicated to the downstream processor that the recycling emission reductions have already been accounted for by Walker's Recycling. Checks must also be done to ensure no other carbon credit projects overlap the boundary of this one.

[4] Calculated using the approach presented in the NBI *South Africa's Grid Emission Factor* report (NBI (2013), *South Africa's Grid Emission Factor,* MAC Consulting for Exxaro. Available from: http://www.nbi.org.za/wp-content/uploads/2016/08/South-Africas-Grid-Emission-Factor-Mar-13.pdf [July 2021]) and the latest Eskom data (Eskom (2020), *Eskom Integrated Report,* Johannesburg. Available from: https://www.eskom.co.za/OurCompany/Investors/IntegratedReports/Pages/Annual_Statements.aspx [July 2021]).

3 FINDINGS

The following findings of the assessment are reported.

3.1 Site visit

Site visits undertaken by The Green House confirmed that the project is in existence and that Walker's Recycling operates as a collector, sorter, processor, transporter and seller of recyclable waste. Transportation equipment, including trucks and trailers (Figure 2), were witnessed to be in an operational state and in use for both the collection of material and subsequent delivery to buyers. Observations were also made of the staff sorting and processing the received material (Figure 3), with stockpiles of material waiting to be transported to buyers being evident (Figure 4). Equipment, such as can compressors and scales, are used as required in this process. Discussion with the management team indicated that employment levels fluctuate depending on the time of year and amount of material available, with the operations currently employing 10 people full-time. The site visit also confirmed the operation to be occurring in an impoverished area and as such it provides an accessible income opportunity to help alleviate poverty.

Figure 2: Trailer used by Walker's for transport of small volume materials, alongside a Mpact skip for storage and delivery of cardboard

Figure 3: Workers processing recyclable material

Figure 4: Baled waste for delivery to recyclers

3.2 Data collection

Walker's Recycling provided delivery dockets from seven processors: Consol, SA Metal Group, Mpact, Extrupet, 3rd Element, New Heights Plastic and Atlantic Plastic Recycler's. These statements reflected the weight of various materials sold by Walker's Recycling and were used to establish the total tonnage of recyclables processed over the assessment period. A summary of the data is presented in

Table 1.

Table 1: Verified recyclate tonnages

Material	Recyclate buyer	2019 sales (tonnes)	2020 sales (tonnes)	2021 sales (tonnes)
Glass	Consol	128	464	254
	Total	128	464	254
Aluminium Cans	SA Metal Group	32	21	8
	Total	32	21	8
Steel Cans	SA Metal Group	5	34	13
	Total	5	34	13
Cardboard	3rd Element	0	18	15
	Mpact	20	23	97
	Total	20	41	112
Paper	3rd Element	0	12	17
	Total	0	12	17
PET plastic	ExtruPET	152	176	193
	Total	152	176	193
LDPE plastic	3rd Element	0	14	10
	Total	0	14	10
HDPE plastic	Atlantic Plastic Recyclers	31	33	0
	ExtruPET	0	24	22
	3rd Element	0	28	13
	Total	31	85	36
Polypropylene	3rd Element	0	21	1
	New Heights Plastic	10	34	21
	Total	10	55	22
Mixed plastic	Atlantic Plastic Recyclers	12	17	0
	New Heights Plastic	4	0,4	0,3
	Total	16	17	0,3

The businesses' fuel receipts for 2019, 2020 and 2021 were also collected and used to calculate emissions associated with transport.

3.3 Calculation of GHG emissions avoided

The total estimated GHG emissions avoided through the Walker's Recycling activities are 541, 831 and 595 tonnes CO_2e for 2019, 2020 and 2021 respectively. A detailed breakdown by material type is provided in Table 2, which shows the avoided emissions factor as well as the emissions avoided per material.

Table 2: Verified avoided GHG emissions

Material	Life cycle emission savings (kg CO_2e / tonne material)	Emissions avoided 2019 (tonnes CO_2e)	Emissions avoided 2020 (tonnes CO_2e)	Emissions avoided 2021 (tonnes CO_2e)	Emissions avoided since last audit (tonnes CO_2e)
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Both the 2019 and 2021 values reflect six months' data, while 2020 data reflects the entire year. The effective decrease in emission savings in 2020 can be attributed to the Coronavirus pandemic affecting operations and the amount of recyclable material produced by restaurants and other commercial entities.

The total fuel use, as obtained from the Walker's Recycling fuel receipts, along with the estimated emissions from the combustion of this fuel are presented in Table 3. As shown in Table 3, the emissions associated with fuel use are negligible (1%, 1.6% and 1% of their recycling emission savings for 2019, 2020 and 2021 respectively) in comparison to the recycling emission savings. Walker's Recycling fuel related emissions per tonne of recycled material is also compared to the DEFRA emission conversion factor for closed loop recycling 'material disposal', which is one of the values that is used in the calculations of the avoided emissions as indicated in the equation in Section 2.3. The comparison shows that Walker's Recycling transport related emissions are significantly lower than the DEFRA value of 21 kg CO_2e/tonne for transport and processing[5]. The use of the DEFRA emission factors thus gives results that are conservative.

Table 3: Total fuel use and related emissions and emission factors

Year	Fuel use (litres)	Fuel emissions (tonnes CO_2e)	Fuel emissions per tonne recycled material (kg CO_2e / tonne material sold)
2019	2,000	5.4	13.7
2020	4,963	13.4	14.6
2021	2,273	6.1	9.3

[5] The DEFRA factor includes emissions associated with the transport of material, assuming an average collection distance of 50 km, and the energy needs for limited processing at the recycling facility

3.4 Response to the Credible Carbon Registry questions

In light of the above, The Green House provides the following responses to the Credible Carbon Registry assessment questions:

Is the project real?

The project is real and operational.

Is the described technology in place and functioning in accordance with its design specification?

The Green House witnessed that recyclable material is collected and transported to the warehouse in numerous vehicles. Here it is sorted, processed and stockpiled for sale using on-site equipment where needed, before the processed material is transported and sold to numerous buyers. These operations divert waste that would otherwise have ended up in landfill sites.

Are the estimates of greenhouse gas emissions reduction reasonable in terms of accepted international standards and unbiased towards buyer or seller?

The estimates presented in this report are based on a life cycle view consistent with the appropriate internationally accepted standards and thus are a reasonable representation of the emissions avoided due to Walker's Recycling operations. The estimates are conservative with respect to the avoided emissions achieved by the project.

Is there a discernible impact on poverty?

The project provides numerous jobs and is an accessible income opportunity in an impoverished area. It therefore makes a discernible impact on poverty.

4 RECOMMENDATIONS

The following are offered for consideration regarding future operations and assessments at Walker's Recycling:

- The data filing and recording system needs to record tonnages sold and it is recommended that this be done digitally[6]. This recording would streamline future audits and ensure that data, and the subsequent carbon credits, are not lost. Lastly, it is recommended that a back-up of statements and records is kept off-site or in the cloud.
- If South African specific emission factors become available, these must be used to ensure more representative emission calculations. Due to the conservative nature of the DEFRA emission factors (see Section 2.4), use of local emission factors will most likely increase the calculated avoided emissions.
- The claimed recycling credits involve the risk of double counting if the upstream producers or downstream purchasers of the recycled material claim the avoided emissions. Walker's Recycling should be aware that ownership of the emission savings might require negotiation in the future.

[6] The site visit confirmed that the equipment is in place to allow digital recording of data.

- This is not an issue in the current audit, as no recycling carbon credits have been registered in South Africa under the Verified Carbon Standard (VCS)[7], Gold Standard[8] or Clean Development Mechanism (CDM)[9] programmes that would result in the double counting of Walker's emission savings

[7] https://www.vcsprojectdatabase.org/#/home
[8] https://registry.goldstandard.org/projects?q=south+africa&page=1
[9] https://cdm.unfccc.int/Projects/projsearch.html