



**Verified Carbon
Standard**

A VERRA STANDARD

3RD MONITORING REPORT: RECIPE FOR CHANGE GROUPED PROJECT

wonderbag.

Document Prepared by Promethium Carbon

Contact Information

Project Title	Recipe for Change Grouped Project
Version	7
Report ID	Recipe for Change: 3 rd Monitoring Report
Date of Issue	17-July-2024
Project ID	2384
Monitoring Period	01-May-2022 to 30-April-2023
Prepared By	Promethium Carbon on behalf of Wonderbag UK Limited
Contact	Wonderbag UK Limited Physical address: Estuary House, Sea Wall, Whitstable, England, CT5 1BX



Telephone: +2782 340 5583

Email: sarah@wonderbagworld.com

Website: www.wonderbagworld.com

CONTENTS

1	PROJECT DETAILS.....	5
1.1	Summary Description of the Implementation Status of the Project	5
1.2	Sectoral Scope and Project Type	7
1.3	Project Proponent	7
1.4	Other Entities Involved in the Project	7
1.5	Project Start Date	8
1.6	Project Crediting Period	9
1.7	Project Location	10
1.8	Title and Reference of Methodology	12
1.9	Participation under other GHG Programs.....	17
1.10	Other Forms of Credit and Supply Chain (Scope 3) Emissions	17
1.11	Sustainable Development Contributions	18
2	SAFEGUARDS	21
2.1	No Net Harm	21
2.2	Local Stakeholder Consultation	22
2.3	AFOLU-Specific Safeguards	24
3	IMPLEMENTATION STATUS	25
3.1	Implementation Status of the Project Activity	25
3.2	Deviations	26
3.3	Grouped Projects	32
4	DATA AND PARAMETERS.....	47
4.1	Data and Parameters Available at Validation	47
4.2	Data and Parameters Monitored.....	54
4.3	Monitoring Plan.....	67
5	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	85
5.1	Baseline Emissions	85
5.2	Project Emissions	92
5.3	Leakage.....	98
5.4	Net GHG Emission Reductions and Removals	98
	APPENDIX A: SUSTAINABLE DEVELOPMENT CONTRIBUTIONS SUPPORTING INFORMATION	105

SD Impact 2: Reduced monetary (ZAR) spending on cooking fuels.....	105
SD Impact 3: Reduction in poverty through provision of economic resources.....	108
SD Impact 4: Number of entrepreneurs, champions/ data monitors that are created within the Wonderbag eco-system.....	109
SD Impact 5: Tonnes of recycled foam used in the manufacturing of Wonderbags	109
SD Impact 6: Tonnes of greenhouse gas emissions avoided or removed	109
SD Impact 7: Tonnes of avoided biomass combustion	109

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

This is the third monitoring report for the Recipe for Change Grouped Project, covering the period 1 May 2022 to 30 April 2023.

The Grouped Project consists of the adoption of the Wonderbag heat-retention cooking devices in kitchens throughout the Republic of South Africa.

The Grouped Project is managed by Wonderbag UK Limited. Wonderbag often outsources the distribution of bags to third parties. Wonderbag is also responsible for the production of the bags, which is undertaken either in-house or subcontracted.

The Wonderbags allow for slow-cooking of nutritious meals in an easy, safe and energy efficient manner. Wonderbags have health, social and environmental and climate benefits associated with reduced fuel consumption for cooking purposes. In particular, women and girls in South Africa are disproportionately burdened with the unpaid labour of collecting fuels and for the cooking of meals. Wonderbags save time, money and fuel when cooking, providing for the opportunity to use these resources in more productive ways such as pursuing education and employment opportunities.

Summary of the implemented activities: Nineteen small-scale Project Activity Instances, that contain a maximum of 20,000 bags each, were in operation under the Grouped Project during the monitoring period.

There were 370,319 Wonderbags distributed into the field in this monitoring period.

Implementation dates: The Group Project and the first Recipe for Change (RfC) Project Activity Instance were initiated by a roll-out of Wonderbags on 15 March 2019. The total emission reductions from all the Project Activity Instances in the Group Project during the monitoring period are as follows:

GHG emission reductions in this monitoring period:

Year	Total Emission Reductions (tCO ₂ e)
2022	120,708
2023	62,727
Total	183,434
Annual Average	169,324

GHG emission reductions in this monitoring period:

PAI	2022	2023	Total (tCO ₂ e)
RfC1	8,916	4,361	13,277
RfC2	9,006	4,405	13,411
RfC3	8,951	4,378	13,328
RfC4	8,819	4,314	13,133
RfC5	6,682	4,314	9,954
RfC6	9,083	4,442	13,525
RfC7	5,686	2,785	8,472
RfC8	5,785	2,834	8,619
RfC9	5,803	2,842	8,645
RfC10	6,395	3,132	9,527
RfC11	6,650	3,257	9,907
RfC12	6,545	3,206	9,750
RfC13	6,301	3,086	9,387
RfC14	6,290	3,081	9,371
RfC15	6,670	3,267	9,937
RfC16	5,495	3,114	8,609
RfC17	3,872	2,793	6,664
RfC18	3,004	2,802	5,806
RfC19	754	1,357	2,111
Total	120,708	62,727	183,434

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification MR 1	15-March-2019 – 31-March-2021	VCS	Carbon Check	3

Verification MR 2	01-April-2021 – 30-April-2022	VCS	TÜV SÜD South Asia Private Limited	1
Verification MR 3	01-May-2022 – 30-April-2023	VCS	Carbon Check	1
Total	15-March-2019 – 30-April-2023	VCS		5

1.2 Sectoral Scope and Project Type

Scope 3: Energy demand, specifically demand side energy efficiency.

Project type: Group project, entailing energy efficient heat retention bags.

1.3 Project Proponent

Organization name	Wonderbag UK
Contact person	Sarah Collins
Title	Chief Executive Officer
Address	Estuary House, Sea Wall, Whitstable, England, CT5 1BX
Telephone	+2782 340 5583
Email	sarah@wonderbagworld.com

1.4 Other Entities Involved in the Project

Organization name	Promethium Carbon
Role in the Project	Development of VCS documentation; assistance in registration
Contact person	Robbie Louw
Title	Director
Address	1 st Floor, Block 2, 32 Peter Place Bryanston, 2060, Johannesburg, South Africa
Telephone	+27 11 706 8185
Email	robbie@promethium.co.za

1.5 Project Start Date

The Group Project start date is 15 March 2019. This is the date in 2019 on which Wonderbag undertook a series of activations.

The following table outlines the start dates of the included project activity instances.

Project Activity Instance	Project start date
RfC1	15 March 2019
RfC2	15 March 2019
RfC3	15 March 2019
RfC4	15 March 2019
RfC5	15 March 2019
RfC6	16 March 2019
RfC7	16 June 2020
RfC8	01 July 2020
RfC9	03 July 2020
RfC10	28 April 2021
RfC11	10 February 2021
RfC12	26 November 2021
RfC13	25 January 2022
RfC14	27 February 2022
RfC15	02 April 2022
RfC16	08 February 2021
RfC17	06 July 2022
RfC18	03 August 2022
RfC19	25 September 2022

1.6 Project Crediting Period

The Grouped Project has a renewable crediting period:

- Total number of years: 7 years, renewable twice.
- Start and end date of first crediting period for the Group Project: 15 March 2019 to 14 March 2026 (total 7 years).

The Project Activity Instances have seven-year renewable crediting periods, renewable twice.

The crediting period start dates are the same as the project start dates outlined above.

Project Activity Instance	1st crediting period start date	1st crediting period end date
RfC1	15 March 2019	14 March 2026
RfC2	15 March 2019	14 March 2026
RfC3	15 March 2019	14 March 2026
RfC4	15 March 2019	14 March 2026
RfC5	15 March 2019	14 March 2026
RfC6	16 March 2019	14 March 2026
RfC7	16 June 2020	14 March 2026
RfC8	01 July 2020	14 March 2026
RfC9	03 July 2020	14 March 2026
RfC10	28 April 2021	14 March 2026
RfC11	10 February 2021	14 March 2026
RfC12	26 November 2021	14 March 2026
RfC13	25 January 2022	14 March 2026
RfC14	27 February 2022	14 March 2026
RfC15	02 April 2022	14 March 2026
RfC16	08 February 2021	14 March 2026
RfC17	06 July 2022	14 March 2026
RfC18	03 August 2022	14 March 2026
RfC19	25 September 2022	14 March 2026

1.7 Project Location

The Project Activity Instances are located across the Republic of South Africa, in each province, as shown in the following figure.



Figure 1 Grouped Project Location

The following are the GPS coordinates for the provinces:

- Western Cape: -32.42, 21.92
- Eastern Cape: -32.09, 26.40
- KwaZulu-Natal: -28.31, 30.92
- Mpumalanga: -25.56, 30.53
- Limpopo: -23.29, 29.40
- North-West: -26.54, 25.31
- Gauteng: -26.14, 28.14
- Free State: -28.45, 26.80
- Northern Cape: -29.04, 21.86

The following table outlines the provinces, per Project Activity Instance, where Wonderbags have been distributed:

Project Activity Instance	Province
RfC1, RfC2, RfC3, RfC4, RfC5, RfC6, RfC7, RfC9, RfC10, RfC11, RfC12, RfC13, RfC14, RfC17	1. Eastern Cape 2. Free State 3. Gauteng 4. KwaZulu Natal 5. Limpopo 6. Mpumalanga 7. North West 8. Northern Cape 9. Western Cape
RfC8	1. Eastern Cape 2. Free State 3. Gauteng 4. KwaZulu Natal 5. Limpopo 6. Mpumalanga 7. Western Cape
RfC15	1. Eastern Cape 2. Free State 3. Gauteng 4. KwaZulu Natal 5. Mpumalanga 6. North West 7. Northern Cape 8. Western Cape

Project Activity Instance	Province
RfC16, RfC18	1. Eastern Cape 2. Free State 3. Gauteng 4. KwaZulu Natal 5. North West 6. Northern Cape 7. Western Cape
RfC19	1. Eastern Cape 2. Gauteng 3. KwaZulu Natal 4. Limpopo 5. Mpumalanga 6. North West 7. Western Cape

1.8 Title and Reference of Methodology

All Project Activity Instances in this monitoring report use both of the following two UNFCCC approved small-scale methodologies:

- AMS-II.C. “Demand-side energy efficiency activities for specific technologies” (Version 15.0)¹
- AMS-II.G. “Energy efficiency measures in thermal applications of non-renewable biomass” (Version 11.1)²

All prior and preceding references to AMS-II.G. in this monitoring report refer to the respective versions of the methodologies stated above.

The associated tools and guideline documents in all Project Activity Instances in this monitoring report include:

¹ Available at: <https://cdm.unfccc.int/methodologies/DB/7Y44EN2RTD02AJ78JVWCGARE8W64KP>.

² Available at: <https://cdm.unfccc.int/methodologies/DB/10PELMPDW951SVSW1B2NRCQEBAX96C>.

- CDM TOOL21 “Demonstration of additionality of small-scale project activities” Version 13.1³,
- CDM TOOL30 “Calculation of the fraction of non-renewable biomass” Version 03.0⁴,
- CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities” version 04.0⁵,
- CDM Standard “Sampling and surveys for CDM project activities and programmes of activities” version 08.0⁶,
- CDM “Non-binding best practice examples to demonstrate additionality for SSC project activities” Version 01.0⁷.

All prior and preceding references to the tools in this project description refer to the respective versions of the documents stated above.

All Project Activity Instances in this monitoring report use of the following standardized baseline:

- ASB0040-2018 Standardized baseline: Grid emission factor for Southern African Power Pool, Version 01.0⁸

All prior and preceding references to the standardized baseline refer to the version of the standardized baseline stated above.

Applicability of AMS-II.G.

AMS-II.G. is applicable to all project activity instances within this grouped project as demonstrated below.

Para 2 of version 11.1 of the methodology outlines the scope requirements and states that “This methodology comprises efficiency improvements in thermal applications of non-renewable biomass. Examples of applicable technologies and measures include the introduction of high efficiency biomass fired project devices (cookstoves or ovens or dryers) to replace the existing devices and/or energy efficiency improvements in existing biomass fired cookstoves or ovens or dryers.”

³ Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf>.

⁴ Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v3.0.pdf>.

⁵ Available at: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20151023152925164-Meth_GC48_-ver04.0-.pdf/Meth_GC48_%28ver04.0%29?t=dXp8cXBLOImfDAoZWl3jtPK-YHzdn-s1Q9I.

⁶ Available at: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20191129115244333-Meth_stan05.pdf/Meth_stan05.pdf?t=SEZ8cXBLOGM1fDCBptKtanuMrwWQpUVsX2bm.

⁷ Available at: https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid15_v01.pdf.

⁸ Available at: https://cdm.unfccc.int/methodologies/standard_base/2015/sb131.html.

Wonderbag improves the energy efficiency of existing biomass fired devices and therefore complies with this paragraph.

Para 3 also outlines the scope requirements and states “In the case of cookstoves, the methodology is applicable to the introduction of single pot or multi pot portable or in-sit cookstoves with rates efficiency of at least 20 per cent...”. Wonderbag does not introduce new cookstoves but improves existing biomass fired units as discussed above. The Wonderbag is a heat retention device and as such a Water Boil Test cannot be conducted to determine a thermal efficiency. Accordingly, this scope requirement is not applicable to the Wonderbag group project.

However, as per para 2 of the methodology, the Wonderbag units are measures that result in improvements in thermal applications of non-renewable biomass. This efficiency can be demonstrated. Efficiency is fundamentally defined as the ratio of output and input. In the case of this project, the output can be defined as one fully cooked meal for the household. The input would be the quantity of fuel required to cook the meal. In the baseline, the wood consumption was established to be 2.96 tonnes/year. After the introduction of the Wonderbag, the wood consumption in the latest monitoring survey indicates a decrease to 1.47 tonnes/year. Since the output remained the same, efficiency would increase due to the reduction in input energy required.

Assuming a 3 stone fire baseline efficiency of 15%, as per the CDM default value Tool33, version 2, a new estimated efficiency can be calculated for the baseline stove plus Wonderbag as 23%. This complies with the requirements in paragraph 3 of Version 11.1 of AMS-II.G.

The new estimated efficiency was calculated as follows:

$$\eta_{\text{new}} = \eta_{\text{old}} * (1 + \Delta\eta)$$

$$\eta_{\text{new}} = 15\% * (1 + 50\%)$$

$$\eta_{\text{new}} = 23\%$$

Where the change in efficiency is calculated as the change in fuel consumption. Since the output, one fully cooked meal, remains the same in both instances. The change in efficiency is directly proportional to the change in useful energy or fuel consumption.

$$\Delta\eta = \left(\frac{B_{\text{new}}}{B_{\text{old}}} - 1 \right) \times 100$$

$$\Delta\eta = \left(\frac{1.47 \frac{\text{tonnes}}{\text{year}}}{2.96 \frac{\text{tonnes}}{\text{year}}} - 1 \right) \times 100$$

$$\Delta\eta = 50\%$$

The grouped project's compliance with the applicability conditions of AMS-II.G version 11.1 is shown in the table below.

No.	Relevant applicability condition	Compliance at each Project Activity Instance
1	The aggregated energy savings of a single project activity shall not exceed the equivalent of 60GWh per year or 180GWh thermal per year in fuel input.	Complies. Each project activity instance will be limited to a maximum of 20,000 Wonderbags in order to remain below this threshold. A single Wonderbag is estimated to save 0.020TJ and the 180GWh thermal is equivalent to 648TJ. A single project activity instance of 20,000 Wonderbags would therefore save approximately 400TJ.
2	Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	Complies. The annual trend for natural forest in South Africa shows a decrease since 1990.
3	For cases where the biomass is sourced from renewable sources, the project participants should use a corresponding Type I methodology.	Not applicable. Only non-renewable biomass is considered in this project.
4	If the project device requires a specific fuel for this device (e.g. briquettes, pellets, woodchips), the consumption of the fuel should be monitored during the crediting period.	Complies. The Wonderbag does not require a specific fuel. It is used in conjunction with the existing cooking system. The consumption of the fuel used will be monitored through surveys during the crediting period.
5	The project description shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations.	Complies. The method of distribution of Wonderbags is described in Section 1.11 of the registered Project Description. Each Wonderbag is issued with a unique ID which avoids double counting.
6.	The project description shall explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	Wonderbag UK Ltd is the only manufacturer of the Wonderbag and keeps records of all manufactured Wonderbags using a unique ID for each bag. A distribution agreement is signed by all distribution partners stating that they will not claim any emission reductions from the distributed Wonderbags.

Applicability of AMS-II.C.

The grouped project's compliance with the applicability conditions of AMS-II.C version 15 is shown in the table below.

No.	Relevant applicability condition	Compliance at each Project Activity Instance
1	This methodology is only applicable if the service level (e.g. rated capacity or output) of the installed, project energy-efficient equipment is between 90% and 150% of the service level of the baseline equipment. Examples of service levels are light output for lighting equipment, water output and temperature for water heating systems, and rated thermal output capacity of air conditioners. The relationship of the service level of the project energy-efficient equipment to the baseline equipment can be one to one replacement (e.g. replacement of inefficient refrigerator with new and efficient refrigerator) or many-to-one (e.g. replacement of small multiple chillers with a central chiller plant). In the latter case, the service level of the project and baseline can be compared on an aggregate basis.	Complies. The service levels of both the Wonderbags and stoves are the cooking of food. The service levels of the installed heat-retaining Wonderbags is 100% of the service level of the stoves used to cook a household's food (i.e. baseline equipment). The relationship of the service level of the Wonderbags to the stoves can be a one to one replacement, for example where a Wonderbag affects the use of a single stove plate. An example of this scenario is the typical paraffin or LPG burners used to cook food, which consists of a single plate, upon which a pot/pan is used to cook food. The relationship of the service level of the Wonderbags to the stoves can also be many-to-one, for example where multiple Wonderbags are installed. In the latter case, the service level of the project and baseline is compared on an aggregate basis.
2	In the event that project output in year y is greater than the average historical output (average of the three most recent years prior to the project implementation ⁹) and the demonstration of the baseline for the incremental capacity is not undertaken, the value of the output in year y is capped at the value of the historical average output level.	Complies. The output (use of the Wonderbags to cook food) will not increase because the meals per adult equivalent will not increase due to the project activities and therefore the fuels used to cook said meals will not increase.
3	If the energy-efficient equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	Not applicable: the Wonderbag does not make use of any refrigerants.

⁹ A maximum of +10% variation is permitted.

No.	Relevant applicability condition	Compliance at each Project Activity Instance
4	This methodology credits emission reductions only due to the reduction in electricity and/or fossil fuel consumption from use of more efficient equipment. However, the calculation of project emissions shall include any incremental emissions, as compared to the baseline, associated with refrigerants used in the project equipment.	Not applicable: the Wonderbag does not make use of any refrigerants.
5	The aggregate energy savings by a single project may not exceed the equivalent of 60GWh per year for electricity end-use energy efficiency technologies. For fossil fuel end-use energy efficiency technologies, the limit is 180 GWh thermal per year in fuel input.	Complies. A single Wonderbag is estimated to save approximately 0.001TJ, 0.0001TJ and 0.00013TJ for coal, LPG and paraffin respectively. A single project activity instance of 20,000 Wonderbags would therefore save 20TJ, 2TJ and 2.6TJ respectively. All of these fall below the threshold of 180GWh thermal converted to 648TJ. In the case of electricity, a single Wonderbag is estimated to save 0.0002GWh. A single project activity instance of 20,000 Wonderbags therefore saves 4GWh which falls below the threshold of 60GWh

1.9 Participation under other GHG Programs

None of the Project Activity Instances in this monitoring report have been registered under any other greenhouse gas programme and are not seeking registration under any other greenhouse gas programme. Wonderbag is however currently applying for a joint registration and verification of indicators related to the Sustainable Development Goals (SDGs), through Verra's SD VSta programme.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

Emission Trading Programs and Other Binding Limits: None of the Project Activity Instances in this monitoring report have been included in an emissions trading program or any other mechanism that includes GHG allowance trading during this monitoring period. None of the Project Activity Instances have been used for compliance under such programs or mechanisms.

Other Forms of Environmental Credit: None of the Project Activity Instances in this monitoring report have sought or received another form of greenhouse gas-related environmental credit, including renewable energy certificates, during this monitoring period. None of the Project Activity Instances are eligible to create another form of greenhouse gas-related environment credit.

1.11 Sustainable Development Contributions

Apart from fuel and emissions savings, the use of Wonderbags has many other benefits for the household, the community and the world at large. It contributes to sustainable development in South Africa through:

- Increased time (minutes) savings for the person cooking, per Wonderbag
- Reduced monetary (ZAR) spending on cooking fuels
- Reducing time spent on unpaid domestic and care work, by sex, age and location
- Full-time employment of staff by Wonderbag
- Recycling of materials used to manufacture the bags
- Progress towards sustainable forest management through avoided biomass combustion

The Recipe for Change Grouped Project is in the process of SD VISTA validation and verification. Hence, demonstration of contribution to the United Nations Sustainable Development Goals is reflected in that process and documentation.

In order to provide a clear overview of our project's impact, the table below highlights the quantifiable contributions made towards specific targets and indicators of the SDGs during the monitoring period.

Verra provided a three-year grace period for the reporting of sustainable impacts under the VCS, for projects registered before 20 January 2023¹⁰. Accordingly, this is Wonderbag's first year of reporting impacts under the VCS and the current contributions and the lifetime contributions are therefore the same values.

¹⁰ VCS V4 Public Consultation Summary of Comments. Summary of Public Comments: Proposal for Mandatory Sustainable Development Contributions Reporting. 20 January 2022.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1	Reduced time (hours) spent on cooking, using a Wonderbag	Implemented activities to decrease	The use of Wonderbags for cooking reduces the amount of time used for both collecting cooking fuel, especially wood, and for cooking, compared to the baseline scenario. The baseline scenario is cooking without the use of a Wonderbag. This is a highly valued benefit for the household as fuel collectors, particularly when collecting wood, and cooks now add productive time to their working day.	This value has not yet been monitored.
2)	1	Reduced monetary (ZAR) spending on cooking fuels	Implemented activities to decrease	By supplying Wonderbags and the use thereof, there was a reduction in the requirements for using cooking fuels and thus monetary spending as a result, of ZAR 232,432,329.	Since monitoring of SD impacts began for VCS, by supplying Wonderbags and the use thereof, there was a reduction in the requirements for using cooking fuels and thus monetary spending as a result, of ZAR 232,432,329.
3)	1	Reduction in poverty through provision of economic resources	Implemented activities to decrease	Donations made to communities in need totalled ZAR 852,215.	Since monitoring of SD impacts began for VCS, donations made to communities in need totalled ZAR 852,215.

4)	8	Number of entrepreneurs, champions/ data monitors that are created within the Wonderbag eco-system	Implemented activities to increase	527 entrepreneurs were employed during the monitoring period.	527 entrepreneurs have been created since monitoring of this impact started on the project.
5)	12	Tonnes of recycled foam used in the manufacturing of Wonderbags	Implemented activities to increase	109 tonnes of recycled foam were used in the manufacturing of Wonderbags.	Since monitoring of SD impacts began for VCS started, 109 tonnes of recycled foam have been used in the manufacturing of Wonderbags.
6)	13	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	During the monitoring period, the total emission reductions for the project were calculated as 197,659 tCO ₂ e.	Since monitoring of SD impacts began for VCS, 197,659 tCO ₂ e in emission reductions have been calculated.
7)	15	Tonnes of avoided biomass combustion	Implemented activities to increase	The use of Wonderbags in communities has led to approximately 84,769 tonnes of avoided biomass use that would otherwise have been combusted.	Since monitoring of SD impacts began for VCS, the use of Wonderbags in communities has led to approximately 84,769 tonnes of avoided biomass use that would otherwise have been combusted.

2 SAFEGUARDS

2.1 No Net Harm

Under South African law and regulation, none of the activities or processes relating to the manufacture or distribution of Wonderbags require Environmental Impact Assessments. The relevant law and regulations are found in section 53(1) of the National Environmental Management: Biodiversity Act (No. 10) 2004, and in sections 24 and 24D of the National Environmental Management Act (1998); specifically, notices No. R. 386 and R. 387 (2006). The 25 activities (under Notice 386) and 10 activities (under Notice 387) that require environmental impact assessments do not include any activities related to Wonderbag.

The lack of regulation requiring Wonderbag to undertake environmental impact assessments supports the assertion that there are no potential negative environmental impacts related to the manufacture or use of a Wonderbag. Wonderbags are manufactured using recycled materials, further supporting the statement that their use contributes to resource efficiencies and a circular economy, which benefit the environment. The use of Wonderbags to reduce the use of cooking fuels, particularly biomass, is well established. Reducing the use of non-renewable biomass for cooking is particularly important for preserving biodiversity and for reducing greenhouse gas emissions resulting from the combustion of biomass.

Furthermore, there are no negative socio-economic impacts related to the use of a Wonderbag. Rather, the use of Wonderbags has positive social-economic impacts. These positive impacts include:

- 1) Increased time (minutes) savings for the person cooking, per Wonderbag
- 2) Reduced monetary (ZAR) spending on cooking fuels
- 3) Reducing time spent on unpaid domestic and care work, by sex, age and location
- 4) Full-time employment of staff by Wonderbag
- 5) Recycling of materials used to manufacture the bags
- 6) Tonnes of greenhouse gas emissions removed from the atmosphere
- 7) Progress towards sustainable forest management through avoided biomass combustion

Points 1 – 3 are notable because they may increase disposable income which can contribute to socio-economic development. For example, such household members may defer their monetary and time saving to other activities, such as education or livelihoods. These are particularly important development impacts for lower income and historically disadvantaged communities in South Africa. Hence, the manufacture and use of Wonderbags results in no net harm to the environment or the communities in which they are used.

2.2 Local Stakeholder Consultation

Local stakeholder consultations were conducted at Group Project level, as per the Project Description. The process for, and the outcomes from, ongoing communication with local stakeholders conducted prior to verification, follow:

Procedures/methods used for engaging local stakeholders: Ongoing, local stakeholder consultations are key components of the Wonderbag operations. Local stakeholder consultations are undertaken prior to the distribution of bags in an area. As a first step, Wonderbag engages with local community members, including municipal ward councilors and community leaders, to identify appropriate end-users and develop the required distribution plans for the community rollout of Wonderbags.

Wonderbag and distribution partners (on behalf of Wonderbag) then undertake interactive training and activation (demonstration) sessions with community members who receive the Wonderbags. These sessions provide information on how to use and care for the Wonderbags as well as to engage with end users regarding queries that they may have in relation to the use of the Wonderbags.

A sample of the Wonderbag physical engagements and bag activations, including physical locations, dates and names of distributing entities etc., are provided in the Wonderbag Local Stakeholder Engagement Report of April 2022.

A summary of the samples provided:

- 27 engagements in the Western Cape, undertaken between August 2021 and February 2022
- 13 engagements in KwaZulu Natal, undertaken between August 2021 and March 2022
- 3 engagements in Gauteng, undertaken between November 2022 and March 2022

Mechanism for on-going communication with local stakeholders: Each Wonderbag includes a recipe booklet which contains contact information whereby stakeholders are invited to contact Wonderbag via provided contact details.

Ongoing engagements are also channeled through Wonderbag's distribution network, largely comprising NGOs and other social development institutions, which typically have ongoing access to, or representatives in, the communities in which Wonderbags are distributed.

Wonderbag also engages with stakeholders through electronic and social media. Wonderbag has recently launched a customer engagement app called MyWonderbag, available at

https://play.google.com/store/apps/details?id=za.racvert.team_wonderbag. MyWonderbag is an interactive community engagement platform where Wonderbag can share information with bag users. This platform is available in app format, webapp as well as USSD in order to make sure that Wonderbag is able to reach all bag users, no matter how rural their location.

MyWonderbag includes recipes, health and wellness information, information about the Wonderbag, competitions and a social media feed where users can post about their experiences with their Wonderbag. In creating MyWonderbag, Wonderbag was mindful of the low-income bag users who will be using this app the most. Both data and airtime are expensive and often unaffordable items for the vast majority of South Africans. Therefore, MyWonderbag was created to use minimal data so that bag users can explore the app without having to worry about data costs. Wonderbag also runs competitions on the app where users can win airtime and food vouchers.

Wonderbag also communicates with stakeholders through other mechanisms, predominantly including telephone calls, email and WhatsApp messages. Specifically, WhatsApp groups are kept for groups such as Stokvels and large local organisations.

Procedures/methods used for documenting the outcomes of the local stakeholder communication: The Wonderbag training and activation teams recognise the importance of ensuring that typical questions raised at stakeholder consultations are addressed. As a procedure in this regard, the Wonderbag team documents major engagements and saves such records in the company's archives. These documents provide details the methods of stakeholder engagements (typically physical meetings related to training of distribution partners and/or end-user activation/demonstration sessions), ongoing mechanisms for engagement and outcomes of stakeholder consultations.

The documented outcomes of the engagements include details such as the participating organisation, the location and date of the engagement, a description of the engagement and details of attendees, if known.

Wonderbag also hosts regular management meetings about distributions, in which the team discuss upcoming implementations. In this meeting regular updates are provided about distribution events and distribution partnerships. Wonderbag keeps record of these meetings on a cloud based storage system and has centrally kept schedules of distribution events for each month. Additionally, Wonderbag also hosts regular meetings with the distribution app development team, as well as the MyWonderbag team. These meetings are used to discuss data, the distribution app and surveys, MyWonderbag content, MyWonderbag user data and comments or queries from Wonderbag users.

In addition, the MyWonderbag app is an important platform for documenting stakeholder comments. There are options for user to share their Wonderbag experience, update their contact details and personal information, as well as provide feedback on their Wonderbag and

feedback on the MyWonderbag app itself. Wonderbag uses this section to receive input from bag users and to regularly ask them for their input.

How due account of all and any input received during ongoing communication has been taken: Wonderbag ensures that the teams engaging with communities are prepared for ongoing communications by engaging in train-the-trainer sessions.

Inputs can be received by the feedback option on the MyWonderbag app and also via the Wonderbag Facebook page (<https://www.facebook.com/TheWonderbag/>). Wonderbag responds personally to each recommendation or complaint to ensure good customer service and customer engagement. None of the comments received during the monitoring period are related to the operation or maintenance of the bags and therefore do not require the project design to be updated or amended.

As per Appendix 2 of the latest Project Description, the typical questions raised at stakeholder consultations and the answers provided include:

Q: Why is the Wonderbag provided for free or at such a discounted rate?

- A: the bags provided under this grouped project are subsidized by carbon funding. This mechanism allows Wonderbag to provide the bags for free, or at a heavily discounted rate, to end users. Wonderbag therefore maintains the right to any carbon credits that accrue due to the use of the bags.

Q: What is the Wonderbag filled with?

- A: approximately 1.5 kg of repurposed insulation foam or other recycled materials.

Q: How long will the bag last?

- A minimum of 15 years assuming if it is properly cared for.

Q: Is it possible to wash the Wonderbag?

- A: Yes it is, both by hand and in the washing machine.

2.3 AFOLU-Specific Safeguards

Not applicable as this is a non-AFOLU grouped projects.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Nineteen small-scale Project Activity Instances, that contain a maximum of 20,000 bags each, were implemented under the Grouped Project during the monitoring period:

Project Activity Instance	Bags in Instance
RfC1	19,934
RfC2	19,960
RfC3	19,989
RfC4	19,990
RfC5	19,986
RfC6	19,954
RfC7	19,997
RfC8	20,000
RfC9	19,994
RfC10	20,000
RfC11	20,000
RfC12	20,000
RfC13	20,000
RfC14	20,000

Project Activity Instance	Bags in Instance
RfC15	20,000
RfC16	20,000
RfC17	20,000
RfC18	20,000
RfC19	10,515
Grouped Project	370,319

Operation of the Project Activity Instances during this monitoring period:

There were no impacts during the monitoring period that affected the GHG emission reductions, there were impacts worth reporting.

Any other changes: There were no other changes e.g., to project proponent or other entities during the monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

As per the VCS Standard v4.5 paragraph 3.20: projects are allowed to deviate from prescribed procedures under specific circumstances. These circumstances include situations where alternative methods are suited to the project context and may prove more efficient for project-specific conditions or where the deviation maintains the same level of accuracy or is more conservative than the methodology's stipulations.

The following deviations are applied for in this monitoring period.

i. Monitoring constant load conditions:

Paragraph 20 of AMS II.C that the constant load condition shall be demonstrated by monitoring or using the historical records of energy consumption data for a one-year period prior to the project implementation.

Deviation from the AMS-II.C methodology requirements:

The group project applies a deviation to the methodology. The deviation is to demonstrate the constant load condition by using a conservative, theoretical approach, instead of monitoring or using the historical records of energy consumption data for a one-year period prior to the project implementation.

Based on the cooking habits of Wonderbag users, the deviation assumes that the stove plates (hobs) used in the project activity are set at a constant setting (i.e. constant load condition), from the start to the end of the cooking process in order to bring the pot of food to the boiling point for the required amount of time. Thereafter, users place the pot of food in the Wonderbag heat retention bag for slow cooking, which does not require any further external heat sources, such as grid electricity. This is conservative as if the user adjusts the stove knob lower, the operating time to boil water will increase. This would result in higher energy consumption as the consumption is calculated by multiplying the power and the operating time. The same result would occur if a user starts cooking on one setting and decreases the stove knob lower. The operating time would be longer resulting in increased energy consumption.

This deviation is applied in conjunction with deviation (ii) below, which provides for the mechanism to robustly quantify the emission reductions in a conservative manner.

ii. Physical verification of “power” and “operating hours”:

Paragraphs 40 of AMS II.C relate to the parameter p_i (electrical power demand (kW) of the baseline equipment).

Paragraph 40 provides for the monitoring approaches that may be used “for projects using Option 1, i.e. if the project equipment installed has a constant current (ampere) characteristic”. Paragraph 40 further requires that “monitoring shall consist of monitoring either the ‘power’ and ‘operating hours’ or the ‘energy use’ of the equipment installed using an appropriate method.” Appropriate methods include:

- (a) Recording the “power” of the project equipment installed (e.g. lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters; or
- (b) Metering the “energy use” of an appropriate sample of the project equipment installed.”

Deviation from the methodology AMS-II.C requirements:

The group project applies deviations to the methodology in this third monitoring period. The deviation is the use of the conservative, theoretical values, instead of monitored data sets that may be physically verified by an auditor. This deviation is linked to Paragraph 40.

The deviation is related to Paragraph 40(a), which is to apply a conservative, theoretical value for the quantification of power, specifically parameter p_i (electrical power demand (kW) of the baseline equipment), as well as the upper bound of the survey results for operating hours.

The value for pi is based on the assumption that Wonderbag users use their electric stove hobs at the highest setting, in a constant load condition, for the duration of the cooking time on the electric stove plate. This measure allows for the robust quantification of project emissions because it therefore assumes the highest value for pi (electrical power demand (kW) of the baseline equipment) in the third monitoring period for the operation of the smallest stove type (1kW) in conjunction with higher operating hours in the project scenario. The use of higher operating hours is conservative, considering that the precision was met for electricity users' operating hours that was derived from the latest User Habit Survey.

The impacts are discussed as follows, with reference to reduced baseline emissions and increased project emissions.

- Reduced baseline emissions: the deviation assumes the use of a 1kW stove plate rating in the third monitoring period, as opposed to a 1.5kW stove plate rating applied previously for the baseline emission calculations. The stove-hob rating of 1kW¹¹ is assumed to be the smallest available stove plate, based on technical specifications from one of South Africa's most popular electric stove manufacturers¹². Applying the lowest stove-hob rating for calculation of the baseline emissions in the third monitoring period allows for robust quantifications because it reduces the baseline emissions and therefore the net emission reductions. This is therefore a conservative approach.

Further support of the conservativeness of this approach is provided for in the results of the household monitoring survey used in this third monitoring report. The survey results indicate that the average household size in the population was 5 people. This large number of household residents would likely require the use of the biggest stove-hob, to accommodate a large pot, which would have the highest stove-hob rating. As per the Defy specifications, the highest stove hob rating would be 2kW. Accordingly, the average power rating of 1kW has been applied to robustly quantify the baseline emissions, which results in materially lower net emission reductions in the third monitoring period. Therefore, this deviation is conservative.

- Increased project emissions: The increased operating hours in the project scenario of the third monitoring report results in higher project emissions.

The result of the deviations is a material decrease in net emission reductions due to decreased baseline emissions and increased project emissions. Therefore, this deviation is conservative.

¹¹ Sources include the technical specifications for a Defy gas-electric hybrid stove model DGS179 and technical specifications available online at: <https://www.defy.co.za/products/freestanding-cookers-stoves-electric>

¹² <https://www.mordorintelligence.com/industry-reports/south-africa-kitchen-appliances-product-market#:~:text=South%20Africa%20Kitchen%20Appliances%20Product%20Market%20Leaders>

In future, monitoring surveys will be conducted to establish the operating hours, through the metering of a sample of the units installed for their operating hours using physical measurements.

iii. Sampling precision value

Paragraph 18(c) prescribes that the option in subparagraph 18(b) of the Sampling Standard is only eligible for the application to the survey undertaken during the first two years of the crediting period of the group project, and when the attained confidence/precision from the actual samples is equal to or better than 90/15 for a small-scale project activity and 95/15 for a large-scale project activity.

Temporary deviation from the requirements of the CDM Sampling Standard:

A temporary deviation is requested to waive the conditions in paragraph 18 (c) of the CDM Sampling Standard to apply paragraph 18(b).

In certain instances, it becomes impractical or unsafe to continue the sampling of data to achieve the required precision. A large number of Wonderbag recipients are located in lower-income communities, and unsafe conditions, such as those experienced in the Western Cape in August of 2023 during the taxi strikes¹³, which makes it unfeasible to conduct surveys in these areas.

Paragraph 18(c) of the Sampling Standard states: The option in subparagraph (b) above is only eligible for the application to the survey undertaken during the first two years of the crediting period of the CDM project activity or component project activities (CPAs) (if sampling is undertaken at the PoA level, the two-year limit applies from the start date of crediting to the PoA), and when the attained confidence/precision from the actual samples is equal to or better than 90/15 for a small-scale CDM project activity and 95/15 for a large-scale CDM project activity.

The temporary deviation is to apply the provisions of paragraph 18(b)(i)(a) of the Sampling Standard. The resulting higher precision and larger standard error requires the use of the upper bound for project emissions. This deviation allows the project emissions to be conservatively and robustly quantified, resulting in lower net emissions reductions due to higher project emissions. Therefore, this temporary deviation is conservative.

Furthermore, the deviation is reasonable considering the country specific circumstances that delayed the undertaking of the surveys during the COVID pandemic and related lock-down rules in South Africa that were in place during 2020-2022.

Future surveys will increase sampling to achieve the necessary precision where it is safe and practical to do so.

¹³ Maseko, N. Radford, A. 2023. *BBC News*, "Five people killed in Cape Town taxi strike violence". [Available Online]: [Five people killed in Cape Town taxi strike violence - BBC News](#)

3.2.2 Project Description Deviations

Project description deviation applied in current monitoring period

Recent thermal testing of the Wonderbags indicates that the lifetime of the Wonderbags can feasibly be 15 years, instead of previously estimated 10 years, if properly cared for.

Scope of deviation: the deviation applies to the lifetime of the bags and does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

Project description deviations applied in previous monitoring period

The project description deviation applied during the 2nd monitoring period was a deviation related to the monitoring of electricity and gas (LPG) used for cooking, with a Wonderbag.

This deviation from the Project Description was applied to all fifteen Project Activity Instances monitored in this 2nd monitoring period.

Section 5.3.1 of the Project Description requires that “Field researchers visit and interview the Wonderbag users identified in the random sample-target population during the respective surveys.” Site visits are required so that the field researchers can physically measure the cooking fuels over a specified number of days.

However, no physical measurements of electricity are taken during the onsite visits. Instead, Wonderbag recipients are asked to provide the typical number of minutes the pot of food is cooked on the stove top, before it is placed in the Wonderbag for further cooking. This is because the measurement of electricity in the context of the project would require the use of electricity meters, to measure cooking time, which is not economically feasible or practical. Hence, the validated approach to calculating electricity emission reductions is based on the amount of time (X minutes) that the food is cooked on a stove top, multiplied by a default maximum electric stove power rating (1 kW). This approach is conservative, as it assumes that the stove plate is used at its maximum capacity for the entire cooking time. This approach is also more precise than taking the full daily electricity readings of a household, as cooking is only one of the activities that households use electricity for.

This approach, to measure cooking time (minutes) on the stove plate, is equally applicable to the Wonderbag users that cook with gas. In addition, measuring the cooking time on the stove plate is more accurate than taking the daily measurement of gas, as recorded currently during physical measurements by survey field researchers. This is also because gas is used for other household activities, such as lighting and heat, in addition to cooking.

Description of the deviation:

Therefore, the requested project deviation is to survey Wonderbag users that cook with electricity and gas via telephone, or other electronic communication means such as

Skype/WhatsApp etc., instead of costly and time-intensive physical visits that would provide the same data sets.

The telephonic surveys represent the deviation from the monitoring plan in the Project Description, with respect to the requirement for:

- 1.) Physical site visits to households that use electricity and gas for cooking and
- 2.) The physical measurement of gas cooking fuels in the implemented project activity, i.e. cooking with a Wonderbag.

This monitoring plan deviation was identified during the user habit survey undertaken for the second monitoring period. This deviation is applicable to this monitoring period (third monitoring period) and is expected to be applicable to future monitoring periods. The results from the gas users raised concerns that the gas bottles were being used for activities in addition to cooking. The physical weighing of the gas does not account for any gas being used for purposes other than cooking. As a result, Wonderbag users were contacted by telephone and asked to provide the typical amount of minutes that their pot spends on their gas stove, when cooking food, prior to being placed in a Wonderbag for further cooking.

The same calculation procedure was applied as calculating electricity consumption. The minutes spent cooking food on the gas stove plate was multiplied by a default power rating for a gas stove plate (3kW).

This deviation was applied only to gas users in the current monitoring period. A total of 145 surveys of gas-users were conducted telephonically as per this deviation, to survey gas used for cooking purposes. The remaining 757 surveys in the monitoring period were completed in person, as per the registered monitoring plan in the Project Description.

The new approach, telephone/electronic communication surveys, will be applied to electricity users from the next monitoring period.

Impact on emission reductions: The deviation does not negatively impact the conservativeness of the quantification of greenhouse gas emission reductions:

- In the case of emission reductions from households that use LPG cooking fuel: the data sets derived from the alternative sampling method, telephonic interviews asking for cooking-time data, led to a lower variability compared to the results of the physical surveys which measured total daily consumption. However, the telephone survey results did not meet the required precision level of 10%. As a result, the upper bound values of the survey results were used in the emission reduction calculations.

The use of the upper bound is the most conservative approach because it assumes that the surveyed households made use of higher quantities of fuels compared to the lower bound values, which may be used when the survey precision values are met. The use of

the upper bound survey values is conservative because it results in fewer emission reductions from this category of cooking fuels.

The use of the upper bound value is aligned with paragraph 18(b)(i)(a) of the CDM Survey Sampling Standard, version 8:

“If the estimates from the actual samples fail to achieve the target minimum levels of precision, the project participants or the coordinating/managing entity shall ...

(b) Apply a correction to the estimates using one of the two options below:

(i) Discounting the emission reduction estimates by ...

(a) Taking the lower or the upper bound, whatever is the more conservative, of the 90 or 95 per cent confidence interval, depending on the type of methodologies applied”

Scope of deviation: The deviation relates to the procedure for monitoring and measurement of electricity and gas (LPG) cooking fuels.

3.3 Grouped Projects

A total of nineteen Project Activity Instances were implemented during the monitoring period. The Project Activity Instances comprise a maximum of 20,000 bags per Project Activity Instances and are very similar in nature. They comprise the same technology, heat-retaining Wonderbags and are distributed in South Africa in communities that use either electricity, coal, paraffin, LPG or biomass as cooking fuels. All the bags were manufactured by Wonderbag and distributed either by Wonderbag or by distributing parties.

Eligibility Criteria for New Project Activity Instances: The eligibility criteria of the first nine Project Activity Instances, RfC PA 1 – PA9, were established at the group project validation and first verification. The eligibility of RfC PA 9 – PA 15 was established in the second verification.

Therefore, the following tables outline the assessment of the subsequent inclusion of four new Project Activity Instances, RfC PA 16 – RfC PA 19, against the eligibility criteria contained in the registered Project Description (Table 2 – Table 9).

Compliance with the VCS rules

The first table that follows outlines the compliance of RfC PA 16 – RfC PA 19 against Table 2 in the registered Project Description. The second table that follows outlines the compliance of RfC PA 16 – RfC PA 19 against Table 3 in the registered Project Description.

Eligibility Criteria for New Project Activity Instances as per Table 2 of the registered Project Description

	Eligibility criteria	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19 ¹⁴
1.	Meet the applicability conditions set out in the methodology applied to the project.	Each new Project Activity Instance must demonstrate compliance with the applicability conditions set out in the employed methodologies: - AMS-II.C. “Demand-side energy efficiency activities for specific technologies” version 15.0 and/or - AMS-II.G. “Energy efficiency measures in thermal applications of non-renewable biomass” version 11.1.	All the Project Activity Instances are compliant with the applicability conditions set out in both the applied methodologies, AMS-II.C. and AMS-II.G., as demonstrated further below in this monitoring report, and as per Tables 5 and 6 of the registered Project Description.
2.	Use the technologies or measures specified in the project description.	Each new Project Activity Instance must comprise only Wonderbag heat retention bags.	All the Project Activity Instances comprise the use of only Wonderbag heat retention bags.
3.	Apply the technologies or measures in the same	Each new Project Activity Instance must confirm that	All the Project Activity Instances comprise the use

¹⁴ Recipe for Change Project Activity Instances 10-15.

	Eligibility criteria	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19 ¹⁴
	manner as specified in the project description.	the type of technology employed by the project activity are standard (also known as large) size Wonderbag heat retention bags. For example, provide declaration or other evidence.	of standard (also known as large) size Wonderbag heat retention bags.
4.	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	Each new Project Activity Instance must demonstrate that the baseline scenarios comprise one or more of the following cooking fuels in South Africa: 1.) Electricity; 2.) Coal; 3.) Paraffin; 4.) LPG; 5.) Biomass.	The baseline scenarios in all the Project Activity Instances include the following cooking fuels in South Africa: 1.) Electricity; 2.) Coal; 3.) Paraffin; 4.) LPG; 5.) Biomass. These baseline fuels were identified during the course of the Baseline Survey, undertaken by an independent third party, and validated at registration of the Group Project.
5.	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project	Each new Project Activity Instance must demonstrate additionality, as per paragraph	All the Project Activity Instances meet the additionality requirement

	Eligibility criteria	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19 ¹⁴
	activity and geographic area. For example, the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological and/or other barriers as the initial instances.	10(a) of the CDM's TOOL21: “Demonstration of additionality of small-scale project activities”, version 13.1. Paragraph 10(a) requires the evidence that in the absence of the VCS grouped project, the project activity instances (i.e. each distributed Wonderbag) would not have occurred due to prevailing investment barriers. Furthermore, each new Project Activity Instance will comprise a maximum of 20,000 Wonderbags.	because the provision of Wonderbags to end users is reliant on the carbon credit revenues derived from the bags. Additionality is demonstrated at a Group Project level, as per section 3.5 of the registered Project Description. Furthermore, each Project Activity Instance contains a maximum of 20,000 distributed Wonderbags.
6.	Where grouped projects include multiple baseline scenarios or demonstrations of additionality, such projects will require at least one set of eligibility criteria for each combination of baseline scenario and	Each new Project Activity Instance must demonstrate which of the following baseline scenarios, i.e. cooking fuels, are applied: 1.) Electricity; 2.) Coal;	All the Project Activity Instances contain at least one of the five eligible baseline cooking fuel scenarios: 1.) Electricity; 2.) Coal; 3.) Paraffin; 4.) LPG; 5.) Biomass.

	Eligibility criteria	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19 ¹⁴
	demonstration of additionality specified in the project description.	3.) Paraffin; 4.) LPG; 5.) Biomass. At least one of the baseline scenarios must be utilised in the project activity instance, which must further demonstrate compliance with all the set of eligibility criteria for the inclusion of new project activities instances as outlined in this table.	The baseline cooking fuels were identified during the course of the Baseline Survey, undertaken by an independent third party. As demonstrated in this table and in the following table, all the Project Activity Instances comply with the set of applicable eligibility criteria for the inclusion of new project activities instances, as required by clauses 3.6.16 and 3.6.17 of the VCS Standard, Version 4.4.

Eligibility Criteria for New Project Activity Instances as per Table 3 of the registered Project Description

	Eligibility criteria for the inclusion of new project activity instances	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19
1.	Geographical boundaries: all new project activity	Demonstrate that the Wonderbags in new Project Activity	The Wonderbags in all the Project

	Eligibility criteria for the inclusion of new project activity instances	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19
	instances must be located within the boundary of the Republic of South Africa.	Instances are distributed within the boundaries of the Republic of South Africa. For example, provide database records.	Activity Instances have been distributed in the Republic of South Africa, as per the database records.
2.	Comply with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial compliance with multiple sets of eligibility criteria is insufficient.	New Project Activity Instances must comply with the full set of eligibility criteria for the inclusion of new project activity instances in this table.	All the Project Activity Instances comply with the full set of applicable eligibility criteria for the inclusion of new project activity instances in this table and in the table above.
3.	Be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the	New Project Activity Instances must comprise monitoring plans that outline the technical, financial, geographic and other relevant information to enable sampling by the validation/verification body.	All the Project Activity Instances comprise the same monitoring plan contained in the Project Description that outlines the technical, financial,

	Eligibility criteria for the inclusion of new project activity instances	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19
	validation/verification body.		geographic and other relevant information to enable sampling by the validation/verification body.
4.	Be validated at the time of verification against the applicable set of eligibility criteria.	New Project Activity Instances must be validated at the time of verification against the applicable set of eligibility criteria.	All the Project Activity Instances will be validated at the time of verification against the applicable set of eligibility criteria, as per the processes undertaken during the course of this first verification of the Grouped Project.
5.	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date	New Project Activity Instances must demonstrate ownership by the project participant, from the start date of the project activity instance.	All the Project Activity Instances are owned by Wonderbag UK Limited. Wonderbags are trade-

	Eligibility criteria for the inclusion of new project activity instances	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19
	upon which the project activity instance began reducing or removing GHG emissions).		marked devices.
6.	Have a start date that is the same as or later than the grouped project start date: 15 March 2019.	New Project Activity Instances must provide evidence that only bags distributed into the field after the Group Project start date are accounted for. For example, provide database records of distributed bags.	The bags employed in all the Project Activity Instances have all been distributed into the field, on or after the Group Project start date of 15 March 2019. The database records detail the dates of distribution into the field.
7.	Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only).	New Project Activity Instances must be eligible for crediting from the start date of the instance through to the end of the project crediting period (only).	All the Project Activity Instances are eligible for crediting from their start dates, through to the end of the respective Project Activity Instance crediting periods. Evidence of

	Eligibility criteria for the inclusion of new project activity instances	Method of Evaluation	Applicability to RfC PA 16 – RfC PA 19
			this is the database records.
8.	Where inclusion of a new project activity instance necessitates the addition of a new project proponent to the project, such instances shall be included in the grouped project within two years of the project activity instance start date	The addition of a new project proponent to Project Activity Instances shall be included in the grouped project within two years of the project activity instance start date.	Not applicable to any of the Project Activity Instances as the only project proponent is Wonderbag UK Limited.

Compliance with the applicability criteria of the two methodologies

The compliance of RfC PA 1 – PA 15 have been demonstrated in previous verifications.

The two tables that follow outline the compliance of RfC PA 16 – RfC PA 19 against Tables 5 (fulfilment of AMS-II.C applicability criteria) and 6 (fulfilment of AMS-II.G applicability criteria) of the registered Project Description.

Fulfillment of AMS-II.C applicability criteria, as per Table 5 of the registered Project Description

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
1	This methodology is only applicable if the service level (e.g. rated capacity or output) of the installed, project energy-efficient equipment is between 90% and 150% of the service level of the baseline	All the Project Activity Instances comply. The service levels of both the Wonderbags and stoves are the cooking of food. The service levels of the installed heat-retaining Wonderbags is 100% of the service level of the stoves used to cook a

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
	equipment. Examples of service levels are light output for lighting equipment, water output and temperature for water heating systems, and rated thermal output capacity of air conditioners. The relationship of the service level of the project energy-efficient equipment to the baseline equipment can be one to one replacement (e.g. replacement of inefficient refrigerator with new and efficient refrigerator) or many-to-one (e.g. replacement of small multiple chillers with a central chiller plant). In the latter case, the service level of the project and baseline can be compared on an aggregate basis.	household's food (i.e. baseline equipment). The relationship of the service level of the Wonderbags to the stoves can be a one to one replacement, for example where a Wonderbag replaces the use of a single stove plate. An example of this scenario is the typical paraffin or LPG burners used to cook food, which consists of a single plate, upon which a pot/pan is used to cook food. The relationship of the service level of the Wonderbags to the stoves can also be many-to-one, for example where multiple Wonderbags are installed. In the latter case, the service level of the project and baseline is compared on an aggregate basis.
2	In the event that project output in year y is greater than the average historical output (average of the three most recent years prior to the project implementation¹⁵) and the demonstration of the baseline for the incremental capacity is not undertaken, the value of the output in year y is capped at the value of the historical average output level.	All the Project Activity Instances comply. The output (use of the Wonderbags to cook food) will not increase because the meals per adult equivalent will not increase due to the project activities and therefore the fuels used to cook said meals will not increase.
3	If the energy-efficient equipment contains refrigerants, then the	Not applicable: the Wonderbag does not make use of any refrigerants.

¹⁵ A maximum of +10% variation is permitted.

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
	refrigerant used in the project case shall have no ozone depleting potential (ODP).	
4	This methodology credits emission reductions only due to the reduction in electricity and/or fossil fuel consumption from use of more efficient equipment. However, the calculation of project emissions shall include any incremental emissions, as compared to the baseline, associated with refrigerants used in the project equipment.	Not applicable: the Wonderbag does not make use of any refrigerants.
5	The aggregate energy savings by a single project may not exceed the equivalent of 60GWh per year for electricity end-use energy efficiency technologies. For fossil fuel end-use energy efficiency technologies, the limit is 180 GWh thermal per year in fuel input.	All the Project Activity Instances comply. A single Wonderbag is estimated to save approximately 0.001TJ, 0.0001TJ and 0.00013TJ for coal, LPG and paraffin respectively. Each Project Activity Instance comprises a maximum of 20,000 Wonderbags. Based on this maximum component of bags, each Project Activity Instance would therefore save 20TJ, 2TJ and 2.6TJ respectively. All of these values fall below the threshold of 180GWh thermal, converted to 648TJ. In the case of electricity, a single Wonderbag is estimated to save 0.0002GWh. A single project activity instance of 20,000 Wonderbags therefore saves 4GWh which falls below the threshold of 60GWh.

Fulfillment of AMS-II.G applicability criteria, as per Table 6 of the registered Project Description

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
1	The aggregated energy savings of a single project activity shall not exceed the equivalent of 60GWh per year or 180GWh thermal per year in fuel input.	All the Project Activity Instances comply. Each Project Activity Instance is limited to a maximum of 20,000 Wonderbags in order to remain below this threshold. A single Wonderbag is estimated to save 0.0001TJ and the 180GWh thermal is equivalent to 648TJ. A single project activity instance of 20,000 Wonderbags would therefore save approximately 1.51TJ.
2	Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	All the Project Activity Instances comply. The annual trend for natural forest in South Africa shows a decrease since 1990.
3	For cases where the biomass is sourced from renewable sources, the project participants should use a corresponding Type I methodology.	Not applicable. Only non-renewable biomass is considered in this project.
4	If the project device requires a specific fuel for this device (e.g. briquettes, pellets, woodchips), the consumption of the fuel should be monitored during the crediting period.	All the Project Activity Instances comply. The Wonderbag does not require a specific fuel. It is used in conjunction with the existing cooking system. The consumption of the fuel used is monitored through surveys.
5	The project description shall explain the proposed method for distribution of project devices including the method	All the Project Activity Instances comply. The method of distribution of Wonderbags is described in Section 1.11 of the registered Project

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
	to avoid double counting of emission reductions such as unique identifications of product and end-user locations.	Description. Each Wonderbag is issued with a unique ID which avoids double counting.
6.	The project description shall explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	Wonderbag UK Ltd is the only manufacturer of the Wonderbag and keeps records of all manufactured Wonderbags using a unique ID for each bag. A distribution agreement is signed by all distribution partners stating that they will not claim any emission reductions from the distributed Wonderbags.

Compliance with the applicability criteria of the respective tools

The compliance of RfC PA 1 – PA 15 have been provided in the pervious verifications. The following tables outline the compliance of RfC PA 16 – RfC PA 19 against Tables 7 to Table 9 in the registered Project Description.

Fulfillment of TOOL21 “Demonstration of additionality of small-scale project activities” applicability criteria, as per Table 7 of the registered Project Description

No.	Relevant applicability condition	Compliance at RfC PA 2 – RfC PA 19 Levels
1	The use of the “Demonstration of additionality of small-scale project activities” is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.	Not applicable. The project does not propose a new methodology.

No.	Relevant applicability condition	Compliance at RfC PA 2 – RfC PA 19 Levels
2	Project participants and coordinating/managing entities may also apply “TOOL19: Demonstration of additionality of microscale project activities” as applicable.	Not applicable. Additionality is proven using the investment barrier analysis as per paragraph 10(a) of the TOOL21. The assessment is undertaken in the following section 3.5 of this project description.

Fulfillment of TOOL30 “Calculation of the fraction of non-renewable biomass” applicability criteria, as per Table 8 of the registered Project Description

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
1	This tool may be used by: (a) DNAs to submit region/country-specific default fNRB values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) (b) project proponents to calculate project or PoA-specific fNRB values.	All the Project Activity Instances comply. The tool was used by the project participant to calculate a project specific value for fNRB under option (b) of applicability condition 1. The tool was applied at a Group Project level.
2	For project or PoA specific fNRB values, project proponents shall assess the area where biomass is sourced and justify the selection of the area in CDM project design documents.	All the Project Activity Instances comply. The area for the calculated value was selected to coincide with the Grouped Project’s project boundary. The fNRB value is applied at a Group Project level.

Fulfillment of ASB0040-2018 “Standardized baseline: Grid emission factor for Southern African Power Pool” applicability criteria, as per Table 9 of the registered Project Description

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
1	Clean development mechanism (CDM) project activities and programmes of activities (hereinafter referred as project activities) can apply this standardized baseline under the following conditions: (a) The project activity is implemented in any one of following countries, which are the SAPP member countries, and is connected to the SAPP; (i) Republic of Botswana; (ii) Democratic Republic of Congo; (iii) Kingdom of Lesotho; (iv) Republic of Mozambique; (v) Republic of Namibia; (vi) Republic of South Africa; (vii) Kingdom of Swaziland; (viii) Republic of Zambia, and (ix) Republic of Zimbabwe. (b) The CDM approved methodology that is applied to the project activity requires the determination of CO₂ emission factor(s) through the application of the grid tool; (c) The project activity uses the ex-ante options for both the operating margin and build margin grid emissions factors, as described in the grid tool, and therefore no monitoring or recalculation of the emission factor during the crediting period is required.	All the Project Activity Instances comply. The respective Wonderbags are distributed within the Republic of South Africa. The methodology requires the use of the grid tool to determine the CO₂ emission factor. The ex-ante options are used in the grid tool therefore no recalculation is required for the emission factor during the crediting period.

No.	Relevant applicability condition	Compliance at RfC PA 16 – RfC PA 19 Levels
2	The latest approved and valid values of this standardized baseline are the only values of the CO ₂ emission factor(s) that shall be applied for the project electricity system in the SAPP member countries listed under sub-para 3(a) above.	All the Project Activity Instances comply. The Project Activity Instances only apply the value from the approved standardized baseline.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Fixed parameters specific to AMS-II.C.

Data / Parameter	EF _{CO₂,ELEC,y}
Data unit	tCO ₂ /MWh
Description	Emission factor for the Southern African Power Pool grid.
Source of data	ASB0040-2018 Standardized baseline: “Grid emission factor for Southern African Power Pool”.
Value applied	0.9481
Justification of choice of data or description of measurement methods and procedures applied	The latest standardized baseline is applied.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	EF _{CO₂,i,y}
Data unit	kgCO ₂ /TJ
Description	Emission factor for the fossil fuel displaced.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: energy, stationary combustion.
Value applied	Paraffin: 71,900 kgCO ₂ /TJ

	LPG: 63,100 kgCO ₂ /TJ Coal: 96,100 kgCO ₂ /TJ.
Justification of choice of data or description of measurement methods and procedures applied	Default values from the 2006 IPCC Guidelines have been used in accordance with paragraph 32 of AMS-IL.C.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	NCV _{FOSSIL FUEL i}
Data unit	TJ/Unit of measurement
Description	Net calorific value for the fossil fuel displaced.
Source of data	South African Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry
Value applied	Paraffin: 0.000038 TJ/litre LPG: 0.000046 TJ/kg Coal: 0.024300 TJ/tonne
Justification of choice of data or description of measurement methods and procedures applied	South African specific values were obtained from the South African Technical Guidelines. These values provide a more accurate indication of the NCV of fuels used in South Africa.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	FC _i								
Data unit	Unit of consumption								
Description	Baseline consumption of fossil fuel i in year y.								
Source of data	Baseline survey.								
Value applied	<table border="1"> <thead> <tr> <th>Fossil Fuel i</th><th>Baseline consumption</th></tr> </thead> <tbody> <tr> <td>Paraffin</td><td>224.6 litres/year/adult equivalent</td></tr> <tr> <td>LPG</td><td>74.5 kg/year/adult equivalent</td></tr> <tr> <td>Coal</td><td>1.3 tonnes/year/adult equivalent</td></tr> </tbody> </table>	Fossil Fuel i	Baseline consumption	Paraffin	224.6 litres/year/adult equivalent	LPG	74.5 kg/year/adult equivalent	Coal	1.3 tonnes/year/adult equivalent
Fossil Fuel i	Baseline consumption								
Paraffin	224.6 litres/year/adult equivalent								
LPG	74.5 kg/year/adult equivalent								
Coal	1.3 tonnes/year/adult equivalent								

Justification of choice of data or description of measurement methods and procedures applied	The baseline consumption is used in accordance with paragraph 32 of AMS-II.C. The values are based on surveys conducted in accordance with the CDM sampling guidance.
Purpose of Data	Calculation of baseline emissions
Comments	During the survey to establish the baseline consumption, the required precision of 10% was not met. Therefore, the lower bound value was used in accordance with paragraph 46 of AMS-II.G.

Data / Parameter	ρ_i
Data unit	kW
Description	Power rating of an electric stove ¹⁶
Source of data	Baseline survey.
Value applied	1 ¹⁷
Justification of choice of data or description of measurement methods and procedures applied	The baseline consumption is used in accordance with AMS-II.C. The values are based upon the specifications of an electric stove.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$O_{i,BL}$
Data unit	Hours/adult equivalent
Description	Cooking time on an electric stove without a Wonderbag in year y.
Source of data	Baseline survey.
Value applied	159
Justification of choice of data or description of measurement methods and procedures applied	The baseline cooking time is used in accordance with AMS-II.C. The values are based on surveys conducted in accordance with the CDM sampling guidance.
Purpose of Data	Calculation of baseline emissions.
Comments	-

¹⁶ Electrical Power Demand (kW) of the electric cook stove

¹⁷ Lowest value available at: <https://www.defy.co.za/products/freestanding-cookers/freestanding-cookers-stoves-electric-dss694>

Fixed parameters specific to AMS-II.G.

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass.
Source of data	Official statistics and historical data sets
Value applied	0.71
Justification of choice of data or description of measurement methods and procedures applied	The source of data to determine the total annual consumption of wood (parameter H in AMS-II.G) in the absence of the project activity in the country are the official statistics from the latest Energy Balance for South Africa (2017), published by the Department of Mineral Resources and Energy. The biomass fraction in the energy balance was converted to tonnes/year using the officially approved NCV value for wood, as per the 2017 South African Technical Guidelines (Table A1), published by the Department of Environment, Forestry and Fisheries. The source of the mean annual increment of woody biomass growth per hectare of forest areas is the subtropical dry forest value for Africa, as per the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 4, Chapter 4_(Table 4.9). The sources of data to determine the natural forest cover in the country were derived from historical data sets in the Global Forest Watch datasets from Global Land Analysis & Discovery. The sources of data to determine the proportion of protected natural forest cover in the country were derived from historical data sets in the country profile for South Africa on the Protected Planet website. See Appendix 1 for more detailed information.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$MAI_{forest,i}$, $MAI_{other,i}$
Data unit	t/ha/yr
Description	Mean Annual Increment of woody biomass growth per hectare in sub-category i of forest areas. Mean Annual Increment of woody biomass growth per hectare in subcategory i of other land areas in the relevant period

Source of data	The following data source may be used: a) Global Forest Resources Assessment 2000 by the FAO for “Distribution of total forest area by ecological zone” (Table 14): and/or b) 2006 IPCC Guidelines for National Greenhouse Gas Inventories for “Above-ground biomass growth rates (t/ha-yr) for different ecological zones” (Chapter 4, Table 4.9). Use a weighted average based on the forest area of two different age categories (i.e. above and below 20 years), if such data is available. Otherwise, use a simple average of the two age categories. c) National studies or government data or official statistics. The most recent available data shall be used. However, the vintage of the above data shall not be before year 2000								
Value applied	<table><tr><td></td><td>MAI_{forest,l}</td><td>MAI_{other,l}</td></tr><tr><td>Value</td><td>2.2</td><td>0</td></tr></table>				MAI _{forest,l}	MAI _{other,l}	Value	2.2	0
	MAI _{forest,l}	MAI _{other,l}							
Value	2.2	0							
Justification of choice of data or description of measurement methods and procedures applied	The source of the mean annual increment of woody biomass growth per hectare of forest areas is the subtropical dry forest value for Africa, as per the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 4, Chapter 4_(Table 4.9). See Appendix 1 for details								
Purpose of Data	Calculation of the fraction of non-renewable biomass								
Comments	-								

Data / Parameter	F _{forest,I} , F _{other,I}
Data unit	ha
Description	Extent of forest in sub-category i Extent of other wooded land in sub-category i
Source of data	The following data source may be used: a) Global Forest Resources Assessment 2015 by the Food and Agriculture Organization of the United Nations (FAO); b) Official statistics; c) Project-specific survey data If the value of fNRB is calculated for a project area for the year “y”, and during this year a decrease in the forest area is projected to occur, the extent of the forest area available to provide woody biomass to the users can correspond to the forest

	area (hectares) at the beginning of the year “y”, or the average of the values of the forest area at the beginning and at the end of the year “y”.		
Value applied		$F_{forest,l}$	$F_{other,l}$
	Value	3,923,142	0
Justification of choice of data or description of measurement methods and procedures applied	The sources of data to determine the natural forest cover in the country were derived from historical data sets in the Global Forest Watch datasets from Global Land Analysis & Discovery. See Appendix 1 for details		
Purpose of Data	Calculation of the fraction of non-renewable biomass		
Comments	-		

Data / Parameter	P_{forest} , P_{other}		
Data unit	ha		
Description	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas. Extent of non-accessible area (e.g. projected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas.		
Source of data	The following data source may be used for the data on protected area: a) Global Forest Resources Assessment 2015 by the Food and Agriculture Organization of the United Nations (FAO) b) National studies or government data or official statistics. The most recent available data shall be used.		
Value applied		P_{forest}	P_{other}
	Value	346,160	0
Justification of choice of data or description of measurement methods and procedures applied	The sources of data to determine the proportion of protected natural forest cover in the country were derived from historical data sets in the country profile for South Africa on the Protected Planet website. See Appendix 1 for details		
Purpose of Data	Calculation of the fraction of non-renewable biomass		
Comments	-		

Data / Parameter	EF _{projected_fossil_fuel}
Data unit	tCO2e/TJ
Description	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers.
Source of data	AMS-II.G: Table 2, Sub-Saharan African default value.
Value applied	73.2
Justification of choice of data or description of measurement methods and procedures applied	The default value was selected in accordance with paragraph 25 of AMS-II.G.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	μ_y
Data unit	-
Description	Adjustment to account for any continued use of pre-project devices during the year y.
Source of data	AMS-II.G.
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	AMS-II.G requires the use of a default adjustment factor of 1.0 in project activities that apply any equations in the methodology other than equations 7 and 9.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	NCV _{biomass}
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted.
Source of data	IPCC default for wood fuel, as per AMS-II.G.
Value applied	0.0156
Justification of choice of data or description of	AMS-II.G allows for the use of a default wood fuel value of 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried'.

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$B_{old,i,j}$
Data unit	Tonnes/year/adult equivalent
Description	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device.
Source of data	Baseline survey.
Value applied	0.77
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey was conducted in accordance with the CDM sampling guidance and the internationally Recognized Kitchen Performance Test Protocol provided by the Clean Cooking Alliance. The survey followed the requirements set out by the CDM sampling guidance.
Purpose of Data	Calculation of baseline emissions.
Comments	-

4.2 Data and Parameters Monitored

Monitored parameters required by AMS-II.C.

Data / Parameter	$E_{BL,y}$
Data unit	kWh
Description	Energy (specifically electricity) consumption for the baseline in year y.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	Calculated based on sample data sets. The samples are carried out in accordance with the CDM's sampling standard and guidance. Energy consumption for the project activity is calculated by determining the electrical power demand (p_i), a fixed parameter, of the electric stoves upon which operational Wonderbags are used (n_i). This value is multiplied by the average number of hours

	that are used to cook food, using a Wonderbag. The calculation also considers the grid transmission and distribution losses (l_y).
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	n/a as this parameter is calculated and not monitored.
Purpose of the data	Calculation of project emissions.
Calculation method	$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_{i,BL} / (1 - l_y))$
Comments	-

Data / Parameter	$E_{PJ,y}$
Data unit	kWh
Description	Energy (specifically electricity) consumption for the project activity in year y.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	Calculated based on sample data sets. The samples were carried out in accordance with the CDM's sampling standard and guidance. The precision value for this parameter was achieved in the User Habit Survey, i.e. precision was below the 10% threshold. Energy consumption for the project activity is calculated by determining the electrical power demand (ρ_i), a fixed parameter, of the electric stoves upon which operational Wonderbags are used (n_i), multiplied by the average number of hours that are used to cook food, using a Wonderbag. The calculation also considers the grid transmission and distribution losses (l_y).
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.

Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	n/a as this parameter is calculated and not monitored.
Purpose of the data	Calculation of project emissions.
Calculation method	$E_{PJ,y} = \sum_t \sum_i (n_i \times \rho_i \times o_i / (1 - l_y))$
Comments	-

Data / Parameter	n_i
Data unit	Wonderbags
Description	Number of pieces of equipment of the group i baseline equipment retrofitted or that would have been retrofitted.
Source of data	Monitored in a database.
Description of measurement methods and procedures to be applied	Calculated based on a representative sample. Sampling standard was used for determining the sample size to achieve 95/10 confidence precision. A discount shall be applied based on the percentage of devices operational as determined by the sample survey, e.g. if surveys shows that 10% of the devices is non-operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a particular batch. The results of User Habit Survey indicate a 100% operational rate and hence no discount was applied.
Frequency of monitoring/recording	Periodic sampling. Data sets are recorded on an ongoing basis and aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	n/a.

Purpose of the data	Calculation of project emissions.
Calculation method	The number of electrical and other fossil fuel stoves is calculated based on the proportion of users cooking on such stoves, with a Wonderbag, derived from sample surveys. The numbers of operational electrical stoves and other fossil fuel stoves are calculated using two different formulas: - The number of electrical stoves in use is calculated as follows: $n_i = N_w \times u_w \times u_{ELEC,w} (1 - f_{rate,w}) * t_w$ - The number of other fossil fuel stoves in use is calculated as follows: $n_i = N_w \times u_w \times u_{FOSSIL,i,w} \times (1 - f_{rate,w}) * t_w$
Comments	The n_i parameter is used to determine the number of both electrical and other fossil stoves.

Data / Parameter	N_w
Data unit	Wonderbags
Description	The number of Wonderbags of type w distributed.
Source of data	Monitored in a database.
Description of measurement methods and procedures to be applied	Each Wonderbag that is distributed into the field is recorded in a database. The database records include the serial numbers of the bags, the distributing entity (for example, particular NGOs), contact details of the people that receive the bags and the dates that the bags are distributed to users.
Frequency of monitoring/recording	Continuous.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	Central database.
QA/QC procedures to be applied	n/a.
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as this is a monitored parameter.

Comments	-
Data / Parameter	o_i
Data unit	Hours
Description	Operating hours (i.e. cooking time using a Wonderbag) of group of i project devices (i.e. electrical stoves) in the time interval t in year y
Source of data	User Habit Surveys
Description of measurement methods and procedures to be applied	The cooking time, using a Wonderbag, was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	252
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	n/a.
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Data / Parameter	l_y
Data unit	%
Description	Average annual grid loss of the national South African grid including transmission and distribution.
Source of data	Eskom Annual Reports.
Description of measurement methods and procedures to be applied	The Methodology states that "This value shall not include non-technical losses such as commercial losses (e.g. theft/pilferage). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country.

	This value is determined from recent data published by the national utility, Eskom.
Frequency of monitoring/recording	Annual.
Value monitored	0.1090
Monitoring equipment	n/a as this value is determined using the Eskom Annual Report, published in 2022.
QA/QC procedures to be applied	n/a as this value is determined using the Eskom Annual Report.
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as this value is determined using the Eskom Annual Reports.
Comments	The time period covered by the report Eskom Integrated report spans March 2021 – March 2022. Hence the same value, 0.1090, is used for the 2022 and 2023 years in the calculation of emission reductions. The 2023 Eskom Annual Report has not been published yet, therefore the 2022 value for transmission and distribution losses has been applied for the emission reductions occurring during 2023.

Data / Parameter	U _w
Data unit	%
Description	Share of users cooking with a Wonderbag in year y.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	The share of users cooking with a Wonderbag was established through sampling. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.

QA/QC procedures to be applied	N/A.
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Data / Parameter	$u_{ELEC,w}$
Data unit	%
Description	Share of users cooking with electric stoves with a Wonderbag in year y.
Source of data	User Habit Surveys
Description of measurement methods and procedures to be applied	The share of users cooking with electric stoves was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Data / Parameter	$E_{BL,FOSSIL,i,y}$
Data unit	TJ
Description	Baseline energy consumption of fossil fuel i in year y.

Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	The baseline consumption of the different fossil fuels was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	The monitoring equipment used to measure fossil fuel consumption includes the use of hand-held scales, foot scales and measuring jugs. The monitoring equipment is typically used in residential or household applications and therefore do not have accuracy ranges or serial numbers associated with meters or equipment utilised in industrial applications.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of baseline emissions.
Calculation method	$E_{BL,FOSSIL,i,y} = FC_i \times NCV_{FOSSIL FUEL i}$
Comments	-

Data / Parameter	$FC_{PJ,i}$
Data unit	Unit of consumption
Description	Project activity energy consumption of fossil fuel i in year y.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	The project activity consumption of the different fossil fuels was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance. The results of the User Habit Survey indicate that the precision values for LPG, paraffin and coal were not met, i.e. the results for these fuels were over the 10% precision threshold. As a result, the upper bound values were used in the emission reduction calculations. The upper bound values are the most conservative approach, as they assume that higher levels of fossil fuels were consumed in the project implementation and hence fewer emission reductions are achieved.

	The use of the upper bound value is aligned with paragraph 18(b)(i)(a) of the CDM Survey Sampling Standard, version 8: “If the estimates from the actual samples fail to achieve the target minimum levels of precision,¹⁶ the project participants or the coordinating/managing entity shall either: ... (b) Apply a correction to the estimates using one of the two options below: (i) Discounting the emission reduction estimates by either: a. Taking the lower or the upper bound, whatever is the more conservative, of the 90 or 95 per cent confidence interval, depending on the type of methodologies applied”
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the ‘Emission Reduction Calcs - 2022’ and ‘Emission Reduction Calcs - 2023’ tabs in the in the ER calculation spreadsheet.
Monitoring equipment	A hybrid monitoring approach was applied in the measurements of fossil fuels, as discussed in section 3.2.2 above. Where physical site visits were conducted, the monitoring equipment used to measure fossil fuel consumption included the use of hand-held scales, foot scales and measuring jugs. The monitoring equipment is typically used in residential or household applications and therefore do not have accuracy ranges or serial numbers associated with meters or equipment utilised in industrial applications.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Data / Parameter	$E_{PJ,FOSSIL,i,y}$
Data unit	TJ
Description	Project activity energy consumption of fossil fuel i in year y.
Source of data	User Habit Surveys.

Description of measurement methods and procedures to be applied	The project activity consumption of the different fossil fuels is established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance. The precision values for the measurements of gas, paraffin and coal were not achieved in the User Habit Survey, i.e. precision was above the 10% threshold. Hence, the upper bound values were used. This is the most conservative approach with respect to determining the project activity consumption of these fossil fuels. The use of the upper bound values means that the project activity makes use of more fuels and hence there are fewer emission reductions claimed.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	Where physical site visits were conducted, the monitoring equipment used to measure fossil fuel consumption included the use of hand-held scales, foot scales and measuring jugs. The monitoring equipment is typically used in residential or household applications and therefore do not have accuracy ranges or serial numbers associated with meters or equipment utilised in industrial applications.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	$E_{PJ,FOSSIL,i,y} = FC_{PJ,i} \times NCV_{FOSSIL FUEL i}$
Comments	-

Data / Parameter	$\mu_{FOSSIL,i,w}$
Data unit	%
Description	Share of users cooking with fossil fuel i in year y
Source of data	User Habit Surveys
Description of measurement methods and procedures to be applied	The share of users cooking with each fossil fuel was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.

Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Data / Parameter	$f_{rate,w}$
Data unit	%
Description	Failure rate of Wonderbags.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	The failure rate was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags. The failure rate is determined through the User Habit Survey, where respondents are asked whether "the "Wonderbag is still used for cooking?". All the survey respondents indicated "yes" to this question. Therefore the failure rate was determined to be 0.
QA/QC procedures to be applied	N/A

Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed Wonderbags.
Comments	-

Data / Parameter	t_w
Data unit	%
Description	Active time in the monitoring period for the full population of Wonderbags type w.
Source of data	User Habit Surveys.
Description of measurement methods and procedures to be applied	The active time was established using survey samples. The surveys were carried out in accordance with the CDM's sampling standard and guidance.
Frequency of monitoring/recording	Periodic sampling. Recording of data is aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	-

Monitored parameters required by AMS-II.G.

Data / Parameter	$N_{y,i,j}$
Data unit	Wonderbags
Description	Number of project devices of type i (specifically biomass stoves) and batch j operating during year y.
Source of data	Monitored in a database.
Description of measurement methods and procedures to be applied	Calculated based on a representative sample. The Sampling Standard was used for determining the sample size to achieve 95/10 confidence precision. The standard requires that a discount shall be applied based on the percentage of devices operational as determined by the sample survey, e.g. if surveys shows that 10% of the devices is non-operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a particular batch. The results of User Habit Survey indicate a 100% operational rate and hence no discount was applied.
Frequency of monitoring/recording	Periodic sampling. Data sets are recorded on an ongoing basis and aggregated on an annual basis.
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	n/a as monitoring is undertaken on a sample basis of distributed Wonderbags.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	The number of biomass stoves is calculated based on the proportion of users cooking on biomass stoves, with a Wonderbag, derived from sample surveys.
Comments	-

Data / Parameter	$B_{new,KPT,i,j}$
Data unit	Tonnes
Description	Annual quantity of woody biomass used in tonnes per project device of type i
Source of data	User Habit Surveys

Description of measurement methods and procedures to be applied	Measured as per the KPT protocol. The KPT was carried out in accordance with the KPT Protocol guidelines listed by the Clean Cooking Alliance. The precision level was met for this parameter.
Frequency of monitoring/recording	Periodic sampling and recorded on an annual basis
Value monitored	Refer to the 'Emission Reduction Calcs - 2022' and 'Emission Reduction Calcs - 2023' tabs in the in the ER calculation spreadsheet.
Monitoring equipment	Where physical site visits were conducted, the monitoring equipment used to measure biomass consumption included the use of hand-held and/or foot scales. The monitoring equipment is typically used in residential or household applications and therefore do not have accuracy ranges or serial numbers associated with meters or equipment utilised in industrial applications.
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions.
Calculation method	n/a as monitoring is undertaken on a sample basis of distributed, operational Wonderbags.
Comments	The value for Bnew will not be affected by seasonal changes. Therefore, the surveys do not need to be conducted on days that take seasonal changes into account.

4.3 Monitoring Plan

Data collection and management methods

The methods for measuring, recording, storing, aggregating, collating and reporting data and parameters in this monitoring period are described below.

Each completed Wonderbag is equipped with a label stating the unique barcoded serial number which is used for references and monitoring. The information contained in the barcode includes:

- Date on which the bag was manufactured;
- The serial number of the bag;

- The date on which the bag is scheduled for distributed, i.e. scheduled to leave the factory premises;
- The details of the entity responsible for distributing the bag (e.g. various NGOs and other entities);
- The anticipated province/ town/ community in which the bags is expected to be distributed.

The unique barcoded serial numbers provide for the basis of monitoring activities and prevent instances of double-counting.

Each barcode on a manufactured Wonderbag is scanned using an electronic device, such as a smartphone or tablet, prior to leaving the factory for distribution purposes. The barcode, and related information, is thus stored in an electronic database. In instances where the bags are baled (i.e. multiple bags are packed in plastic containers) for bulk distribution, the bales have their own unique barcodes which include the following information:

- The serial numbers of all bags included in the bale;
- The date on which the bag is scheduled for distributed, i.e. scheduled to leave the factory premises;
- The details of the entity responsible for distributing the bag (e.g. various NGOs).

The Wonderbags are transported to distributing entities around the country, largely by road. The Wonderbags are distributed to users by distributing entities.

Wonderbag's data collection and management process has a strong technological focus which includes the secure, cloud-based storage of data. Wonderbag has developing and is testing an app, which will enable the collection of data on a much larger scale. The app will also provide Wonderbag current information on Wonderbag stock location, activity of distribution partners and data sets that have been collected.

The envisaged Wonderbag app flow is described in the following figure:

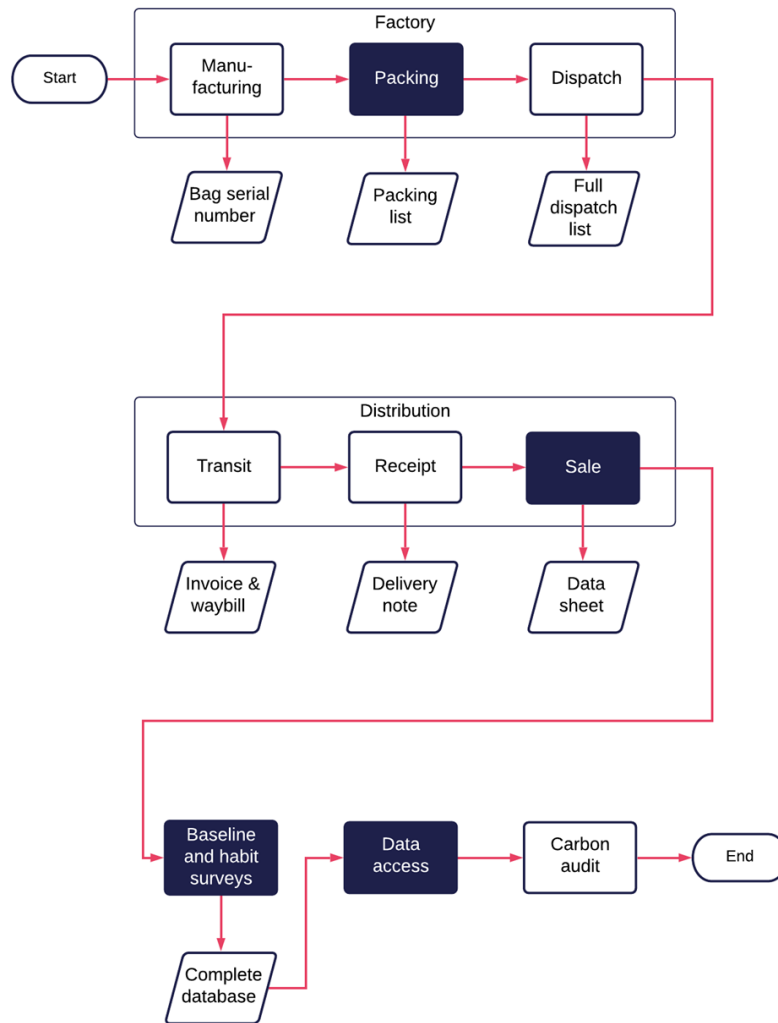


Figure 2: Wonderbag app flow

Distribution questionnaires:

The distributing entities use standardized distribution questionnaires for recording the contact details and relevant information (e.g. type of cook stove used, type of fuel used for cooking, number of children in the household, number of females in the household, number of males in the household, how much time do they spend cooking before and after using the Wonderbag, etc.) of each Wonderbag user, against the respective serial number of the provided Wonderbag.

The data sets from the distribution questionnaires are captured directly into an application on an electronic device, such as a smartphone or tablet. The distributing entities may also use manual recording methods where the required electronic device is not available at the time of distributing the bag. The manual data sets are subsequently uploaded and captured into the electronic database at a later stage.

Wonderbag users are encouraged to update their contact and personal information recorded in the distribution questionnaires. Users may update their contact details through a variety of means, including direct contact with Wonderbag representatives that may live in local communities and/or field researchers undertaking monitoring surveys, as well as other electronic means such as by email or in future, potentially by logging on to the Wonderbag app.

The Wonderbags and related individual users that are captured in the database form the total population upon which the user habit surveys are based and respective sample (target) populations are drawn.

Baseline Survey

The baseline survey is a once off survey used to establish baseline and fixed parameters. The baseline survey was conducted according to the CDM Sampling Standard. A total of 990 household interviews and measurements were conducted where relevant across all fuels included in the grouped project. Each household was surveyed 3 times in accordance with the Kitchen Performance Test protocol procedure. The surveys were stratified as follows:

- Electricity – 171 households
- Gas – 35 households
- Paraffin – 15 households
- Coal – 9 households
- Wood – 100 households

The arithmetic mean of all survey results was calculated along with the standard deviation and precision. A 95% confidence was applied in the calculations. These values were stratified by fuel type and are presented in the table below. Where the precision was above the 10% threshold from the Sampling Standard, the lower bound was applied in the emission reduction calculations to be conservative.

Fuel	Mean	Standard deviation	Precision
Electricity	26.19 minutes/day/adult	20.26	4.66%
Gas	0.25 kg/day/adult	0.49	35.60%
Paraffin	0.71 litres/day/adult	0.63	25.93%
Coal	4.08 kg/day/adult	2.79	26.88%
Wood	2.52 kg/day/adult	2.83	10.66%

Electric stove ratings:

The electric stove rating used in this Grouped Project, of 1kW, is compared with other information sources, including government reports, peer reviewed literature and independent studies.

For example, the South African government has published two applicable guidelines^{18,19} which reference the average power ratings of different household appliances in the City of Cape Town. The guidelines provide a list of generic wattage ratings for some appliances used in the Western Cape province in South Africa. The guidance documents further indicate that these generic wattage readings can be used if there is no indication on the appliance, indicating that these values are considered as standard values. The guidelines indicate the following standard wattage values for cooking appliances:

- Electric stove: 3,000 watts
- Hotplate large: 2,400 watts
- Hotplate small: 1,275 watts

All values listed above are higher than the assumed uniform 1kW (1,000 watts) applied in the Group Project calculations. Thus the 1kW rating value is conservative as it results in lower baseline emissions, and will therefore prevent over-issuance by a significant margin.

The use of a 1kW stove rating in the baseline also provides for events where users may use a lower setting while bringing the food to a boil prior to putting the pot into the heat-retention Wonderbag.

The values in the government reports, as mentioned above, are used as proxies for the values across the country.

In addition, the following table outlines the different types and ratings of commonly available stove plates in South Africa, as identified in a water boil study undertaken by Global Carbon Exchange in 2012.

¹⁸ Available at:

https://resource.capetown.gov.za/documentcentre/Documents/Procedures%2c%20guidelines%20and%20regulations/Smart_Living_Audit_Guide_for_Your_Home.pdf

¹⁹ Available at:

https://resource.capetown.gov.za/documentcentre/Documents/Procedures,%20guidelines%20and%20regulations/SOH_Audit_Energy_cheat_sheet.pdf

Electric Stove Plate Type	Power Rating
Table-top 2 Plate stove, solid plate	1.5kW ²⁰
Table-top 2 Plate stove, coil plate	1.35kW ²¹
4 Plate stove with oven, solid plate	1.5kW ²²
4 Plate stove with oven, coil plate	1.35kW ²³
4 Plate stove with oven, glass top	2kW ²⁴
2 Plate stove with small oven, solid plate	1.5kW ²⁵

The study conducted in 2012 for the above stove types (solid, coil and glass) made use of a water boil test to compare the electricity consumption of various stove plate types. This study measured the electricity consumption to boil 1.5litres of water using each stove plate type. The result of this study indicated that consumption varied by -4% to 6.8% in relation to the reference stove plate type. No significant difference in energy consumption is thus evident based on the type of stove plate. The reference stove in this study was a table-top 2 plate coil stove.

The result of a -4% to 6.8% variation in the total energy consumption therefore falls within the range of +/- 10% as specified in paragraph 20 of AMS-II.C, and satisfies the requirement of paragraph 40 of AMS-II.C that states:

*“... monitoring shall consist of monitoring either the “power” and “operating hours” or the “energy use” of the equipment installed using an appropriate method. Appropriate methods include: ...
(b) Metering the “energy use” of an appropriate sample of the project equipment installed.”*

The listed stove ratings above are all larger than the rating of 1kW applied in this Grouped Project. Accordingly, the examples listed above all confirm that the use of a 1kW rating value is conservative, as it results in lower baseline emissions compared to the other listed electric

²⁰ STOVE DEFY 60 cm GE 3B 1S ELECTRIC OVEN DGS179 Spec

²¹ <https://www.builders.co.za/Electrical/Electrical-Tools-and-Accessories/Stove-Plates/Stove-Plate-Spiral-150mm-1350w/p/000000000000027064>

²² STOVE DEFY 60 cm GE 3B 1S ELECTRIC OVEN DGS179 Spec

²³ <https://www.builders.co.za/Electrical/Electrical-Tools-and-Accessories/Stove-Plates/Stove-Plate-Spiral-150mm-1350w/p/000000000000027064>

²⁴ <https://www.defy.co.za/products/built-in-sets/cooking-built-in-sets-dcb115>

²⁵ Assumed similar rating as 4 plate stove with oven as no change in stove plates. The only difference is the size of the oven between these models

stoves commonly used in South Africa. This approach guarantees, with a significant margin, that the over-issuance of credits will not occur.

Constant load condition

The demonstration of the constant load condition is based on the cooking habits of Wonderbag users. The calculation of the emission reductions are based on the Wonderbag users operating the stove in a constant setting (constant load condition) to bring the pot of food to a boil, and keeping that constant boiling condition, for a time period specific to the food that is being cooked. It is important that the food is maintained at a boiling condition, prior to being placed in the Wonderbag where the food continues cooking without the use of additional fuel sources, through the retention of the residual heat in the pot of food.

Some food types require more energy to cook, while others less energy; for example, rice requires less energy, while some legumes require more energy. It should however be noted that both food types require the pot to be brought from room temperature up to boiling point. Both these food types therefore require the same amount of energy and therefore the same load setting. The fact that legumes cook longer than rice is not relevant in the case where Wonderbag is used, as the legumes will simply be left in the bag longer than rice, and contrary to the base case where more energy is required, no extra energy is required for legumes as opposed to rice.

The process of bringing a pot of food to the boil, in preparation for using a Wonderbag, does allow users to use the stove at a constant rate prior to placing the food in the Wonderbag for further cooking without additional fuel sources²⁶. It is important that the food is maintained at a constant boiling condition, prior to being placed in the Wonderbag where the food continues cooking without the use of additional fuel sources.

The demonstration of the constant load condition is further supported by a study undertaken in 2014 by the Islamic University of Technology in Bangladesh²⁷, in collaboration with the Programme Sustainable Energy for Development, supported by the Bangladeshi Ministry of Power, Energy and Mineral Resources and the German Federal Ministry for Economic Cooperation and Development through the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

The resulting report, titled *Performance Test of Wonder Bag: A Pathway to Reduce Cooking Energy Consumption and CO₂ Emission*, provides a detailed quantitative analysis of possible energy savings and CO₂ emission reduction for cooking different food items using a Wonderbag.

²⁶ See page 209 of provided supporting doc, published by government, titled 'City of CT 2020 Smart Living Handbook ref to Wonderbag', for reference to needing to bring the pot of food to the boil before transferring to the Wonderbag for further cooking. See also instructions for use of Wonderbags at: <https://www.wonderbagworld.com/how-it-works#:~:text=To%20cook%2C%20simply%20bring%20the,the%20pot%20into%20the%20Wonderbag.&text=Cin%20the%20Wonderbag%20tightly%20with,for%20up%20to%208%20hours.>

²⁷ Source: [Wonderbag performance test.](#)

The research was carried out in a controlled environment and entailed the cooking of food items using an electric Induction cooker and an LPG stove plate, with and without the use of Wonderbag. The food items assessed in the study were plain rice, plain potato, chicken curry and a mixed vegetable curry (potato, pointed gourd, spinach stem).

The report provides detailed descriptions of the cooking methods related to the four food items, with and without the use of a Wonderbag. In each test that involved cooking without a Wonderbag, the cooking methodology entailed bringing the pot of food to the boil and then reducing the power input for the duration of the cooking process and time. For example, when cooking plain rice with an Induction cooker, without the use of Wonderbag:

“The induction cooker was switched on with full power controlled by Variac. A thermocouple has been inserted into the rice-water mixture to measure the temperature throughout the process. The temperature reached the boiling temperature 100 °C after 13 minutes. Soon after that, the power input was decreased to 75% (1.06 kW) at 15 minutes. The cooking is completed at 29 minutes, and the induction cooker is switched off.”

However, this methodology was amended in each test that involved cooking with a Wonderbag, to mimic the Wonderbag user habits, which typically entails cooking at a constant load condition when cooking with a Wonderbag. For example, when cooking plain rice with an Induction cooker, whereafter the food is cooked further in a Wonderbag:

“The induction cooker was switched on with 100% power (1.39 kW) controlled by Variac. A thermocouple has been inserted into the rice-water mixture to measure the temperature throughout the process. The temperature reached the boiling temperature 100 °C at 14.5 minutes. Instantly after that the pan was put inside the Wonderbag and sealed off. The pan was kept inside the Wonderbag for 35 minutes.”

The same cooking methodologies, when assessing the cooking of food with and without a Wonderbag, were used in the rest of the study to assess the other dishes (plain potatoes, chicken and vegetable curries), using both the electric Induction cooker and LPG stove plate.

The cooking methodology related to cooking with a Wonderbag in the study supports the assumption that users of the Wonderbags in the Recipe for Change Grouped Project typically cook at a constant load condition when cooking with a Wonderbag.

Electricity consumption

The values used in the Grouped Project are conservative and will not result in the over-issuance of credits, as demonstrated by comparing the values to the results of an academic study that was conducted to monitor electricity consumption in a middle income household in Gauteng, South Africa. This peer reviewed study was published in the Elsevier Journal in 2022²⁸. The

²⁸ Masebinu, R and Kambule, N (2022) ‘Electricity Consumption Data of a Middle-income Household in Gauteng, South Africa: Pre and Post COVID-19 Lockdown (2019-2021)’, Elsevier, 43: 1-11, doi.org/10.1016/j.dib.2022.108341

study monitored electricity consumption from all household appliances for 30 months. The average electricity consumption from the household's stove was 15.3158kWh/week. This yields an average consumption of 796kWh/ year. The study covered multiple years and accounts for variations in power demand due to varying loads.

The baseline survey results yield an average consumption per household of 463kWh/year. This is significantly lower than the consumption provided in the peer reviewed study. Wonderbags are generally distributed to lower income households thus inherently will have lower electricity consumption due to lower income. Furthermore, the lower baseline consumption for stove use is conservative, as it results in lower baseline emissions, which results in lower emission reductions.

Furthermore, in this Grouped Project, electricity consumption is calculated by multiplying the uniform electric stove rating by the usage (hours or minutes). The typical electric stove rating of 1kW is supported by public literature discussed above. With regards to usage, government's published guidelines²⁹ on the average power use of different household appliances in the City of Cape Town provides for the average electric stove usage per household of 2 hours/day. This use of total power consumption is consistent with the requirements of Paragraph 40 of AMS-II.C.

The average usage value, as per the government's recommendation discussed above, is consistent with the baseline survey results. As per the table above, the baseline survey in the Grouped Project indicates the average use of electric stoves of 26.19 minutes/day/adult. The baseline survey further indicated an average household size of 5 individuals relying on electricity for cooking. Accordingly, applying the baseline survey usage 26.19 minutes/day/adult, the total usage time per household of 5 individuals would amount to about 02h10 hours (5 individuals x 26.19 minutes/day/adult), which correlates well with the figure reported in the government guidelines of 2 hours. In addition, the baseline survey results providing person/household is on par with national statistics, which indicate that about a quarter (25%) of households in South Africa in 2023 had four to five members³⁰.

Accordingly, the government recommendations recognise the energy savings and efficiencies that may be achieved using energy efficient cooking devices like the Wonderbag. A government publication in 2020 provides guidance on how to reduce electricity and related carbon emissions. The 2020 publication states that *"LOW-COST TIPS: Invest in a Hot Box or Wonderbag, which can cut your cooking costs by up to 60%. These boxes and bags insulate your cooking pot so that it retains the initial heat. Foods such as rice, porridge, soups or stews*

²⁹ Available at:

https://resource.capetown.gov.za/documentcentre/Documents/Procedures%2c%20guidelines%20and%20regulations/Smart_Living_Audit_Guide_for_Your_Home.pdf

³⁰ Available at: <https://www.statssa.gov.za/?p=17283>

can be brought to the boil on the stove, and then be transferred to the box or bag to continue the cooking process.”³¹

User Habit Survey

The user habit surveys are periodic surveys undertaken to establish the ongoing monitored parameters.

The number of bags in field makes its impractical and economically unfeasible to monitor every bag in use. Field surveys, based on random samples of the bags in the field, are therefore used to statistically quantify the number of carbon credits generated by the total population (bags in use). Field researchers visit and/or interview the Wonderbag users identified in the random sample-target population during the respective surveys.

The data sets collected in the surveys by field researchers are also captured, collated and stored in the electronic database. Data sets are inputted by field researchers directly into an application on an electronic device, such as a smartphone or tablet. The field researchers may also use manual recording methods where the required electronic devices are not available at the time of the survey interviews. In such cases the manual data sets are subsequently uploaded into the electronic database at a later stage.

The User Habit Survey was initiated on 15 March 2022 and completed on 27 May 2022. The survey included 902 interviews. These surveys include a Kitchen Performance Test to establish the fuel consumption with the Wonderbag. The surveys from the 2nd MP have been applied as per the provisions in section 4.8.2 of the General Guidelines for SSC CDM Methodologies, v23.1. This section makes provision for the use of survey results for 2 years based on several conditions being met. These provisions are:

1. Microscale thresholds must be met at unit level
2. Lifetime of unit is known and greater than 4 years.
3. At least 50% of units must be distributed before the survey start date
4. Surveys shall not have more than 24 months between start dates

All of the above conditions are met as follows:

1. Each Wonderbag falls below the microscale thresholds
2. The lifetime of a Wonderbag is 10 years as per the current PD. This is being updated to 15 years as per the project description deviation applied for in this MR.

³¹ Available at:

https://resource.capetown.gov.za/documentcentre/Documents/Procedures%2c%20guidelines%20and%20regulations/CCT_Smart_Living_Handbook.pdf

3. Approximately 70,000 Wonderbags were distributed in the 3rd MP. This is only 19% of the total Wonderbags in the project. Therefore this condition is met.

4. The survey results are only used for 2 years and the next habit survey will be conducted before 15 March 2024 to meet this condition.

The sample households were selected using a systematic random approach. The selected households were taken from the database population by selecting entries randomly and exporting their distribution information.

It was necessary to contact households to find out where they and their bags currently were. This is because many people have recently moved back to their hometowns and villages, or elsewhere. This is due to the current socio and economic impacts of the Covid pandemic which have disproportionately affected poorer communities, such as those in which the Wonderbags are distributed in.

The Kitchen Performance Test guidelines was used as a starting point to determine the sample size. The Kitchen Performance Test guidelines requires a sample of 100 households for groups larger than 1,000. Oversampling was employed in order to be conservative. A total of 902 surveys results were achieved with physical interviews being conducted three times at each household. The surveys were stratified by fuel type as follows:

- Electricity – 114 households
- Gas – 48 households
- Paraffin – 39 households
- Coal – 5 households
- Wood – 116 households

The arithmetic mean of all survey results was calculated along with the standard deviation and precision. A 95% confidence interval was applied in accordance with the CDM Sampling Standard for cross project activity instance sampling. These values were stratified by fuel type and are presented in the table below. Where the precision was above the 10% threshold from the Sampling Standard, the upper bound was applied in the emission reduction calculations to be conservative. The values in the table are provided per Wonderbag per adult equivalent (as defined by the KPT). The mean can be extrapolated to a consumption per Wonderbag by multiplying by the average adult equivalent of the fuel strata. The average adult equivalent is provided in the table below.

Fuel	Mean per Wonderbag	Standard deviation	Precision	Adult equivalent
Electricity	10.72 minutes/day/adult	9.06	8.87%	3.87
Gas	0.03 kg/day/adult	0.03	16.28%	4.68
Paraffin	0.32 litres/day/adult	0.15	10.07%	3.06
Coal	2.38 kg/day/adult	0.82	22.95%	3.13
Wood	1.18 kg/day/adult	0.58	5.46%	3.41

The data sets collected in the surveys by field researchers were captured, collated and stored in the electronic database. Data sets were inputted by field researchers directly into an application on an electronic device, such as a smartphone or tablet. The data sets were subsequently uploaded into Wonderbag's electronic database.

All the monitored data parameters outlined in section 4 above are captured and managed in the electronic database, described in the following figure.

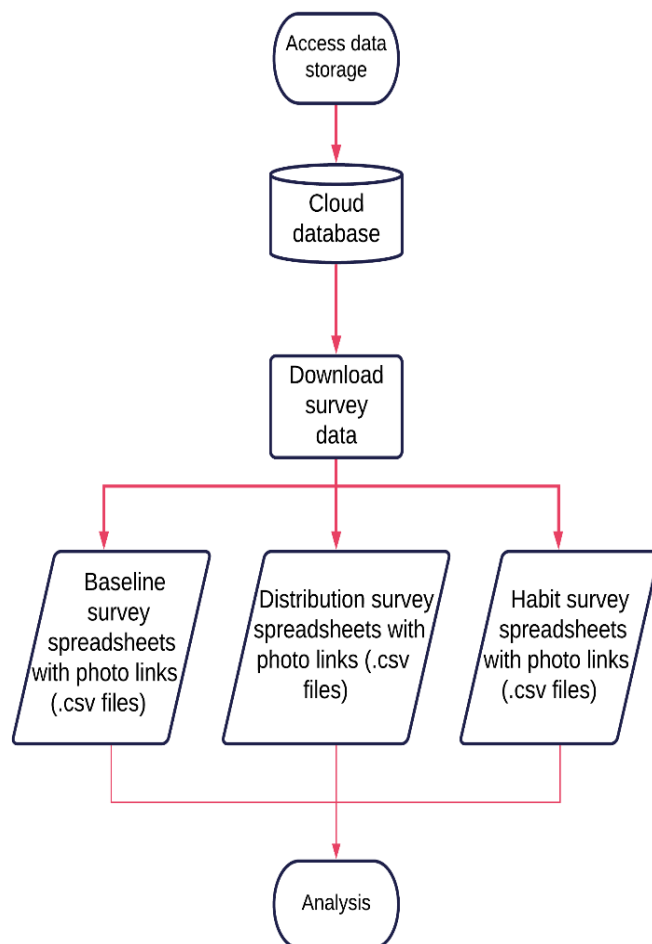


Figure 3: Web-based data storage and management process

The electronic database therefore provides for professional data management services, from which periodic monitoring reports to be drawn. This includes the number and dates of bags distributed per distributing entity, the number of bags distributed per project activity instance, the distribution of bags across national provinces, the quantities of fuels used for cooking purposes, types of fuel that may be used for cooking purposes, etc.

Calibration procedures for monitoring equipment:

Due to the nature of the project, none of the monitoring equipment utilised for survey purposes requires calibration. This is because the pieces of monitoring equipment used, which includes hand-held scales, foot scales and measuring jugs, are typically used in residential or household applications and therefore do not have accuracy ranges or calibration requirements associated with meters or equipment utilised in industrial applications.

Organisational structure and data management responsibilities

Wonderbag is the sole responsible party for the VCS grouped project. This includes:

- Manufacturing of Wonderbags
- Deployment of senior level staff and consultants with competencies for management of the grouped project and for effectiveness in the roles listed here
- Training, capacity-building, technical support and operational guidance to Wonderbag manufacturers and distributors
- Focal point for communications with the VVB, the VCS-registry operator and the VCS
- Oversight of record-keeping by manufacturers and quality control of all programme documentation and records, such as the Wonderbag database
- Oversight and accountability for the commissioning of monitoring surveys. Wonderbag is responsible for ensuring that the in-house personnel or third parties undertaking monitoring activities have the required competencies
- Reports summarizing user records together with results of monitoring surveys for submission to verifying VVB
- Continuous improvement of VCS grouped project management system
- On-going support to users to ensure proper use of Wonderbags
- Registration of representative pool of Wonderbag users
- Facilitation of tracking and quality assurance, data authentication, elimination of double-counting risks, investigation by VVBs and other auditors

The organisational structure of Wonderbag, including the responsibilities for the VCS grouped project, is depicted in the figure below.

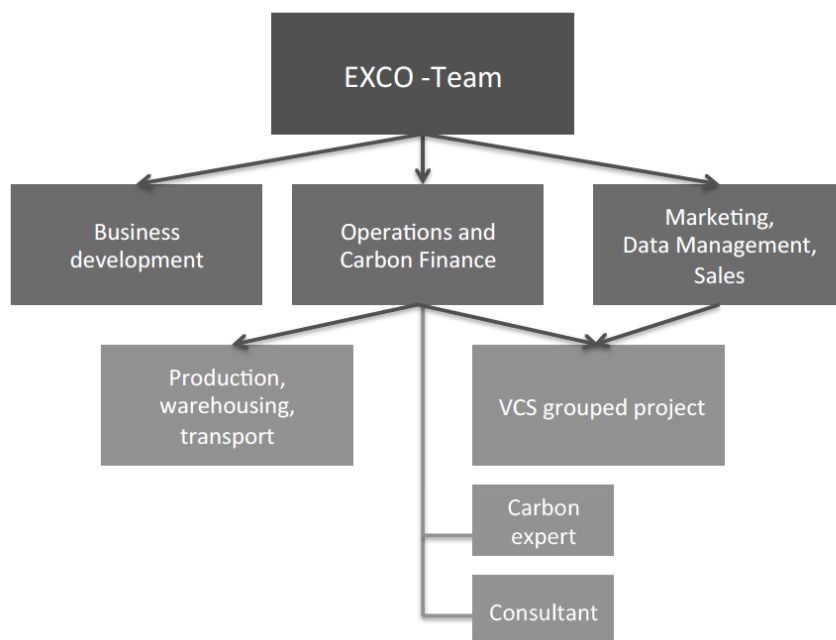


Figure 4 Organisational Chart - Wonderbag

Internal auditing and QA/QC

Wonderbag undertakes internal quality checking processes during the manufacturing of the bags. The internal QA/QC procedures include the checking of completed bags. The checks include the removal of chalk dust and threads on the fabric, as well as checks on the quality of the stitching. Bags that do not pass the internal QA/QC process are returned to the production line for the required amendments.

The bags are only vacuum packed for distribution once they have successfully passed the internal QA/QC procedure.

Wonderbag also undertakes periodic training to ensure that quality control is maintained. The training covers monitoring requirements, such as app usage, and QA/QC procedures related to data collection and management.

Wonderbag will implement a procedure to address the issue of Wonderbags being exchanged with other end-users. This procedure will make use of both the Wonder Woman initiative and the periodic User Habit Surveys to check the serial numbers and which names they are registered to. Where the bag has been swapped with another end-user, the entries within the database will be updated to reflect this change. Furthermore, at the distribution of the bags, it will be emphasised that the Wonderbag must be maintained and kept by the person it is registered to. Regular social media campaigns will be conducted to sensitise end users around the maintenance, use and keeping of the Wonderbags.

Non-conformances with the monitoring plan

The use of a central database, which generates reports related to the monitored data parameters, provides for the timeous identification of non-conformances with the monitoring plan. Data sets are regularly reviewed and assessed for completeness, consistency, accuracy and transparency. Any non-conformances are flagged and addressed as they are identified, to ensure that monitoring is undertaken as per the stipulated monitoring plan. Where necessary, field researchers may be deployed back into the field to recapture the relevant data sets.

Sampling plan

Sampling in this monitoring period has occurred at Grouped Project level. The purpose of sampling is to obtain unbiased and reliable estimates of the mean value of parameters used in the calculations of greenhouse gas emission reductions. ‘Unbiased’ in this case indicates that the sampling will not systematically underestimate or overestimate the mean value determined. The sampling design is based on the following UNFCCC guidance:

- The CDM’s “General guidelines for sampling and surveys for small-scale CDM project activity”; and
- The Clean Cooking Alliance’s “Kitchen Performance Test”³².

The sampling plan below contains:

- A. Sampling design and method; and
- B. Data to be collected.

A: Sampling design

(O) (i) *Objectives and Reliability Requirements*

The objective of the surveys is to establish the reduction in energy use for the cooking systems that employ the use of heat retaining Wonderbags.

Sampling is necessary to establish variables in the calculation of the reduction in energy use. Hence it results in mean annual values over the monitoring period.

The minimum desired precision of the sample group is a sampling error of 10% and a confidence level of 95%.

The Kitchen Performance Test guidelines was used as a starting point to determine the sample size. The Kitchen Performance Test guidelines requires a sample of 100 households for groups larger than 1,000.

³² Bailis, B., Thompson, R., Lam, N., Berrueta, V., Muhwezi, G., and Adams, E. 2018. *Kitchen Performance Test (KPT), Version 4.0*.

This sample size was however increased for the User Habit Survey, to account for potential variance in as well as non-responses. Over-sampling is allowed for in the Project Description, as per section 5.3.5. Stratification was employed by fuel type resulting in separate sample selections for each fuel.

Samples were conducted for each fuel type listed in the baseline scenario, this results in one strata for each fuel. The statistical analyses on strata sample size and results were conducted independently of each other. This ensures that results from the strata do not affect each other.

Samples were selected for each stratum, based on the information about household fuel use in the Wonderbag database. The results of the surveys were applied to all Wonderbags that use that particular fuel type.

145 surveys were conducted telephonically, focusing on gas users only, as per the described project deviation, where respondents were requested to the amount of cooking time on a gas stove.

757 surveys were conducted on a face-to-face basis to determine the use of electricity, coal, paraffin and LPG cooking fuels in the project scenario, over a period of three days per household. In the case of electricity used for cooking purposes, the households were physically interviewed by field researchers to determine the amount of time the users spent cooking on their electric stoves, however electricity consumption was not physically measured during the surveys.³³

In addition, physical surveys were prioritized in the KwaZulu Natal, Western Cape and Gauteng Provinces. Wonderbag has long standing contacts within these communities and felt confident that the safety of the field researchers and respondents could be assured there.

(ii) Target Population

The target sample populations are drawn from the Wonderbag database, which consists of all registered Wonderbag users in South Africa at the time of the survey.

(iii) Sampling Method

The selection of sample-households is on a random basis. The survey methodology is a paired-sample study with no control. A paired-sample study compares household's fuel use without the use of a Wonderbag (established in the once-off baseline survey) and with the use of a Wonderbag (established in the periodic user habit surveys).

In the user habit survey, the sample was selected using a systematically random method. The selected households were taken from the current database population and phoning that

³³ Note that in the next monitoring period, Wonderbag will interview the sample of the electricity users by telephone or other electronic communication means, as per the project deviation outlined in section 3.2 of this monitoring report.

person. If there was no response, then the next name in the sample was selected and contacted and so on.

(iv) Sample Size

In order to minimize non-sampling errors, such as non-responses and errors, the field team engaged in the practice of over-sampling from the population. The aim was to ensure the integrity of the sample group and maintain the randomness of participant selection.

A total of 902 surveys were conducted. 145 of these surveys were conducted telephonically, where gas-users were requested to provide indications of cooking time.

757 surveys were conducted on a face-to-face basis to determine the use of electricity, coal, paraffin and LPG cooking fuels in the project scenario, over a period of three days per household. In the case of electricity used for cooking purposes, the households were physically interviewed by field researchers to determine the amount of time the users spent cooking on their electric stoves, however electricity consumption was not physically measured during the surveys.³⁴

B: Data to be collected:

(0) (i) Field measurements

The following monitored data parameters were collected during the user habit survey:

- a. Number, age and gender of people in the household
- b. Serial numbers (unique identifier) of distributed Wonderbags
- c. Failure rate of distributed Wonderbags
- d. Type of cooking system e.g. electric stove; other fossil fuel stove or biomass cooking system
- e. Time spent cooking on the household stove with a Wonderbag
- f. Quantity of fossil fuel or biomass consumed with a Wonderbag

On site surveying was conducted by researchers using a prepared questionnaire, which was manually uploaded thereafter to the electronic Wonderbag database.

(ii) Quality Assurance/Quality Control

Wonderbag is responsible for the QA/QC for the grouped project. A third-party survey team was contracted for the execution of the User Habit Surveys and assisted by Wonderbag personnel.

³⁴ Note that in the next monitoring period, Wonderbag will interview the sample of the electricity users by telephone or other electronic communication means, as per the project deviation outlined in section 3.2 of this monitoring report.

The randomly selected survey sample population, specifying names, contact numbers and Wonderbag ID etc., was made available to the field researchers. A predefined questionnaire provided for high-levels of data accuracy.

The physical surveys were conducted in accordance with the CDM's "General guidelines for sampling and surveys for small-scale CDM project activity" the Clean Cooking Alliance's "Kitchen Performance Test Protocol", to ensure quality data was collected and captured.

(iii) Analysis

The obtained data from the survey was captured and processed in the Wonderbag database. The resulting emission reductions are calculated based on the energy consumption in both the baseline and project scenarios.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are determined by the electricity consumption and/or fossil fuel consumption and/or biomass consumption.

$$BE_y = BE_{ELEC,y} + BE_{FOSSIL,y}$$

Where:

BE_y Baseline emissions in year y (tCO₂e)

$BE_{ELEC,y}$ Baseline emissions from electricity consumption in year y (tCO₂e/y)

$BE_{FOSSIL,y}$ Baseline emissions from fossil fuel combustion in year y (tCO₂e/y)

The total fossil fuel baseline emissions in the Group Project are outlined in the following subsection. The baseline emissions are determined separately according to the biomass methodology, as outlined in Section 5.4 below.

Baseline electricity consumption

The baseline emissions from electricity-based cooking systems are calculated as follows in accordance with Option 1 – Constant load equipment in AMS-II.C (section 5.4.1.1):

$$BE_y = E_{BL,y} \times EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL}$$

(Equation 1, AMS-II.C.)

An example calculation is provided for the year 2021 for RfC PA1:

This equation is modified as follows to distinguish between the use of electricity or fossil fuels in the baseline.

$$BE_{ELEC,y} = E_{BL,y} \times EF_{CO2,ELEC,y} + Q_{ref,BL} \times GWP_{ref,BL}$$

(Equation 1, AMS-II.C., modified for electricity baseline)

Where:

$BE_{ELEC,y}$	Baseline emissions from electricity consumption in year y (tCO ₂ e/y)
$E_{BL,y}$	Energy consumption for the baseline in year y (kWh)
$EF_{CO2,ELEC,y}$	Electricity emission factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in ASB0040 version 01.0. If electricity displaced is captive electricity, the emission factor in year y shall be calculated in accordance with the “Tool to calculate baseline, project and/or leakage emission from electricity consumption”

An example calculation is provided for the year 2023 for RfC PA1:

Year	$BE_{ELEC,y}$	$E_{BL,ELEC,y}$	$EF_{CO2,ELEC,y}$
	tCO ₂ e	kWh	tCO ₂ /MWh
2023	1,844	1,944,726	0.9481

E_{BL} is calculated as follows:

$$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_{i,BL} / (1 - l_y))$$

(Equation 2 AMS-II.C.)

Where:

n_i	Number of pieces of equipment of the group i baseline equipment retrofitted or that would have been retrofitted
ρ_i	Electrical power demand (kW) of the group i baseline equipment. In the case of a retrofit activity, electrical power demand is the weighted average of the rated power (kW) of group i baseline equipment. The baseline equipment for this grouped project consists of different electrical stoves. The power ratings of these electrical stoves can be fixed ex ante.
$O_{i,BL}$	Average annual operating hours of the group of i baseline equipment. The operating hours of the baseline equipment in year y can be determined using surveys by measurement of usage hours of baseline equipment. For a

large population of baseline equipment : (a) Use a representative sample (sampling determined by a minimum 95% confidence interval and 10% maximum error margin); and (c) Ensure that sampling is statistically robust and relevant, i.e. the selection of the equipment to be analysed for operating hours has a random distribution and is representative of target population (size, location).

I_y Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. The reliability of the data used (e.g. appropriateness, accuracy/uncertainty, especially exclusion of non-technical grid loss) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable.

An example calculation is provided for the year 2023 for RfC PA1:

Year	$E_{BL,ELEC,y}$	$\sum n_i * \rho_i * o_i$	I_y
	kWh		%
2023	1,944,726	1,732,751	10.9

$\sum n_i * \rho_i * o_i$	n_i	$\rho_i * o_i$
1,732,751	8,572	202

The number of Wonderbags in use (n_i) can be calculated as follows:

$$n_i = N_w \times (u_w - f_{rate,w}) \times u_{ELEC,w} \times t_w$$

Where:

N_w	The number of Wonderbags of type w distributed
u_w	Share of users actually cooking with a Wonderbag of type w (%)
$u_{ELEC,w}$	Share of users cooking on an electric stove of type w (%)
$f_{rate,w}$	Failure rate of the Wonderbags (%)
t_w	Active time in the monitoring period for the full population of Wonderbags type w (%)

An example calculation is provided for the year 2023 for RfC PA1:

Year	n_i	N_w	u_w	$UELEC_w$	$f_{rate,w}$	t_w
2023	8,572	19,934	100%	43%	0%	100%

Baseline fossil fuel consumption

The baseline emissions from fossil fuel consumption in cooking systems can be calculated as follows in accordance with paragraph 32 of AMS-II.C:

$$BE_{FOSSIL,y} = E_{BL,FOSSIL,i,y} \times EF_{CO2,i,y} \times n_i$$

(Paragraph 32 of AMS-II.C)

Where:

$BE_{FOSSIL,y}$ Baseline emissions from fossil fuel combustion in year y (tCO₂e/y)

$E_{BL,FOSSIL,i,y}$ Baseline energy consumption of fossil fuel i in year y (TJ)

$EF_{CO2,i,y}$ Emission factor for fossil fuel i in year y (tCO₂/TJ)

n_i Number of pieces of equipment of the group i baseline equipment retrofitted or that would have been retrofitted

An example calculation is provided for coal in the year 2023 for RfC PA1:

	$BE_{coal,y}$	$EF_{CO2,coal}$	NCV_{coal}	n_i
Year	tCO ₂ e	tCO ₂ /TJ	TJ/tonne	
2023	19	96.10	0.02	6

The number of Wonderbags in use (n_i) can be calculated as follows:

$$n_i = N_w \times (u_w - f_{rate,w}) \times u_{FOSSIL,i,w} \times t_w$$

Where:

N_w The number of Wonderbags of type w distributed

u_w Share of users actually cooking with a Wonderbag of type w (%)

$u_{FOSSIL,w}$ Share of users cooking using fossil fuel i with a Wonderbag of type w (%)

$f_{rate,w}$ Failure rate of the Wonderbags (%)

t_w Active time in the monitoring period for the full population of Wonderbags type w (%)

An example calculation is provided for coal in the year 2023 for RfC PA1:

Year	n_i	N_w	U_w	$f_{rate,w}$	t_w	Share of users using stove type j with a Wonderbag
2023	6	19,934	100%	0%	100%	0.03%

The baseline energy consumption can be calculated as follows:

$$E_{BL,FOSSIL,i,y} = FC_i \times NCV_{FOSSIL FUEL i}$$

Where:

FC_i Baseline consumption of fossil fuel i (unit of consumption/year)

$NCV_{FOSSIL FUEL i}$ Net calorific value of fossil fuel i (TJ/unit of consumption)

An example calculation is provided for coal in the year 2023 for RfC PA1:

NCV_{coal}	Baseline fuel consumption using stove type j
TJ/tonne	tonne/week
0.02	0.08

The following table summarises the parameters used in the calculation of the baseline emissions for fossil fuels. The values for the first project activity instance, RFC 1 are presented for illustration purposes. The full details, per project activity instance in this monitoring period, are contained in the provided Excel Emission Reduction Calculation spreadsheet.

Parameters – Example – RFC1

Parameter	Unit	RfC1 value for 2023
μ_y		1
$NCV_{biomass}$	TJ/tonne	0.0156
$EF_{projected_fossil\ fuel}$	tCO ₂ e/TJ	73.2
Leakage Adjustment		0.95
$f_{NRB,y}$		0.71
LE_y	tCO ₂ e	-
$EF_{CO2,ELEC,y}$	tCO ₂ /MWh	0.95
$Q_{ref,BL}$	tonnes/year	-
$GWP_{ref,BL}$	tCO ₂ e/t refrigerant	-
I_y	%	10.90%
N_w		19,934
U_w	%	100%
$UELEC,w$	%	43.0%
$f_{rate,w}$	%	0.0%
Percentage replacing biomass	%	51.0%
Percentage replacing electricity	%	43.0%
Percentage replacing paraffin	%	0.3%
Percentage replacing LPG	%	5.7%

Percentage replacing coal	%	0.03%
EF _{CO2,paraffin}	tCO ₂ /TJ	71.90
EF _{CO2,LPG}	tCO ₂ /TJ	63.10
EF _{CO2,coal}	tCO ₂ /TJ	96.10
NCV _{paraffin}	TJ/litre	0.00004
NCV _{LPG}	TJ/kg	0.00005
NCV _{coal}	TJ/tonne	0.02
Average adult equivalent in households using biomass	adult equivalent	3.41
Electric stove power rating	kW	1.0
Average cooking hours in baseline per year per adult equivalent	hours	158.88
Average adult equivalent in households using electricity	adult equivalent	3.87
Average cooking hours in project activity per year per adult equivalent	hours	70.79
Paraffin - Baseline fuel consumption per week	litres/week/per adult equivalent	4.32
LPG - Baseline fuel consumption per week	kg/week/adult equivalent	1.43
Coal - Baseline fuel consumption per week	tonne/week/adult equivalent	0.02
Average adult equivalent in households using paraffin	adult equivalent	3.06
Average adult equivalent in households using LPG	adult equivalent	4.68
Average adult equivalent in households using coal	adult equivalent	3.13
Paraffin - Project fuel consumption per week	litres/week/per adult equivalent	2.47
LPG - Project fuel consumption per week	kg/week/adult equivalent	0.24
Coal - Project fuel consumption per week	tonne/week/adult equivalent	0.02
Electricity - tw	%	100%
Paraffin - tw	%	100%
LPG - tw	%	100%
Coal - tw	%	100%

The following tables summarise the total results of the baseline emission reduction calculations, for fossil fuels, for the project activity instances in this monitoring period. The full details, per project activity instance, are contained in the provided Excel Emission Reduction Calculation spreadsheet.

<u>AMS-II.C.</u>	Unit	RfC1 results	RfC2 results	RfC3 results
BE _y	tCO ₂ e	6,928	6,582	6,956

<u>AMS-II.C.</u>	Unit	RfC4 results	RfC5 results	RfC6 results
BE _y	tCO ₂ e	7,468	12,082	6,715

<u>AMS-II.C.</u>	Unit	RfC7 results	RfC8 results	RfC9 results
BE _y	tCO ₂ e	14,663	15,145	14,985

<u>AMS-II.C.</u>	Unit	RfC10 results	RfC11 results	RfC12 results
BE _y	tCO ₂ e	13,831	15,076	14,915

<u>AMS-II.C.</u>	Unit	RfC13 results	RfC14 results	RfC15 results
BE _y	tCO ₂ e	14,676	14,656	15,112

<u>AMS-II.C.</u>	Unit	RfC16 results	RfC17 results	RfC18 results
BE _y	tCO ₂ e	13,434	11,013	9,444

<u>AMS-II.C.</u>	Unit	RfC19 results
BE _y	tCO ₂ e	2,917

The total fossil fuel baseline emissions in the monitoring period, related to methodology AMS-II.C, were 216,601 tCO₂e.

Baseline biomass consumption

The emission reductions are determined separately for the biomass methodology in the emission reduction section (Section 5.4). This is because the AMS.II.G. methodology does not separate the calculation between baseline and project emissions and only provides the equation for calculation the emission reductions.

5.2 Project Emissions

The project emissions are determined by the electricity and/or fossil fuel and/or biomass consumption during the project activity. The emission reductions are determined separately for the biomass methodology in the emission reduction section (Section 5.4).

$$PE_y = PE_{ELEC,y} + PE_{FOSSIL,y}$$

Where:

PE_y	Project emissions in year y (tCO ₂ e)
$PE_{ELEC,y}$	Project emissions from electricity consumption in year y (tCO ₂ e/y)
$PE_{FOSSIL,y}$	Project emissions from fossil fuel combustion in year y (tCO ₂ e/y)

The fossil fuel project emissions per each Project Activity Instance are available in the respective emission reduction calculation spreadsheets.

Project emissions from electricity-based cooking systems

The use of the Wonderbags for cooking purposes reduces the amount of fuel used, compared to the business as usual scenario.

The project emissions from electricity-based cooking systems are calculated as follows in accordance with AMS-II.C.:

$$PE_y = E_{PJ,y} \times EF_{CO2,y} + PE_{ref,y}$$

(Equation 7, AMS-II.C.)

Where:

PE_y	Project emissions in year y (tCO ₂ e)
$E_{PJ,y}$	Energy consumption for the project activity in year y (kWh)
$EF_{CO2,y}$	Electricity emission factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in ASB0040 version 01.0. If electricity displaced is captive electricity, the emission factor in year y shall be calculated in accordance with the “Tool to calculate baseline, project and/or leakage emission from electricity consumption”
$PE_{ref,y}$	Project emissions from physical leakage of physical refrigerant from the project equipment in year y (tCO ₂ e/y)

This equation is modified for this Grouped Project as follows:

$$PE_{ELEC,y} = E_{PJ,y} \times EF_{CO2,ELEC,y}$$

(Equation 7, AMS-II.C., modified for electricity consumption)

Where:

$E_{PJ,y}$	Energy consumption for the project activity in year y (kWh)
$EF_{CO2,ELEC,y}$	Electricity emission factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in ASB0040 version 01.0. If electricity displaced is captive electricity, the emission factor in year y shall be calculated in accordance with the “Tool to calculate baseline, project and/or leakage emission from electricity consumption”

An example calculation is provided for the year 2023 for RfC PA1:

Year	$PE_{ELEC,y}$	$E_{PJ,ELEC,y}$	$EF_{CO2,ELEC,y}$
	tCO ₂ e	kWh	tCO ₂ /MWh
2023	821	866,449	0.9481

$E_{PJ,y}$ is calculated as follows:

$$E_{PJ,y} = \sum_t \sum_i (n_i \times \rho_i \times o_i / (1 - l_y))$$

(Equation 8 AMS-II.C.)

Where:

n_i	Number of pieces of equipment of the group i baseline equipment retrofitted or that would have been retrofitted.
ρ_i	Electrical power demand (kW) of the group i project devices measured during the time interval t in year y .
O_i	Operating hours of group of i project devices in the time interval t in year y Note that ρ_i and O_i may be determined separately or in combination, i.e. as energy consumption.
l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g. theft). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. The reliability of the data used (e.g. appropriateness, accuracy/uncertainty, especially exclusion of non-technical grid loss) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical

grid losses, if no recent data are available or the data cannot be regarded accurate and reliable.

An example calculation is provided for the year 2023 for RfC PA1:

Year	$E_{PJ,ELEC,y}$	$\sum n_i \cdot \rho_i \cdot o_i$	l_y
	kWh		%
2023	866,449	772,006	10.90

$\sum n_i \cdot \rho_i \cdot o_i$	n_i	$\rho_i \cdot o_i$
772,006	8 572	124.11

$\rho_i \cdot o_i$	Power rating of stove	Average number of operating hours
90.07	1	273.95

The number of Wonderbags in use (n_i) can be calculated as follows:

$$n_i = N_w \times (u_w - f_{rate,w}) \times u_{ELEC,w} \times t_w$$

Where:

N_w	The number of Wonderbags of type w distributed
u_w	Share of users cooking with a Wonderbag of type w (%)
$u_{ELEC,w}$	Share of users cooking on an electric stove with a Wonderbag of type w (%)
$f_{rate,w}$	Failure rate of the Wonderbags (%)
t_w	Active time in the monitoring period for the full population of Wonderbags type w (%)

An example calculation is provided for the year 2023 for RfC PA1:

Year	n_i	N_w	u_w	$u_{ELEC,w}$	$f_{rate,w}$	t_w
2023	8 572	19 934	100%	43%	0%	100%

Project emissions from fossil-fuel-based cooking systems

The use of the Wonderbags for cooking purposes reduces the amount of fuel used, compared to the business as usual scenario.

The project emissions from fossil fuel consumption in cooking systems can be calculated as follows in accordance with AMS-IL.C.:

$$PE_y = E_{PJ,y} \times EF_{CO2,y} + PE_{ref,y}$$

(Equation 7, AMS-II.C.)

Where:

PE_y	Project emissions in year y (tCO ₂ e)
$EP_{j,y}$	Energy consumption for the project activity in year y (kWh)
$EF_{CO_2,y}$	Electricity emission factor. If electricity displaced is grid, the emission factor in year y shall be calculated in accordance with the provisions in ASB0040 version 01.0. If electricity displaced is captive electricity, the emission factor in year y shall be calculated in accordance with the “Tool to calculate baseline, project and/or leakage emission from electricity consumption”
$PE_{ref,y}$	Project emissions from physical leakage of physical refrigerant from the project equipment in year y (tCO ₂ e/y)

The equation above is modified for fossil fuel consumption as follows:

$$PE_{FOSSIL,y} = EP_{j,FOSSIL,i,y} \times EF_{CO_2,i,y} \times n_i$$

(Equation 7, AMS-II.C., modified for fossil fuel consumption)

Where:

$EP_{j,FOSSIL,i,y}$	Project activity energy consumption of fossil fuel i in year y (TJ)
$EF_{CO_2,i,y}$	Emission factor for fossil fuel i in year y (tCO ₂ /TJ)
n_i	Number of pieces of equipment of the group i baseline equipment retrofitted or that would have been retrofitted

An example calculation is provided for coal in the year 2023 for RfC PA1:

	$PE_{coal,y}$	$EF_{CO_2,coal}$	NCV_{coal}	n_i
Year	tCO ₂ e	tCO ₂ /TJ	TJ/tonne	
2023	15	96.10	0.02	6

The number of Wonderbags in use (n_i) can be calculated as follows:

$$n_i = N_w \times (u_w - f_{rate,w}) \times u_{FOSSIL,i,w} \times t_w$$

Where:

N_w	The number of Wonderbags of type w distributed
u_w	Share of users actually cooking with a Wonderbag of type w (%)
$u_{FOSSIL,i,w}$	Share of users cooking using fossil fuel i with a Wonderbag of type w (%)

$f_{rate,w}$	Failure rate of the Wonderbags (%)
t_w	Active time in the monitoring period for the full population of Wonderbags type w (%)

An example calculation is provided for coal in the year 2023 for RfC PA1:

	n_i	N_w	U_w	$f_{rate,w}$	t_w	Share of users using stove type j with a Wonderbag
2023	6	19 934	100%	0%	100%	0.03%

The project activity energy consumption can be calculated as follows:

$$E_{PJ,FOSSIL,i,y} = FC_{PJ,i} \times NCV_{FOSSIL FUEL i}$$

Where:

$FC_{PJ,i}$ Project activity consumption of fossil fuel i (unit of consumption/year)

$NCV_{FOSSIL FUEL i}$ Net calorific value of fossil fuel i (TJ/unit of consumption)

An example calculation is provided for coal in the year 2023 for RfC PA1:

NCV_{coal}	Baseline fuel consumption using stove type j
TJ/tonne	tonne/week
0.02	0.08

The following tables summarise the parameters used in the calculation of the project emissions for fossil fuels. The values for the first project activity instance, RFC 1 are presented for illustration purposes. The full details, per project activity instance in this monitoring period, are contained in the provided Excel Emission Reduction Calculation spreadsheet.

Project Emissions Parameters – Example – RFC PA1

Parameter	Unit	RfC PA1 value for 2023
$EF_{CO2,paraffin}$	tCO ₂ /TJ	71.90
$EF_{CO2,LPG}$	tCO ₂ /TJ	63.10
$EF_{CO2,coal}$	tCO ₂ /TJ	96.10
$NCV_{paraffin}$	TJ/litre	0.00004
NCV_{LPG}	TJ/kg	0.00005
NCV_{coal}	TJ/tonne	0.02
n_i	Household	60
n_i	Household	1136
n_i	Household	6
N_w		19,934

U_w		100%
$f_{rate,w}$		0.0%
t_w	%	1.00
t_w	%	1.00
t_w	%	1.00
Share of users using stove type j with a Wonderbag	%	0.3%
Share of users using stove type j with a Wonderbag	%	5.7%
Share of users using stove type j with a Wonderbag	%	0.03%
PE_y	tCO ₂ e	920.73
$PE_{ELEC,y}$	tCO ₂ e	821.48
$PE_{FOSSIL,y}$	tCO ₂ e	99,25
$E_{PJ,ELEC,y}$	kWh	866,449
$EF_{CO2,ELEC,y}$	tCO ₂ /MWh	0.9481
$\sum n_i \cdot \rho_i \cdot o_i$		772,006
l_y	%	10.90%
$\rho_i \cdot o_i$		90.07
Power rating of stove	kW	1
Average number of operating hours	hours	273.95
$PE_{Paraffin,y}$		21
$PE_{LPG,y}$		63
$PE_{coal,y}$		15
Project fuel consumption using stove type j	litres/week	7.56
Project fuel consumption using stove type j	kg/week	1.12
Project fuel consumption using stove type j	tonne/week	0.06
Project energy consumption-- Paraffin	TJ/week	0.02
Project energy consumption-- LPG	TJ/week	0.06
Project energy consumption-- Coal	TJ/week	0.01

The following tables summarises the total results of the project emission calculations, for fossil fuels, for the project activity instances in this monitoring period.

AMS-II.C.	Unit	RfC1 results	RfC2 results	RfC3 results
PE_y	tCO ₂ e	2,801	2,747	2,803

AMS-II.C.	Unit	RfC4 results	RfC5 results	RfC6 results
PE_y	tCO ₂ e	3,151	4,935	2,781

AMS-II.C.	Unit	RfC7 results	RfC8 results	RfC9 results
PE_y	tCO ₂ e	6,354	6,688	6,520

AMS-II.C.	Unit	RfC10 results	RfC11 results	RfC12 results
PE _y	tCO ₂ e	5,222	5,205	5,237

AMS-II.C.	Unit	RfC13 results	RfC14 results	RfC15 results
PE _y	tCO ₂ e	5,307	5,303	5,193

AMS-II.C.	Unit	RfC16 results	RfC17 results	RfC18 results
PE _y	tCO ₂ e	4,842	4,390	3,769

AMS-II.C.	Unit	RfC19 results
PE _y	tCO ₂ e	1,127

The total fossil fuel project emissions in the monitoring period, related to methodology AMS-II.C, were 84,376 tCO₂e.

Project emissions from biomass-based cooking systems

The use of the Wonderbags for cooking purposes reduces the amount of fuel used, compared to the business as usual scenario. The emission reductions are determined separately for the biomass methodology in the emission reduction section (Section 5.4). The AMS.II.G. methodology does not separate the calculation between baseline and project emissions and only provides the equation for calculation the emission reductions.

5.3 Leakage

Leakage is considered only under AMS-II.G, i.e. not under AMS-II.C. Leakage has therefore been taken into account in the calculation of emission reductions from reducing consumption of non-renewable biomass.

Leakage related to non-renewable biomass use is considered by multiplying the parameter $B_{y,savings,i,j}$ by a factor 0.95 in accordance with paragraph 39 of AMS-II.G.

5.4 Net GHG Emission Reductions and Removals

The Grouped Project emission reductions in this monitoring period arise from both of the eligible methodologies:

- AMS-II.C. “Demand-side energy efficiency activities for specific technologies”.
- AMS-II.G. “Energy efficiency measures in thermal applications of non-renewable biomass”.

The total value of emission reductions is therefore the sum of the emission reductions, calculated in accordance with each methodology.

$$ER_y = ER_{AMS-II.C.,y} + ER_{AMS-II.G.,y}$$

Where:

ER_y Total emission reductions of the project in year y (tCO₂e)

$ER_{AMS-II.C.,y}$ Emission reductions calculated using the equations in AMS-II.C. in year y (tCO₂e)

$ER_{AMS-II.G.,y}$ Emission reductions calculated using the equations in AMS-II.G. in year y (tCO₂e)

Based on the formula above, the total emission reductions for the Grouped Project in this monitoring report, comprising RfC PA 1 – RfC PA 19, are summarised in the following table:

Total Emissions Reductions for RfC PA 1 – RfC PA 19

Grouped Project: RfC PA 1 – RfC PA 19	Total Emission Reductions (tCO ₂ e)
Total	183,434
Annual Average	169,324

The summarised emission reductions for the Grouped Project, comprising RfC PA 1 – RfC PA 19, broken down per AMS-II.C. and AMS-II.G., follow.

Grouped Project: RfC PA 1 – RfC PA 19	Reductions under AMS-II.C. (tCO ₂ e)	Reductions under AMS-II.G. (tCO ₂ e)
Total	132,225	51,210
Annual Average	122,054	47,270

The details of the emission reduction calculations, per respective methodology, are provided in the following subsections.

Electricity and fossil fuel emission reductions as per AMS-II.C ($ER_{AMS-II.C.,y}$)

AMS-II.C. specifies the calculation of emission reductions as follows:

$$ER_y = (BE_y - PE_y) - LE_y$$

(Equation 10, AMS-II.C.)

AMS-II.C. Emissions Reductions for RfC PA 1 – RfC PA 19

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2022	141,384	55,073	-	86,312
2023	75,216	29,303	-	45,913
Total	216,601	84,376	-	132,225

Biomass emission reductions as per AMS-II.G (ER_{AMS-II.G.,y})

The biomass emission reductions were calculated as follows:

$$ER_{y,i,j} = B_{y,savings,i,j} \times 0.95 \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel}$$

(Equation 2, AMS-II.G.)

Where:

ER _{y,i,j}	Emission reductions by project device type <i>i</i> and batch <i>j</i> during year <i>y</i> in tCO ₂ e
B _{y,savings,i,j}	Quantity of woody biomass that is saved in tonnes per cookstove device type <i>i</i> and batch <i>j</i> during year <i>y</i>
N _{y,i,j}	Number of project devices of type <i>i</i> and batch <i>j</i> operating during year <i>y</i>
μ _y	Adjustment to account for any continued use of pre-project devices during the year <i>y</i> when applying equations 7 and 8 (fraction). Use 1.0 in other cases.
f _{NRB,y}	Fraction of woody biomass that can be established as non-renewable biomass
NCV _{biomass}	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried').
EF _{projected_fossil_fuel}	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers

An example calculation is provided for the year 2023 for RfC PA1:

Year	ER _{y,i,j}	B _{y,savings,i,j}		N _{y,i,j}	μ _y	f _{NRB,y}	NCV _{biomass}	EF _{projected_fossil fuel}
	tCO ₂ e	tonnes		Number of devices			TJ/tonne	tCO ₂ e/TJ
2023	3,004	1.17	0.95	10,166	1.00	0.71	0.0156	73.2

The quantity of woody biomass that is saved due to the project activity is calculated as follows in accordance with option 2 of the AMS-II.G. methodology:

$$B_{y,savings,i,j} = B_{old,i,j} - B_{new,KPT,i,j}$$

(Equation 6, AMS-II.G.)

Where:

B_{old,i,j} Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type *i* and batch *j*

B_{new,KPT,i,j} Annual quantity of woody biomass used in tonnes per project device of type *i* and batch *j*, measured as per the Kitchen Performance Test (KPT) protocol. The KPT shall be carried out in accordance with national standards (if available) or international standards or guidelines. (e.g. the KPT Protocol listed by Clean Cooking Alliance)

An example calculation is provided for the year 2023 for RfC PA1:

Year	B _{y,savings,i,j}	B _{old,i,j}	B _{new,KPT,i,j}
	tonnes	tonnes	tonnes
2023	1.17	2.64	1.466

The following table summarises the parameters used in the calculation of the emission reductions for biomass. The values for the first project activity instance, RFC 1 are presented for illustration purposes. The full details, per project activity instance in this monitoring period, are contained in the provided Excel Emission Reduction Calculation spreadsheet.

AMS-II.G.	Unit	RfC1 value for 2023
B _{y,savings,i,j}	tonnes	1.17
N _{y,i,j}	Number of devices	10,166
μ _y		1
f _{NRB,y}		0.71
NCV _{biomass}	TJ/tonne	0.0156
EF _{projected_fossil fuel}	tCO ₂ e/TJ	73.2
B _{old,i,j}	tonnes	2.64
B _{new,KPT,i,j}	tonnes	1.466

The following tables summarise the total results of the emission reduction calculations, for biomass, for the project activity instances in this monitoring period. The full details, per project

activity instance, are contained in the provided Excel Emission Reduction Calculation spreadsheet.

AMS-II.G.	Unit	RfC1 results	RfC2 results	RfC3 results
ER _{y,i,j}	tCO ₂ e	9,150	9,575	9,175

AMS-II.G.	Unit	RfC4 results	RfC5 results	RfC6 results
ER _{y,i,j}	tCO ₂ e	8,816	2,806	9,590

AMS-II.G.	Unit	RfC7 results	RfC8 results	RfC9 results
ER _{y,i,j}	tCO ₂ e	162	162	180

AMS-II.G.	Unit	RfC10 results	RfC11 results	RfC12 results
ER _{y,i,j}	tCO ₂ e	918	36	72

AMS-II.G.	Unit	RfC13 results	RfC14 results	RfC15 results
ER _{y,i,j}	tCO ₂ e	18	18	18

AMS-II.G.	Unit	RfC16 results	RfC17 results	RfC18 results
ER _{y,i,j}	tCO ₂ e	18	41	131

AMS-II.G.	Unit	RfC19 results
ER _{y,i,j}	tCO ₂ e	321

The total emission reductions per year follow. Note that the AMS.II.G. methodology does not separate the calculation between baseline and project emissions and hence only the calculation results for the emission reductions are provided in the following table.

AMS-II.G. Emissions Reductions for RfC PA 1 – RfC PA 19

Year	Baseline emissions or removals (tCO₂e)	Project emissions or removals (tCO₂e)	Leakage emissions (tCO₂e)	Net GHG emission reductions or removals (tCO₂e)
2022	-	-	-	34,396
2023	-	-	-	16,813
Total	-	-	-	51,210

Total Emissions Reductions for RfC PA 1 – RfC PA 19

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01-May-2022 to 31-December-2022	141,384	55,073	-	120,708
01-January-2023 to 30-April-2023	75,216	29,303	-	62,727
Total	216,601	84,376	-	183,434

Comparison against ex ante emission reductions

The achieved emission reductions (total of the emission reductions achieved under both methodologies) for the full monitoring period of 13 months are compared with the total ex

ante emission reduction estimates for the same period, per Project Activity Instance (PAI), in the table below.

PAI	Achieved Emission Reductions (tCO ₂ e)	Ex Ante Emission Reductions (tCO ₂ e)
RfC1	13,277	18,384
RfC2	13,411	18,517
RfC3	13,328	18,437
RfC4	13,133	18,569
RfC5	9,954	17,241
RfC6	13,525	18,595
RfC7	8,472	17,215
RfC8	8,619	17,568
RfC9	8,645	17,432
RfC10	9,527	16,771
RfC11	9,907	16,557
RfC12	9,750	16,556
RfC13	9,387	16,492
RfC14	9,371	16,492
RfC15	9,937	16,539
RfC16	8,609	15,022
RfC17	6,664	12,960
RfC18	5,806	11,233
RfC19	2,111	3,726
Total	183,434	304,306

The achieved emission reductions for the included projects activity instances (PAIs) are lower than the ex ante emission reductions and hence no further justifications are required.

<u>Ex-ante emissions reductions/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
304,306	183,434	-40%	The decrease is due largely to the surveyed actual fuel consumption being higher than the estimated ex ante values.

APPENDIX A: SUSTAINABLE DEVELOPMENT CONTRIBUTIONS SUPPORTING INFORMATION

SD Impact 2: Reduced monetary (ZAR) spending on cooking fuels

Monitoring Period 3				
Baseline fuel consumption using stove type <i>j</i>	litres/hh/week	Paraffin	13.2	Cell D107 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Baseline fuel consumption using stove type <i>j</i>	kg/hh/week	LPG	6.7	Cell D108 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Baseline fuel consumption using stove type <i>j</i>	tonne/hh/week	Coal	0.1	Cell D109 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Baseline fuel consumption using stove type <i>j</i>	kWh	Electricity	58,485,862	Sum of cells D72 to V72 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Project fuel consumption using stove type <i>j</i>	litres/hh/week	Paraffin	7.6	Cell D123 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Project fuel consumption using stove type <i>j</i>	kg/hh/week	LPG	1.1	Cell D124 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Project fuel consumption using stove type <i>j</i>	tonne/hh/week	Coal	0.1	Cell D125 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
Project fuel consumption	kWh	Electricity	26,057,672	Sum of cells D113 to V113 of 'RfC MR3 ER calcs' : Emission

using stove type j				Reductions Calcs - 2023
ni	Equivalent Household	Households using paraffin	1,362	Sum of cells D95 to V95 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
ni	Equivalent Household	Households using LPG	52,323	Sum of cells D96 to V96 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
ni	Equivalent Household	Households using coal	480	Sum of cells D97 to V97 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
ni	Equivalent Household	Households using electricity	257,784	Sum of cells D76 to V76 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
ni	Equivalent Household	Households using biomass	56,896	Sum of cells D58 to V58 of 'RfC MR3 ER calcs' : Emission Reductions Calcs - 2023
B _{old}	tonnes/year/Wonderbag		2.64	Cell D63 of 'RfC MR3 ER calcs' : Emission Reduction Calcs - 2023
B _{new}	tonnes/year/Wonderbag		1.5	Cell D64 of 'RfC MR3 ER calcs' : Emission Reduction Calcs - 2023
Biomass savings	tonnes/year/Wonderbag		1.17	Calculated by subtracting B _{new} from B _{old}

Fuel type	Average cost during	Unit	Source/Reference	Notes
-----------	------------------------	------	------------------	-------

	monitoring period (01/04/2021- 30/04/2023)			
Electricity	192.6	c/kWh	Eskom. <i>Tariffs & Charges Booklet 2021/2022</i> . https://www.eskom.co.za/distribution/wp-content/uploads/2022/04/Tariff-Booklet-final.pdf	2021/2022 Non-local authority residential tariffs (tariffs applicable to Eskom direct customers), block 1 (0-600 kWh) used.
LPG	2,962	cents/litre	South African Petroleum Industry Associated. <i>Old Fuel Prices</i> . https://www.sapia.org.za/old-fuel-prices/	Coastal prices used due to at least 81% of distributed in coastal provinces in South Africa
Paraffin	988.3	cents/litre	South African Petroleum Industry Associated. <i>Old Fuel Prices</i> . https://www.sapia.org.za/old-fuel-prices/	Coastal prices used due to at least 81% of distributed in coastal provinces in South Africa
Coal	427.8	cents/kg	Balmer, M. 2007. Household coal use in an urban township in South Africa. <i>Journal of Energy in Southern Africa</i> 18: 27-32	Price adjusted for inflation to 15 years since publication of paper
Biomass	131.9	cents/kg	Shackleton, C. <i>et al.</i> 2022. Fuelwood in South Africa Revisited: Widespread Use in a Policy Vacuum. <i>Sustainability</i> 14: https://doi.org/10.3390/su141711018 .	Mean urban value of fuelwood used by households surveyed (value in Rands per households per year in 2021 divided by kg per households per year) in Table 1. Difficult to account for number of users who harvest their own for free.

The inputs above were used to calculate the monetary savings summarized below.

Fuel type	MP3 Savings (ZAR) = Total Savings Since Start of Monitoring of SD Impacts for VCS (ZAR)
Electricity	R99,529,684
LPG	R15,541,385
Paraffin	R3,948,830
Coal	R1,618,004
Biomass	R111,794,426
TOTAL	R232,432,329

SD Impact 3: Reduction in poverty through provision of economic resources

Recipient	MP3 Contribution (ZAR) = Total Contributions Since Start of Monitoring of SD Impacts for VCS (ZAR)
1	R 10 080
2	R 7 220
3	R 3 000
4	R 12 240
5	R 24 220
6	R 46 440
7	R 8 120
8	R 9 280
9	R 3 600
10	R 13 855
11	R 9 220
12	R 9 600
13	R 740
14	R 7 100
15	R 1 320
16	R 14 400
17	R 4 000
18	R 98 520
19	R 61 620
20	R 299 790
21	R 14 220
22	R 73 820
23	R 72 630
24	R 47 180

Grand Total	R	852 215
--------------------	----------	----------------

SD Impact 4: Number of entrepreneurs, champions/ data monitors that are created within the Wonderbag eco-system

MP3 Entrepreneurs = Total Entrepreneurs Since Start of Monitoring of SD Impacts for VCS
Total Entrepreneurs: 527

SD Impact 5: Tonnes of recycled foam used in the manufacturing of Wonderbags

Supplier codes	MP3 Tonnes Recycled Foam = Total Tonnes Recycled Foam Since Start of Monitoring of SD Impacts for VCS
FIR001	34
L001	7
LR001	32
STF001	36
Grand Total	109

SD Impact 6: Tonnes of greenhouse gas emissions avoided or removed

MP3 Emissions Reductions [tCO₂e] = Total tCO₂e Since Start of Monitoring of SD Impacts for VCS	Source
201,148	'RfC MR3 ER calcs' : Emission Reduction Summary Cell C8 & C9

SD Impact 7: Tonnes of avoided biomass combustion

MP3 Tonnes of avoided biomass combustion = Total Tonnes Since Start of Monitoring of SD Impacts for VCS			
B_{old}	2.64	Tonnes/year/Wonderbag	Cell D63 of 'RfC MR3 ER calcs' : Emission Reduction Calcs - 2023
B_{new}	1.466	Tonnes/year/Wonderbag	Cell D64 of 'RfC MR3 ER calcs' : Emission Reduction Calcs - 2023
Wonderbags in household using biomass	56,896	Wonderbags	Sum of cells D58 to R58 of 'RfC MR3 ER calcs' : Emission Reduction Calcs - 2023
Biomass Savings	1.17	Tonnes/year/Wonderbag	Calculated by subtracting B _{new} from B _{old}
Monitoring Period Start Date	2022/05/01		

Monitoring Period End Date	2023/04/30		
Days in Monitoring Period	364	Days	
Days in a Year	365	Days	
Total Biomass Saved	66,386	Tonnes	