



# MILA RANO - SAFE WATER ACCESS FOR MADAGASCAR

Document Prepared by CARBON CREDITS CONSULTING SRLS.R.L.

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|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b> | MILA RANO - SAFE WATER ACCESS FOR MADAGASCAR                                                                                                                                                                                                             |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

The purpose of the grouped project activity is to provide safe drinking water to households in rural communities of Madagascar. The proposed project activity aims to reduce the use and demand of fossil fuels or non-renewable biomass (NRB) that would have been used to boil the water to purify water in the absence of the proposed project activity, by the construction of solar powered water supply systems.

The geographical boundary is in Madagascar and the target are households in rural communities with not previous water purifiers access; the purified water will be distributed to users free of cost.

Around the world, inequalities in access to water between people living in urban and rural areas have decreased but remain significant. Eight out of ten people without access to safe drinking water live in rural areas; Sub-Saharan Africa is experiencing the slowest rate of progress in the world, only 54% of people used safe drinking water, and only 25% in fragile contest<sup>1</sup>. The poorest populations continue to use untreated surface water from lakes or rivers. Many of these disadvantaged communities are in remote areas that are difficult to access. This is particularly the case in Madagascar. where only half of the population has access to drinking water, 22.9 million people who lack access to safe water in the country ranked fourth-worst in water quality in Africa. Water is a necessity for survival, and 88% of people in Madagascar do not have access to improve sanitation. Over 2,100 children a year die from diarrhea because of unsafe and poor water quality in Madagascar. 66% percent of people who live in urban areas have access to safe drinking water, but less than 15 percent of people in the rural area have access to safe drinking water. Families who live in isolated villages do not have access to clean drinking water. Wells are contaminated with bacteria and viruses, and those who drink that water are exposing themselves to diseases. Most have no alternative to drinking the contaminated water unless the water is boiled. The scarcity of water also makes it very difficult to practice agriculture and livestock<sup>2</sup>.

Madagascar's energy balance shows that about 80% of its overall energy consumption is based on biomass (mainly firewood 68%, charcoal 10% and other biomass 2%); for households all over the country, but especially in rural areas firewood and charcoal for heating and cooking are the most important energy sources<sup>3</sup>. In absence of the project activity the equivalent amount of thermal energy generated using firewood and charcoal in three stone open fires or traditional

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<sup>1</sup> WHO – Billions of people lack access to safe water.

<sup>2</sup> [Speaking About the State of Water Quality in Madagascar \(borgenproject.org\)](http://borgenproject.org)

<sup>3</sup> Madagascar Energy Situation - [Madagascar Energy Situation - energypedia](http://energypedia)

inefficient stove *Fatapera* to meet the boiling water demand, as confirmed by the baseline survey report<sup>4</sup>.

Carbon Credits Consulting is the project proponent and Madaprojects is the project developer. The project is carried out in agreement with the Mayor of the Behompy rural communities<sup>5</sup> who identify the villages in which to build the water systems and provide the operational and methodological guidelines for the construction, supervision, and maintenance of the same.

The total emission reductions are estimated to be 64,953 tCO<sub>2</sub>e over the 7-years first crediting period, and the annual average is 9,279 tCO<sub>2</sub>e.

## 1.2 Sectoral Scope and Project Type

The project activity is a grouped project. The project activity instances as part of the grouped projects will be applied under Sectoral Scope 3 Energy Demand.

Project type III: other project activities not included in Type I or Type II that result in GHG emission reductions not exceeding 60,000 tCO<sub>2</sub>e per year in any year of the crediting period.

The project activity applies Type III small-scale methodology AMS-III.AV. Energy Low greenhouse gas-emitting safe drinking water production systems (version 08.0 of 12/06/2020). The applied methodology refers to the following methodology and tools:

- Small-scale Methodology AMS-I.E Switch from non-renewable biomass for thermal applications by the user (version 13.0)
- TOOL21 Demonstration of additionality of small-scale project activities (version 13.1)
- TOOL30 Calculation of the fraction of non-renewable biomass (version 04.0)
- Methodological tool TOOL33 – Default values for common parameters (version 02.0 of 08/09/2022).
- Standard: Sampling and surveys for CDM project activities and programme of activities (version 09.0)
- Guideline: Sampling and surveys from CDM project activities and programme of activities (version 04.0)

## 1.3 Project Eligibility

Project activity involves the construction of water systems which falls under the category of efficiency improvements in thermal applications and reduce the use and demand of wood fuel and non-renewable biomass that would have been used to boil the water.

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<sup>4</sup> IEST – Baseline survey report of 01/08/2022 (survey conducted in July 2022)

<sup>5</sup> Agreement between Madaprojects and Mayor of Behompy rural communities, 20 July 2022

The host country of the project is Madagascar which is an LDC. Therefore, the project activity does not fall under the excluded list of projects as prescribed under the table 1 of section 2.1.3 of the VCS Standard version 4.4.

## 1.4 Project Design

### Eligibility Criteria

The project activity is a Grouped Project activity, therefore for each new instance the following eligibility criteria are to be confirmed according §3.6.16 of the VCS Standard version 4.4:

| Eligibility criteria                                                                         | Compliance with the eligibility criteria                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Meet the applicability conditions set out in the methodology applied to the project.         | The project activity instance VPA-001 and the future instances will meet all applicability conditions set out in the applied methodology AMS-III.AV Low greenhouse gas emitting safe drinking water production systems (version 08.0).                                                                                                                                                                                                                                      |
| Use the technologies or measures in the same manner as specified in the project description. | <p>The water purification technology includes a low greenhouse gas emitting technology, meaning the construction of boreholes with solar powered pump which allows to reduce the use and demand of wood fuel and charcoal that is used in the pre-project scenario to boil the water for being purified.</p> <p>The project activity instance VPA-001 and the future instances will use the technology stated above and no other project device is expected to be used.</p> |

|                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Apply technologies or measures in the same manner as specified in the project description.</p>                                 | <p>The technology used does not foresee the use of fossil fuels since it has a solar powered pump system and shall meet the minimum criteria as outlined below:</p> <p>Construction of borehole in conjunction with a storage tower with capacity tank of 6 mc.</p> <p>Flow rate: from 3,500 to 5,500 l/hr. depending on the pump size.</p> <p>Pump powered by solar panels with energy storage batteries.</p> <p>Each unit must achieve water quality for drinking according to the national law Decree No. 2004-635 of 15/06/2004<sup>6</sup> which define the parameters for drinking water.</p> <p>The project activity instance VPA-001 and the future instances will only apply the low greenhouse gas emitting technology as described above.</p> |
| <p>Are subject to the baseline scenario determined in the project description for the specified activity and geographic area.</p> | <p>The geographic area is the country Madagascar, and the baseline scenario is assumed that fossil fuel and/or non-renewable biomass is used to boil water as means of water purification in the absence of the project activity.</p> <p>The project activity instance VPA-001 is implemented in the rural villages of Mahabo, Behompy, Ampasy, Ampihalia, Andranofoty, in the Region of Atsimo-Andrefana – Madagascar.</p>                                                                                                                                                                                                                                                                                                                              |

<sup>6</sup> Malagasy national law Decree no. 2004-635 of 15/06/2004

|                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.</p> | <p>The additionality of each project instance will be demonstrated by investment barrier analysis according to para 10 (a) of the methodological TOOL21 Demonstration of additionality of small-scale project activities.</p> <p>The additionality of the project activity instance VPA-001 is described in section 3.5 of the VCS PD.</p> |
| <p>Capacity limit</p>                                                                                                                                            | <p>According to the criteria of project Type III, each project instance will have a maximum capacity of 60,000 tCO<sub>2</sub>e/year throughout the project instance crediting period.</p> <p>The project activity instance VPA-001 satisfies the criteria. The estimated emission reductions are 9,279 tCO<sub>2</sub>e/year.</p>         |
| <p>Target group</p>                                                                                                                                              | <p>Each project instance will target end users which includes households who use traditional cookstove to boil water.</p> <p>According to the baseline survey carried out for project activity instance VPA-001 is confirmed that the households are using traditional cookstove to boil water.</p>                                        |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conditions that avoid double counting of emission reductions | <p>Each project instance will be identified assigning unique ID; each water system installed and which the project instance belongs will be identified with the ID instance assignment and will have corresponding end user details. This will be recorded as part of the beneficiary agreement and project database. The beneficiary agreement will be signed by the CME with the representative of the village who use the drinking water from the installed water system in the project instance. The agreement will include also the owner transfers the rights to the emission reductions exclusively to the CME.</p> <p>The ID of project instance will be: VPA-XXX where XXX is the number of project instance.</p> <p>The ID of water system installed will be: VPA-XXX-PPPP where XXX is the number of project instance and PPPP is the number of users from that system.</p> |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 1.5 Project Proponent

|                          |                                                                                      |
|--------------------------|--------------------------------------------------------------------------------------|
| <b>Organization name</b> | CARBON CREDITS CONSULTING SRLS.R.L.                                                  |
| <b>Contact person</b>    | Mr. Andrea Saverio CORNACCHIA                                                        |
| <b>Title</b>             | CEO – Authorized Signatory                                                           |
| <b>Address</b>           | Via del Monte, 10 – BOLOGNA (Italy)                                                  |
| <b>Telephone</b>         | +39 3929050342                                                                       |
| <b>Email</b>             | <a href="mailto:asc@carboncreditsconsulting.com">asc@carboncreditsconsulting.com</a> |

## 1.6 Other Entities Involved in the Project

|                            |                                     |
|----------------------------|-------------------------------------|
| <b>Organization name</b>   | Madaprojects SRL SB                 |
| <b>Role in the project</b> | Project Developer                   |
| <b>Contact person</b>      | Davide Enzo BERTAPELLE              |
| <b>Title</b>               | CEO – Project Manager               |
| <b>Address</b>             | Via Barontini, 20 – BOLOGNA (ITALY) |
| <b>Telephone</b>           | + 39 3289778080                     |
| <b>Email</b>               | davide@madaprojects.it              |

## 1.7 Ownership

As per the VCS Program Definitions version 4.2, the project ownership is the legal right to control and operate the project activity. Carbon Credits Consulting S.r.l. is the project proponent that has overall control and responsibility of the projects. The agreement signed with Madaprojects (the project developer) defines responsibilities within the two entities (§2.2 of terms and conditions included in the agreement signed between the parties).

The construction and the equipment costs of water system are paid by both the parties as per §4 of the signed agreement; the water to user's will be free supply. The beneficiary will possess the ownership of the water purifier system, but the beneficiary agreement<sup>7</sup> will be the proof that all the rights of the credits that may be generated by the operation of the water purifier system will be irrevocably transferred to both the parties (project proponent and project developer). According to §5 of the signed agreement Carbon Credits Consulting is the entity who has the responsibility to negotiate and sell the carbon credits will be generated by the project.

The municipality of Behompy has free land within the villages, the Chief of each village in the municipality, and the committee within each village, given the authorization and decided where to allow the construction of the wells. The authorization is signed by the Mayor of the municipality of Behompy<sup>8</sup>.

## 1.8 Project Start Date

According to para 3.8 of the VCS Standard version 4.4 the start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions. Based on that the

<sup>7</sup> Carbon rights assertions Ampasy, Ampialia, Andranofoty, Behompy, Mahabo -

<sup>8</sup> Municipality of Behompy – Authorization for available land.

start date of each project activity instance will be the commissioning date of the water purifier system.

The starting date of the project activity instance VPA-001 is expected to be on 31/05/2023 when the water system will start to provide safe drinking water, which owes to the real implementation in accordance to start date definition of VCS Standard Version 4.4. 25/07/2022<sup>9</sup> is the date when the construction contract is signed.

## 1.9 Project Crediting Period

The crediting period of the project activity is for seven years, twice renewable for a total of 21 years. The length of the first crediting period is 31/05/2023 to 30/05/2030 (both dates are included).

## 1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☒ <20,000 tCO<sub>2</sub>e/year

According to the VCS Standard version 4.4 the project activity falls under small-scale project activity since the annual average emission reductions are less than 300,000 tCO<sub>2</sub>e.

| Project Scale |   |
|---------------|---|
| Project       | X |
| Large project |   |

| Year                    | Estimated GHG emission reductions or removals (tCO <sub>2</sub> e) |
|-------------------------|--------------------------------------------------------------------|
| 31/05/2023 – 31/12/2023 | 5,466                                                              |
| 01/01/2024 – 31/12/2024 | 9,279                                                              |
| 01/01/2025 – 31/12/2025 | 9,279                                                              |
| 01/01/2026 – 31/12/2026 | 9,279                                                              |
| 01/01/2027 – 31/12/2027 | 9,279                                                              |
| 01/01/2028 – 31/12/2028 | 9,279                                                              |

<sup>9</sup> Construction works contract between Zanary Sarl and Madaprojects Srls – 25/07/2022.

|                                        |               |
|----------------------------------------|---------------|
| 01/01/2029 – 31/12/2029                | 9,279         |
| 01/01/2030 – 30/05/2030                | 3,813         |
| <b>Total estimated ERs</b>             | <b>64,953</b> |
| <b>Total number of crediting years</b> | <b>7</b>      |
| <b>Average annual ERs</b>              | <b>9,279</b>  |

### 1.11 Description of the Project Activity

The purpose of the project activity VPA-001 is to provide safe drinking water to households in rural communities of Madagascar. The proposed project activity aims to reduce the use and demand of fossil fuels or non-renewable biomass (NRB) that would have been used to boil the water to purify water in the absence of the proposed project activity, by the construction of solar powered water supply systems. By reducing the consumption of wood fuel and non-renewable biomass, it can contribute to improving public health problems, furthermore it contributes to Madagascar's climate change respond and sustainable development.

The project directly helps reducing the rate of deforestation in the host country where most Malagasy households have no alternative to firewood and charcoal <sup>10</sup> using the traditional stoves to boil water.

The PP aims to construct 5 new boreholes with a solar powered pump in the Region of Atsimo-Andrefana within the project instance VPA-001 of the grouped project. The rural villages where the water supply system will be implemented are the following, falling into Municipality of Behompy:

| Location                       | No. of households | No. of inhabitants |
|--------------------------------|-------------------|--------------------|
| Rural community of Mahabo      | 259               | 1,544              |
| Rural community of Behompy     | 1,326             | 8,319              |
| Rural community of Ampasy      | 281               | 1,593              |
| Rural community of Ampihalia   | 1,373             | 8,017              |
| Rural community of Andranofoty | 760               | 5,406              |

Table 1 – List of rural municipalities.

<sup>10</sup> IEST – Baseline survey report – August 2022

The expected construction start date is 01/10/2022 and the expected commissioning date will be within 31/05/2023<sup>11</sup>.

The estimates of annual average and total GHG emission reductions for the chosen renewable 7 years crediting period for project instance VPA-001 are 9,279 tCO<sub>2</sub>/year, and 64,953 tCO<sub>2</sub> respectively.

**Technology.** According to the applied methodology, the project technology/equipment will achieve compliance either with: (i) the Comprehensive Protection performance target as per “Evaluating household water treatment options: health-based targets and microbiological performance specifications” (WHO, 2011) and “International Scheme to Evaluate Household Water Treatment Technologies” (WHO, 2014); or (ii) an applicable national standard or guideline. The implemented technology does not emit greenhouse gases. The water wells be installed in the selected areas where there is no public distribution network and the normal maintenance instructions, and management method of the water purifier system will be transferred to beneficiaries. The water taken by the solar pump is transferred to the tank, passing through a skimmer that provides chlorine purification, the chlorine pads are loaded into the skimmer every 30 days depending on the capacity of the skimmer which can be from 3 or 5 kg of chlorine<sup>12</sup>. The use of the purified water is simple, people can get clean and safe drinking water that is safely stored in the water tank.

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<sup>11</sup> Construction contract between ZANARY SARL and MADAPROJCETS SRLS signed on 25/07/2022.

<sup>12</sup> Technical sheet 24429E201-05 - ASTRAPOOL

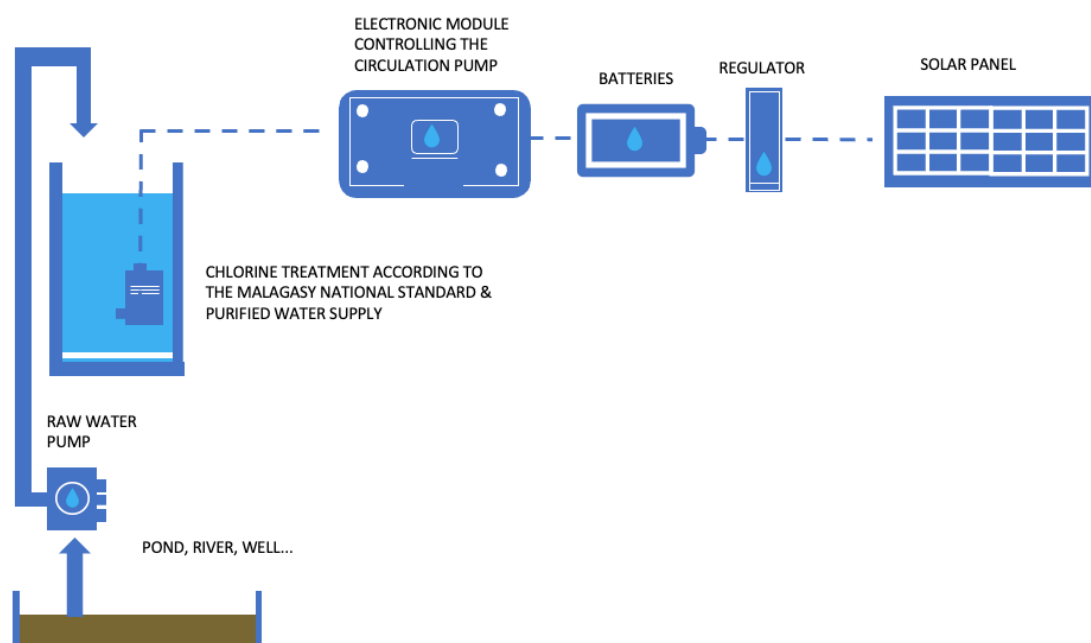


Figure 1 – Water system design

Following a specification for project sample device:

#### Technical specifications – Technology set up 1

|                                        |                                           |
|----------------------------------------|-------------------------------------------|
| 1 Water tank capacity                  | 6 mc                                      |
| 1 Submersible Solar Pump Hmax 90-110 m | flow rate 5,500 <sup>13</sup> liters/hour |
|                                        | Rated power W 1000                        |
| 6 Solar panels                         | 200 W 12 – 24V each panel                 |
| 1 Load regulator                       | 30 A                                      |
| 4 Solar batteries                      | 200 Ah 12V                                |

#### Technical specifications – Technology set up 2

|                                       |                             |
|---------------------------------------|-----------------------------|
| 1 Water tank capacity                 | 4 mc                        |
| 1 Submersible Solar Pump Hmax 90-96 m | flow rate 3,500 liters/hour |
|                                       | Rated power W 750           |

<sup>13</sup> Picture of solar pump

|                   |                           |
|-------------------|---------------------------|
| 6 Solar panels    | 200 W 12 – 24V each panel |
| 1 Load regulator  | 30 A                      |
| 4 Solar batteries | 200 Ah 12V                |

The water tower is Height 8m, Length 2.5m, and depth 2m

Well depth between 12-15 mt

The project instance VPA-001 will install technology set up 1 at Ampihalia and Behompy rural communities, while technology set up 2 at Ampasy, Andranofoty and Mahabo rural communities.

According to the applied methodology the technology applied is identified as Point of Use (POU) which means the system treat only the water intended for direct consumption, typically at a single tap or a limited number of taps.

The system is made up of different elements which can have a lifespan varying between 2 and 12 years<sup>14</sup>. As per the contract with the constructor, the system has a 12-month warranty from the commissioning date<sup>15</sup>. After installation, members of the water committee<sup>16</sup> are trained for system operation and ordinary maintenance and each village is provided with a toolkit consisting of spare parts (taps, electrical cable, tube) for the ordinary maintenance. The purification system (the skimmer installed in the tank which purifies with chlorine) has a life cycle dictated by its wear and therefore simply by inserting chlorine tablets every 30 days the state of the same is checked and therefore in this case it will be replaced. On site, in each water tower, there is a 24-hour supervisor, responsible for small maintenance, and a permanent technician who checks the system every week.

## 1.12 Project Location

The grouped project will be hosted by Madagascar. The project instance VPA-001 is implemented in several rural communities of in the region Atsimo-Andrefana. under the Tulear II district: *Mahabo, Behompy, Ampasy, Ampihalia, Andranofoty*.

<sup>14</sup> Technical details of the installed equipment issued by Societe Zanaray Sarl on 16/06/2023

<sup>15</sup> Construction contract of 25/07/2022.

<sup>16</sup> Water committee agreement of 10/08/2023

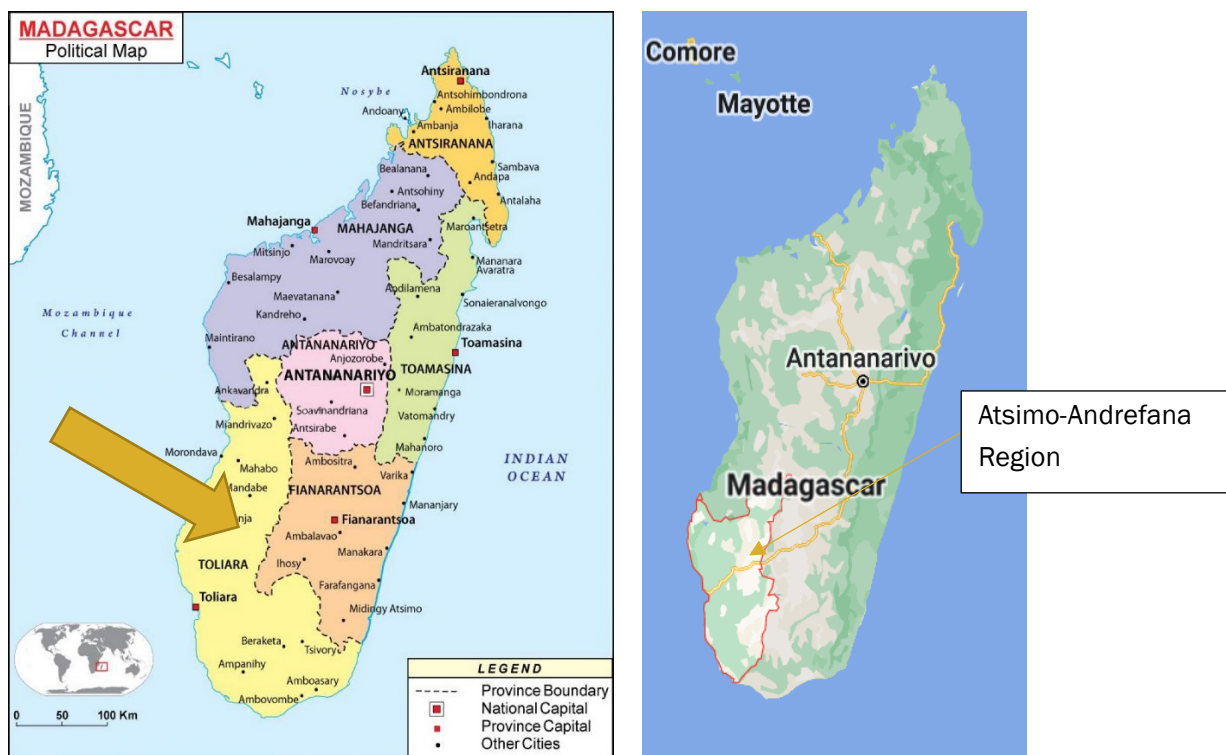


Figure 2 – Map of Madagascar.

The geographical coordinates are the following:

| Community   | South coordinate | East coordinate  |
|-------------|------------------|------------------|
| MAHABO      | S 23° 15' 27.55" | E 43° 50' 21.96" |
| AMPASY      | S 23° 14' 38.80" | E 43° 51' 11.98" |
| AMPIALIA    | S 23° 14' 13.01" | E 43° 51' 17.20" |
| BEHOMPY     | S 23° 14' 51.61" | E 43° 51' 20.80" |
| ANDRANOFOTY | S 23° 13' 42.62" | E 43° 53' 01.39" |

KML file is provided with the PDD.



Figure 3 – VPA-001 Project area.

### 1.13 Conditions Prior to Project Initiation

Over 2 billion people globally lack access to safely managed drinking-water services and approximately 485,000 diarrheal deaths in low- and middle-income countries each year are attributable to unsafe drinking<sup>17</sup>. Over 2,100 children a year die from diarrhoea because of unsafe and poor water quality in Madagascar<sup>18</sup>. Access to basic water and sanitation services in Madagascar suffers from severe inequalities and low-quality services. Only 54.4% of the population has access to basic water services, and only 12.3% of the population has access to basic sanitation services. Madagascar is at the bottom of the list of 76 developing counties with the lowest access to basic sanitation. Madagascar is facing a water crisis given its extreme vulnerability to climate vulnerability impacts and weather shocks as evidence by the recent cyclones<sup>19</sup>. Madagascar is the fourth largest island in the world and is home to diverse hydroclimatic conditions, ranging from the generally water-rich high plateau to the extremely arid southern desert. As a result, Madagascar's water resources area similarly diverse and clean water challenges vary dramatically from region to region and even from commune to commune.

VPA-001. Due the water scarcity of the municipality of Behompy, prior to the project, families do not have access to clean drinking water and the communities collect the water far from the villages where it is collected unsafe water because wells and rivers are contaminated with

<sup>17</sup> WHO International Scheme to Evaluate Household Water Treatment Technologies – July 2019

<sup>18</sup> [Speaking About the State of Water Quality in Madagascar \(borgenproject.org\)](http://borgenproject.org)

<sup>19</sup> [Madagascar: \\$220 Million to Improve Basic Water and Sanitation Services and Supply - Madagascar | ReliefWeb](https://reliefweb.int/emergency-operations/2017/12/madagascar-2220-million-improve-basic-water-and-sanitation-services-supply)

bacteria and viruses. There is no alternative to drinking the contaminated water unless they boil<sup>20</sup>.

In absence of the project activity the equivalent amount of thermal energy is generated using firewood and charcoal in three stone open fires or traditional inefficient stove *Fatapera* to meet the boiling water demand, as confirmed by the baseline survey report<sup>21</sup>.

## 1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Despite these differences, limited access to clean water is of near universal concern in Madagascar. Globally, Madagascar ranks third from last in terms of access to safe water. Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is a voluntary effort by the project proponent. There is no mandatory law or requirement in Madagascar to foster the implementation of safe drinking technology. Further in terms of local laws, statues and regulatory framework, there is no specific policies available for water distribution and implementation of water purifier technology. The safe drinking technology implemented within the project instance VPA-001 is agreed with the Mayor of Behompy Municipality<sup>22</sup> who represent all the villages involved in the project implementation.

The Malagasy government has made improved access to drinking water in the country a high priority<sup>23</sup>. In 2019, the Government of Madagascar launched the Madagasikara Madio 2025 (Clean Madagascar 2025) campaign. One of the goal sets by the campaign is 70% of the population has access to basic drinking water by 2023. Madagascar has shown progress towards achieving access to safe drinking water; however, the country is currently off track on meeting the goal<sup>24</sup>.

Safe drinking services are essential to self-reliance and the implementation of the project activity can plan, finance, and implement sustainable solutions to deliver water to all to improve health, livelihoods, and dignity among citizens.

Decree No. 2004-635 of 15/06/2004 is relative to surveillance and control of water supplied for human consumption; the water supplied by the safe drinking system must be complaint with the criteria and parameters established by the law<sup>25</sup>. When the project will be in operation, the condition will be checked periodically during the crediting period. The laboratory test will be carried out by recognized national standard.

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<sup>20</sup> Water quality in Madagascar (The Borgen Project)

<sup>21</sup> IEST – Baseline survey report of 01/08/2022 (survey conducted in July 2022)

<sup>22</sup> Partnership agreement between Behompy rural municipality and Madaprojects – 20/07/2022

<sup>23</sup> [Madagascar: \\$220 Million to Improve Basic Water and Sanitation Services and Supply - Madagascar | ReliefWeb](#)

<sup>24</sup> USAID MADAGASCAR – Water for the World Country Plan, September 2020.

<sup>25</sup> Decret N° 2004-635 of 15/06/2004 – Water consumption characteristics.

## 1.15 Participation under Other GHG Programs

### 1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered, nor it is seeking registration under any other GHG program.

### 1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG program.

## 1.16 Other Forms of Credit

### 1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not included in an emission trading program or any other mechanisms that includes GHG allowance trading.

### 1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit.

### Supply Chain (Scope 3) Emissions

The section is not applicable. The project does not impact emissions associated with a good or service.

## 1.17 Sustainable Development Contributions

The grouped project will contribute to sustainable development objectives related to Prosperity, People, and planet.

**Prosperity.** The grouped project will address SDG1, SDG8

**SDG1.** The grouped project will provide access to a basic service in the form of safe drinking water through the construction of water tower distributing purified water in rural communities, in alternative of boiling water or even drinking the contaminated water. Madagascar is facing a water crisis given its extreme vulnerability to climate vulnerability impacts and weather shocks as evidence by the recent cyclones<sup>26</sup>. The scarcity of water also makes it very difficult to practice agriculture and livestock. Madagascar is the fourth largest island in the world and is home to diverse hydroclimatic conditions, ranging from the generally water-rich high plateau to the extremely arid southern desert. As a result, Madagascar's water resources area similarly diverse and clean water challenges vary dramatically from region to region and even from commune to commune<sup>27</sup>. A baseline survey report is conducted to understand the household's profile, the

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<sup>26</sup> Madagascar: \$220 Million to Improve Basic Water and Sanitation Services and Supply - Madagascar | ReliefWeb

<sup>27</sup> USAID MADAGASCAR – Water for the World Country Plan, September 2020.

daily water consumption, the purification method used, in case of boiling water the type of device and the fuel type and consumption per week<sup>28</sup>. As per the baseline survey report the households lack access to reliable safe drinking water, 100% of the families purify water through boiling. Having safe water drinking available for free of cost, it contributes savings time and money that can be utilized for other needs like education, healthcare, and income-generating activities. Moreover, the amount of water provided by the implemented technology is higher than the cap of 5.5 l/person/day based on WHO recommendations<sup>29</sup>, therefore the availability of the water could also contribute to increase the practice agriculture and livestock.

|                               |                                                                                                                                                                                                                                                                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID1                           | Reduction of international poverty line                                                                                                                                                                                                                                                                         |
| SDG Target                    | 1.1                                                                                                                                                                                                                                                                                                             |
| SDG indicator                 | 1.1.1                                                                                                                                                                                                                                                                                                           |
| Affected Stakeholder Group(s) | Households' end-users                                                                                                                                                                                                                                                                                           |
| Monitoring approach           | Monitoring the proportion of population below the international poverty line by sex, age, employment status and geographical location (urban/rural).<br><br>The baseline is fixed ex-ante as default value as 81% (2022 data) <sup>30</sup> .<br><br>Source of data: publicly available survey country related. |
| Monitoring frequency          | Biennially.                                                                                                                                                                                                                                                                                                     |
| Sampling                      | NA                                                                                                                                                                                                                                                                                                              |

|                               |                               |
|-------------------------------|-------------------------------|
| ID2                           | Access to safe water drinking |
| SDG Target                    | 1.4                           |
| SDG indicator                 | 1.4.1                         |
| Affected Stakeholder Group(s) | Households' end-users         |

<sup>28</sup> IEST – Baseline survey report of 01/08/2022 (survey conducted in July 2022)

<sup>29</sup> Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003 – AMS-III.AV version 08.0 CDM methodology.

<sup>30</sup> THE WORLD BANK – As growth slows, Madagascar needs a new reform, June 2022.

|                      |                                                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Monitoring approach  | Monitoring the population of the village that use the safe water system.<br>Source of data: field survey population census. |
| Monitoring frequency | Annually.                                                                                                                   |
| Sampling             | NA                                                                                                                          |

**SDG8.** Communities are deeply involved in the implementation of the grouped project. The construction of the water safe drinking technology oversees a local construction company<sup>31</sup>. The operation and maintenance will create job opportunities within local communities, as well the for the monitoring staff. The access to safe water can support local employment and economic growth.

|                               |                                                                                                                                                                                                                                                                                                                              |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID8                           | Employment generation                                                                                                                                                                                                                                                                                                        |
| SDG Target                    | 8.3                                                                                                                                                                                                                                                                                                                          |
| SDG indicator                 | 8.3.1                                                                                                                                                                                                                                                                                                                        |
| Affected Stakeholder Group(s) | Local partner and survey agencies.                                                                                                                                                                                                                                                                                           |
| Monitoring approach           | Monitoring the number of local people employed for construction, maintenance and monitoring the safe drinking system.<br>The baseline shall be considered of 0 as in absence of project activity there would not have been any increase in employment opportunity.<br>Source of data: employment records, service agreement. |
| Monitoring frequency          | Annually.                                                                                                                                                                                                                                                                                                                    |
| Sampling                      | 100%                                                                                                                                                                                                                                                                                                                         |

**People.** The grouped project will address SDG3, SDG4, SDG5 and SDG6

**SDG3.** Water is a necessity for survival, and 88% of people in Madagascar do not have access to improve sanitation. Over 2 billion people globally lack access to safely managed drinking-water services and approximately 485,000 diarrheal deaths in low- and middle-income countries each

<sup>31</sup> Construction works contract between Zanary Sarl and Madaprojects Srls – 25/07/2022.

year are attributable to unsafe drinking<sup>32</sup>. Over 2,100 children a year die from diarrhea because of unsafe and poor water quality in Madagascar. 66% percent of people who live in urban areas have access to safe drinking water, but less than 15 percent of people in the rural area have access to safe drinking water. Families who live in isolated villages do not have access to clean drinking water. Wells are contaminated with bacteria and viruses, and those who drink that water are exposing themselves to diseases. Most have no alternative to drinking the contaminated water unless the water is boiled<sup>33</sup>. Access to basic water and sanitation services in Madagascar suffers from severe inequalities and low-quality services. Only 54.4% of the population has access to basic water services, and only 12.3% of the population has access to basic sanitation services. Madagascar is at the bottom of the list of 76 developing counties with the lowest access to basic sanitation<sup>34</sup>. Despite these differences, limited access to clean water is of near universal concern in Madagascar. Globally, Madagascar ranks third from last in terms of access to safe water. While 82% of urban residents have access to clean water, only 34% of rural residents<sup>35</sup>.

The grouped project also leads to the reduction in indoor air pollution from wood smoke and avoid smoke related health disorders. In Sub-Saharan Africa, about 79% of the population use solid fuels. There is strong evidence linking solid fuel use with acute lower respiratory infection, chronic obstructive pulmonary disease, chronic bronchitis and lung cancer, and adverse pregnancy outcomes.<sup>36</sup> Globally, exposure to smoke from cooking fires causes an estimated 3.2 million premature deaths each year and remain one of the predominant causes of pollution-related disease and death in Africa. Globally, 16% of ambient air pollution comes from household air pollution. The avoidance of boiling water reduces smoke exposure to particular matter, carbon monoxide and toxic elements.

Therefore, the implementation of the grouped project will result in a decrease of mortality rate attributed to unsafe water and to household and ambient air pollution.

|                               |                                  |
|-------------------------------|----------------------------------|
| ID3                           | Reduced households air pollution |
| SDG Target                    | 3.9                              |
| SDG indicator                 | 3.9.1                            |
| Affected Stakeholder Group(s) | Households' end-users            |

<sup>32</sup> WHO International Scheme to Evaluate Household Water Treatment Technologies – July 2019

<sup>33</sup> Water quality in Madagascar – The Borgen Project

<sup>34</sup> [Madagascar: \\$220 Million to Improve Basic Water and Sanitation Services and Supply - Madagascar | ReliefWeb](#)

<sup>35</sup> USAID MADAGASCAR – Water for the World Country Plan, September 2020.

<sup>36</sup> Global Health Risk Factors: Air Pollution – A. Kofi Amegah [Global Health Risk Factors: Air Pollution | SpringerLink](#)

|                      |                                                                                                                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitoring approach  | Monitoring the mortality rate attributed to household and ambient air pollution compared with the baseline. The baseline is fixed ex-ante as default value of 93.1 attributable death rate per 100,000 population <sup>37</sup> .<br><br>Source of data: publicly available survey Country related |
| Monitoring frequency | Annually.                                                                                                                                                                                                                                                                                          |
| Sampling             | NA                                                                                                                                                                                                                                                                                                 |

|                               |                                                                                                                                                                                                                                               |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID4                           | Reduced exposure to unsafe water                                                                                                                                                                                                              |
| SDG Target                    | 3.9                                                                                                                                                                                                                                           |
| SDG indicator                 | 3.9.2                                                                                                                                                                                                                                         |
| Affected Stakeholder Group(s) | Households' end-users                                                                                                                                                                                                                         |
| Monitoring approach           | Monitoring the mortality rate attributed unsafe water. The baseline is fixed ex-ante as default value of 30.2 attributable death rate per 100,000 population <sup>38</sup> .<br><br>Source of data: publicly available survey Country related |
| Monitoring frequency          | Biennially.                                                                                                                                                                                                                                   |
| Sampling                      | NA                                                                                                                                                                                                                                            |

**SDG4.** Technical and field staff responsible for the maintenance of the water system will be trained in terms of understanding the requirement of the monitoring system, to ensure that the data recorded is complete and accurate, which would increase their employability and chances of getting long-term employment even after the completion of the project.

<sup>37</sup> The global health observatory – Period 2019 Ambient and household air pollution attributable death rate [Indicator 3.9.1: Mortality rate attributed to household and ambient air pollution \(per 100 000 population\) \(who.int\)](#)

<sup>38</sup> WHO – Global Health Observatory data repository (last updated 07/02/2019).

|                               |                                                                                                                                                                                                                                                        |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID5                           | Skill set development and awareness generation                                                                                                                                                                                                         |
| SDG Target                    | 4.3                                                                                                                                                                                                                                                    |
| SDG indicator                 | 4.3.1                                                                                                                                                                                                                                                  |
| Affected Stakeholder Group(s) | Local partner staff                                                                                                                                                                                                                                    |
| Monitoring approach           | Monitoring the number of individuals trained compared with the baseline, where the baseline shall be considered a value of 0 as in absence of project activity, no training would be required to be conducted.<br><br>Source of data: training records |
| Monitoring frequency          | Each monitoring periods.                                                                                                                                                                                                                               |
| Sampling                      | NA                                                                                                                                                                                                                                                     |

**SDG5.** Living in a household or abandoned, the female gender is the one who is responsible for the tasks of drawing water, collecting, and breaking firewood, producing food, taking care of agriculture and small livestock and manual tasks that require time and strengths.

Women and girls are disproportionately affected by the lack of access to clean water. This has especially negative impacts on their health and safety, self-esteem, education, and well-being. Women and girls are twice as likely as men to fetch water. This is time that cannot be spent on more productive economic, social, and educational activities. In 85% of household, women are responsible for fetching water, taking them around 11 h/week<sup>39</sup>.

Without safely managed water, women and girls are more vulnerable to abuse, attack and ill-health, affecting their ability to study, work and live in dignity. Women and girls usually have the responsibility of fetching water. This can be dangerous, time consuming and physically demanding task. Long journeys by foot can leave women and girls vulnerable to attack and often precludes them from school or earning an income. Access to water is human rights. Where females are enabled to enjoy those rights, their health is profoundly affected, curtailing their educational and economic opportunities, and denying them their full role in society<sup>40</sup>.

Women are mostly responsible for cooking, including boiling water, and procuring fuel. Using a more efficient cookstove allows them to spend their time on more productive tasks as well as education. Globally, women conduct 91% of the work to obtain fuel and cook; women and girls can spend up 10 hours a week on fuel collection and four hours a day cooking over traditional

<sup>39</sup> UNICEF Madagascar – Water, sanitation and Hygiene (WASH) sectoral report, March 2019.

<sup>40</sup> United Nations – Water and gender <https://www.unwater.org/water-facts/water-and-gender>

stoves, effectively keeping them from higher-value, income generating activities and perpetuating gender inequality and economic poverty while trapping them in a life of drudgery<sup>41</sup>. Not only does cooking endanger their health, but they may be removed from school because of domestic work like firewood collection and walk ever-greater distances carrying heavy loads due to forest degradation.

To improve access to drinking water, change the lives of children, women, and vulnerable people, and contribute to long-term resilience. Enhancing women's access to safe water has positive effects on social inclusion, poverty alleviation, health, environmental sustainability, and food security<sup>42</sup>.

Thus, the implementation of the grouped project it would be able to contribute to SDG 5 achieving gender equality and empower all women and girls.

|                               |                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID6                           | Reduces drudgery                                                                                                                                                                                                                                                                                                                                                                                             |
| SDG Target                    | 5.4                                                                                                                                                                                                                                                                                                                                                                                                          |
| SDG indicator                 | 5.4.1                                                                                                                                                                                                                                                                                                                                                                                                        |
| Affected Stakeholder Group(s) | Woman and young girls within the project area                                                                                                                                                                                                                                                                                                                                                                |
| Monitoring approach           | Monitoring the average time spent in fetching water compared with the baseline scenario. The baseline is fixed ex-ante as default value of 11h/week <sup>43</sup> .<br><br>Source of data: field monitoring survey conducted to determine the average time saved in the project scenario.                                                                                                                    |
| Monitoring frequency          | Annually                                                                                                                                                                                                                                                                                                                                                                                                     |
| Sampling                      | Requirements of the standard and guideline of "Sampling and surveys for CDM project activities and programme of activities (version 04.0)". The PP will use 90/10 confidence/precision as the criteria of the reliability of sampling efforts. In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of devices. |

<sup>41</sup> Clean Cooking Alliance – Accelerating clean cooking as nature-based climate solution

<sup>42</sup> OECD iLibrary – Women and SDG 6, Clean water and sanitation.

<sup>43</sup> UNICEF Madagascar – Water, sanitation and Hygiene (WASH) sectoral report, March 2019.

**SDG6.** Around the world, inequalities in access to water between people living in urban and rural areas have decreased but remain significant. Eight out of ten people without access to safe drinking water live in rural areas, nearly half of them in sub-Saharan Africa. The poorest populations continue to use untreated surface water from lakes or rivers. Many of these disadvantaged communities are in remote areas that are difficult to access. This is particularly the case in Madagascar, where only half of the population has access to drinking water, 22.9 million people who lack access to safe water in the country ranked fourth-worst in water quality in Africa.

Madagascar is a low-income country with significant natural resources but a long story of frequent economic crises. Access to water is perhaps the most severe infrastructure challenge in this economy. As of 2018 84% of the households did not have access to drinking water on premises, and 57% of the Malagasy population did not have access to an improved water source with a significant regional variation between urban and rural areas. Regarding water quality, on average, 80% of the population drinks water contaminated with E.Coli (i.e. fecal matter)<sup>44</sup>.

The southern regions of Madagascar have the country's lowest water supply coverage and is highly vulnerable to drought. Access to potable drinking water is a major challenge for the local population. Chronic droughts lead to annual emergency appeal to save the lives of acute malnourished children. Yet the root cause of this situation is the availability and access to safe water. Families often resort to negative coping strategies to the detriment of their children, such as having to discontinue their children's education to be able to buy water at exorbitant price. In rural areas, only 36% of household utilized improved water facilities<sup>45</sup>.

Thus, the implementation of the grouped project it would be able to contribute to SDG 6 achieving universal and equitable access to safe and affordable drinking water for all.

|                               |                                                                                                                             |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| ID7                           | Access to safe drinking water                                                                                               |
| SDG Target                    | 6.1                                                                                                                         |
| SDG indicator                 | 6.1.1                                                                                                                       |
| Affected Stakeholder Group(s) | End-users                                                                                                                   |
| Monitoring approach           | Monitoring the population of the village that use the safe water system.<br>Source of data: field survey population census. |
| Monitoring frequency          | Annually.                                                                                                                   |

<sup>44</sup> UNITED NATIONS UNIVERSITY – Impact of gender mainstreaming in infrastructure projects. Evidence from a water project in Madagascar.

<sup>45</sup> UNICEF – Improving access to safe water in South Madagascar.

|          |    |
|----------|----|
| Sampling | NA |
|----------|----|

Planet. The project will address SDG13, SDG15

**SDG13.** The grouped project aims to reduce the use and the demand of fossil fuels and/or non-renewable biomass (NRB) that would have been used to boil water to purify water in the absence of the proposed project activity, by the construction of solar powered water supply systems. By reducing the rate of deforestation in the host country where most Malagasy households have no alternative to firewood and charcoal using the traditional stoves to boil water<sup>46</sup>. Under VPA-001 the PP aims to construct 5 new safe water supply systems in the region of Andrefana implemented in five different rural communities, providing safe drinking water to about 4,000 households and overall, about 24,900 people. The estimates of annual average and total GHG emission reduction for the chosen renewable 7 years crediting period are 9,279 tCO<sub>2</sub>/year and 64,953 tCO<sub>2</sub> respectively.

**SDG15.** Between 1990 and 2010, Madagascar lost an average of 56,950 ha or 0.42% per year. In total, between 1990 and 2010, Madagascar lost 8.3% of its forest cover, or around 1,139,000 ha<sup>47</sup>. Over time, the reduction of forest extraction and reduced pressure have been proven to lead to both an increase in forest biomass and higher levels of diversity and abundance of seedlings of indigenous tree species. Charcoal production is a major driver of deforestation; hence the project activity preserves forests and biodiversity.

The proposed project will deliver a long term, secure and simple contribution to sustainable development in Madagascar that would not exist without carbon finance.

## 1.18 Additional Information Relevant to the Project

### Leakage Management

Not applicable to this project activity.

The project activity does not use fossil fuel combustion and/or electricity for the water purification system which is powered by renewable energy through solar panel.

<sup>46</sup> C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024. Madagascar\_Madaprojects Srl SB\_National fNRB CDM Tool30 v4.0 2022\_Calculation sheet\_19 Jan 2024.xlsx

<sup>47</sup> Madagascar Forest Information and Data (mongabay.com)

### Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

### Further Information

Not applicable.

## 2 SAFEGUARDS

### 2.1 No Net Harm

No potential negative environmental or socio-economic impacts have been identified for the project. In July 2022 a geophysical study was carried out by a third party to identify the appropriate location for the wells<sup>48</sup>. The study was the base to obtain the authorization by the water minister to implement the project activity<sup>49</sup>.

### 2.2 Local Stakeholder Consultation

An invitation letter was hand delivered to related stakeholders including local authorities, representatives of local communities, policy makers, media, NGOs, local vendors, and households on 29<sup>th</sup> September 2022 at the “Salle Polyvalente – Jardin de la Mer” in Tulear, Madagascar<sup>50</sup>. The invitation was delivered from 3 to 12/08/2022 and a follow-up has been done from 5 to 16/09/2022 for getting the confirmation of the meeting attendance. Stakeholder were identified as those whose activities directly and indirectly impact the project and those who are impacted by the project activity. The meeting was attended by 58 participants including 24 females and 34 males<sup>51</sup>.

Mr. Auguste Romain Rahajason, the local representative of Madaprojects, made a presentation on the social, economic, and environmental impacts of the project activities to local communities. The purpose of the VPA-001 is to provide safe drinking water to household in rural communities. The project aims to reduce the use and demand of wood fuel and non-renewable biomass that would have been used to boil the water to purify water in the absence of the proposed project activity, by the construction of solar powered water supply systems. By reducing the consumption of wood fuel and non-renewable biomass, it can contribute to improving public health problems, furthermore it contributes to Madagascar’s climate change respond and sustainable

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<sup>48</sup> ARAF SARL – Geophysical study Municipality of Behompy, July 2022

<sup>49</sup> Water Minister – Authorization prot. MEAH/DCP/SR-EAH/0012/08/22 of 03/08/2022

<sup>50</sup> Madaprojects and Carbon Credits Consulting – Invitation letter for stakeholder consultation meeting / List of invitation.

<sup>51</sup> List of participant stakeholder consultation meeting held on 29/09/2022.

development. Mr. Rahajason also give a brief introduction of VCS and SD VSta process registration. After the presentation, questions and the answer section made by the stakeholders. Currently the project received all supportive comments from local stakeholders without any negative one. The feedback received during the stakeholder meeting has been considered and the PP provide immediate response. Details of comments received during the stakeholder consultation process are contained in Stakeholder Consultation Report<sup>52</sup>.



Summary of relevant comments received:

| Issue                                                                                                                                                                                                                                                                                | PPs response                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Likelihood to change the place where to construct the water tower in Behompy village. The community sustain that the identified place could not assure the water, so that they would change in a place for which they are confident for water.                                       | The project developer has confirmed the availability to change the place according to their request, considering the importance to have available water below ground.                                                |
| A request to expand the project in other areas of Tuelar II district is submitted by the assistant of deputy of the district.                                                                                                                                                        | The project developer replied that they intend to expand the project, and the areas will be identified in conjunction with the local authorities based on the priority.                                              |
| Most of the comments are related to the positive impacts from the project activity to the local communities. Representatives of local authorities and communities have formulated some requests as construction of school, canteen in the schools, roads, and other infrastructures. | At this regard the project developer confirmed that they know the needs of the communities, and they have been informed that it will be find the adequate moment and place to discuss on future cooperation on that. |

<sup>52</sup> Stakeholder Consultation Report version 0 of 30/09/2022

As a part of on-going communication with local stakeholders, it was explained during the meeting that they are free to voice grievances regarding the project activity. They were informed about the communication channel; they can directly refer to the Water Committee available in each municipality where the safe drinking system is implemented. The Water Committee representative has direct contact with the local referent of Madaprojects (local project coordinator) according to the information provided during the local stakeholder consultation meeting. The water committee is made up of several representatives who are not necessarily the village head and others but are freely chosen through an internal meeting of the village in which the village head together with us coordinates the selection based on proximity to the well, skills demonstrated in time and availability. Any relevant concern received during operation of project activity will be addressed according to its merit.

## 2.3 Environmental Impact

No negative environmental impacts have been identified from the grouped project and environmental impact assessment (EIA) is not required for the project. The decree on the “Compatibility of Investments and Environment” (Decree 99.954 dated 15 December 1999) amended by Decree No 2004--167 of 03 February 2004 on the compatibility of investments with the environment (MECIE) determines which type of projects must execute an EIA and the necessary procedures. According to this decree the proposed project does not fall into category mandated for conducting Environmental Impact Assessment<sup>53</sup>.

## 2.4 Public Comments

The project was open for public comment from 18/01/2023 to 17/02/2023. No comments were received during the 30-day public comment period.

## 2.5 AFOLU-Specific Safeguards

Not applicable as the project is not-AFOLU project.

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<sup>53</sup> Environment Law in Madagascar | -(Jurismada)-

## 3 APPLICATION OF METHODOLOGY

### 3.1 Title and Reference of Methodology

Type III – Other project activities that result in emission reductions of less than or equal to 60 kt CO<sub>2</sub> equivalent per year.

Methodology: AMS-III.AV –Low greenhouse gas-emitting safe drinking water production system (Version 08.00 of 12/06/2020).

Sectoral Scope: 03

The applied methodology refers to the following methodology and methodological tools:

- Small-scale methodology AMS-I.E Switch from non-renewable biomass for thermal applications by the user (version 13.0 of 08/09/2022)
- TOOL21 Demonstration of additionality of small-scale project activities (version 13.1)
- TOOL30 Calculation of the fraction of non-renewable biomass (version 04.0)
- Methodological tool TOOL33 – Default values for common parameters (version 02.0 of 08/09/2022).
- Standard: Sampling and surveys for CDM project activities and programme of activities (version 09.0)
- Guideline: Sampling and surveys from CDM project activities and programme of activities (version 04.0)

### 3.2 Applicability of Methodology

| Applicability criterion                                                                                                                                                                                                                                                                                                                                                    | Compliance with the applicability criterion                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| This methodology comprises introduction of low greenhouse gas emitting water purification systems to provide safe drinking water (SDW). Water purification technologies that involve point-of-use (POU) or point-of-entry (POE) treatment systems for residential or institutional applications such as systems installed at a school, or a community centre are included. | <p>The grouped project applies a low greenhouse gas emitting water purification system to provide safe drinking water.</p> <p>The technology applied in VPA-001 involve the Point of Use (POU) with limited number of taps. Applicability criterion is met.</p> |
| Soil filtration schemes (boreholes, wells) that include container disinfection (e.g.                                                                                                                                                                                                                                                                                       | Madagascar does not expect requirements for soil filtration schemes. The project                                                                                                                                                                                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>chlorination) may be applied. Project proponents shall demonstrate ex ante that the rehabilitation and/or construction of the wells complied with relevant national and/or international standards and that measures are taken to ensure that water and well are not contaminated.</p>                                                                                                                                                                            | <p>construction will be done according to the construction best practice.</p> <p>At the time of water system commissioning the CME will provide two different laboratory tests, one first pre-treatment and another post-treatment. The second one has the aim to ensure the achievement with the requirements established by the national law, through a recognized test laboratory.</p> <p>Applicability criterion is met.</p>                                                                                                                                                                                        |
| <p>Prior to the implementation of the project activity a public distribution network supplying SDW to the project boundary does not exist.</p>                                                                                                                                                                                                                                                                                                                       | <p>For each project instance shall proof that a public distribution network supplying safe drinking water does not exist in the project boundary. If during the crediting period SDW is made available through a public distribution network, the emission reductions related to the households supplied by the public system will be not claimed from that point onwards. The condition will be checked periodically during the crediting period.</p> <p>For the project instance VPA-001 it is confirmed that the applicability criterion is met, as per the Baseline Survey conducted on July 2022<sup>54</sup>.</p> |
| <p>It shall be demonstrated based on laboratory testing or official notifications that the application of the project technology/equipment achieves compliance either with: (i) the Comprehensive Protection performance target as per “Evaluating household treatment options: Health based targets and microbiological performance specification” (WHO, 2011) and “International Scheme to Evaluate Household Water Treatment Technologies” (WHO2014); or (ii)</p> | <p><b>DECREE N. 2003-941</b> on water monitoring, the control of water intended for human consumption and the priorities of access to water resources<sup>55</sup> establishes: (a) art. 6 Water intended for human consumption, instead of being made available to the user, must satisfy quality requirements relating essentially to physico-chemical and bacteriological parameters; water intended for human consumption must not show signs of deterioration in its quality; (b) art. 14 The</p>                                                                                                                  |

<sup>54</sup> IEST – Baseline survey report July 2022

<sup>55</sup> Decree no. 2003-941 of 09/09/2003

|                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>an applicable national standard or guideline. Applicable national standard should be based on laboratory efficacy testing that, at minimum, includes quantitative microbial measures of pre-and post-treatment challenge waters that are representative of potential drinking water sources, and that includes measured reductions based on at least one pathogen class (bacteria, viruses, protozoa).</p> | <p>taking of water samples for the purpose of carrying out the analysis program must be carried out by agents of the Provincial Directorate of Health, by agents of one or more laboratories recognized by the State and designated by the Ministry of Health or by agents of the sanitation services municipalities that actually carry out the verification of water intended for human consumption. (c) art. 15 The analysis of water samples taken under the conditions referred to in Article 14 must be carried out by institutions recognized by the State.</p> <p>Article 5 requires that all water delivered for human consumption must comply with the standards of potability provided for in Article 6. According to Article 6 the water intended for human consumption must meet quality requirements mainly concerning physicochemical and bacteriological parameters. Furthermore, water intended for human consumption must not show any sign of deterioration in its quality. The annex of the potability standards define the drinkable water any water intended for human consumption must never be likely to harm the health of those who consume it. It must also, if possible, be pleasant to consume. It must have the following characteristics:</p> <p>a) Organoleptic and Physical Parameters. The water should be if possible: scentless, without colour, without unpleasant flavour; The recommended temperature is 15° (a higher temperature causes the proliferation of germs); Turbidity should not exceed, if possible, 5NTU; Conductivity: it must be measured to monitor pollution. The conductivity is less than 3000 uS/cm at 20°C. The recommended PH is between 6.5 and 8.5;</p> <p>b) Water must contain a certain number of chemical elements in acceptable quantities. There are elements called "normal elements" (i.e. calcium, magnesium, chlorinated, sulphate); abnormal elements, for which the</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>variations in the content indicate chemical pollution (i.e. organic matter, free chlorine, ammonia, nitrates, total nitrogen, manganese, iron, phenols, zinc, nitrites, phosphorus); toxic elements (i.e. arsenic, cyanide, hexavalent chromium, lead, nickel, cadmium, mercury). Water delivered for human consumption is water free of pathogenic germs and germs indicative of fecal pollution, namely: fecal coliforms 0/100 ml, fecal streptococci 0/100 ml, heat-resistant coliforms (E.coli) 0/100 ml, Sulphite-reducing clostridium 0/20 ml.</p> <p>For all the chemical element the law fix a threshold limit to be respected.</p> <p><b>Decree no. 2004-635</b> of 15 June 2004. Amendment of decree no. 2003-941 of 9 September 2003 on water monitoring, control of water intended for human consumption and priorities for access to water resources<sup>56</sup>, establishes: (a) organoleptic and physical parameters including bacteria, viruses, and protozoa and (b) the frequency of the analysis: at least 2 times a year in rural areas (1 in the dry season and 1 in the wet season). Within the amendment the type and the limit of the pathogenic germs and germs indicative of fecal pollution have been changed into: total coliforms 0/100 ml, fecal streptococci 0/100 ml, thermo-tolerant coliforms (Ecoli) 0/100 ml, sulphite-reducing clostridium &lt; 2/20 ml, anaerobic sulphite-reducing spores.</p> <p>The condition will be checked according to the national requirements during for the whole project lifetime. The laboratory test will be carried out by institutions recognized by the State<sup>57</sup>.</p> <p>VPA-001. Due the water scarcity of the municipality of Behompy, prior to the project,</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

<sup>56</sup> Decree No. 2004-635 15/06/2004

<sup>57</sup> Ministry Of Water De Sanitation And Hygiene – Decree No. 2022-211 Laboratory accreditation IEST (Institut d’Enseignement Supérieure de Toliara)

|                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                | <p>families do not have access to clean drinking water and the communities collect the water far from the villages where it is collected unsafe water because wells and rivers are contaminated with bacteria and viruses. There is no alternative to drinking the contaminated water unless they boil<sup>58</sup>.</p> <p>At the time of water system commissioning the CME will provide two different laboratory tests, one first pre-treatment and another post-treatment. The second one has the aim to ensure the achievement with the requirements established by the national law, through a recognized test laboratory.</p> <p>Applicability criterion is met.</p> |
| In cases where the life span of the water treatment technologies is shorter than the crediting period of the project activity, there shall be documented measures in place to ensure that the end users have access to replacement purification systems of comparable quality. | <p>The CME has the responsibility to contract the local partner for maintaining the operation of the water system for the whole crediting period.</p> <p>VPA-001. According to the agreement signed with the community<sup>59</sup> the project developer has the responsibility to carry out the periodical maintenance, and to replace spare part of the equipment if necessary. The measures that will be put in place by the project developer will ensure the access to the purification water system.</p> <p>Applicability criterion is met</p>                                                                                                                       |
| It should be demonstrated that the project appliances use technologies that meet the technology standards as per paragraph 4(b) and that they deliver microbiologically safe drinking water.                                                                                   | <p>The project technology shall follow the technology standards as per paragraph 4(b) and the water quality shall meet the parameters fixed by the national law.</p> <p>VPA-001. The project technology applied is identified as Point of Use with limited number</p>                                                                                                                                                                                                                                                                                                                                                                                                       |

<sup>58</sup> Water quality in Madagascar (The Borgen Project)

<sup>59</sup> Partnership agreement between Behompy rural municipality and Madaprojects – 20/07/2022

|                                                                                                                                                                |                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                | <p>of taps. At the time of water system commissioning the CME will provide the laboratory test of the post-treatment water to ensure the achievement with the requirements established by the national law.</p> <p>Applicability criterion is met.</p> |
| The use of AMS-III.AV methodology under grouped project is legitimate if the leakage is estimated and accounted for as per the relevant provisions of AMS-I.E. | Net gross adjustment factor 0.95 is used according AMS-I.E methodology.                                                                                                                                                                                |
| TOOL21 Demonstration of additionality of small-scale project activities (version 13.1).                                                                        | <p>Each project instance will demonstrate additionality according to the methodology procedure as per the methodological tool.</p> <p>VPA-001 demonstrates the additionality through the investment barriers.</p>                                      |
| TOOL30 Calculation of the fraction of non-renewable biomass (version 04.0)                                                                                     | <p>CME calculates VPA-specific <math>f_{NRB}</math> values</p> <p>VPA-001. 71% is the <math>f_{NRB}</math> value project specific<sup>60</sup>.</p>                                                                                                    |
| TOOL33 Default values for common parameters (version 02.0)                                                                                                     | The methodological tool is applied in conjunction with the applied methodology AMS-I.E version 13.00 in relation to the wood-to-charcoal conversion factor.                                                                                            |
| Sampling standard and guideline.                                                                                                                               | The standard and guideline are applied to define the sampling methods.                                                                                                                                                                                 |
| AMS-I.E Switch from non-renewable biomass for thermal applications by the user.                                                                                | Regional default values of the emission factor of fossil fuels projected to substitute non-renewable woody biomass by similar consumers.                                                                                                               |

<sup>60</sup> C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass ( $f_{NRB}$ ). 19/01/2024.  
Madagascar\_Madaprojects Srl SB\_National  $f_{NRB}$  CDM Tool30 v4.0 2022\_Calculation sheet\_19 Jan 2024.xlsx

### 3.3 Project Boundary

As per the applied methodology AMS-III.AV (version 08.0) the project boundary is the physical, geographical sites of low greenhouse gas emitting technologies for water purification installed by the project activity and the household/institutional buildings where the consumers of safe water provided by the systems are located.

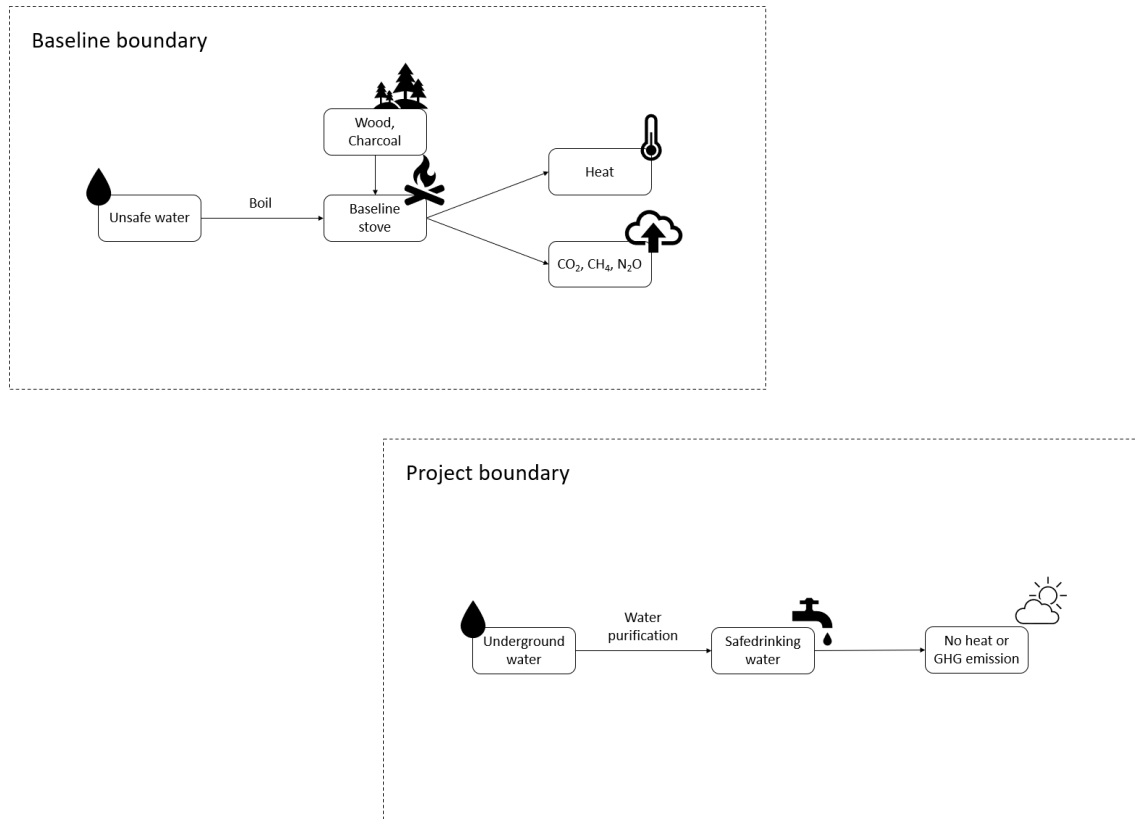


Figure 4 – Baseline and project boundary diagram.

The emission sources to be included in, or excluded from, are presented in the table below.

| Source   |                                                                                                                       | Gas              | Included? | Justification/Explanation                                                                            |
|----------|-----------------------------------------------------------------------------------------------------------------------|------------------|-----------|------------------------------------------------------------------------------------------------------|
| Baseline | Combustion of wood and/ or non-renewable biomass for obtaining safe drinking water displaced due to project activity. | CO <sub>2</sub>  | Yes       | Main source of emission.                                                                             |
|          |                                                                                                                       | CH <sub>4</sub>  | No        | Negligible source                                                                                    |
|          |                                                                                                                       | N <sub>2</sub> O | No        | Negligible source                                                                                    |
|          |                                                                                                                       | Other            | No        | Negligible source                                                                                    |
| Project  | CO <sub>2</sub> emissions from on-site consumption of fossil fuels                                                    | CO <sub>2</sub>  | Yes       | NA. The operation of the water purification system does not involve consumption of fossil fuels. The |
|          |                                                                                                                       | CH <sub>4</sub>  | No        |                                                                                                      |
|          |                                                                                                                       | N <sub>2</sub> O | No        |                                                                                                      |

| Source | Gas   | Included? | Justification/Explanation                                   |
|--------|-------|-----------|-------------------------------------------------------------|
|        | Other | No        | electricity is provided by the installation of solar panel. |

### 3.4 Baseline Scenario

According to the methodology AMS-III.AV (version 08.0), it is assumed that in the absence of the project activity, the baseline scenario would be the project use fossil fuels or non-renewable biomass (NRB) to boil waters as means of water purification. As this is a small-scale methodology, each instance under the grouped project will achieve emission reductions below 60,000 tCO<sub>2e</sub> per annum. The baseline scenario will be confirmed through project area specific survey and the NRB will be calculated according to the region where the project will be implemented.

**VPA-001.** The project developer has conducted a field survey to confirm the baseline scenario and to establish the baseline biomass consumption. A sample households survey was conducted by a third party, IEST in rural municipality of *Ampasy, Ampihalia, Andranofoty, Behompy, Mahabo*, where the project instance will be implemented<sup>61</sup>. The following objectives were addressed by the baseline study: the household's profile, the daily water consumption, the purification method used, in case of boiling water the type of device and the fuel type and consumption per week. The baseline survey was conducted with the help of an offline survey App<sup>62</sup>. The survey App allows to build the survey question, collect responses, and analyse the results. The survey approach has been prepared based on planning, field work, analysis, and preparation of the baseline survey report.

The minimum sample size of household user of traditional stoves is determined using the procedure outlined in the CDM Standard: Sampling and survey for CDM project activities and programme of activities, Version 09.0. The methodology applied does not give specific guidance for sampling requirements; according to para 11 of the CDM survey standard is used 90/10 confidence/precision as criteria for the reliability of sampling efforts expected for the small-scale projects. If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30. Equation 1 of *Guideline: sampling and survey for CDM project activities and programmes of activities version 4.0* shall be applied, but if the parameter is a Mean value (section 2.1.6) the equation 18 shall be used. The population using the cookstove for boiling water is homogeneous therefore the simple random

<sup>61</sup> IEST – Baseline survey report of 01/08/2022 (survey conducted in July 2022)

<sup>62</sup> [Online Survey Software for Web & Offline Data Collection App for iOS and Android \(survtapp.com\)](https://survtapp.com/)

sampling would be appropriate method to estimate the proportion of households for baseline consumption.

The simple random sampling is used in accordance with the equation (1) § 2.1.1 of the Guideline, to give us the required sample size is:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 p(1-p)} \quad \text{Equation (1)}$$

Where:

|       |                                                                                                   |
|-------|---------------------------------------------------------------------------------------------------|
| $n$   | Sample size                                                                                       |
| $N$   | Total number of households                                                                        |
| $p$   | Our expected proportion (0.90)                                                                    |
| 1.645 | Represents the 90% confidence required                                                            |
| 0.1   | Represents the 10% relative precision ( $0.1 \times 0.5 = 0.05 = 5\%$ points either side of $p$ ) |

In case the parameter is a Mean value the simple random sampling is calculated in accordance with the equation (18) § 2.1.7 of the guideline:

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V} \quad \text{Equation (18)}$$

Where:

|       |                                        |
|-------|----------------------------------------|
| $V$   | $\left( \frac{SD}{mean} \right)^2$     |
| $n$   | Sample size                            |
| $N$   | Total number of households             |
| Mean  | Our expected mean                      |
| SD    | Our expected standard deviation        |
| 1.645 | Represents the 90% confidence required |
| 0.1   | Represents the 10% relative precision  |

To calculate the sample size of the project activity, equation (1) and (18) are applied considering the raw taken from the field survey <sup>63</sup>:

| Rural municipality | No. of households | Average litres/day/households | Average person per households | Litres/person/day |
|--------------------|-------------------|-------------------------------|-------------------------------|-------------------|
| Ampasy             | 281               | 73.4                          | 10.2                          | 7.6               |
| Ampihalia          | 1373              |                               |                               |                   |
| Andranofoty        | 760               |                               |                               |                   |
| Behompy            | 1326              |                               |                               |                   |
| Mehabo             | 259               |                               |                               |                   |

The following calculation were carried out to confirm the correctness of the sample size:

- 1) Considering the number of households (3999) and according to the sample size equation (1) the sample of total households in the project boundary account 30. The PP did a sample of 141 households which is greater than the expected.

| Total number of households |             |      | Sample size |             | Sample done    |
|----------------------------|-------------|------|-------------|-------------|----------------|
|                            | Ampasy      | 281  |             | 27,24834601 |                |
|                            | Ampihalia   | 1373 |             | 29,44361172 |                |
|                            | Andranofoty | 760  |             | 28,95936516 |                |
|                            | Behompy     | 1326 |             | 41,38350302 |                |
|                            | Mehabo      | 259  |             | 27,03308644 |                |
|                            |             |      |             | 30,81358247 |                |
|                            |             | 3999 |             | 29,84997829 | 141 households |

- 2) Considering the average litres of water consumed per household per day (73.4), and according to the sample size equation (18) the sample accounts to 97; where the standard deviation is calculated based on the average of litres of water consumed per household. The PP did a sample of 141 households which is greater than the expected sample size.

|                               |                                        |  |             |       |             |
|-------------------------------|----------------------------------------|--|-------------|-------|-------------|
| n                             | sample size                            |  | 97,21       |       |             |
| N                             | Average litres/household/day           |  | 73,4        |       |             |
| SD                            | our expected standard deviation        |  | 44,50847    |       |             |
| 1.645                         | Represents the 90% confidence required |  | 90%         |       |             |
| V                             |                                        |  | 0,368084    |       |             |
| num                           |                                        |  | 3983,178    |       |             |
| den                           |                                        |  | 40,97604    |       |             |
| Average litres/day/households |                                        |  | Sample size |       | Sample done |
|                               |                                        |  |             | 97,21 | 141         |

- 3) Considering the average litres of water consumed per person per day (7.6) and according to the sample size equation (18) the sample accounts to 15; where the standard deviation is calculated

<sup>63</sup> Sample size - Baseline survey July 2022.xls

based on the average of litres of water consumed per person. The PP did a sample of 141 households which is greater than the expected sample size.

- 4) Considering the cap consumption per person per day as per the applied methodology (5.5) and according to the sample size equation (18) the sample accounts to 29. The PP did a sample of 141 households which is greater than the expected sample size.

|                                |                                        |     |          |                    |                    |
|--------------------------------|----------------------------------------|-----|----------|--------------------|--------------------|
| <i>n</i>                       | sample size                            |     | 28,97    |                    |                    |
| <i>N</i>                       | Litres/person/day - cap                |     | 5,5      |                    |                    |
|                                |                                        |     |          |                    |                    |
| SD                             | our expected standard deviation        |     | 1,806    |                    |                    |
| 1.645                          | Represents the 90% confidence required |     | 90%      |                    |                    |
| V                              |                                        |     | 0,107823 |                    |                    |
|                                |                                        |     |          |                    |                    |
| num                            |                                        |     | 1166,792 |                    |                    |
| den                            |                                        |     | 40,27177 |                    |                    |
| <b>Litres/person/day - cap</b> |                                        |     |          | <b>Sample size</b> | <b>Sample done</b> |
|                                |                                        | 5,5 |          | 28,97              | 141                |

The calculation of sample size per average litres of water consumed per person per day and the sample size per cap consumption per person per day as per the applied methodology, resulted less than 30, therefore the Student's t-distribution is used.

|                  |            | <b>Litres/person/day</b> | <b>Litres/person/day - cap</b> |
|------------------|------------|--------------------------|--------------------------------|
| <b>t-student</b> | <b>num</b> | 2,971600164              | 2,97087                        |
| <b>z=1,645</b>   | <b>den</b> | 0,757389355              | 0,55                           |
|                  | <b>n</b>   | 15,39367642              | 29,17708614                    |

As mentioned above, the PP did a sample of 141 households which is greater than the expected sample size calculated both with equation (1) and equation (18) as demonstrated. The total 141 households were randomly selected in each municipality and interviewed regarding their water consumption and purification method. Based on the data collected from the field survey, the baseline water consumption as well as the fuels used in case of boiling water, has been analysed<sup>64</sup>. In conclusion the sample size carried out in the baseline survey is adequate and in accordance with both the equation (1) and equation (18) of the Guideline: sampling and survey for CDM project activities and programmes of activities version 4.0.

As per the baseline survey report the households lack access to reliable safe drinking water, 100% of the families purify water through boiling using unimproved traditional cooking device (*Fatapera*) or the three stones and are left vulnerable to the negative effects associated with the emission of greenhouse gases.

<sup>64</sup> IEST – Baseline survey report of 01/08/2022 (survey conducted on July 2022)

|                                          |                                                                                                                      |      |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------|
| <b><i>BL<sub>fuel,i</sub></i></b>        | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction) | 100% |
| <b><i>BL<sub>fuel,wood</sub></i></b>     | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction) | 49%  |
| <b><i>BL<sub>fuel,charcoal</sub></i></b> | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction) | 51%  |

The high proportion of non-renewable biomass demonstrates that the typical household water boiling contributes to deforestation and threatens biodiversity. Most Malagasy peoples live in rural areas and the households that live in rural areas use firewood and charcoal as their main source of energy. As per the third-party study<sup>65</sup> the value is determined as 71%.

Based on the above assumption, it is confirmed the baseline scenario assumed by the applied methodology.

### 3.5 Additionality

The proposed project activity is a voluntary action by Carbon Credits Consulting and Madaprojects; there is no mandatory law or requirement in Madagascar to promote the installation of water purification technologies. The voluntary action would be not possible in the absence of the project activity due to the cost associated with it.

Under the grouped project, the additionality is demonstrated by barrier analysis that is in line with TOOL21 Demonstration of additionality of small-scale project activities (version 13.1). The instances shall demonstrate additionality by investment barriers, by demonstrating the eligibility criteria that the installation of SDW systems is free of cost to users.

**VPA-001.** The project activity demonstrates the existence of an investment barrier. The construction and the equipment require capital<sup>66</sup>, which is a barrier to the end user of the project due to difficulties in accessing capital, a wide dissemination of such technology in Madagascar is unlikely. The project instance will alleviate these barriers since the PP assume all the related costs for construction, equipment and maintenance during the crediting period and the purified water will be free of cost, which means no money shall be charged to users<sup>67</sup>; hence there is no financial return from the project other than revenue from the sale of GHG credits revenue. The actions under the project activity will alleviate these barriers, hence in line with para 10 (a) of the methodological tool (TOOL21) the project faces investment barrier and its additional.

<sup>65</sup> C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024.  
Madagascar\_Madaprojects Srl SB\_National fNRB CDM Tool30 v4.0 2022\_Calculation sheet\_19 Jan 2024.xlsx

<sup>66</sup> Construction works contract between Zanary Sarl and Madaprojects Srls – 25/07/2022.

<sup>67</sup> Agreement between the mayor of the rural community of Behompy and Madaprojects – 20/07/2022

### 3.6 Methodology Deviations

Not applicable as there are no methodological deviations for this project activity.

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 4.1 Baseline Emissions

In accordance with para 14 of AMS-III.AV (version 08.0), the emissions are calculated based on the energy demand for boiling the water, and in case of displacement of NRB the baseline emissions are corrected for the fraction of the biomass that can be demonstrated to be non-renewable.

The baseline emissions are calculated as follows:

$$BE_y = QPW_y \times m \times X_{boil} \times SEC \times \sum_i (BL_{fuel,i} \times f_i \times EF_{projected\_fossil\ fuel,i} \times 10^{-9}) \quad \text{Equation (1)}$$

Where:

|                                                    |                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>BE<sub>y</sub></i></b>                       | Baseline emissions during the year y in (t CO <sub>2</sub> e) Q                                                                                                                                                                                                                                                                                    |
| <b><i>QPW<sub>y</sub></i></b>                      | Total quantity of water purified by the project in year y (L)                                                                                                                                                                                                                                                                                      |
| <b><i>m</i></b>                                    | Fraction of functional appliances that are providing the SDW (%). Only project appliances that (i) use technologies that meet the technology standards as per paragraph 4(b) and (ii) are operating or replaced by an equivalent in service appliance and (iii) deliver microbiologically safe drinking water, are counted for emission reductions |
| <b><i>X<sub>boil</sub></i></b>                     | Fraction of the population served by the project activity for which the common practice of water treatment is or would have been water boiling. It is determined ex ante through surveys                                                                                                                                                           |
| <b><i>SEC</i></b>                                  | Specific energy consumption required to boil one litre of water (kJ/L), to be calculated according to paragraphs below                                                                                                                                                                                                                             |
| <b><i>BL<sub>fuel,i</sub></i></b>                  | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction)                                                                                                                                                                                                                               |
| <b><i>f<sub>i</sub></i></b>                        | Fraction of non-renewable fuel type i used in the absence of the project activity in year y. For biomass, it is the fraction of woody biomass that can be established as non-renewable biomass (f <sub>NRB</sub> ). If the baseline fuel is fossil fuel, the value to be applied is 1                                                              |
| <b><i>EF<sub>projected_fossil fuel,i</sub></i></b> | Emission factor of the fuel type i substituted (t CO <sub>2</sub> /TJ)                                                                                                                                                                                                                                                                             |

**Determination of purified water in a year.** According to para 17 of the applied methodology, the quantity of purified water in a year is calculated as per option 2.2: the population services by the project activity and an average volume of drinking water per person per day, as follows:

$$QPWy = P_y \times \min (QPWpp ; 5.5 ) \times 365 \quad \text{Equation (3)}$$

Where:

|                                |                                                                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>P<sub>y</sub></i></b>    | Population who consumes the purified water serviced by the project activity in year y                                                   |
| <b><i>QPW<sub>pp</sub></i></b> | Average volume of drinking water per person per day (L/person/day) determined ex ante of the crediting period through a baseline survey |

The population who consumes the purified water service by the project activity is determined through population census of the area involved in the project instance implementation. For the ex-ante calculation, it is used the cap as the maximum quantity of drinking water per person per day of 5.5 l/person/day (para 18 of the applied methodology). Compared to the standard of 30 liters a day per person, the average water consumptions are set up as 11 liters a day per person<sup>68</sup>.

The population who consumes the purified water service by the project activity is determined through population census of the area involved in the project instance implementation. For the ex-ante calculation, it is used the cap as the maximum quantity of drinking water per person per day of 5.5 l/person/day (para 18 of the applied methodology). As per the baseline survey report conducted on July 2022, within a sample of 141 households, the average water consumption l/day/household is 73.2 lt, considering that the average of household members account to 10, the water consumption l/day/person is 7.32 lt. Compared to the standard of 30 liters a day per person, the average water consumptions are set up as 11 liters a day per person<sup>69</sup>. Therefore, the cap of 5.5 l/day/person is used in the calculation.

**Determination of specific consumption required to boil one litre of water.** According to para 20 of the applied methodology, default values are applied, therefore SEC is calculated as follows:

$$SEC = [357.48 \text{ kJ/L}] / n_{wb} \quad \text{Equation (5)}$$

The efficiency of the water boiling system being replaced is estimated ex ante according to the default values of Table 3 of the applied methodology, meaning:

- The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of systems is encountered.
- 0.10 default value may be optionally used if the replaced system or the system that would have been used is a three-stone fire or a conventional system for woody biomass lacking

<sup>68</sup> Evaluation of the USAID/Madagascar water supply – September 2014.

<sup>69</sup> Evaluation of the USAID/Madagascar water supply – September 2014.

improved combustion air supply mechanism and flue gas ventilation system that is without a grate as well as a chimney; for the rest of the system using woody biomass 0.2 default value may be optionally used.

- (c) 0.5 default value may be used if the replaced system or the system that would have been used is a fossil fuel combusting system.

According para 35 of the AMS-I.E methodology, where charcoal is used as the fuel by baseline or project devices, the quantity of woody biomass shall be determined by using a default wood to charcoal conversion factor. The default value provided in methodological tool “Default values for common parameters” TOOL33 version 02.0, is used. The default value for wood-to-charcoal conversion factor is 4.0 kg of fuelwood per kg of charcoal.

**Determination of NRB.** According to the methodological tool (Tool30) “Calculation of the fraction of non-renewable biomass” version 04.0 of 08/09/2022, the following equation is used:

$$f_{NRB} = \frac{NRB}{NRB + RB} \quad \text{Equation (1)}$$

Where:

|             |                                                                                                                               |
|-------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>fNRB</b> | Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)                               |
| <b>NRB</b>  | Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)                             |
| <b>RB</b>   | Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes) |

The fraction of non-renewable biomass (fNRB) for Madagascar is estimated at the country level according to the requirements of the Methodological TOOL30 version 4.0. The methodological tool stipulates that the difference between total woody biomass consumption and available woody biomass growth constitutes the non-renewable biomass (NRB). From this, an fNRB of 0.71 was obtained, indicating that the woody biomass consumption from the accessible forest in Madagascar is not suitable. Following the summary and the conclusion sourced from the third-party report who did the calculation<sup>70</sup>:

The resulting fNRB value is different from the range of fNRB values reported in peer-reviewed literature that used the woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) method<sup>71</sup>. While direct comparisons between the WISDOM and CDM methodologies are not always appropriate because of their different approaches, certain factors can still contribute to variations in the fNRB estimates between the two methods.

- This study for Madagascar uses 2022 population data which indicates an increase in population numbers from the 2009 figures used in the comparison study.

<sup>70</sup> C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024. Madagascar\_Madaprojects Srl SB\_National fNRB CDM Tool30 v4.0 2022\_Calculation sheet\_19 Jan 2024.xlsx

<sup>71</sup> Bailis R, Drigo R, Ghilardi A, Masera O. 2015. The carbon footprint of traditional woodfuels. Nature Climate Change. 5, 266–272. Available at: <https://doi.org/10.1038/nclimate2491>.

- The updated 2022 FAO Forest Products statistics were used in this study, whereas the comparison study used values prior to 2013 from either FAO Forest Products statistics, United Nations (UN) Energy Database or country specific reports depending on the availability of the consumption data.
- The approach used in this study to determine the accessible forest areas for wood harvesting yields different estimates than in the comparison study. Given that the accessible harvesting area is used to determine the RB, differences in this estimate can lead to differences in the fNRB. Moreover, in the present study, more recent data on global administrative zones, roads, protected areas and tree cover change was used to determine accessibility.
- The calculation of MAIs in this study involved using a weighted average based on the forest area of three categories – primary forests and secondary forests above and below the age of 20 years. Data from the 2019 Refinement of the 2006 IPCC guidelines were used. The observed forest gain extents between 2000 and 2012 were extrapolated to a future 20-year period to determine the age of stand. As per the comparison study, MAI values were derived from field observations, followed by a modelled estimation of growth rates as a percentage of standing stock with relatively low  $R^2$  of 0.45 indicating a measure of inaccuracy. This approach often yields higher MAIs and may lead to higher estimations of RB and, subsequently, lower estimations of NRB and fNRB.

The calculated fNRB value of 0.71 indicates that the consumption of woody biomass from the accessible forest in Madagascar is above the country's capacity to renew the supply sustainably. Report and calculation spreadsheet are available to VVB.

**Determination of fraction of functional appliances that are providing the SDW.** Since the grouped project expects to construct Point of Use with taps, it is assumed that 100% are in operation and they deliver microbiologically safe drinking water. The quality of the safe drinking water quality is monitored at least every two years and shall meet potable water standards according to the country law.

## 4.2 Project Emissions

According to para 22 of the applied methodology if the operation of the project water purification system involves consumption of fossil fuels and/or electricity, CO<sub>2</sub> emissions from on-site consumption of fossil fuels and electricity due to the project activity shall be accounted for as project emissions. Based on the technology applied for the grouped project, as described in section 1.10 of the project description, the pumps will be supplied by renewable energy through solar panels, therefore there is no project emissions to be considered.

### 4.3 Leakage

The project activity applies CDM Methodology AMS-III.AV (version 08.0). According to the para 21 of the methodology, where relevant leakage relating to the non-renewable woody biomass shall be assessed as per the relevant procedures of AMS-I.E Switch from non-renewable biomass for thermal application by the user (version 13.0). According to §49 of the AMS-I.E methodology version 13.0., the following leakages are estimated and accounted where applicable, on a sample basis using a 90/30 precision for the selection of samples, and accounted for:

(a) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities can also be a potential source of leakage. If this leakage assessment quantifies a portion of non-renewable woody biomass saved under the project activity that is then used as the baseline of other CDM project activities, then  $B_y$  is adjusted to account for the quantified leakage;

(b) Increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines can also be a potential source of leakage. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass outside the project boundary, then  $B_y$  is adjusted to account for the quantified leakage;

c) as an alternative to subparagraphs (a) and (b) above,  $B_y$  can be multiplied by a net to gross adjustment factor of 0.95 to account leakages, in which case surveys are not required.

Subparagraph (c) is applied to project activity which allow the use of a net gross adjustment factor of 0.95 in lieu of conducting a survey to account leakage emissions.

### 4.4 Net GHG Emission Reductions and Removals

According to para 25 of the applied methodology, emission reductions are calculated as:

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation (7)}$$

Where:

|                          |                                                        |
|--------------------------|--------------------------------------------------------|
| <b><math>ER_y</math></b> | Emission reductions in year y (t CO <sub>2</sub> e/yr) |
| <b><math>BE_y</math></b> | Baseline emissions in year y (t CO <sub>2</sub> /yr)   |
| <b><math>PE_y</math></b> | Project emissions in year y (t CO <sub>2</sub> e/yr)   |
| <b><math>LE_y</math></b> | Leakage emissions in year y (t CO <sub>2</sub> e/yr)   |

### Ex ante calculation of emission reductions – VPA-001.

#### BASELINE EMISSIONS

##### Determination of purified water in a year

| Parameter               | Description                                                                                                                             | Value         | Source                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------|
| <b>QPW<sub>y</sub></b>  | Total quantity of water purified by the project in year y (L)                                                                           | 49.944.592,50 | Calculated                                         |
| <b>P<sub>y</sub></b>    | Population who consumes the purified water serviced by the project activity in year y                                                   | 24879         | Third Party Population Census Report_19072022      |
| <b>QPW<sub>pp</sub></b> | Average volume of drinking water per person per day (L/person/day) determined ex ante of the crediting period through a baseline survey | 5,5           | AMS-III.AV (version 08.0) para 18. Established cap |

##### Determination of specific consumption required to boil one liter of water

| Parameter             | Description                                                                                                                       | Value  | Source                                                                                                                                                                              |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEC</b>            | Specific energy consumption required to boil one litre of water (kJ/L), to be calculated according to paragraphs below            | 3574,8 | Calculated                                                                                                                                                                          |
| <b>WH</b>             | Specific heat of water (kJ/L °C)                                                                                                  | 357,48 | Default value. Para 20 AMS-III.AV (version 08.0)                                                                                                                                    |
| <b>n<sub>wb</sub></b> | Efficiency of the water boiling systems being replaced, estimated ex ante. Default values in Data / Parameter table 3 may be used | 0,1    | Default value. Table 3 AMS-III.AV (version 08.0). Based on Baseline survey report _July2022 the system used is a conventional system for woody biomass lacking improved combustion. |

##### Determination of NRB

As per the third-party study<sup>72</sup>, in targeted sub-national region, the value is determined as 71%. Please refer to section 4.1

##### Determination of quantity of wood biomass by using the default wood to charcoal factor.

| Parameter                         | Description                                   | Value | Source                                                  |
|-----------------------------------|-----------------------------------------------|-------|---------------------------------------------------------|
| <b>CF</b>                         | Conversion factor wood to charcoal (kg/kg)    | 4     | Default value- AMS-I-E version 13.0/TOOL33 version 02.0 |
| <b>BL<sub>fuel,wood</sub></b>     | Average wood quantity/year/household (kg)     | 6552  | Calculated                                              |
| <b>BL<sub>fuel,charcoal</sub></b> | Average charcoal quantity/year/household (kg) | 6822  | Calculated                                              |
| <b>BL<sub>fuel,wood</sub></b>     | Conversion wood to charcoal (kg)              | 1638  | Calculated                                              |
|                                   | Total (kg)                                    | 8460  |                                                         |

<sup>72</sup> C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024.  
Madagascar\_Madaprojects Srl SB\_National fNRB CDM Tool30 v4.0 2022\_Calculation sheet\_19 Jan 2024.xlsx

The baseline emissions are calculated as follows:

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                         | Value         | Source                                                                                                                                                                                                                                  |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BE<sub>y</sub></b>                                | Baseline emissions during the year in (tCO <sub>2</sub> e)                                                                                                                                                                                                                                                                                          | 9279          | Calculated                                                                                                                                                                                                                              |
| <b>QPW<sub>y</sub></b>                               | Total quantity of water purified by the project in year y (L)                                                                                                                                                                                                                                                                                       | 49,944,592.50 | Calculated                                                                                                                                                                                                                              |
| <b>m</b>                                             | Fraction of functional appliances that are providing the SDW (%). Only project appliances that (i) use technologies that meet the technology standards as per paragraph 4(b) and (ii) are operating or replaced by an equivalent in service appliance and (iii) deliver microbiologically safe drinking water, are counted for emission reductions. | 1             | AMS-III.AV (version 08.0) Table 11. The SDW technology meet the requirements as per para 4(b)                                                                                                                                           |
| <b>X<sub>boil</sub></b>                              | Fraction of the population served by the project activity for which the common practice of water treatment is or would have been water boiling. It is determined ex ante through survey                                                                                                                                                             | 1             | Determined ex-ante - Third party Baseline survey report _July2022                                                                                                                                                                       |
| <b>SEC</b>                                           | Specific energy consumption required to boil one litre of water (kJ/L), to be calculated according to paragraphs below                                                                                                                                                                                                                              | 3574.8        | Calculated                                                                                                                                                                                                                              |
| <b>BL<sub>fuel,wood</sub></b>                        | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction)                                                                                                                                                                                                                                | 0.19          | Determined ex-ante - Third party Baseline survey report _July2022                                                                                                                                                                       |
| <b>BL<sub>fuel,charcoal</sub></b>                    | Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (fraction)                                                                                                                                                                                                                                | 0.81          | Determined ex-ante - Third party Baseline survey report _July2022                                                                                                                                                                       |
| <b>f<sub>i</sub></b>                                 | Fraction of non-renewable fuel type i used in the absence of the project activity in year y. For biomass, it is the fraction of woody biomass that can be established as non-renewable biomass (fNRB). If the baseline fuel is fossil fuel, the value to be applied is 1                                                                            | 0.71          | C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024. Madagascar_Madaprojects Srl SB_National fNRB CDM Tool30 v4.0 2022_Calculation sheet_19 Jan 2024.xlsx                               |
| <b>EF<sub>projected,fossil fuel,charcoal,i</sub></b> | Emission factor of the fuel type i substituted (t CO <sub>2</sub> /TJ)                                                                                                                                                                                                                                                                              | 73.2          | Table 2 of AMS-I.E version 13.0 Regional default values of the emission factors of fossil fuels projected to substitute non-renewable woody biomass by similar consumer. Madagascar falls into developing region of Sub-Saharan Africa. |

The portions of baseline fuel type are calculated after applying the conversion factor from wood to charcoal.

Emission reductions are calculated:

| Year                               | Estimated baseline emissions or removals (tCO <sub>2</sub> e) | Estimated project emissions or removals (tCO <sub>2</sub> e) | Estimated leakage emissions (tCO <sub>2</sub> e) | Estimated net GHG emission reductions or removals (tCO <sub>2</sub> e) |
|------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|
| 31-May-2023 - 31-December-2023     | 5,466                                                         | 0                                                            | 0                                                | 5,466                                                                  |
| 01-January 2024 - 31-December-2024 | 9,279                                                         | 0                                                            | 0                                                | 9,279                                                                  |
| 01-January-2025 - 31-December-2025 | 9,279                                                         | 0                                                            | 0                                                | 9,279                                                                  |
| 01-January-2026-31-December-2026   | 9,279                                                         | 0                                                            | 0                                                | 9,279                                                                  |
| 01-January-2027-31-December-2027   | 9,279                                                         | 0                                                            | 0                                                | 9,279                                                                  |
| 01-January-2028-31-December-2028   | 9,279                                                         | 0                                                            | 0                                                | 9,279                                                                  |

|                                  |               |          |          |               |
|----------------------------------|---------------|----------|----------|---------------|
| 01-January-2029-31-December-2029 | 9,279         | 0        | 0        | 9,279         |
| 01-January-2030-30-May-2030      | 3,813         | 0        | 0        | 3,813         |
| <b>Total</b>                     | <b>64,953</b> | <b>0</b> | <b>0</b> | <b>64,953</b> |

## 5 MONITORING

### 5.1 Data and Parameters Available at Validation

|                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter</b>                                                                             | <b>QPWpp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Data unit</b>                                                                                    | Litres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>                                                                                  | Average volume of drinking water per person per day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Source of data</b>                                                                               | Estimated through ex ante survey. IEST – Baseline survey report of 01/08/2022 (survey conducted in July 2022)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Value applied</b>                                                                                | 7.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Justification of choice of data or description of measurement methods and procedures applied</b> | For the ex-ante calculation, it is used the cap as the maximum quantity of drinking water per person per day of 5.5 l/person/day (para 18 of the applied methodology). Compared to the standard of 30 liters a day per person, the average water consumptions are set up as 11 liters a day per person <sup>73</sup> . As per the baseline survey report conducted on July 2022, within a sample of 141 households, the average water consumption l/day/household is 73.2 lt, considering that the average of household members account to 10, the water consumption l/day/person is 7.32 lt. |
| <b>Purpose of Data</b>                                                                              | Calculation of baseline emissions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Comments</b>                                                                                     | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                         |                                          |
|-------------------------|------------------------------------------|
| <b>Data / Parameter</b> | <b>LS</b>                                |
| <b>Data unit</b>        | Years                                    |
| <b>Description</b>      | Lifespan of water treatment technologies |

<sup>73</sup> Evaluation of the USAID/Madagascar water supply – September 2014.

|                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source of data                                                                               | Manufacturer's specifications                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Value applied                                                                                | Between to 2 to 12 years according to the technical details of the equipment installed, issued by the constructor.                                                                                                                                                                                                                                                                                                                                                                   |
| Justification of choice of data or description of measurement methods and procedures applied | <p>The PP ensures maintenance expecting measures in place to ensure that the end users can access continuously to the safe water.</p> <p>In case where the life span of the water technologies is shorter than the crediting period of the project activity, the PP ensure that the units are replaced to continue claiming emission reductions. The PP ensures that the end users have access to replacement purification system of comparable quality as per the section 1.11.</p> |
| Purpose of Data                                                                              | Deliver microbiologically safe drinking water                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Comments                                                                                     | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                                              |                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $\eta_{wb}$                                                                                                                                                                    |
| Data unit                                                                                    | %                                                                                                                                                                              |
| Description                                                                                  | Efficiency of the water boiling system being replaces                                                                                                                          |
| Source of data                                                                               | Project activity site                                                                                                                                                          |
| Value applied                                                                                | 0.10                                                                                                                                                                           |
| Justification of choice of data or description of measurement methods and procedures applied | Default value. The systema system that would have been used is a three-stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism. |
| Purpose of Data                                                                              | Calculation of baseline emissions.                                                                                                                                             |
| Comments                                                                                     |                                                                                                                                                                                |

|                  |                                                             |
|------------------|-------------------------------------------------------------|
| Data / Parameter | $BL_{fuel,wood}$                                            |
| Data unit        | Fraction                                                    |
| Description      | Proportions of baseline fuel type $i$ (NRB and fossil fuel) |
| Source of data   | Estimated ex ante through baseline survey.                  |
| Value applied    | 0.19 (VPA-001)                                              |

|                                                                                              |                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Justification of choice of data or description of measurement methods and procedures applied | Value applied for VPA-001 based on baseline survey.                                                                                                                                                              |
| Purpose of Data                                                                              | Calculation of baseline emissions.                                                                                                                                                                               |
| Comments                                                                                     | The baseline scenario of VPA-001 established through the baseline survey shows that 100% of the people used traditional stoves using firewood and charcoal to boil water in the absence of the project activity. |

|                                                                                              |                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $BL_{fuel, charcoal}$                                                                                                                                                                                            |
| Data unit                                                                                    | Fraction                                                                                                                                                                                                         |
| Description                                                                                  | Proportions of baseline fuel type $i$ (NRB and fossil fuel)                                                                                                                                                      |
| Source of data                                                                               | Estimated ex ante through baseline survey.                                                                                                                                                                       |
| Value applied                                                                                | 0.81 (VPA-001)                                                                                                                                                                                                   |
| Justification of choice of data or description of measurement methods and procedures applied | Value applied for VPA-001 based on baseline survey.                                                                                                                                                              |
| Purpose of Data                                                                              | Calculation of baseline emissions.                                                                                                                                                                               |
| Comments                                                                                     | The baseline scenario of VPA-001 established through the baseline survey shows that 100% of the people used traditional stoves using firewood and charcoal to boil water in the absence of the project activity. |

|                  |                                                                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter | $f_i$                                                                                                                                                                                                                                   |
| Data unit        | Fraction                                                                                                                                                                                                                                |
| Description      | Factor to determine amount of non-renewable fuels.                                                                                                                                                                                      |
| Source of data   | Third-party study/calculation C4 EcoSolutions (Pty) Ltd – Calculation of the fraction of non-renewable biomass (fNRB). 19/01/2024. Madagascar_Madaprojects Srl SB_National fNRB CDM Tool30 v4.0 2022_Calculation sheet_19 Jan 2024.xlsx |
| Value applied    | 0.71 (VPA-001)                                                                                                                                                                                                                          |

|                                                                                              |                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Justification of choice of data or description of measurement methods and procedures applied | The fNRB has been calculated using the methodological tool (TOOL30) "Calculation of the fraction of non-renewable biomass" (version 04.0). The study has been conducted and values and calculation are reported by an independent third party. The supporting documents related to fNRB calculation are submitted to DOE. |
| Purpose of Data                                                                              | Calculation of baseline emissions.                                                                                                                                                                                                                                                                                        |
| Comments                                                                                     |                                                                                                                                                                                                                                                                                                                           |

|                                                                                              |                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | <b><i>EF<sub>projected_fossil_fuel,i</sub></i></b>                                                                                                                                                                                                    |
| Data unit                                                                                    | tCO <sub>2</sub> /TJ                                                                                                                                                                                                                                  |
| Description                                                                                  | Emission factor of the fuel type <i>i</i> substituted                                                                                                                                                                                                 |
| Source of data                                                                               | Table 2 of AMS-I.E version 13.0                                                                                                                                                                                                                       |
| Value applied                                                                                | 73.2                                                                                                                                                                                                                                                  |
| Justification of choice of data or description of measurement methods and procedures applied | Regional default value of the emission factor of fossil fuels projected to substitute non-renewable woody biomass by similar consumers. According Appendix 1 of the AMS-I.E methodology, Madagascar falls into Sub-Saharan Africa developing regions. |
| Purpose of Data                                                                              | Calculation of baseline emissions                                                                                                                                                                                                                     |
| Comments                                                                                     | The parameter shall remain fixed for the first 7 years crediting period.                                                                                                                                                                              |

|                                                                                              |                                                                                                                                                      |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | <b><i>X<sub>boil</sub></i></b>                                                                                                                       |
| Data unit                                                                                    | %                                                                                                                                                    |
| Description                                                                                  | Fraction of the population services by the project activity for which the common practice of water purification is or would have been water boiling. |
| Source of data                                                                               | Established ex ante through baseline survey.                                                                                                         |
| Value applied                                                                                | 100% (VPA-001)                                                                                                                                       |
| Justification of choice of data or description of measurement methods and procedures applied | Third party Baseline survey report _July2022. The baseline survey shows that 100% of the population used to boil water for purifying.                |

|                                                                                              |                                                                                     |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Purpose of Data                                                                              | Calculation of baseline emission.                                                   |
| Comments                                                                                     | /                                                                                   |
| Data / Parameter                                                                             | <b>CF</b>                                                                           |
| Data unit                                                                                    | -                                                                                   |
| Description                                                                                  | Wood-to-charcoal conversion factor                                                  |
| Source of data                                                                               | Methodological tool TOOL33 version 02.0                                             |
| Value applied                                                                                | 4.0 kg of fuelwood per kg of charcoal                                               |
| Justification of choice of data or description of measurement methods and procedures applied | According the AMS-I.E methodology the default value provided in TOOL33 may be used. |
| Purpose of Data                                                                              | Calculation of baseline emission.                                                   |
| Comments                                                                                     | /                                                                                   |

## 5.2 Data and Parameters Monitored

|                                                                 |                                                                                                                                               |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | <b><i>Py</i></b>                                                                                                                              |
| Data unit                                                       | Number                                                                                                                                        |
| Description                                                     | Population who consumes the purified water serviced by the project activity in year y                                                         |
| Source of data                                                  | Survey records                                                                                                                                |
| Description of measurement methods and procedures to be applied | A survey shall be conducted annually to check the number of persons who consume the purified water supplied by functional project SDW system. |
| Frequency of monitoring/recording                               | Annually                                                                                                                                      |
| Value applied                                                   | 24,879 (VPA-001)                                                                                                                              |
| Monitoring equipment                                            | /                                                                                                                                             |

|                                |                                                                                                                                                                                                                |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| QA/QC procedures to be applied | Data will be collected using standard procedures and will be kept for two years after the end of the crediting period or the last issuance of carbon credits for the project instance, whichever occurs later. |
| Purpose of data                | Calculation of baseline emissions.                                                                                                                                                                             |
| Calculation method             | Field survey.                                                                                                                                                                                                  |
| Comments                       | VPA-001. The data is sourced from Third Party Population Census Report_19072022.                                                                                                                               |

|                                                                 |                                                                                                                    |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | <i>QPW<sub>y</sub></i>                                                                                             |
| Data unit                                                       | Litres                                                                                                             |
| Description                                                     | Quantity of purified water in year y                                                                               |
| Source of data                                                  | Calculated                                                                                                         |
| Description of measurement methods and procedures to be applied | The parameter is calculated based on equation:<br>$QPW_y = P_y \times \min(QPW_{pp}; 5.5) \times 365$ Equation (3) |
| Frequency of monitoring/recording                               | Annually                                                                                                           |
| Value applied                                                   | 49,944,592.5 (VPA-001)                                                                                             |
| Monitoring equipment                                            | /                                                                                                                  |
| QA/QC procedures to be applied                                  | /                                                                                                                  |
| Purpose of data                                                 | Calculation of baseline emissions.                                                                                 |
| Calculation method                                              | Equation 3 of AMS-III.AV (version 08.0)                                                                            |
| Comments                                                        | /                                                                                                                  |

|                  |                                                              |
|------------------|--------------------------------------------------------------|
| Data / Parameter | <i>m</i>                                                     |
| Data unit        | Fraction                                                     |
| Description      | Fraction of functional appliances that are providing the SDW |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source of data                                                  | Microbiological testing report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description of measurement methods and procedures to be applied | <p>The SDW system shall be checked for meeting and maintain the following conditions:</p> <ul style="list-style-type: none"> <li>(a) Only use technologies that are meeting the SDW technology standards as per para 4(b).</li> <li>(b) They are still operating</li> <li>(c) They are delivering microbiologically safe drinking water. The system shall deliver treated water verified to be &lt;1 cfu/100 ml <i>E.coli</i>, using methods for measurement with a low detection limit (LDL) of 1 cfu/100 ml <i>E.coli</i> per 100 ml sample.</li> </ul> |
| Frequency of monitoring/recording                               | Annually                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Value applied                                                   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Monitoring equipment                                            | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| QA/QC procedures to be applied                                  | Sampling plan including provisions to collect information for records of replacement of appliances, filters and maintenance.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Purpose of data                                                 | Calculation of baseline emissions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Calculation method                                              | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Comments                                                        | <p>A statistically valid sample of appliances can be used to determine the parameter value, as per the relevant requirements for sampling in the “Standard for sampling and surveys for CDM project activities and programme of activities”.</p> <p>90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameter.</p>                                                                                                                                                                                        |

|                                                                 |                                                                                                                                                       |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | <b><i>Quality of safe drinking water</i></b>                                                                                                          |
| Data unit                                                       | /                                                                                                                                                     |
| Description                                                     | The quality of the safe drinking water.                                                                                                               |
| Source of data                                                  | Analysis by recognized third party laboratory                                                                                                         |
| Description of measurement methods and procedures to be applied | The safe drinking water quality is monitored to verify the compliance with the parameters established by the national law of human consumption water. |

|                                   |                                                                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Frequency of monitoring/recording | 2 times per year (1 in the dry season and 1 in the wet season) according to the national law of water monitoring for human consumption. |
| Value applied                     | /                                                                                                                                       |
| Monitoring equipment              | /                                                                                                                                       |
| QA/QC procedures to be applied    | /                                                                                                                                       |
| Purpose of data                   | Calculation of baseline emission.                                                                                                       |
| Calculation method                | /                                                                                                                                       |
| Comments                          | Emission reductions cannot be claimed if project activity fails to meet SDW standards.                                                  |

|                                                                 |                                                                                                                                                                     |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | <b><i>Check for SDW public distribution network</i></b>                                                                                                             |
| Data unit                                                       | /                                                                                                                                                                   |
| Description                                                     | Annual check if there is a public distribution network supplying SDW is installed.                                                                                  |
| Source of data                                                  | Surveys (this may be checked through a signed questionnaire/statement from relevant local authority/organizations based on laboratory testing or end-user surveys). |
| Description of measurement methods and procedures to be applied | Monitoring shall include annual check if there is public distribution network supplying SDW.                                                                        |
| Frequency of monitoring/recording                               | Annually                                                                                                                                                            |
| Value applied                                                   | /                                                                                                                                                                   |
| Monitoring equipment                                            | /                                                                                                                                                                   |
| QA/QC procedures to be applied                                  | /                                                                                                                                                                   |
| Purpose of data                                                 | Calculation of baseline emission.                                                                                                                                   |
| Calculation method                                              | /                                                                                                                                                                   |

|          |                                                                                                                                                                                                                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comments | If SDW is made available through a public distribution network during the crediting period, the emission reductions pertaining the households/buildings supplied by the public system cannot be claimed from that point onwards. This condition should be checked annually during the crediting period. |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 5.3 Monitoring Plan

The Monitoring Plan applied by the project activity involve several key elements that ensure the PP have high-quality, unbiased, and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating the emission reductions following AMS-III.AV (version 08.0). The overall monitoring will be coordinate by the PP, they will ensure successful monitoring of emission reductions of the grouped project instances during its crediting period. Different quality control and quality assurance measures will be put in place by the PP to ensure that all emission reductions are real. Surveys and testing will be carried out by independent third parties and the PP will check the consistency of the results and ensure that the studies are accurate and that a conservative approach has been taken. All the data and records will be kept for at least two years after the crediting period or the last issuance of credits for the project activity instance.

All technical staff responsible for surveillance and maintenance of the SDW system will be trained in terms of understanding the requirements of the monitoring system, to ensure that the data recorded is complete and accurate. The monitoring training will be provided by the PP.

The PP oversees supervising all the monitoring activities through its managing director and will have the direct responsibility for all the monitoring activities, including data collection, data monitoring, and writing the Monitoring Report.

The PP will assess all monitoring data and produce a Monitoring Report corresponding to the preceding monitoring period to be verified by the selected VVB. The monitoring report will present the data relating to the emission reductions generated by the project activity instance during the monitoring period.

# APPENDIX

## ACRONYMS

|            |                                  |
|------------|----------------------------------|
| <b>BE</b>  | Baseline Emissions               |
| <b>CDM</b> | Clean Development Mechanism      |
| <b>CME</b> | Coordinating and Managing Entity |
| <b>ER</b>  | Emission reductions              |
| <b>GHG</b> | Greenhouse gas                   |
| <b>LDC</b> | Least Developed Country          |
| <b>LE</b>  | Leakage                          |
| <b>NRB</b> | Non-renewable biomass            |
| <b>PD</b>  | Project Description              |
| <b>PE</b>  | Project Emissions                |
| <b>PoU</b> | Point of Use                     |
| <b>PP</b>  | Project Proponent and Developer  |
| <b>SDG</b> | Sustainable Development Goal     |
| <b>SDW</b> | Safe Drinking Water              |
| <b>VCS</b> | Verified Carbon Standard         |
| <b>WHO</b> | World Health Organization        |