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BOKU
Universität für Bodenkultur Wien
University of Natural Resources and Applied Life Sciences, Vienna

Project Update 02/2020

CO_2 Reduction & Safe Drinking Water in Bangladesh

April 2020

Bangladeshi woman with children, ©Helioz 2020

Key project facts

Project title:	CO_2 Reduction & Safe Drinking Water in Bangladesh
Project start:	2017 March
Duration of the project (in years):	2017-2022
Project region:	Bangladesh, Bagerhat district, Sarankhola (region)
Start baseline survey on site:	November 2017
First monitoring on the site:	February 2018
Second monitoring on site:	January 2020 (external verification by BOKU)
Monitored carbon emission reduction:	**2,12 t CO_2 e / WADI / year based on monitoring data after BOKU verification in January 2020**
Carbon reduction estimation whole project:	**10.625 t CO_2** annually
Coordinating organisation for monitoring:	Center for Global Change and Sustainability at the University of Natural Resources and Life Sciences, Vienna (BOKU), Dänenstraße 4, 1190 Vienna
Responsible monitoring coordinator:	Mag. Dominik Schmitz
Contact person & project leader:	Mag. Dominik Schmitz, dominik.schmitz@boku.ac.at
Field Visit Executer and author:	BSc Max Reisinger, max.reisinger@boku.ac.at
Client:	HELIOZ GmbH, Mariahilfer Straße 81/1/15 1060 Vienna, Austria; CDD (Centre for Disability in Development, http://www.cdd.org.bd/); VOSB (Voice of South Bangladesh, http://www.voiceofsouth.org/)
Version number of project update:	1.0

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WADI in use in Sarankhola, ©Helioz 2020

1. Background and description of verification method

This verification and CO_2 project update has been developed for the purpose to externally verify CO2 emission reductions achieved by the project activity in the monitoring period 2018-2019. Furthermore it calculates the updated annual emission reduction values, which should be taken from 2020 onwards. The Project update has been written based on questionnaires (survey after rainy season), as well as observations and interview from a field visit in January 2020.

The project activities started in 2017. Since project start BOKU has been responsible for the verification and parts of the monitoring of the CO_2 emissions. For this verification and report earlier observations and results have been taken into account. The sources of the calculation of the CO_2 emission reduction are:

- best available international literature
- data from baseline survey from project region
- field visit data (1. Field Visit Q1 2018 and 2. Field Visit Q1 2020).

The Project Update is based on the results of the following earlier reports developed by BOKU:

- Monitoring Report 2018
- Results CO_2 Reduction 2019 (including data from rainy season)
- analysis of Field Visit Data 2020.

Group meeting with local partners, field workers and beneficiaries, ©Helioz 2020

WADI owner, ©Helioz 2020

Kids playing in the village, ©Reisinger 2020

2. Recent Developments and Field Visit Observations

2.1 Water disinfection practices

Due to the good and reliable work of the local partner 'Center for Disability in Development' (CDD) and 'Voices of South Bangladesh' (VoSB) the practices for water disinfection have improved constantly since the start of the project. Villagers in the project region of Sarankola changed from disinfecting water by boiling it with firewood to Solar Water Disinfection (SODIS) supported by the WADI device. Awareness raising, capacity building and workshops enabled this transition. Beside CO_2 reductions many health and education related co-benefits occurred.

2.1.1 Firewood Usage

The common practice to purify water for drinking purposes has mainly been boiling it by using firewood. As firewood is a limited resource and a long process families sometimes just used a flocculent and consumed the unsafe water. In contrary to earlier assumptions, we are now calculating with a more conservative value on firewood usage. Based on observations we now assume that 30% of the baseline drinking water supply had not been boiled with firewood but taken without boiling. Since the project has started the need for using firewood had been reduced in the area. Nowadays no firewood for drinking water purification is needed anymore. Even in the rainy season villagers are able to purify all of their water by using the WADI and by storing the treated water for 2-3 days. Quotes from project beneficiaries like 'the firewood chapter is closed now' and 'firewood belongs in a museum' describe that development. This results in higher CO_2 reduction as initially anticipated as we assumed a need for firewood in the rainy season (3 months). Villagers partially started to use the treated water also for cooking and washing purposes.

2.1.2 'Sharing Method'

Families were encouraged to share their WADI device with neighbours and friends. By doing this, the CO_2 reduction impact got scaled up and more people benefit from the new technology. Since 2019 this practice gets more promoted by the fieldworkers at the training workshops. The so called 'Sharing Method' is the attempt of the local partners to reach and therefor benefit far more people with the project. At the moment the additional indirect beneficiaries are assumed to be a third of the direct beneficiaries (conservative assumption) as reported by the WADI owners. Therefor additional CO_2 reduction were taken into account. .

2.2 Climate Change Impact and Adaptation

The consequences of climate change in the south of Bangladesh are tragic already and get worse year by year. Sea level rise is causing salinification of drinking water sources and fertile land which makes living conditions very harsh. Floods and cyclones are getting more frequent and make people lose their

homes or even the lives of family members regularly, which also happened to WADI owners last November during cyclone Bulbul. Due to a World Bank study around 2000 people are leaving the most vulnerable coastal areas every day (McPherson, 2015). As climate refugees they are moving to the slums of the capital Dhaka looking for hope but often just have to face new problems there. People are also reporting more inconstant rainy seasons. Furthermore, the dry season last longer every year and drinking water ponds dry out earlier causing water shortages. These empty ponds could be observed during the last field visit. The WADI project tackles this critical water issue and helps the community to be more resilient to face these problems (climate change adaption).

Drinking water source, ©Helioz 2020

Households next to river – regularly flooded area, ©Reisinger 2020

2.3 Co-Benefits

2.3.1 Health situation

People in the project region report an essential decrease of waterborne diseases. Before the project started different people were ill several days or even weeks every month. Now they don´t report any drinking water related illnesses anymore. Men can work and earn more money for the household and kids can attend school more regularly as sickness rates are clearly reduced. WADI is a part of the family's lives now which brings more stability and resilience.

2.3.2 Inclusion of disabled people

Recently also disabled people got included in the project. The local partner CDD is specialized on the inclusion and work with disabled people in Bangladesh. So another Co-Benefit is created. Synergies and existing knowledge is used to make sure that also disabled people can create ownership and a feeling of security in the village by being included on eye-level. CDD is going to open a new office in the project area. An inclusion of more disabled people from the region is aimed for.

2.3.3 School education programmes

The second local Partner VoSB initiated school education programmes in the region additionally to the project. More and more they integrate environmental and climate related topics like water and waste water, climate change, ecosystem protection and pollution issues. They include the drinking water topic and the WADI solution to spread that awareness and knowledge. During the filed visit we were able to visit one of these schools and attend the award ceremony of an art and essay competition related to drinking water. Many kids know how solar water disinfection works even if their family is not part of the project.

One winner of the art competition, ©Helioz 2020

School competition, ©Helioz 2020

2.4 Local Partners

Throughout the last years the local partners CDD and VoSB are cooperating and communicating very reliantly and efficient. The register of the households, the documentation and reporting is transparent. Their passionate work and qualitative set-up of the necessary structures and methods makes the project a best practice project in the country. Also Helioz is reporting good collaboration.

2.5 Threads and Mitigation

2.5.1. River water sources

Due to less freshwater coming from the rivers upstream (irregular closing of damn in India) people face more water scarcity. For some families these rivers are also a source for fetching drinking water. Due to heavy pollution from industry, shipping and waste there are heavy concerns about the water quality and it´s suitability for the SODIS method. As long as no quality tests have been applied which ensure the absence of heavy metals, arsenic and other poisonous substances, the river water should not be used for SODIS treatment. Only the rainwater fed ponds, where only microbiological contamination takes place, are meant to be a drinking water source for the SODIS method. This type of contamination can be resolved by using the WADI.
In hard dry seasons also the salty ground water is used. This is also not suitable for SODIS.

The local partners are informed and the field workers should actively educate the beneficiaries at their visits and regular workshops about this issues.

2.5.2. Direct rain water consumption

In the rainy season some people reported to harvest the rainwater from their rooftops directly and drink it without further treatment. This can also be a health risk, as rooftops are not meeting cleanness standards. To be safe, people are advised to also use the WADI like they do for treating the pond water.

WADI owner, ©Helioz 2020

Data collection in interview situation, ©Helioz 2020

3. Updated CO_2 Values and Parameters

Observations at the last field visit and the validation of the gathered data led to an updated version of the CO_2 reduction calculation. The changes for the calculation occurred at the values listed in the following table. Green boxes correlate positively and red boxes correlate negatively with the overall CO_2 reduction:

Value	Description	2018-2019	2020 onwards
n	Total number of WADIs	4100	**5000**
$N_{p,y}$	Numbers of persons.days/year: direct + indirect ('Sharing Method')	1953	**2603**
$Q_{p,rawboil}$	Raw water boiled due to rainy season in project scenario	3 months	**0 months**
$Q_{p,y} + Q_{p,rawboil}$	Demand of safe drinking water in liter per person/day	4,92 l	**4,5 l**
C_j	Proportion of users already consuming safe (and/or unsafe) water without boiling it (in baseline scenario)	5 %	**30 %**

The change in the values can mainly be explained due to the following factors:

- n: 900 additional WADIs have been distributed within the last months so more people can apply the SODIS method.
- $N_{p,y}$: People are actively encouraged to share their WADI with friends and neighbors. This so called 'Sharing Method' gets instructed at the trainings by the field workers. At least 1/3 additional beneficiaries (conservative value) who benefit indirectly (see 2.1.2) can be verified.
- $Q_{p,rawboil}$: Even in the rainy season no boiling of firewood for water purification purposes is used anymore (see. 2.1.1).
- $Q_{p,y} + Q_{p,rawboil}$: The annual average demand for drinking water seems to be slightly lower than previously assumed.
- C_j: The average amount of water boiled with firewood seems to be lower than previously calculated (see 2.1.1). This is mainly due to a lack of money or time for firewood sourcing. Also the quality and duration of the boiling process was reported lower than assumed. Given that also the drastic improvement of the health situation compared to the baseline scenario (see 2.3.1) can be explained.

4. Results: Updated annual CO_2-Reduction

The updated values from the Field Visit 2020 lead to an updated overall CO_2 reduction calculation. Earlier results counted for the period 2019-2020. The updated reduction calculation replaces this earlier value and at the same time counts as the new annual reduction value from the year 2020 onwards. The improvements of the project implementation caused higher total annual CO_2 reductions than calculated previously:

Previously estimated total annual CO_2 emission reductions (after rainy season survey)	8.880 t / year
Actual estimated total annual CO_2 emission reductions (after field visit 2020)	**10.625 t / year**

The annual **CO_2** emission reduction per WADI was slightly smaller than calculated before.

Previously estimated CO_2 emission reductions per WADI/year (after rainy season survey)	2,17 tCO_2
CO_2 emission reduction per WADI/year (after field visit 2020)	**2,12 tCO_2**

To ensure the continuous emission reduction, ongoing monitoring of the usage rate and the input parameters is recommended. In the next Monitoring Report (Q4 2020) the emission reduction will be verified again based on comprehensive data of user questionnaires, i.e. 200-250 households.

5. List of References

McPherson, P. 2015: Dhaka: the city where climate refugees are already a reality. The Guardian. Available at: https://www.theguardian.com/cities/2015/dec/01/dhaka-city-climate-refugees-reality [Revised 18.02.2020]

Group meeting, ©Helioz 2020