
Climate Action
Accelerator
webinar
February 20
Webinar
How to improve resilience and address water scarcity through innovative solutions?

Practical information

PROGRAMME

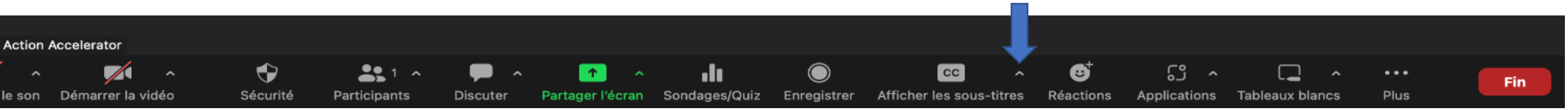
01:00 PM | Climate Action Accelerator Introduction
01:10 PM | Presentations
02:00 PM | Questions & Answers
02:30 PM | End

- This webinar is recorded and will be made available on replay on our website and Youtube channel.
- Please keep your audio and video off at all times, unless you are given the floor by the CAA moderator during the Q&A session.
- To ask a question, please write in the chat or raise your hand. The moderator will read questions and give the floor to attendees during the Q&A session.
- Translation to French is available via zoom.
- Link to webinar page: https://climateactionaccelerator.org/events_and_webinars/

Translation

How to activate subtitles on Zoom ?

1) Click on « Show captions» or « Afficher les sous-titres » in the bottom bar (small arrow to the right).



2) Select the spoken language and the language you want to translate into.

Who are we?

The **Climate Action Accelerator** is a non-profit initiative based in Geneva that aims to mobilize a critical mass of community-based organisations around the world to scale up implementation of climate solutions, keep global warming well below 2°C and avoid the risk of dangerous drift.

The goal is to help move the aid, health and higher education sectors towards a radical transformation of their practices, pursuing emission reduction targets (-50% by 2030) and a 'net zero' trajectory, in line with the Paris Agreement.

Our objectives

EMPOWER

Empower organizations to at least halve their emissions by 2030 through a hub of expertise and resources.

CHAMPION

Transform them into ambassadors of change within their networks, capable of influencing their peers.

COMMUNITY

Build a global community of action, sharing climate solutions as a universal common good, to scale up their deployment.

Our partners

RACE TO ZERO
PARTNER

Key figures

3.5
Million

Approximately 3.5 million people die each year due to inadequate water supply, sanitation and hygiene.

2
Billion

Over two billion people live in countries where water supply is inadequate.

1/2

Half of the world's population could be living in areas facing water scarcity by as early as 2025

700
Million

Some 700 million people could be displaced by intense water scarcity by 2030

Our speakers today

Maria Giovanna Di Bitonto

PhD Candidate, Politecnico di Milano (PoliMi)

Sébastien Mercier

Project Manager, Terre des hommes Foundation

Carola Bänziger

Environmental Scientist, FHNW - University of Applied Sciences and Arts Northwestern Switzerland

Fog Harvesting Textile Architecture to face the hydric crisis

Maria Giovanna Di Bitonto
PhD Candidate in Architecture, Department of Architecture, Built environment and Construction engineering, Politecnico di Milano
mariagiovanna.dibitonto@polimi.it

LIGHTWEIGHT ARCHITECTURE FOR WATER HARVESTING

Growing concerns over water scarcity worldwide have led to research about technologies that have the potential to obtain water from **nontraditional sources**.

Fog stands as an optimal alternative water resource where a hydric distribution system is absent, such as in extreme conditions.

The research aims to integrate this technology in the lightweight structure design, for its application in architecture, in particular in **emergency camps**.

What is it?
It is an alternative water resource

FOG HARVESTING TEXTILE ARCHITECTURE TO FACE THE HYDRIC CRISIS

Why is it important?

What is it?
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FOG HARVESTING TEXTILE ARCHITECTURE TO FACE THE HYDRIC CRISIS

Why is it important?

What is it?
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Where does it work?
In fog oases

FOG HARVESTING
TEXTILE ARCHITECTURE
TO FACE THE HYDRIC CRISIS

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Where does it work?
In fog oases

How does it work?
It is a passive system, Fog water is harvested by the **FOG COLLECTOR**

FOG HARVESTING
TEXTILE ARCHITECTURE
TO FACE THE HYDRIC CRISIS

Why is it important?

How does it work?
It is a passive system,
Fog water is harvested
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Where does it work?
In fog oases

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water resource

FOG HARVESTING
TEXTILE ARCHITECTURE
TO FACE THE HYDRIC CRISIS

What is it?
An isolated device
composed of:
MESH and STRUCTURE

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TEXTILE ARCHITECTURE
TO FACE THE HYDRIC CRISIS

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How muche water it can collect?
Depending on the
LOCATION and DEVICE
COMPONENTS,
its range goes from
2 to 22 l/m²/day

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TEXTILE ARCHITECTURE
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What is it used for?
Agriculture,
Reforestation,
Community use

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What are the weacknesses?
- Lone structure
- Fragile structure due to both design and components
- Limited application field

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What is it?
An isolated device composed of:
MESH and STRUCTURE

What are the objectives?
- Improve the device's efficiency
- Explore the application field

What are the weacknesses?
- Lone structure
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What is it used for?
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How muche water it can collect?
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FOG PHENOMENON

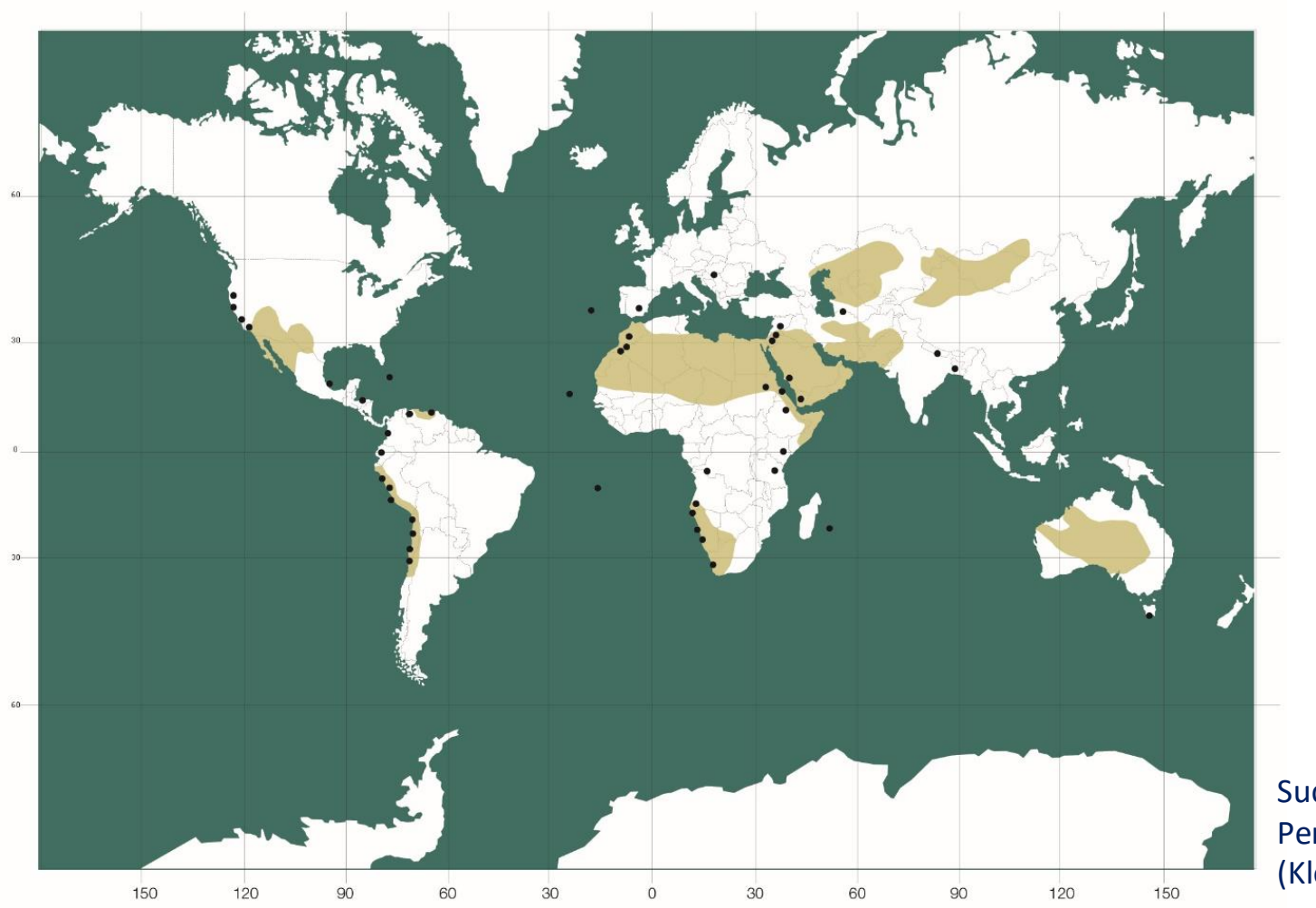
Radiation fog

Advection fog

Steam fog

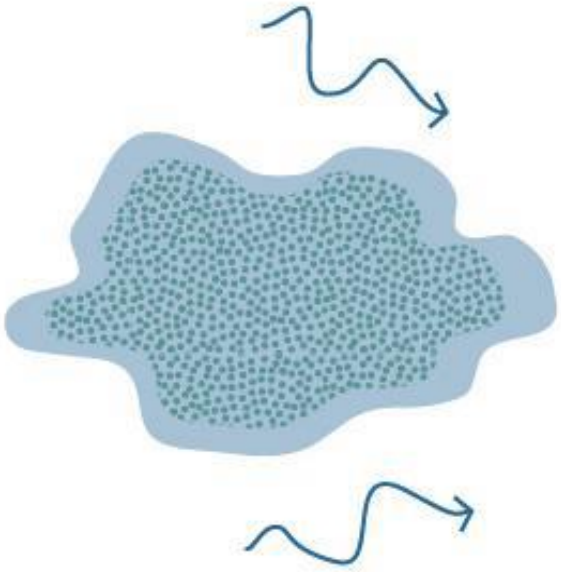
Upslope fog

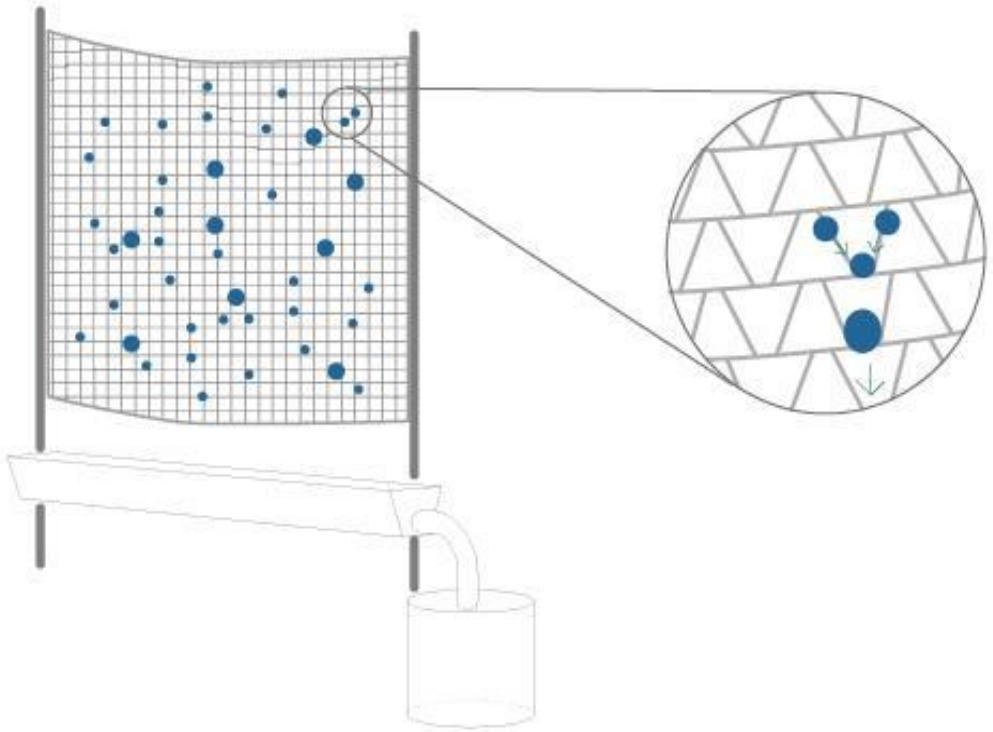
FOG HARVESTING PROJECTS

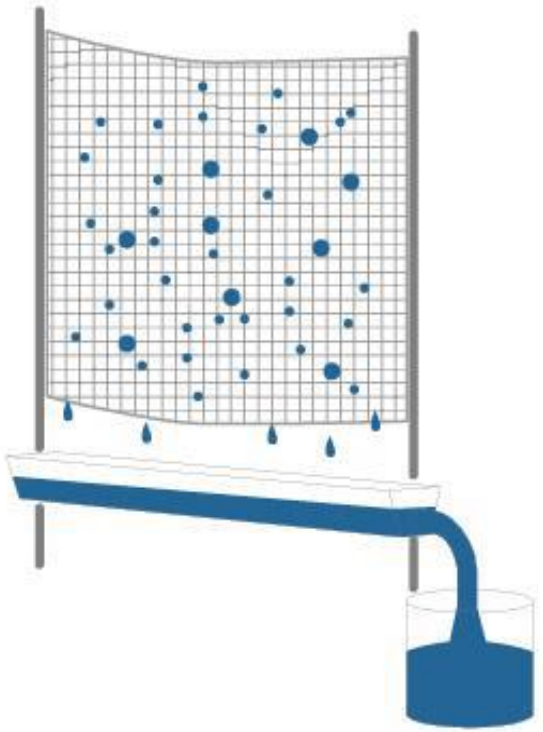


Successful fog harvesting projects
Personal elaboration based on
(Klemm et al., 2012)

FOG HARVESTING SYSTEM







1 Water particles are carried by wind driven fog

2 Mesh captures Fog droplets

3 Droplets drainage depending on the mesh

4 Water collection and storage

FOG COLLECTORS

NGO

Projects in: Oman, Yemen, Morocco, Ethiopia, Eritrea, Chile, Perú, Ecuador, Dominican Republic, Guatemala, Nepal

Aim: drinking water, agriculture

Innovation: -

Private company

Projects in: Morocco, Tanzania, Bolivia, Kenya, California

Aim: drinking water, agriculture, vodka production

Innovation: Alternative mesh and rigid structure

Private company

Projects in: Canary islands, Portugal, Spain

Aim: bottled water, farming, forestry

Innovation: Structure

Patent: P201530042

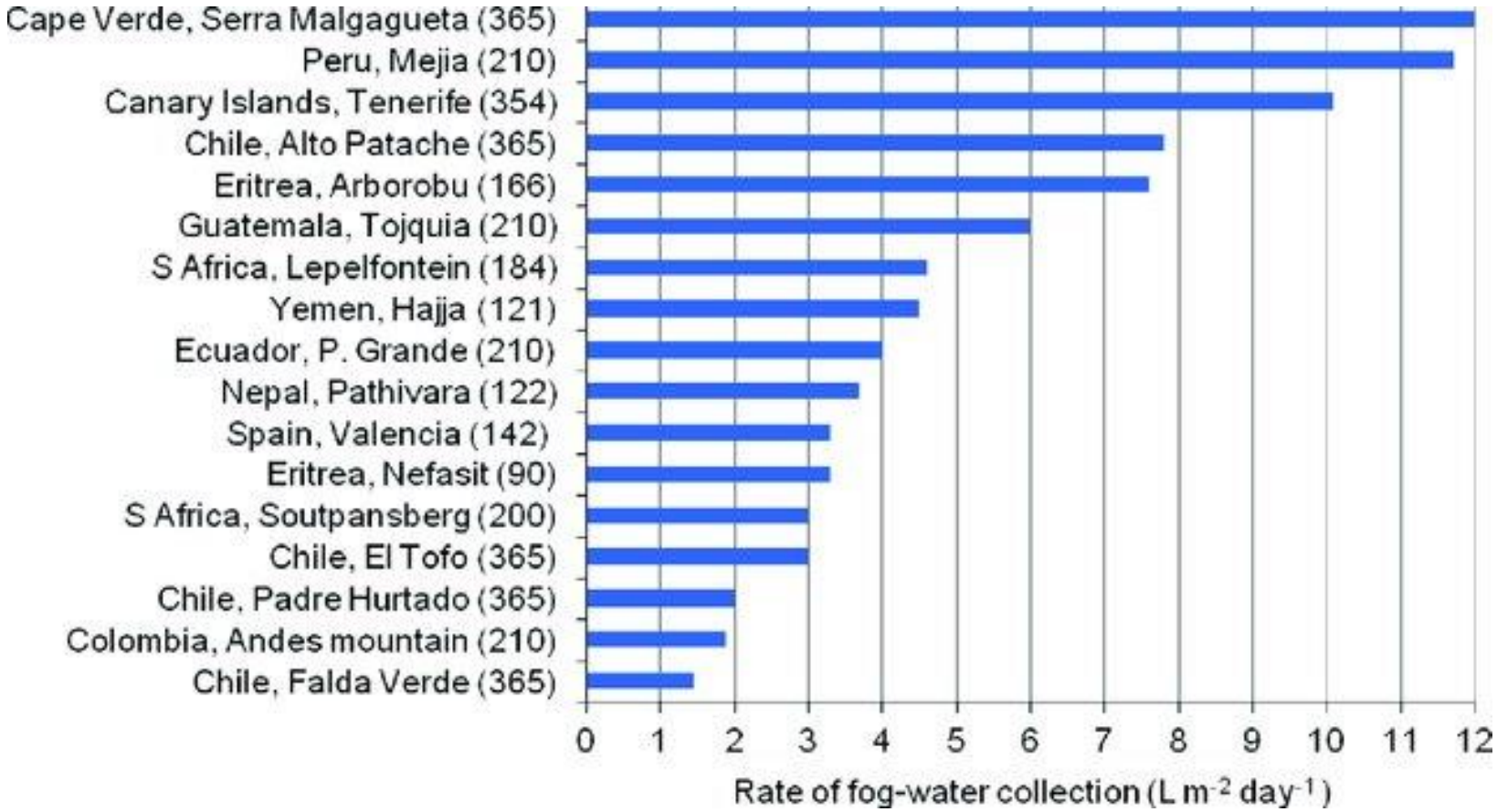
NGO

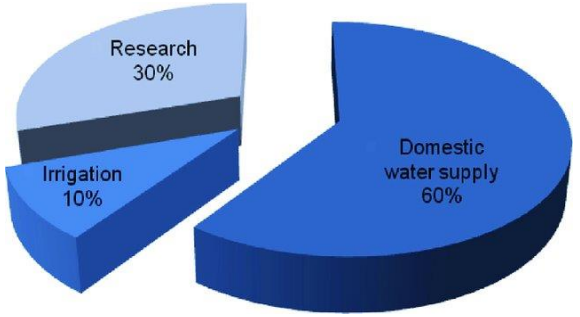
Projects in: Ethiopia, Cameroon, Haiti, Togo

Aim: drinking water, agriculture

Innovation: Alternative structure and materials

FOG WATER COLLECTION





Percentage of global fog-water utilization for domestic water supply, research, and irrigation. (Fessehaye et al., 2014)

Rate of fog collected (l/m2/d) for the countries that utilized the technology of fog collection. (Fessehaye et al., 2014)

WATER SYSTEM IN EMERGENCY CAMPS

Water tanks get filled with water as part of emergency response in Refugee Camp.

Photo: Gilles Amadou Ouédraogo / LWF

INNOVATION IN HUMANITARIAN HABITAT

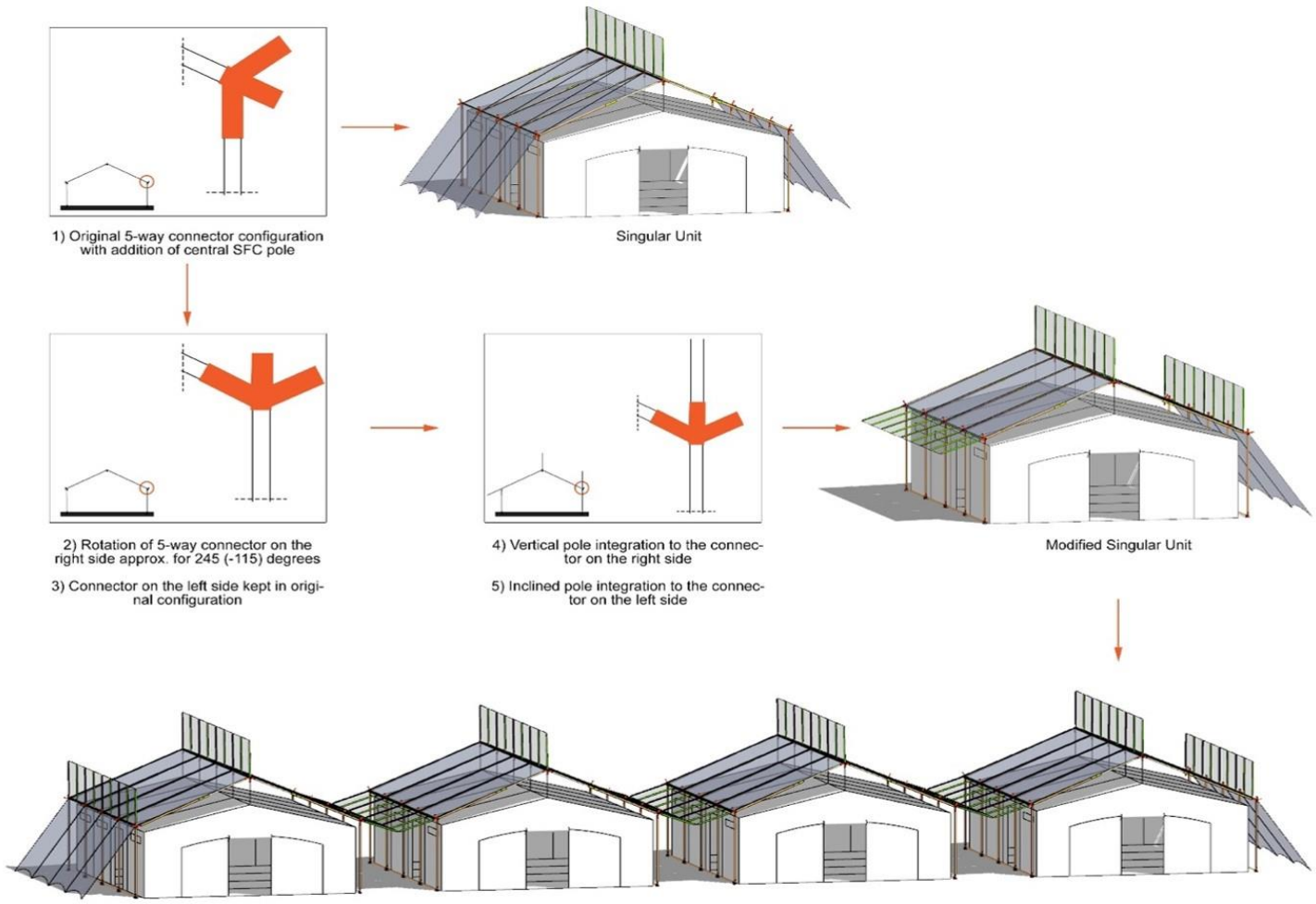
A proposal for adaptation to existing tents on the market was studied based on their connecting elements and mounting systems.

The system can be applied in the areas where there is a correlation between the frequent phenomenon of fog, the frequency of hazards, and the presence of emergency camps.

It is the case in some parts of North and Southwest Africa, the Central West of South America, and the Mediterranean. **The proposals suggest integrating the fog harvesting device on existing tents**, analyzed in the previous part, by adjusting its components.

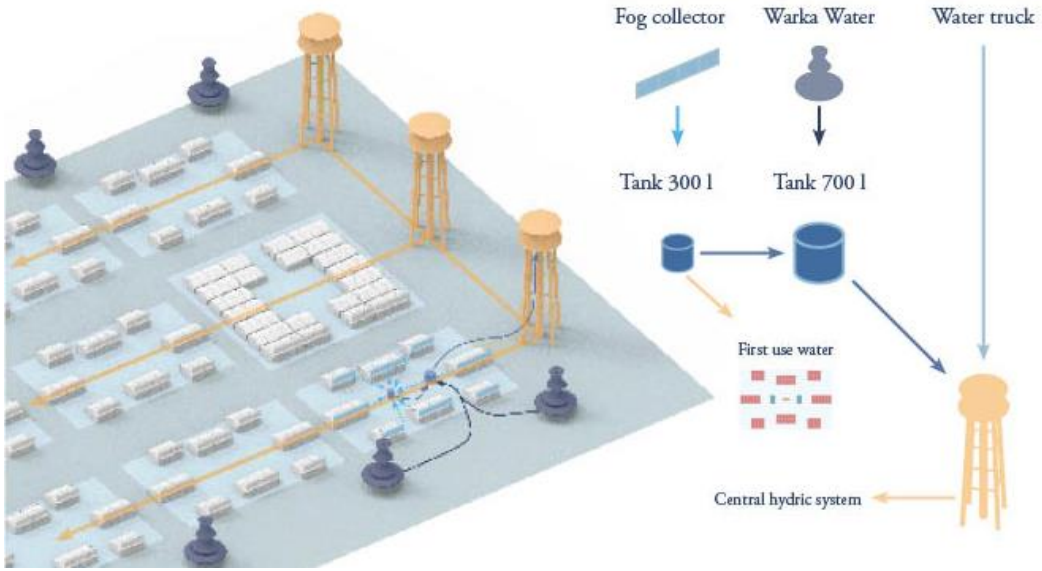
MULTIPURPOSE TENT

	Structural frame	Crosspiece junction	Tent mesh	Shading / Rain collector mesh	Fog collector junction node	Fog collector structure	Fog collector mesh
Element	32 poles $\emptyset\ 35mm$	15	1	1	5	5 poles $\emptyset\ 35mm$	4
Material	aluminum	steel	Nylon - PVC	Polycotton	steel	aluminum	Rashel
Dimension	55 m	-	136 mq	60 mq	-	12.5 m	20mq

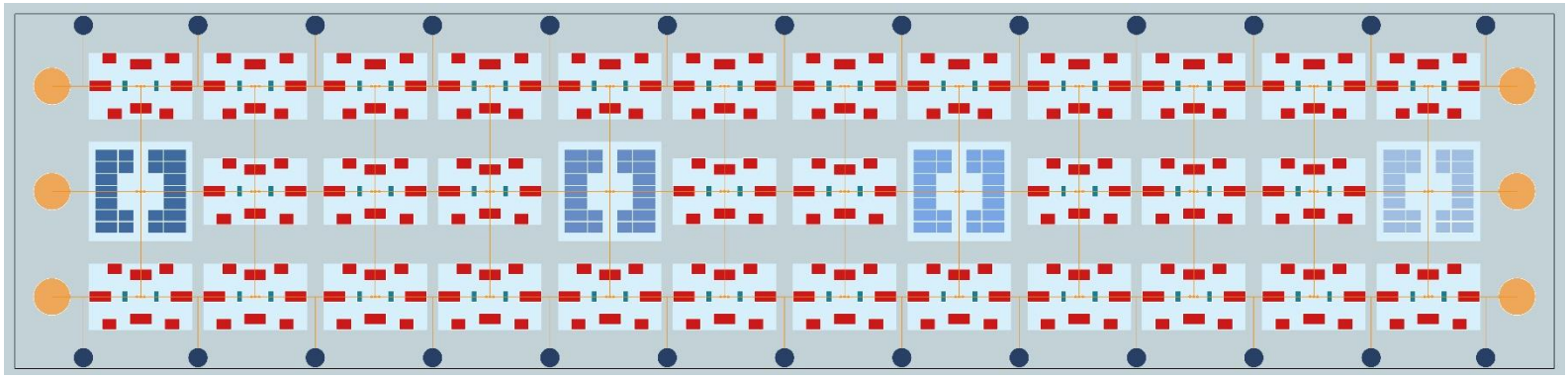


DESIGN «The camp»

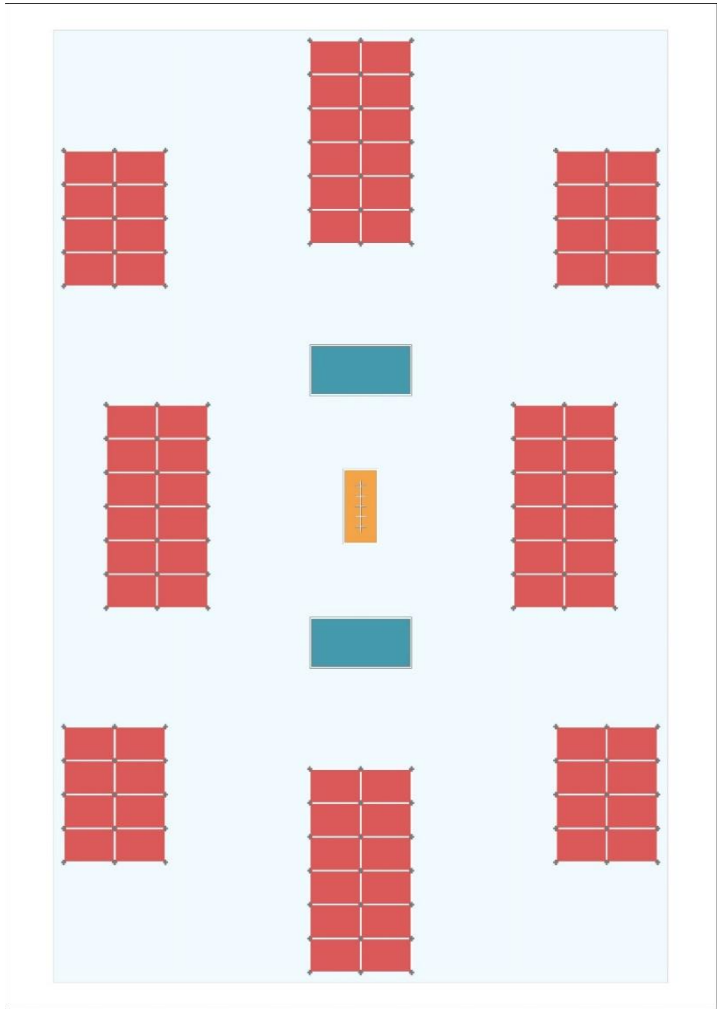
The hydric system



The settlement

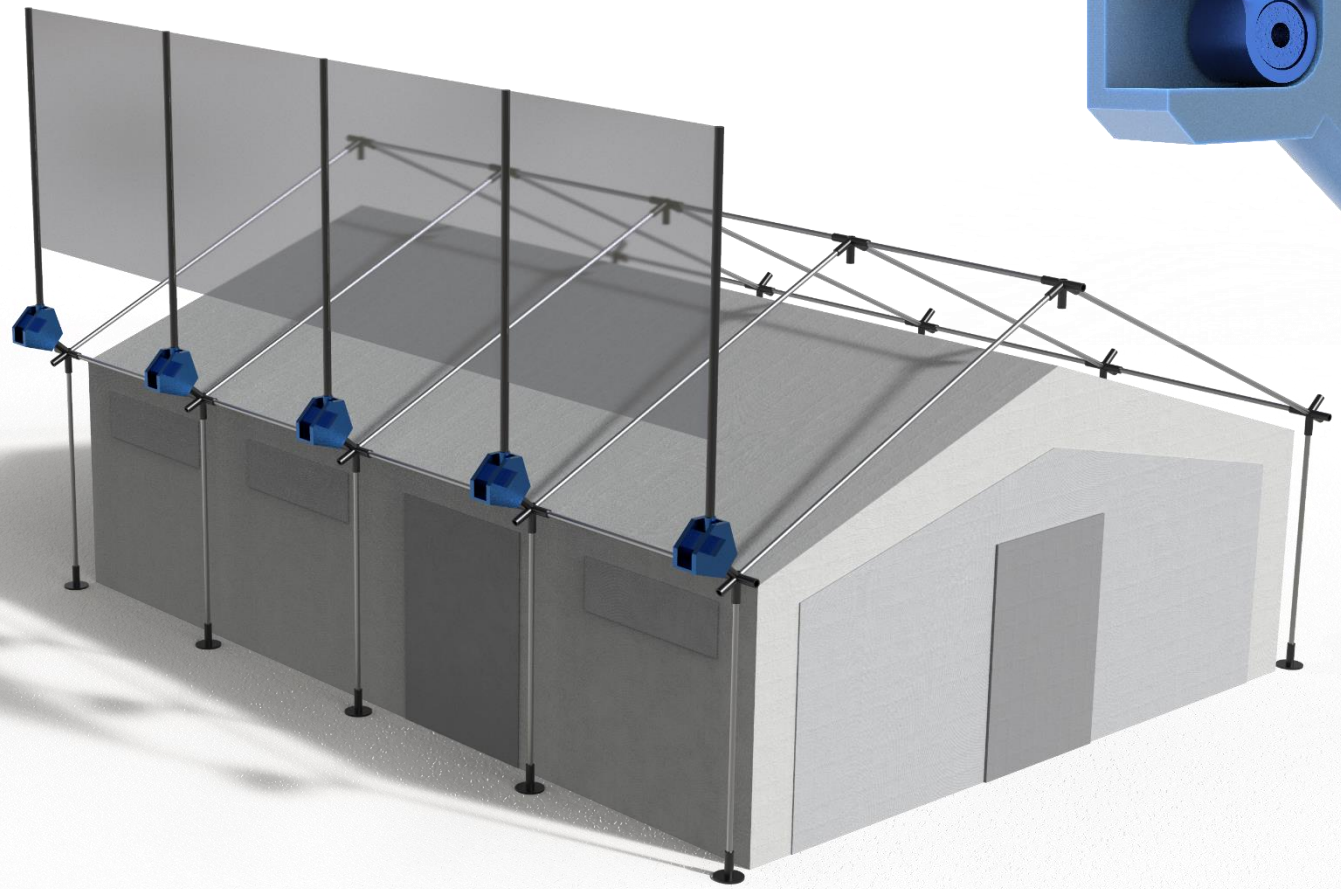


The block

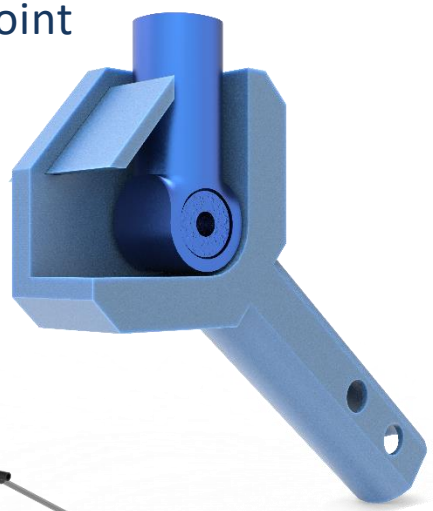


DESIGN «The device»

The tent



The joint



The water collector

LOCATION ANALYSIS

Sub-Saharan Africa is the region located south of the Sahara Desert. The Sahel is a transitional belt within Sub-Saharan.

The last decades have seen the development of severe drought in sub-Saharan Africa. However, since the 1980s, summer rainfall in the region has been on the rise, leading to what is commonly referred to as a '**greening**' of the Sahel.

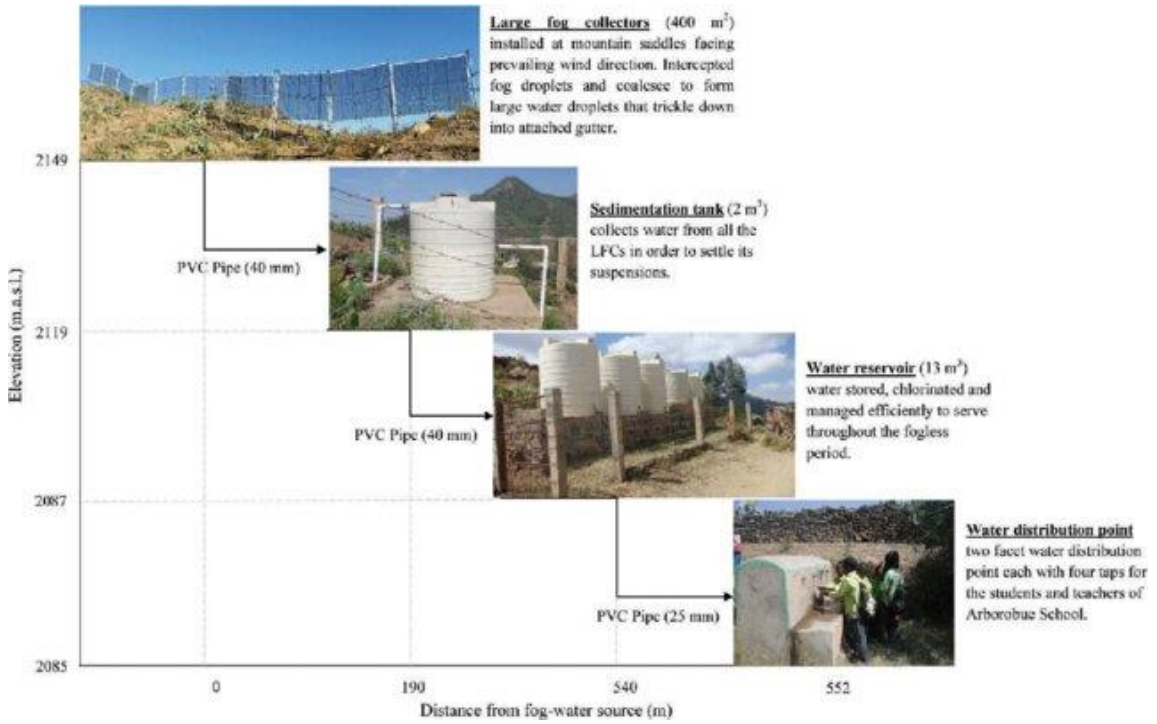
WATER ESTIMATION

The requirement is **15 liters of water per day per person**.
Each tent can host 5 persons and it is equipped with 20 m2 of fog collecting mesh
(De Buck et al., 2015)

Eritrea

Reported fog collection of 3.1l/m2/d +
Annual precipitarions registerd 350mm
(Fog Quest, 2009)

It results in 19 liters per person daily
126% covered



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It results in 19 liters per person daily
126% covered

Haiti

Reported collection of 5.5l/m2/d
(Fessehaye et al., 2017; World Bank Group, 2021)

It results in 22 liters per person daily
146% covered

IS IT A COMPETITIVE RESOURCE?

From the literature, the cost of a Large Fog Collector is estimated to be around **$1500** (Qadir et al. 2018),

it can be predicted that the integrated fog collection device in this proposal will have a total production cost corresponding approximately to the same amount, even though its size is smaller but has more hinges.

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For the project, a **lifespan of 10 years** has been considered for the tents, which corresponds also to the life span of the Raschel mesh. The calculated minimum water price must equal or be lower than the **current market price** of water, which as be considered **3$ for 1m^3** (Fessehaye et al., 2015), for the fog water collection system to be deemed an economically feasible and competitive water supply solution.

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A liter of water collected by the tent, composed of rain and fog water, will cost around **4,3$ per m^3** for ten years of installation. The price is higher than the current market price of water. Still, it must be taken into consideration that, currently, the reservoir of the distribution systems is filled from underground wells through pumps or water trucks, underground basins are not a reliable water resource, and these systems require energy to function. At the same time, fog harvesting is a **passive system**.

FOG WATER QUALITY

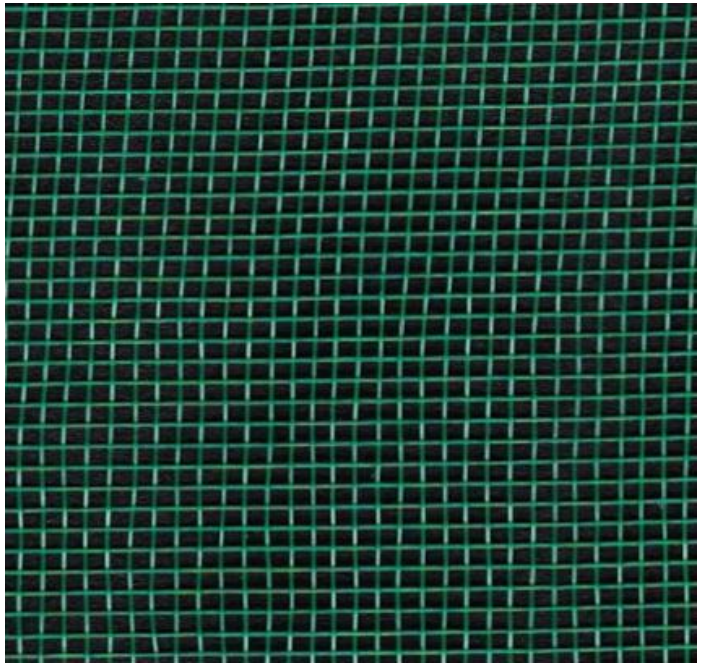
Parameter	WHO	Oman (1990)	Oman (1992)	Oman (2005)	Chile	USA	Canada	Zambia (2003)	India	France	Taiwan	South Africa Tshanowa	South Africa Lepelfonte
EC (micros/cm)				122-200									
TDS	1000			79-130				8.5-12.6				37,00	188,00
Total hardness				51-99									
Turbidity				0.21-0.29				0.42-0.56					
PH	6,5-8	6.32-7.9	7.00-7.9	7.87-7.94	**4.7**	**3.3**	**3.9**	7.0-7.03	**4.0**-6.5	**3.94**	**4.08**	**5.9**	7.23
Clacium	200	12	15	12-24	1,00	2.3			12.2-35.4	1.4-65.4	1.9	2.7	14,00
Magnesium		<2	2.9	5-10	0.7	0.4			1.6-6.2		1.5	3.1	11.8
Sodium	200	7.3	24	12-18	74.8	0.6	0.2					3.4	26.4
Potassium		1.1	1.1	0.2-0.4	0.3	0.4	0.3					1.09	2.47
Iron	0,3	0.1	0.02	0.01	<0.05-0.21				0.29-**0.96**	**0.67**		0,00	0,00
Total alkalinity		51	10.8	36-45								15.4	56.5
Chloride	250	7.5	44	32-34	8.7	1.4	0.2	5-6	12.2-35.4	49.4	28.2	8.9	35.7
Sulphate	250	<1	3.4	7-22	12.3	52,00	10.9	1.66-1.69	21.1-110.5	<0.05	17,00	2.9	23.3
Nitrate	20	2.5	4.7	11-13	1.6	22,00	4.5	4.15-10.0	16.1-31.9	**123,00**	5.4	0,00	7.77
Fluotite	1,5	0.1	0.02	0.01-0.7					0.5-**2.4**			0.01	0.06

Concentrations of anions and cations are in mg/L; WHO data were take from WHO Guidelines (2006); Oman data were taken from Eckardt & Schemenauer (1998), Schemenauer & Cereceda (1991, 1992); Chile data were taken from Eckardt & Schemenauer (1998), Schemenauer & Cereceda (1991, 1992); USA data were taken from (Saxena et al., 1989); Canada data were taken from Schemenauer & Winston (1988); Zambia data were taken from Handia et al. (2003); India data were taken from Patel et al. (1998); France data were taken from Herckes et al. (1998); Taiwan data were taken from Lin & Peng (1998); South Africa data were taken from Olivier & De Rautenbach (2002). In bold are represented the data that don't meet the WHO standards. [Source: Table elaborated by the author based on (Abdul-Wahab et al., 2007a)]

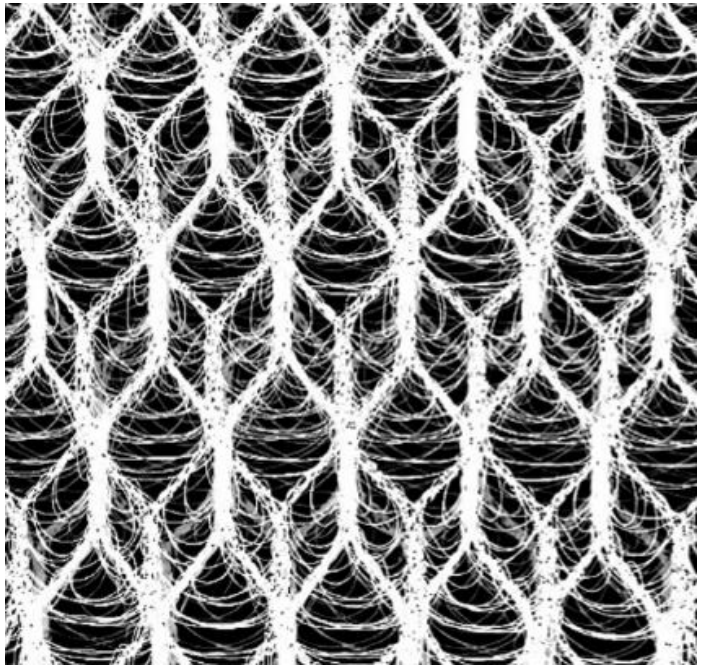
FOG COLLECTOR MESH COMPONENT

Prisma MDF - Raschel
Arrigoni, Italy

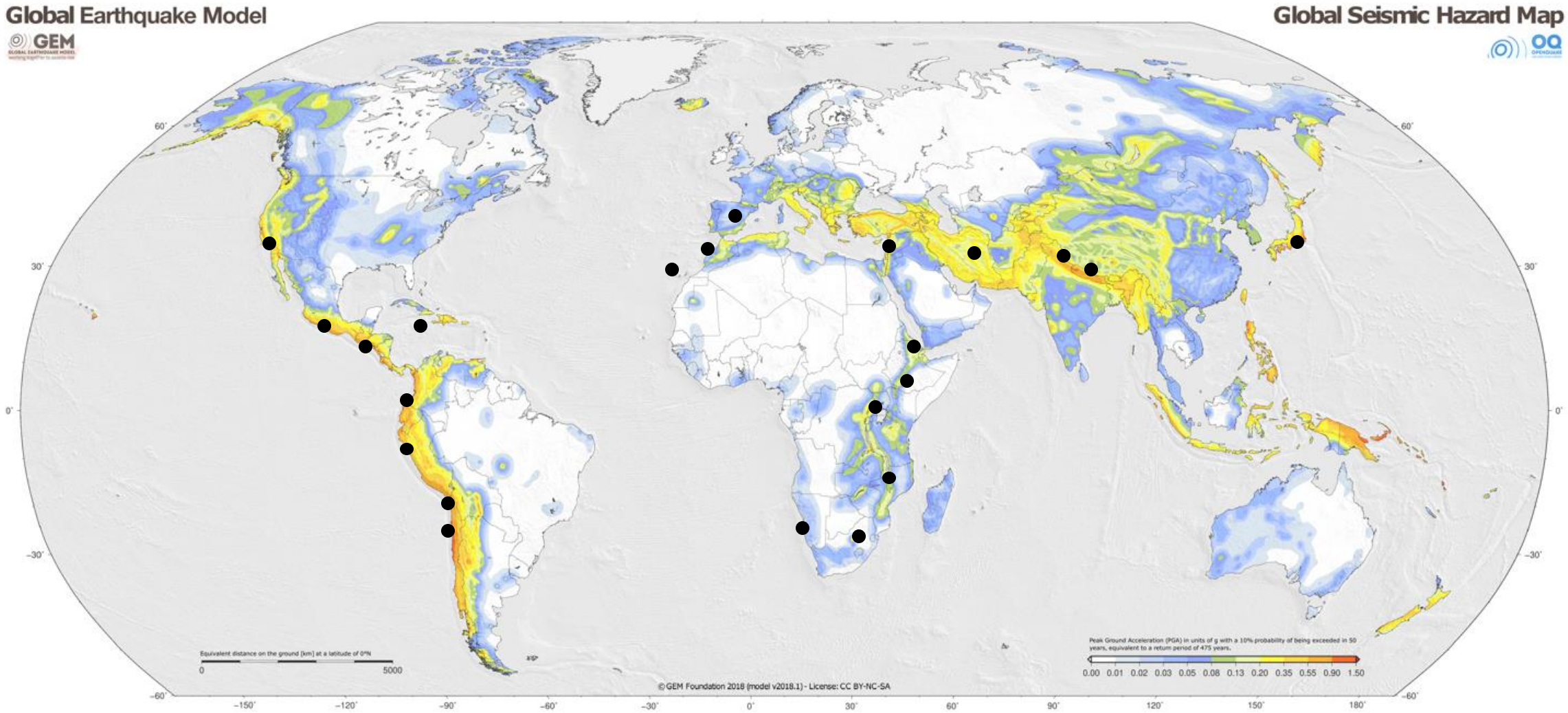
Mosquito net
TexDelta, Spain



Cloudfisher
Essedea, Germany



MAP OF GLOBAL SEISMIC EVENTS AND FOG OASIS



source Global Earthquake model

CONCLUSIONS

Water is defined as 21st Century “Blue Gold”

Water Civilization International Centre

Fog stands as an optimal alternative water resource
especially in contexts where no other source is available

Fog harvesting device should be developed
Let’s start with its integration into emergency shelters

University of Applied Sciences and Arts Northwestern Switzerland
School of Life Sciences

Terre des hommes
Aide à l'enfance.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

hands4health

Hand hygiene, water quality and sanitation in primary health care facilities and schools without functional water supply

20.02.2024 Climate Action Accelerator Webinar

Carola Bänziger – FHNW (University of Applied Sciences Northwestern Switzerland) carola.baenziger@fhnw.ch
Sébastien Mercier – Terre des hommes Switzerland

hands4health consortium: 10 partners

Academia

University of Applied Sciences and Arts Northwestern Switzerland

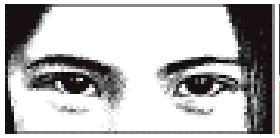
Swiss TPH
Swiss Tropical and Public Health Institute

EPFL

University of Maiduguri
(Faculty of Engineering)

Palestinian Polytechnical University

NGO International humanitarian organisations



Terre des hommes
Aide à l'enfance.

cesvi

skat foundation

Private

RANAS | SPIN-OFF of Eawag
We Understand Behaviour Change

MARTIN

4 countries – humanitarian crises areas

Mali

Burkina Faso

Nigeria

Palestine

Terre des hommes
Aide à l'enfance.

cesvi

Objectives- Systemic approach to hand hygiene, water quality and sanitation adapted to local context and needs of users and implementers

Technology & infrastructure
- Technologies that work
- Innovation
- Local production

Health impact
- Health impact & health benefit evaluation

Stakeholders
- National / International level
- Authorities / Organisations
- Feedback, contribution, participation

Data management and monitoring
- FACET
- Online monitoring
- Knowledge platform

Social science
- RANAS behavior change
- User-centred design

Integration of the existing and novel WASH interventions into a practical user-friendly tool

Tools / interventions

Assessment: FACET and Theory of Change

Hardware


Gravit'eau handwashing


Chlorination


Rehabilitation

Management and monitoring


WASH FIT


Preventive maintenance


Monitoring


Digital data collection

Behaviour change


Ranas4HCF

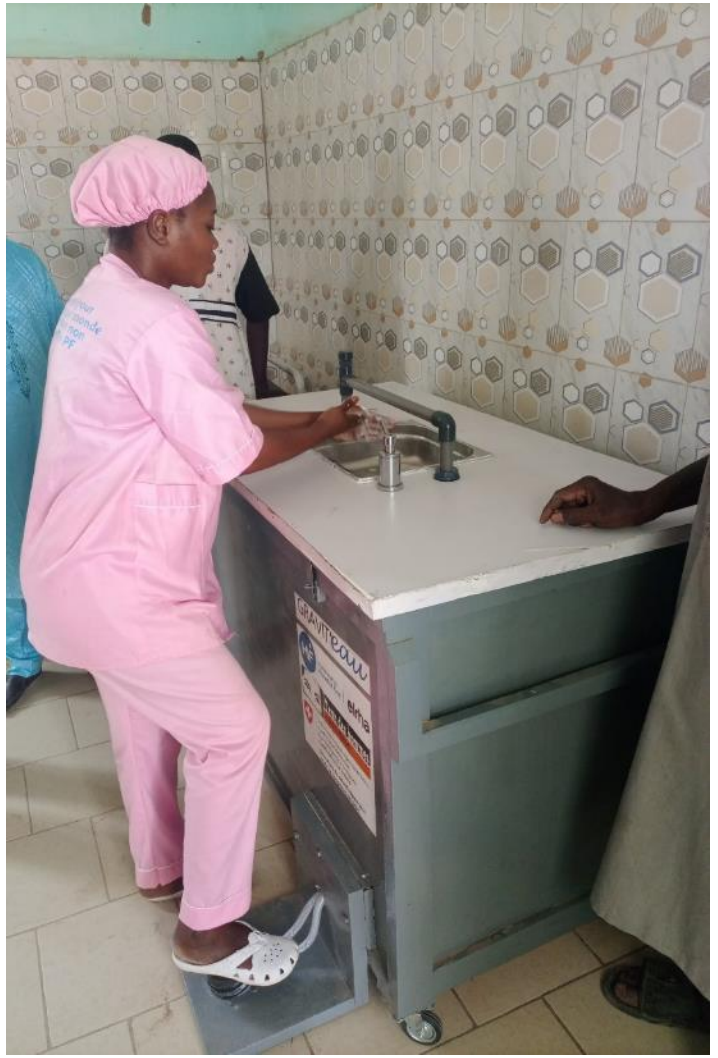

Ranas4Schools

Impact Evaluation

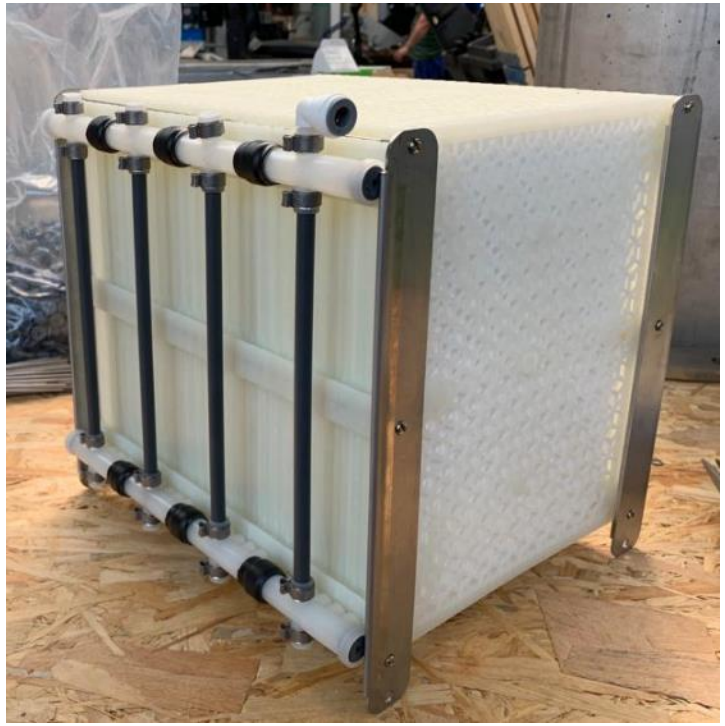
Handwashing water recycling systems

HANDWASHING WATER RECYCLING SYSTEM

GRAVIT'eau



Handwashing water recycling systems



- water recirculates
- treated through gravity
- no energy needed
- less water transport
- 97% water saved

Gravit'eau handwashing

GRAVIT'eau

Gravit'eau construction

- Workshops in Mali, Burkina Faso, Nigeria
- Membrane, pump and connectors delivered from Europe, rest local

Gravit'eau maintenance and monitoring

GRAVIT'eau

- Gravit'eau focal point in every institution
- Following Gravit'eau guidelines
- Regular monitoring by Terre des hommes
  - Microbial tests
  - Questionnaires

Ranas4Schools

Ranas4HCF

Behaviour change → RANAS activities

Preconditions	Measurement	Analysis	Activity catalogue
Check for: - **Behavioural** - **Infrastructural** - **Organisational** preconditions	Survey to assess target **behaviour** and related **RANAS factors**	Automatically provides results of **Doer & Non-Doer analysis**: factors to target	Catalogue with ready-to-use **activities**

By country-based trained Ranas Experts

WASH FIT

Preventive maintenance

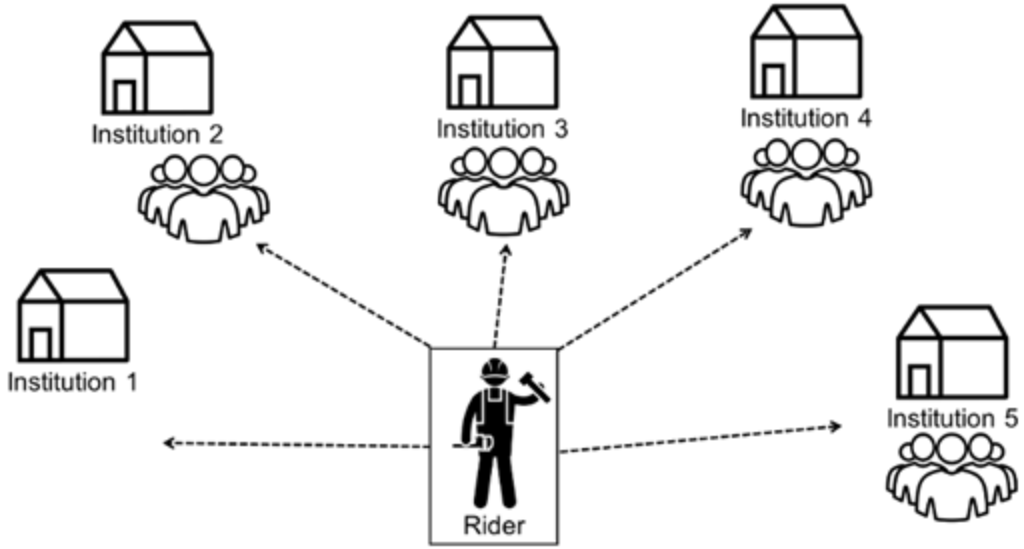
Rehabilitation

Preventive maintenance & WASH FIT

- **Maintenance and rehabilitation of infrastructure**

- **Preventive maintenance:** Inspection, maintenance and repair on spot, training of the staff on maintenance

- **Monitoring and reporting:** training staff, collect and share data, evaluate the costs



Chlorination

Collect evidence on water quality in schools/HCF

Training of trainers

Establish a digital tool to collect, transfer real-time data and visualize the data

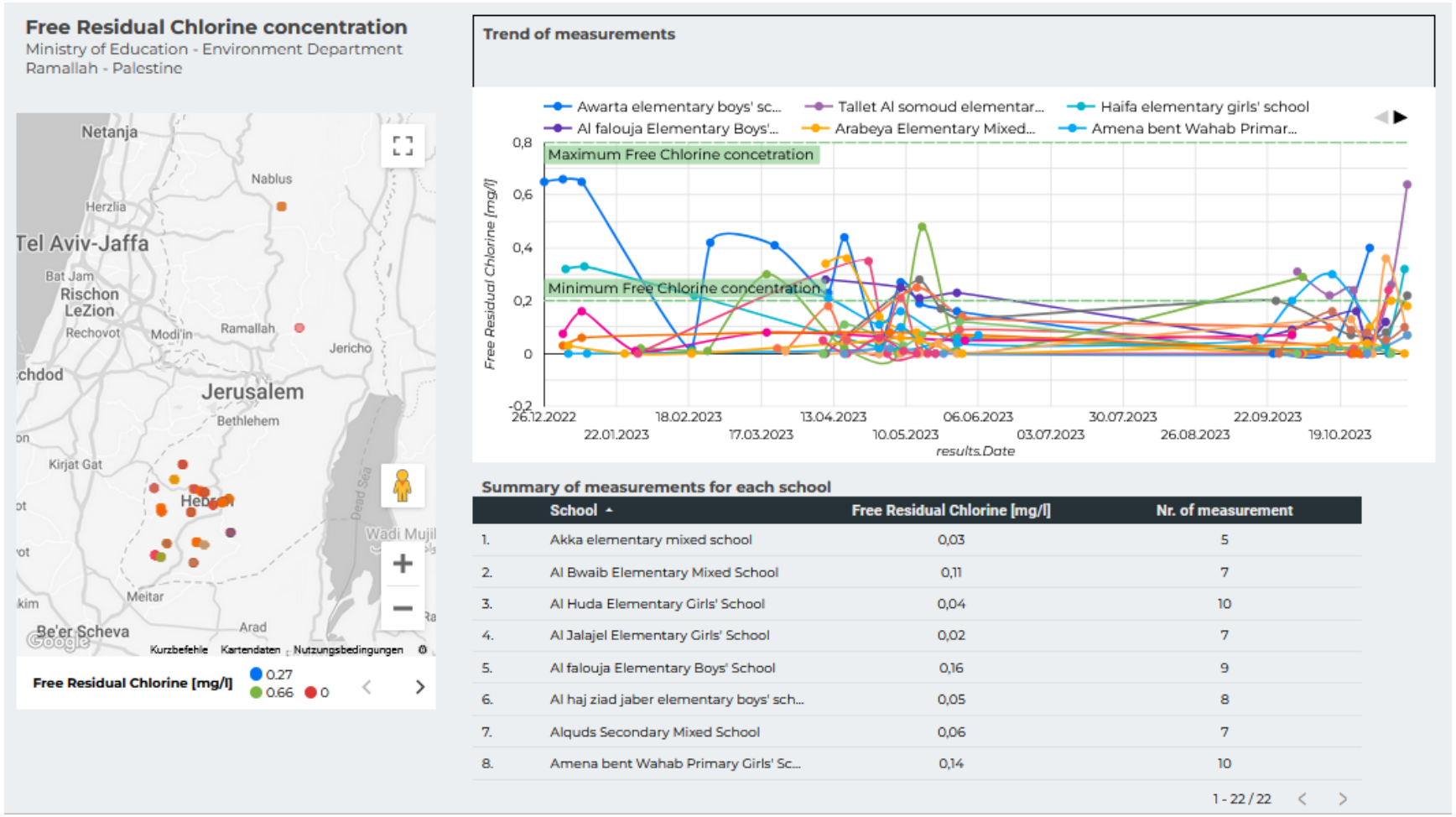
(Improve infrastructure, establish supply chains,)
Establish chlorination at the school/HCF

Dialogue with Ministries
Uptake into national guidelines

Monitoring

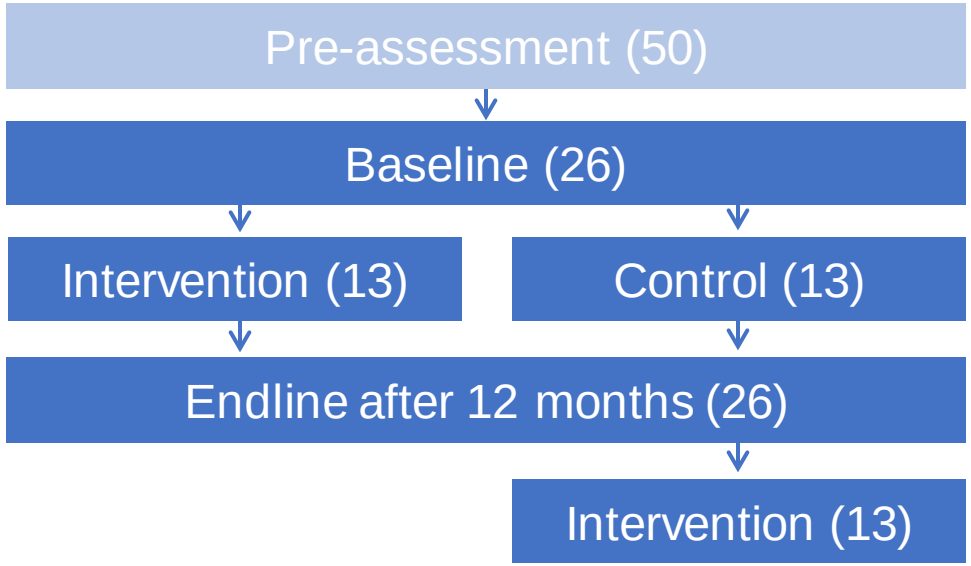
Digital data collection

Digital chlorination monitoring system



Health impact evaluation

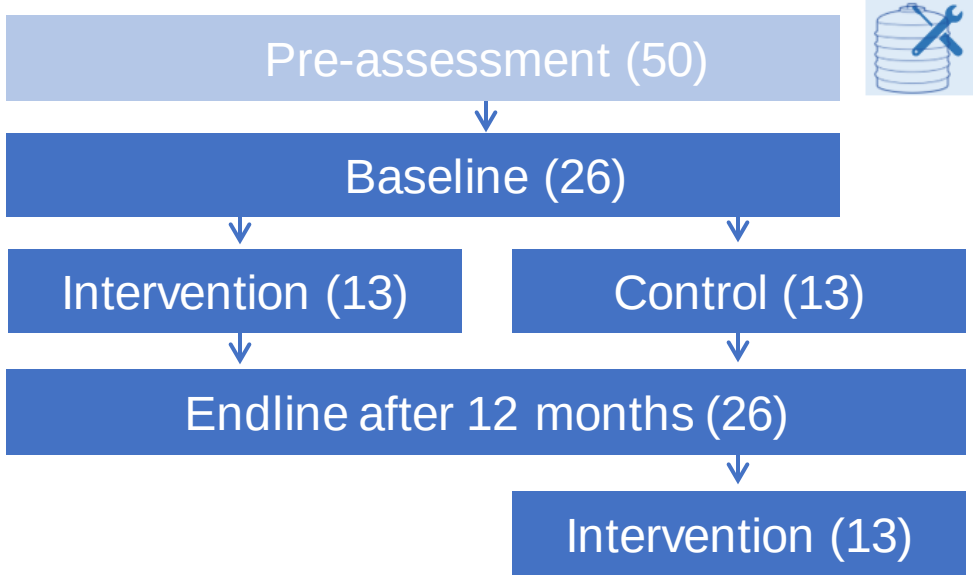
Randomized controlled trial

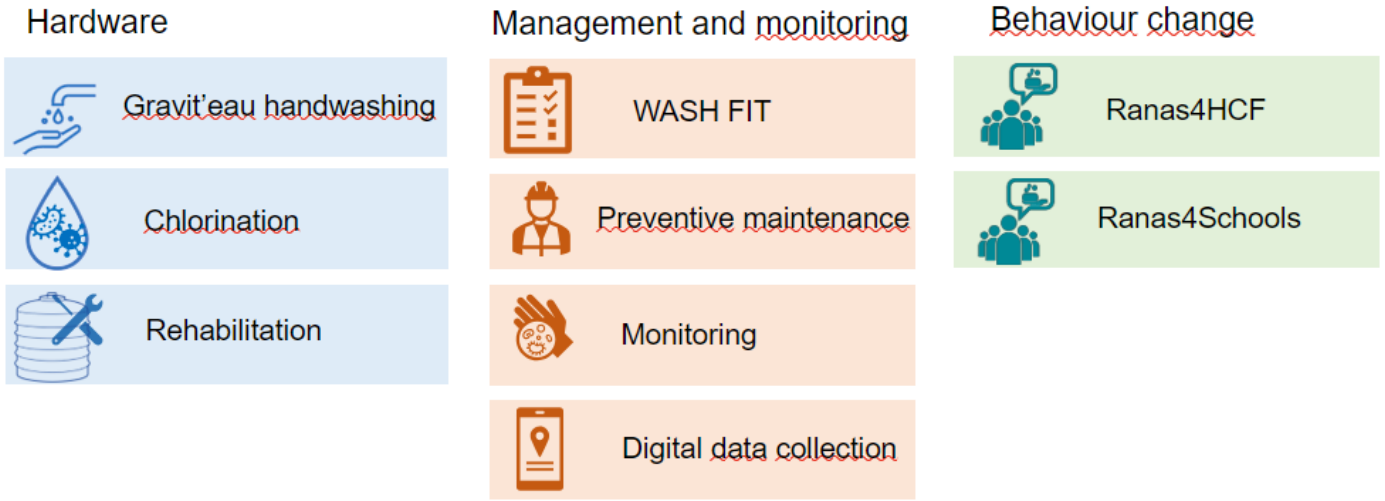


(x) = number of institutions per country

Health impact evaluation

Randomized controlled trial





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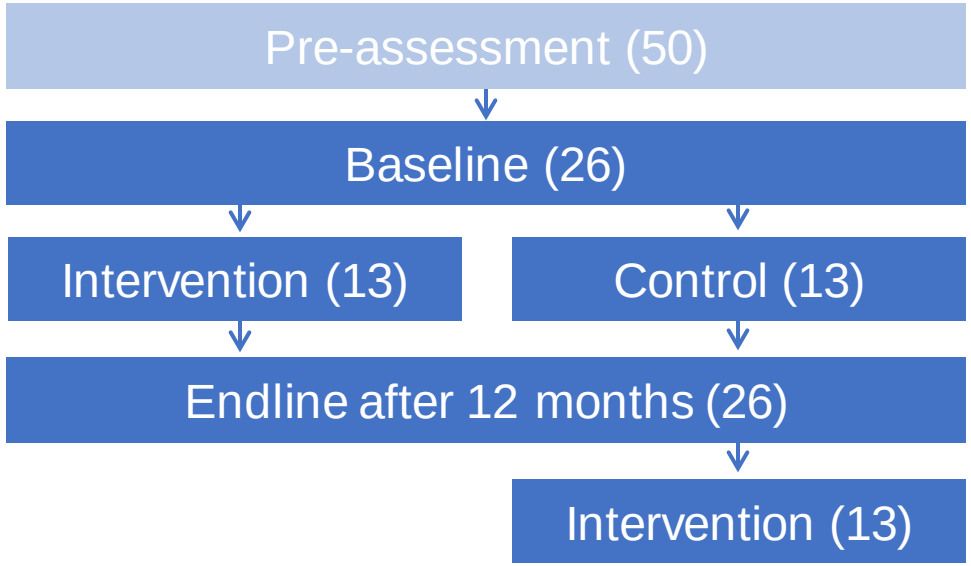
Health impact evaluation

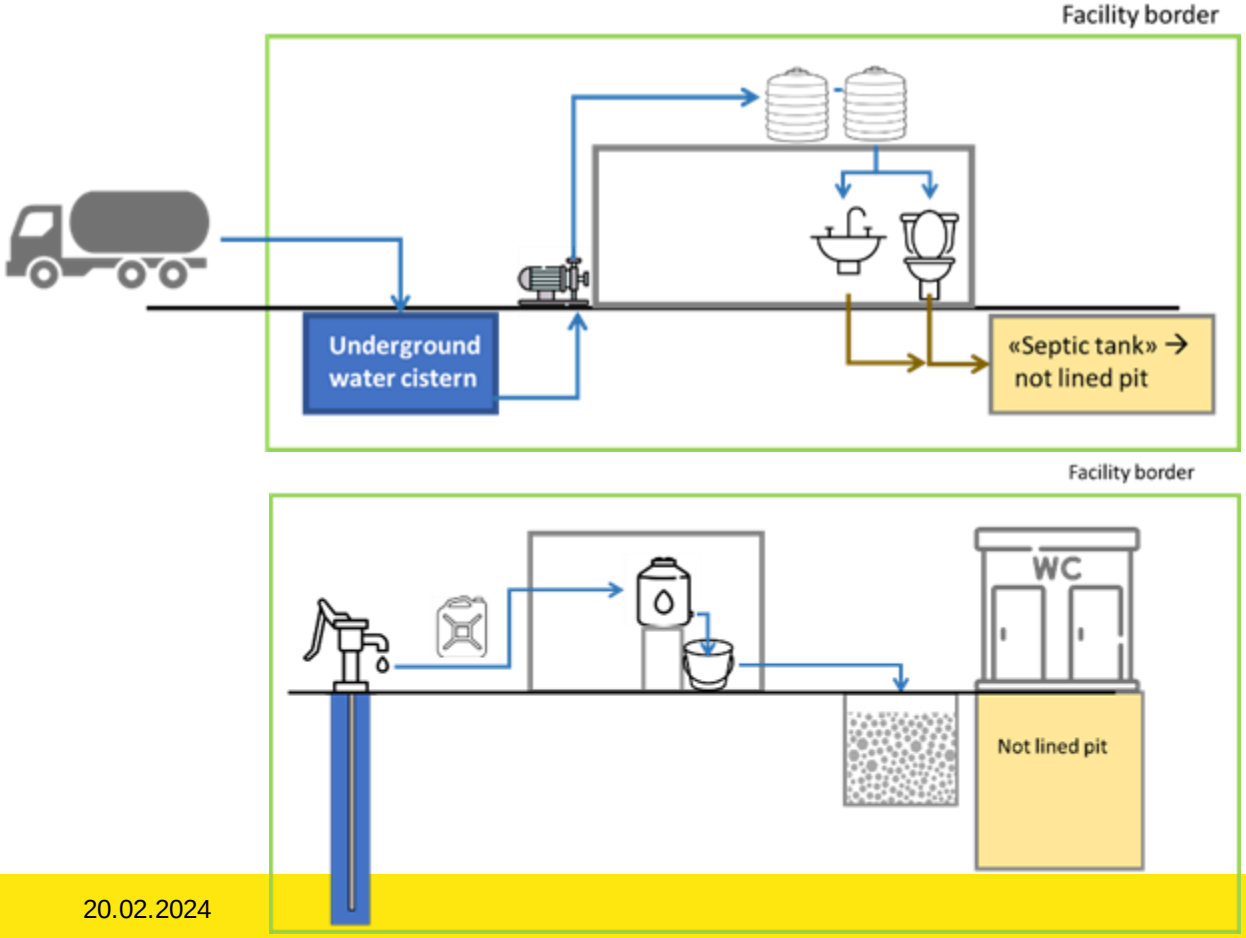
Randomized controlled trial



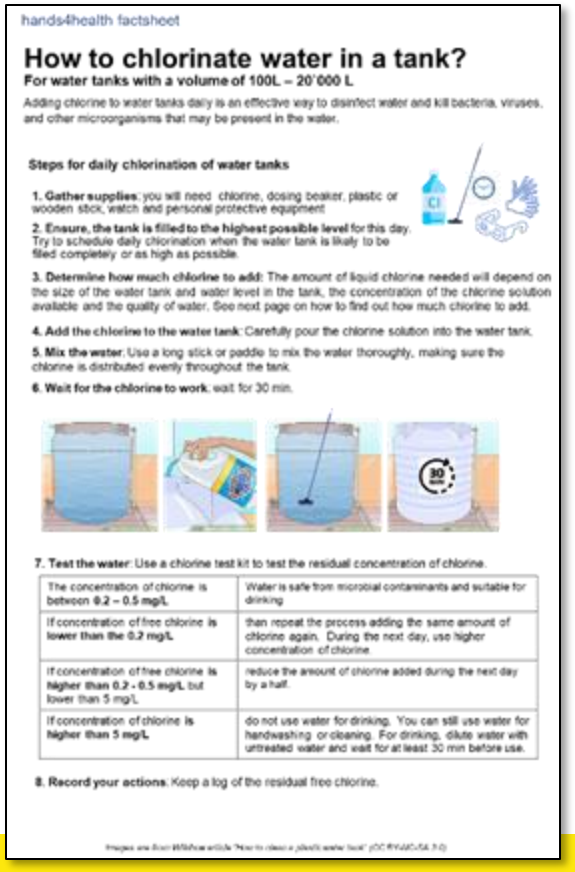
(x) = number of institutions per country

Catalogue / improvement planning tool

System improvement planning tool



Catalogue



hands4health factsheet

How to chlorinate water in a tank?

For water tanks with a volume of 100L – 20'000 L

Adding chlorine to water tanks daily is an effective way to disinfect water and kill bacteria, viruses, and other microorganisms that may be present in the water.

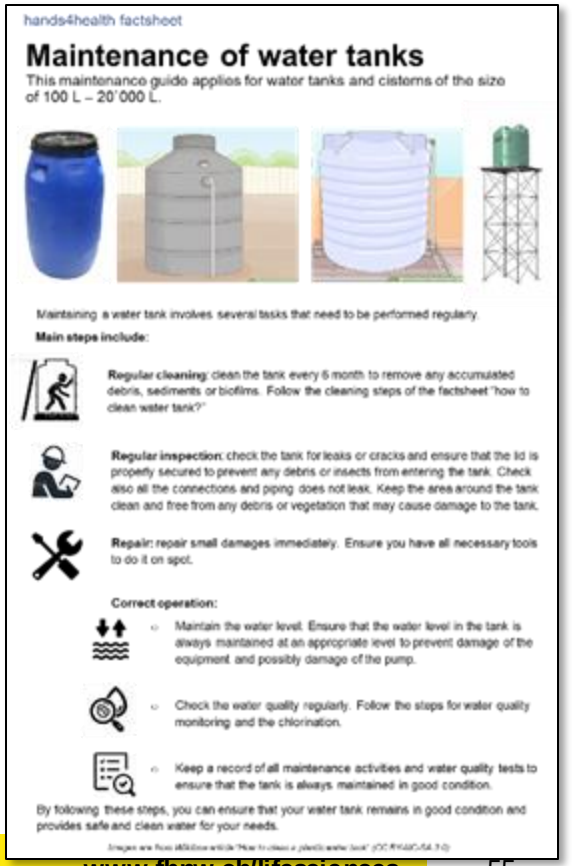
Steps for daily chlorination of water tanks

1. **Gather supplies**: you will need: chlorine, dosing beaker, plastic or wooden stick, watch and personal protective equipment
2. **Ensure, the tank is filled to the highest possible level** for this day. Try to schedule daily chlorination when the water tank is likely to be filled completely or as high as possible.
3. **Determine how much chlorine to add:** The amount of liquid chlorine needed will depend on the size of the water tank and water level in the tank, the concentration of the chlorine solution available and the quality of water. See next page on how to find out how much chlorine to add.
4. **Add the chlorine to the water tank**: Carefully pour the chlorine solution into the water tank.
5. **Mix the water**. Use a long stick or paddle to mix the water thoroughly, making sure the chlorine is distributed evenly throughout the tank.
6. **Wait for the chlorine to work**, wait for 30 min.

7. **Test the water**: Use a chlorine test kit to test the residual concentration of chlorine.

The concentration of chlorine is between **0.2 – 0.5 mg/L**	Water is safe from microbial contaminants and suitable for drinking
If concentration of free chlorine is **lower than the 0.2 mg/L**	then repeat the process adding the same amount of chlorine again. During the next day, use higher concentration of chlorine
If concentration of free chlorine is **higher than 0.2 - 0.5 mg/L** but lower than 5 mg/L	reduce the amount of chlorine added during the next day by a half.
If concentration of chlorine is **higher than 5 mg/L**	do not use water for drinking. You can still use water for handwashing or cleaning. For drinking, dilute water with untreated water and wait for at least 30 min before use.

8. **Record your actions**. Keep a log of the residual free chlorine.



hands4health factsheet

Maintenance of water tanks

This maintenance guide applies for water tanks and cisterns of the size of 100 L – 20'000 L.

Maintaining a water tank involves several tasks that need to be performed regularly.

Main steps include:

Regular cleaning: clean the tank every 6 month to remove any accumulated debris, sediments or biofilms. Follow the cleaning steps of the factsheet "how to clean water tank?"

Regular inspection: check the tank for leaks or cracks and ensure that the lid is properly secured to prevent any debris or insects from entering the tank. Check also all the connections and piping: does not leak. Keep the area around the tank clean and free from any debris or vegetation that may cause damage to the tank.

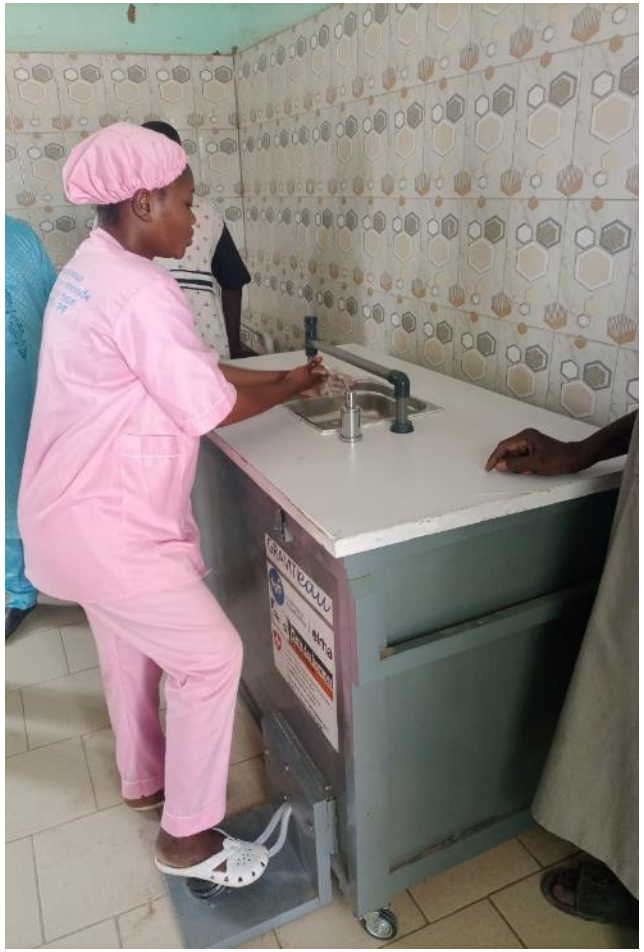
Repair: repair small damages immediately. Ensure you have all necessary tools to do it on spot.

Correct operation:

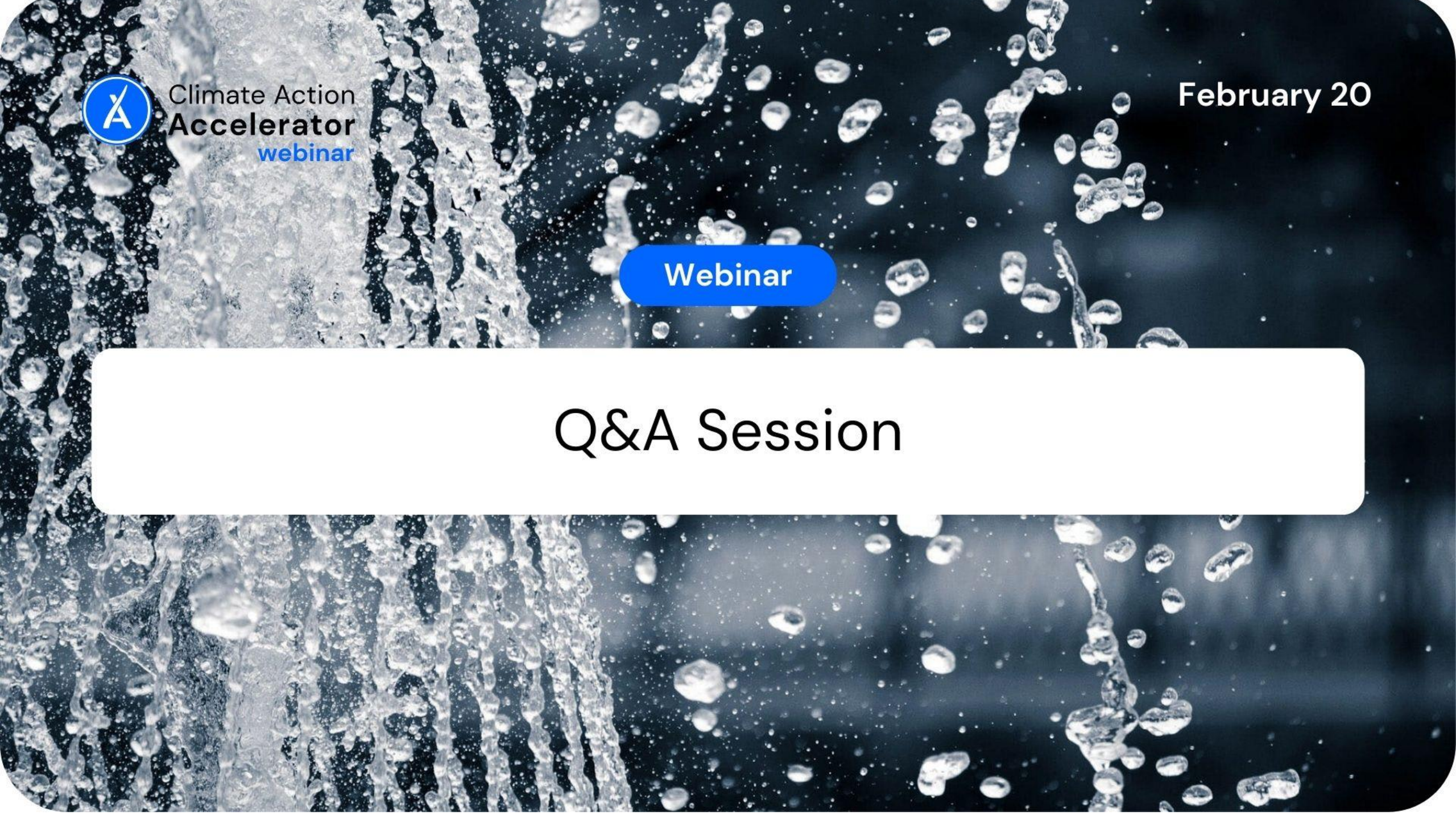
- Maintain the water level. Ensure that the water level in the tank is always maintained at an appropriate level to prevent damage of the equipment and possibly damage of the pump.
- Check the water quality regularly. Follow the steps for water quality monitoring and the chlorination.
- Keep a record of all maintenance activities and water quality tests to ensure that the tank is always maintained in good condition.

By following these steps, you can ensure that your water tank remains in good condition and provides safe and clean water for your needs.

Questions?



Hardware	Management and monitoring	Behaviour change
Gravit'eau handwashing	WASH FIT	Ranas4HCF
Chlorination	Preventive maintenance	Ranas4Schools
Rehabilitation	Monitoring	
	Digital data collection	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