



Heavy metals in drinking water - a proposal for their removal

A webinar by RésEAU, CDE Network and the SDC Office in Lima

June 13, 2024

We are starting soon....

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Heavy metals in drinking water - a proposal for their removal

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June 13, 2024

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Interpretation

ENGLISH

Live voice interpretation is available in Spanish, French and English.

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FRANÇAIS

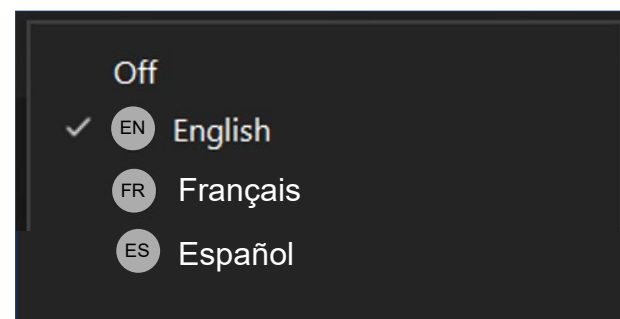
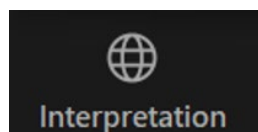
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Technical housekeeping



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This event will be recorded and will be available on the RésEAU website



For more technical support, contact Cesar Robles: cesar.robles@helvetas.org

Agenda

Introduction and welcome

Helen Gambon

Presentations by the experts

Laura Velásquez, Sreenath Bolisetty, Herberth Pacheco

**Comments about the
presentations**

Divya Kashyap Sharma

Questions and answers

Summary of learnings

Helen Gambon

Evaluation and closing

Facilitador: Dr. Daniel Maselli, Punto Focal de la RésEAU

Introduction and welcome

Welcome remarks



Helen Gambon

Programme Officer Disaster
Risk Reduction & Rapid
Response

SDC Office in Lima, Peru

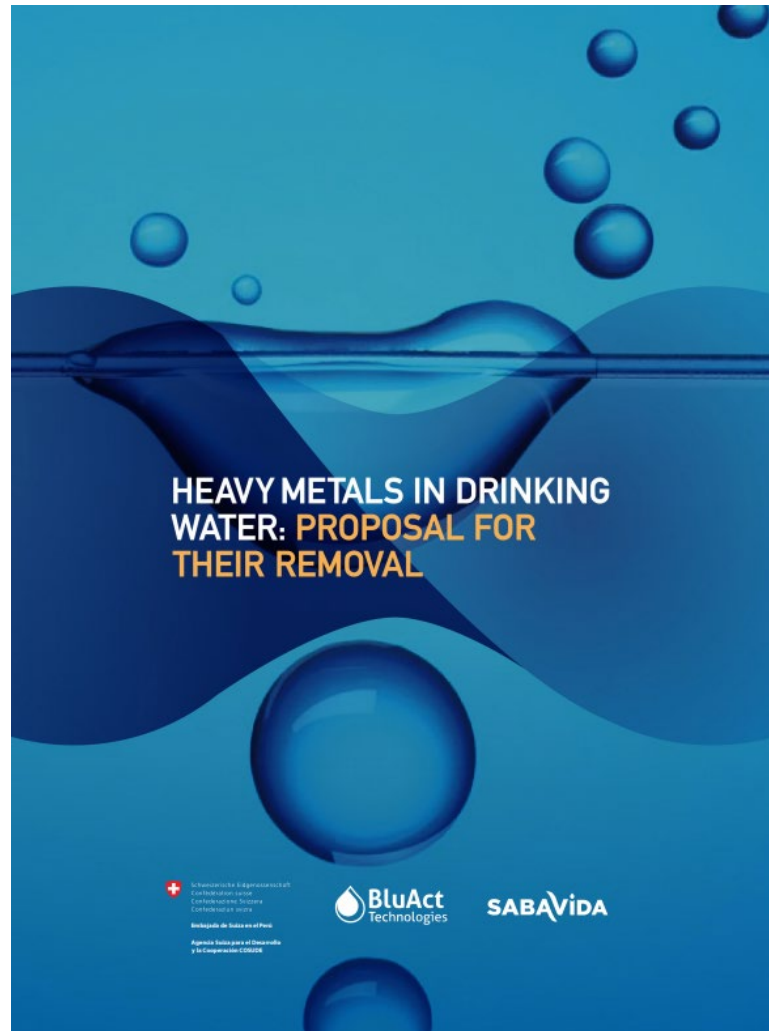
Relevance of the project

- Prevalence of a **high risk of exposure** of the population to water contaminated by heavy metals: **Arsenic and Lead** in Peru.
- **+ 10 million people at risk** of exposure to heavy metals and other toxic substances.
- Switzerland committed to contribute to **reduce the risks of exposure** to heavy metals with a special focus on the most vulnerable populations.

Objectives

- Share the experience and lessons learned from the summary publication with a broader audience outside Peru.
- Showcase the technology to inspire replication and establish link between interested professionals from the public and private sector and BlueAct

Download the summary



bitly

Panel of experts



Laura Velásquez
Department of
Sanitation, Water and
Solid waste for
Development,
SANDEC - EAWAG

7/1/2024



Sreenath Bolisetty
Chief Technical Officer
(CTO)
BluAct Technologies



Herberth Pacheco
Director fo the NGO
SABAvida in Peru



Divya Kashyap Sharma
Deputy Head of
Cooperation at SDC in
India

Survey

Follow the **link in the chat or scan the QR code** to access the mentimeter survey

Go to
www.menti.com

Enter the code

6323 6667



Or use QR code

Presentations



Laura Velásquez
Department of Sanitation,
Water and Solid waste for
Development, SANDEC -
EAWAG

Introduction to heavy metals in water for human consumption as a public health problem

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Introduction to Heavy Metals in Drinking Water as a Public Health Problem

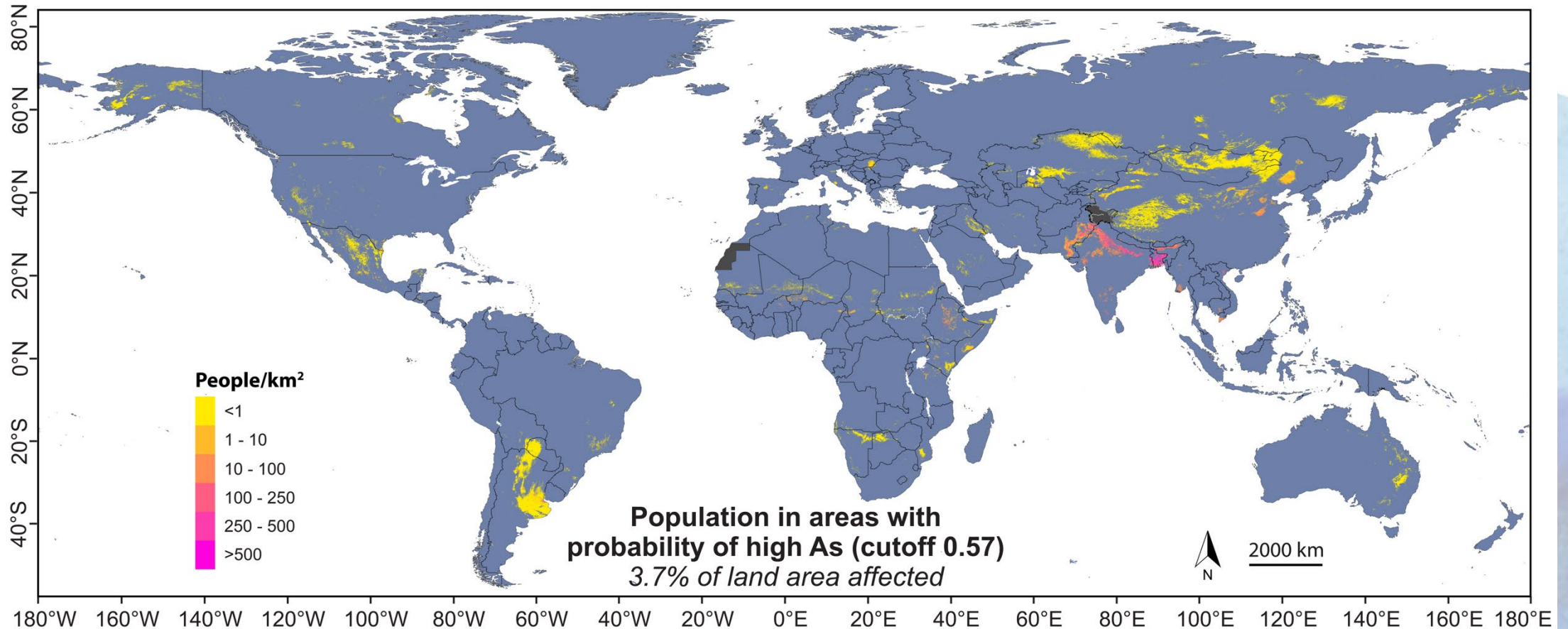
Laura Velásquez
Water Supply & Treatment Group
Eawag / Sandec
Dübendorf, Switzerland

Heavy metal contamination is a global public health issue

- 1 in 3 people globally **lack access** to safe drinking water (UNICEF, WHO)
- **Heavy metal** contamination affects drinking water supplies worldwide
- Significant **health impacts**:
 - **Arsenic** and **fluoride** are the most significant
 - **Lead, manganese, cadmium** and **iron** are also concerns



Population living with **arsenic** in groundwater exceeding 0.01 mg/L

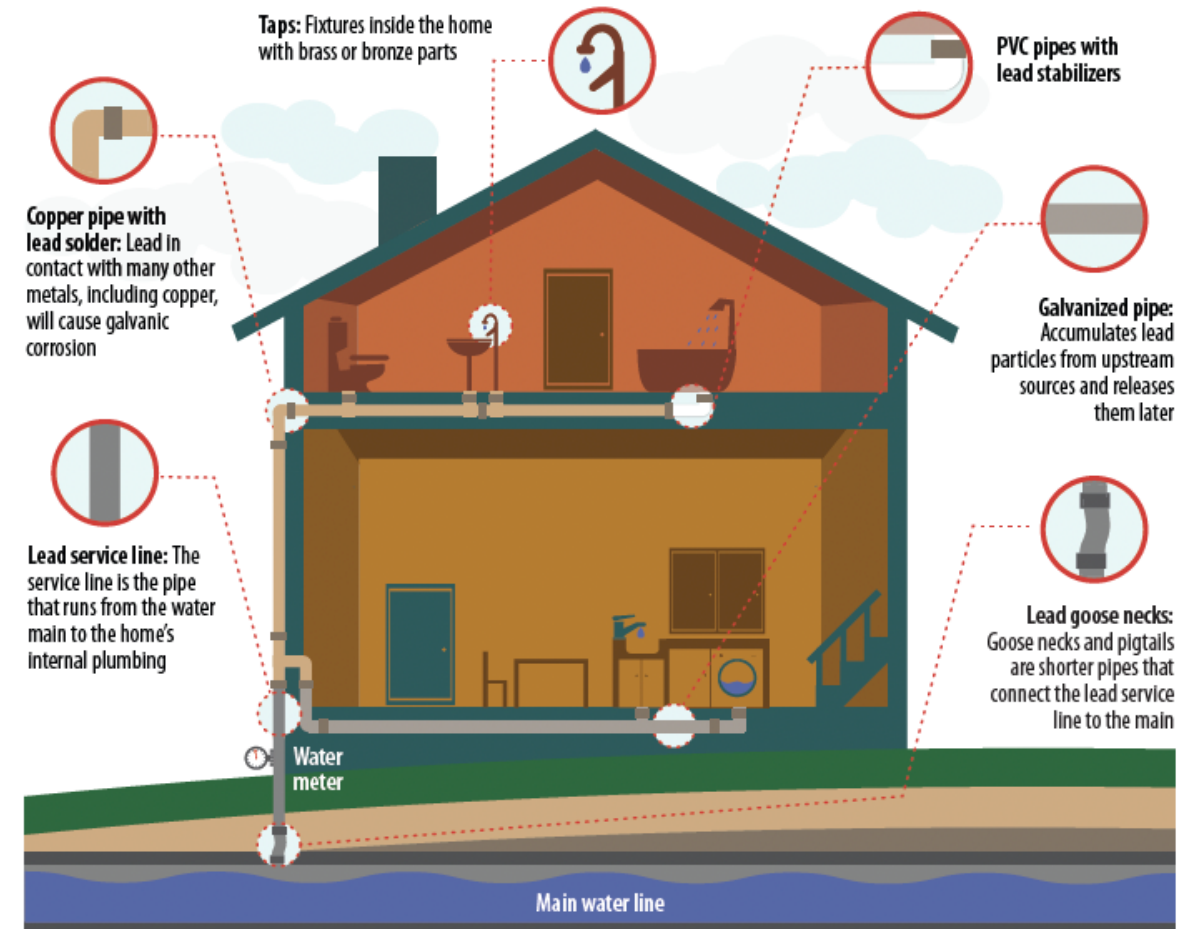


Source: Podgorski & Berg (2020), Global threat of arsenic in groundwater. *Science*, 368(6493), 845-850.

Lead is also a major public health concern

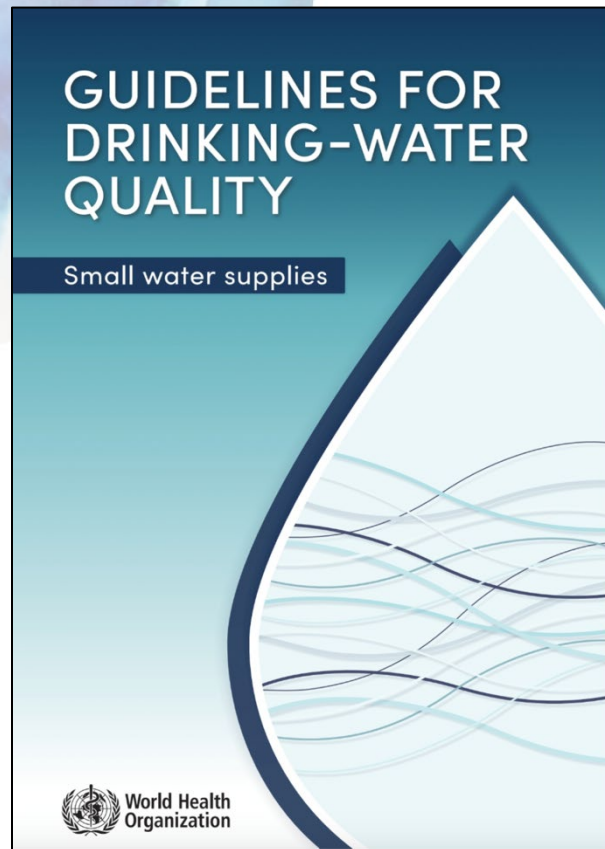
Sources of lead in drinking water

- Lead-containing components in water systems:
 - Service pipes, household plumbing
 - Well and handpump components
- Source water
 - Natural occurrence in bedrock
 - Industrial pollution



Chemical monitoring

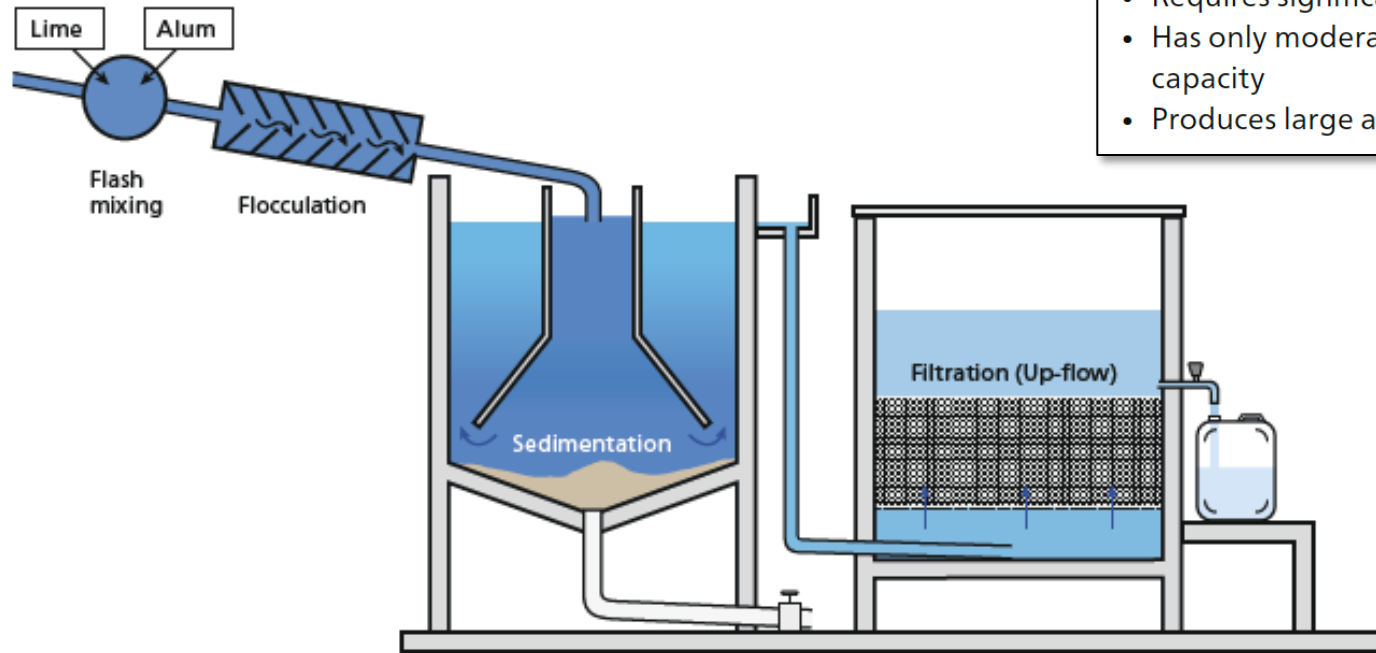
Guideline values and minimum frequencies



	Household managed	Community managed	Professionally managed
<i>Guideline value</i>	Arsenic: 0.01 mg/L Fluoride: 1.5 mg/L		
<i>Min. monitoring frequency</i>	Once initially	1-2x per year	2-4x per year
<i>Monitoring location</i>	Point of collection	No treatment: point of collection With treatment: point of exit	

Fluoride removal by precipitation/coagulation

Example: Nalgonda technique



Nalgonda technology:

⊕ Advantages

- Uses readily available chemicals
- Operates inexpensively

⊖ Disadvantages

- Requires significant labor
- Has only moderate fluoride adsorption capacity
- Produces large amounts of waste



Graphic: WHO, *Compendium of Drinking Water Systems & Technologies*

Photo: Eawag (2017), *Geogenic Contamination Handbook*

Arsenic removal by adsorption/precipitation

Example: SONO filter

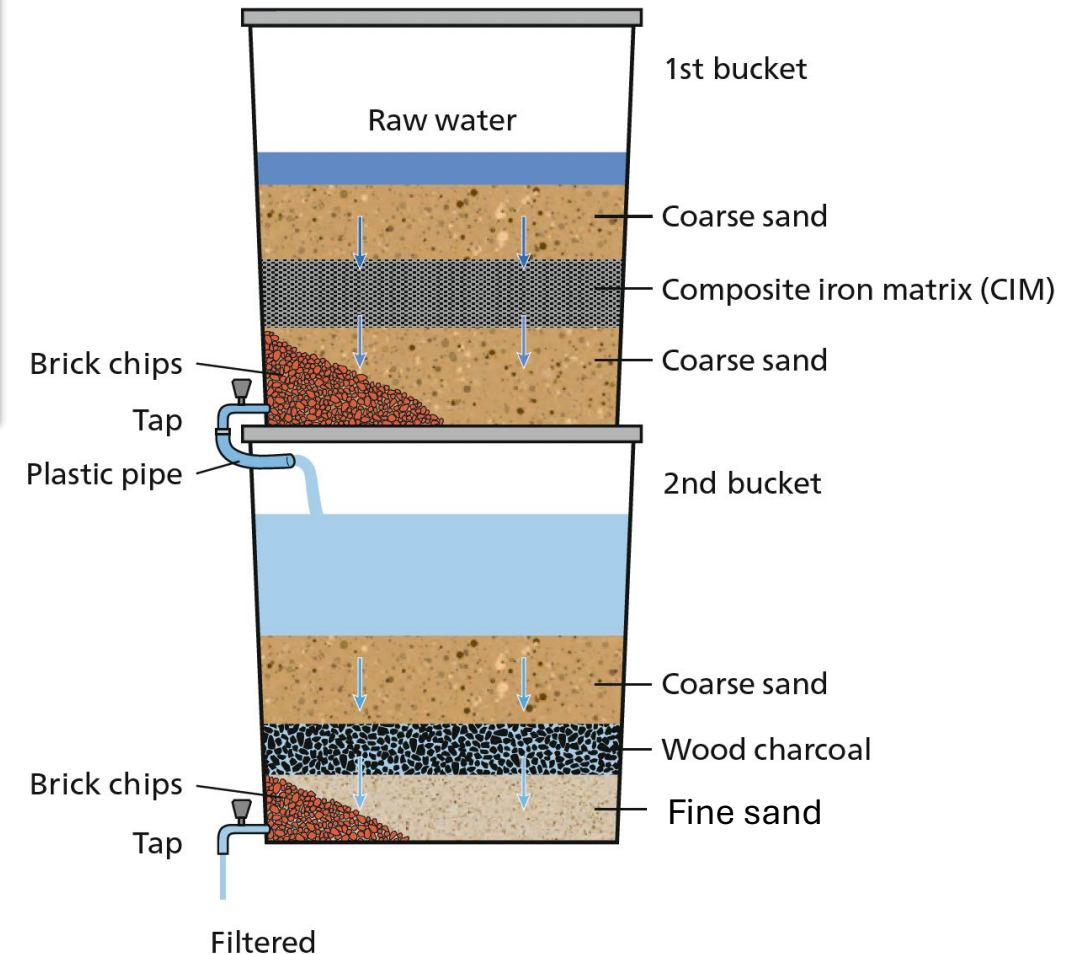


+ Advantages

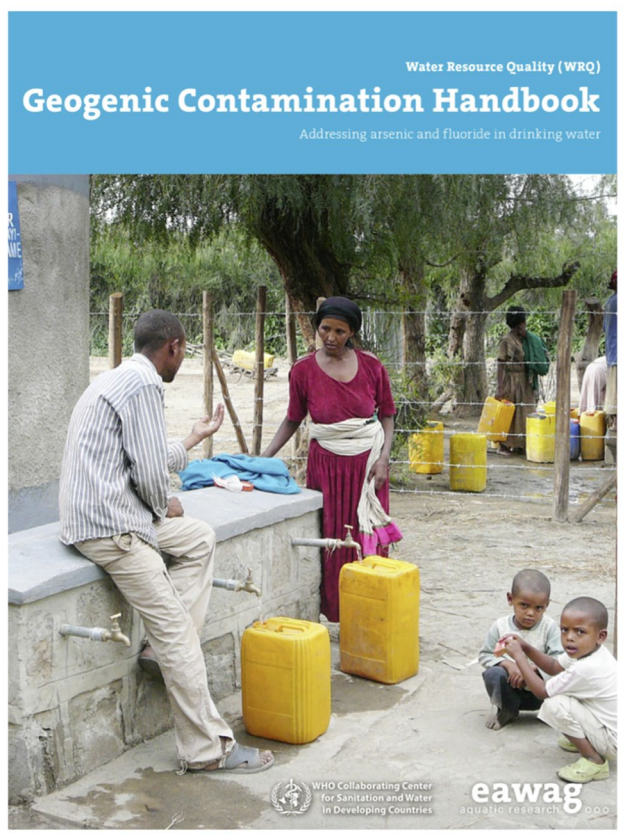
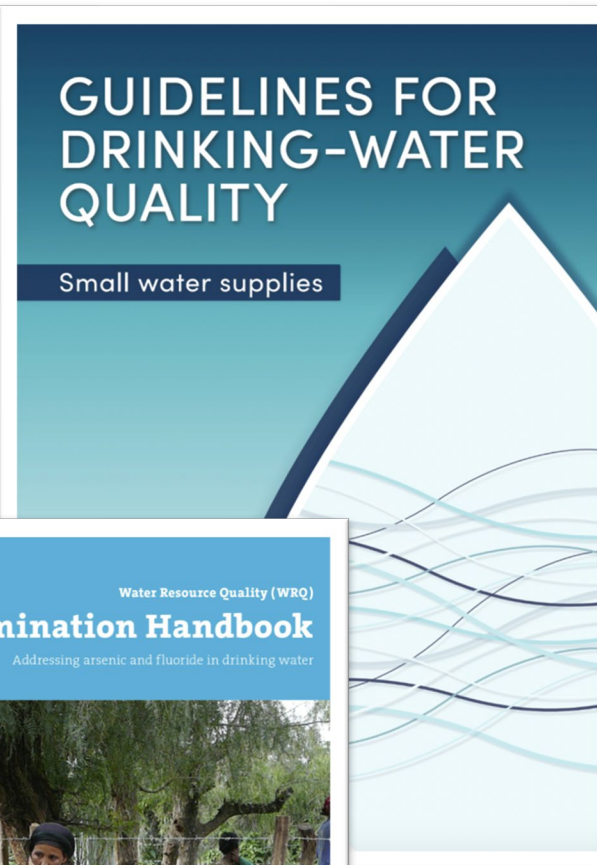
- Is relatively inexpensive and easy to use
- Requires locally available materials

- Disadvantages

- Has varying arsenic removal efficiencies
- Is not ideal for anion-rich water (e.g. sulphate and phosphate are competing ions)
- Not used regularly by all users



The image is a composite. The top half features a blue background with the word 'Compendium' in large white font, followed by the subtitle 'Drinking water systems and technologies from source to consumer' in a smaller white font. Below the text is a colorful illustration of a water supply system. It shows a mountain range with a cloud raining over it, a body of water, a water treatment plant with large blue tanks, a 'WATER KIOSK' with a sign, and a yellow truck. In the foreground, there are buildings, one with solar panels on its roof, and people. The bottom right corner shows a photograph of a man in a striped shirt standing next to a concrete water pump structure, with trees in the background.









Groundwater Assessment Platform

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GAP Maps

The Groundwater Assessment Platform is a free, interactive online GIS platform for the viewing, mapping, sharing and statistical modelling of groundwater quality data

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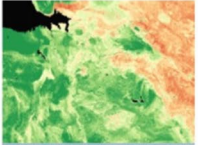
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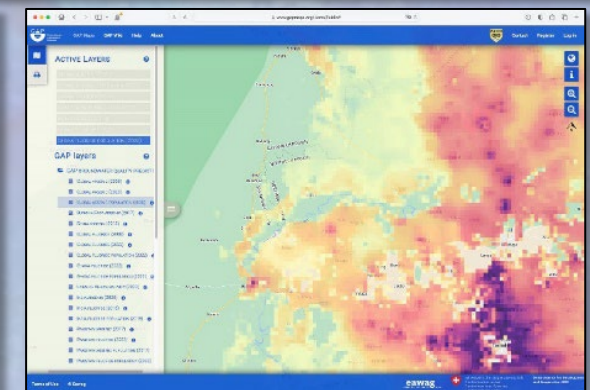
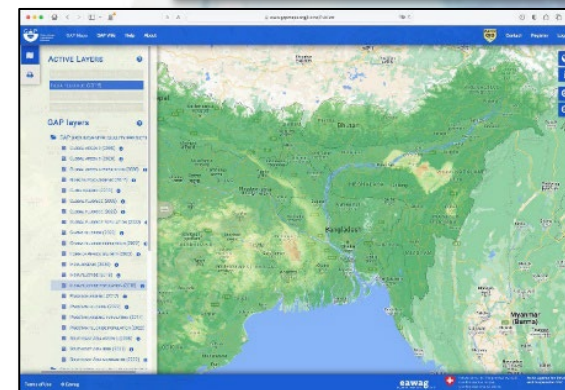
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Sreenath Bolisetty
Chief Technical Officer
(CTO)
BluAct Technologies

Water purification using protein nanofibrils (NFP)

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Water Purification using Protein Nanofibrils (PNF)

BluAct Technologies AG,
Zurich, Switzerland
www.bluact.com

Solutions



Industry

Improve decade-old technologies for better efficiency or sustainability

Coagulation: Low efficiency & sludge

Adsorbants: Low efficiency & pollutant specific

Membrane: Expensive & energy intensive

Distillation : Expensive

Ionexchange: Ion specific & expensive

BluAct



Protein Nano-Fibrils

**Disruptive
Nanotechnology**



Performant



Cost effective



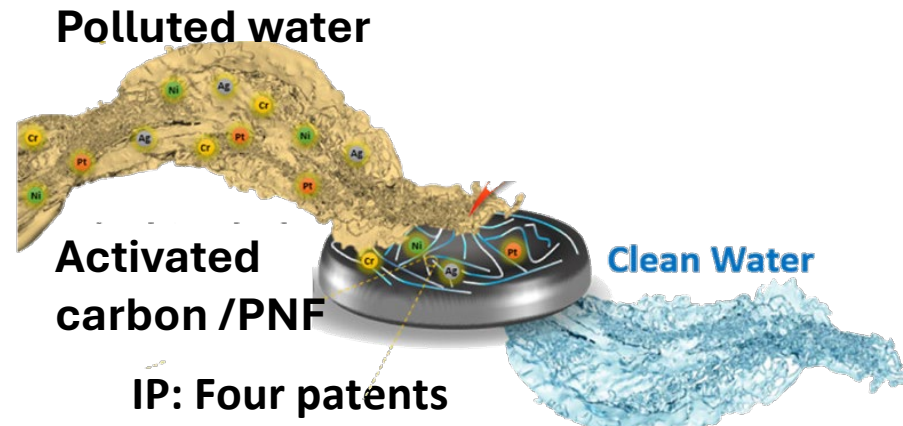
Eco-friendly

BluAct Technology & Solution

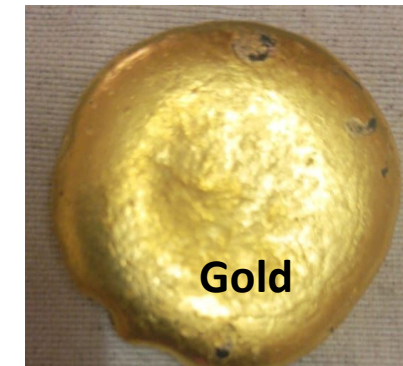
Whey Protein



Protein Nanofibrils (PNF)

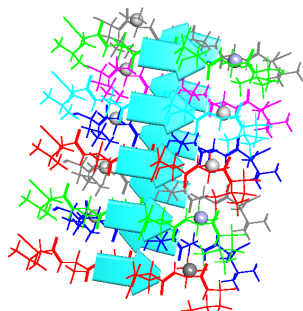


Regeneration/Recovery



Waste from the cheese factory

Nano Engineering



Protein Nanofibrils

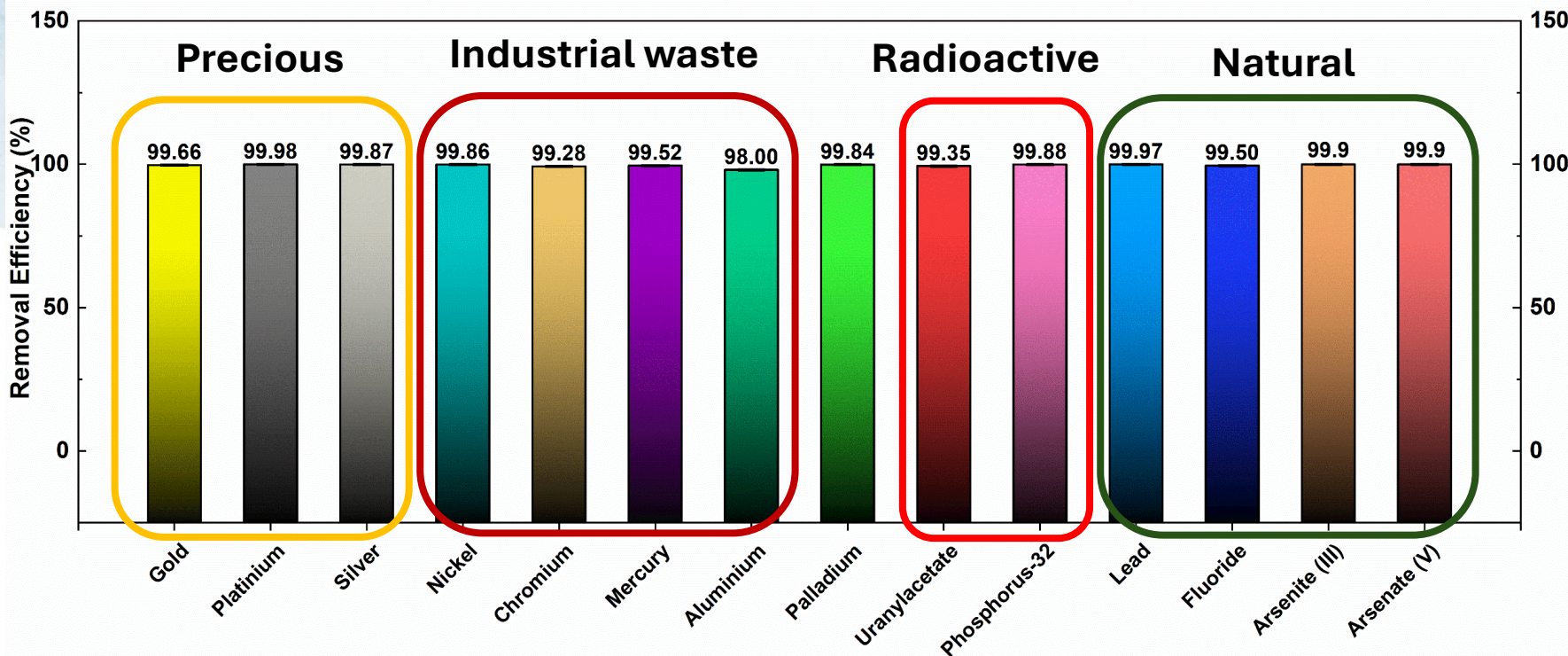
Adsorption & size separation

Multiple Dissolved Pollutants:

Heavy metals, radioactive pollutants, arsenic, fluoride and viruses

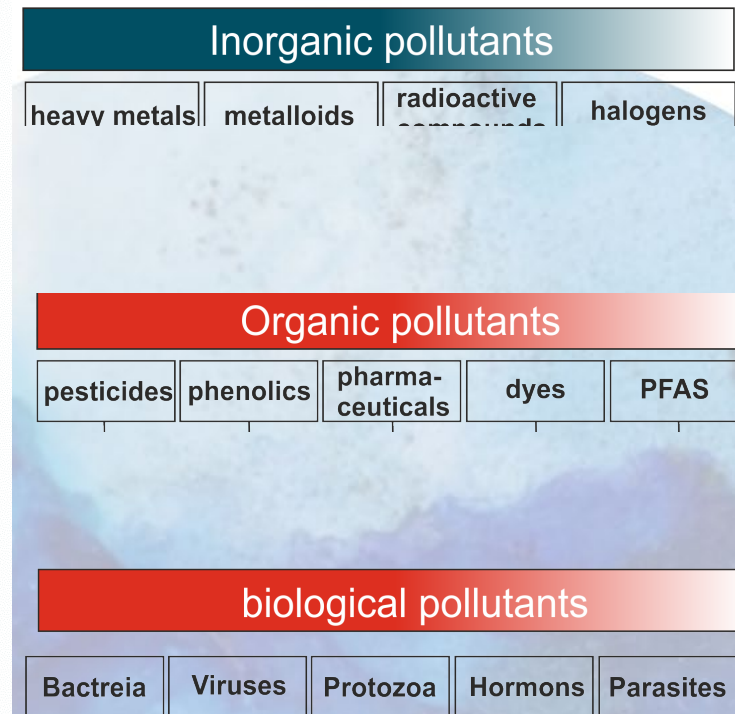
Performance

Unprecedented efficiency



Simultaneous removal, Re-usable

Works for both Arsenite As (III) & Arsenate As (V)



Products

Large scale

Promembrane



**Precious wastewater &
Radioactive water
treatment**

GraPro



**Electroplating inexpensive
metals &
Drinking water treatment**

Small scale

Smart Multipure



Household water filters

Advantages

1



**Highest Heavy metal
removal
(>99%)**

2



**Retrofit solution
(92% CAPEX savings to
RO)**

3



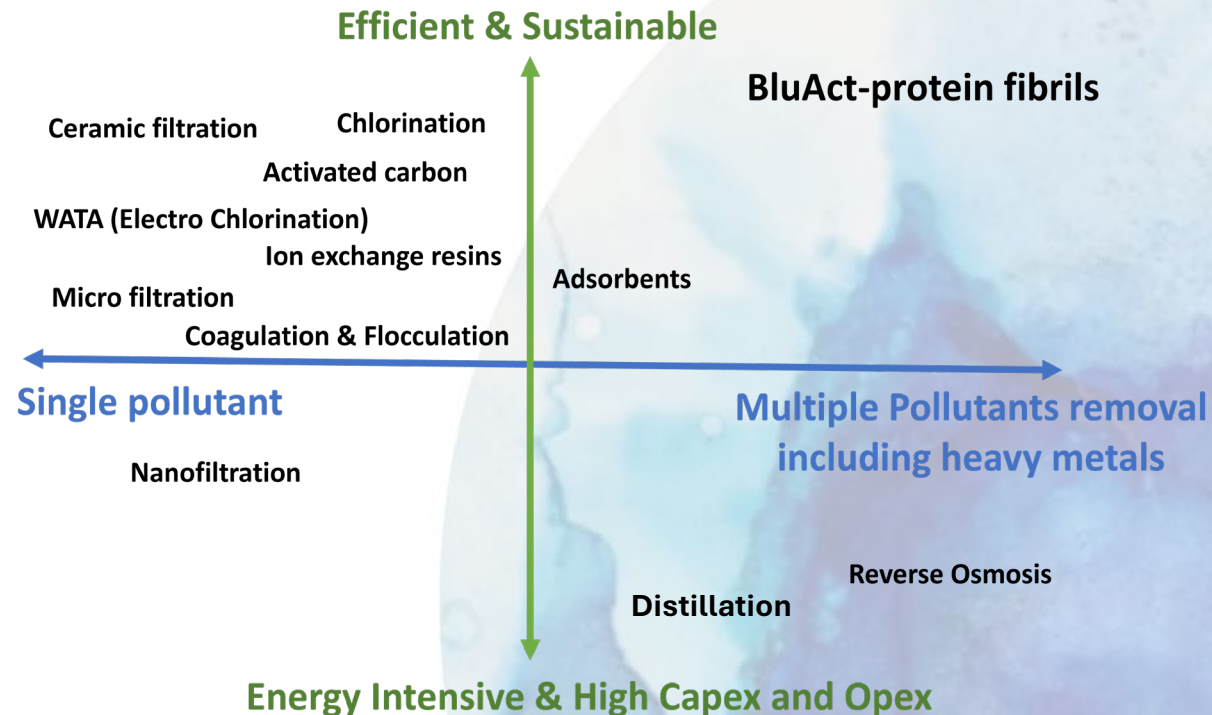
**80% OPEX savings
(compared to RO)**

4



**89% energy savings
(compared to RO)**

**Plus:
Sustainable
Scalable
Recovery of
metals
Universal**





Thanks

Do you want to know more?

www.bluact.com



Herberth Pacheco
Director of the NGO
SABAvida in Peru

Experience in the implementation of technology to remove heavy metals from water for human consumption in rural Peru

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Experience in applying a technology to remove heavy metals from drinking water in the rural context of Peru



1. The problem: heavy metals in water for human consumption



Arsenic
Arsenic, cadmium
Arsenic, lead
Lead

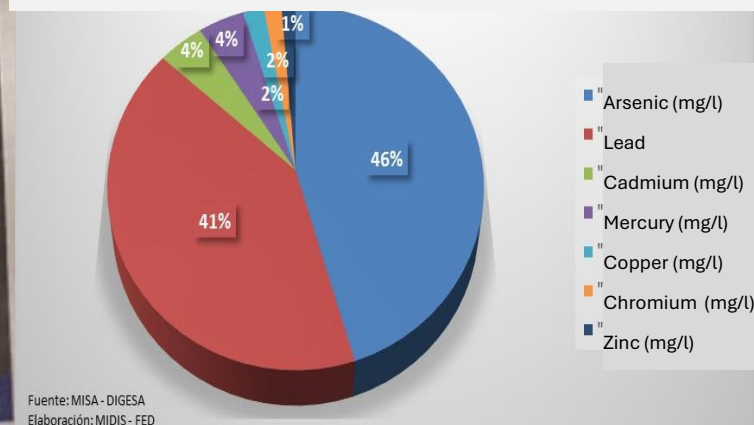
**+ 6 million
(20%) people
potentially at risk of
exposure to arsenic
and other metalloids.**

Source: Viceministerio de Salud Pública. Informe Especial N° 060-2020-JAMC-DENOT-DGIESP/MINSA

1. The problem: heavy metals in water for human consumption



Cases of presence of heavy metals exceeding the maximum permissible limits in water supply systems in villages in rural areas



- Pollution of heavy metals in drinking water represents a serious threat for human health.
- The Peruvian Ministry of Housing, Construction and Sanitation considers the integration of technologies to remove heavy metals from water sources as one of the problems yet to be solved.
- The National Plan for Sanitation for 2022-2026 recognizes the problem of drinking water contaminated with heavy metals and plans the development and validation of technological solutions for their removal.

2. Project Objective

Through a pilot study, validate the efficiency and effectiveness of membrane-filter technology for the removal of heavy metals from drinking water



1

Household filter



Made of a casing and a cartridge, as well as a system that measures and digitally displays the liters of filtered water and indicates when the cartridge must be replaced.

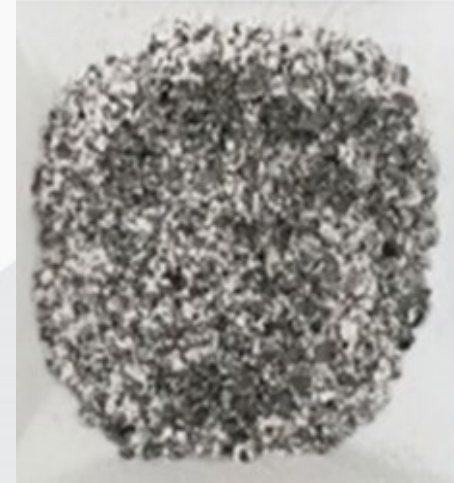
Treatment capacity: 4,000 – 8,000 liters/cartridge (lasts about 6 months)

Dimensions: 18 cm (w) x 31 cm (h) x 17 cm (d)

Costs of treatment: 13 – 7 USD/m³

2

Granular filtration material



Filtration for collective (several households) systems with hybrid granules, composed of a mixture of amyloid protein fibers and porous activated carbon, highly efficient to remove heavy metal ions.

Treatment capacity : 40 – 70 m³/ kg granulate material

Dimensions: The product is sold in smalll sacks of 20-25 kilos.

Costs of treatment : 0.44 – 0.15 USD/m³

3. Results:

Small filters at household level



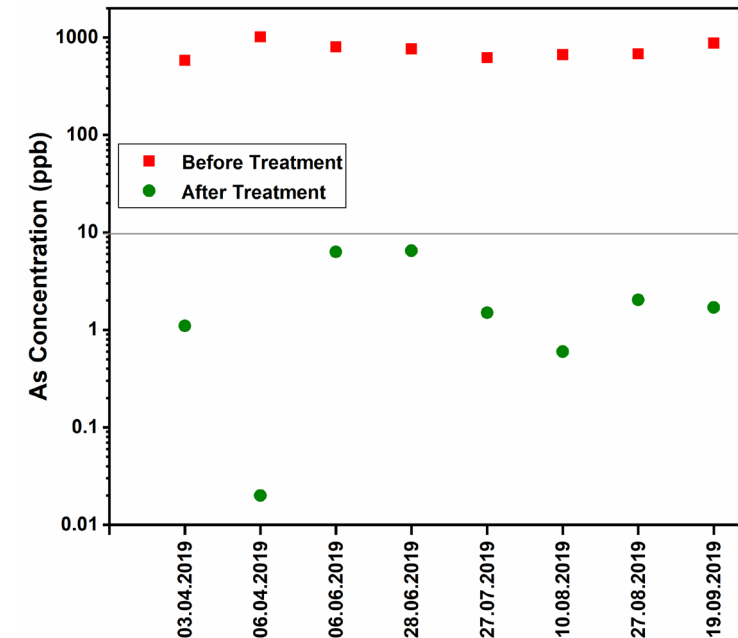
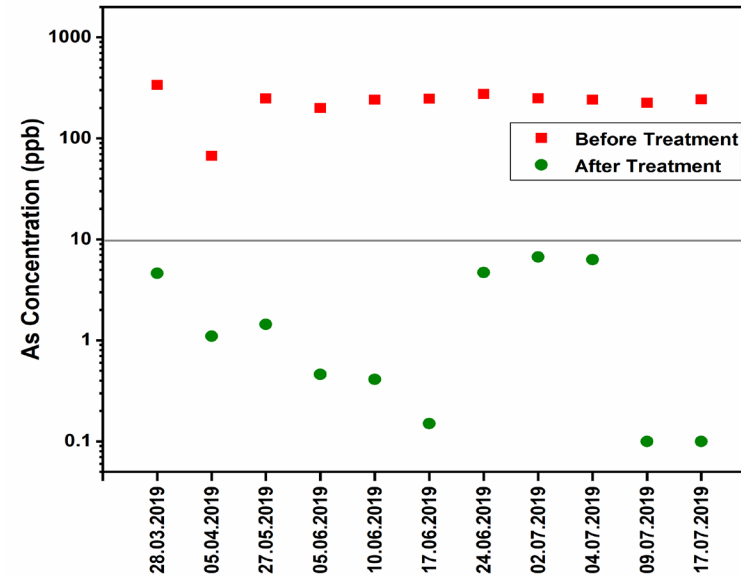
The validation
of household
filter models
was initiated

- Families participate in the entire process
- End-users' motivation and interest



3.Results:

Small filters at household level



3.Results:

Small-scale collective (multi-households) filters



Village of Poquera Inclan - Tacna

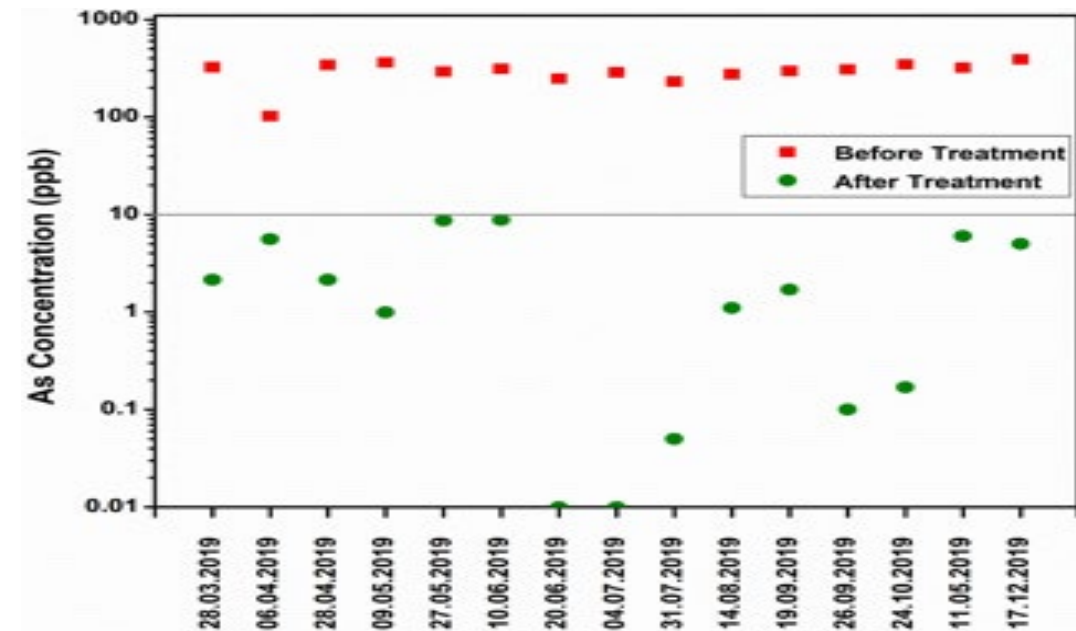
Following
positive
results,
the project
was scaled up
to collective
filters



**Compact plant in Torata - Moquegua
Sector Jorge Chavez B**

3.Results:

Small-scale collective filters



3. Results:

Scaled-up implementation in new community-level water systems



Plant in operation
Community of Tala – Torata – Moquegua
 $Q_{max} = 0.70 - 2.0$ lt/sec
AngloAmerican Quellaveco



Plant in operation
Community Coscore Torata – Moquegua
 $Q_{max} = 0.65 - 1.5$ lt/sec
AngloAmerican Quellaveco

4. Lessons learned

- The family's **appreciation of water** is increased when water quality is improved.
- The technology is **adaptable** to the household and collective level. Its use is recommended in **collective** systems because of costs - O&M (economy of scale).
- The regeneration of the product allows it to be **reused** before being replaced, increasing its useful life. Care must be given to properly dispose of the removed material.
- Official and **regulatory recognition** of the technology is an important factor in facilitating its scaling-up
- **Availability** of the product in the **local market** is needed to facilitate access and massive use.
- **Capacity building** of families, operational staff and project managers is key to facilitate proper use and scaling up of this technology.



5. Final remarks

The technology has great potential:

- Improves the removal of heavy metals from water
- Easy to retrofit into existing rural water treatment infrastructure
- Affordable
- Easy to use and maintain





Divya Kashyap Sharma
Deputy Head of Cooperation
at SDC in India

Experience using BluAct technology in the context of India

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Discussion and conclusions

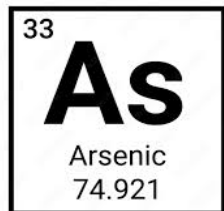
Questions & Answers

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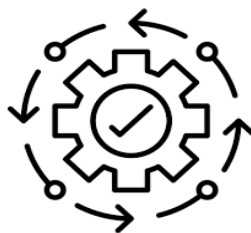
Questions that cannot be addressed during the webinar will be answered in writing and sent after the event.



Summary and conclusions



High exposure



**Effective
removal**



Reusable



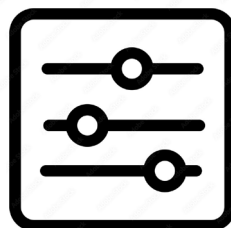
Cost-efficient



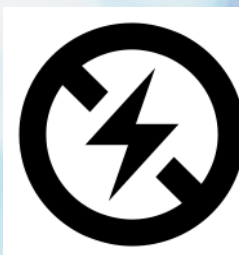
**Government
commitment is
key**



Simple

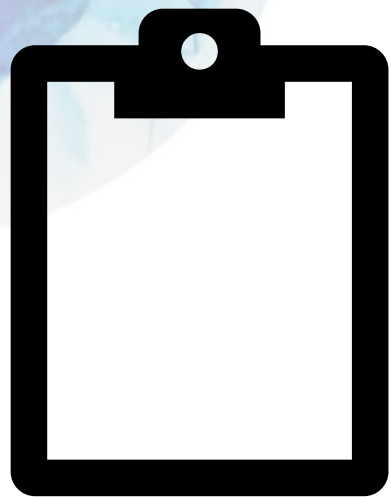


Adaptable



**No power
required**

Final Poll



Complete the poll that appears on your screen.



Thank you!

The publication of the pilot project in Peru:

Connect with BluAct:

sreenath@bluact.com

Join the Community:

RésEAU – <https://dgroups.org/sdc/reseau>

CDE – <https://www.sdc-cde.ch/en/become-a-network-member>

