

Solarsenic Technology, Novel system for removing arsenic from contaminated water:

Progress in intellectual property indicators

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"Closing the Gender Gap in Intellectual Property – Women and the Sustainable Development Goals" , WIPO, April 2024

Description

- Arsenic (As) removal system from groundwater, surface water or mining effluents with As up to 30.000 ppb.
- Based on a versatile nanomaterial able to remove “in a single step” different species of arsenic (As III and As V) among other contaminants.
- Obtains strict water quality levels such as drinking water or irrigation (As < 10 ppb or < 100 ppb, respectively).

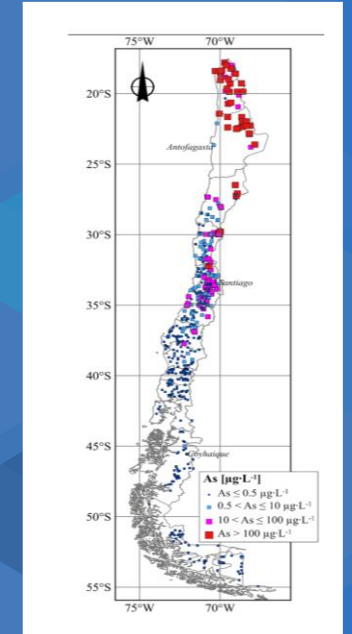
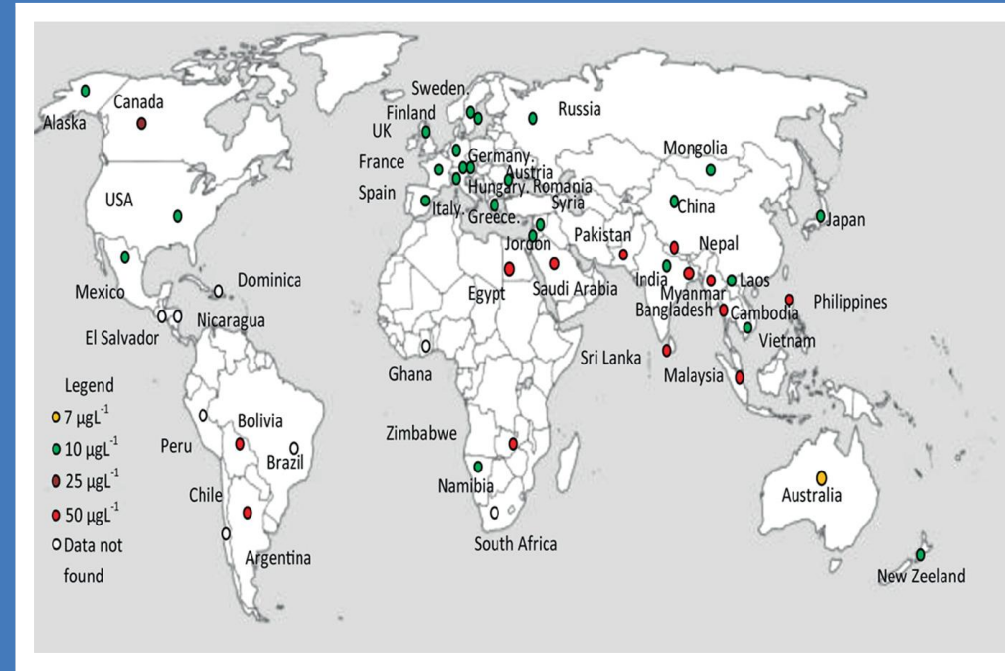


Arsenic (As) in water resources and its impacts



Problem

Opportunity



J. Tapia, 2019

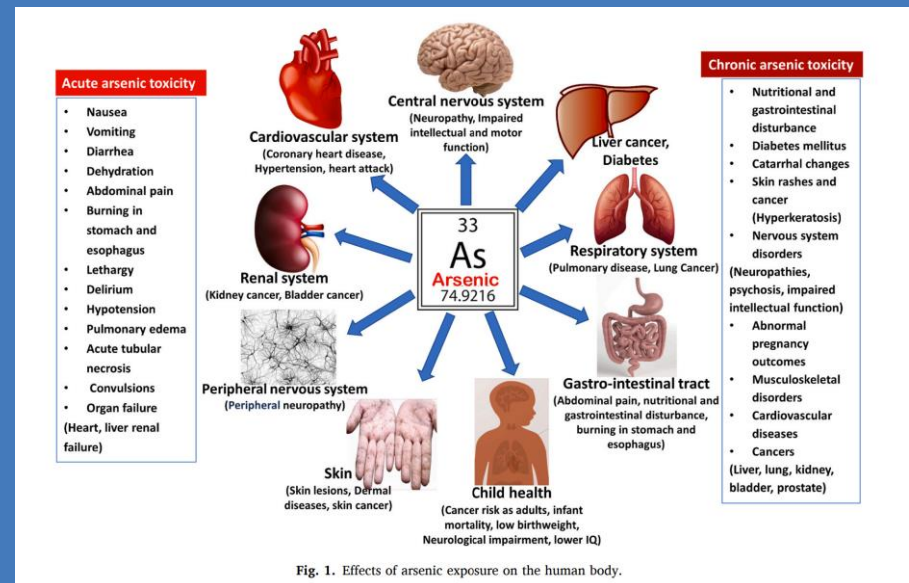


Fig. 1. Effects of arsenic exposure on the human body.



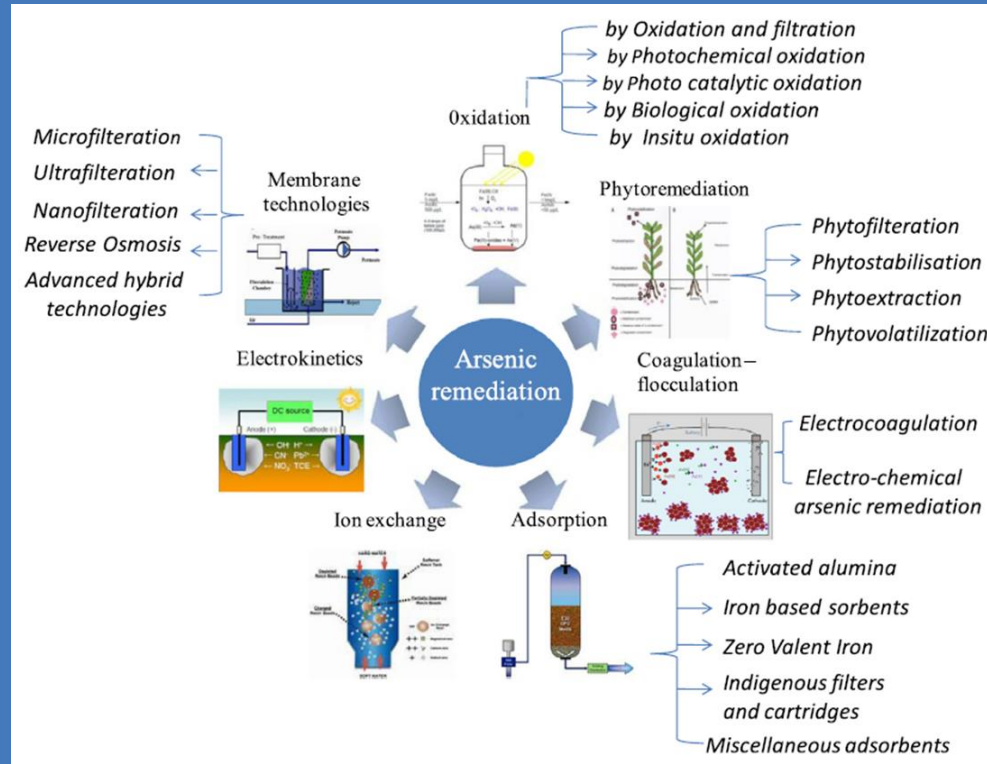
As < 10 ppb (ug/L)

Md. Shiblur Rahaman, 2021

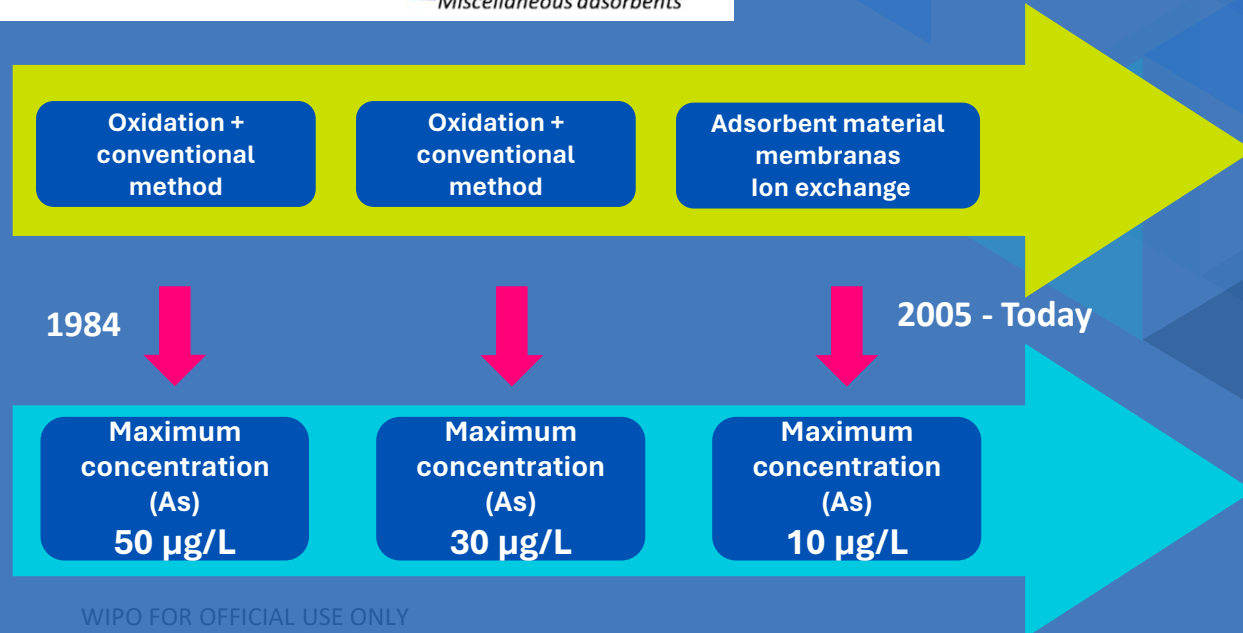




Problem Opportunity

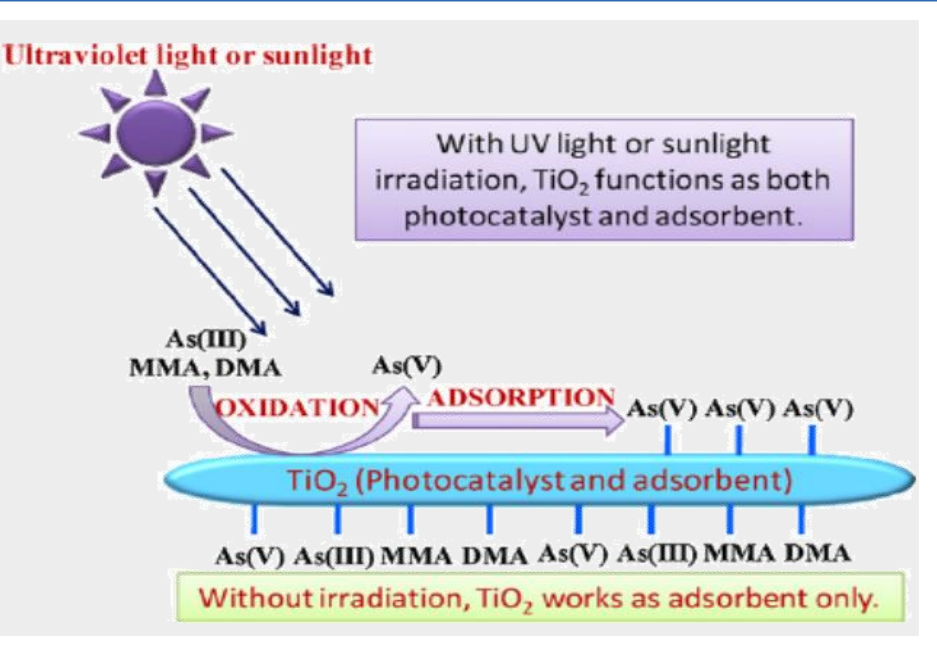


Technologies for removing arsenic



Solarsenic Technology

Novel nanomaterial (TiO₂-NP)

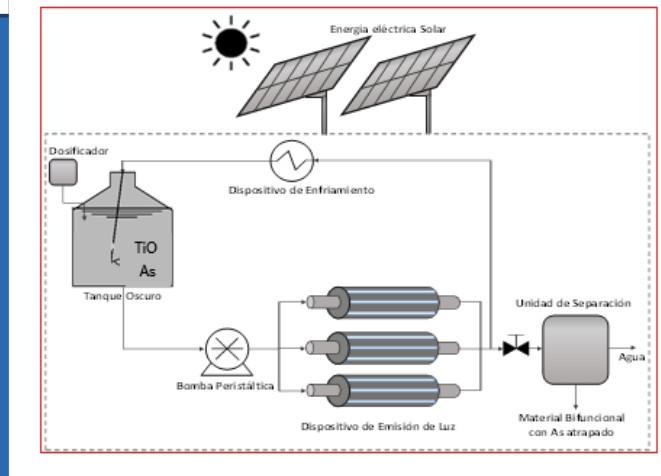
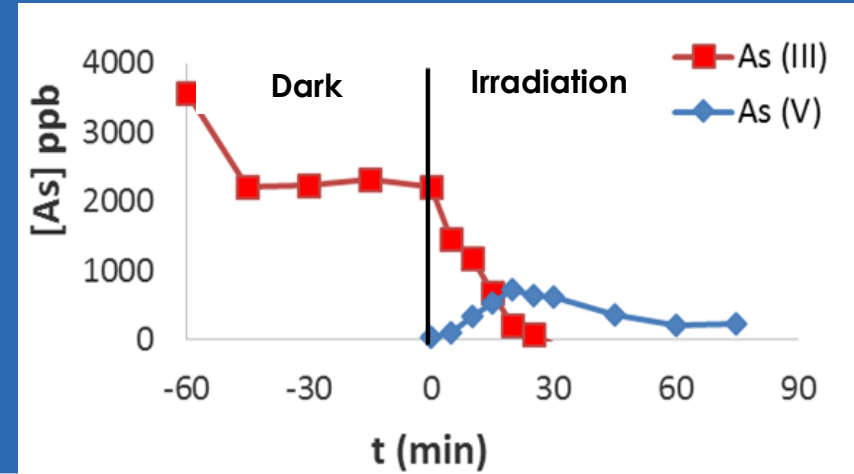
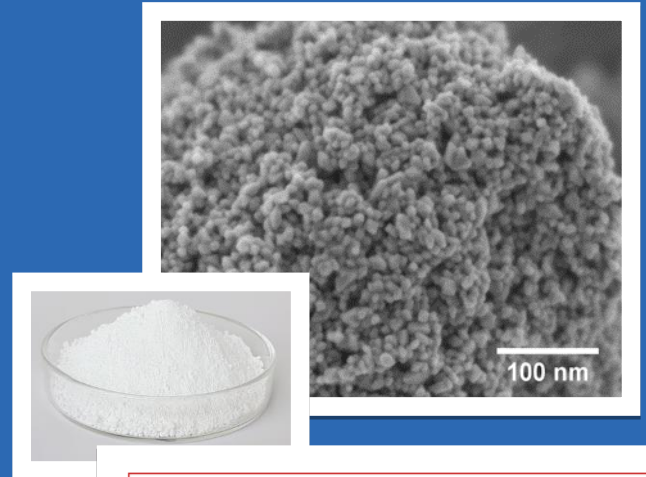


Adapted from D. Harikishore Kumar Reddy, 2014

Photo-oxidation As (III)



Adsorption As (V)



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Value proposal

Technology Attributes

Cost-effective



Effective removal of arsenic (III and V) reaches drinking water quality standard ($\leq 10 \mu\text{g/L}$) from waters with up to 30.000 ppb ($\mu\text{g/L}$) and high physicochemical variability.

Costs below current systems.

Easy operation



Simple contact under stirring of contaminated water and nanomaterial powder.

Zero dependence on the electrical grid



Autonomous with incorporation of solar radiation.

Low environmental impact



Reuse and regeneration of nanomaterial.

Waste stabilization



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Technological traction



Level of development

Pilot plant with a capacity of 200 L/h.



TRL

TRL 7, validated in a real environment



Validation Tests

Surface and groundwater of the Loa River-Chile with As up to 5.000 ug/L
Mining effluents with As up to 30.000 ug/L.



Intellectual Property indicators

Invention patents

- Patent Granted 2022, INAPI, CL2018001987
- Patent Applied 2022, PCT, PCT/CL2022/050015
- Patent Applied 2023, WO2023/150896A1

Trademark SolArsenic



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IP Strategies



CL2018001987
Patent Granted (2022)

Material, method and
system to remove As
from surface water.



WO2023/150896
Patent Applied (2022)

Improvement of method
and material



PCT/IB2023/058180
Patent Applied (2023)

Improvements of the
material to remove As and
other contaminants.

Application for real mining
waste.



1570275
Trademark (2023)

SOLARSENIC



Funding history

2016-2018
Fondef R&D,
~USD 250.000



2019

H2020 Project, Novel
Advanced Filters for
Heavy Metals



2020-2022

Fondef IT, ~USD 400.000

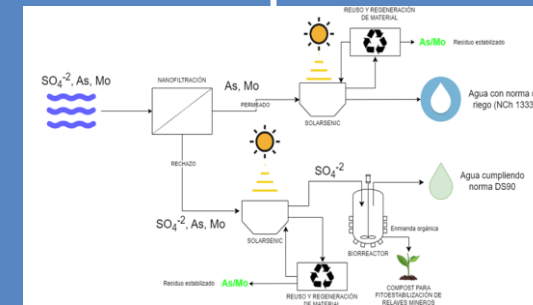


2022-2023 Sequía, ~USD
400.000

2024-2026 FONDEF, ~USD



Current



Laboratory Prototype, 7L/h

- Laboratory scale validation, TRL 4
- Patent application (1st).
- Papers, conferences, and community outreach



Pilot plant, 200L/h

- Validation in real environment, TRL 7
- Patent granted.
- New patent application (2nd).
- Commercial agreement with Glaubén Ecology.
- Presentations, conferences and



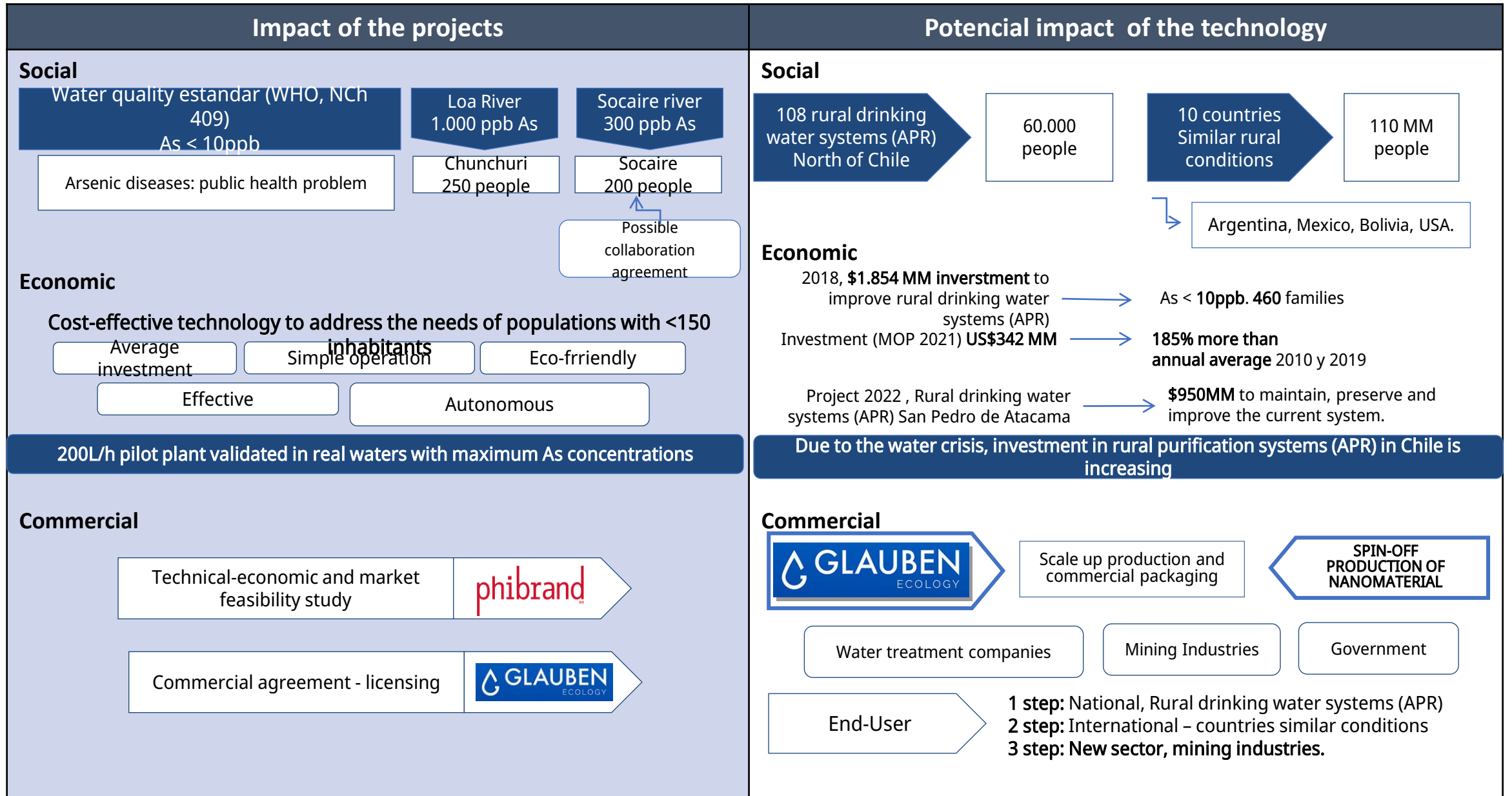
New application Mining effluent

- Integrated system for mining effluents.
- Laboratory scale validation, real water, TRL4.
- New patent application (3rd)

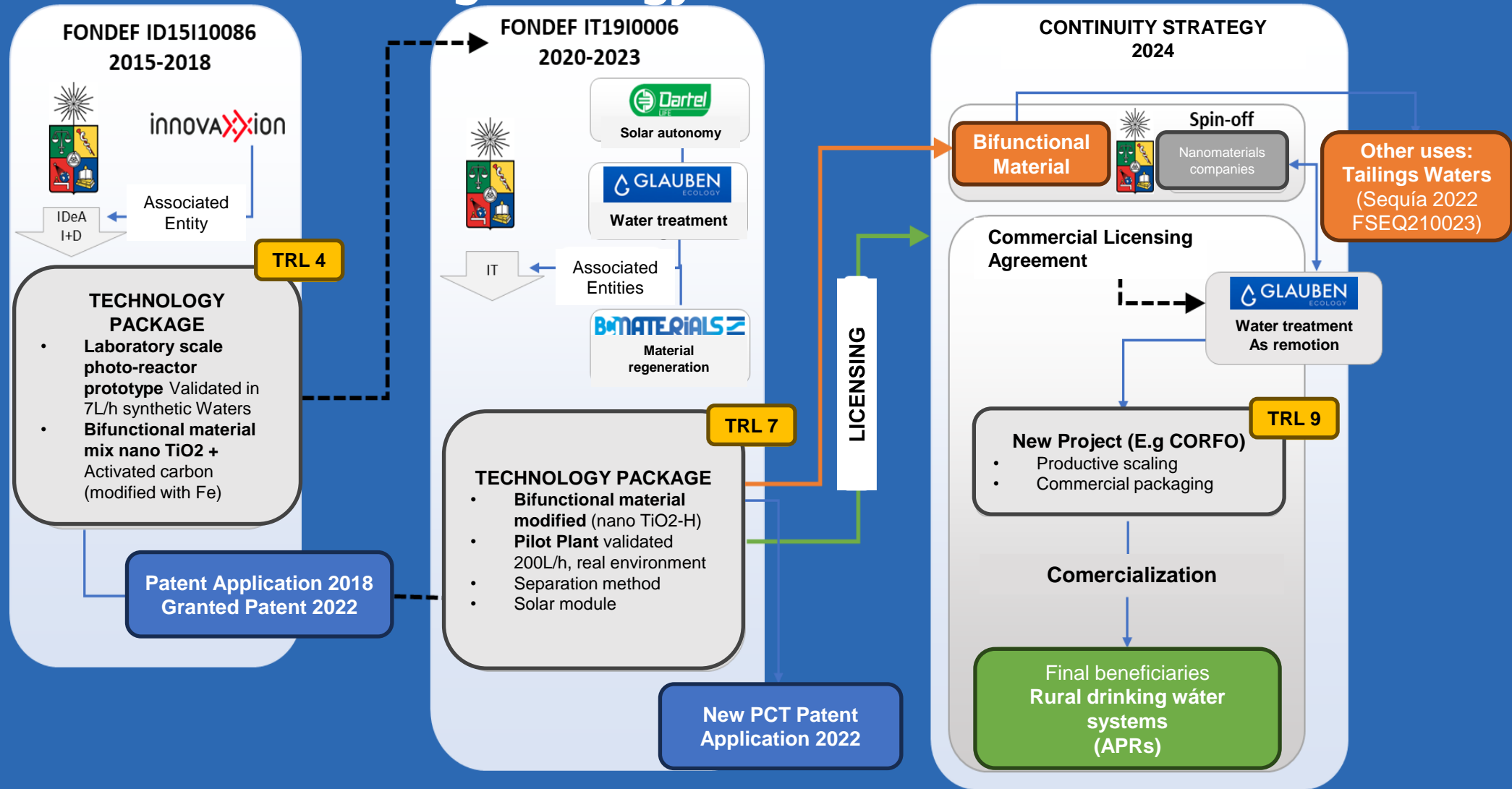


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Technology Impact



Marketing Strategy



Road to a Spin - Off



**MASSIVE PRODUCTION OF THE
NANOMATERIAL**



Researchers
U. Chile



Glauben Ecology
Company



Nanomaterials
Company



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PhD. Andreina García
Nanotechnology for water
treatment



PhD. Santiago Montserrat
Hydraulic System



PhD. Humberto Estay
Process Engineering



PhD. Maibelin Rosales
Material Science



Multidisciplinary Team



- PhD. Vania Rojas
- PhD.(c) Marcela Quintero
- Eng. Rodrigo Quezada
- Eng. Giovanni Arredondo
- Eng. Wladimir Paz
- Eng. Constanza Vázquez



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Awards and Honours Research and Innovation

- Recognition "25 Women in Latin American Science, 2023", by 3M Company.
- Felipe Alvarez Award, 2023, for innovation contribution
- Distinction from the WIPO, Women Project in STEM areas in Latin America, 2023.
- Recognition for scientific and innovation contribution, University of Chile, 2022.
- Recognition from the Chilean Academy of Sciences, 2019 for the quality of research as a young researcher.



Andreina García es reconocida como una de las "25 mujeres en la ciencia 2023"

Fue seleccionada entre las científicas latinoamericanas cuyas investigaciones están impactando la vida diaria de personas y comunidades. La investigadora lidera un proyecto para remover arsénico de aguas contaminadas.

Marzo 2023,
<https://ingenieria.uchile.cl/noticias/203041>



SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY 	2 ZERO HUNGER 	3 GOOD HEALTH AND WELL-BEING 	4 QUALITY EDUCATION 	5 GENDER EQUALITY 	6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY 	8 DECENT WORK AND ECONOMIC GROWTH 	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	10 REDUCED INEQUALITIES 	11 SUSTAINABLE CITIES AND COMMUNITIES 	12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION 	14 LIFE BELOW WATER 	15 LIFE ON LAND 	16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	17 PARTNERSHIPS FOR THE GOALS 	 SUSTAINABLE DEVELOPMENT GOALS

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