



30 years of bringing green ideas to LIFE

LIFE is 30 ...in Italy
Celebrazioni del trentennale del Programma per
l'Ambiente e l'Azione per il Clima (LIFE)



Webinar
LIFE IS ENVIRONMENT:
idee e soluzioni innovative per
«Economia circolare e qualità della vita»



Progetto LIFE BIOAs
Rimozione dell'arsenico dall'acqua
mediante un BIO-adsorbente innovativo
derivato dagli scarti del settore
agroindustriale
(LIFE19ENV/IT/000512)

Prof. Francesca Pagnanelli



Removal of As from water using innovative BIO-adsorbents produced from byproducts of the agro-industrial sector (01/09/2020 - 31/08/2023)

Coordinating Beneficiary:

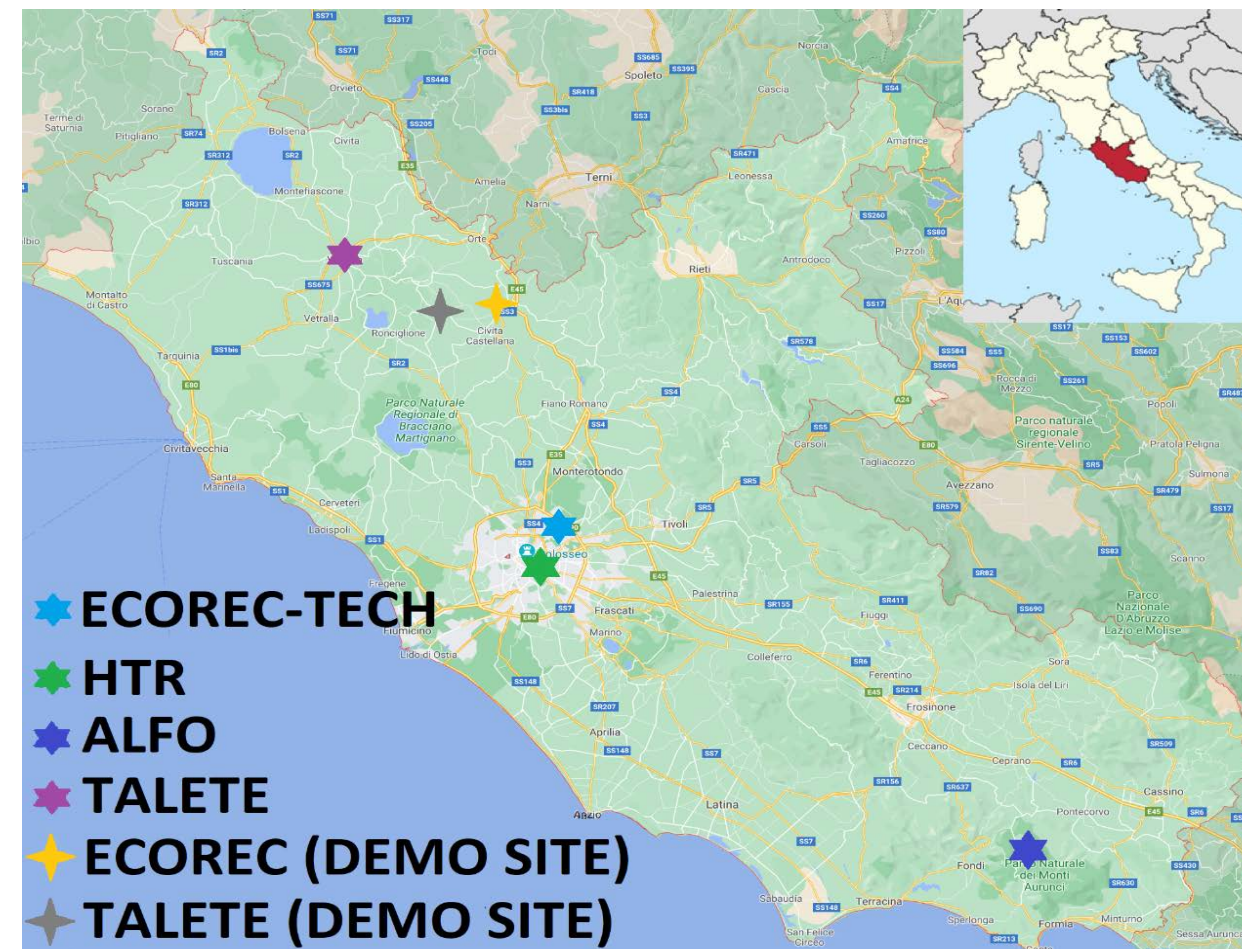
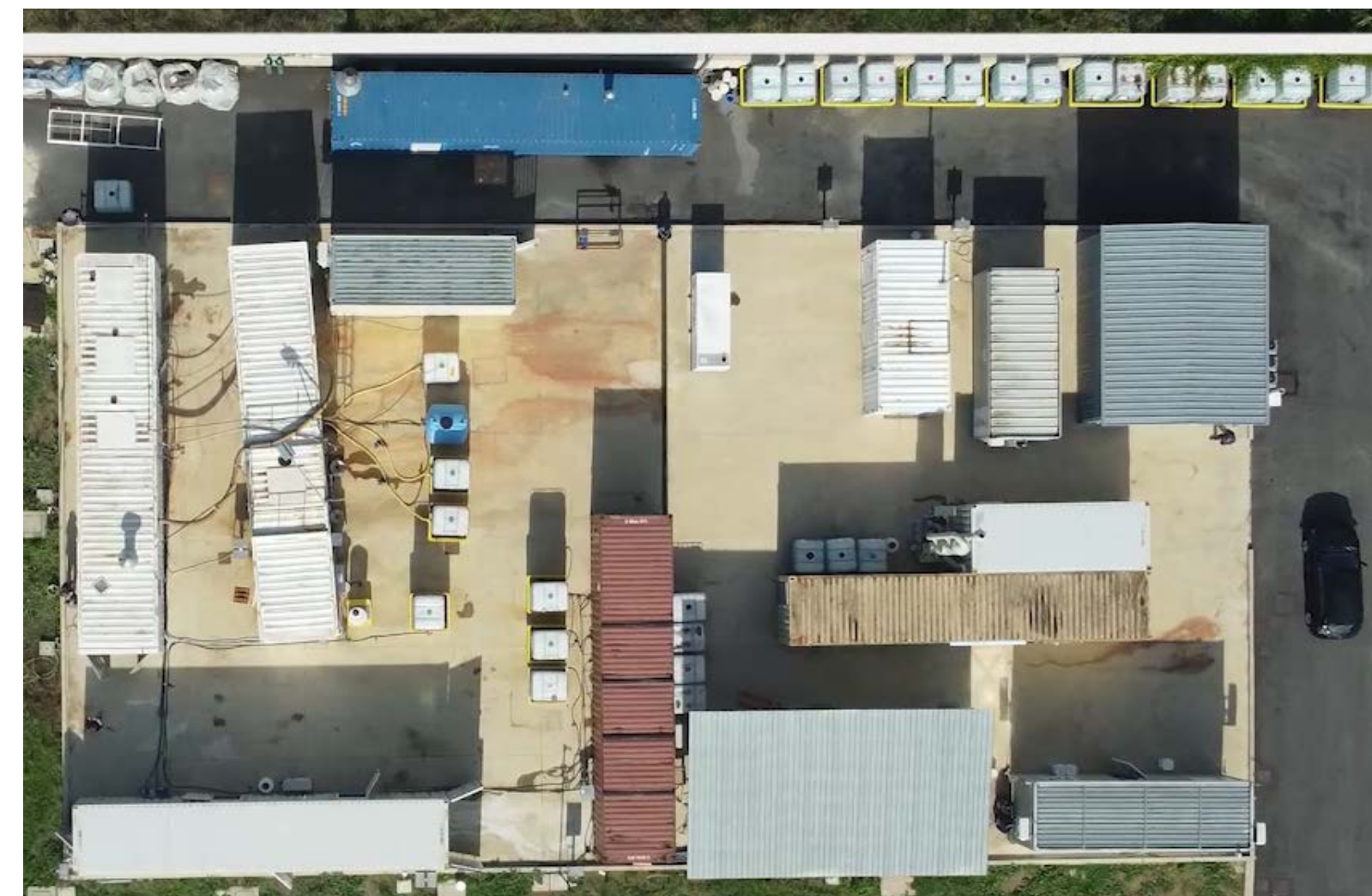
Eco Recycling S.r.l.

Spin off company of Sapienza University of Rome

Mission: technology transfer for recycling processes

Associated Beneficiaries:

- **ALFO ENERGIA** (*energy production and biomasses management*)
- **High Tech Recycling Research Centre**
- **TALETE SpA** (*management of public water in Viterbo Province*)
- **Technosind S.r.l.** (*engineering for technology transfer*)
- **Universidade de Évora** (*experts in activation and granulation*)



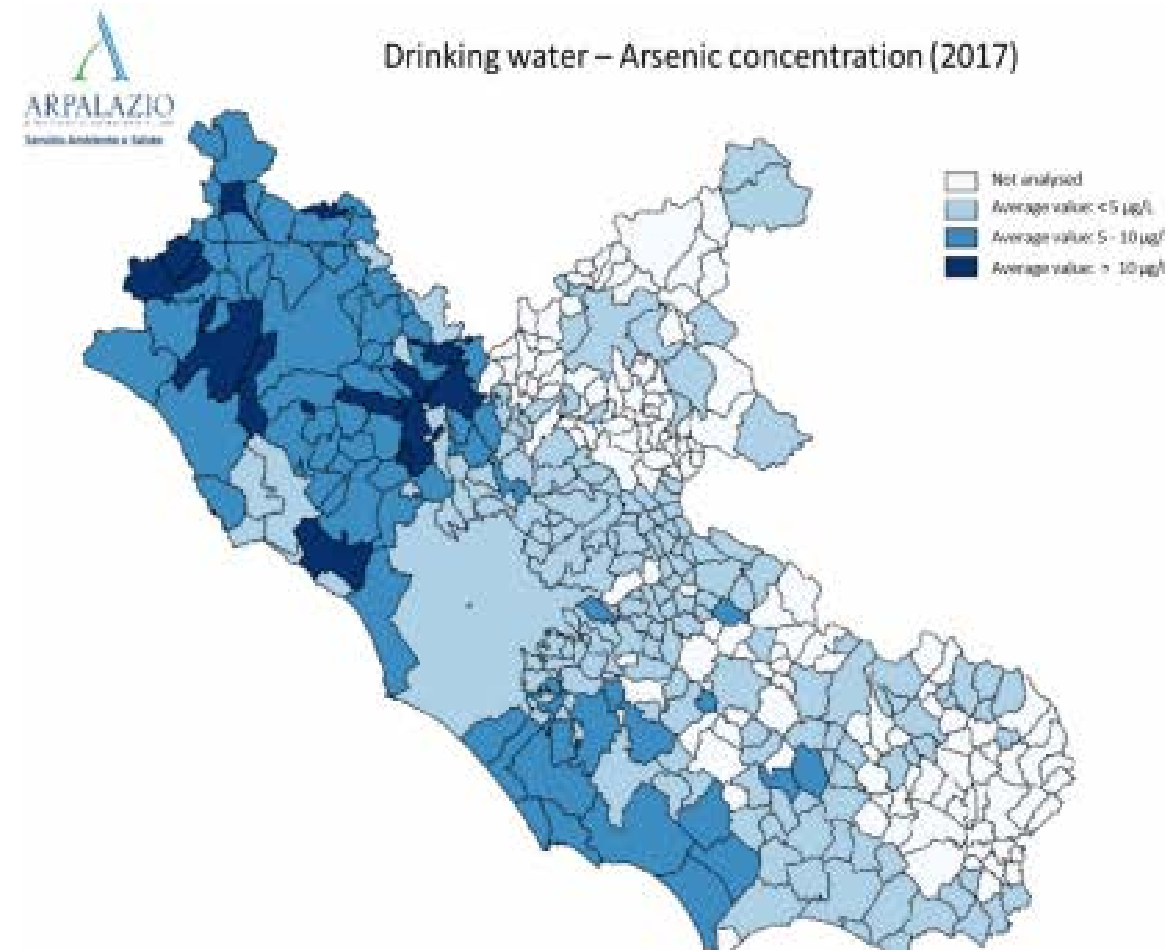


ENVIRONMENTAL PROBLEM TARGETED

Arsenic contamination of groundwaters due to antropogenic and natural sources.

EU has fixed As limit in drinking water to **10 µg/L** (Directive 98/83/CE).

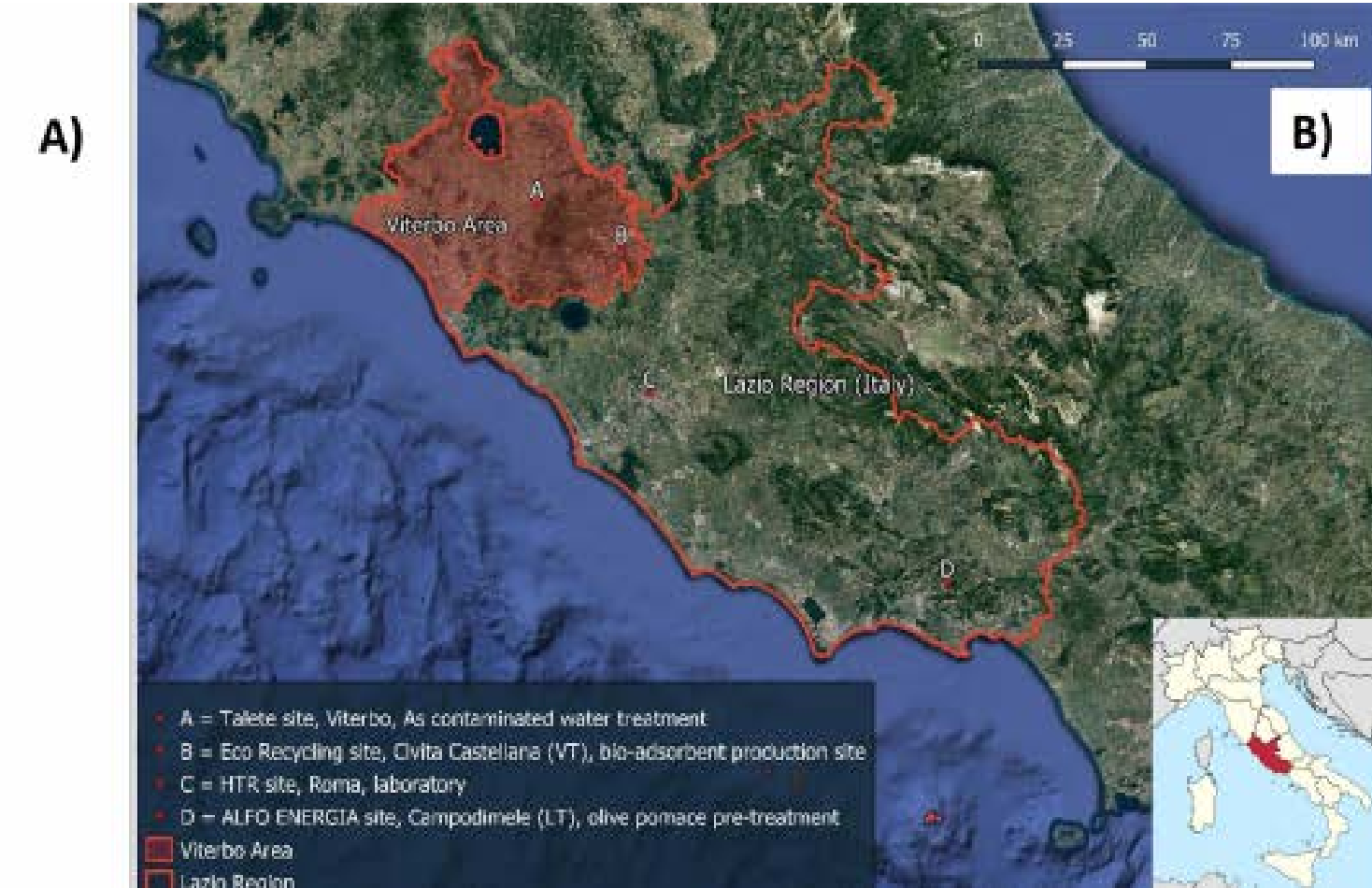
Several EU areas are still exceeding such limits: 10-1500 µg/L have been found in regions of Italy, Greece, Croatia, Germany, Portugal and other countries.



Current treatments use Fe oxide sorbents

9.5-12.8 €/kg (≈ 50% OPEX for treating As-containing drinking waters)

No efficient regeneration technique

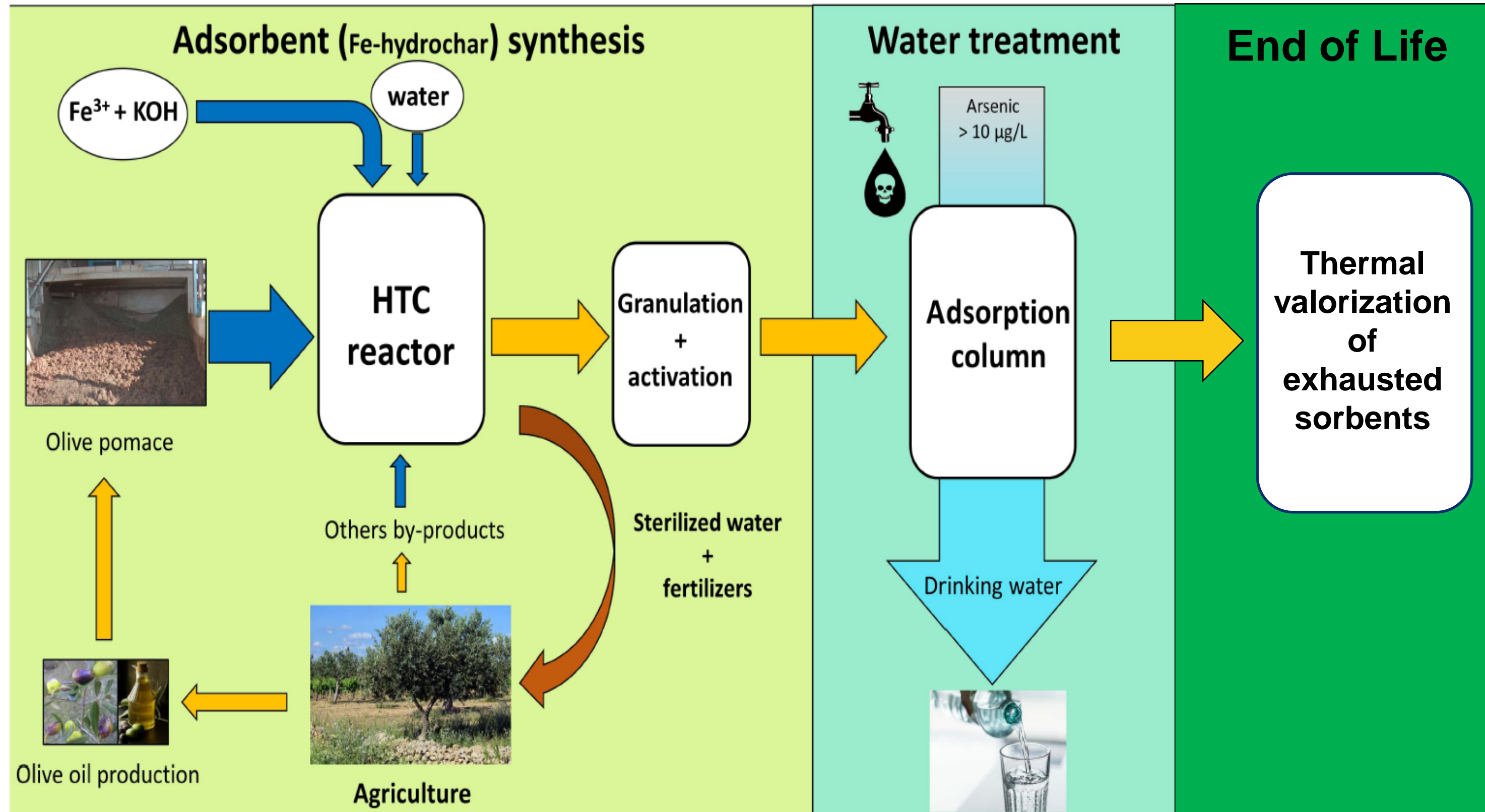


Granular Ferric Hydroxide, GFH





Solution proposed: low-cost adsorbent for As removal (Fe-hydrochar)



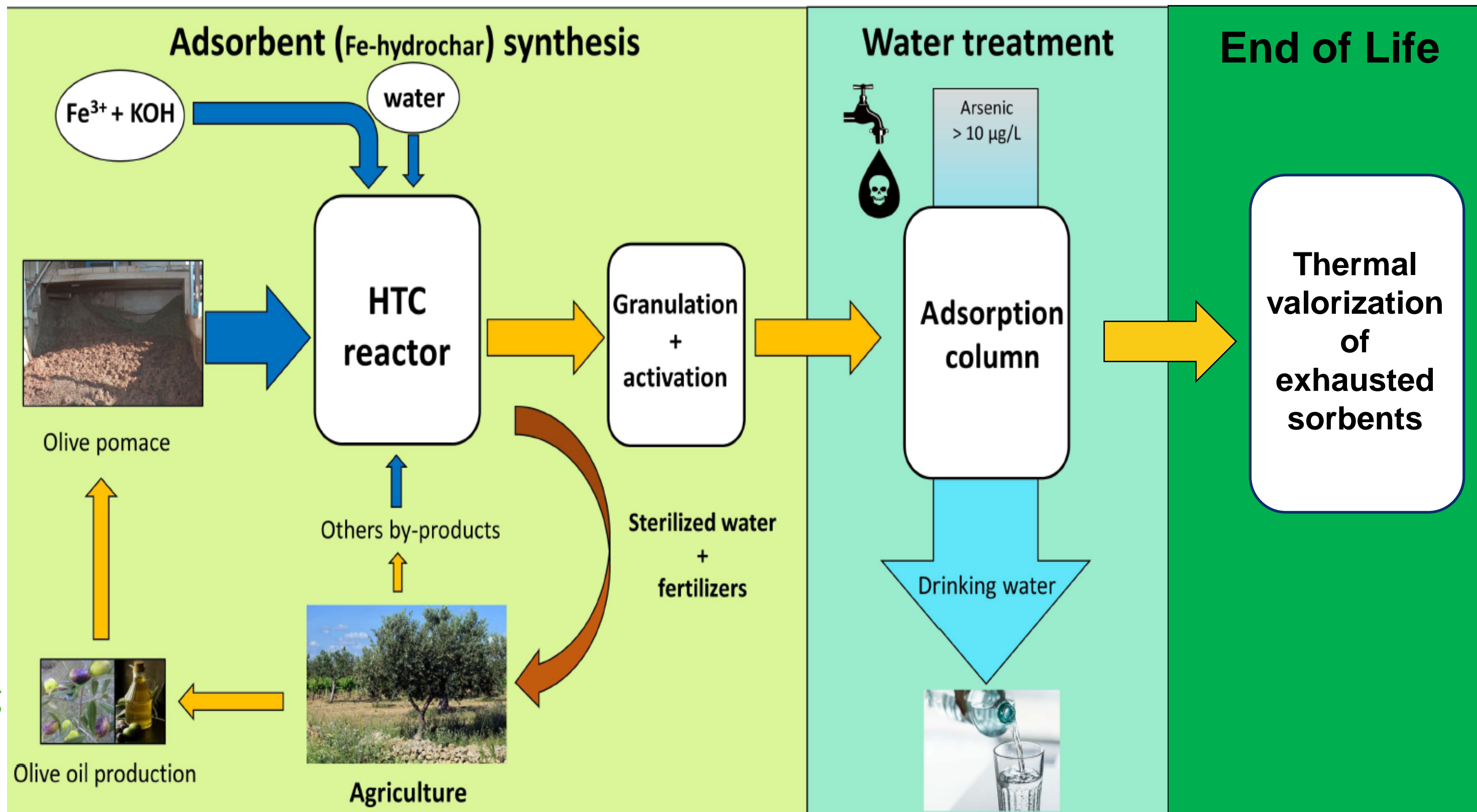


6 points of strength from an environmental point of view

1
Using a by-product of olive oil production

2
Reducing primary resource consumption (6% of Fe vs 60%)

3
Using an energy saving carbonization technology



4
0 waste (producing fertilizers from soluble organics in HTC)

5
Producing energy from exhausted sorbents

6
Reducing wastes to be disposed off (-85%)



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EC  **Recycling**

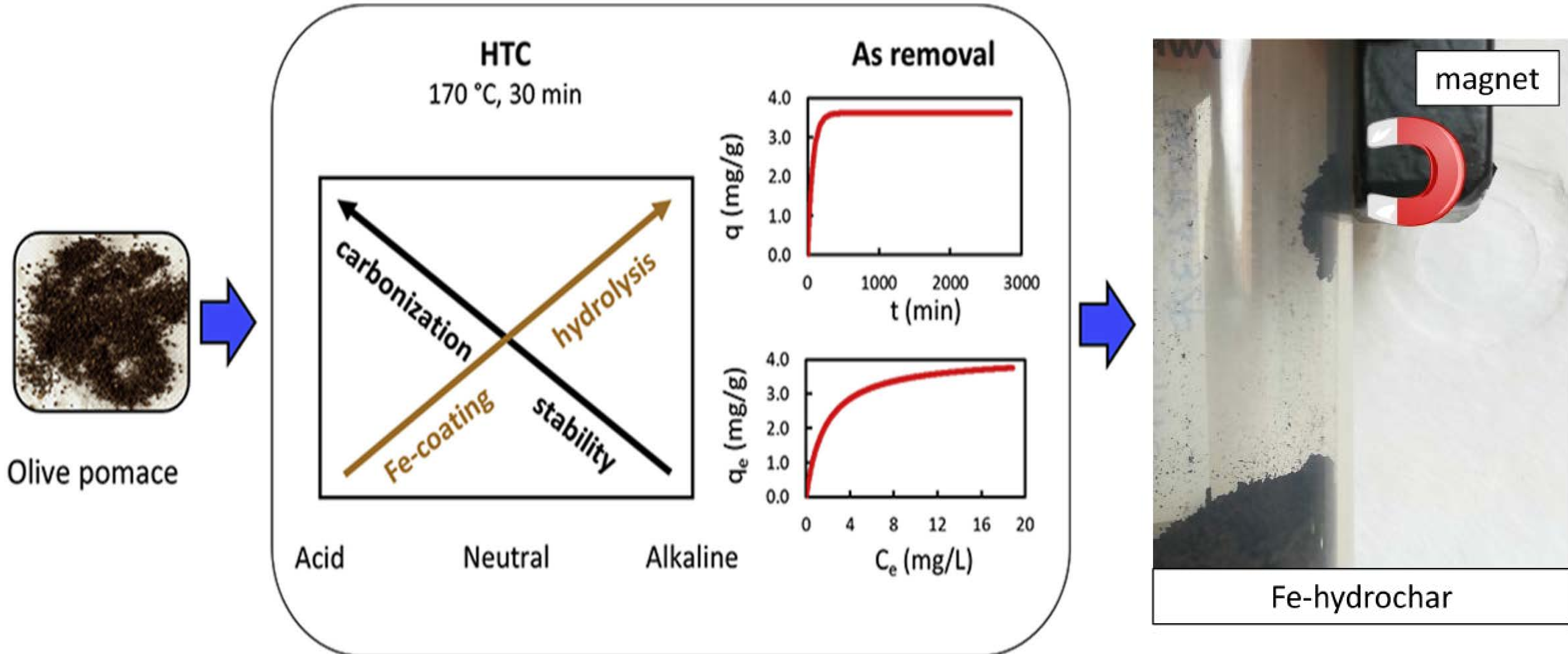


MAIN PROJECT TARGETS

- Design and Construction **Prototype for Fe-hydrochar production (6.3 kg/d)**
- Design and Construction **Prototype for water treatment (0.55 L/s)**
- Design and Construction **Portable prototype for outdoor water purification (4 L/h)**
- **Demonstration for Fe-hydrochar production** → 1500 Kg Fe-hydrochar
- **Demonstration for water treatment in Italy (Viterbo)** → 5000 m³ of As-bearing water at water depuration facility (240 inh eq)
- **Replication in Portugal:** Fe-hydrochar testing in portable water treatment prototype
- Transferability actions: **testing other biomasses and removing emerging organic pollutants (i.e. Bisphenol A)**
- Economic feasibility
- Environmental impact

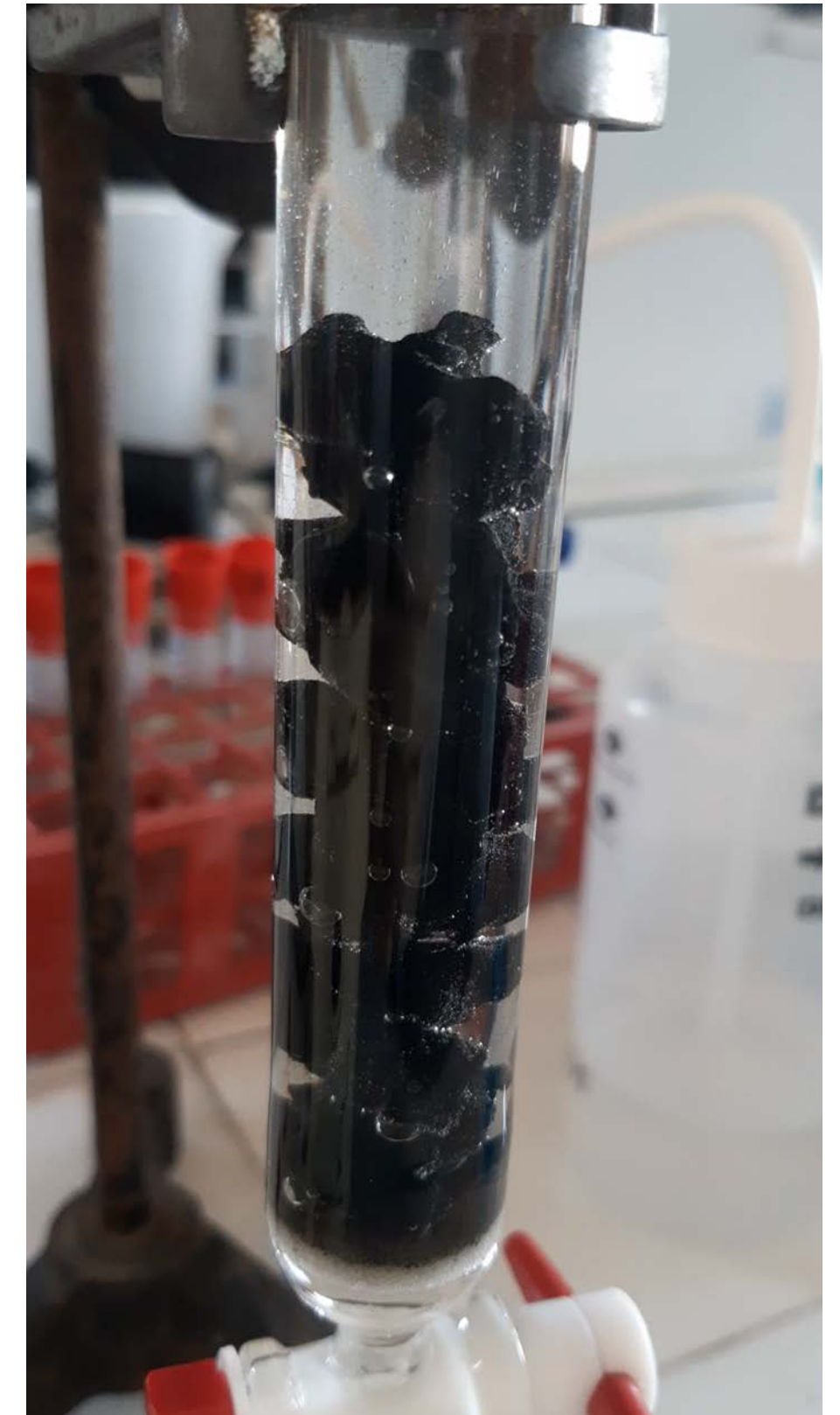
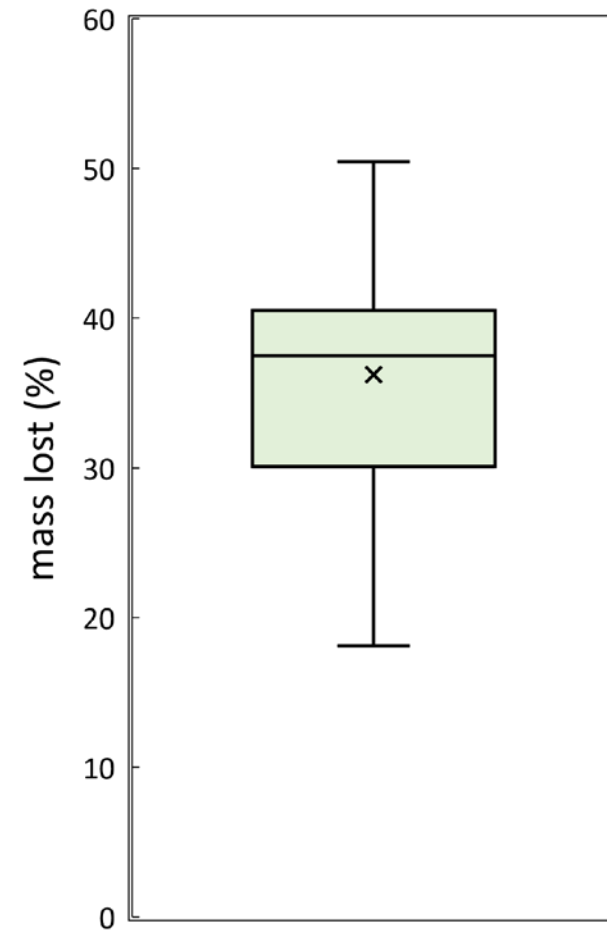
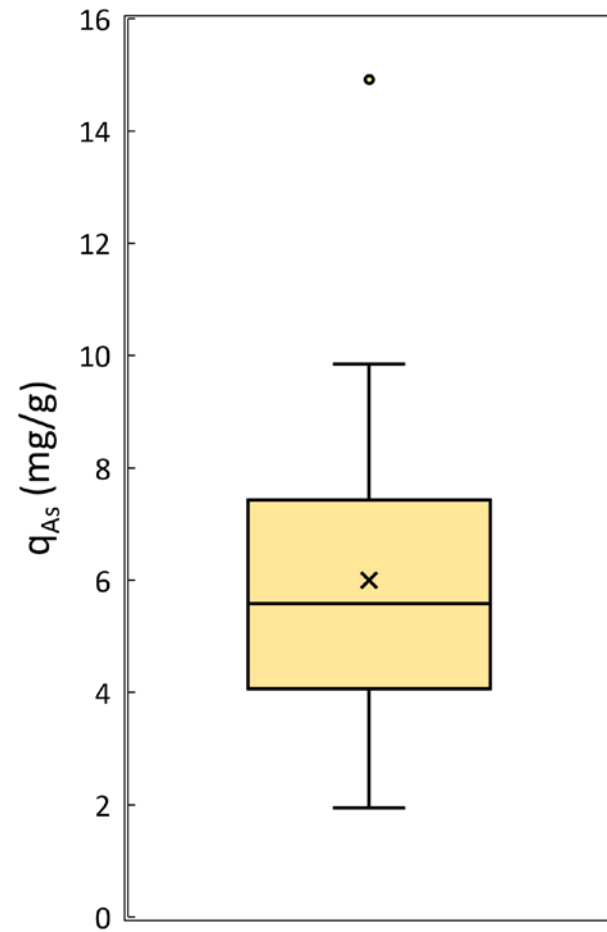


Supporting process design: Fe-hydrochar recipe optimization at Sapienza University





Supporting process design: agglomeration optimization at Evora University





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Eco Recycling



Design and construction of prototype for Fe-hydrochar production at Eco Recycling site





Design and construction of prototype for water treatment at Talete site



Compressor

Pumps

Reagent dosing station



Design and construction of the mobile prototype for water treatment in Portugal



Using portable water treatment prototype

For bio-adsorbent testing

- in Portuguese municipalities (Ponte de Sor and Vila Flor)

- in outdoor campaigns (basin of Zêzere river)



Demonstration activities for Fe-hydrochar production (in progress)



OLIVE POMACE



HTC
GRANULATION
THERMAL TREATMENT



Fe-HYDROCHAR



Expected impacts

Objective	Indicators		END OF THE PROJECT		AFTER 5 YEARS*	
			Estimated Impact (absolute value)	Estimated Impact (in %)	Estimated Impact (absolute value)	Estimated Impact (in %)
Improved Environmental and Climate Performance (including resilience to climate change)	Waste management	Exhausted adsorbent to disposal	1.275 ton/y	-85%	1020 ton/y	-85%
	Water	Improved water quality for As removal	5000 m3/y	+36%	18980000 ton/y	+65%
Better use of natural resources	Reduced resource consumption	Iron salt	0.808 ton/year	-90%	647 ton/y	-90%
Economic Performance, Market Uptake, Replication	Employment	Jobs created	7 FTE		28 FTE	
	Replication / Transfer	N . of replication / Transfer	2			
	Reduction of cost per unit	adsorbent cost	3.05 Euros / kg	-49%	2.05 Euros / kg	-66%
Communication, dissemination, awareness rising	Awareness raising	Number of entities/individuals reached/ made aware	1000 per year		1200 per year	
	Website	Number of contacts/download of materials	1000 per year		1500 per year	

* Industrial HTC plant in the Lazio region (Italy) producing 1200 t/y of Fe-hydrochar bio-adsorbent for the requirement of about 260'000 inhabitants equivalents

- Exhausted biosorbent can be gassified leaving only 15% solid residue to be disposed off
- 36% of the water demand of the Faleri area (Fabrica di Roma, Viterbo, Lazio) where public supply of drinking water was stopped because arsenic has a value of 40 µg/L
- Production of Fe-hydrochar bio-adsorbent needs 6% of iron against 60% of GFH
- Estimated cost of the Fe-hydrochar bio-adsorbent is 2.8 euro/kg against 6 euro/Kg for GFH



Quote

Further technical information and updates available in the project web-site

<https://lifebioas.eu/>

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Thank You!



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