AquaSPICE

Advancing Sustainability of Process Industries through Digital and Circular Water Use Innovations

AquaSPICE CS# 5 Agricola

Rezultate

The AquaSPICE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958396.

Despre proiectul Aquaspice – Horizon 2020

Numar proiect	958396	Acronim proiect	AquaSPICE
Titlu proiect	Advanced Sustainability of Process Industries through Digital and Circular Water Use Innovation		
Data de inceput	01.12.2020		
Durata/data de final	51/54 luni – 28.02.2025 ?31.05.2025		

Cost total € 12 157 849

Contribuție UE € 10 522 185

Coordonat de

RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN Germania

https://aquaspice.eu/

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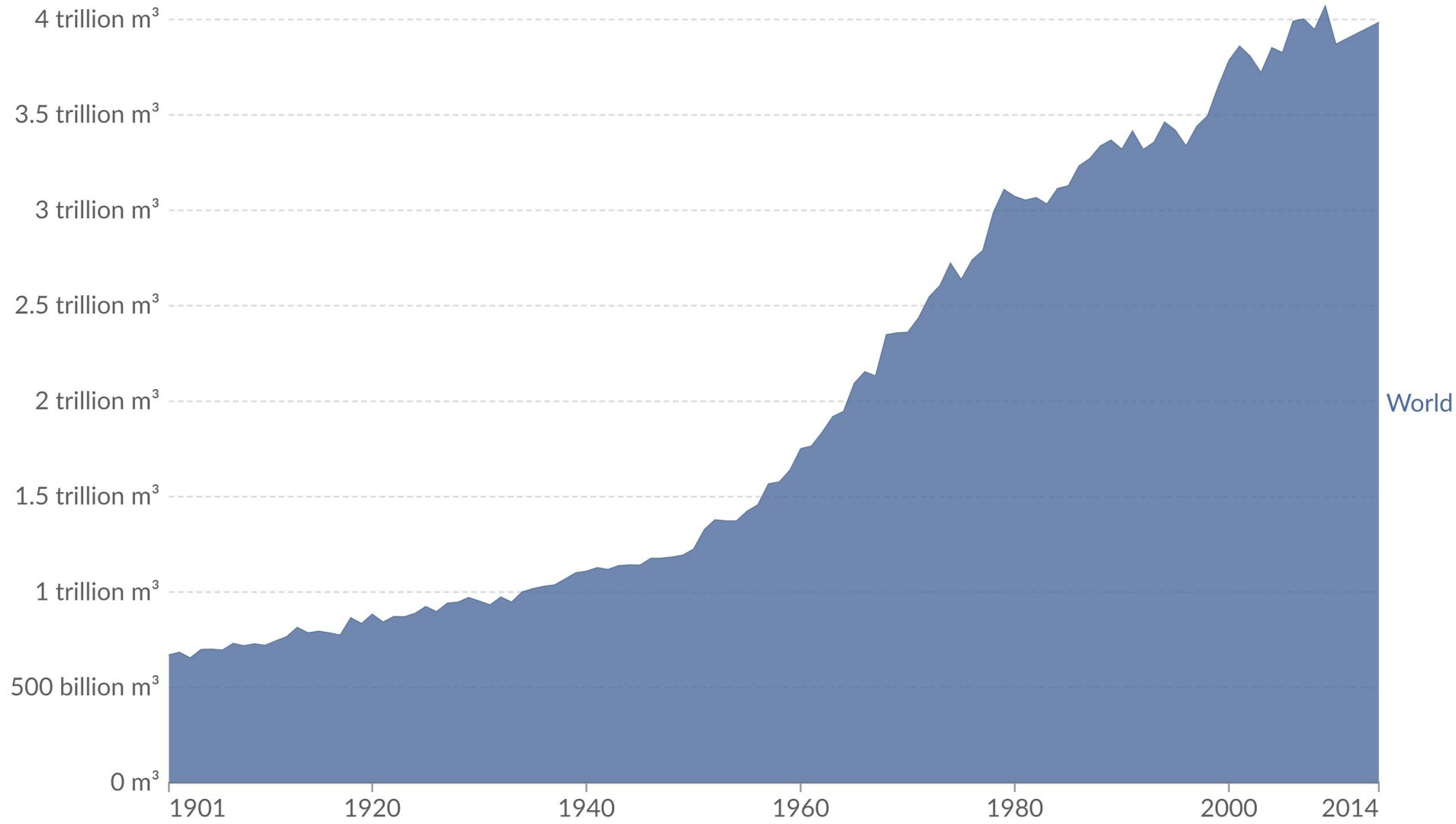
Global freshwater use over the long-run

Global freshwater withdrawals for agriculture, industry and domestic uses since 1900, measured in cubic metres (m^3) per year.

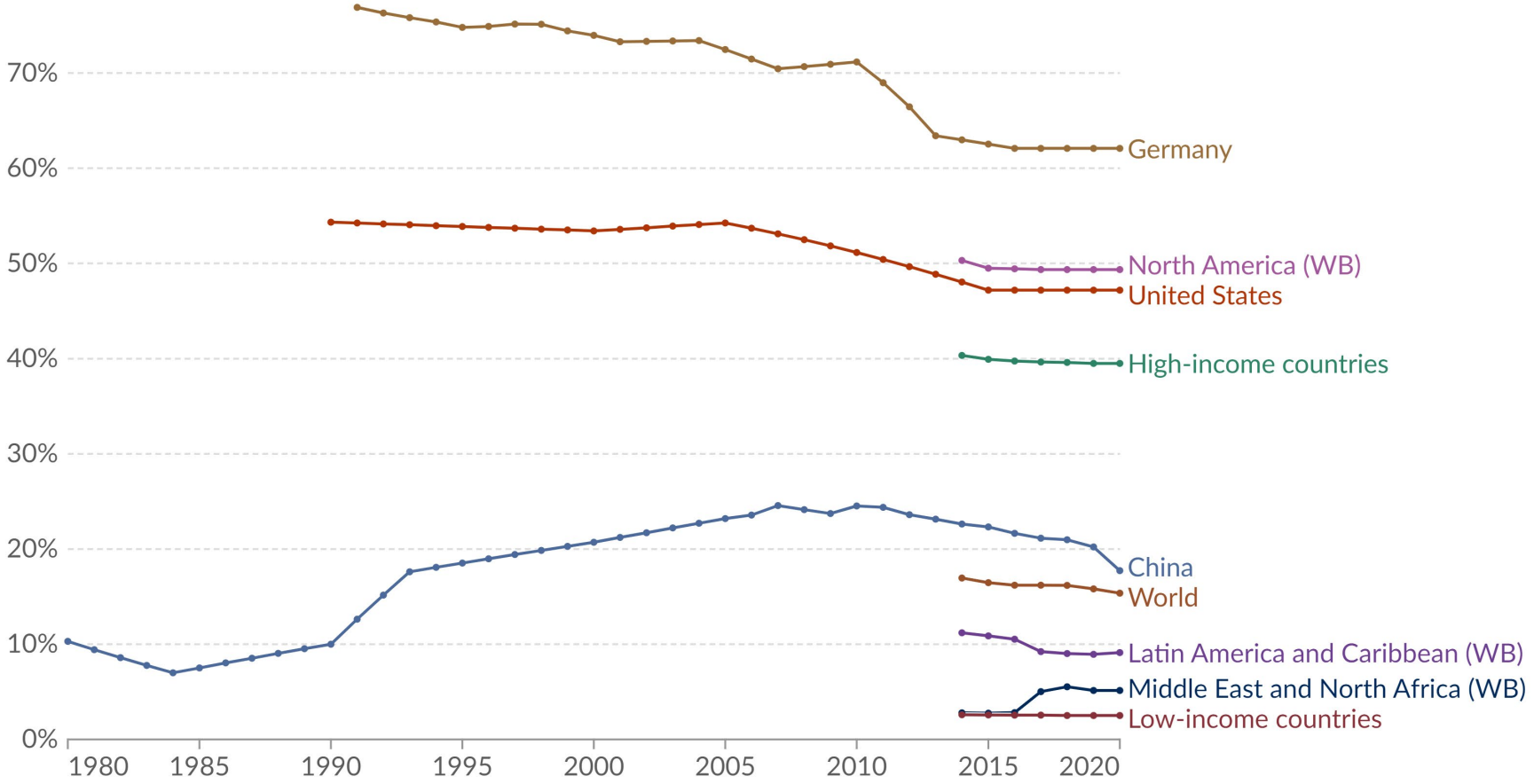
Our World in Data



Data source: Global International Geosphere-Biosphere Programme (IGB)

Industrial water as a share of total water withdrawals, 1980 to 2020

Industrial water withdrawals as a percentage of total water withdrawals (which is the sum of water used for agriculture, industry, and municipal purposes).



Data source: Multiple sources compiled by World Bank (2024)

OurWorldinData.org/water-use-stress | CC BY

Note: The industrial water sector refers to self-supplied industries not connected to the public distribution network. The ratio between net consumption and withdrawal is estimated at less than 5%. It includes water for the cooling of thermoelectric and nuclear power plants, but it does not include hydropower.

Deficitul de apa – water scarcity (water stress)

Apa poate lipsi din diferite motive: cerere mai mare decat oferta, infrastructura neadecvata, sau institutiile nu reusesc sa echilibreze nevoile tuturor.

Deficitul de apă este o problemă din ce în ce mai mare pe fiecare continent, comunitățile mai sărace fiind cele mai grav afectate. Pentru a construi reziliența împotriva schimbărilor climatice și pentru a servi o populație în creștere, trebuie adoptată o abordare integrată și incluzivă pentru gestionarea acestei resurse finite.

Deficitul de apă este un concept relativ. Cantitatea de apă care poate fi accesată fizic variază pe măsură ce cererea și oferta se schimbă. Deficitul de apă se intensifică pe măsură ce cererea crește și/sau pe măsură ce aprovizionarea cu apă este afectată de scăderea cantității sau calității.

Schimbările climatice înrăutățesc deficitul de apă. Impactul schimbărilor climatice face apa mai imprevizibilă. Stocarea apei terestre – apa reținută în sol, zăpada și gheața – este în scădere. Acest lucru duce la o penurie crescută de apă, care perturbă activitatea societății.

22 martie – Ziua Mondială a Apei

Case Studies

Goals

- Reduce Water by Reuse
- Optimization
- Digital Monitoring
- Smart Control

Industry	Case Study 1	Case Study 2	Case Study 3	Case Study 5	Case Study 6
Country	Netherlands, Germany	Italy	Belgium	Romania	Turkey
Focus	Technology Focus for Freshwater Intake Reduction	Water Treatment and Re-Use within Peroxide Production Units	Sustainable and Robust Water System for the Industrial Zone of Antwerp	Sustainable Water Use in Meat Production in the Circular Economy	Water Treatment and Re-use within Refinery
Goal					

Case Study 1: DOW

Technology Focus for Freshwater Intake Reduction

DOW Terneuzen (Netherlands)

- Cooling Tower Blow Down Reuse
- Site Condensate Reuse
- WaterCPS design and implementation

Reduce Water by Reuse:
Fresh water intake reduction by 20 %

Full digital smart control:
Design and implementation

DOW Böhlen (Germany)

- Improvement Raw Water Treatment
- Cooling Tower Blow Down Reuse
- Site Condensate Reuse
- WaterCPS design and implementation

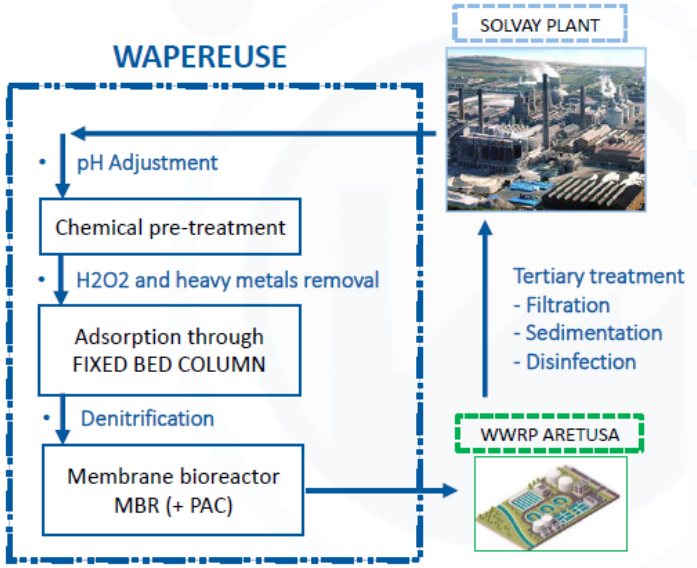
Reduce Water by improved Treatment and Reuse: Fresh water intake reduction by 20 %

Full digital smart control:
Design and implementation

Case Study 2: SOLVAY, ARETUSA (ITALY)

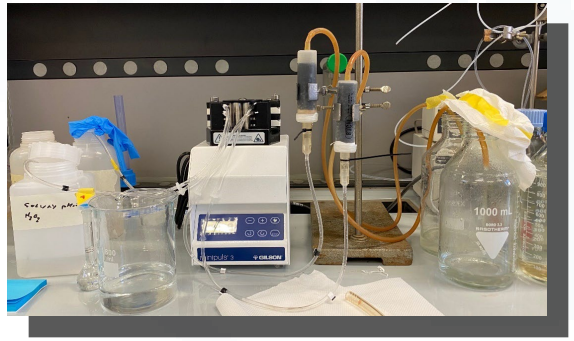
Water Treatment and Re-Use within Peroxide Production Units

- Water Reuse through treatment of waste water from peroxide and peracetic acid production at Solvay (WAPEREUSE) in pilot-scale
- WaterCPS design and implementation for WAPEREUSE system for optimization strategies



Reduce Water Intake by Reuse of Industrial Waste Water

Full digital smart control: Design and implementation

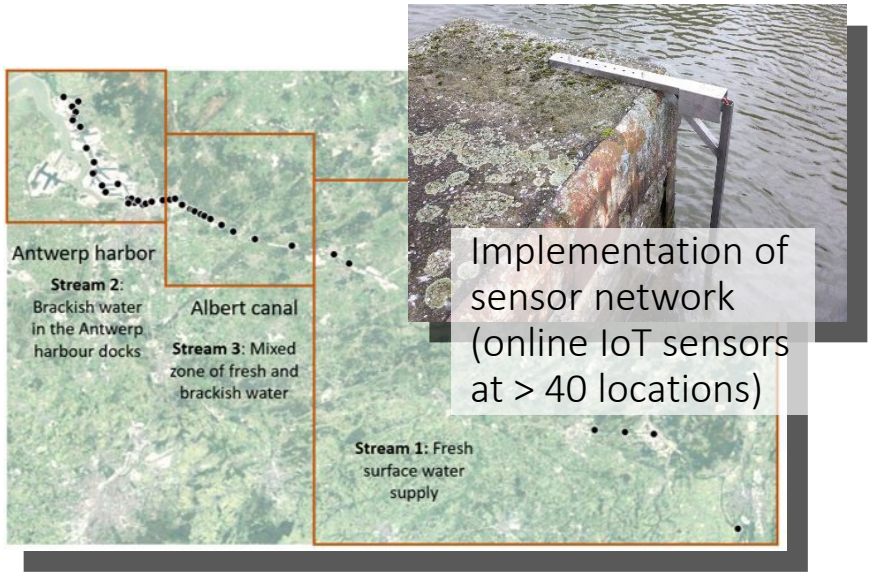


Case Study 3: BASF & Water-Link (Belgium)

Sustainable and Robust Water System for the Industrial Zone of Antwerp

Subcase 1:

Antwerp harbor and Albert canal



Implementation of sensor network (online IoT sensors at > 40 locations)

Digital monitoring:
Design and implementation

Subcase 2:

Water reuse and cooling water

- Cooling Tower Process Optimization and Digitalization for Water Intake Reduction
- Water Reuse of RO concentrate and steam cracker process streams

Reduce Water Intake by better Processes and Reuse

Digital monitoring of water treatment facilities: Design and implementation

Case study 6: TUPRAS (Turkey)

Water Treatment and Re-use within Refinery

- Reuse Water for Cooling Water and Firefighting Water
- Application of advanced Biological Treatment (Aerobic Granular Biomass) for Water Reclamation
- Separation process with regenerated membranes (end-of-life RO membranes from desalination plants)
- Smart Monitoring

Reuse produced Water and Material (End-of-Life Membranes)

Digital smart control:
Design and implementation

Case Study 5: AGRICOLA (Romania)

Sustainable Water Use in Meat Production in the Circular Economy

- Promotion of Circular Water Use in Romania and AGRICOLA group
- Establish CoP on Circular Economy in Bacau, Romania
- Production Process Optimization
- Integration of WaterCPS with several intelligent monitoring and management systems

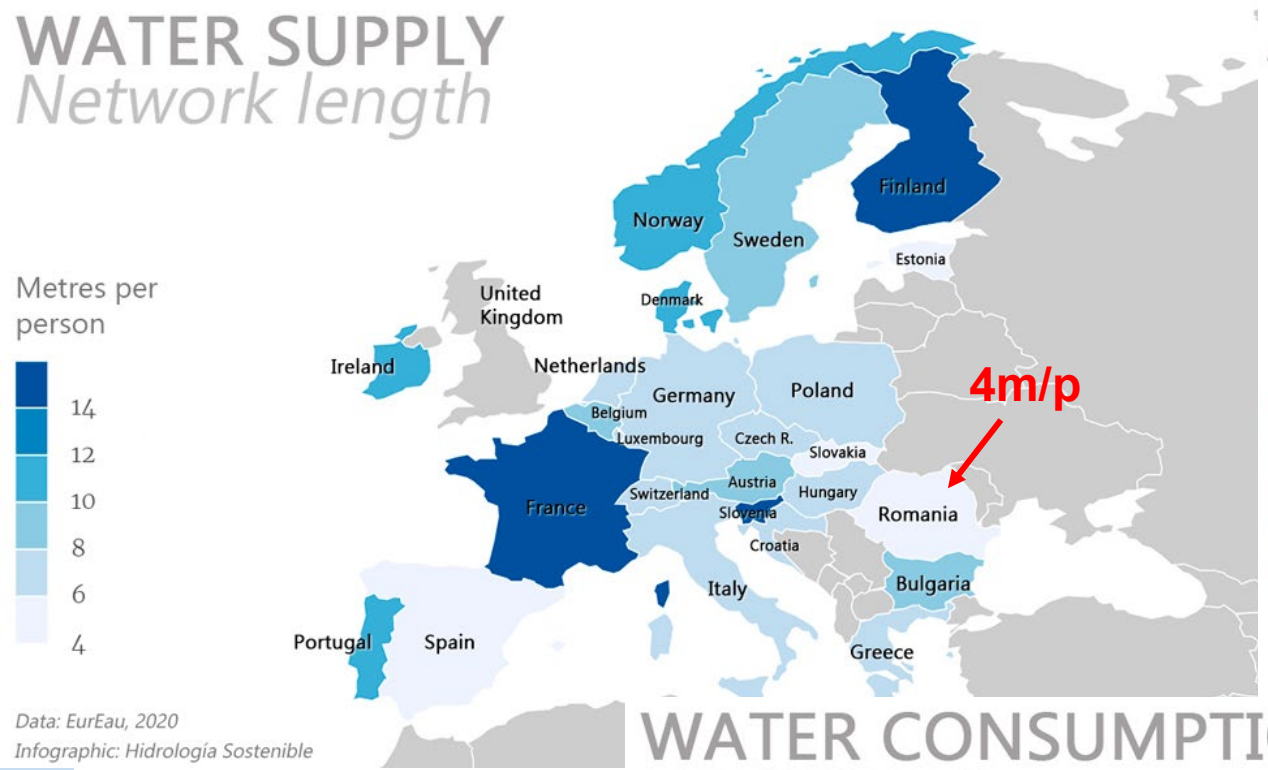
Process optimization

WaterCPS: Design and implementation

Current situation in Romania

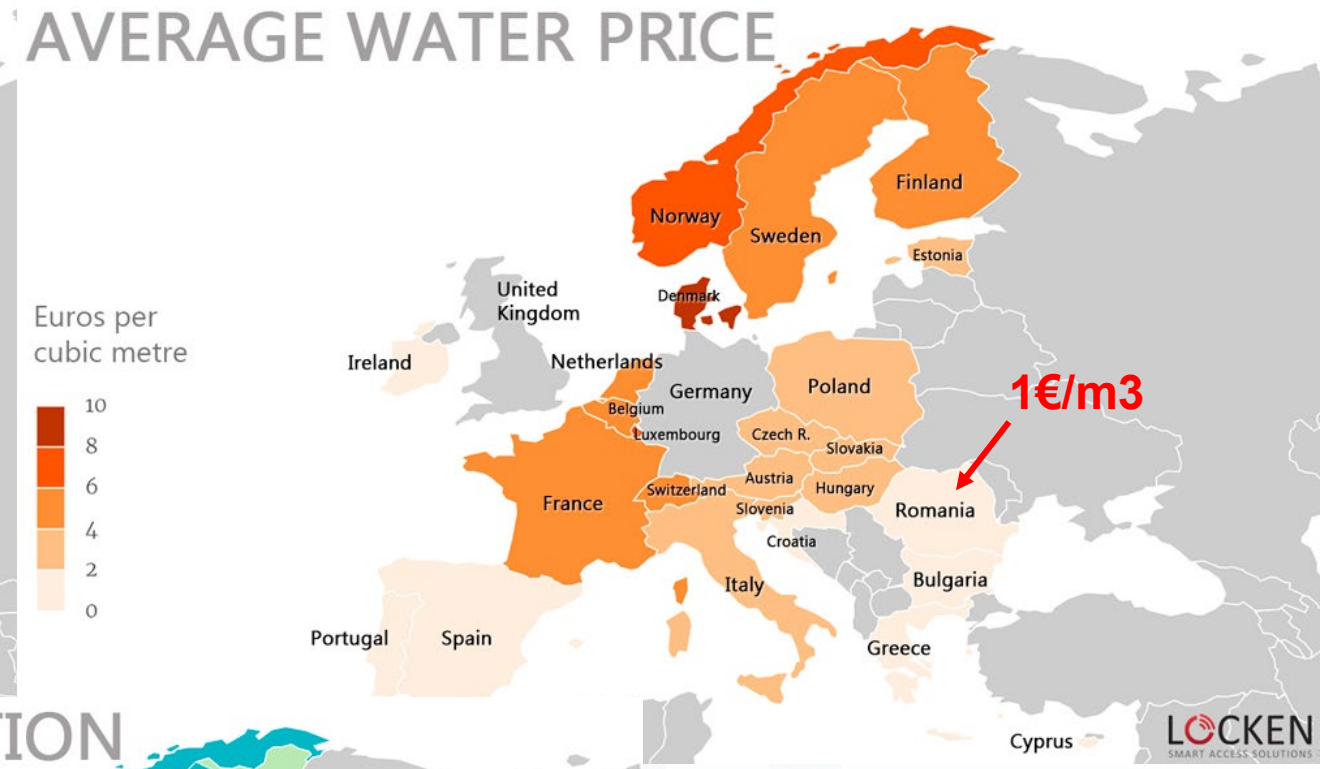
- Romania is a medium-sized country, with a population of about 19.4 m inhabitants.
- Romania ranks 9th by geographical area and 7th by population among the EU Member States.
- Challenging transition periods to comply with the relevant EU Water Directives, with a final deadline for compliance set at 31 December 2018 (that was missed).
- Romania is the only EU country that has a large portion of its population still without access to safe potable water (20% of population, or about 4 million). Adequate sanitation (32% of total population, or about 6 million).
- Romania is striving to make significant efforts to meet the relevant EU water standards.
- More needs to be done regarding institutional coordination and sector leadership.
- Water security and resilience to climate change are increasingly becoming important emerging issues in the Romanian water sector.
- The need to raise awareness among the population remains significant.
- Legislations need to be revised and adapted to the current situation in order to support the execution of innovative projects.

WATER SUPPLY
Network length

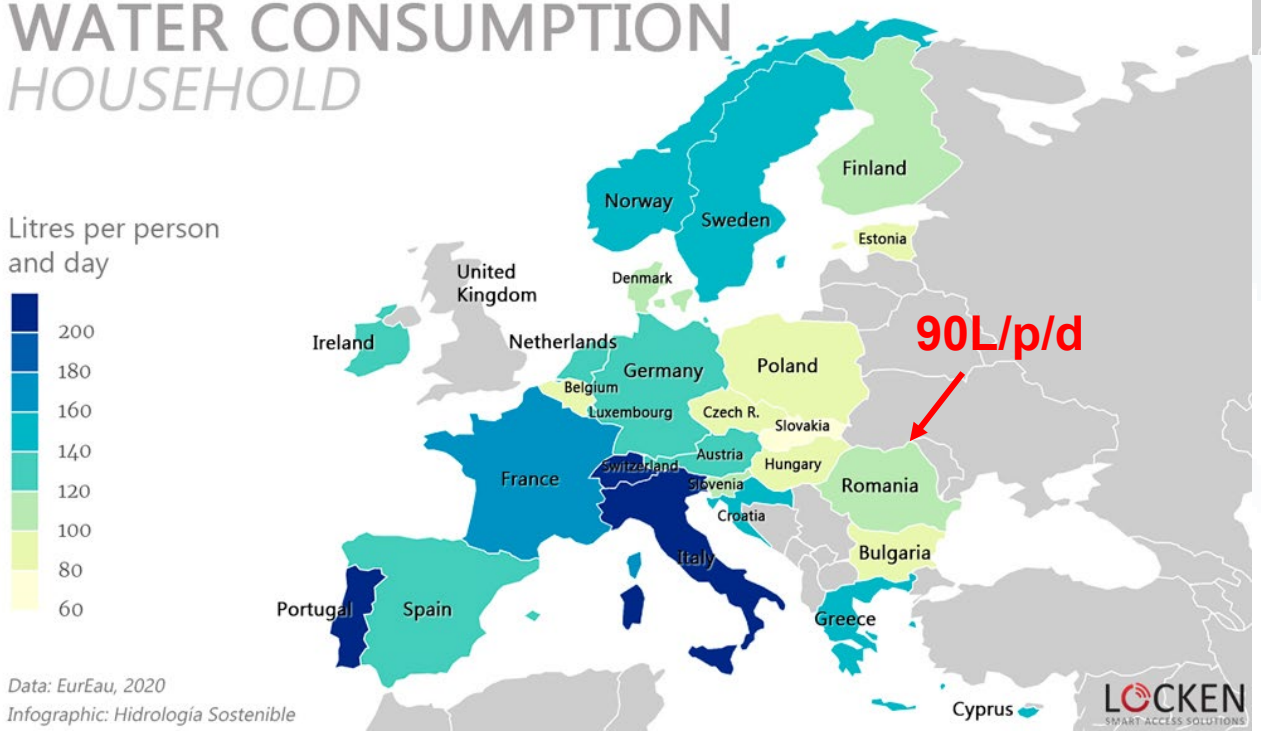


Data: EurEau, 2020
Infographic: Hidrología Sostenible

AVERAGE WATER PRICE

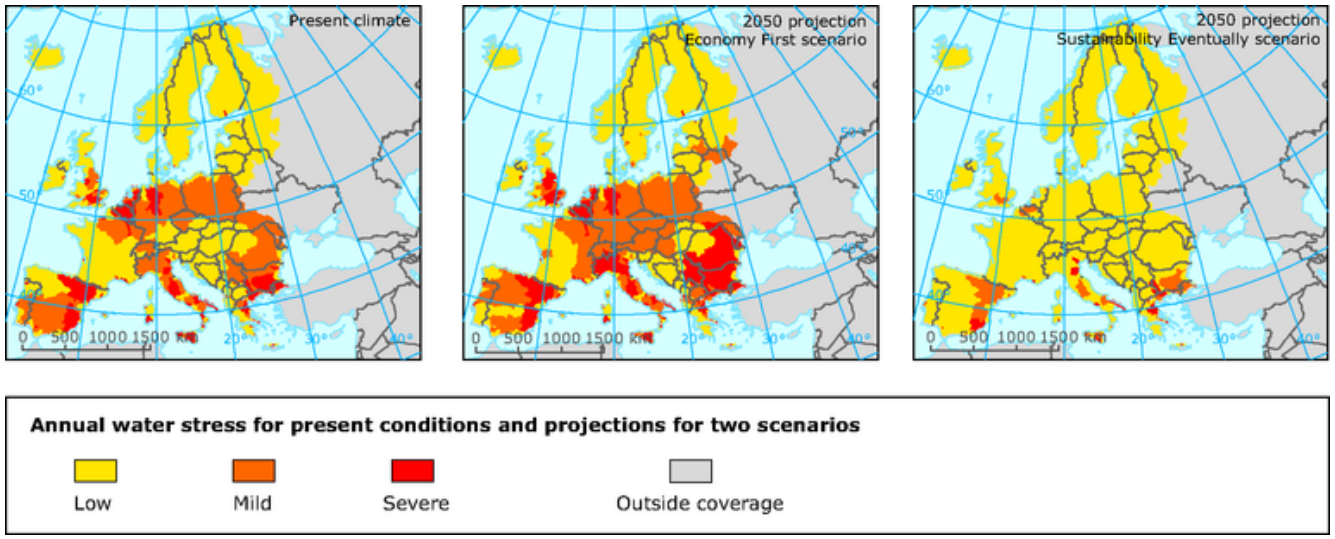


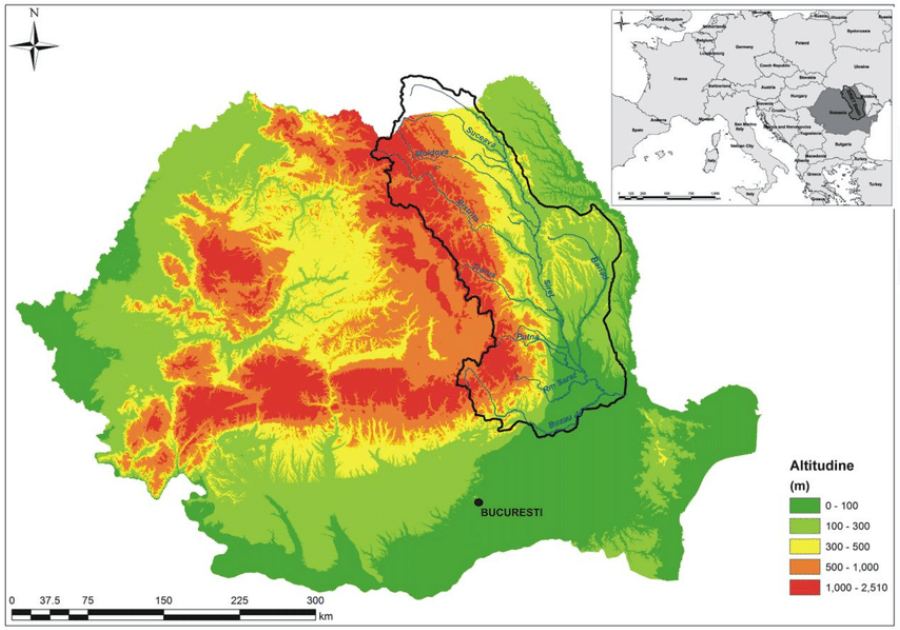
WATER CONSUMPTION
HOUSEHOLD



Data: EurEau, 2020
Infographic: Hidrología Sostenible

Necesitatea reutilizarii apei in industrii





Localizare bazinul raului Siret

17% din volumul total al resurselor de apa ale Romaniei*

Populatia totala a bazinului aprox. 2,800,000 locuitori ,15% din populatia totala a Romaniei

*According to 2018 World Bank** assessment of the Romanian water sector Siret RB is close to be a water- scarcity basin*

Source: Siret River - www.wikipedia.ro)*

Source**:https://documents1.worldbank.org/curated/es/805041531982015095/pdf/Executive-Summary.pdf

AGRICOLA
neam de gospodari

AquaSPICE

Abator AGRICOLA Bacău

- Construit 1975 – modernizare 2008, 2022
- 2008 construire statie de epurare
- Capacitate maxima 550.000 capete/ saptamana (5 zile lucratoare – 8 ore)
- Productie 850 tone de carne pe saptamana
- Consum apa aprox 1200 mc/zi

Obiectivele principale Agricola:

- Sa demonstreze potentialul de reducere a consumului de apa potabila in zonele in care apa “nu atinge carnea” – zona de receptie si agatare, apa utilizata pentru conditionare (racire), zona deseurilor precum si spalare alei si udare spatii verzi.
- Sa demonstreze ca apa tratata astfel nu are capacitatea de contaminare bacteriologica.

Parametrii așteptați pentru apa uzată re-tratată

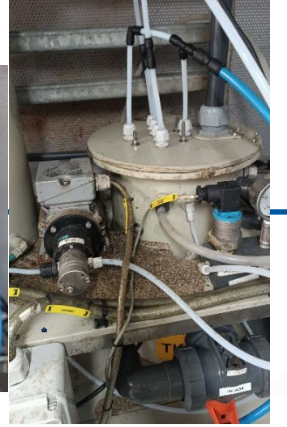
Parametri	UM	Calitate minim așteptată		
		Instalatie de răcire	Reg. EU 741/2020 folosire apă uzată irigații	Industria alimentară
BOD5	mg/l		≤ 10	
TSS	mg/l		≤ 10	
Turbiditate	FTU		≤ 5	
Duritate	mg/l	< 200		
NH_3/NH^{4+}	mg/l	0		
Cloruri	mg/l	< 100		
Total Fe	mg/l	< 0,1		
Alcalinitate	mg/l	< 150		
Conductivitate	µS/cm	< 750		
SO_2^{-4}	mg/l	< 200		
Siliciu solubil	mg/l	< 30		
E.coli	UFC/ 100ml			0
Legionella spp.	UFC/ 100ml			0
Campylobacter spp	UFC/ 100ml			0
Salmonella spp	UFC/ 100ml			0
Pseudomonas spp.	UFC/ 100ml			0
Staphylococcus aureus	UFC/ 100ml			0
Număr total de germeni	UFC/ 100ml			0
Total Coliformi	UFC/ 100ml			0


1
2
3
Posibila locatie pilot


VEOLIA

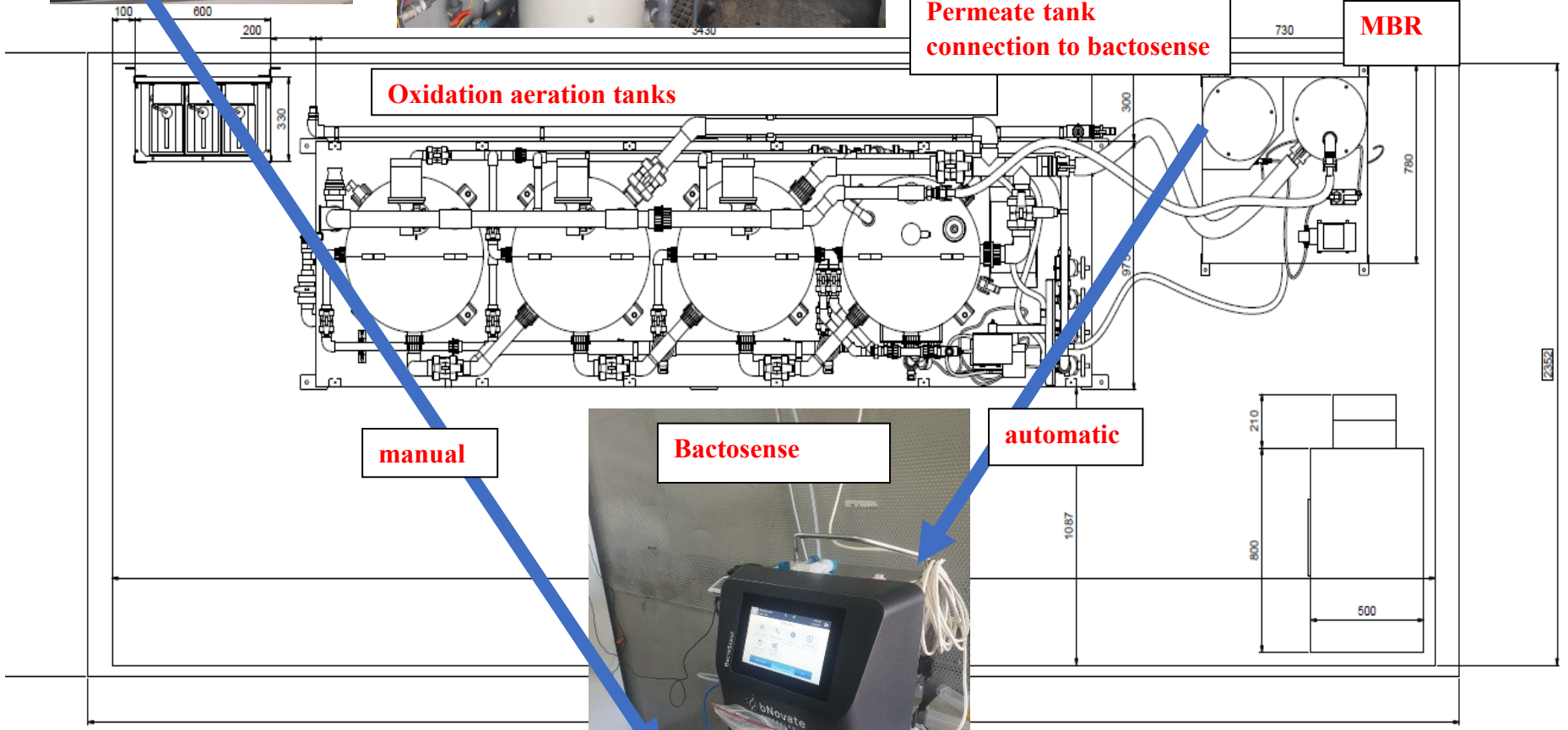

VEOLIA
100190 3
22 G1

UV system Connection to bactosense + UV



Permeate tank connection to bactosense

MBR



Oxidation aeration tanks

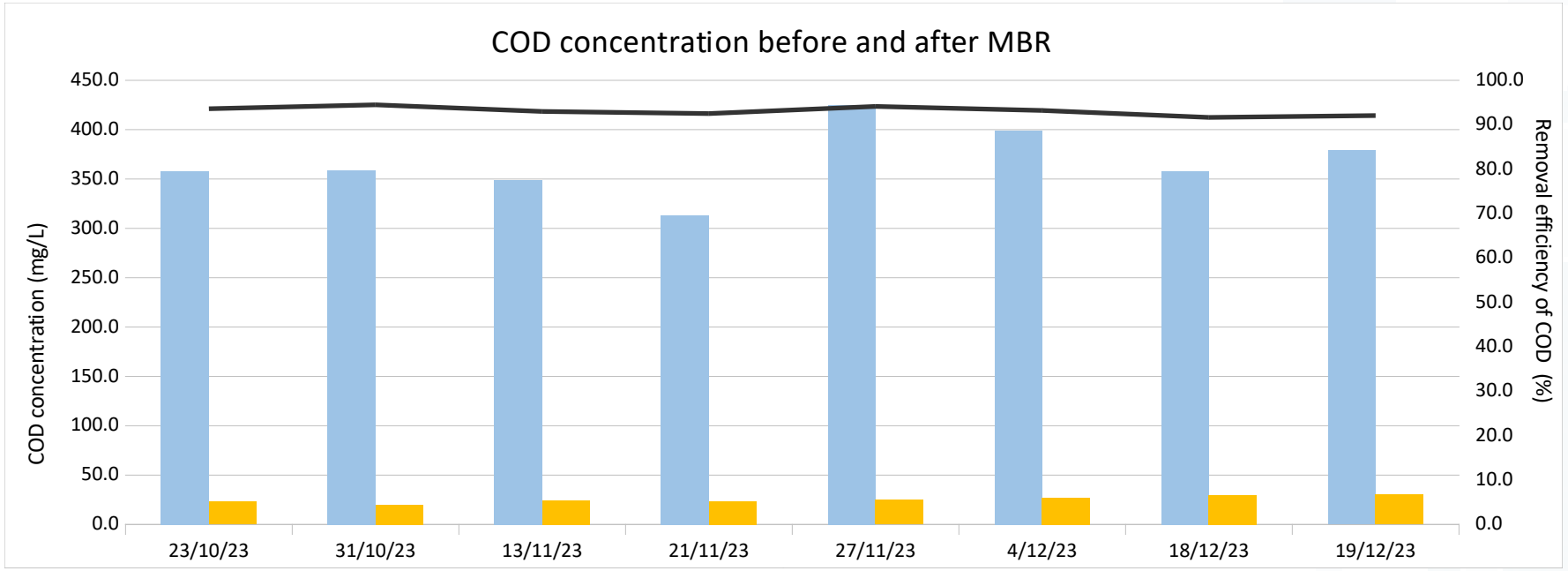
manual

automatic

Bactosense

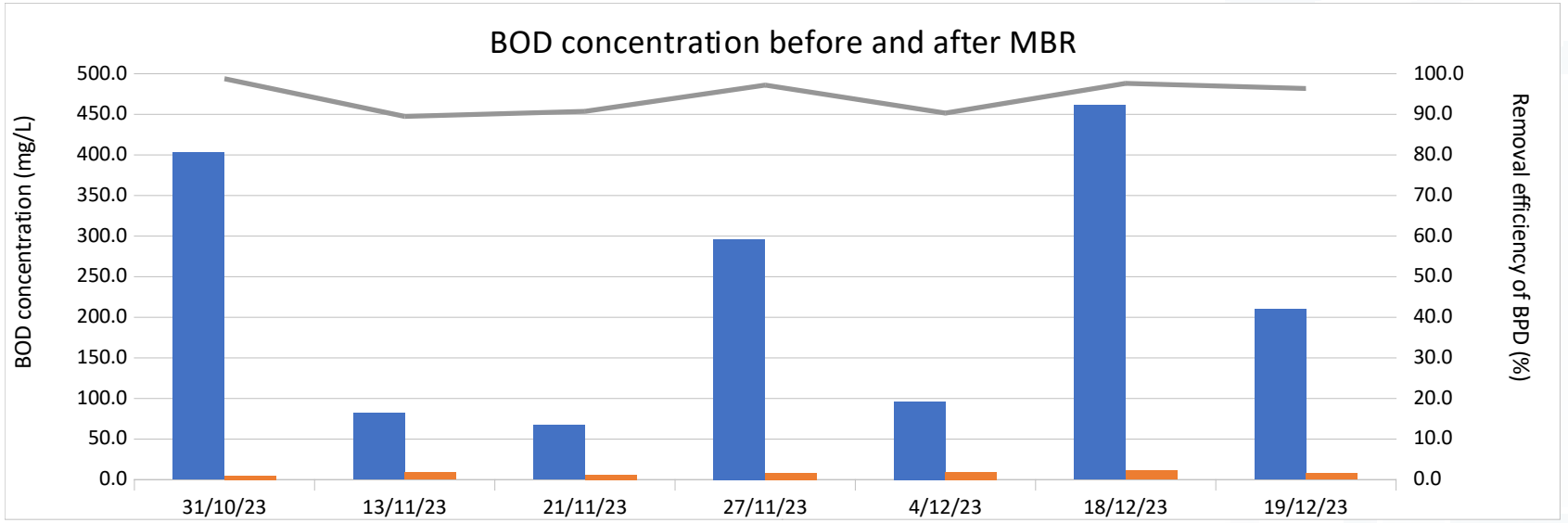
Rezultate obtinute – CCOCr

consumul chimic de oxigen



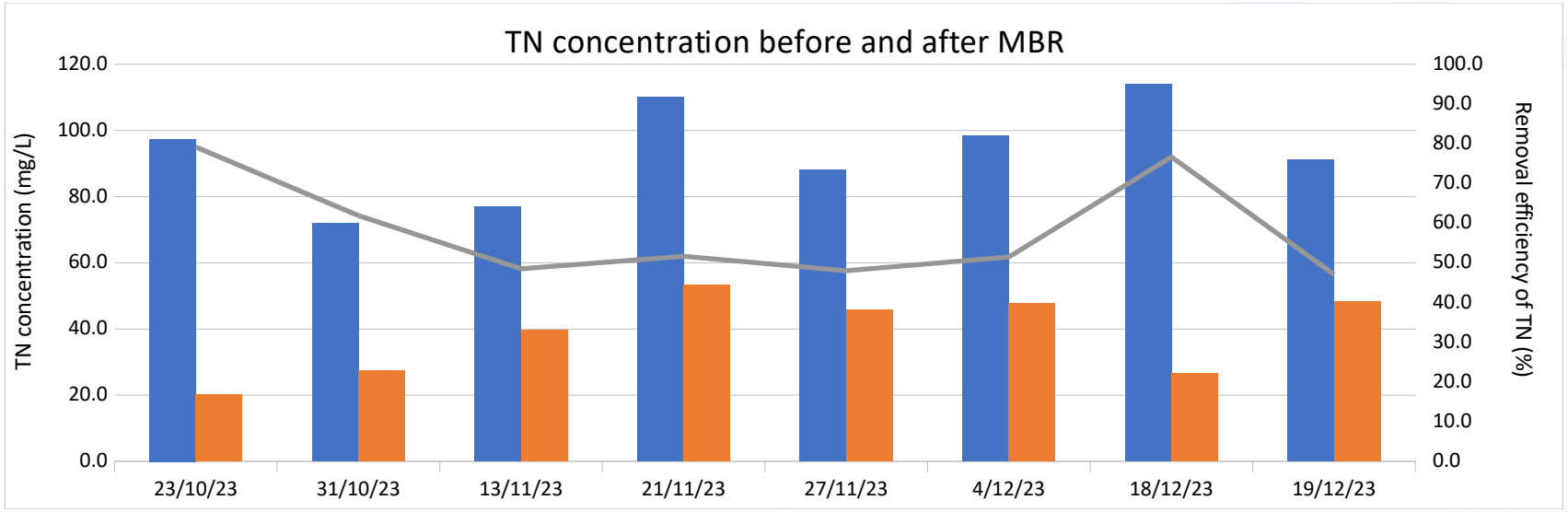
Rezultate obtinute – CBO5

consumul biochimic de oxigen

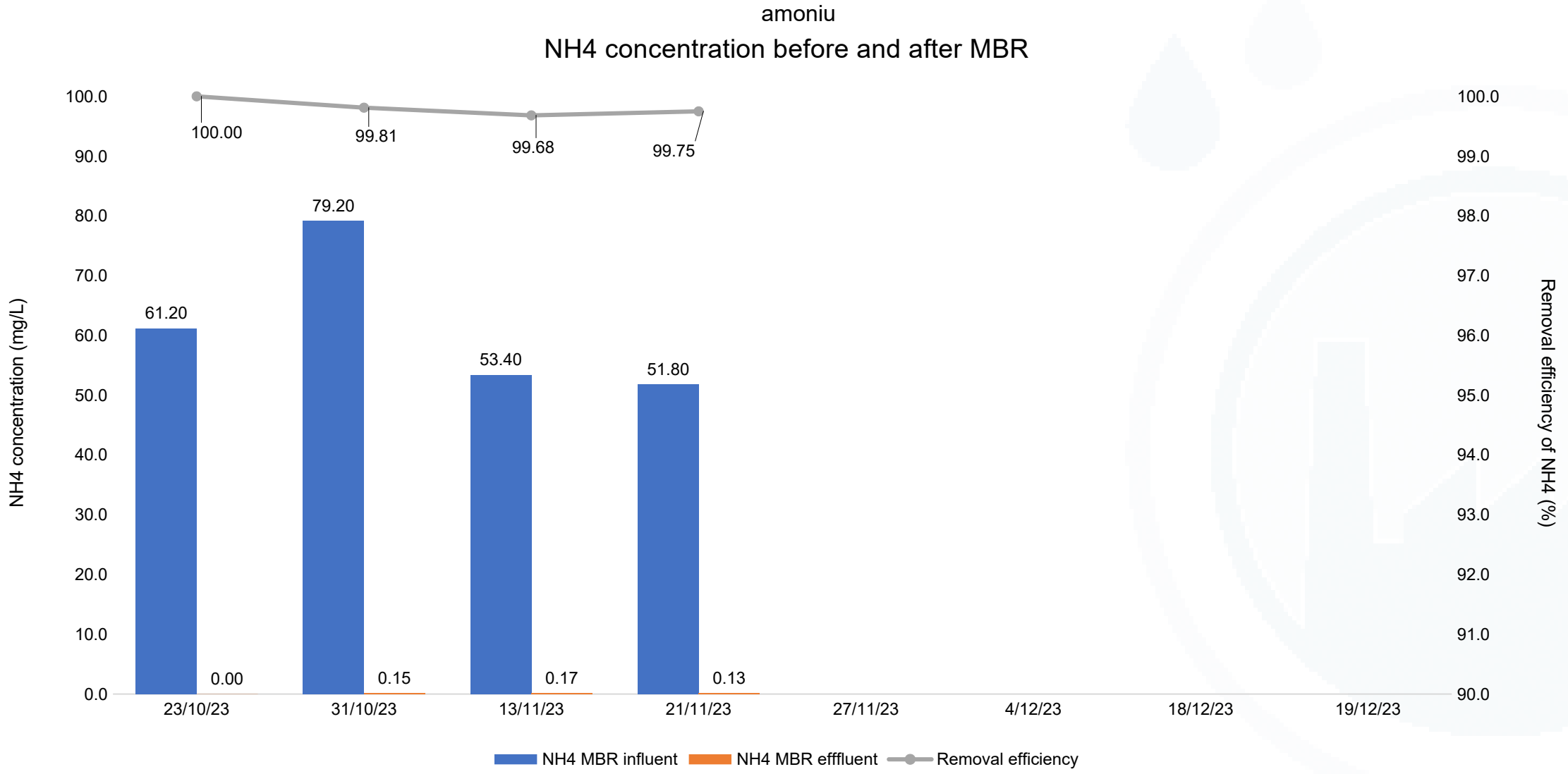


Rezultate obtinute – NT

azot total

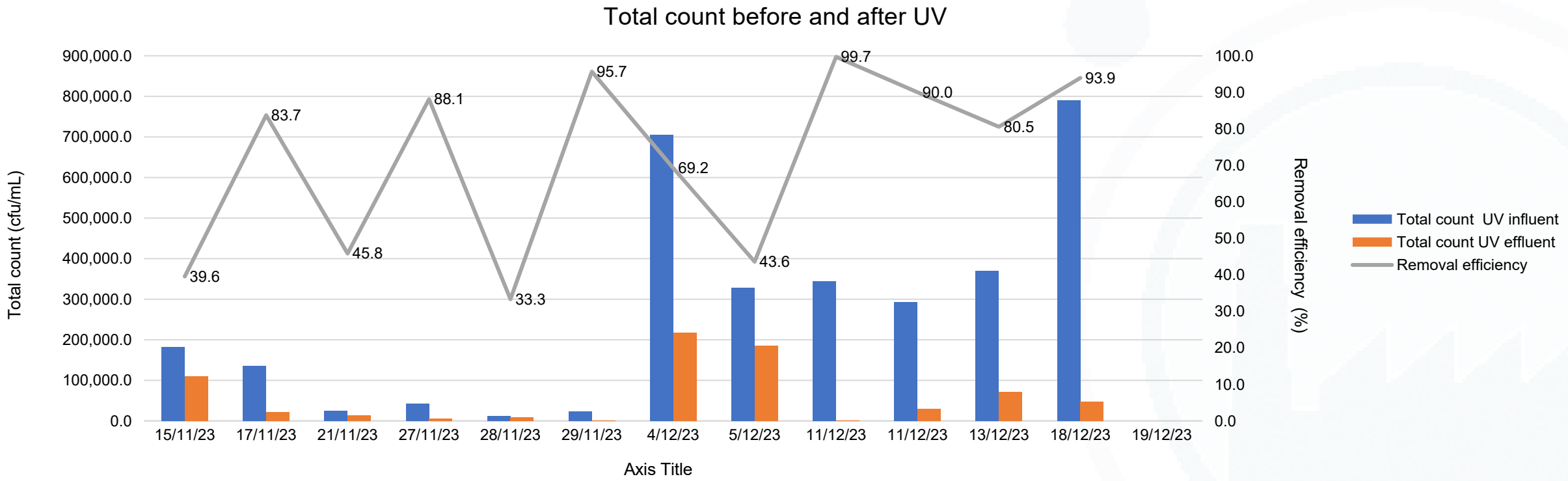


Rezultate obtinute – NH4+



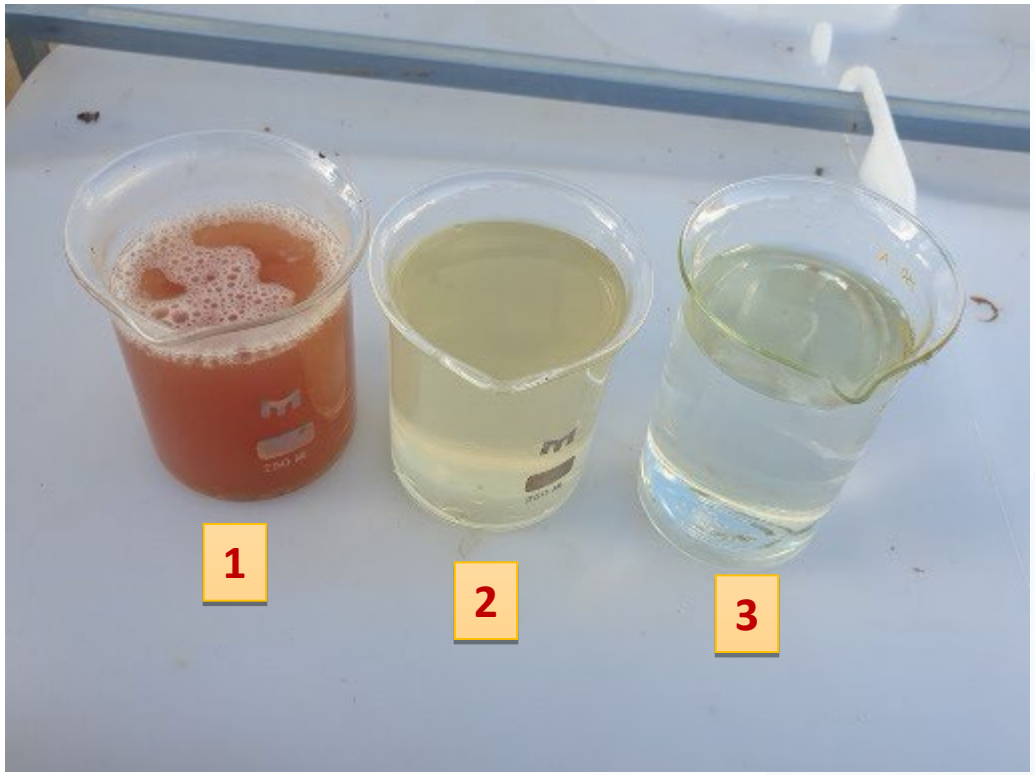
Rezultate obtinute – NTG

numar total de germeni



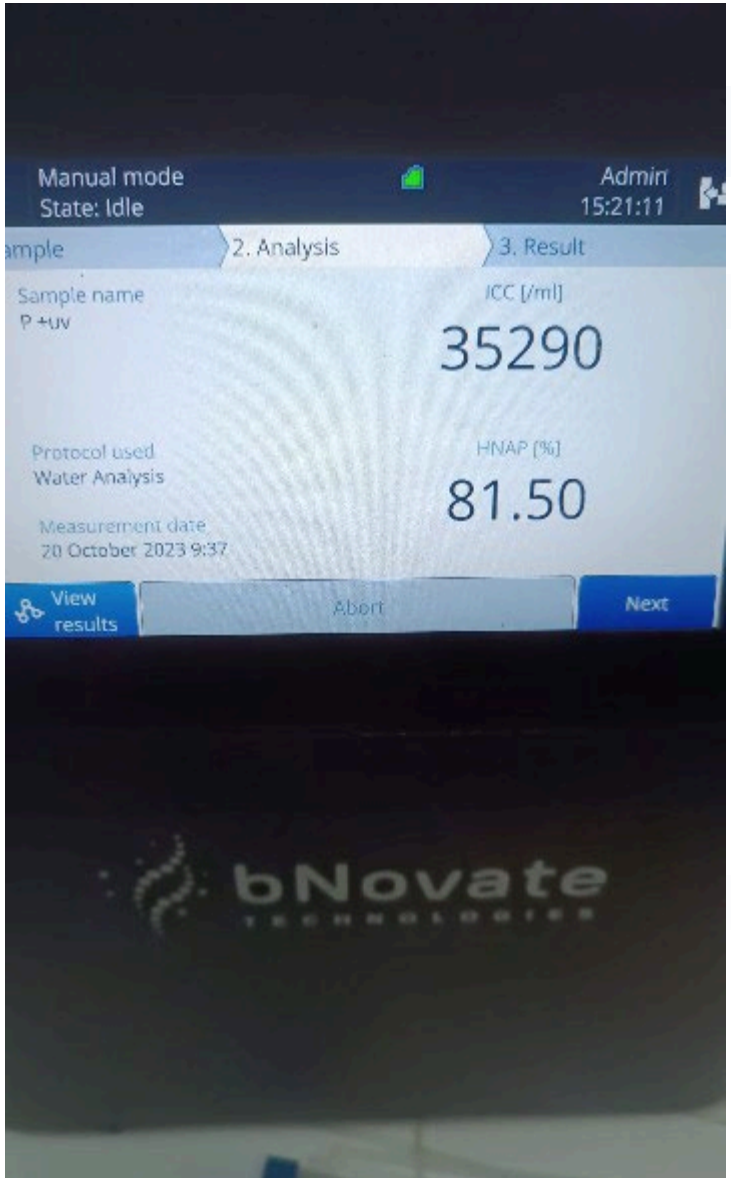
Rezultate obtinute

1 apa uzata intrare statia de epurare
2 apa tratata in statia de epurare
3 apa tratata pilot



Bactosense

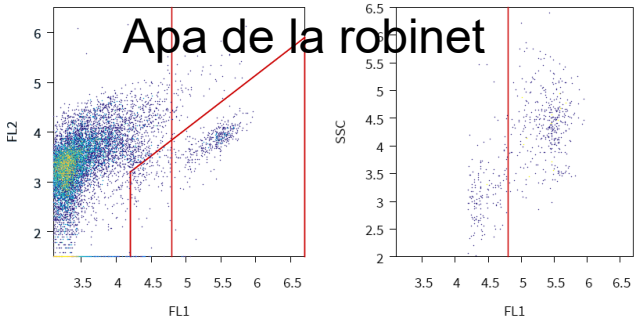

BACTOSENSE
bNovate
TECHNOLOGIES

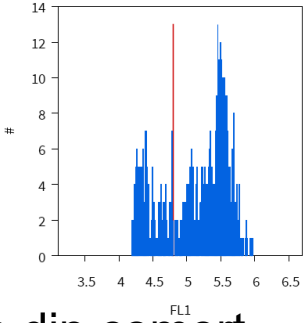

Manual mode
State: Idle
Admin
15:21:11
2. Analysis
3. Result
Sample name
P +UV
ICC [/ml]
35290
Protocol used
Water Analysis
HNAP [%]
81.50
Measurement date
20 October 2023 9:37
View results
Abort
Next
bNovate
TECHNOLOGIES


Auto mode
State: Analyzing
Admin
12:31:41
6 Hours
No data
available
8 Nov 2023
12:42:00
Stop
BACTOSENSE
bNovate
TECHNOLOGIES

ICC – intact cell count

Apa de la robinet





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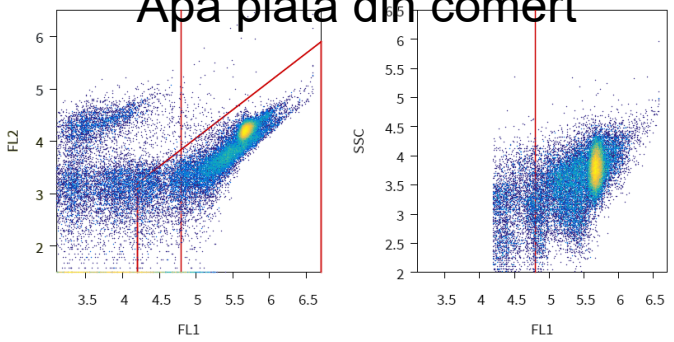
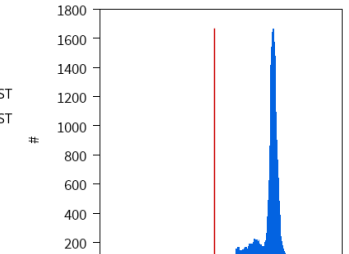
Local sampling date:	2023-09-20 11:02:25 CET/CEST
Instrument SN:	910026
Cartridge fill SN:	BNO-ICC-00186
ICC [/ml]:	6200
HNAP [%]:	71.61

Apa plata din comert





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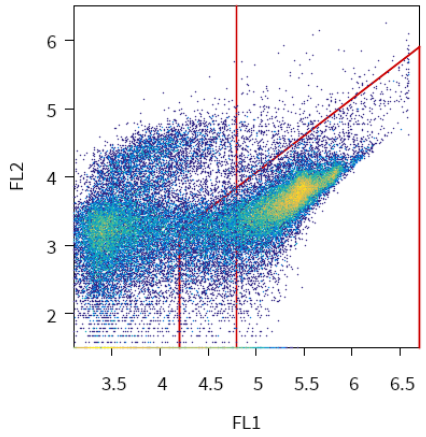
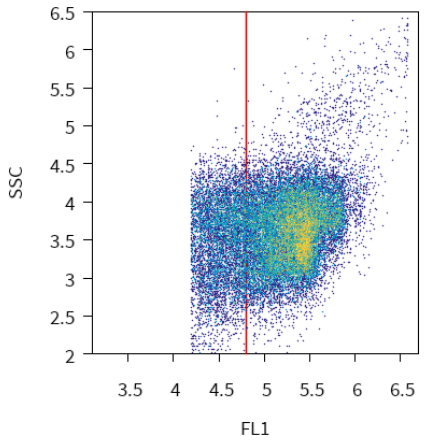
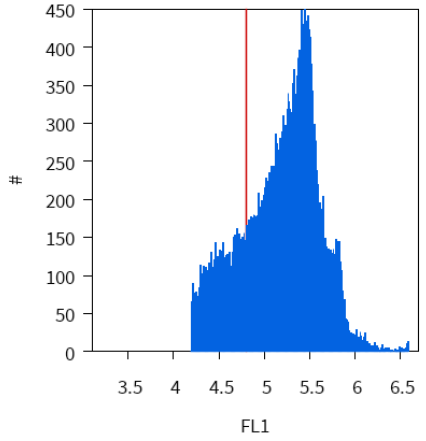
Instrument SN:	910026
Cartridge fill SN:	BNO-ICC-00186
ICC [/ml]:	390310
HNAP [%]:	90.61

Permeat - UV







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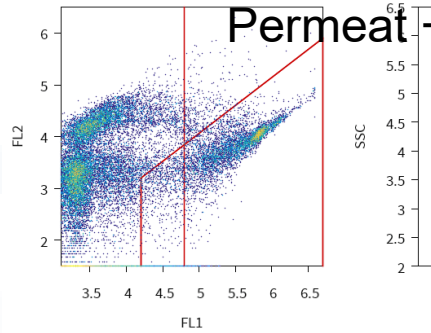
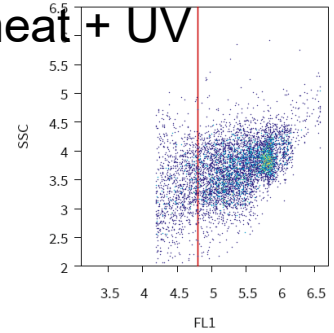
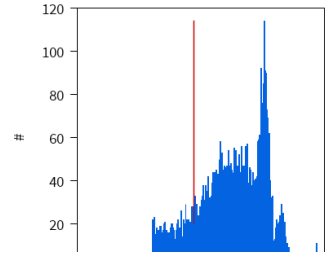
ICC [/ml]:	358570
HNAP [%]:	79.34

Permeat + UV







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Local sampling date:	2023-10-20 09:15:23 CET/CEST
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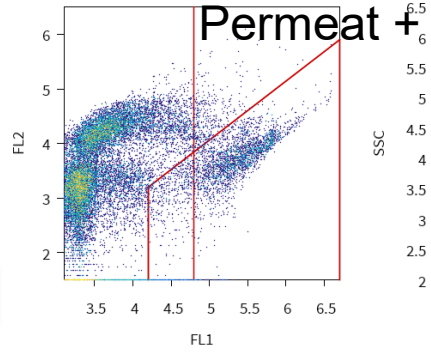
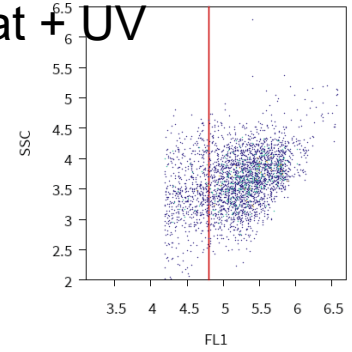
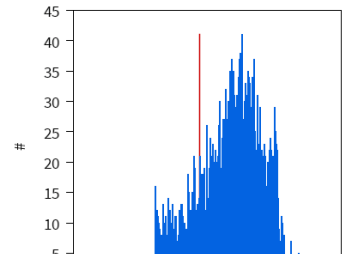
ICC [/ml]:	70680
HNAP [%]:	84.10

Permeat + UV







Name:	P +uv
Protocol:	analysis water
UTC date:	2023-10-20 07:37:13
Local date:	2023-10-20 09:37:13 CET/CEST
Local sampling date:	2023-10-20 09:40:10 CET/CEST
Instrument SN:	910026
Cartridge fill SN:	BNO-ICC-00186
ICC [/ml]:	35290
HNAP [%]:	81.50

Dashboard for Agricola pilot plant – Bactosense unit

Beneficiile aplicării conceptului de “apă circulară” în cazul de studiu Agricola

1. Reducere semnificativă a utilizării resurselor de apă dulce

2. Atingerea țintei zero de descărcare a apei uzate folosind sistemul de buclă închisă în procesele industriale

3. Creștere semnificativă a recuperării de apă, energie și/sau substanțe și materiale

4. Diseminare eficientă către angajații actuali și către generațiile viitoare

5. Demonstrarea câștigurilor de mediu

6. Potențial de replicare

Concluzii

Potențiale obstacole în implementarea unui proiect de cercetare în economie circulara

- Absenta producatorilor de utilaje în Romania
- Cooperare deficitara cu Autoritățile locale
- Lipsa unor stimulente pentru firmele private
- Absenta unor departamente specializate în cercetare în cadrul firmelor private

Sugestii de imbunatatire a procesului de implementare a unui proiect de cercetare în economie circulara

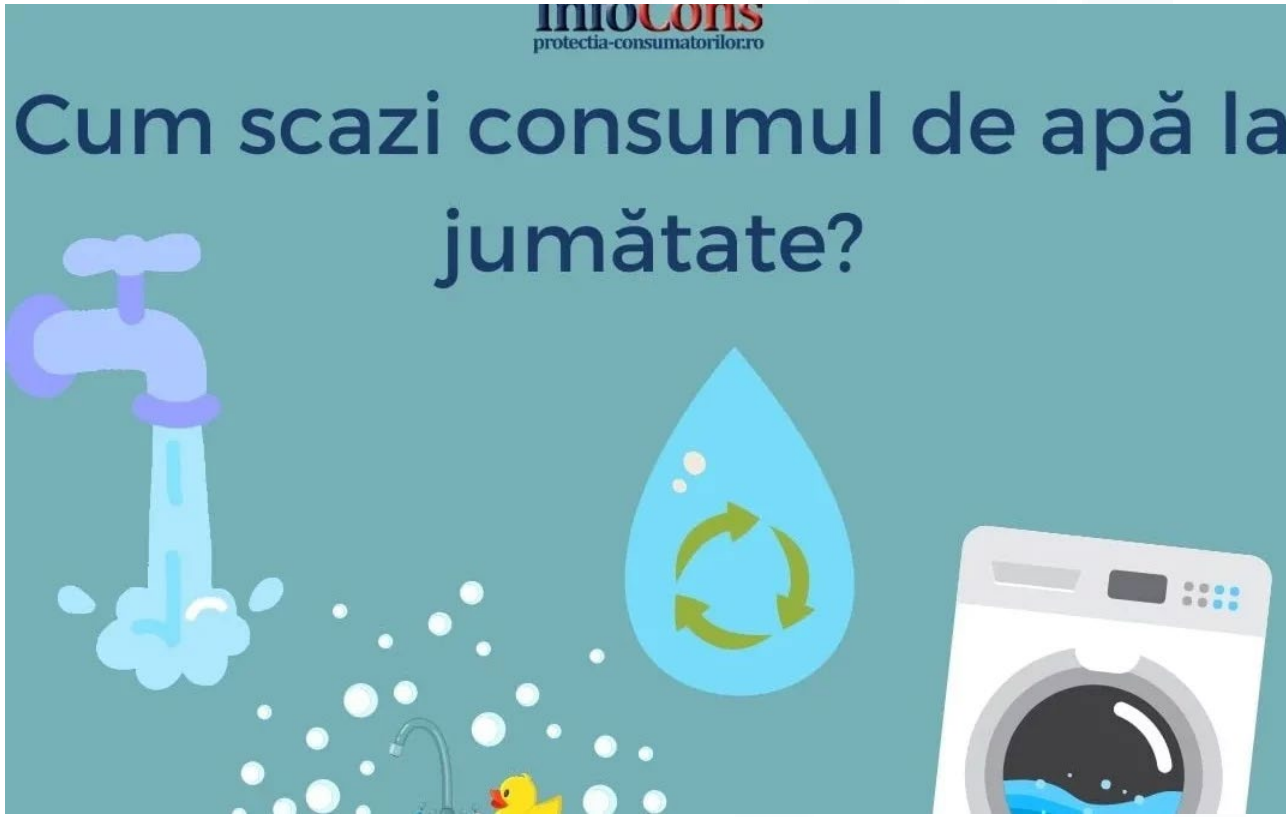
- Formarea unor specialisti în economie circulara în cadrul Autoritatilor
- Crearea unor stimulente/facilitati pentru firmele private care obțin proiecte de cercetare
- Sustinerea și incurajarea firmelor private în realizarea unor departamente specializate
- Colaborarea cu o unitate (Universitate/Institut de cercetare) care sa consilieze/conduca cercetarea

De ce este importanta apa

- Din cele mai vechi timpuri apa este un element important – spiritualitate
- Pamantul 70% apa – corpul omenesc 70% apa
- Inca din 2003 ONU a dat un semnal de alarma privind scaderea disponibilitatii apei potabile
- Iar apa nu poate fi inlocuita

Cum actionam?

Reducerea risipei



ŞTIAŢI CĂ…

- un robinet care picură consumă aproximativ **17** litri într-o singură zi, iar o toaletă, aproximativ **40** de litri?
- un singur robinet neetanş sau un vas WC care pierde o singură picătură pe secundă vor duce la o pierdere de apă de 0,5 mc (**500** de litri)/lună?
- dacă firul de apă care se prelinge din cauza unui singur robinet sau vas WC defecte este de 3 mm, pierderea lunară poate depăşi **26** de mc, mai mult decât echivalentul consumului mediu de apă a patru persoane timp de o lună?

- un bloc cu aproximativ 40 de apartamente cu robinete care pierd câte o picătură pe secundă şi cu vase WC care pierd un fir de apă de doar 1 mm timp de 10 secunde, ajunge la o pierdere de peste **280** mc/lună?
  - Scurtarea timpului de duş cu un minut, poate economisi pâna la **1710** de litri de apă pe lună

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Advancing Sustainability of Process Industries through Digital and Circular Water Use Innovations

Multumesc

Agricola Internațional SA – Nicoleta FRUNZA