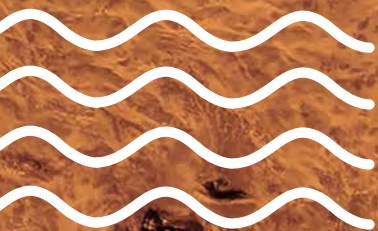




SEA4 VALUE

Mining value from brines

Recovery of minerals and metals from seawater desalination brines, turning them into the third source of valuable raw materials in the European Union



- 16** partners
- 08** countries
- 10** new technological solutions
- 10** extracted minerals / metals

BENEFITS

The project contributes to the security of supply and reduces the dependency on raw material imports

Critical raw materials for the European Union, such as magnesium, boron, scandium, gallium, vanadium, indium and lithium, will be recovered (as well as other non-critical but strategic elements such as rubidium, molybdenum and calcium).

Production of a new local source for valuable raw materials

Helping the European industry to shift towards a circular economy.

An enormous potential source of minerals and metals

Compared to conventional mines, seawater desalination plants are multi-mineral and are an enormous potential source of minerals and metals as approximately 20,000 plants are installed worldwide.

New technological solutions available

For separation mechanisms, concentration and crystallisation – not only for desalination plants but also for other processes that generate low concentration elements, like waste from mining effluents.

New technologies with minimum environmental footprint

New technologies developed by the project have a minimum environmental footprint: low reagent consumption and environment-friendly reagents.

Waste streams recycled

Some of the waste produced is regenerated (solvents and chemicals) and re-used in the process thus minimising consumption of reagent and the release of wastewater streams.

On-site chemical production reducing reagents consumption

Some chemicals required – such as sodium hydroxide for magnesium precipitation – are generated as a by-product in other stages of the process. They are fed into the process loop thus reducing reagents consumption and their associated production impacts.

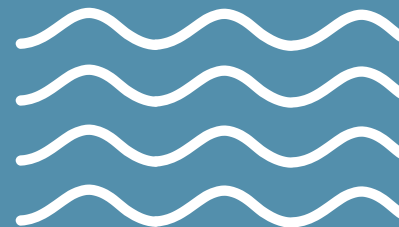
Desalination efficiency: 80% recovery of fresh water

A sharp increase in water desalination efficiency – 80% recovery of fresh water for consumption against 50% or less today.

Reduction in the brines discharged in the sea

Fostering industrial symbiosis and cross-sectorial collaboration

Among seawater desalination constructors and operators and raw materials providers and distributors.



PIONEERS

Most projects and technologies dealing with metal and mineral recovery from brines, focus on individual elements, which makes the process economically unfeasible. Sea4Value goes **one step further**: it draws on a combination of advanced separation technologies and seeks to design and install a moving lab in one desalination plant with all components of the modular **multi-element recovery**. This should enable the validation of the technical and economical feasibility of the process.

BRINE MINING PROCESS



**Multi-mineral production
of 10 metal and minerals**



Modular and flexible



Cost-effective

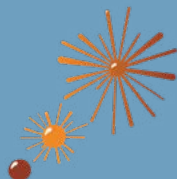
10 TECHNOLOGIES

PRE-TREATMENT



Nanofiltration membranes for monovalent and multivalent ions separation

CONCENTRATION



Advanced membrane crystallisation

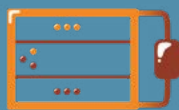


Advanced multi-effect distillation

SELECTIVE RECOVERY



Ion-selective polymer inclusion membranes



Electrodialysis with bipolar membranes



3D-printed adsorption modules



Ionic liquid solvent extraction



Binary extractant solvent extraction



Synergic solvent extraction combined with solvometallurgy



Non-dispersive solvent extraction

APPLYING A CIRCULAR SUPPLY MODEL

Seawater brines as a resource of raw materials recovery



10 EXTRACTED MINERALS / METALS *

12 24.305 Mg Magnesium	21 44.956 Sc Scandium	23 50.942 V Vanadium	31 69.723 Ga Gallium	5 10.81 B Boron
49 114.82 In Indium	3 6.941 Li Lithium	42 95.94 Mo Molybdenum	37 85.468 Rb Rubidium	20 40.08 Ca Calcium

* Color scale based on the availability of critical raw materials listed by the European Commission.

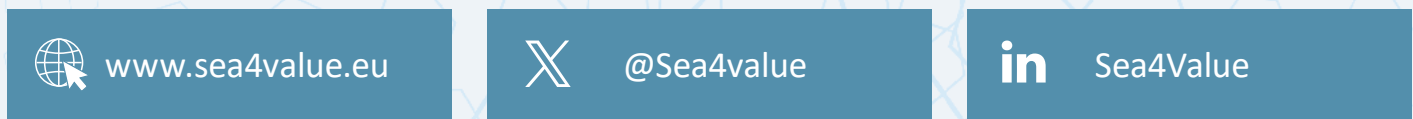


PARTNERS

Sea4Value brings together 16 partners from Spain, Germany, Italy, Belgium, Ukraine, Netherlands, Finland and Switzerland to develop and upscale technologies to sustainably mine raw materials from brines.



FOLLOW OUR JOURNEY



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