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

16 partners
08 countries
10 new technological solutions
09 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 and molybdenum).

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 19,744 plants are installed worldwide (and with an annual growth rate of app. 7.8% yearly, according to the International Water Association, 2017).

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

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

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Waste streams recycled

Some of the waste produced is regenerated (solvents and chemicals) and re-used in the process thus minimizing 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.

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

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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.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N°869703.
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 a technical and economically feasible process for multi-element recovery.

### 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
- Electrolysis 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

### BRINE MINING PROCESS
- Multi-mineral production of 9 metal and minerals
- Modular and flexible
- Cost-effective

### 9 EXTRACTED MINERALS / METALS

- Mg
- Sc
- V
- Ga
- B
- In
- Li
- Mo
- Rb

### APPLYING A CIRCULAR SUPPLY MODEL
Seawater brines as a resource of raw materials recovery

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#### Process
- Seawater
- Desalination plant
- Pure water
- Brine
- Minerals & metals