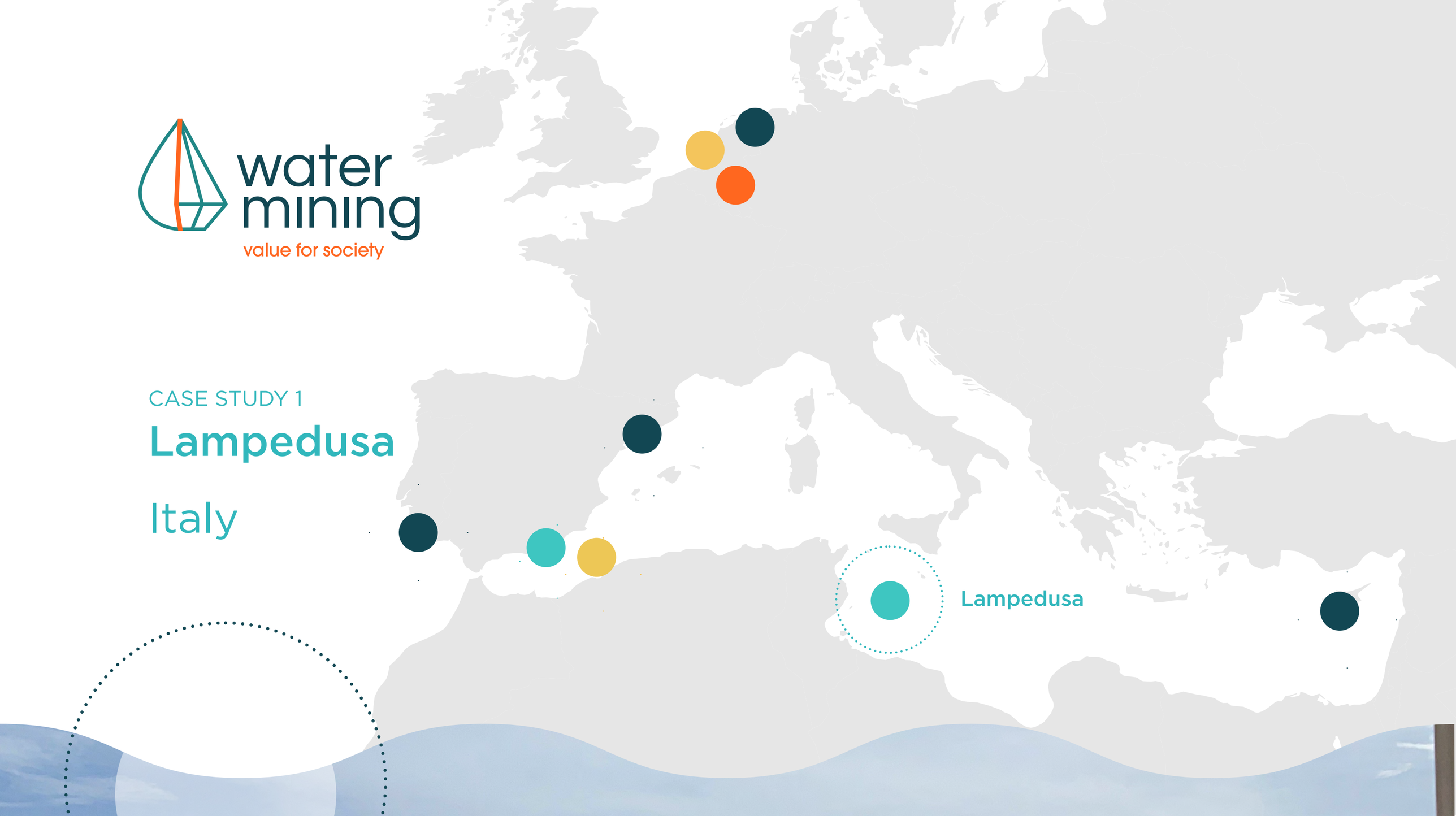
water mining

value for society

CASE STUDY 1

Lampedusa

Italy

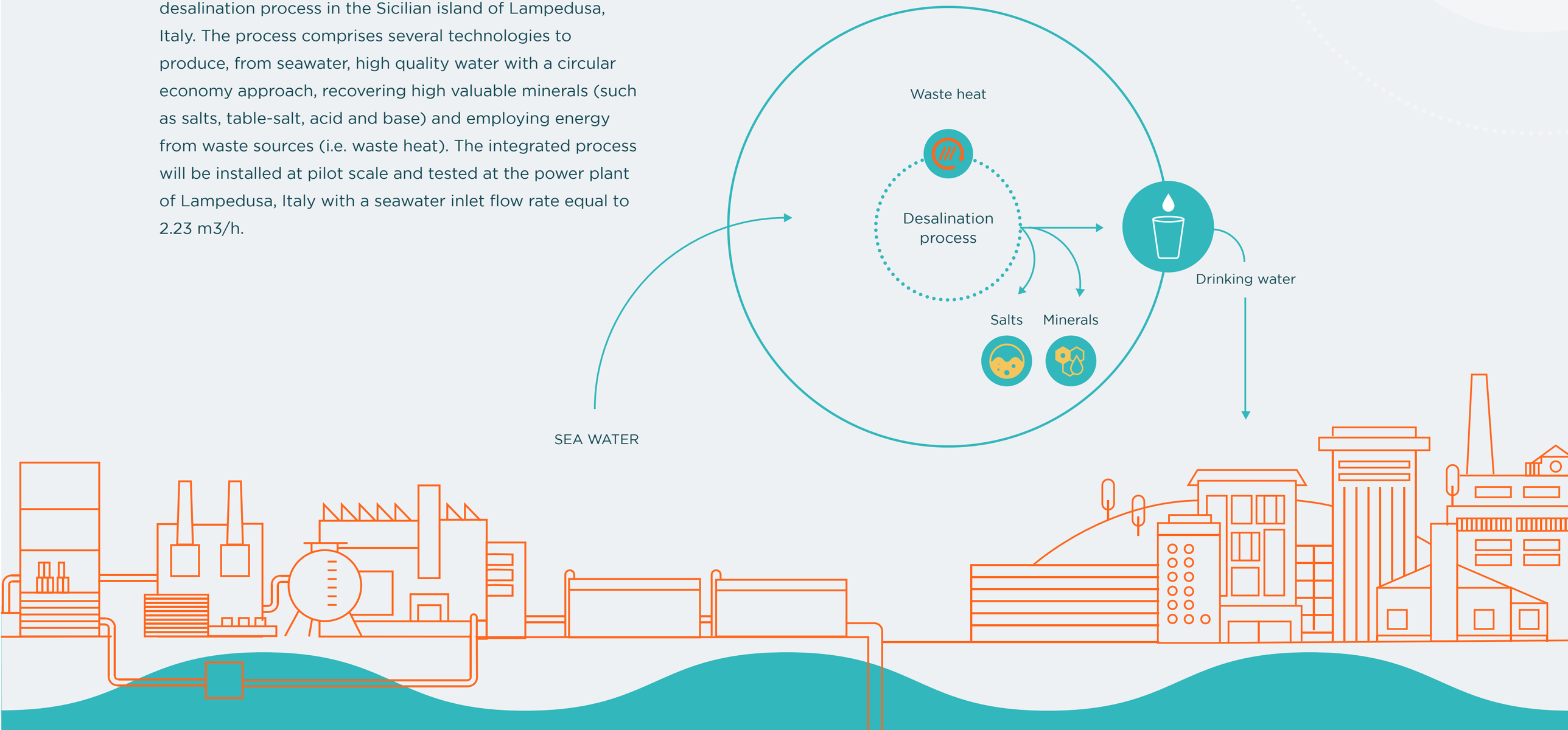


DESALINATION

CS1 CASE STUDY 1

Lampedusa
Italy

The CS1 will demonstrate the feasibility of an advanced desalination process in the Sicilian island of Lampedusa, Italy. The process comprises several technologies to produce, from seawater, high quality water with a circular economy approach, recovering high valuable minerals (such as salts, table-salt, acid and base) and employing energy from waste sources (i.e. waste heat). The integrated process will be installed at pilot scale and tested at the power plant of Lampedusa, Italy with a seawater inlet flow rate equal to 2.23 m3/h.



Key innovations

Waste heat recovery: Waste heat provided by the power plant of Lampedusa for the operation of the Multiple Effect Distillation (MED) process allows low energy consumption of the entire process.

Mineral recovery: Production of high valuable salts, such as magnesium and calcium hydroxides, sodium sulphate and table-salt. In addition, also chemicals (hydrochloric acid and sodium hydroxide) are produced, which can be used as process reactants or for cleaning purposes.

Water production: High quality water will be achieved, suitable for drinking purpose and/or also for agricultural and industrial needs.

Main challenges

Recovery of magnesium and calcium with the Multi Feed–Plug Flow Reactor (MF-PFR): The presence of these ions could compromise the functioning of the technologies downstream (i.e. the scaling of the membranes in the Electrodialysis unit);

Quality of the chemicals produced: Low concentrations of sodium hydroxide produced by the Electrodialysis with Bipolar Membranes (EDBM) unit could not be sufficient for the MF-PFR target operation;

Employment of waste heat: The waste heat produced within the power plant could not fit all the requirements from the MED unit.

Outcomes

+50%

More than 50% of waste heat recovered to drive the process

-10%

Reduction in energy consumption by 10%

80%

Total water recovery up to 80% (doubling the current value for standard desalination)

+90%

Purity of magnesium hydroxide higher than 90%

+90%

Purity of sodium chloride higher than 90%

Expected impact on society

CS 1 allows promoting a more competitive desalination process thanks to a less expensive method for water production and the contemporary production and sale of high valuable salts. In addition, the environmental impact is reduced due to a reduced volume of desalination brine that is discharged into water bodies. Finally, CS1 can contributes to secure sustainable access to Mg within the EU.

Thanks to CS1 the often negative public opinion on drinking water production by desalination can be overcame due to safely and environmental sustainability of the proposed process.

Business opportunities

The business opportunities are based on the production and sale of: (i) high quality water, (ii) magnesium and calcium hydroxides, (iii) salts, such as sodium sulphate and table-salt, (iv) chemicals, such as acid and base. The chemicals can also be partially used in the process reducing the global operating costs.

The production of magnesium hydroxide will contribute to fulfil the European market demand for Mg, which belongs to the Critical Raw Material (CRM) i.e. the list of materials which procurement takes place outside the EU. Moreover, sea salt production will consequently increase thanks to the implementation of the integrated chain.

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