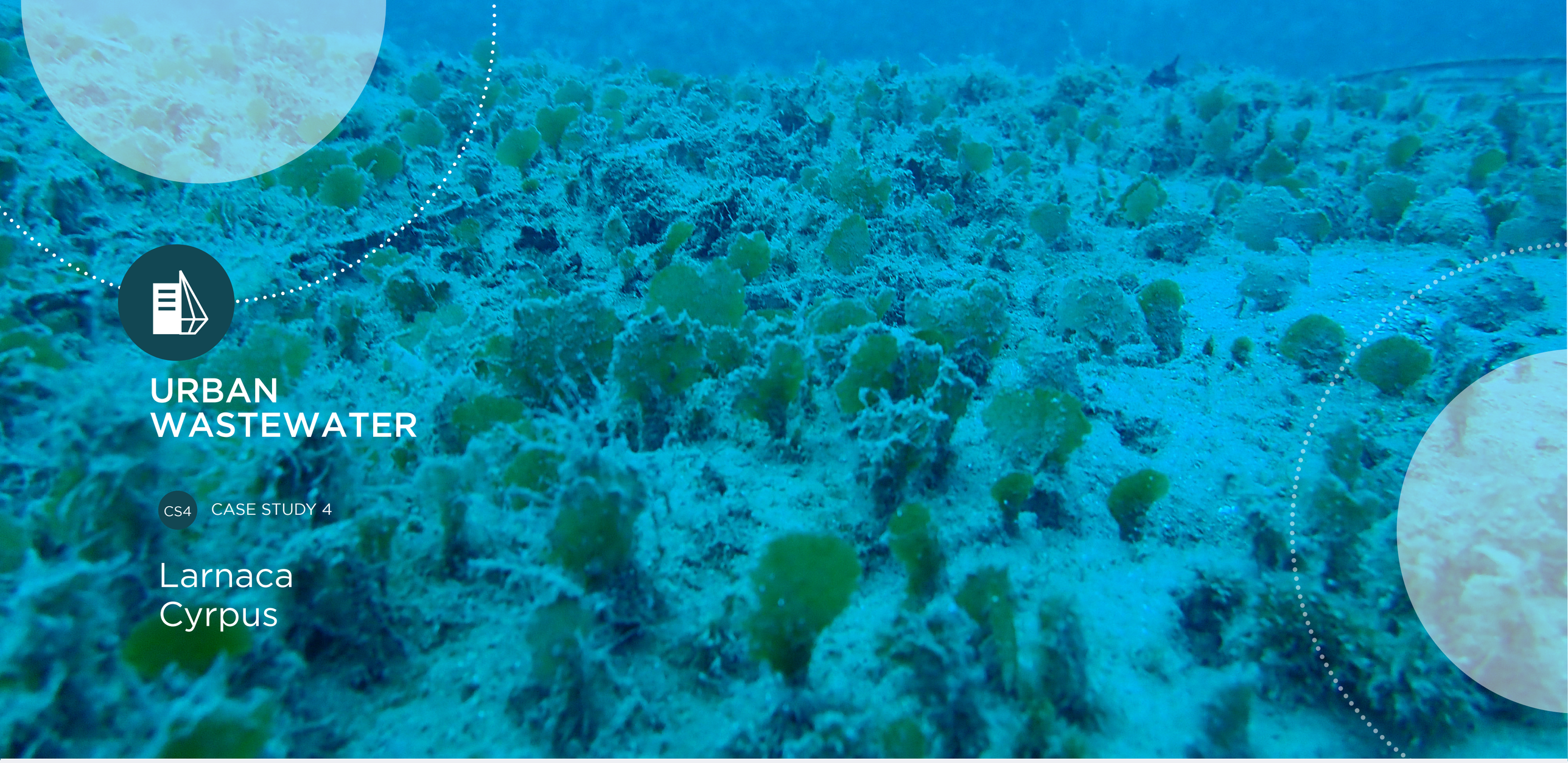
water mining

value for society

CASE STUDY 4

Larnaca

Cyprus



URBAN WASTEWATER

CS4 CASE STUDY 4

Larnaca
Cyrpus

CS4 focuses on the desalination of urban wastewater (Urban-Mining). At the Larnaca WWTP different innovative solutions for phosphorus removal to ultra-low levels through adsorption and salts removal using filtration and evaporation technologies (potentially powered by renewable energy) are demonstrated. The treated water can be then used for irrigation or in the industrial sector. Next to water, valuable salts and phosphorus can be recovered and marketed.

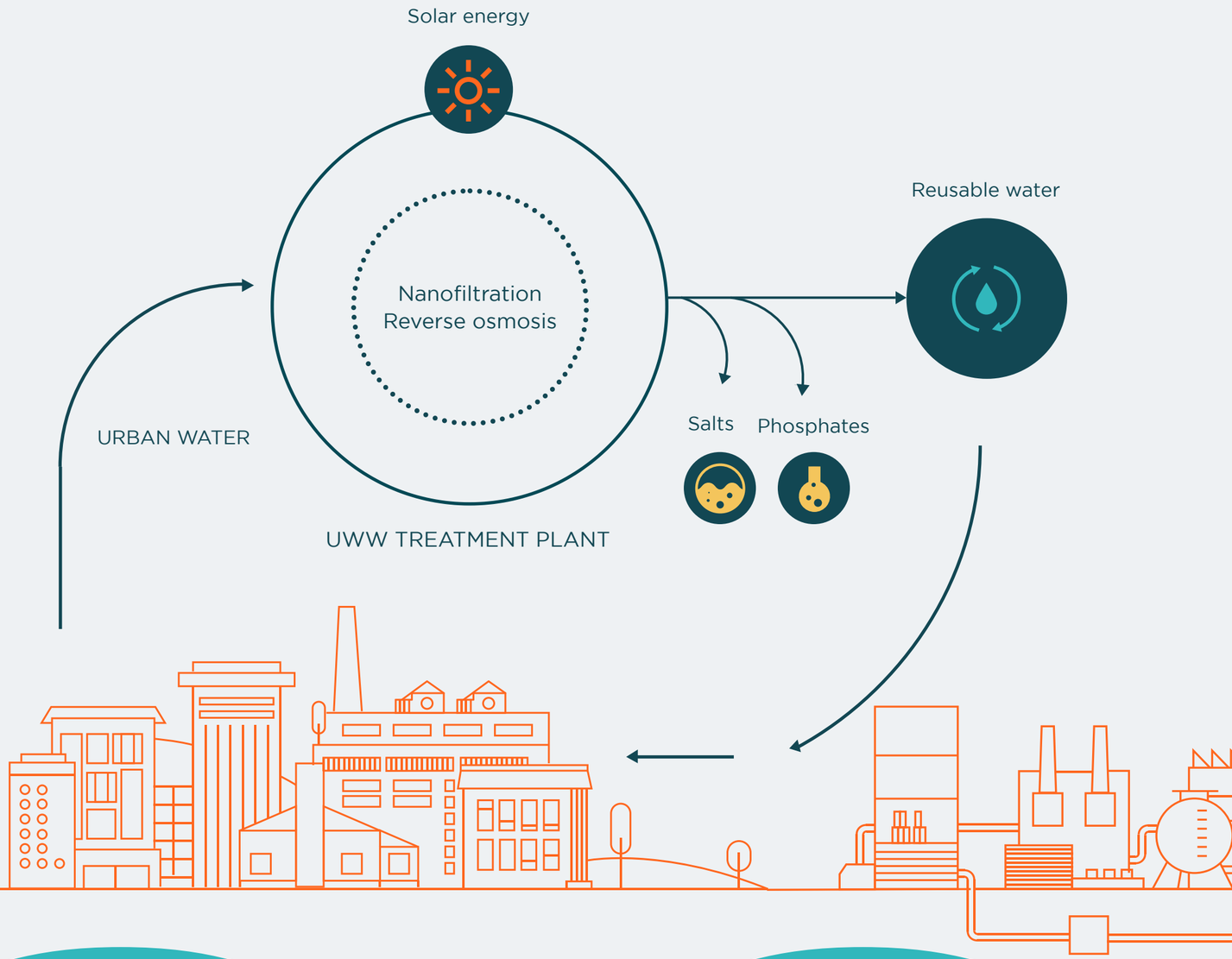
The proposed process is demonstrated at pilot scale and was designed to treat an inflow of 24 m3/day (1m3/h).

BioPhree: An adsorption process that is capable to remove phosphate to ultra-low concentrations (<10ppb). The recovered phosphorus can be used in fertilizers.

Nanofiltration: A NF stage follows the phosphorus recovery stage for the removal of divalent ions as Ca and Mg salts.

Reverse Osmosis: At this stage, the monovalent ions mainly Na and Cl are separated from water resulting in two streams one of high purity water and one containing NaCl.

Multi-Effect Distillation: Evaporator (MED) and Crystallizer: More high purity water is recovered at these two processes from which is finally produced a saturated solution of NaCl or NaCl crystals.



Key innovations

Phosphorous recovery: Removal and recovery of phosphorus achieved with the BioPhree technology provided by Wetsus. The effluent from the MBR treatment of the WWTP is treated with BioPhree, an adsorption process that is capable to remove phosphate to ultra-low concentrations. The total phosphorus will be reduced from 1.5 mg/L to 10-40 Qg/L. This will prevent biofouling in subsequent membrane processes. The innovation in BioPhree

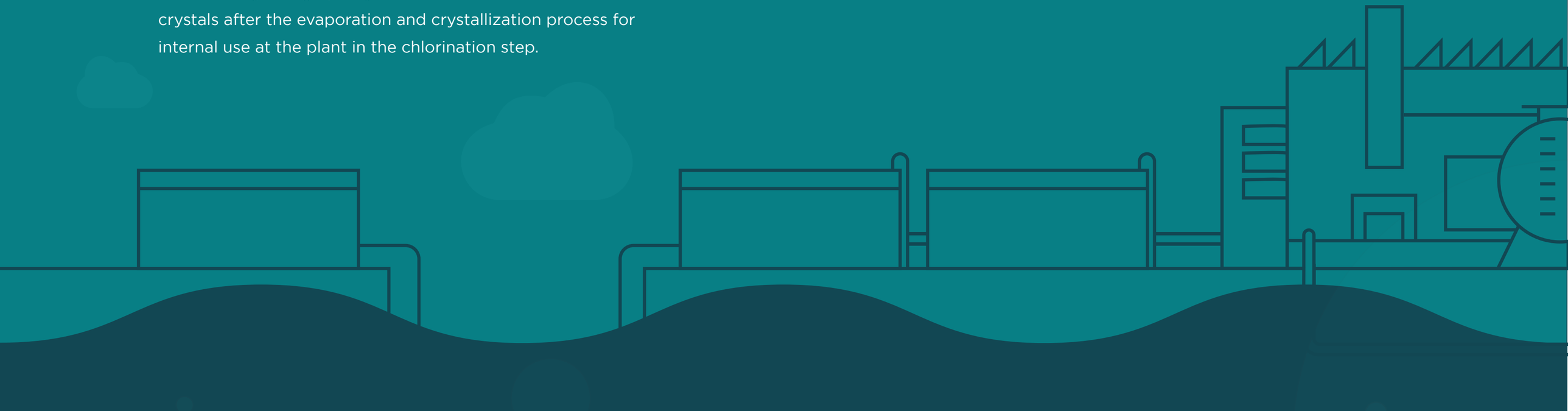
Nanofiltration, Reverse Osmosis, MED evaporator, and Crystallizer are technologies mostly used in the water sector to desalinate seawater/brackish water, and as a water purification process step. In CS4 these technologies are evaluated according to their feasibility to operate in the urban wastewater sector.

Main challenges

The challenge for BioPhree lies in the optimization of adsorbant regeneration and re-use. This is what makes BioPhree cost-effective and sustainable.

To operate the systems with the minimum energy consumption achieving at the same time high quality water and salts with high purity.

The recovery of high purity saturated stream in NaCl or NaCl crystals after the evaporation and crystallization process for internal use at the plant in the chlorination step.



Outcomes

100%

Reuse of water recovered from the treatment of urban WWTP

< 10ppb

Removal and recovery of phosphorus

>99%

Recovery of a high purity saturated stream in NaCl or NaCl crystals (purity >99%)

Expected impact on society

CS4 contributes to changing the perspective of urban wastewater treatment: the society should no longer think about urban wastewater as a residue that must be treated to be discharged, but as a source of valuable materials for the market chain. In CS4 we aim to demonstrate, at a pilot scale, the implementation of circularity in an urban wastewater treatment plant, and the technical, economical, and environmental feasibility of the proposed solution. This Case Study aims to propose a solution minimizing the environmental impact from the use of water with high salinity for irrigation (salinization of underground reservoirs) and concomitantly creating a revenue from the marketable recovered products (salts).

Business opportunities

The business opportunities are based on the three resources that can be recovered by implementing the proposed solution: water, salts and phosphorus.

The proposed system is acting towards the circular business models. The full-scale implementation of the process will contribute to the recovery of high purity water suitable for irrigating different types of crops increasing the potential revenues of the farmers. The phosphorus that will be recovered could be used in fertilizers industry. Furthermore, the recovered salts also increase the revenue of the process making the investment for the proposed process more appealing. The initial investment, the acceptance of the products from the society as well as the changes that should be done in the National and Europe policies are the major challenges faced in the market exploitation of the proposed system. CS4 addresses to a market with a value of approx.

Water

Salts

Phosphorus

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