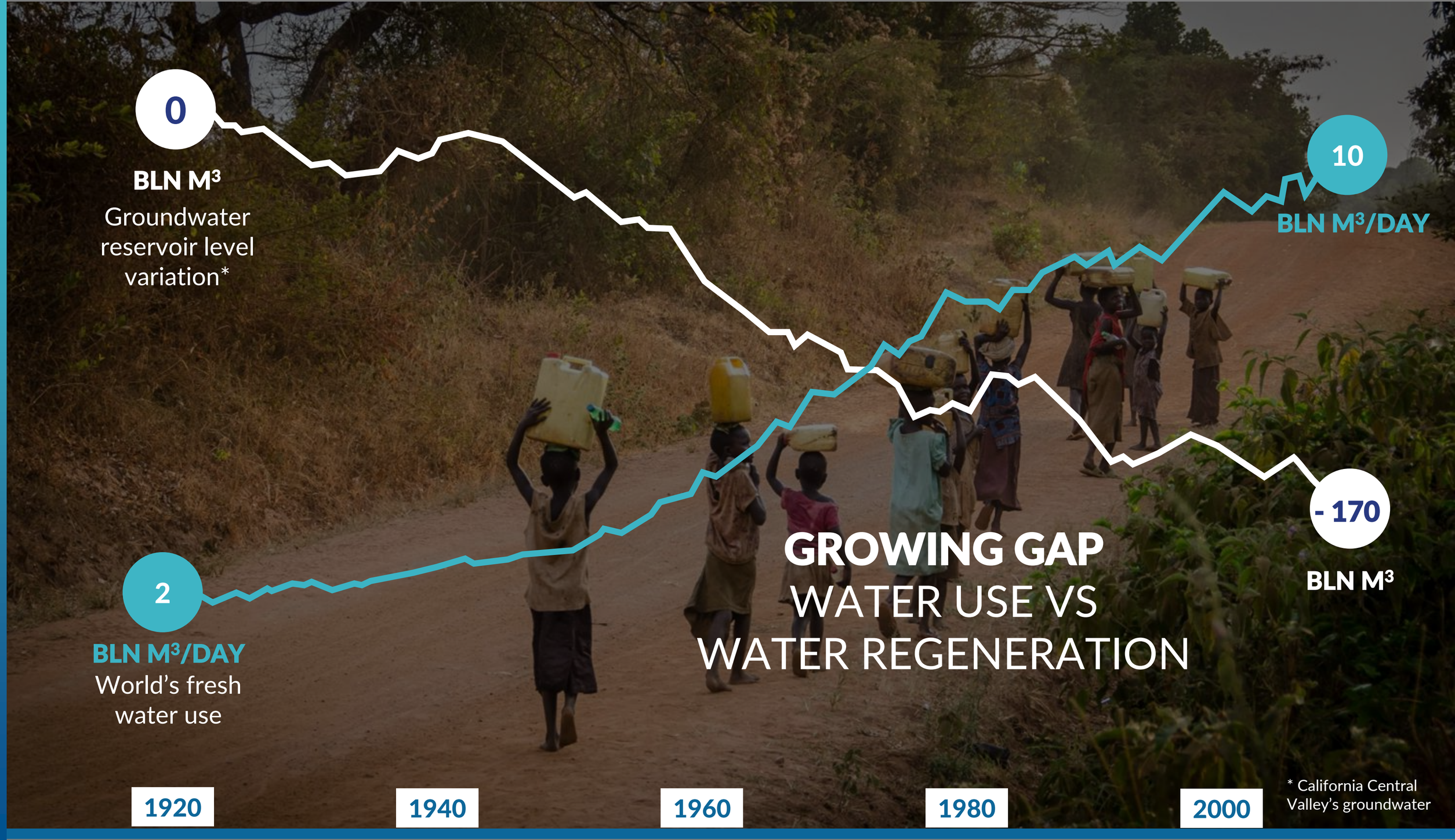
Wave-Powered Desalination: A Sustainable Way to Increase Resilience to Water Scarcity

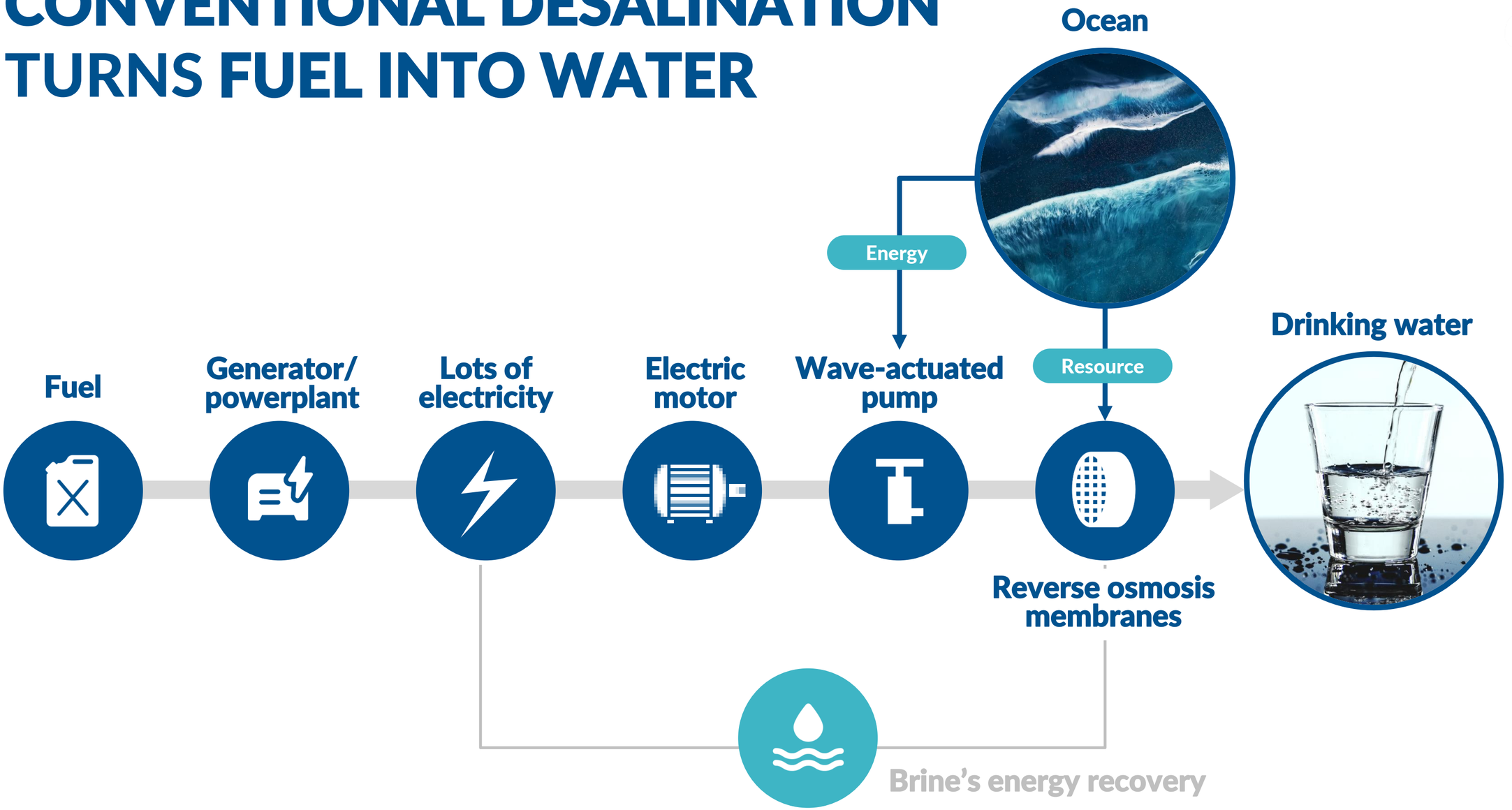
by Dragan Tutic,
CEO & Founder of Oneka Technologies

Making the oceans a sustainable, affordable and accessible source of drinking water

February 9th, 2022


0
BLN M³
Groundwater reservoir level variation*
10
BLN M³/DAY
- 170
BLN M³
2
BLN M³/DAY
World's fresh water use
GROWING GAP
WATER USE VS
WATER REGENERATION
1920
1940
1960
1980
2000
* California Central Valley's groundwater

CONVENTIONAL DESALINATION TURNS FUEL INTO WATER



CONVENTIONAL DESALINATION COST BREAKDOWN

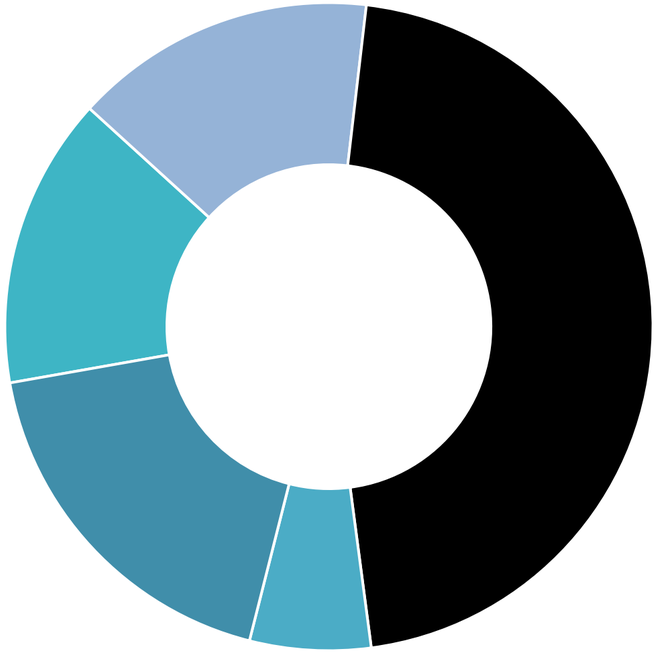
20,833
m3/day plant example

15%
Total cost of capital at interest 8%

15%
Total capital cost

18%
OpEx - total materials and others

6%
OpEx – total labor



46%
OPEX – TOTAL ENERGY COST

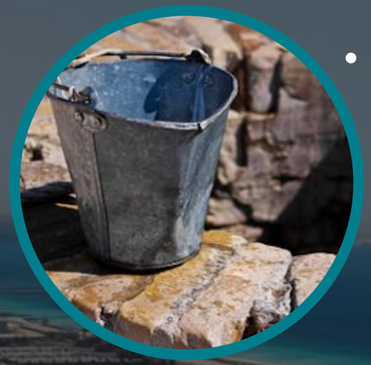
5,500,000 $/yr

Numerous suppliers (>10) and stakeholders sharing the Capital costs and Operational costs value chain

4,500,000 $/yr

Single largest cost
One single source

WATER SCARCITY



CONVENTIONAL DESALINATION

CLIMATE CHANGE

2020

~1 %
of world's population lives on desalinated water

=

~0,5 %
of world's CO_2 emissions

2050

10 %
of population

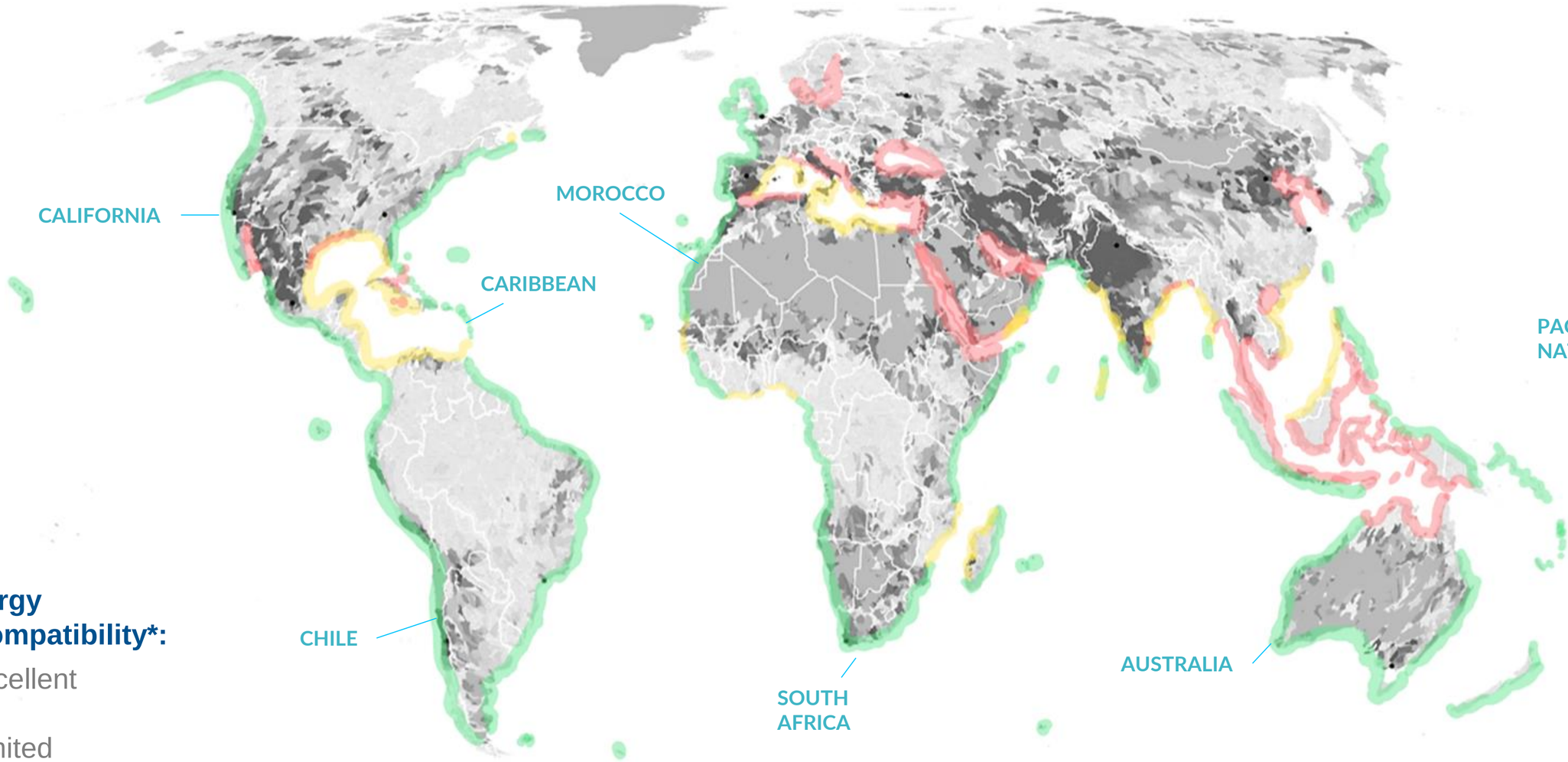
desalination to roughly tenfold at current growth rate

=

~ 5 %
of today's world's CO_2 emissions

about twice the aviation industry

WAVE ENERGY MEETS
WATER SCARCITY

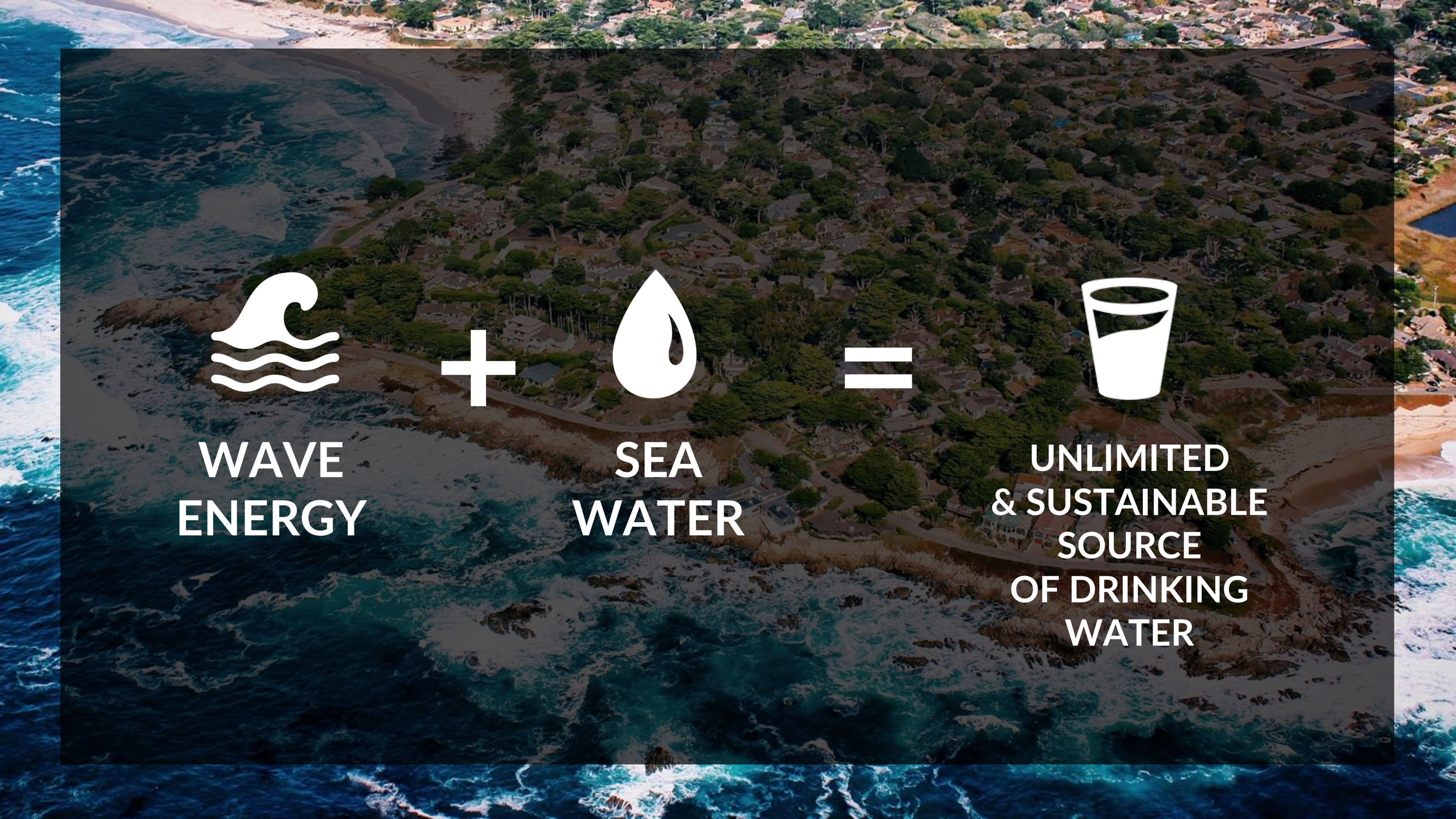


Wave Energy density compatibility*:

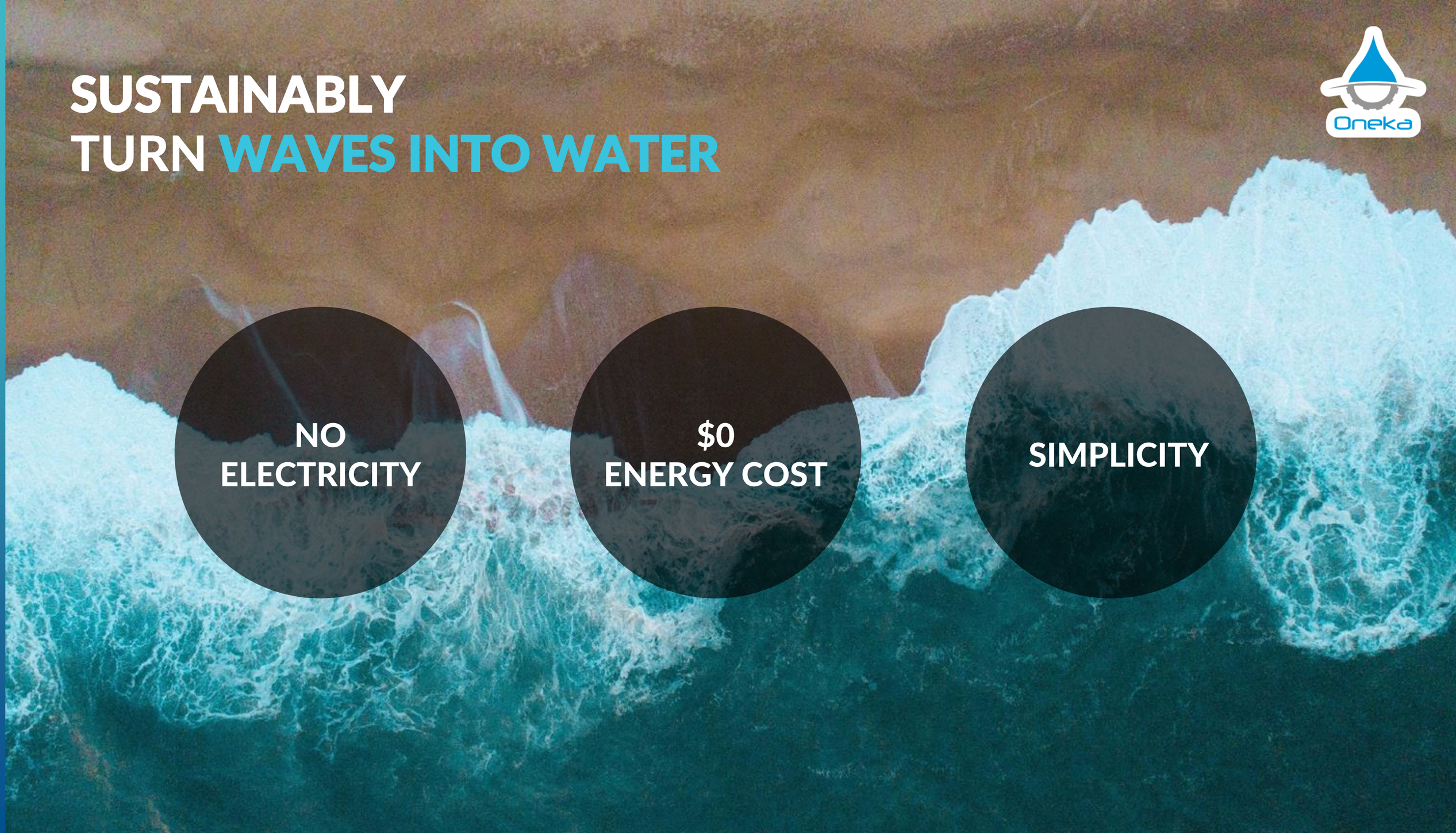
- Excellent
- Ok
- Limited

*approximative zones for indicative purposes

Market examples facing water scarcity


WAVE ENERGY
+
SEA WATER
=
UNLIMITED & SUSTAINABLE SOURCE OF DRINKING WATER

SUSTAINABLY
TURN WAVES INTO WATER

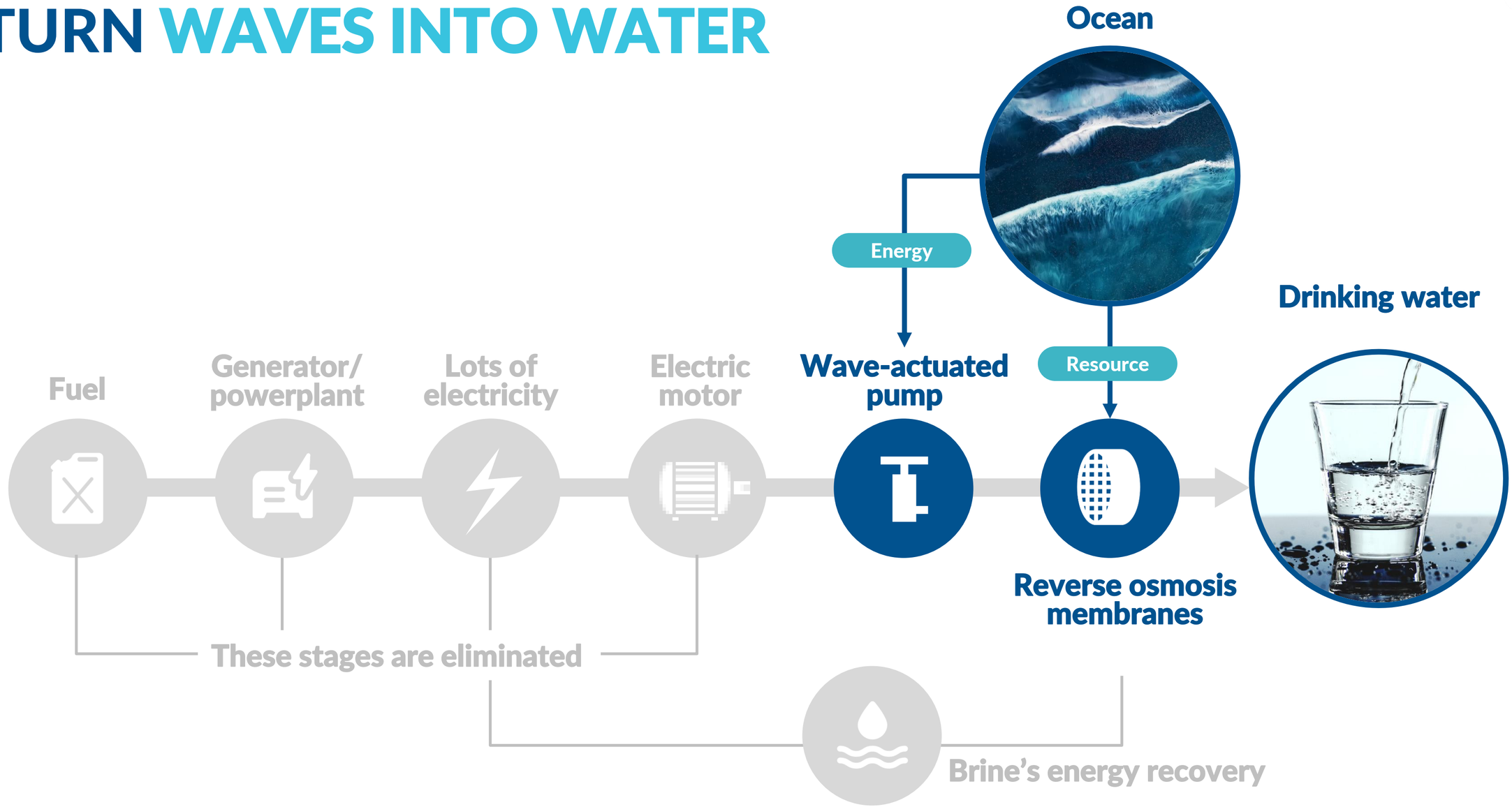


NO
ELECTRICITY

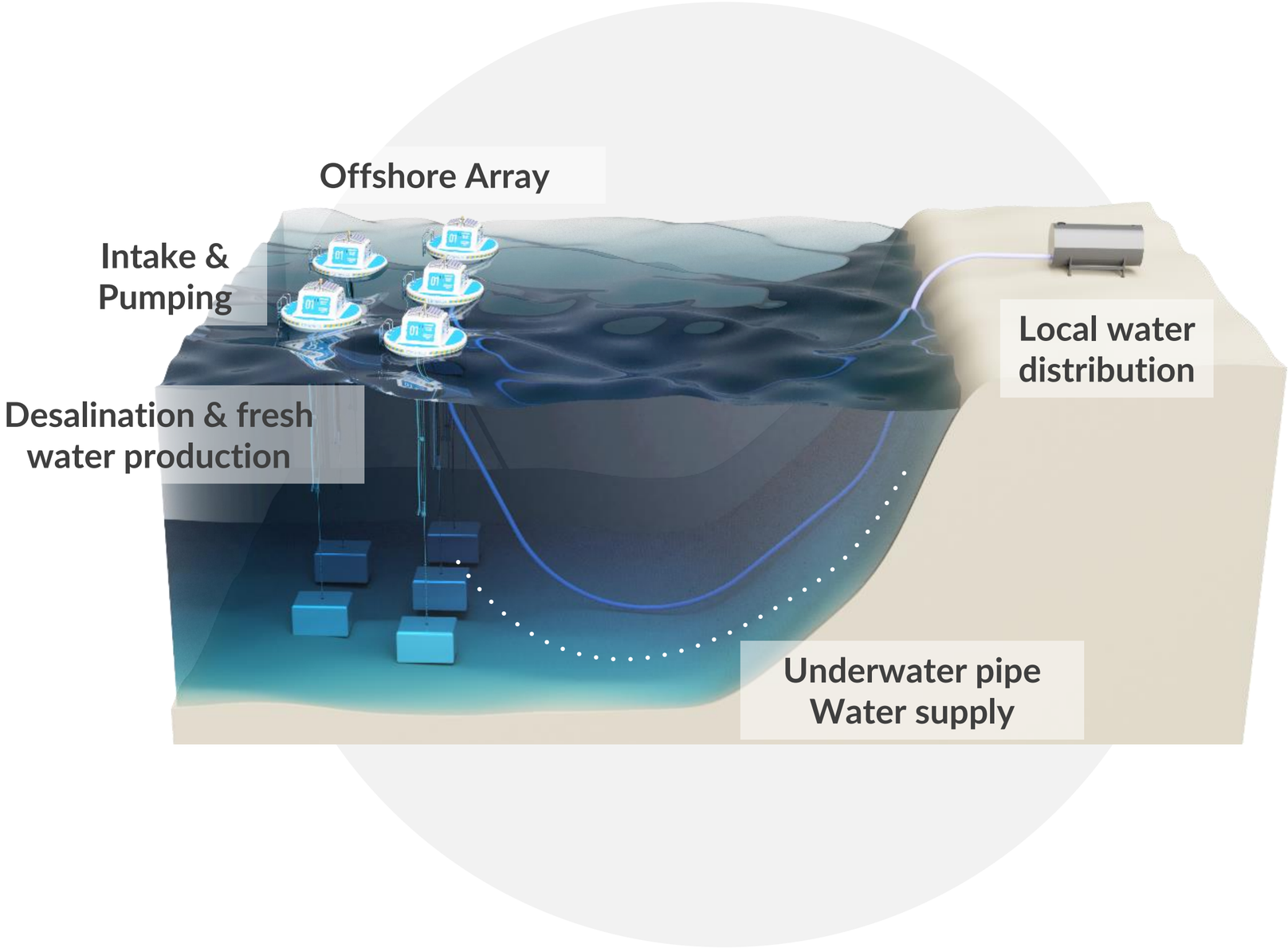
$0
ENERGY COST

SIMPLICITY

SUSTAINABLY
TURN WAVES INTO WATER



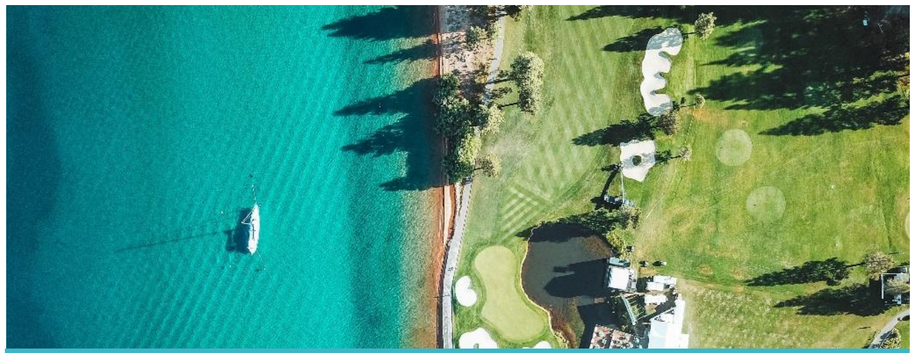
SOLUTION


Offshore Array
Intake &
Pumping
Desalination & fresh
water production
Local water
distribution
Underwater pipe
Water supply

VERSATILE APPLICATIONS AND MARKETS

MUNICIPAL/ COMMUNITIES

INDUSTRIES



TOURISM & RESORTS

EMERGENCY RELIEF

PRODUCT CLASSES

CURRENT

SNOWFLAKE CLASS

Emergency Relief Applications

- Capacity: 1.5 m^3/day
- Diameter: 1.5 m

P - CLASS

Piloting & Demonstration Purposes

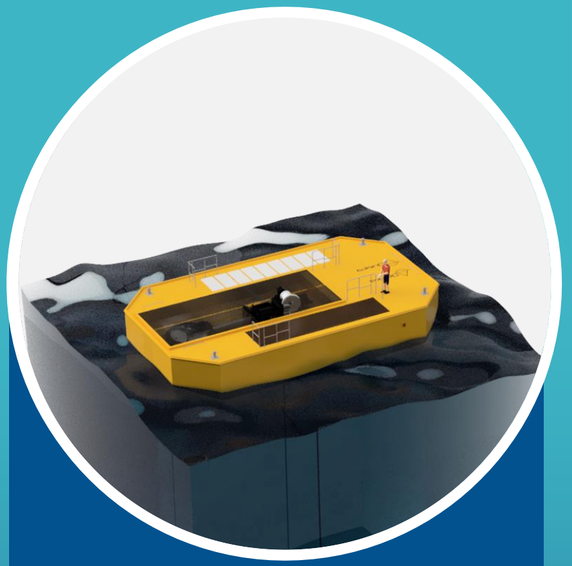
- Capacity: 10 m3/day
- Eq. Diameter: 3.5 m
- 20 t CO_2e/yr Savings

ICEBERG CLASS

Smaller Scale (<2000 m3/d) Commercial Projects

- Capacity: 50 m3/day
- Eq. diameter: 6.5 m
- ~ 120 t CO_2e/yr Savings

UPCOMING

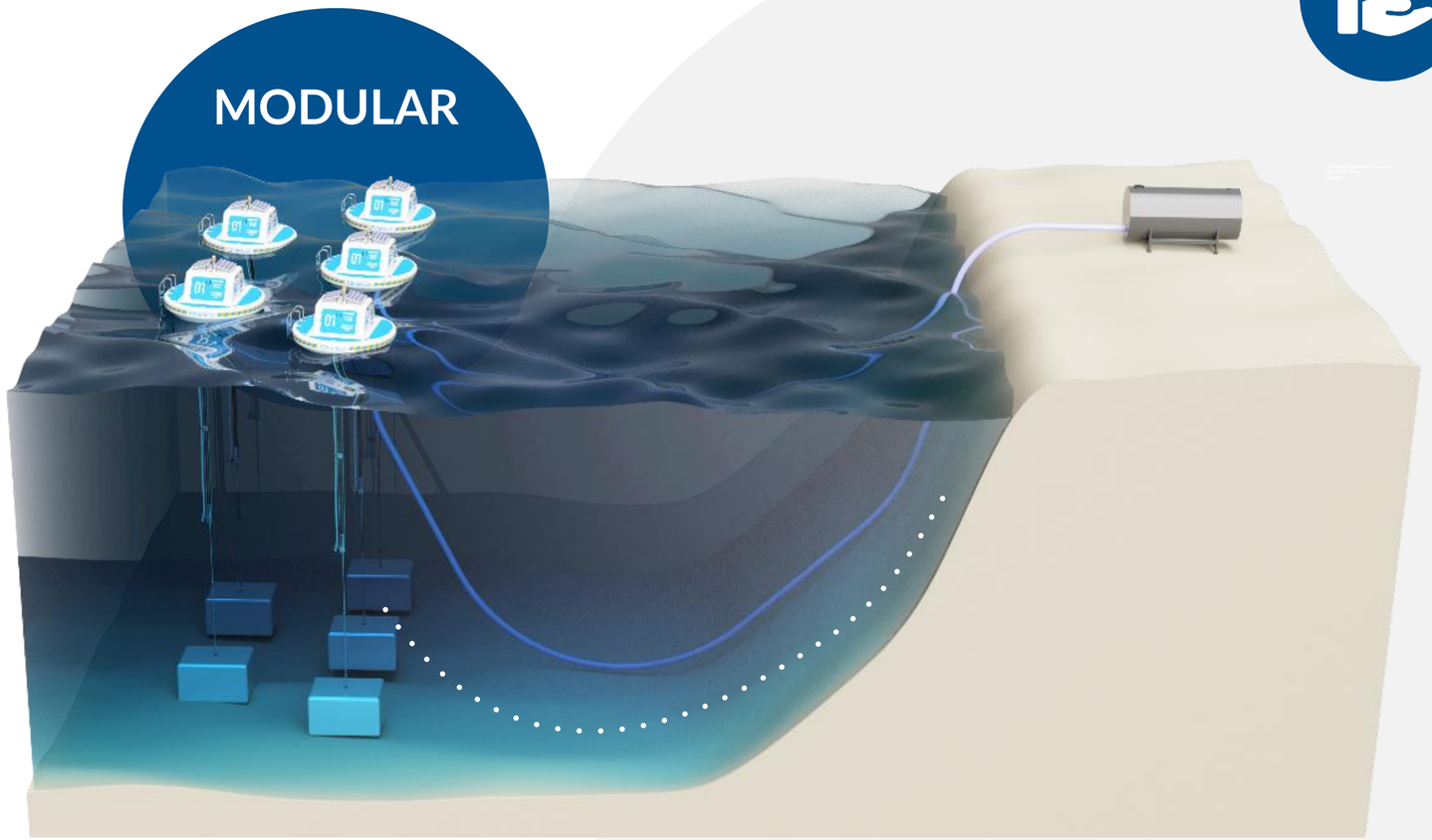


GLACIER CLASS

Large Scale (>20,000 m3/d) Utility Projects

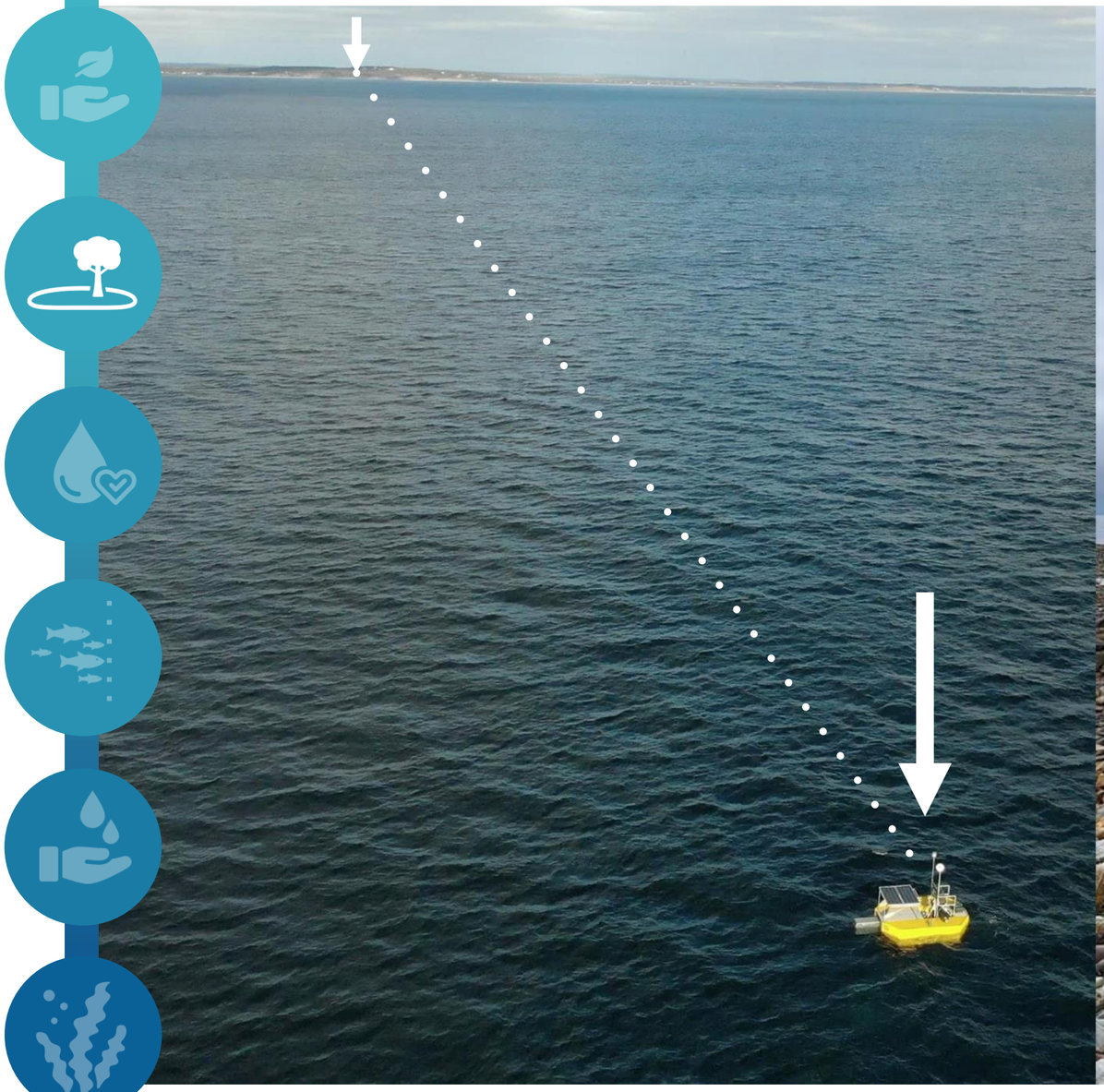
- Details TBA

SOLUTION'S BENEFITS



- ZERO GHG EMISSIONS
- ZERO LAND USE
- RESPONSIBLE BRINE
- SAFE INTAKES
- DECENTRALIZED
- ARTIFICIAL REEFS

No land or visual impact



Compared to solar powered desal

Responsible brine: Low concentration + diffusion

	WAVE POWERED DESALINATION	CONVENTIONAL DESALINATION
Salinity	**±35%** higher salinity than seawater High efficiency energy recovery enables low recovery and reduces membrane fouling	**±100-150%** higher salinity than seawater Maximize recovery for energy cost efficiency, results in high salinity brine
Diffusion	**Brine released over a vast area** Modular system, offshore release combined with wave action mixing	**Localized brine released zone** Released from the coast, any diffusion systems are an additional burden or cost
Result	**The salinity variation is extremely limited**	**Localised salinity increase can be significant in some cases**

Responsible Brine: Brine outfall example

Brine specifications

Salinity Increase

+ 2000 ppm California's salinity increase limit at 100m radius

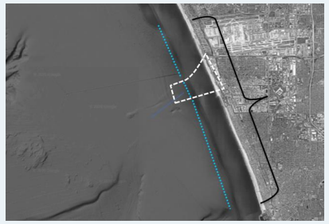
Wave-powered desalination Los Angeles Project example (same capacity)

Brine with a salinity of +10,000 ppm (+30%) diffused over 10 km

under +100 ppm

Based on a preliminary calculation using local currents, wave climate information

Diluted over 10 km



Potential alternative:

Mix it with the Hyperion's waste water outfall. 10x diffusion released 5 miles offshore with over 200ft depth

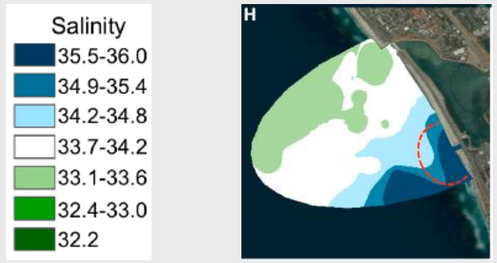
SAN DIEGO'S CARLSBAD DESAL PLANT

Brine with a salinity of + 45,000 ppm (+ 120%) diluted 10x in a powerplant's outflux and diffused at a single point right on the shallow beach

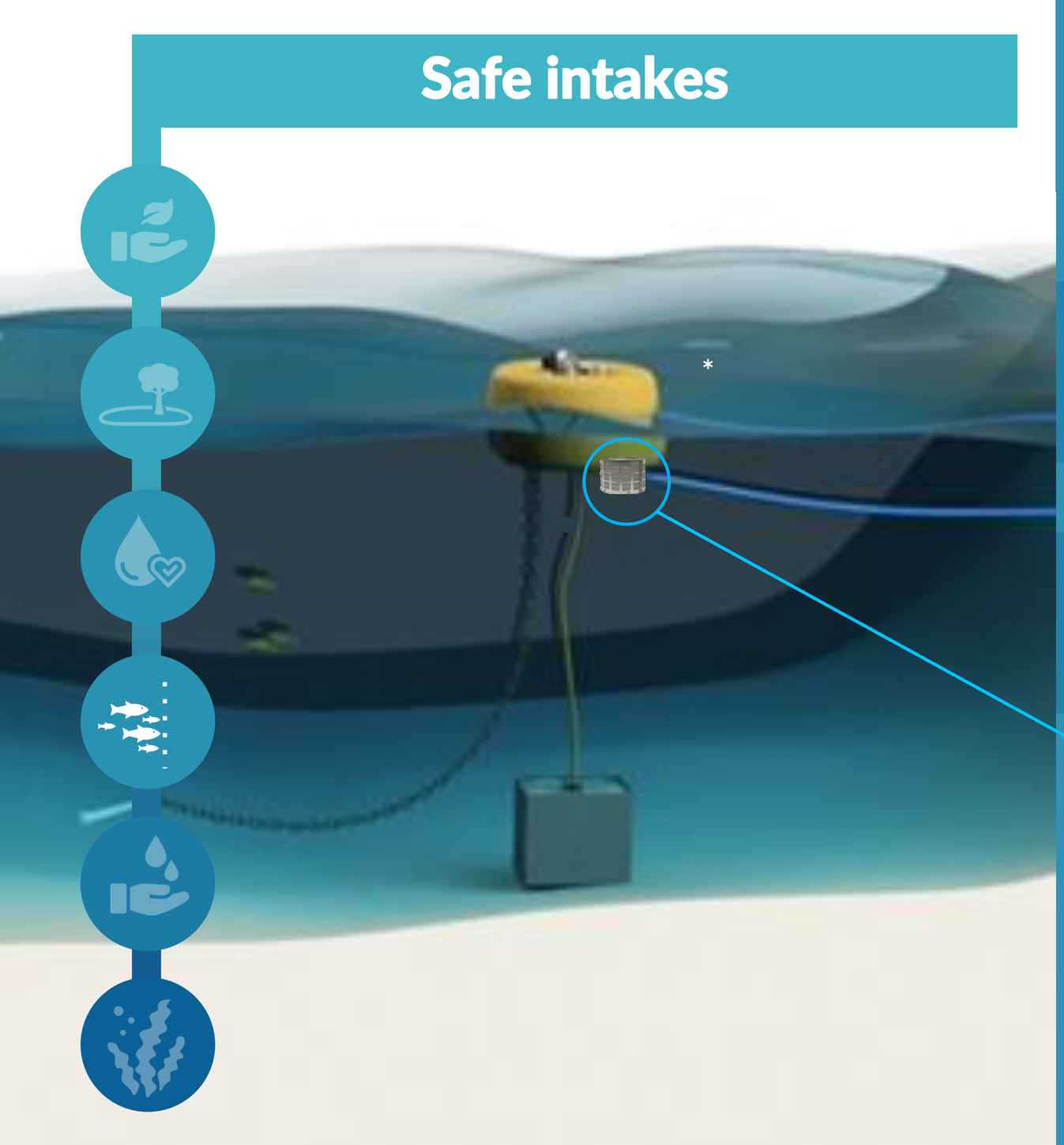
+2700 ppm

Value measured at over 200m from the outfall. Carlsbad got a derogation to move the point of measure to 200m instead of 100m. The impacts on the environment seem limited event in that situation. (Peterson, 2019)

Sanity variation chart

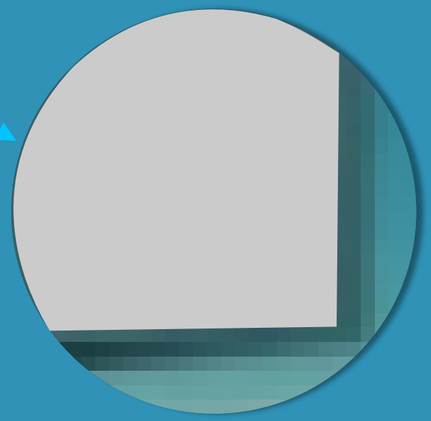


Safe intakes



Engineered to protect sea life:

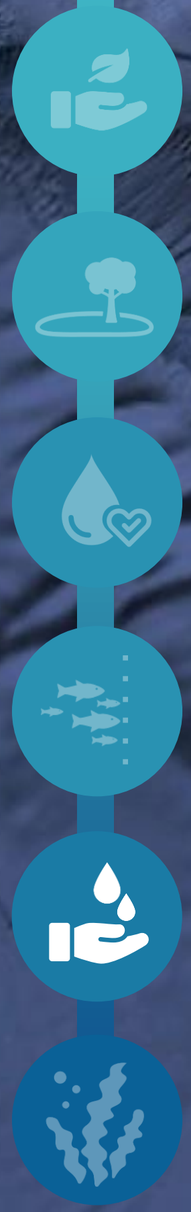
- 60-micron-size intake holes to prevent harmful impact on ecosystems (adjustable)
- Backwashed to reduce maintenance and ensure enhanced suction protection



*ONEKA SNOWFLAKE UNIT AS AN EXAMPLE (EMERGENCY RELIEF)

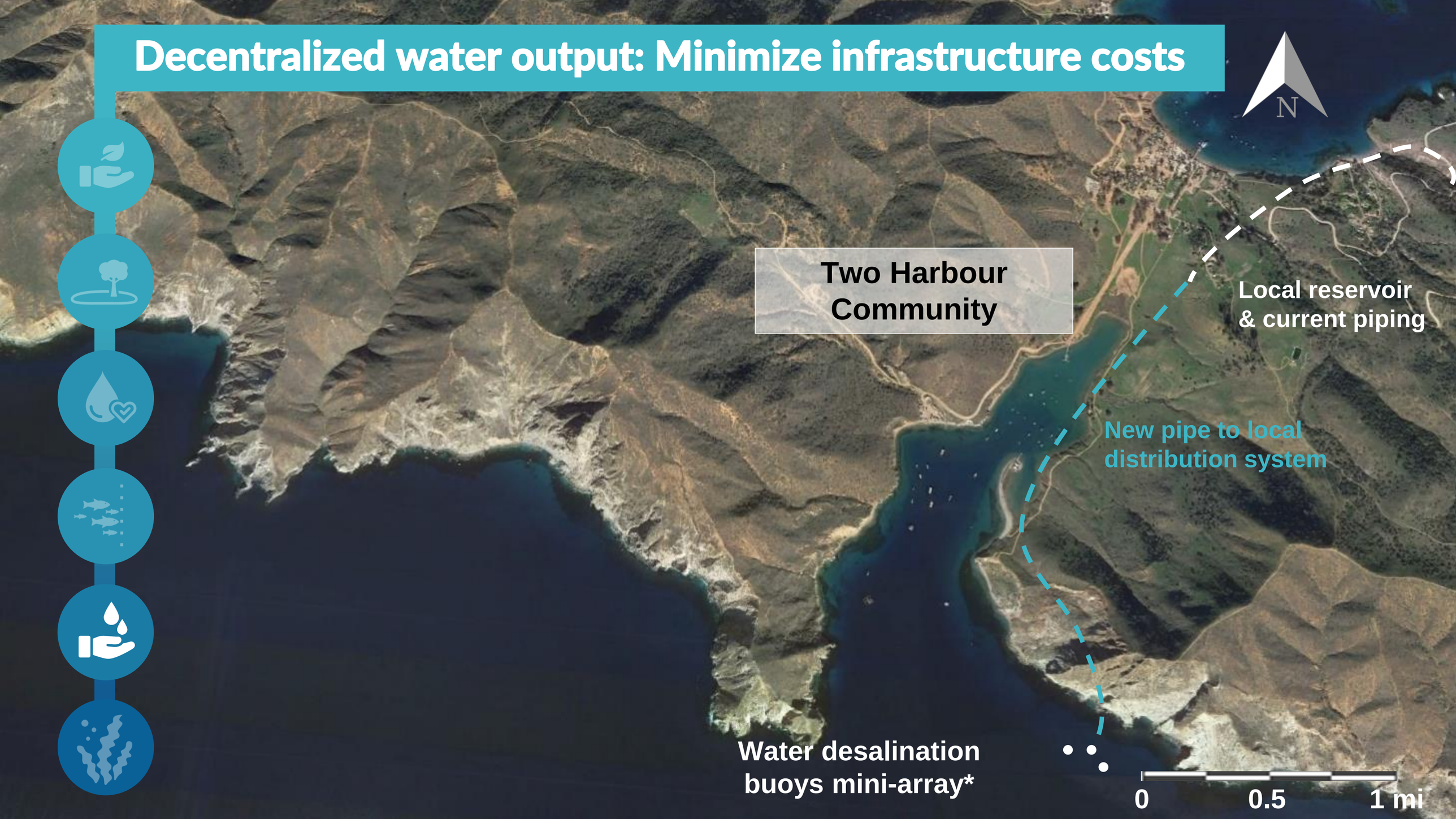
Decentralized water output: Minimize infrastructure costs

SANTA CATALINA ISLAND EXAMPLE



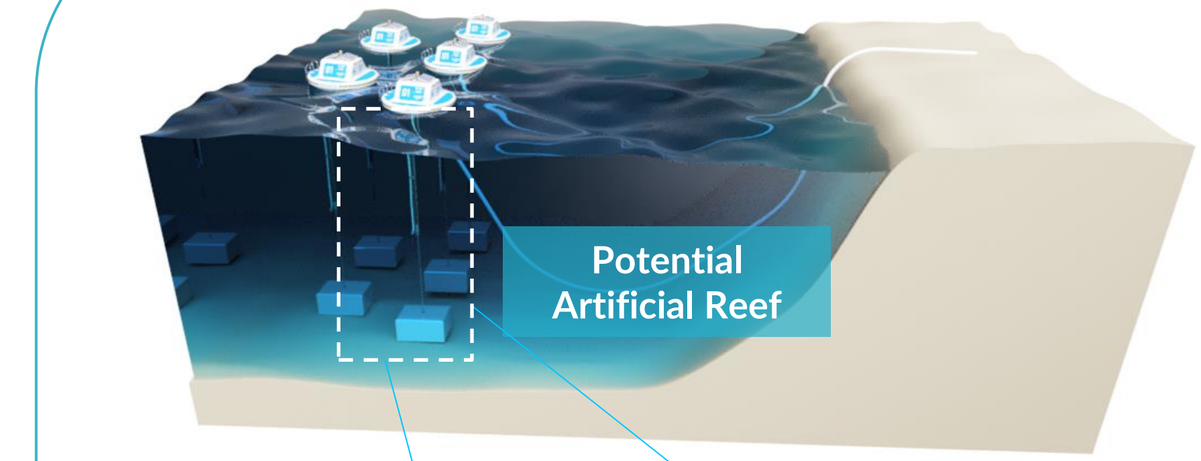
OnekaWater.com

Decentralized water output: Minimize infrastructure costs

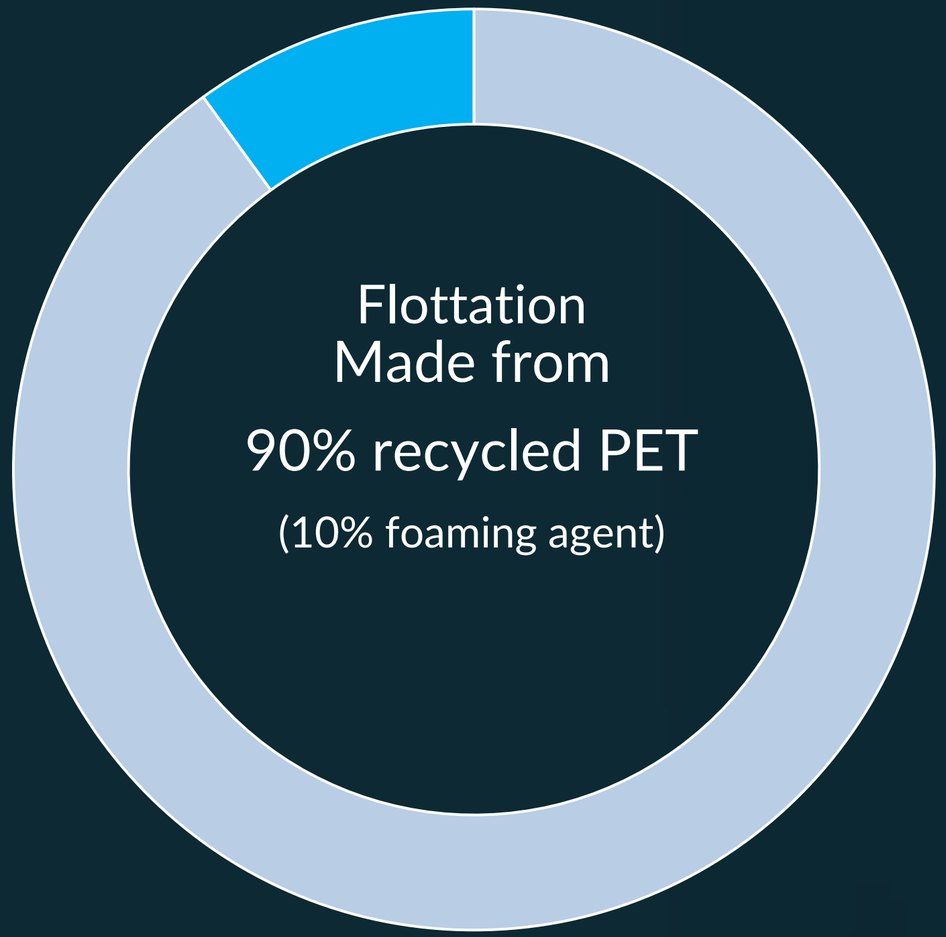


POTENTIAL ARTIFICIAL REEF

- Seabed footprint used positively for the ocean
- Can be adapted to a specific site needs (marine life, hardbottoms, corals etc.)



RESPONSIBLE MATERIALS



Which represents :

P1

30,000

Iceberg (50% larger)

150,000

Typical Small Project (500 m^3/d)

1,500,000

GET INVOLVED:

- Sites for deployment in California
- 3rd party environmental studies & validation
- Environmental benefits optimization (artificial reefs)

Contact: DT@onekawater.com