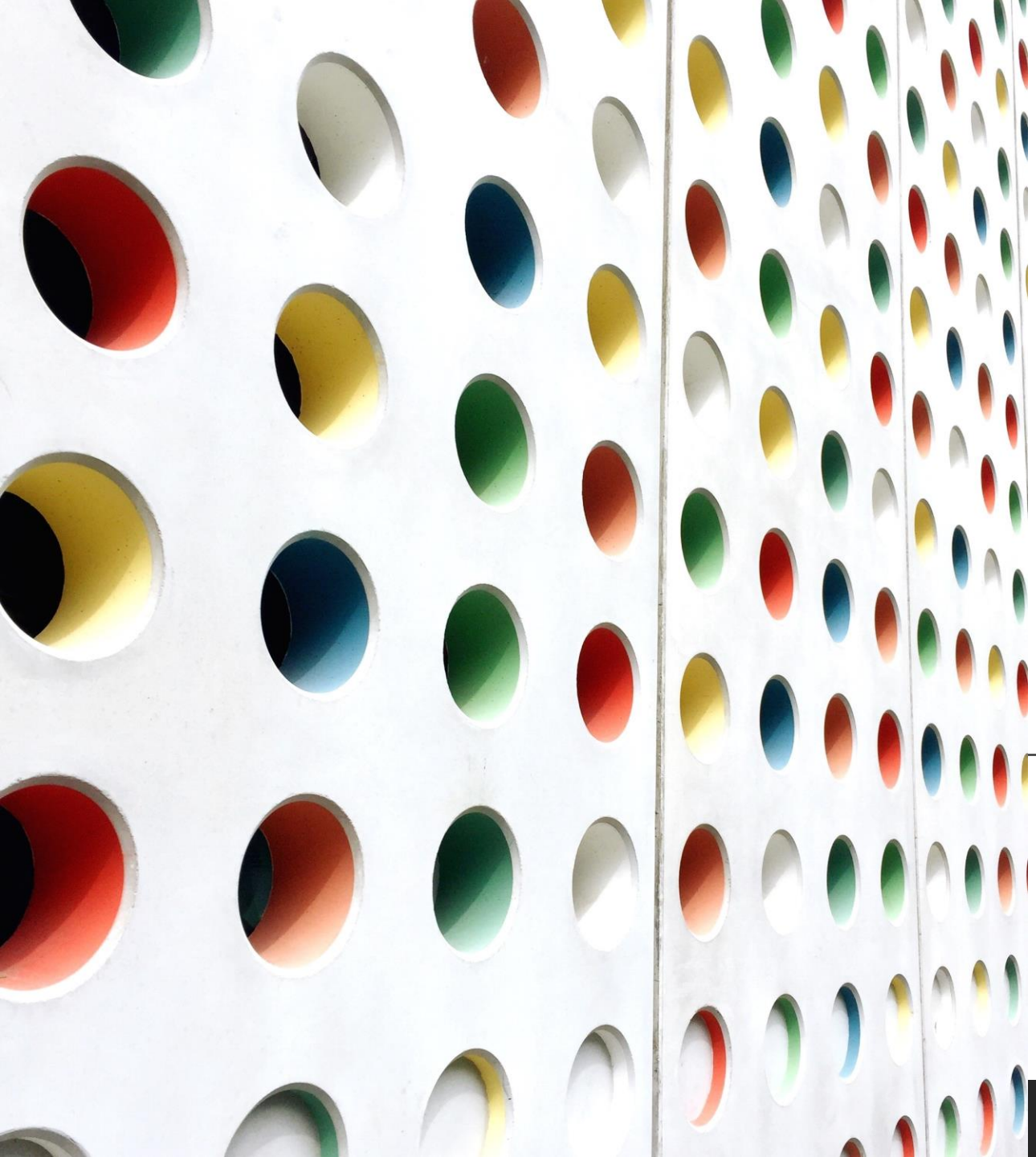


Marine Aquaculture, Renewable Energy, Reefs & Ecotourism for Ecosystem Services (MAR²E³S)

17 FEBRUARY 2021

Rationale

Regenerative Utilization of resources

- **DMCs current reliance on unsustainable linear extractive and low value industries and policy status quo**
- **Paradigm shift: creation of higher value industries with more local content and retained value in healthy oceans →**

Regenerative Marine Industries

Rationale

Reduce fossil fuel emissions with rapid increase in regenerative green hydrogen production

Replace unsustainable fisheries and tourism with regenerative aquaculture and new tourism models

Integrate new climate-proof food production to augment local economies while building local capacity

Commercialize cultivated reefs for coastal defense (nature-based insurance policies)

Create new industries with capacity for rapid scale up to international markets – Hydrogen (& alternate fuels)

- Using marine renewable energy to make hydrogen and alternative fuels (ammonia, methanol, ethanol)
- Creating export market for the hydrogen, accelerating global green hydrogen development
- Using the fuels locally for transport and industry
- Using the energy locally to accelerate nature-based defenses and marine aquaculture for domestic and export markets while regenerating the ocean surrounding the infrastructure whilst
- Attracting high value tourism to see ocean regeneration in action.

The MAR^2E^3S APPROACH

Energy

Fuel for Marine
Transport & Export

Food

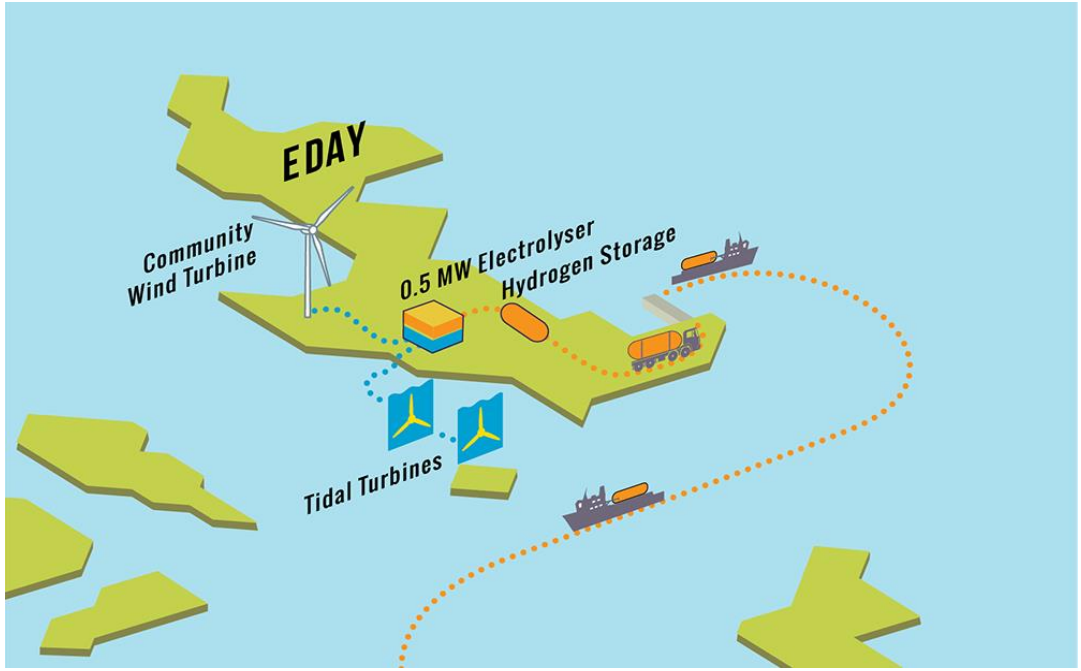
Regeneration

Similar Approaches for Energy Only

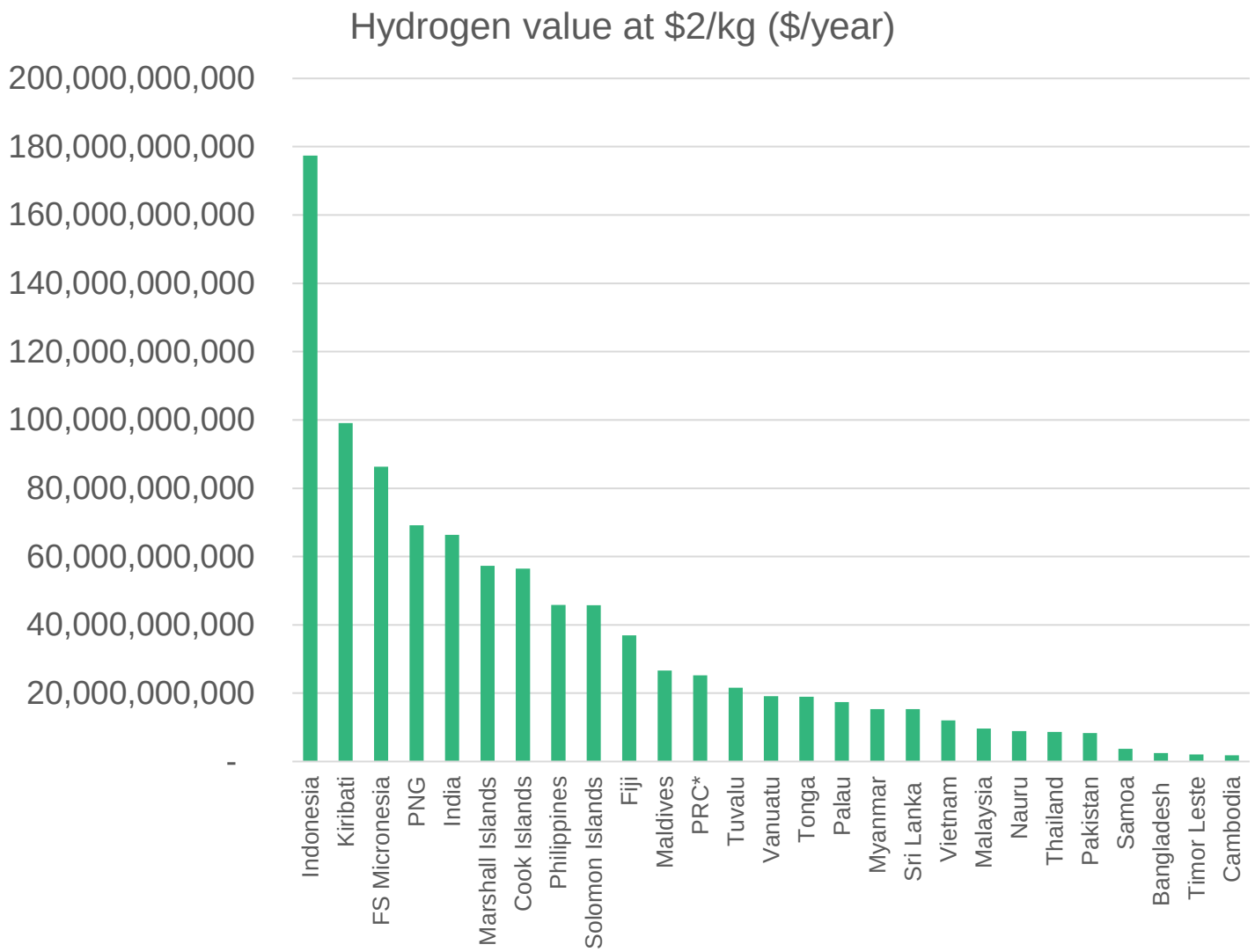
The use of marine energy to make hydrogen has been demonstrated successfully in the Orkney islands, Scotland. Orsted, Total and Siemens are expanding capacity in marine power to hydrogen.

https://www.surfnturf.org.uk/
Orkney Islands – Surf 'n turf hydrogen project

https://www.climatechangenews.com/2020/08/24/orsted-backs-danish-offshore-wind-powered-hydrogen-project/nshore
Orsted's offshore wind to onshore hydrogen project

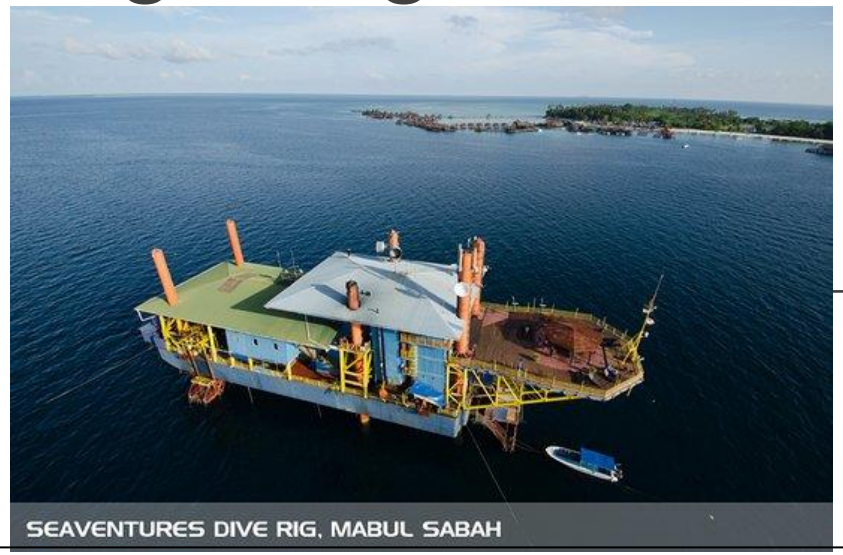


Economic Drivers for Marine Renewable Energy to H_2



- 27 of ADB Developing Member Countries (DMCs) have Exclusive Economic Zones (EEZs).
- By using 1% of EEZ area for marine renewable energy, 23,000 TWh/y could be generated. (Equal to current global electricity output).
- Converting this electricity to hydrogen could displace 40% of global natural gas production.
- *1% of 27 ADB DMCs EEZ producing green hydrogen could create an industry with revenues of* ***$1 Trillion/year.***

Integrating Marine Renewable Energy in MAR²E³S



Reefs come in many forms, including converted offshore energy infrastructure, and can be grown faster than natural reefs are dying

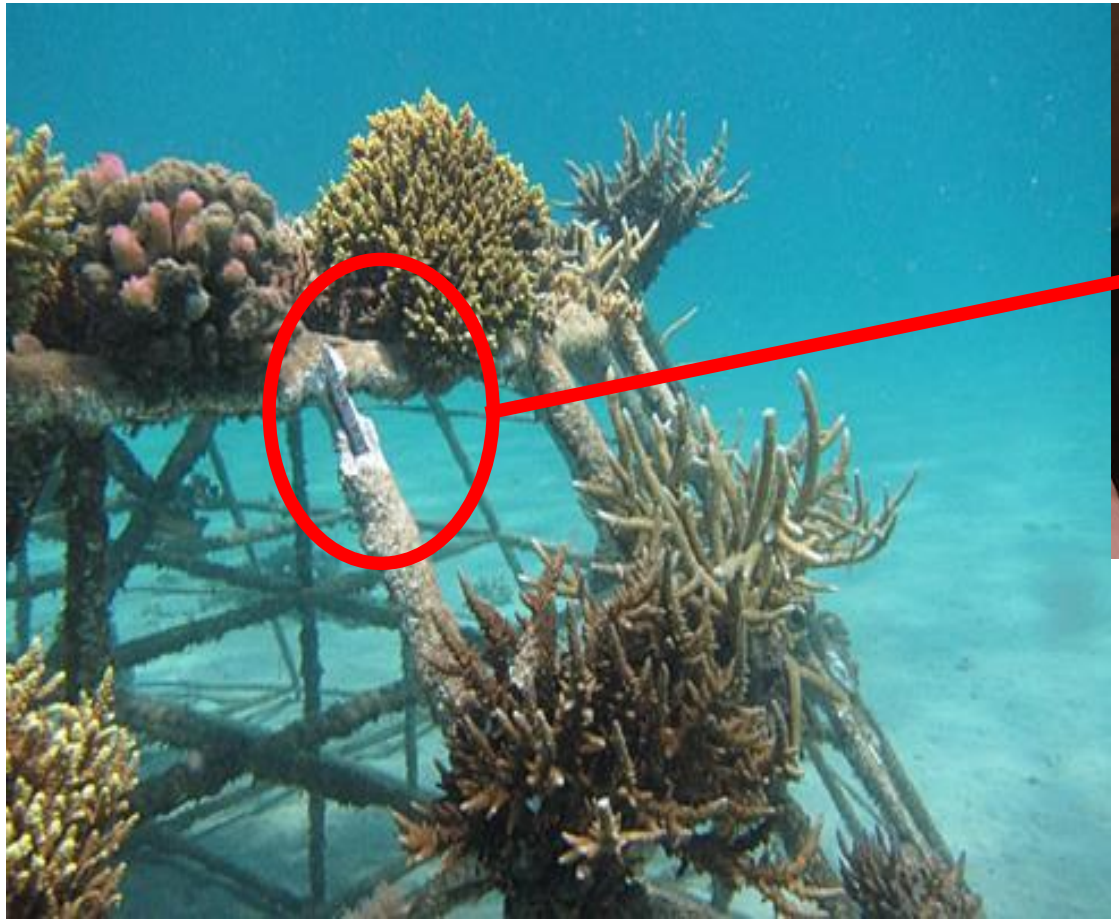
Using locally made energy for regenerative works to reduce ocean acidification, create livelihoods and clean the oceans

Ecotourism can be developed around cultivated reefs and integrated with marine aquaculture

Advanced marine aquaculture output could be 100 times current global seafood consumption

Integrating Cultivated Reefs and Aquaculture

Limestone ($CaCO_3$) grown* using trickle charge electricity to augment coral propagation, nature-based defenses, and mitigate any energy infrastructure impact while directly mitigating local ocean acidification.

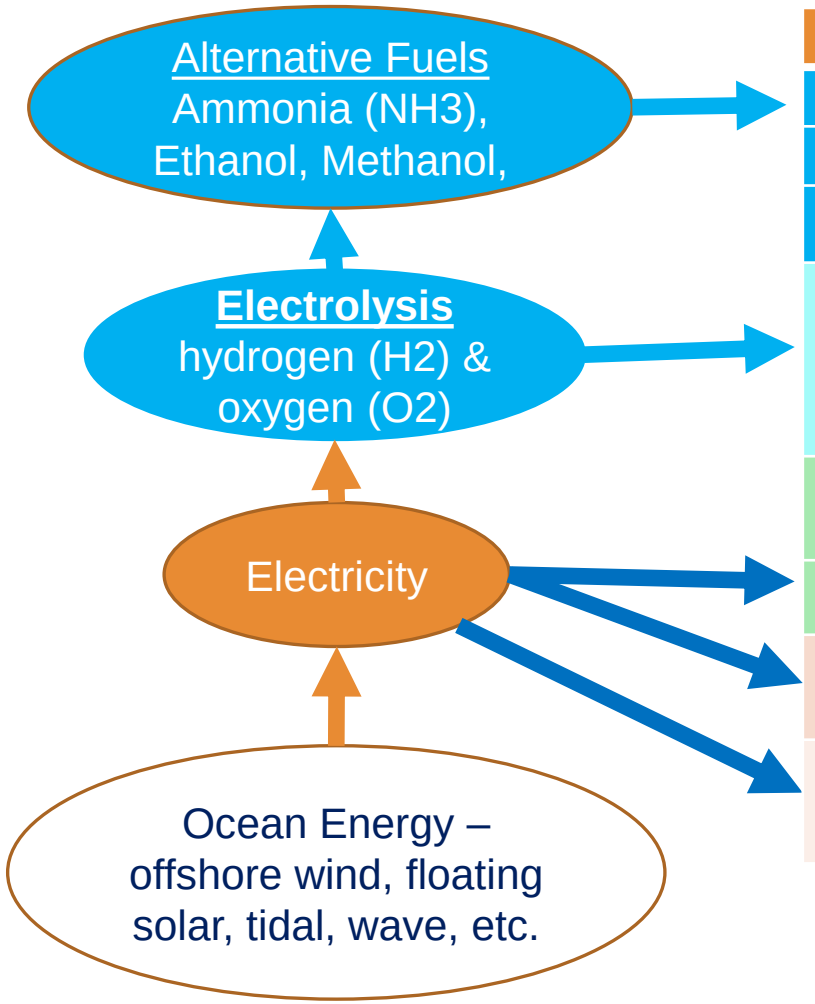


This technique has been demonstrated at multiple sites in Asia for more than 10 years.

Photos courtesy of Scott Countryman, Coral Triangle Conservancy: ree.ph

**** Each ton of $CaCO_3$ sequesters 0.44 tons CO_2***

Including Regenerative Aspects to Supply Chain



USE CASE	TA SCOPE	SCALE UP
Marine Transport (Shipping)	Learning from existing business models.	H2 AMC supported for target production price
Aviation Transport		
Local Marine Transport		
Bulk Transport to existing markets for fuels to be sold at commodity prices, albeit with regenerative fuel premium.	Hydrogen Fuel Advanced Market Commitment Fund – (H2 AMC) $Bn to catalyze supply chain and create market for Hydrogen @ US$2/kg	
Nature Based Defenses (coastal zone reefs)	Learning from existing business models.	New Insurance Product Line
Cultivated Reefs (including rigs to reefs)		
Regenerative Marine Aquaculture	Learning from existing business models.	PSOD Industry Support
Wrecks to Reefs	Pacific Blue Shipping Program (US$ 500m) Carbon offset Fund	

Emphasis on scaling up existing investment/lending outcomes from current and TA derived knowledge base. Integrating nature-based defenses into mitigation of marine energy infrastructure

Proposed Solutions

OUTPUT 1

Healthy ocean investments catalyzed through clean energy interventions.

a)to strengthen efforts to create regenerative business models using ocean resources to bolster ocean health and community resilience.

b)to identify a pipeline of projects which can showcase regenerative impacts on ocean health through energy source changes (fossil to renewable), sustainable aquaculture integrating nature-based defence whilst enhancing sustainable tourism potential including rigs to reef.

c)to identify key stakeholders to scale up regenerative ocean investment pipeline and the possibility of advanced market commitment for the offtake of green marine hydrogen.

OUTPUT 2

Knowledge, regional cooperation, and financing for innovation in healthy oceans improved

a)to study to identify existing and planned initiatives in the four core MAR^2E^3S areas: (i) marine energy (offshore solar, wind, tidal energy coupled with hydrogen electrolysis and H2 to X), (ii) cultivated reefs (including rigs to reefs), (iii) restoration through regenerative aquaculture and (iv) ecotourism.

b)to assess current policy and regulatory models as well as capacity to foster developments in the core MAR^2E^3S areas.

The MAR^2E^3S APPROACH

- Using marine energy to make hydrogen and alternative fuels (ammonia, methanol, ethanol, etc.)
- Creating export market for the hydrogen, accelerating global green hydrogen development
- Using the fuels locally for transport and industry
- Using the energy locally to accelerate nature-based defenses and marine aquaculture for domestic and export markets while regenerating the ocean surrounding the infrastructure whilst
- Attracting high value tourism to see ocean regeneration in action.

Thank You!

We look forward to your support in developing the regenerative marine industrial ecosystem.