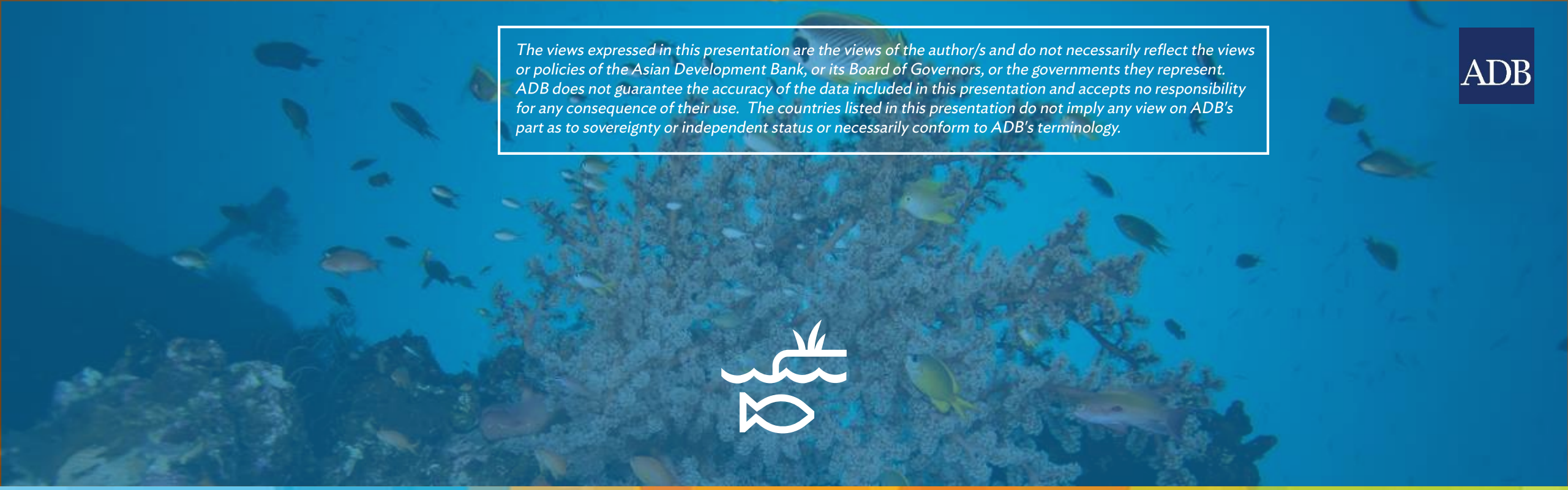

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ADB

Marine Aquaculture, Renewable Energy, Reefs & Ecotourism for Ecosystem Services (MAR^{2}E^{3}S)

Steve Peters, Senior Energy Specialist (Waste to Energy) , Energy Sector Group,
Sustainable Development and Climate Change Division, Asian Development Bank

10 February 2023

Rationale – Ocean Regeneration

Regenerative Utilization of resources

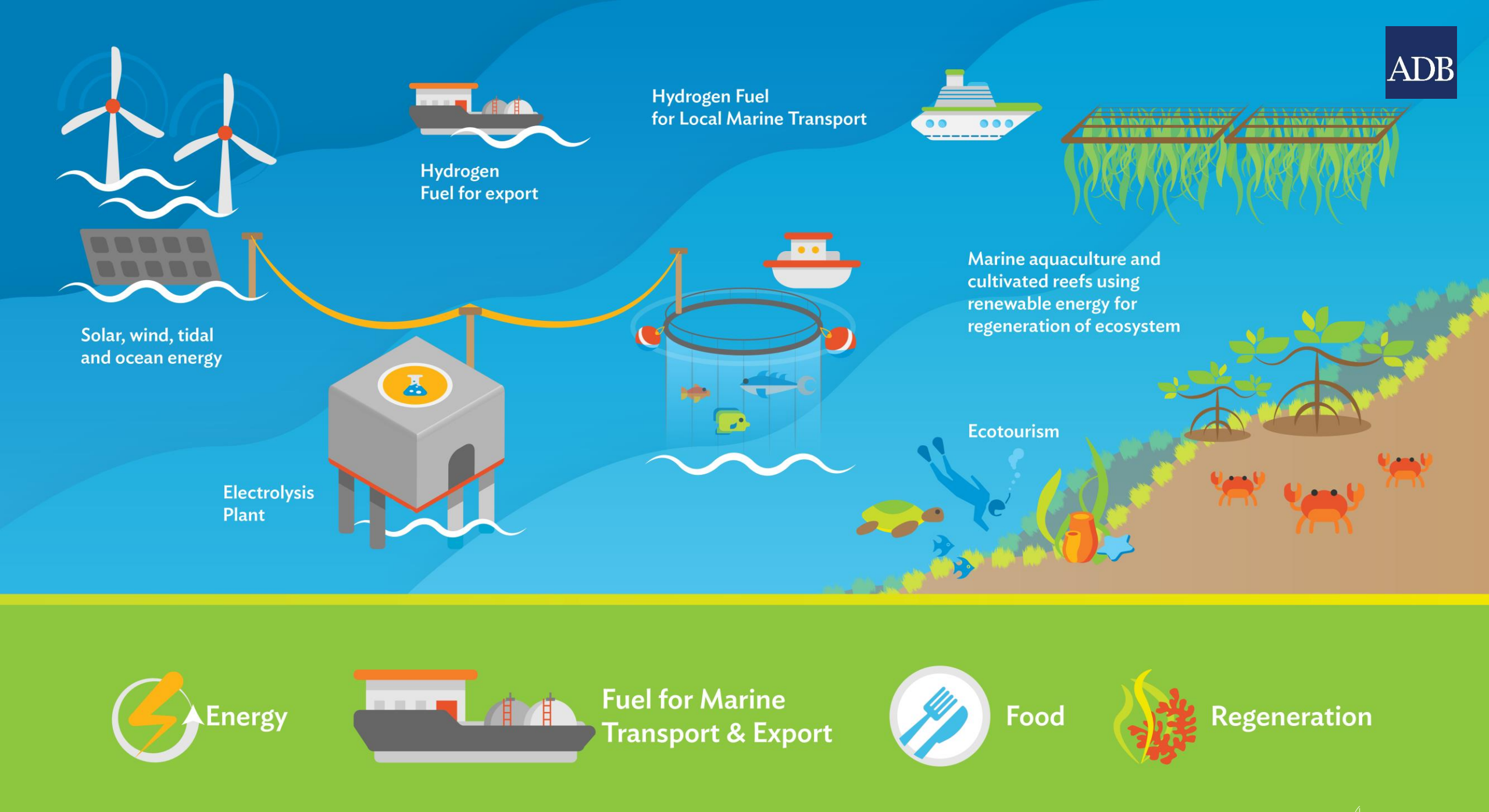
- **DMCs current reliance on unsustainable linear extractive and low value industries and policy status quo**
- **Paradigm shift: creation of higher value industries with more local content and retained value in healthy oceans →**

Regenerative Marine Industries

The MAR^{2}E^{3}S APPROACH

- 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.

Developing regenerative marine business ecosystems


Hydrogen Fuel
for Local Marine Transport
Hydrogen
Fuel for export
Marine aquaculture and
cultivated reefs using
renewable energy for
regeneration of ecosystem
Solar, wind, tidal
and ocean energy
Ecotourism
Electrolysis
Plant
Energy
Fuel for Marine
Transport & Export
Food
Regeneration

Aligned with ADB Action Plan for HEALTHY OCEANS & BLUE ECONOMIES

ADB Commitment: $5 billion by 2024

Flagship Programs

Coastal Resilience

Marine Plastics

Ocean Finance and Blue Economy

Mainstreaming Oceans in Key Sectors

Ports and Shipping

Wastewater, Sanitation, Solid Waste Management

Agriculture and Water

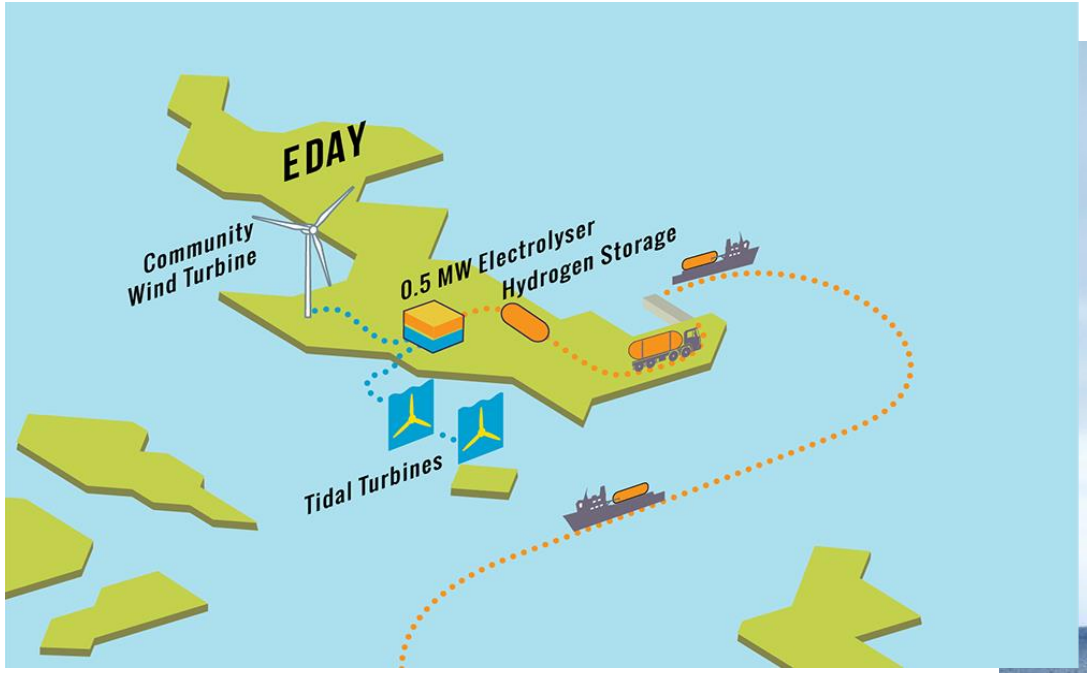
MARES Components includes marine renewables, alternative fuels (H2), Marine aquaculture, cultivated reefs, rigs to reefs, coastal resilience and eco-tourism

Existing Similar Approaches for Energy Only

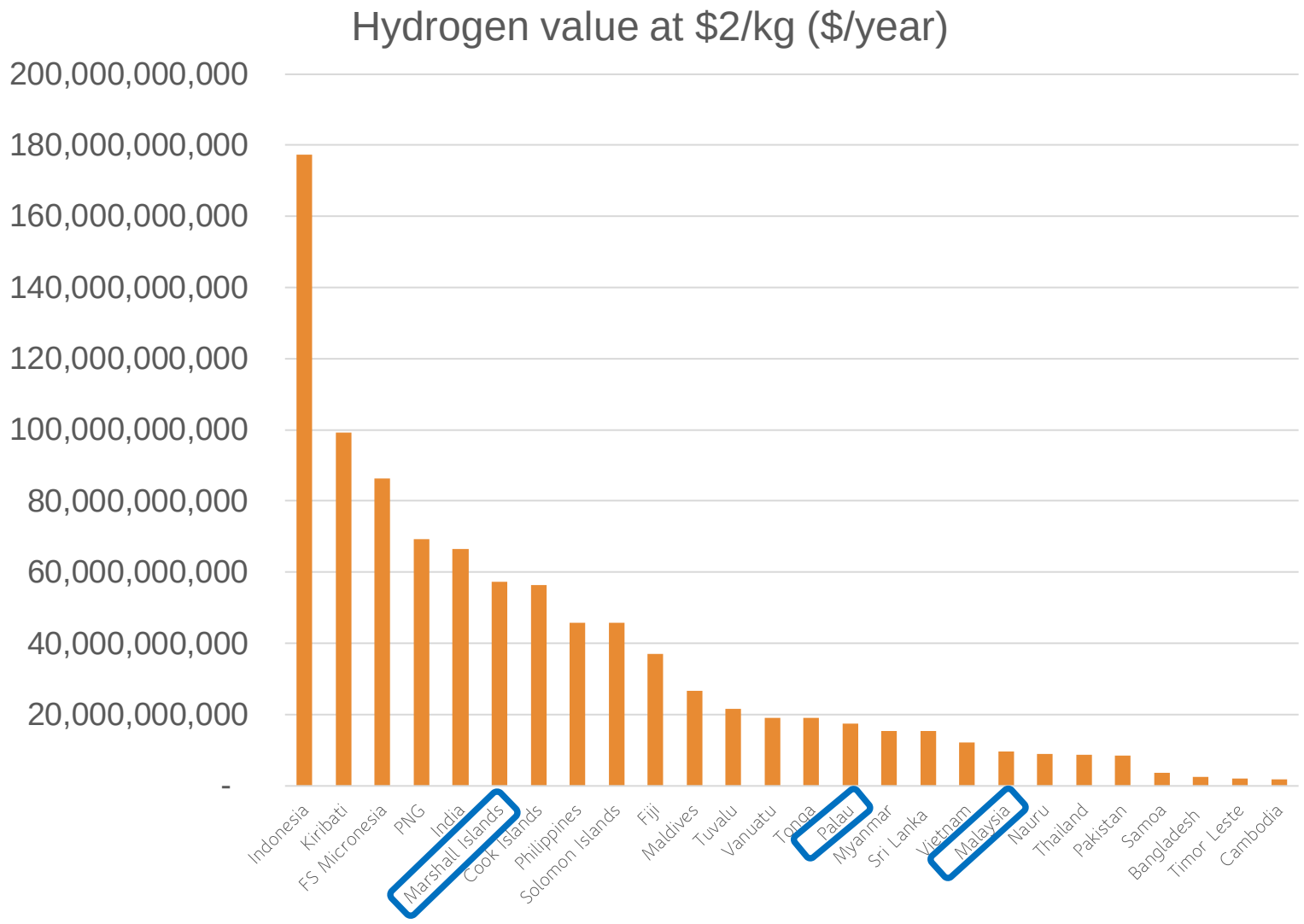
The use of marine energy to make hydrogen has been demonstrated successfully in the Orkney islands, Scotland. Orsted, Total and Siemens are expanding capacity in marine power to hydrogen.

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

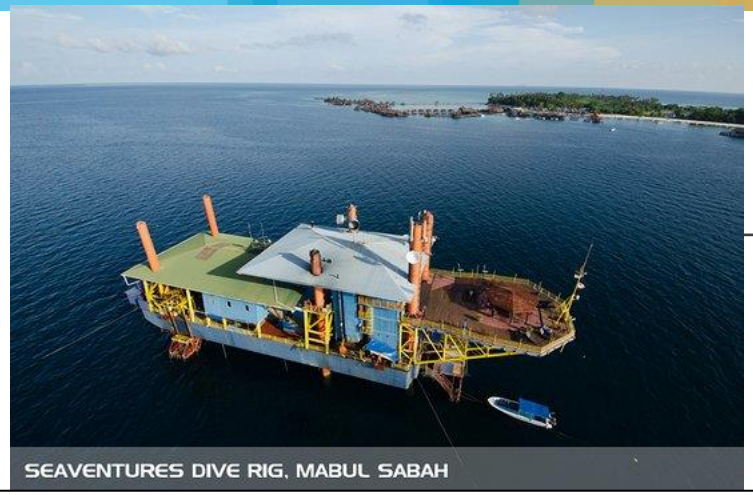


Economic Drivers for Marine Renewable Energy & H_2



- 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

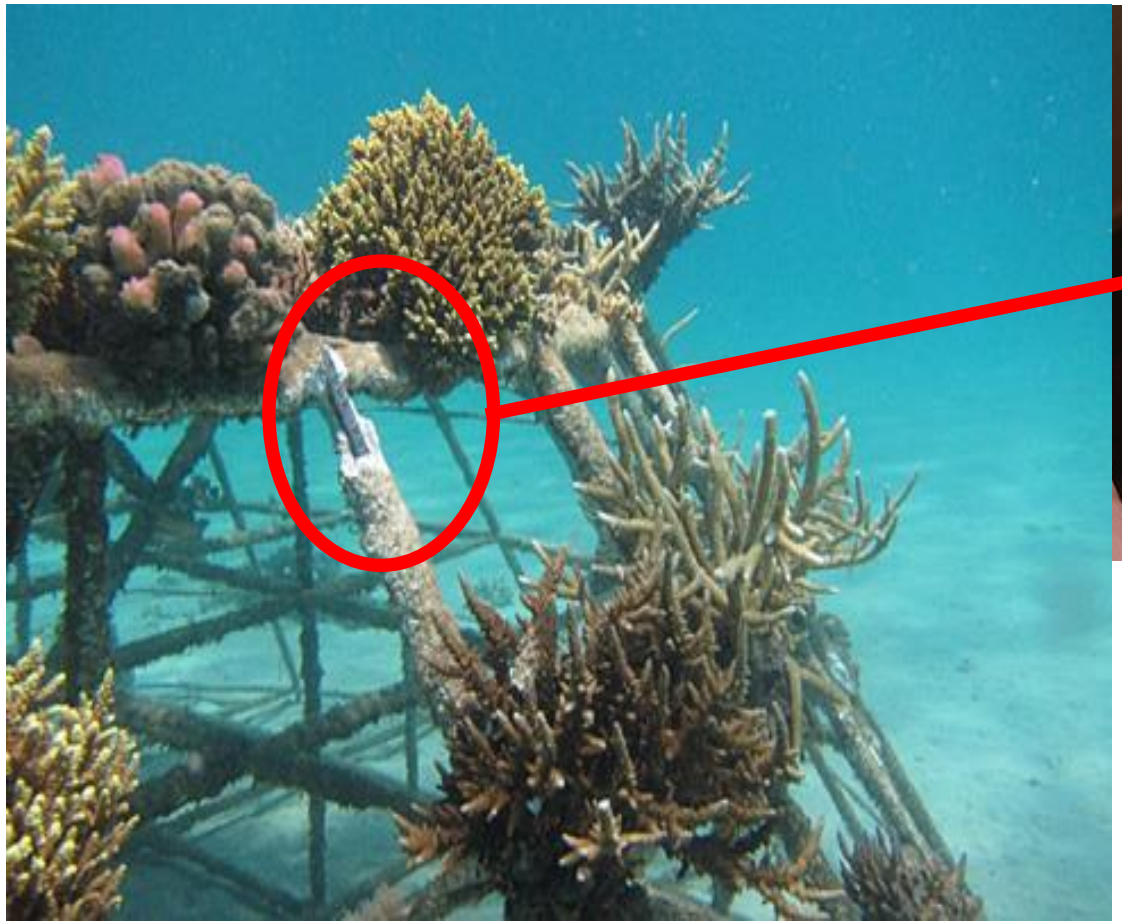
Using locally made energy for regenerative works to reduce ocean acidification, create livelihoods and clean the oceans

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.

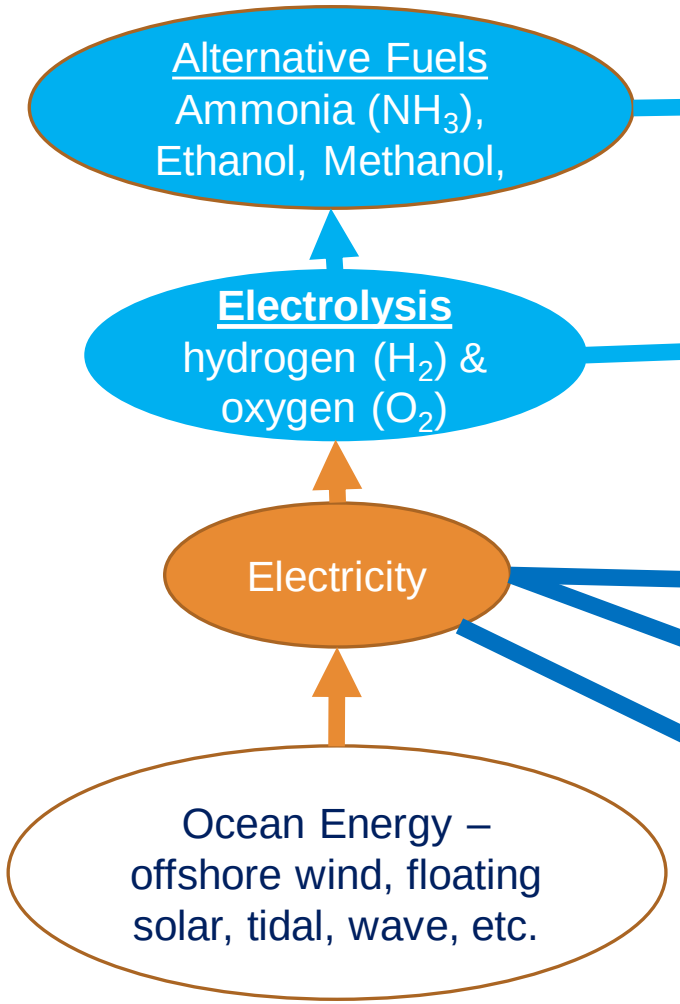


This technique has been demonstrated at multiple sites in Asia for more than 10 years.

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

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

Scaling Up Regenerative Aspects to Supply Chain



USE CASE	TA SCOPE	SCALE UP
Marine Transport (Shipping)	Learning from existing business models.	H_2 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 – (H_2 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

MARES Alignment With Proposed Pacific Ocean Finance Facility

Focus Areas

Ocean-Climate Nexus

Circular Economy

Blue Foods

MARES Alignment underlined in bold

Enabling Conditions	Project Origination	Project Preparation	Project Finance
Ocean governance assessment & investment mapping	**Roundtables (High Level Investor Forum)**	**Technical assistance to develop and prepare projects**	**Matching projects to funding:**
Blue economy policy development (MARES Component)	**Country Technical assistance**	**Adding ocean co-benefits to traditional investments**	*New Pacific fund*
~~*Ocean Finance Trainings*~~	**6 Capacity building events**	**Developing new ocean-positive projects (2 projects for Pipeline)**	*SME Financing*
Knowledge Products (5)	**Blueprints of blue economy projects (6 projects with pre-feasibility screening)**		**One ADB sovereign & private pipeline**
			Innovative Project and Financing mechanisms

Expert Consultants

Rear Admiral Nick Lambert, Ocean Economy Expert **LinkedIn** Rear Admiral Nick Lambert

A master mariner and a committed proponent of the maritime users' perspective, Rear Admiral Nick Lambert concluded a long naval operational career as the UK National Hydrographer in December 2012. He advises on a wide range of maritime issues and the blue economy and is engaged in a variety of situational awareness, fisheries and aquaculture management, marine autonomous systems and vessel efficiency projects.

Scott Countryman, Cultivated Reef Expert **LinkedIn** Scott Countryman

Scott is an expert on the process of mineral accretion using marine renewable energy to grow limestone structures for marine habitats, coastal storm defence and breakwaters. His Nusugbu installation grows artificial reefs complementing offshore energy development. His work on MARES will highlight how regenerative industries can be aligned with marine renewable energy use. Integrating energy users to support regenerative activities

Gregor Hodgson, Marine Environmental Business and Development Specialist **LinkedIn** Gregor Hodgson

Gregor Hodgson is a marine biologist specializing in coral reef ecology and Coastal and Marine Spatial Planning. He is the Founder and former Executive Director of the global coral reef education, monitoring and management organization called "Reef Check" with operations in 60 countries. He has trained and helped establish national coral reef monitoring programs and Marine Protected Area networks in many tropical countries from Tobago to the Philippines. He holds PhD from the University of Hawaii at Monoa.

Expert Consultants

Dr Mike Abundo, Marine Renewable Energy Expert LinkedIn Mike Abundo

Mike has over 15 years in Marine Renewable Energy (i.e. Technologies and Project Development), innovation and Research, Development, & Demonstration (RD&D) Ecosystems, Supporting Industry, Academe, and Government collaborations in Digitalization+Sustainability, Blue Economy, and Sustainable Energy Transitions Mike looks at the appropriate Marine Renewable Energy (Solar, Wind, Tides, Currents, Waves, Ocean Thermal, Salinity Gradients, Hybrid) . He provides a holistic and development pathways using Marine Renewable Energy. Mike looks beyond Techno-Economic metrics to assess candidate MARES projects.

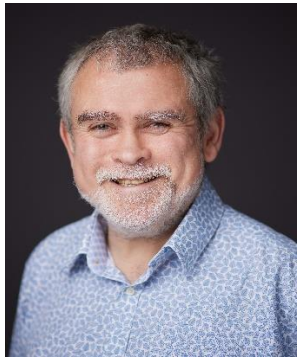
Dr Nguyen Dinh, Marine Hydrogen Expert, LinkedIn Nguyen Dinh

Dr Nguyen Dinh holds a PhD from AIT and has worked for Wood, MaREI with extensive Post Doctoral engagement with Trinity College Dublin. He is a Senior Associate and Principal Consultant to OWC and is based in Cork, Ireland. Nguyen Dinh works on the current status of offshore hydrogen production developments and opportunities to produce ammonia and methanol for shipping and local communities. He provides the expertise to analyse marine hydrogen production and supply chains.

Dan Brian Millison, MARES TA Consultant LinkedIn Dan Brian Millison

Dan Millison of Transcendergy L.L.C. works on sustainable infrastructure investment programs. He is a passionate advocate for the sea and clean energy. Dan Millison works on the challenges and opportunities created by the declining Marine Environment.. By using Marine Renewable Energy as the entry point with complementary technologies and business models, Oceanic regeneration may be able to reverse ocean acidification but only through rapid decarbonization. Dan was the intellectual driver who developed the concept which became MARES.

Consultant Firm Expertise



Alex Rogers, Marine Scientist & Environmental Safeguards Specialist **LinkedIn** Alex Rogers

Alex is a marine ecologist interested in how biodiversity is distributed in the ocean, human impacts on the ocean and how to manage human activities to mitigate or reduce degradation of marine ecosystems. His work has taken him to the Atlantic, Indian and Southern Oceans and to the Caribbean investigating coral reef ecosystems, seamounts and deep-sea hydrothermal vents. Alex has worked with governments, intergovernmental and non-governmental organisations in publicising human impacts, especially those from deep-sea fishing and climate change, and on the development of policy solutions to such problems.

Andy Hamflett, Alternate Project Director **LinkedIn** Andy Hamflett

A journalist, researcher and expert fundraiser, Andy is a storyteller who helps organisations to articulate their needs and aspirations so they can set about meeting them. He has a particular penchant for fundraising and has raised several million pounds for socially responsible projects and organisations.

Andy also leads innovative research projects exploring the emerging potential of digital and data tools for social impact. He applies rigorous foresight research to immediate organisational challenges to inspire teams to develop solutions fit for the future. Andy will be available to assist when required.

Gary Hesling, Project Coordinator **LinkedIn** Gary Hesling

Captain Gary Hesling is a professional HM Royal Navy officer, master mariner and Category A hydrographer. His work focuses on the utility of advanced sensors, autonomous technologies and automated information systems to collect, collate, fuse, analyse and display marine and maritime data in game changing formats and services. Gary is a Senior Visiting Fellow at the National Oceanography Centre and is qualified as an APAEWE Expert Witness. Gary will be responsible for the flagship knowledge product, “Regenerative Marine Industry”.

Consultant Firm Expertise

Dr Jack Dyer, Marine Resource Economist **LinkedIn** Jack Dyer

Dr Jack Dyer is a specialist climate change, development and blue/ocean economist and has worked with UNDP on developing blue economy financing mechanisms, institutional capacity building, monitoring and evaluation frameworks for Barbados, Grenada, St Vincent and the Grenadines. He works across a broad spectrum of ocean and blue economy related areas from MPAs and renewable energy to blue economy strategies and ocean governance. Dr Dyer will be responsible for developing the assessment framework for MARES type projects.

Fabian Iyar – MARES National Coordinator and Social Sector Specialist for Palau

Linkedin Fabian Iyar

Fabian was born and raised in Palau. Fabian has over 20 years of professional experience in leadership, managing teams and advising on projects in the fields of conservation, public health, finance and tourism. He provides the lead on the ground support for the MARES TA in the Republic of Palau, Fabian has a Bachelor's Degrees in International Business & International Tourism; MBA in Business Administration focused in Business Administration and Management, General from University of Guam.

Ivory Vogt, Sustainable Travel International Ecotourism Specialist **LinkedIn** Ivory Vogt

As a Palauan, Ivory is especially concerned about the way climate change and tourism are impacting the livelihoods and environments of island nations. She works in sustainable tourism, creating livelihoods for people and preserving local cultures. Ivory works as the Program Manager for Climate & Resilience at Sustainable Travel International where she helps businesses and island destinations measure, reduce and offset their carbon emissions.

Consultant Firm Expertise

Don Hess, National Coordinator Marshall Islands

Hess semi-retired in 2016 after more than 20 years of working in the environmental and marine science field at the College of Marshall Islands (CMI). He served as Vice President for Academic and Student Affairs and taught courses primarily in marine and environmental sciences. Currently Hess is engaged in marine science education and grant writing/management on climate change and conservation in the Marshall Islands, notably on coral reef management, restoration, community projects and sewage outfall projects. He serves on the board for the Marshall Islands Conservation Society.

Setoki Qalubau, Social Sector Specialist Marshall Islands **LinkedIn** Setoki Qalubau

Setoki teaches History, Politics and Sociology for the RMI USP joint education program at the University of the South Pacific Majuro Campus. A former civil servant for the Fiji Government, he was involved in the establishment of a National Inventory for iTaukei Traditional Knowledge & Expression of Culture (TKEC) as part of the Cultural Mapping Program. Setoki also engaged in national and regional efforts in the development of a legislation to safeguard national TK&EC and inventories. He was also a consultant for the UN consulting and training on Traditional Knowledge and Cultural Expressions (TK&EC) in the Asia Pacific region.

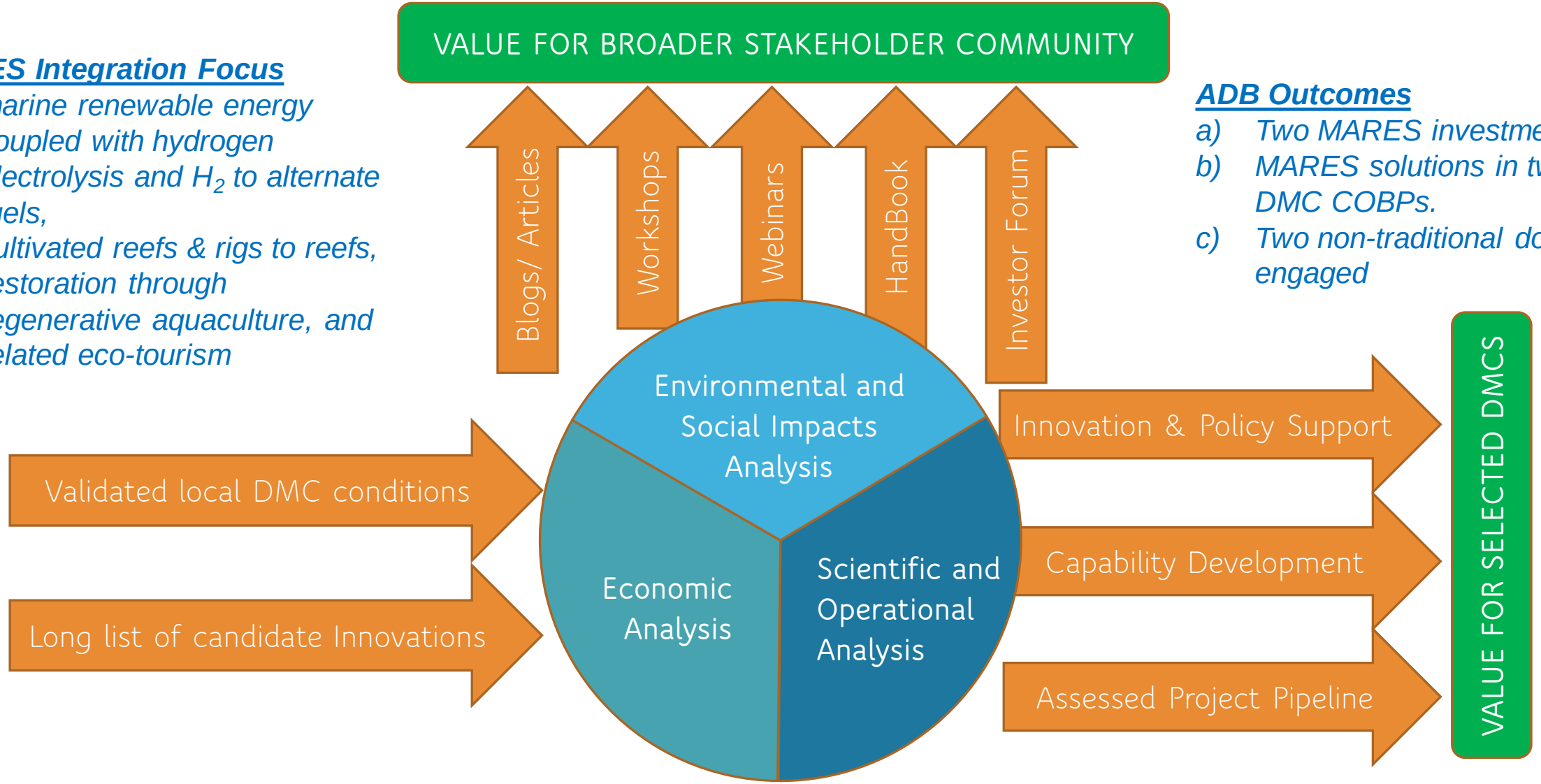
Sabina Rustamova-Aliyeva, Social Safeguards Specialist **LinkedIn** Sabina Rustamova-Aliyeva

Sabina is a social and gender specialist with wide cross cultural experience in various research, gender, social impact, community development and evaluation projects. Her has completed research projects in the South Caucasus and Central Asian countries funded by many international organisations including WB and ADB. These projects have included studying social impact issues, social safeguards and gender mainstreaming in infrastructural and development projects in collaboration with National State agencies.

Activity Summary

MARES Integration Focus

(i) marine renewable energy coupled with hydrogen electrolysis and H_2 to alternate fuels,
(ii) cultivated reefs & rigs to reefs,
(iii) restoration through regenerative aquaculture, and
(iv) related eco-tourism



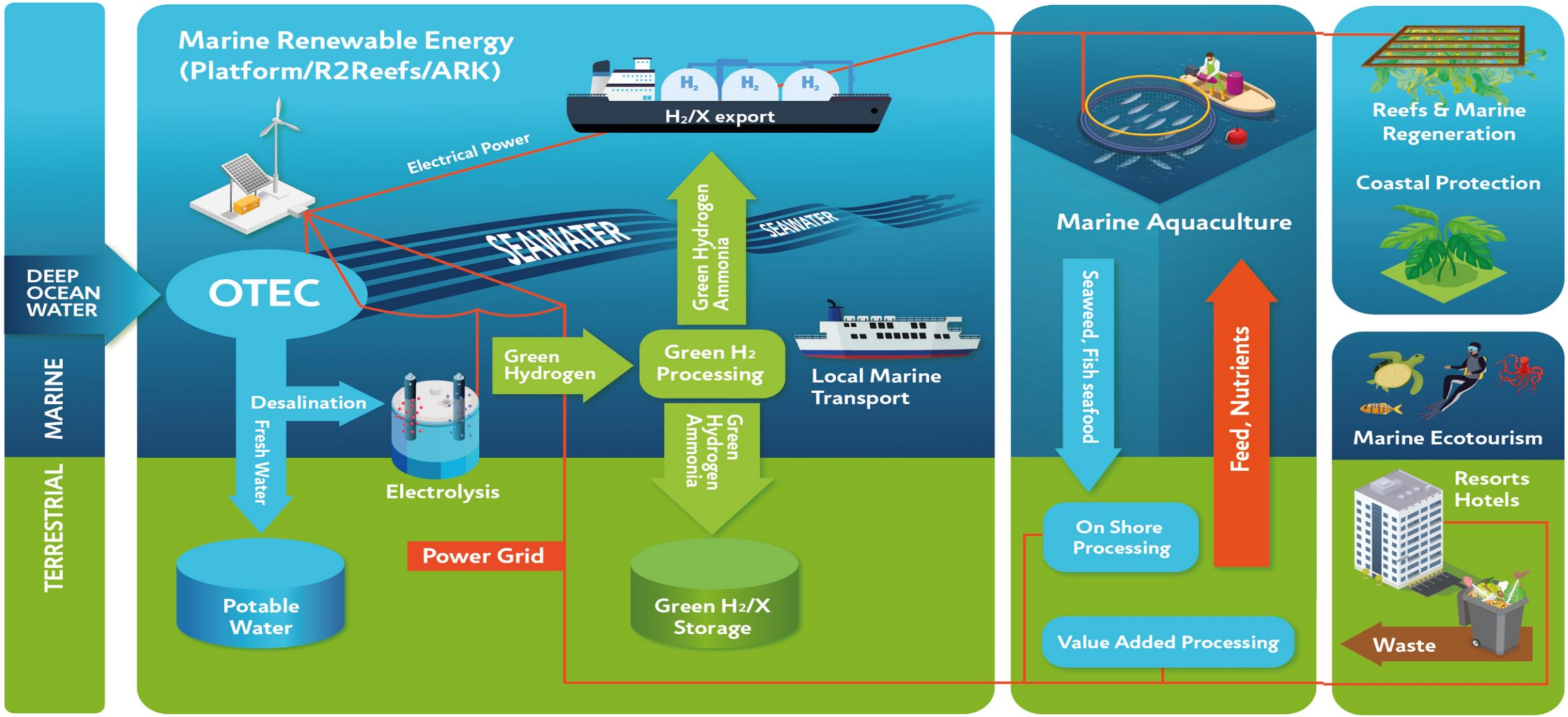
ADB Outcomes

a) Two MARES investments
b) MARES solutions in two DMC COBPs.
c) Two non-traditional donors engaged

High Level Investor Forum

<u>High Level Investor Forum</u> (HLIF) in Kuala Lumpur, 7 February 2023 with over 150 participants from government, energy and infrastructure developers, investors, blue economy businesses types and community groups gathered together to discuss how to realize a "New Ocean Energy Economy" as part of a just transition. Link here.

MARES - Multifunction Approach



Thank You

Our dataroom has more information at https://events.development.asia/learning-events/adb-data-room-marine-aquaculture-reefs-renewable-energy-and-ecotourism-ecosystem

speters@adb.org