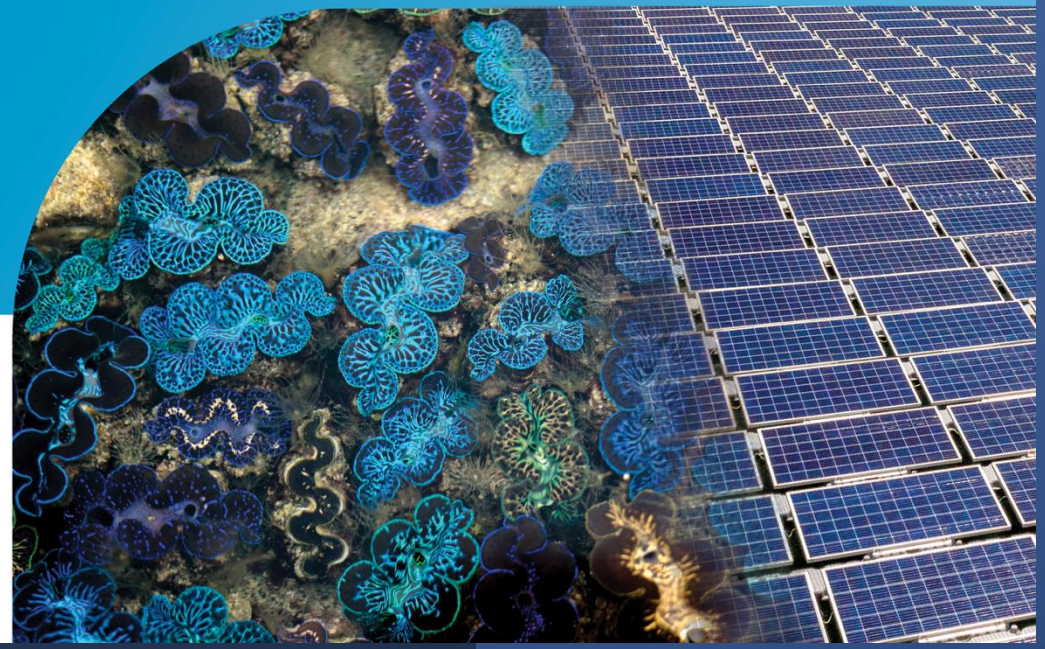
WAVES OF CHANGE

Harnessing Technology to Power the Sustainable Blue Economy

Workshop Two
25–28 May 2026 • Busan, Republic of Korea

ADB

Ministry of Oceans and Fisheries



Session 6: Fostering Renewable Energy for Coastal and Marine Systems: ADB

Ocean-Positive Energy Solutions: ADB's Role in Enabling Policy and Providing Innovative Financing to Meet DMC Needs

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ADB's Strategy 2030, the Energy Sector Vision, and the role of Emerging Areas

Energy Sector Vision and Approach

Supporting Just Low-Carbon Transition in Asia and the Pacific: Confronting Climate Change Challenge

Principle 1	Principle 2	Principle 3	Principle 4	Principle 5
Securing Energy for a Prosperous and Inclusive Asia and the Pacific	Building a Sustainable and Resilient Energy Future	Supporting Institutions, Private Sector Participation, and Good Governance	Promoting Regional Cooperation and Integration	Integrated Cross-Sector Operations to Maximize Development Impact

Areas of Delivery

Decarbonization	Decreasing energy intensity	Digitalization	Decentralization

Energy Access	Energy Security	Environmental Sustainability	Sector Governance

https://www.adb.org/sites/default/files/publication/892771/strategy-2030-energy-sector-directional-guide-summary.pdf

Energy is a cross-cutting enabler in addressing climate change and plays a key role in the development of other sectors and industries: agriculture, education, health, transport, urban, and water.

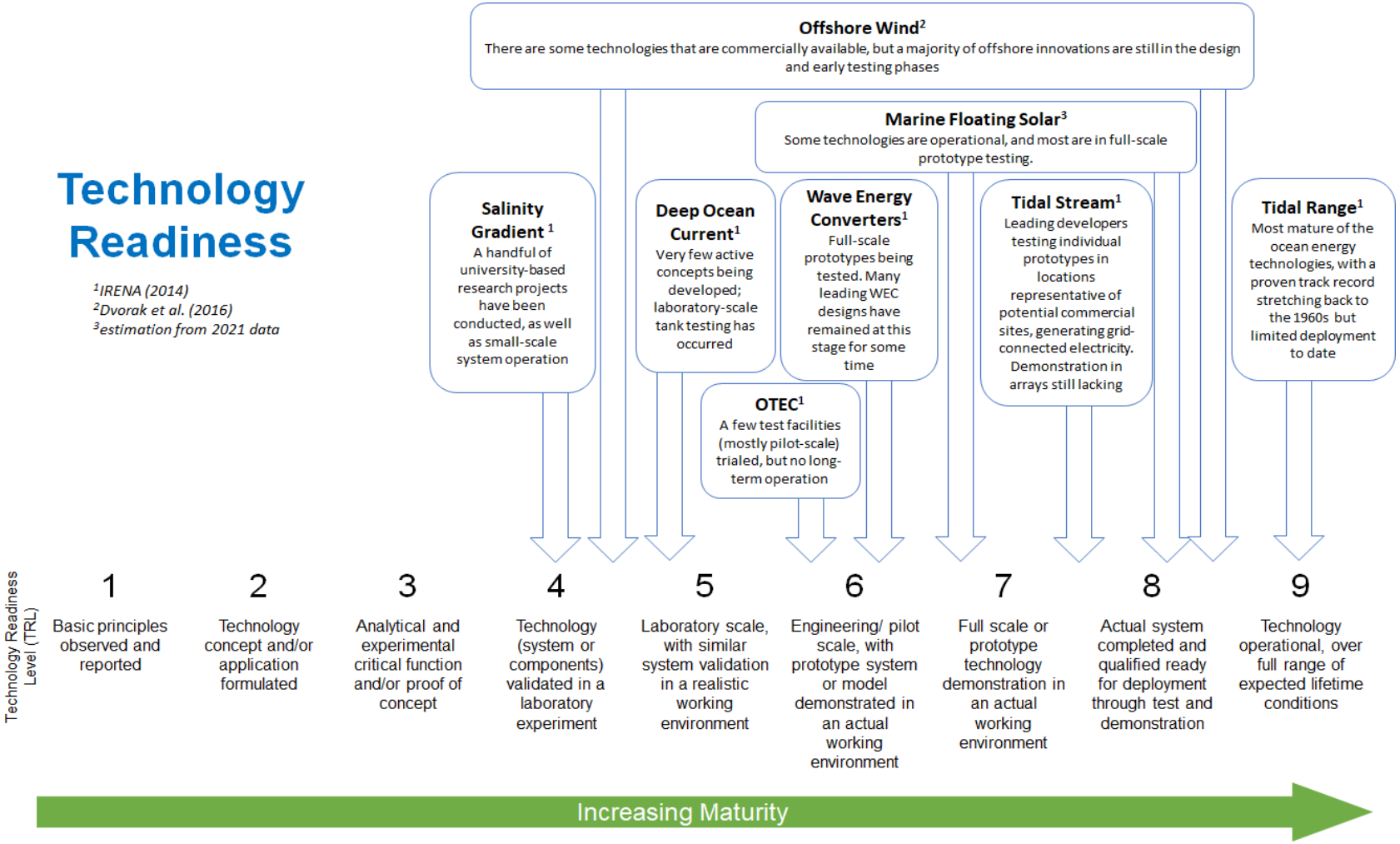
Key priorities:

- Advancing **Principles 2 and 5** by building a sustainable and resilient energy future through integrated, cross-sector operations that maximize development impact.
- Driving **innovation, frontier technologies, and new financing models**.
- Strengthening **collaboration and knowledge management**.
- Operationalizing the **NOM 4 Shifts:** solutions, climate, private sector, new ways of working.

Emerging Ocean and Marine Renewable Energy Technologies for Ocean-Positive Solutions

Technology Readiness

[1]IRENA (2014)
[2]Dvorak et al. (2016)
[3]estimation from 2021 data



Technology	Typical Plant Capacity Factors*
Solar PV	16.1% to 20.8%
Offshore Wind	30% to 50%
Tidal Range (e.g. Barrage)	Typically 25%
Tidal Stream	25% to 40%
Ocean Current	Up to 70%
Wave	32% to 40%
OTEC	90% to 95%

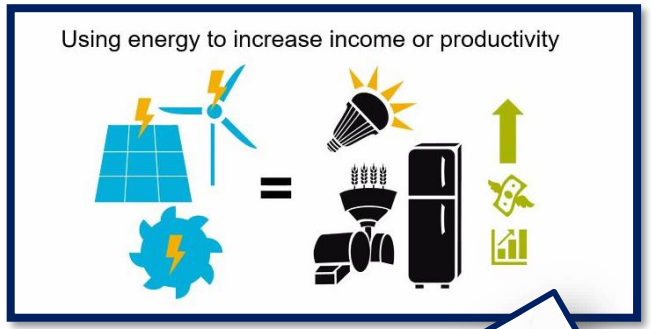
***Note: these are dependent on other factors such as: site, resource, technology, and other project parameters**

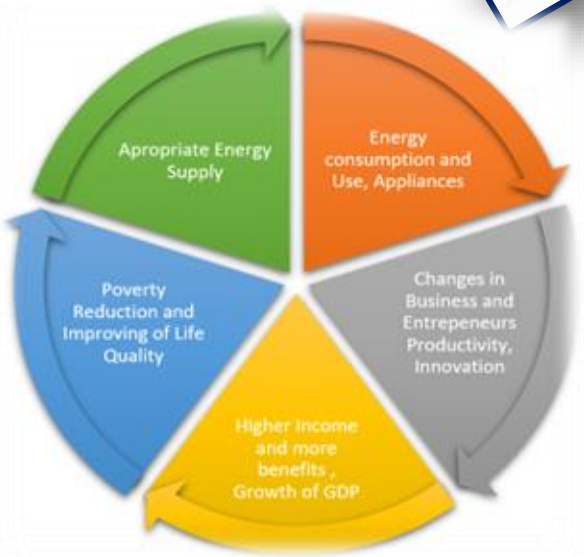
Ocean-positive energy solutions refer to renewable energy technologies that harness marine, coastal, or water-based resources while minimizing negative environmental impacts and, where possible, delivering net benefits to ocean health and coastal communities. This concept goes beyond simply locating infrastructure offshore; it emphasizes responsible design, siting, and operation that align energy development with marine conservation and sustainable livelihoods.

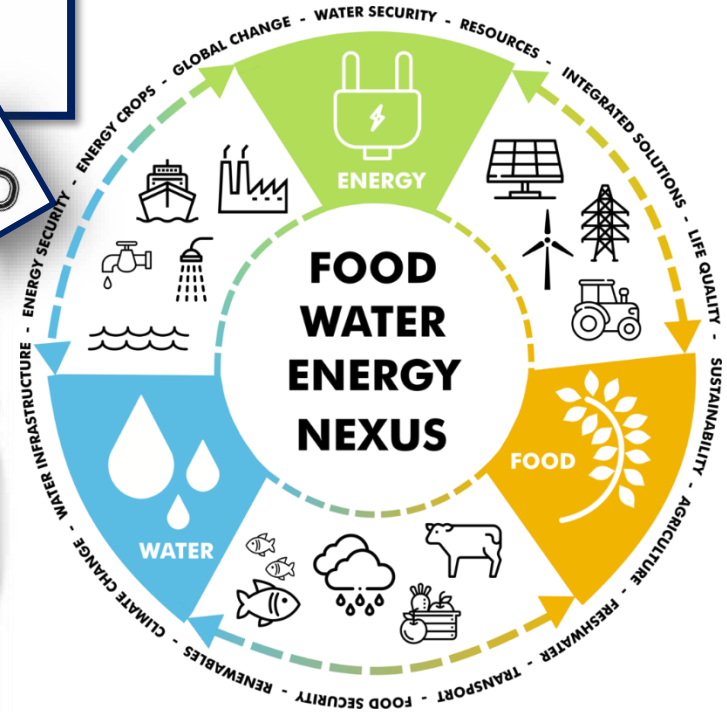
https://www.energytransitionpartnership.org/wp-content/uploads/2024/04/Marine-Renewable-Energy-in-the-Philippines-Sustainable-Energy-from-Ocean-Spaces-and-Resources-2022.pdf

Challenge: Achieving Climate Change Adaptation and Resilience through *Smart, Low-Carbon, Integrated, Multi-Sectoral Solutions and Approaches*

- Challenge: Climate resilience investments are developed within a single sector, hence opportunities for more effective, **multi-sectoral solutions are missed**;
- Solution: This program targets climate vulnerabilities in any or all sectors through the **early identification and provision of appropriate interventions** that are enabled/supported by smart energy services.
- Approach: Rapid analysis of each sector (enabled by data); develop **suitable smart solutions investment that adapts or builds resilience**; ensure total focus on most vulnerable; implement smart solutions (i.e. multi-sector / cross-sector) investments
- Innovations/transformations: **multi-sectoral, collaborative, and cohesive**; e.g. energy sector becomes an enabler, i.e.. service provider (providing adaptation solutions), productive uses of energy (PUE); many new energy and energy-linked technologies; ICT standards across different sectors
- Specific co-benefits:
  - **Contributes to livelihoods, economic development**, energy/food/water security, disaster resilience
  - Demand driven approach increases scope for revenue and attracting private investments.

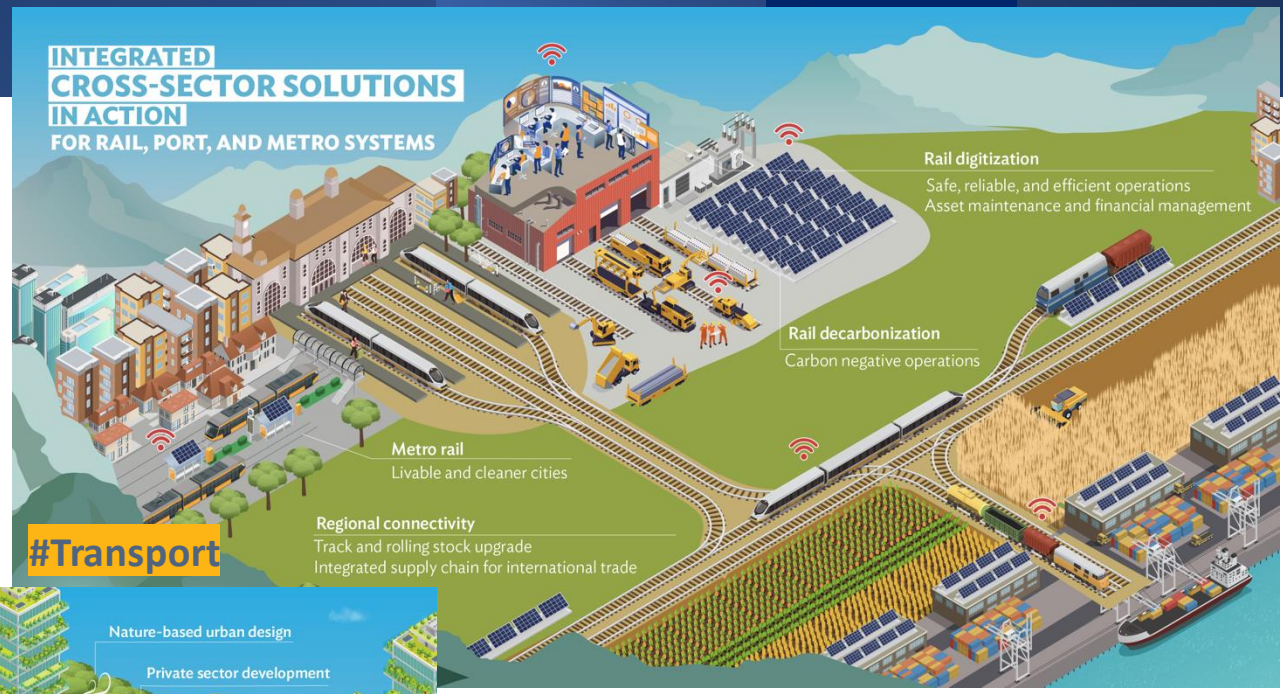






Examples of Cross-Sector Integrated Solutions

#Marine RE - Floating Solar PV ++



#Transport

#Urban Space

Site Selection, FPV Roadmapping and Project Preparation for the 11 smaller Pacific Island Countries

Top zones selected and floating PV roadmap prepared for 11 small Pacific Island Countries FPV plus productive uses of energy and sustainable blue economy projects in Kiribati, Tonga, and Tuvalu under preparation

South Tarawa, Kiribati (2024)

Over 60% (~70,000) of the population lives on Tarawa with only 16 km^2 of land but with 500 km^2 of lagoons; less than 3 meters above sea level and less than 500 meters wide. South Tarawa needs 25 MW PV and 32 MWh of battery energy storage system to reach the 2025 target of 100% RE penetration (currently 9%). South Tarawa has 5.5 MW diesel and 1.5 MW PV.

Tongatapu, Tonga (2028)

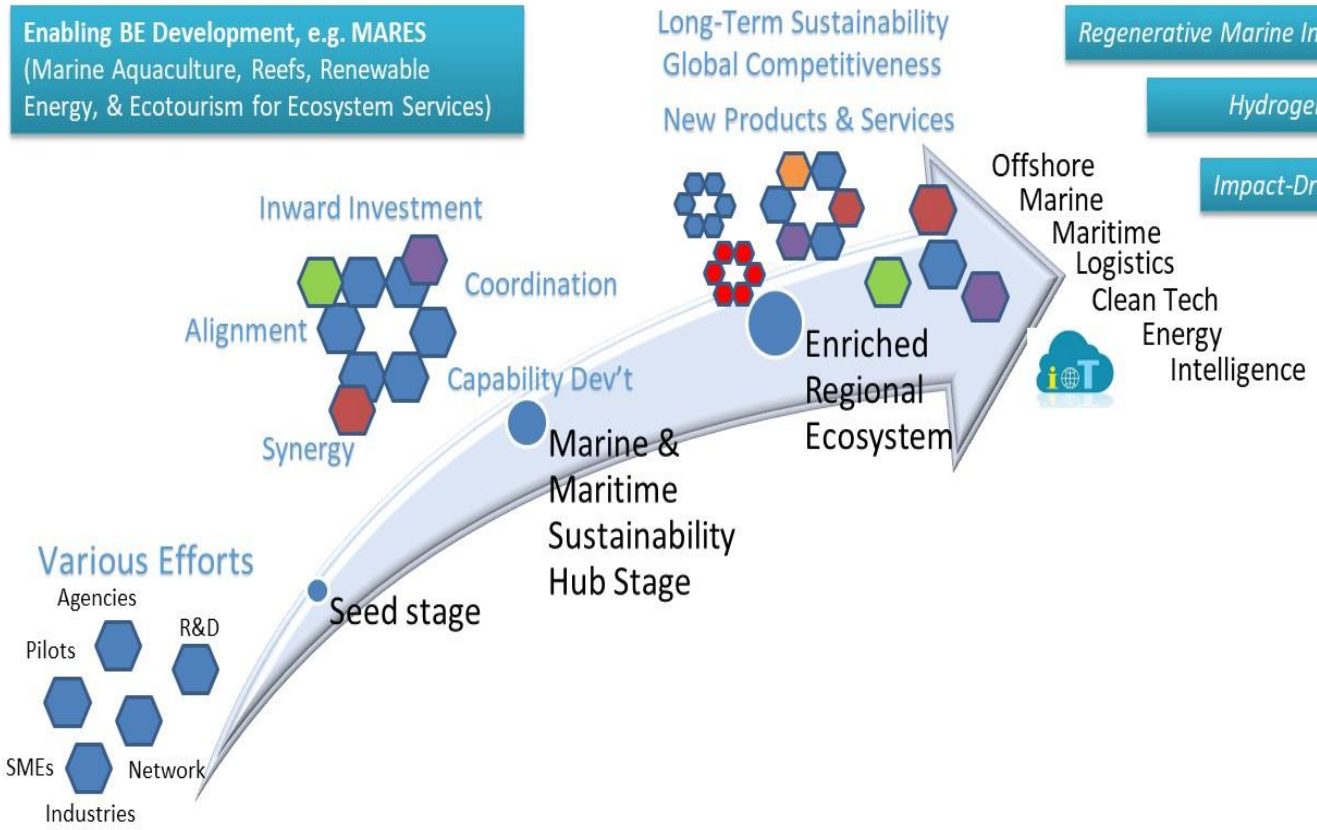
Tonga aims to achieve 70% renewable energy penetration by 2030, needing 30 MW more PV, and is open to private sector investments, particularly in the main island of Tongatapu where 75% of the population lives. Tongatapu has 260 km^2 of land and several bays and large lagoons.

Funafuti, Tuvalu (2023)

Over 50% (~6,000) Tuvaluans live in Fongafale on the Funafuti atoll, with only 2.8 km^2 of land but 252 km^2 of lagoons; less than 3 meters above sea level and less than 500 meters wide. Funafuti needs 7.6 MW PV and 14 MWh of battery energy storage system while to reach the 2025 target of 100% RE penetration (currently 16%). Funafuti installed capacity is 1.8MW diesel and 735 kW PV.

Indicative Pipeline of Ocean-Positive Energy Solutions

Values: (i) Address the issue of scarce land space to scale up renewable energy; and (ii) Sustainable blue economy.



South Tarawa, Kiribati (2024)

Funafuti, Tuvalu (2023)

TA 6680: Preparing Floating Solar Plus Projects under PREIF
TA 10080: PREIF Phase 3 and Preparing EASSIF)

Floating PV, Offshore Wind (OFW), OTEC. Tidal and Current :

- AZE: Caspian Sea OFW grid infrastructure
- AZE: FPV on lakes and hydro reservoirs
- BAN: FPV/OFW
- IND: FPV
- INO: FPV marine and inland
- KGZ: FPV on hydro and irrigation reservoirs
- NAU: FPV on pond
- PIC/SIDS (MLD, PAL, TON, VAN, FIJ): OTEC, tidal, current, wave
- PHI: OFW; FPV/Tidal energy hybrid
- PHI: FPV on hydro and irrigation reservoirs
- PNG: FPV on reservoirs

List is not exhaustive, subject to country programming and due diligence

Ongoing Projects and TAs Supporting Ocean-Positive Energy Solutions

Project/TA Name	DMC	Technology Type	Year Approved	Loan/Grant Amount ($million)	TA Amount ($million)	Financing
Floating Solar Energy Project, Da Mi	VIE	FPV on reservoir	2018	47.96		PSOD/OCR/blended cofin
Floating Solar Energy Development	AFG, AZE, KGZ	FPV	2018		3.00	CEF
Boyukshor Lake Floating Solar Pilot	AZE	FPV on lake	2018			CEF
HPP-5 Floating Solar Pilot	KGZ	FPV on reservoir	2018			CEF
Preparing Outer Islands for Sustainable Energy Development, POISED,	MLD	Marine FPV	2020	61.00		ADF/SREP/JFPR
Marine Aquaculture, Reefs, Renewable Energy, and Ecotourism for Ecosystem Services, MARES	REG	FPV, Offshore Wind	2020		1.00	CEF
Offshore Wind Regulatory Framework	PHI	Offshore Wind	2021		2.76	TASF/CCF
Accelerating Sustainable System Development Using Renewable Energy Project, ASSURE	MLD	FPV	2023	75.50	0.50	ADF/COL/CTF/JFJCM/CCF
ASSURE Ocean Energy Devices Pilot	MLD	Tidal/current	2023		1.00	TASF
Project Preparatory and Capacity Building for Renewable Energy Projects	MLD	FPV	2023		1.00	TASF
Increasing Access to Renewable Energy Project, Additional Financing	TUV	Marine FPV	2023	7.80		ADB/GEF/URTF/ITF
South Tarawa Renewable Energy Project, Phase 2	KIR	Marine FPV	2024	26.90		ADB/ITF
Energy Transition Project, marine and wind technology demonstrations	RMI	Marine RE	2024	19.69		ADF
Preparing West Bengal Floating Solar Project	IND	FPV on reservoir	2024	1.06		OCR
Supporting Offshore Wind Port Development Planning	PHI	Offshore Wind	2024		0.40	CCF
Hijaunesia Program GCL Solar Subprojects, Gajahmungkur Floating Solar	INO	FPV on reservoir	2025			AIIB/PSOD
Maldives Solar PPP Project / Maldives Seawater Floating Solar PPP Project	MLD	Marine FPV	2025	30.00	1.10	OMDP/AP3F
Innovative West Bengal Floating Solar with BESS Project	IND	FPV	2025		1.06	PRF
Catalyzing Cross-Sectoral Integrated Energy Solutions, Subproject 1	PHI	Tidal/Wave/FPV	2025		0.20	SEIF/CEFPF
Catalyzing Cross-Sectoral Integrated Energy Solutions, Subproject 1	AZE	Offshore Wind	2025		0.15	SEIF/CEFPF
Accelerating Climate Action, Innovation, and Private Sector Development through Sector Operations	AZE	Offshore Wind	2025		0.15	TASF
Accelerating Climate Action, Innovation, and Private Sector Development through Sector Operations	PNG	FPV on reservoir	2025		0.20	TASF
				284.61	12.17	

AZE Lake Boyukshor Pilot

KGZ Bishkek HPP5 Pilot

List is not exhaustive, subject to country programming and due diligence

ADB's Financing Instruments and Modalities Supporting Ocean-Positive Solutions

- ADB deploys financing instruments and funds for projects and TA tailoring its approach to country context, project maturity, and risk profile.
- Core instruments: sovereign and nonsovereign loans from ordinary capital resources, concessional loans and grants from the Asian Development Fund, and a variety of technical assistance modalities supporting policy reform, project preparation, and capacity building.
- ADB offers guarantees, equity investments, and transaction advisory services to mobilize private capital and structure bankable projects.
- Climate-focused trust funds and special funds play a critical role in marine renewable energy, particularly where technologies are innovative or risks are not yet fully priced by the market.

Fund	Type	Relevance
Clean Energy Fund (CEFPF)	Trust fund	Supports RE, incl. floating PV, BESS
Climate Change Fund	Special fund	Grants for climate mitigation/adaptation
Asia-Pacific Climate Finance Fund (ACliFF)	Trust fund	Risk-sharing & financial innovation for climate tech
Climate Investment Funds (CIF – CTF, SCF, SREP)	Global fund	Large-scale RE financing (~$1.5B portfolio with ADB) [adb.org]
ADB Ventures Investment Funds (1 & 2)	Venture fund	Early-stage climate tech
Canadian Climate Fund / Australian Climate Finance Partnership	Trust funds	Private sector RE mobilization

Blended finance platforms linking multiple funds:
Clean Energy Financing Partnership Facility (CEFPF)
Includes Clean Energy Fund, Smart Energy Innovation Fund
Urban / Climate / ASEAN Catalytic Green Finance Facility (ACGF)
Supports green infrastructure including RE systems
Asia-Pacific Project Preparation Facility (AP3F)
Early-stage project development support
FPFs enable multi-donor cofinancing + TA + investment bundling

Fully-administered grant project-specific cofinancing:
Bilateral
Australia, Ireland, Japan, Republic of Korea, New Zealand, Norway, United Kingdom
Multilateral (Project and TA)
CIF, EU, GEF, GCF, WB
Asia-Pacific Project Preparation Facility (AP3F)
Early-stage project development support
FPFs enable multi-donor cofinancing + TA + investment bundling

Key Challenges and Opportunities to Scaling Ocean-Positive Energy

Challenges

High Capital Costs

High upfront expenses for offshore wind and marine technologies hinder project initiation and growth.

Regulatory Uncertainty

Unclear permitting and overlapping mandates delay investments and project timelines.

Grid Integration Limits

Limited technical and grid capacity in coastal regions demands upgrades for renewable energy absorption.

Environmental and Social Concerns

Projects must address marine ecosystem protection and coastal community interests to avoid opposition.

Lack of (digital) data (resources/infrastructure, risks, constraints)

Designing and deploying climate-resilient and sustainable ocean-positive energy solutions require massive amount of data

Opportunities

Declining Technology Costs

Costs for offshore wind and floating solar continue to decline due to global innovation and deployment.

Growing Private Sector Interest

Private developers seek new markets while governments offer clearer policies supporting ocean energy.

Advances in Digitalization and Storage

Digital tools, forecasting, and energy storage advances enhance integration of ocean renewables into power systems.

Regional Cooperation Benefits

Collaboration and knowledge sharing speed learning and reduce effort duplication in ocean energy development.

Emergence of Artificial Intelligence and Regional Data Platforms

Advances in AI, smarter grids and management system, GIS and Earth Observation, and development of regional data platforms and observatories

ADB's Role and Strategic Way Forward

Conclusions and Strategic Way Forward

- **Ocean-Positive Energy Benefits:** Ocean-positive energy solutions enable energy security, climate resilience, and sustainable ocean use for developing countries.
- **ADB's Integrated Approach:** ADB supports transition through policy, reforms, regulatory frameworks, institutional support, innovative financing, transaction advisory, technical assistance, partnerships, and project expertise.
- **Strategic Focus Areas:** Scaling pilots, strengthening regulations, and mobilizing private and climate finance are key strategic priorities.
- **Regional Cooperation and Innovation:** Enhancing cooperation and knowledge sharing will accelerate sustainable energy progress and shared prosperity.

Innovative Approaches and Financing:

- **Resource assessments, technology mapping, and digital platforms and AI-enabled tools:** ADB supports upstream assessments, resource mapping, multi-hazard risks assessment, climate and vulnerability assessments, and deployment of shared resources and data platforms and AI-enabled tools for siting, designing, developing, monitoring, and evaluating infrastructure solutions.
- **Risk Mitigation:** ADB can provide concessional finance, guarantees, risk sharing, securitization, and insurance to attract private sector investments into energy efficiency and renewable energy, including ocean and marine renewables.
- **Scaling Up:** These technologies often start at the frontier, where risks and costs are higher. ADB can support their development through funding and risk-sharing mechanisms until they become commercially viable.
- **Blended Finance:** Combining public and private sector funds can lower the overall cost of capital and make projects more attractive to investors.
- **Green Bonds and Sustainable Finance:** ADB and DFIs can issue green bonds or provide technical assistance to countries and companies in structuring sustainable finance solutions.
- **Climate Finance, Carbon markets, and Natural Capital** – carbon markets (Climate Action Catalyst Fund)

ADB Sectors Departments and Regional Departments

- Sectors Departments –
  - SD1 – Energy Sector Office; Transport Sector Office
  - SD2 – Agriculture, Food, Nature and Rural Development Digital; Water and Urban Development
  - SD3 – Finance; Human and Social Development; Public Sector Management and Governance
- Regional Departments
  - Central and West Asia
  - East Asia
  - South Asia – Maldives, Sri Lanka; (Bangladesh, Bhutan, India, Nepal)
  - Southeast Asia –Cambodia, Indonesia, Lao PDR; Malaysia, Myanmar, Philippines, Thailand, Timor Leste, Vietnam (Brunei graduated)
  - Pacific – 14 member countries: Cook Islands, Fiji, FSM, Kiribati, Nauru, Niue, Palau, PNG, RMI, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu
- Country Resident Missions - all countries except the 11 smaller Pacific Island Countries (Solomon Islands Country Office became an RM in 2025)
- Pacific Developing Member countries
  - PNG Resident Mission (PNRM)
  - Solomon Islands Resident Mission (SORM)
  - North Pacific Advisor – FSM, RMI, Palau
  - Pacific Liaison and Coordination Office (PLCO) based in Sydney – cover Nauru and Vanuatu
  - South Pacific Subregional Office (SPSO) based in Suva – cover COO, FIJ, KIR, NIU; SAM, TON, TUV

Country Partnership Strategies and the Pacific Approach

- Country Partnership Strategy
  - South Asia – Maldives, Sri Lanka
  - Southeast Asia –Cambodia, Indonesia, Lao PDR; Malaysia, Philippines, Thailand, Vietnam (Brunei graduated)
  - Pacific – Fiji, PNG, SOL
- *Pacific Approach, 2021–2025* for the PIC-11 and Pacific Approach 2026-2030 under development
  - Cook Islands, FSM, Kiribati, Nauru, Niue, Palau, RMI, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu
- Pacific Developing Member countries
  - PNG Resident Mission (PNRM)
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Thank you!