Offshore Wind

One of the key drivers for the Energy Transition in Asia-Pacific

NIRAS
ASIA MANILA

16th June 2023

Outline

- Introduction
- APAC Offshore Wind Maturing
- Paving the Way
- Outlook for South-East Asia

NIRAS in APAC

NIRAS Offices

Project Areas

Current Activities in the region

- Offshore Energy & Infrastructure
- Environment & Nature
- Ports & Harbors
- International Development
- Process Industry

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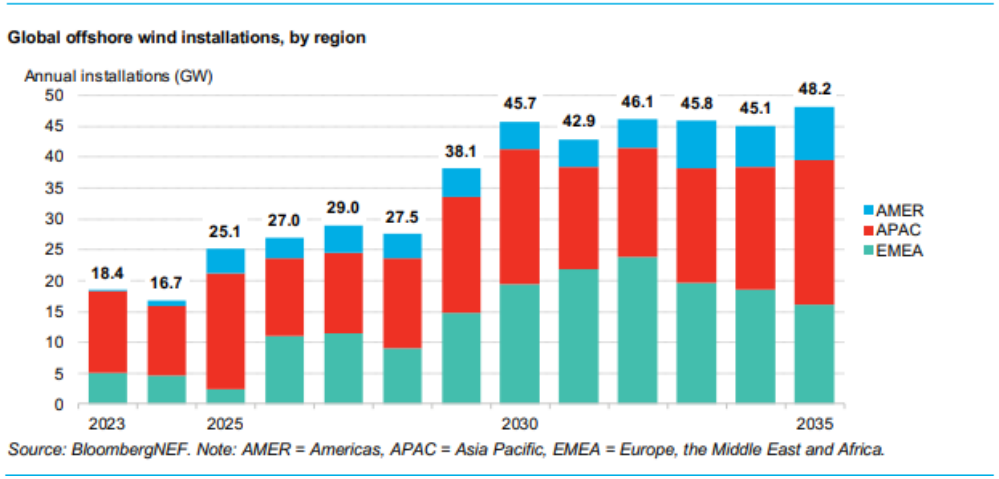
APAC – Offshore Wind Maturing

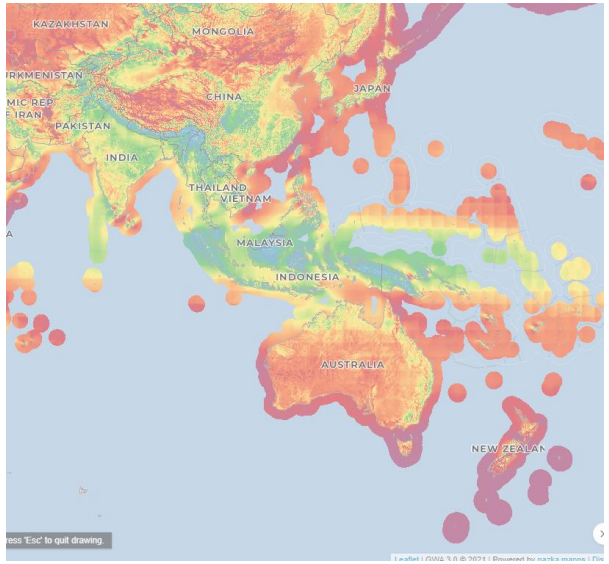
Offshore Wind, **a matured technology**, enjoys a comparable higher capacity factor 35% - 45% and can be build at large scales (1GW+ per site) on the sea.

In installed capacity China is leading the region and globally with 26.5GW of installed capacity in 2022 (World Forum Offshore Wind), followed by one mature market in the region that reached 1GW with 3.7GW starting or already in construction. Japan with 140MW is on the verge of creating a larger market. Vietnam has achieved 396MW with nearshore projects.

APAC will play one of the leading roles in construction activity over the next 7 years. (Bloomberg NEF, World Forum Offshore Wind).



Source: World Forum Offshore Wind Report 2022



Source: Global Wind Atlas by World Bank Group, ESMPA, Vortex & DTU

APAC is also host to a large part of the supply chain, mainly concentrated in China, but also across South-East and North-East Asia.

Since 2018 we have seen North-East Asia with high activity, now joined by Southeast Asia. We expect Japan (2nd auction to end June), South Korea (Floating Wind 100MW project with financial close) to be playing a crucial role with Vietnam coming back with the passing of PDP8. Australia has introduced robust legislation end of 2021 and we see very high development activities with first auction this April. The Philippines has fast tracked their development, ignited by the World Bank Report 2022 and strong push by DoE and others. Bangladesh is running a feasibility study and India is in the starting blocks.

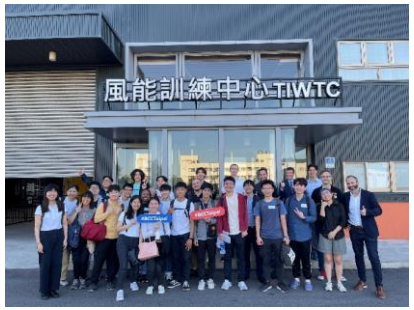
Paving the way

Building a roadmap for Offshore Wind I

Offshore Wind is for the majority of countries in APAC new. **It poses unique challenges to the policy environment, energy market designs, grid infrastructure, industry planning, environment and social constraints as well as finance sector.**

Governments both central and local are key to making this a success.

Orderly marine spatial planning, infrastructure and industry policies, understanding of timelines and a well thought through allocation and permitting process are crucial as Offshore Wind are needed for a stable support environment for project owners to proceed.



Paving the way

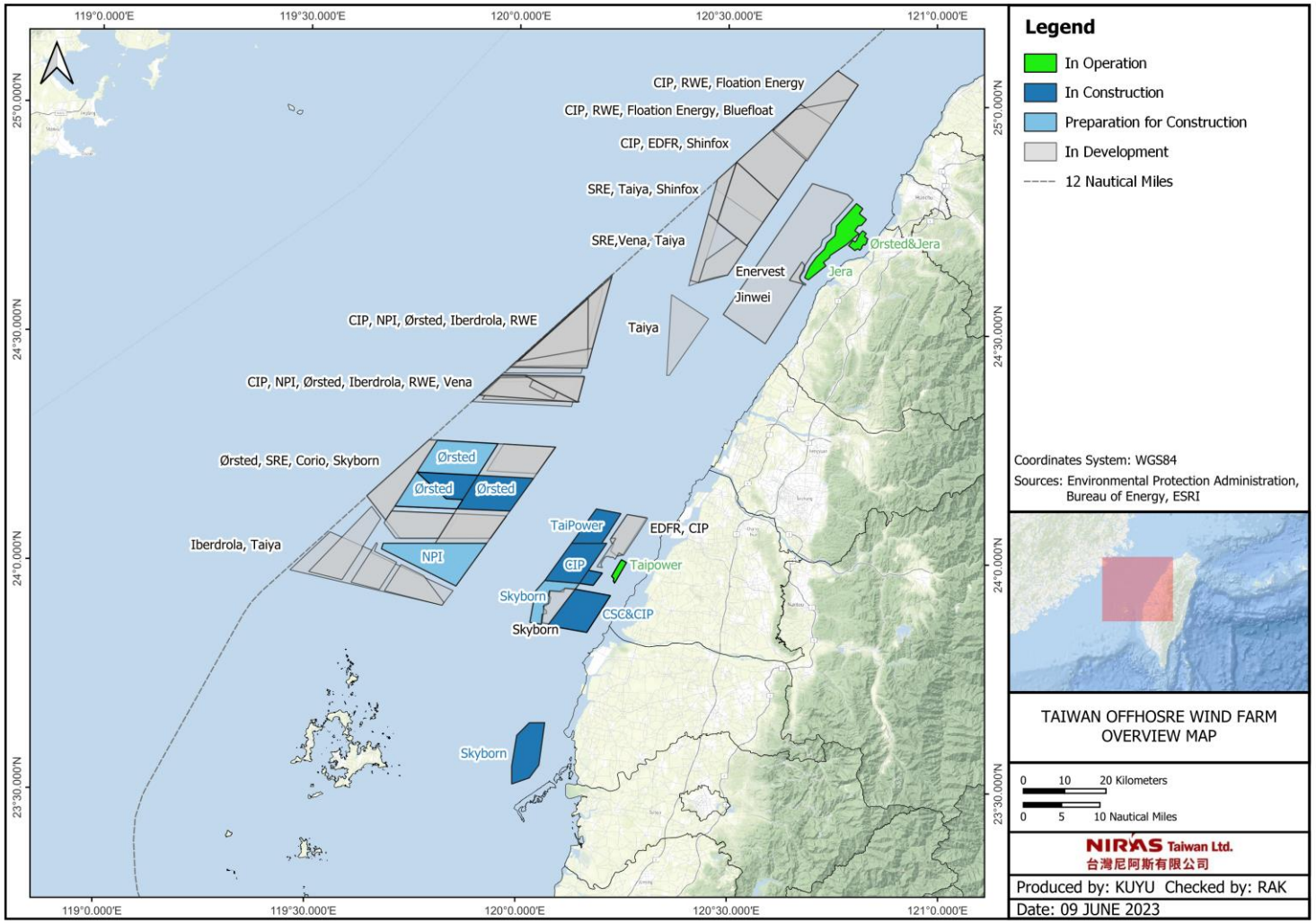
Building a roadmap for Offshore Wind II

With Europe having a strong come back in Offshore Wind and the US policies, we see **an intensive global competition for resources** (supply chain bottle necks) and need to keep markets attractive for capital allocation.

New markets need to address: policy robustness, sound environmental and social frameworks, supply chain development and up-skilling.

There is significant economies of scale associated with Offshore Wind. **By 2030 South, Southeast and Northeast Asia want to achieve a combined 70.1GW – excluding China, who is already far upfront – which provincial level plans already might hit similar levels. Australia could be around 2-4GW and Philippines might see similar levels (not yet announced).**

The aim would be to focus on industrial strength of each country and work across the region to bring down cost – there is also a need for more vessel investments focused on the region and port upgrades.



Outlook for Southeast Asia

將者，智、信、仁、勇、嚴也。

1. **Marine Spatial Planning:**
   Project owners have a tendency to move before market designs – that helps to create momentum but also can lead to irritation for the government, stakeholders, market designs and policy plans. Strong zonal planning from government is important, to avoid later delays or even worse.

2. **Understanding of local environment and issues:**
   Build a strong understanding of current regulations, industry & infrastructure structures, stakeholder environment and need to address them efficiently and reform, or introduce new measures.

3. **Clear regulatory path:**
   Offshore Wind has totally new demands on marine users, environment and other regulations – while it can't be fully front loaded the framework needs to be set and guidelines given. This will have a very positive effect on investment security.

4. **Work with Good International Industry Practice:**
   E.g. environment IFC PS considerations should be included as early as possible – same applies for HSE and other international standards.

5. **Capacity Building, Collaboration and Transparency:**
   New markets have a need of capacity building that needs to be supported by both government, industry associations and private sector. New markets also have a need for stronger collaboration to help uplift industry standards and build supply chains. Transparency on market developments and outlooks will help to steer investments of the supply chain.

6. **Mobilize development banks and finance:**
   In light of economic structures there is a strong need to have regional and global development banks to start de-risking the investment environment, make transitional funds available and support / guarantee loans.

Thank You

謝謝 | Salamat!

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NIRAS
ASIA MANILA

NIRAS Global Perspective

A Leading Global Multidisciplinary Engineering Consultant

59
Offices
in **34** countries

In **Offshore Wind**:

75 dedicated staff are fully dedicated to Offshore Wind across Engineering and Environment working on project delivery in Europe and APAC region.

2600
Professionals
+**43,000** external experts in our network

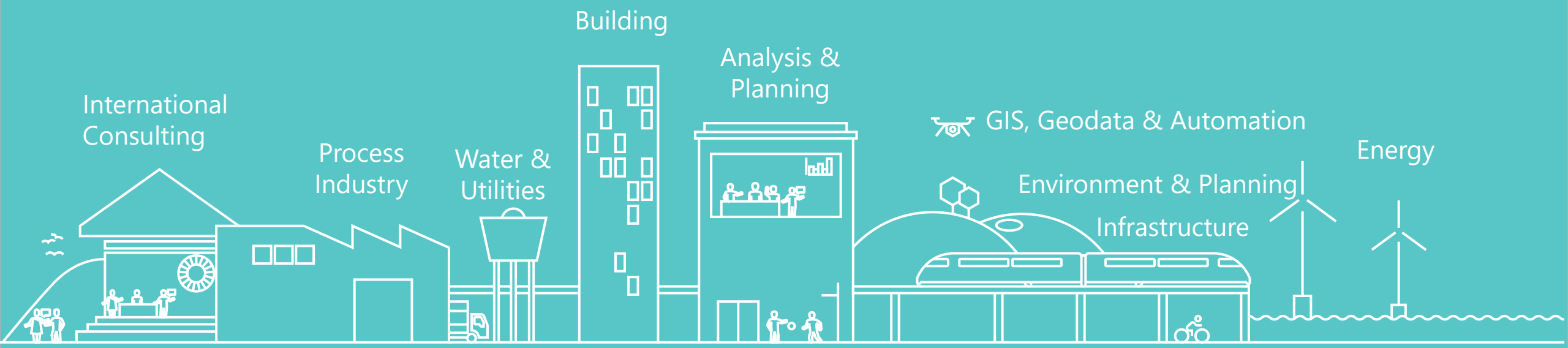
+400
Projects/year
delivered across **120** countries

NIRAS

NIRAS Global Presence

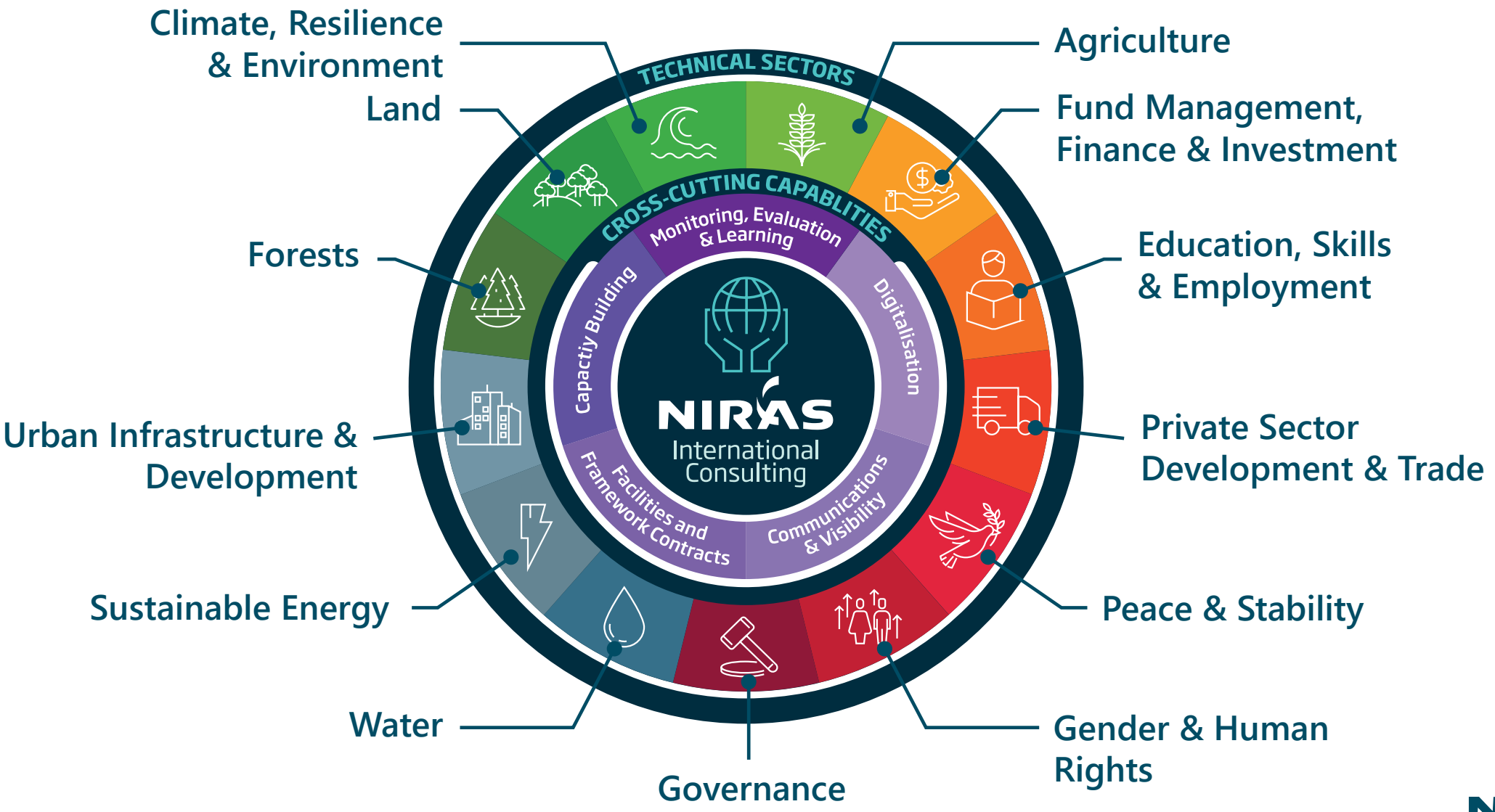
Working with NIRAS

An integrated, holistic and cross-disciplinary approach is in our DNA



"Cooperation across sectors and locations provides our partners and clients with access to the latest knowledge."

NIRAS International Consulting



NIRAS in the Philippines

Serves as the

Regional Hub

for NIRAS' APAC presence with a specialized offshore wind office in Taipei and an energy consulting office in Viet Nam

Recognized as the

Top 2 Consulting Firm

by the **Asian Development Bank** for Consulting Services in the Philippines for Loans, Grants and Technical Assistance Projects

The office also hosts NIRAS'

International Infrastructure Unit

that provides Filipino engineering expertise to our projects worldwide

NIRAS in Taipei

APAC Hub Offshore Wind Focused Team

Our Team

- Policy and Economic Specialist
- Project Development Specialist
- Licensed Civil / Structural Engineer (P.E.)
- Foundation Specialist
- Project Engineers / Project Managers
- Foundation Fabrication Experts
- Environmental Engineers (P.E.)
- GIS Specialist
- Marine Scientists
- EIA/ESIA Managers and Consultants
- ESG Strategy and Planning Consultants

Our Services

- Technical Advisory
- Owner's Engineer
- Due Diligence
- Marine Environment
- EIA / ESIA
- Biodiversity (net gain)
- Critical Habitat
- ESG

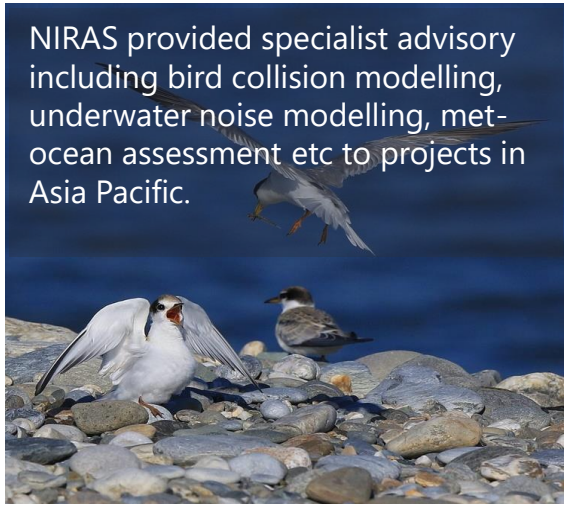
With support from NIRAS' global team of 2,600 experts

Environmental & Consenting Services

Our experience in APAC

Specialist advisory and assessment including:

- Ornithology
- Marine Mammals
- Underwater Noise Modelling
- Fisheries Economics
- Benthic Ecology
- Met-ocean



NIRAS provided specialist advisory including bird collision modelling, underwater noise modelling, met-ocean assessment etc to projects in Asia Pacific.

Environmental Impact Assessment

- Delivery of EIA to local laws or the management of this process
- Consent management

NIRAS' Environment and Consenting team hand-delivering an EIA

Bankable Environmental and Social Impact Assessment (ESIA) related work including:

- EIA Due Diligence and Gap Analysis (PS1)
- Biodiversity and Ecosystem Impact Assessment (PS6)
- Cumulative Impact Assessment (CIA) (PS1)
- Critical Habitats Assessment (CHA) (PS6)
- Fisheries Livelihood and Restoration Plan (FLRP) (PS5)

NIRAS supported two offshore wind projects' in completing ESIA documents to IFC standards required to successfully achieve financial close.

Environmental survey / monitoring support including:

- Survey and Monitoring Specifications
- Management of Survey and Monitoring
- Offshore Supervision
- Remote Monitoring System Solutions

NIRAS performing offshore supervision of marine ecological surveys.

Technical Advisory Services APAC

In-house and technical support

Development, Design and Procurement Phase:

- Feasibility studies
- Strategy (auction, market, timelines)
- CAPEX, OPEX, LCOE
- Wind and metocean assessment
- Geotechnical and UXO assessment
- Concept design and design management
- Tender support
- EPC package management

Manufacturing & Construction Phase:

- Fabrication management
- Installation supervision

O&M Phase:

- Foundation structural health monitoring
- Remote monitoring systems

Example reference: Owner's Engineering for Taiwan Power Company's Offshore Wind Farm (109 MW) that just start commercial operation (2021)

NIRAS provided **Owner's Engineering** services.

NIRAS' roles include:

- Package management
- Technical review and assurance
- EPC contractor management
- Technical supervision of the installation of
  - Foundation and pin piles
  - Offshore cables
  - Wind turbines
- HSE and technical trainings

Technical training of client group on HSE and offshore installation

Ports & Harbour

Solid experience in engineering for design/upgrade of port infrastructure to support renewable energy / green port development

- NIRAS has over 40 years experience in port and harbour projects and is experienced in engineering for offshore wind related ports
- NIRAS provides planning, tender, design, and construction supervision support for both construction/pre-assembly ports and O&M ports for offshore wind and other marine projects
- Our experience throughout the whole life cycle of offshore wind farm development (from planning to design, construction, operations, and decommissioning) complements with the port engineering needs

Our services related to ports and harbour engineering include:

- Owner's engineering
- Concept design and FEED
- Detailed design
- Tender preparation and contract negotiation
- Construction supervision
- Prepare onshore and offshore logistics operational setup

Training and Transfer of Know-how

For example, as early as 2012-2013, NIRAS provide **offshore wind technology transfer** to government, local consultants and developers in North-East Asia.

Selected References | Offshore Wind

Region	Client/Project	Works	Year
Taiwan	Developer	Technical advisory to support project development of Round 3 offshore wind farm	2022
Taiwan	Developer	EIA for several Round 3 offshore wind farms	2021 -
Taiwan	Developer (Under Construction)	• Substation package management • Foundation fabrication management support • O&M Harbour accessibility and feasibility study • Support in consenting and Environmental & Social Impact Assessment documents	2019 – ongoing
Taiwan	Developer (Under Construction)	• Foundation fabrication management support and supervision • EPC tender support • O&M Harbour accessibility and feasibility study • Design management support for offshore foundation design • Support in EIA/consenting and Environmental & Social Impact Assessment documents • Fisheries social-economic studies • Support in proposal preparation and panel review of government selection/auction	2017 – ongoing
Taiwan	Chu Feng OWF	To support wind measurements for a planned offshore wind farm, NIRAS provided technical scope and requirement to the installation of LiDAR onshore and FLiDAR offshore.	2018
Taiwan	Taipower & Sinotech	Owner's engineering for Taiwan Power Company's Phase I Offshore wind farm: • Technical review and assurance of EPCI con-tractor's documentation • Technical supervision of - Offshore foundation installation - Offshore cable installation - Wind turbine installation, commissioning, test run	2016 - 2022
Taiwan	Semco Maritime	FEED for Offshore Substation of Hai Long Offshore Wind Farm	2018
Taiwan	Changhua Offshore Pilot Project	Metocean report, foundation design, and owner's engineering	2014- 2017

Selected References | Offshore Wind

Region	Client/Project	Works	Year
Japan	Investor	Red flag due diligence review to support M&A process for the buyer.	2021
Japan	Kajima Corporation	Design of Tower Stands for Offshore Wind Farm: • Basic and detailed design of temporary support steel structures for wind turbine towers of a commercial 140MW offshore windfarm in Akita	2020 – 2021
Korea	Developer	Regulatory overview for offshore wind project development	2021
Korea	Developer	Environmental Due Diligence Support for offshore wind project	2020
Japan	Developer	Studies for a Potential Offshore Wind Site in Japan: • Wind resource assessment and Site Assessment • Wind Farm Layout • Calculation of CAPEX, OPEX and LCOE	2020
Japan	Developer	Pre-feasibility Study for Potential Offshore Wind Sites in Hokkaido: • Wind resource and metocean assessment • Seabed conditions • Environmental issues and stakeholder concerns • Grid availability & capacity • Overview of permitting process and associated timeline	2019
Japan	Developer	Turbine contract for a commercial-scale offshore wind farm: • Review of Turbine Supply Agreement (TSA) • Review of Service Availability Agreement (SAA) • Drafting of Employer's Requirements for TSA and SAA • Support negotiations with turbine supplier	2018

Selected References | Offshore Wind

Region	Client/Project	Works	Year
USA	Developer	NIRAS provided geotechnical experts to support Offshore Wind Project: • Review the site investigation contractors' factual reports • Prepare Geotechnical Interpretative Reports which will form the basis for the subsequent design of foundations for wind turbine and substation.	2018 –
UK	Kincardine Floating Off-shore Wind Ltd	Consent and environment management for entire project life cycle (site selection through to post construction monitoring).	2018 -
Denmark	Vattenfall	Kriegers Flak and Vesterhav Nord & Syd offshore wind projects: • Managed EIA investigations • EIA reports for Vesterhav Nord, VesterhavSyd and Bornholm OWF • FEED for foundations • Detailed design of secondary and tertiary structures	2013 - 2018
UK	Smart Wind / Dong Energy (Ørsted)	Hornsea Project Two Offshore Wind Farms: Provided in-house support as lead for birds and marine mammals	2013 - 2016
NL	Jan De Nul	BORSSELE III & IV offshore wind farm • Basic design of monopiles	2016
UK	SSE	Greater Gabbard Offshore Wind Farm: support in Marine ecology, consenting and monitoring from EIA scoping phase to post construction monitoring.	2004 - 2018
Belgium	Northwind	Northwind Offshore Wind Farm: foundation design	2012-2015
UK	DONG Energy (Ørsted)	West Of Duddon Sands offshore wind farm: • Construction management • Support in project management from planning to commissioning phase	2010-2015

More references can be provided upon request

Our mission is to deliver sustainable solutions to our customers, and we have integrated UN's **Sustainable Development Goals (SDGs)** in our forward strategy. In every sector, we ask ourselves whether we can introduce new services so that, together with clients, we can contribute to the development goals.

NIRAS