UN-GGIM WGMGI1

Wind farms in coastal areas of Africa and in high-seas: the need for marine data to promote the access to energy (SDG7)

International Hydrographic Organization

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Introduction

The objective of this presentation is to highlight the need of marine data to:

- allow the production of energy in coastal areas of Africa; and
- address the potential impact of wind farms in the high seas

Food for thought

Introduction

This presentation is not a technical analysis of wind generation but to present cases addressing the need of data in support of marine spatial planning and management of sea areas.

Introduction

Sustainable Development Goal 7

Ensure access to affordable, reliable, sustainable and modern energy for all.

Energy is crucial for achieving almost all of the Sustainable Development Goals, from its role in the eradication of poverty through advancements in health, education, water supply and industrialization, to combating climate change.

The need for marine data to allow the production of energy in coastal areas of Africa

Reference: Continental-scale assessment of the African offshore wind energy potential: Spatial analysis of an under-appreciated renewable energy resource.

Paul Elsner

Energy in Africa

The African continent is facing substantial energy challenges: 620 million people do not have access to electricity, which represents more than 50% of its population. This number is set to increase by 45 million in the upcoming decade. This problematic situation is expected to become more challenging in the future, as the energy demand of Africa is projected to increase by 600% between 2010 and 2040. The International Energy Agency (IEA) is estimating that the electricity generating capacity will need to at least quadruple by 2040.

Energy in Africa

A potentially attractive clean energy technology that could provide electricity supply at scale is offshore wind energy (OWE). Large wind park projects located offshore have capacities in the order of several hundred MW and therefore could form a significant element of a clean energy pathway in Africa.

Energy in Africa

Data sets considered in the study for the offshore wind generation in Africa:

- Wind speed (S-412)
- Bathymetry (GEBCO data, S-102)
- EEZ data (S-121)
- Marine protected areas (S-122)

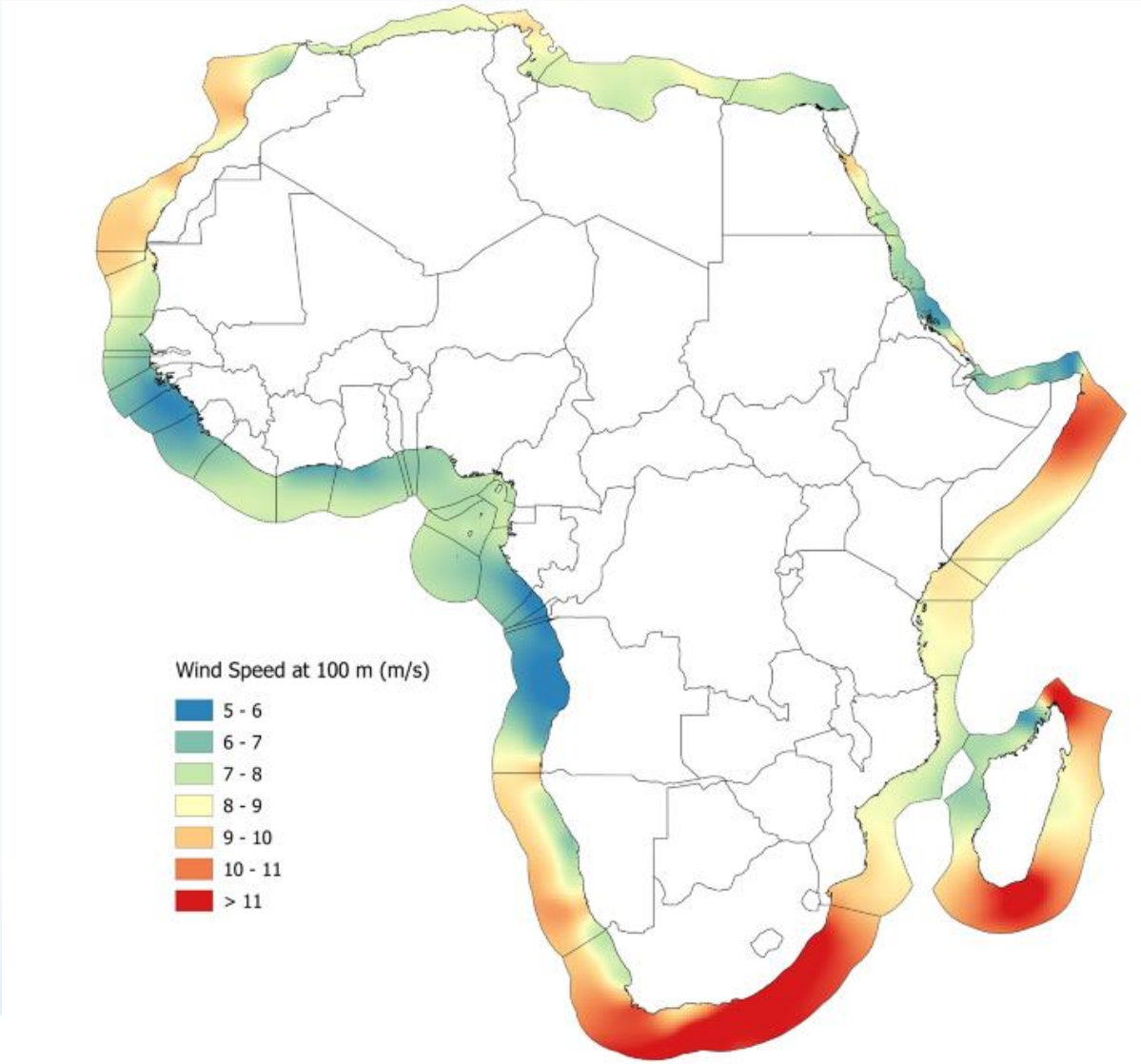
Energy in Africa

Data that are necessary for effectively using the energy generated offshore:

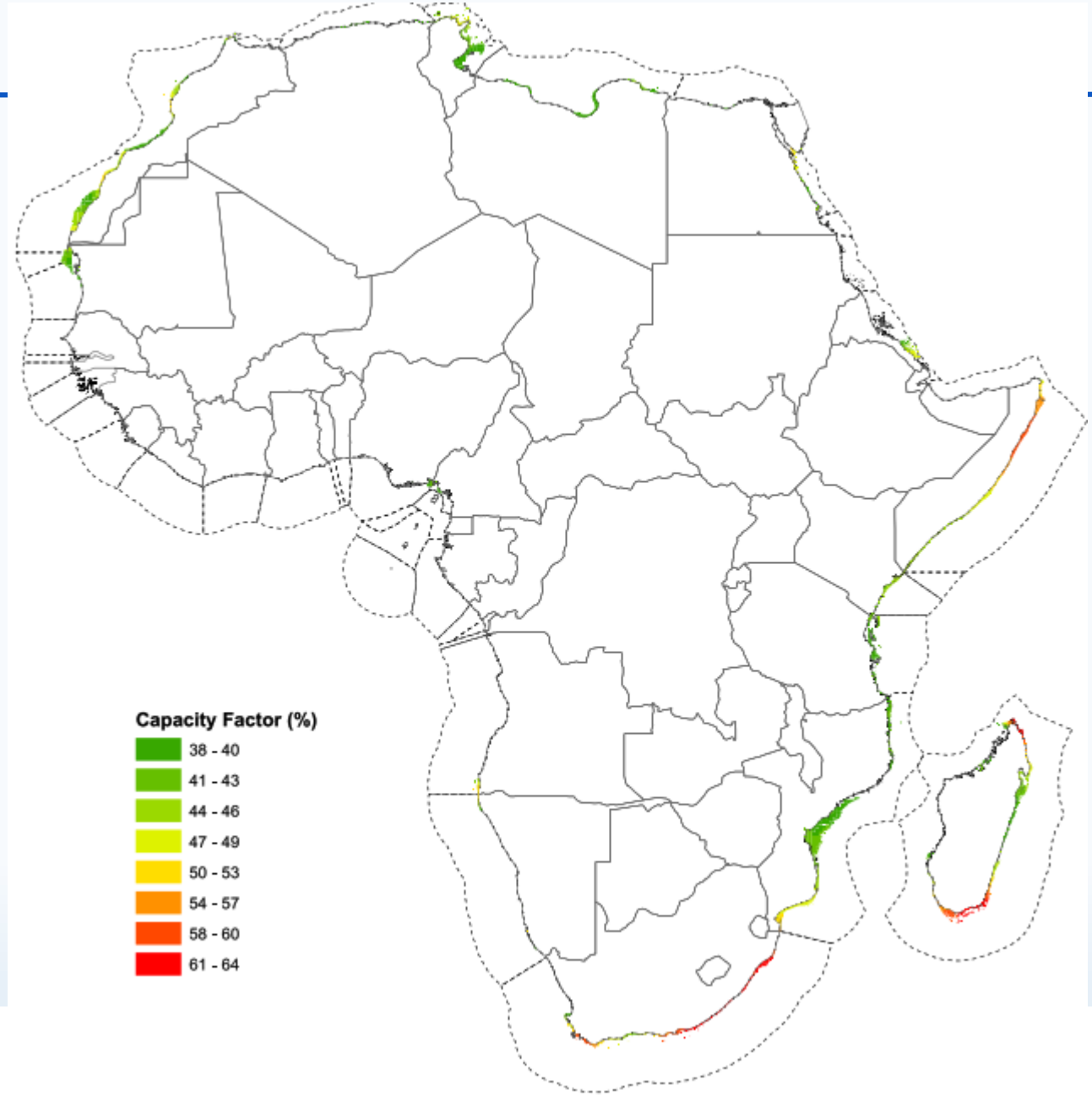
- Tides and Water Level (S-104)
- Physical Environment (S-126)
- Marine Traffic Management (S-127)
- Terrain, population distribution, existing gaps in energy availability, available infrastructures

Energy in Africa

Wind speed at 100m above sea level (m/s)



Capacity factor for waters shallow than 50m and up to 50 NM from the coast



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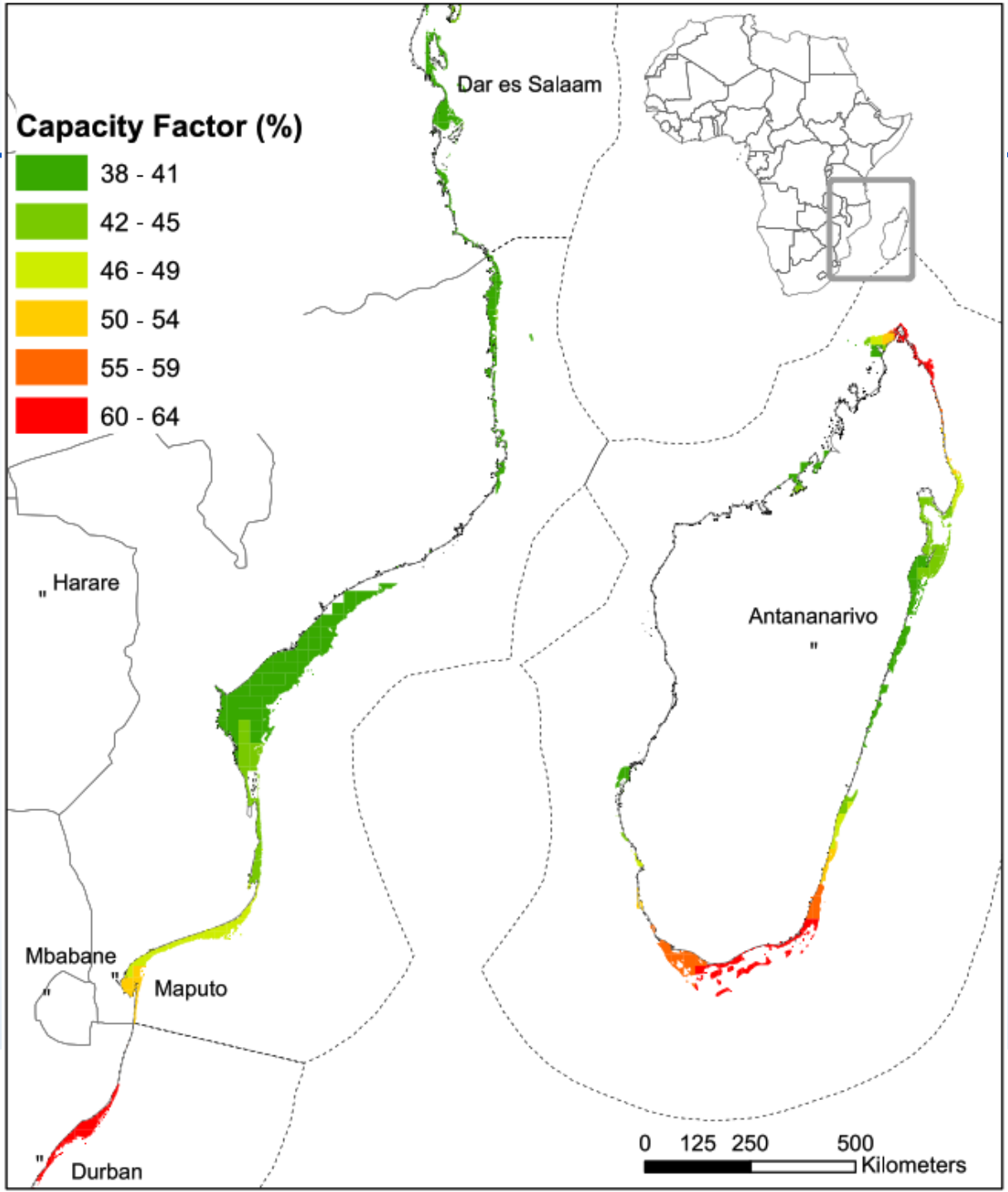
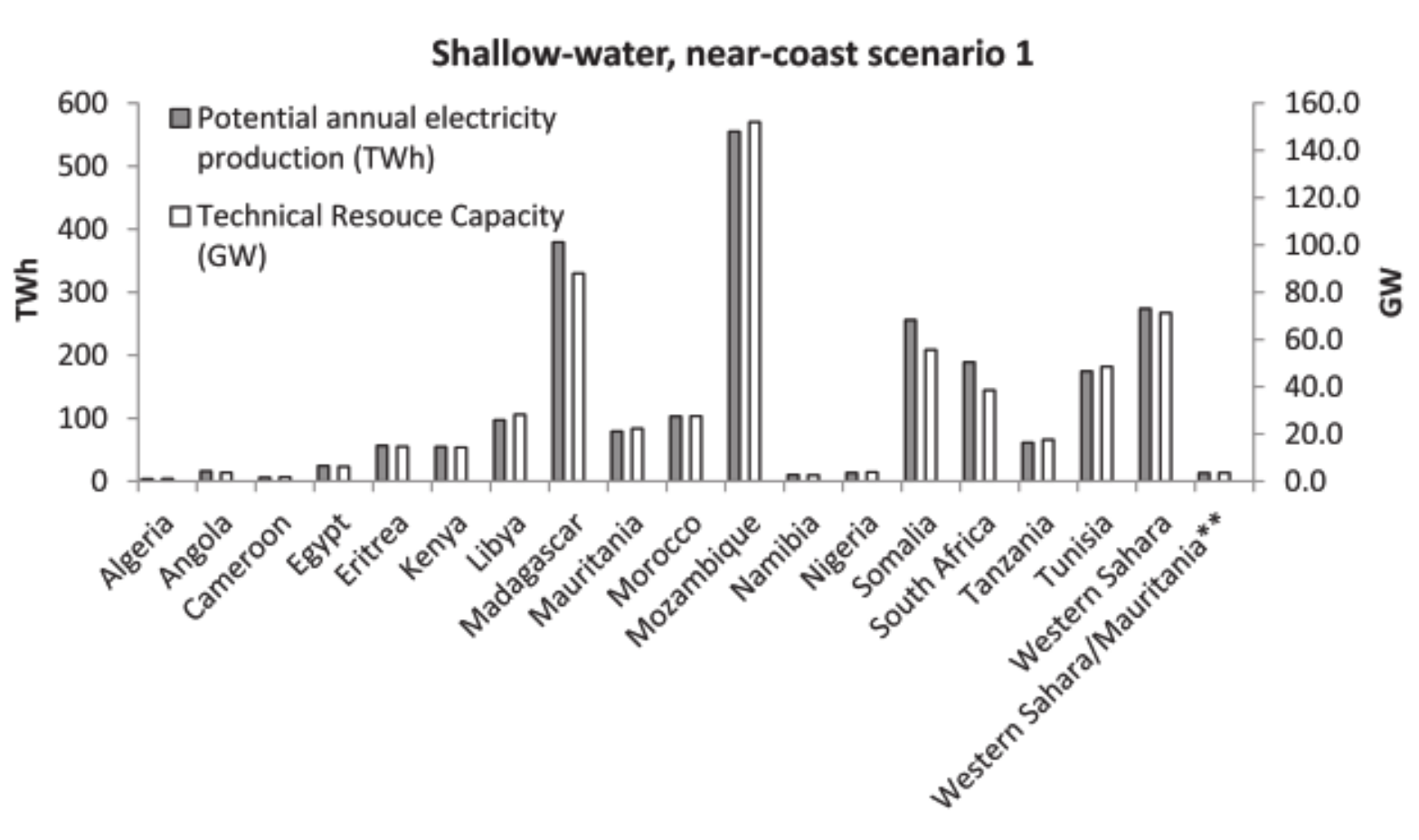


Energy in Africa

Capacity factor



Energy in Africa

The author emphasizes the large uncertainty in the study due to the limitations of data!

Energy in Africa

Technical offshore wind resource for the five African power pools and their respective electricity demand in 2015 and 2040 and the potential energy generation:

Technical offshore wind resource for the five African power pools and their respective electricity demand in 2015 and 2040.

Power Pool	Electricity generation 2015 (TWh)[a]	Electricity demand 2040 (TWh)[b]	Technical OWE resource energy potential Scenario 1 (TW h)	Technical OWE resource energy potential Scenario 2 (TW h)
WAPP	58.3	243.5	13.4	13.9
EAPP	273.3	774.1	237	1460
CAPP	89.3	94.5	22.2	76.6
SAPP	380.8	1060.6	831.8	5397.3
COMELEC	157.4	n/a	457.8	2376.7

The need of marine data to address the potential impact of wind farms in the high seas

Reference: Renewable energy from the high seas: Geo-spatial modelling of resource potential and legal implications for developing offshore wind projects beyond the national jurisdiction of coastal States

Paul Elsnera, Suzette Suarez

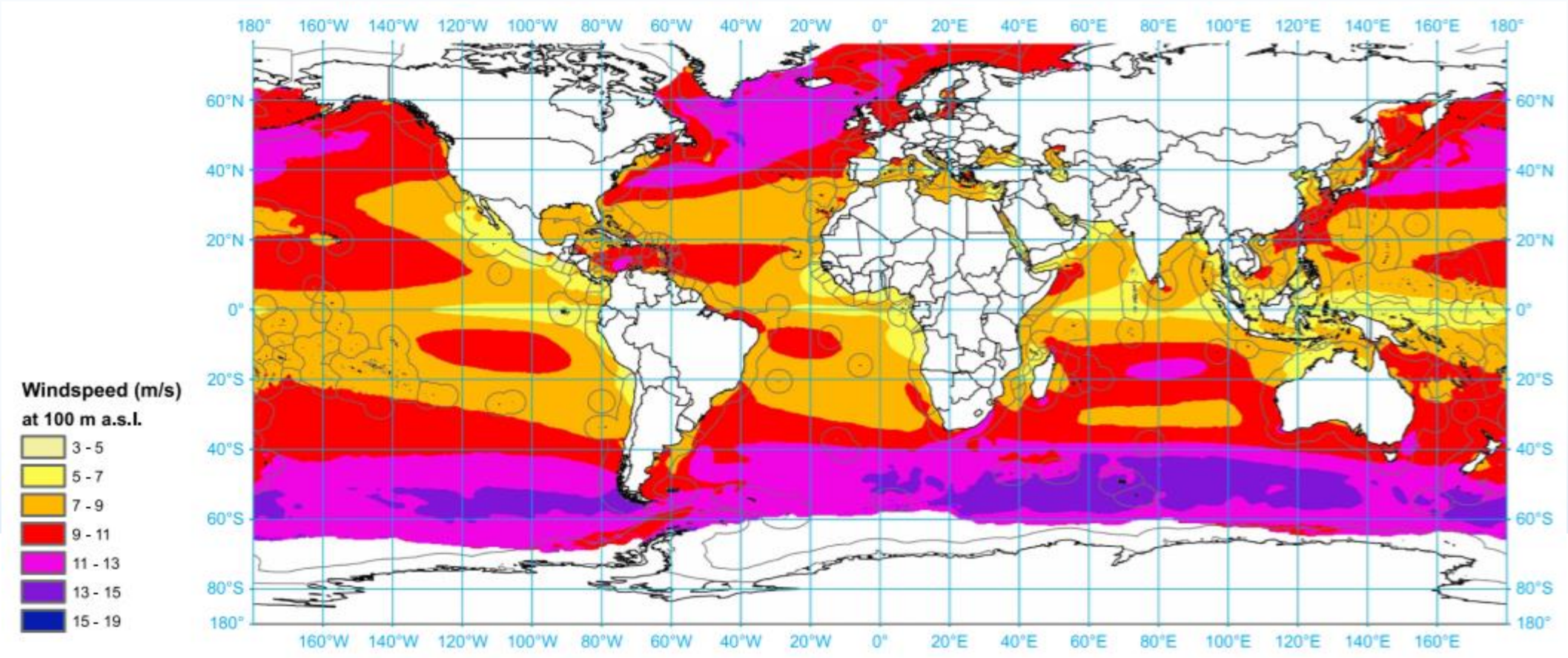
Wind farms in the high seas

Offshore wind energy projects are currently restricted to the exclusive economic zones of coastal States. Recent advances in technology are raising the prospect of utilizing excellent wind resources on the high seas.

Offshore wind energy is the most mature and cost-effective technology of the renewable possibilities at sea.

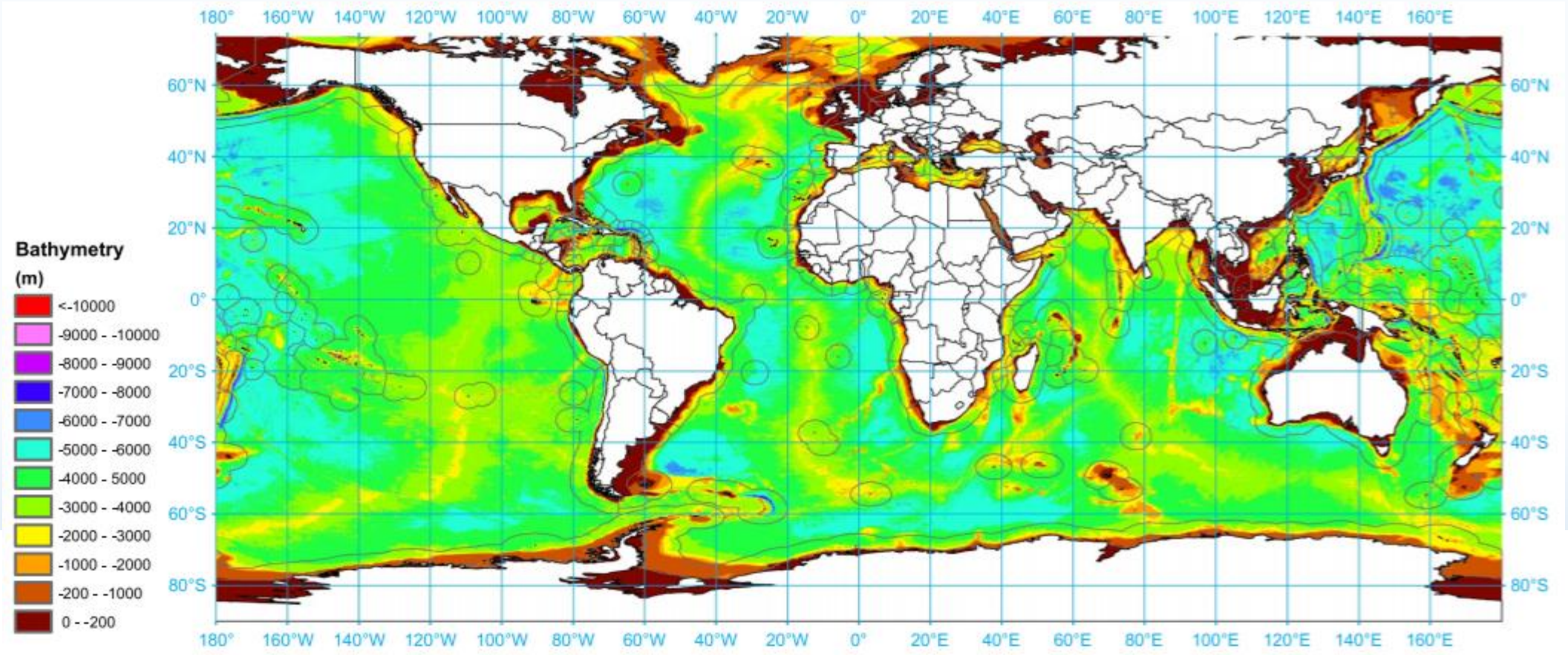
Wind farms in the high seas

Annual average wind speed distribution at 100 m above sea level:



Wind farms in the high seas

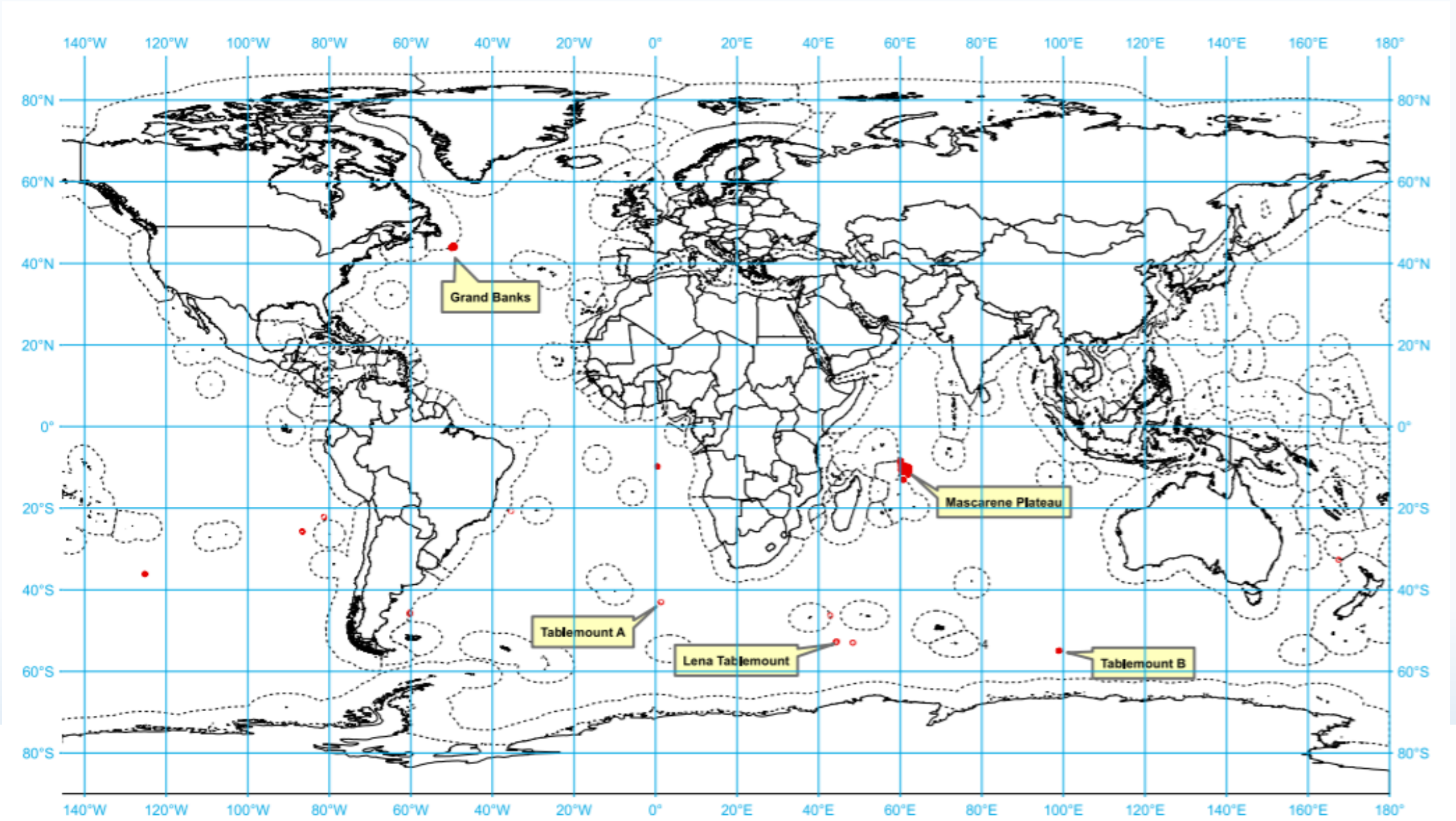
Global bathymetry. Grey lines outline the respective exclusive economic zones of coastal States:



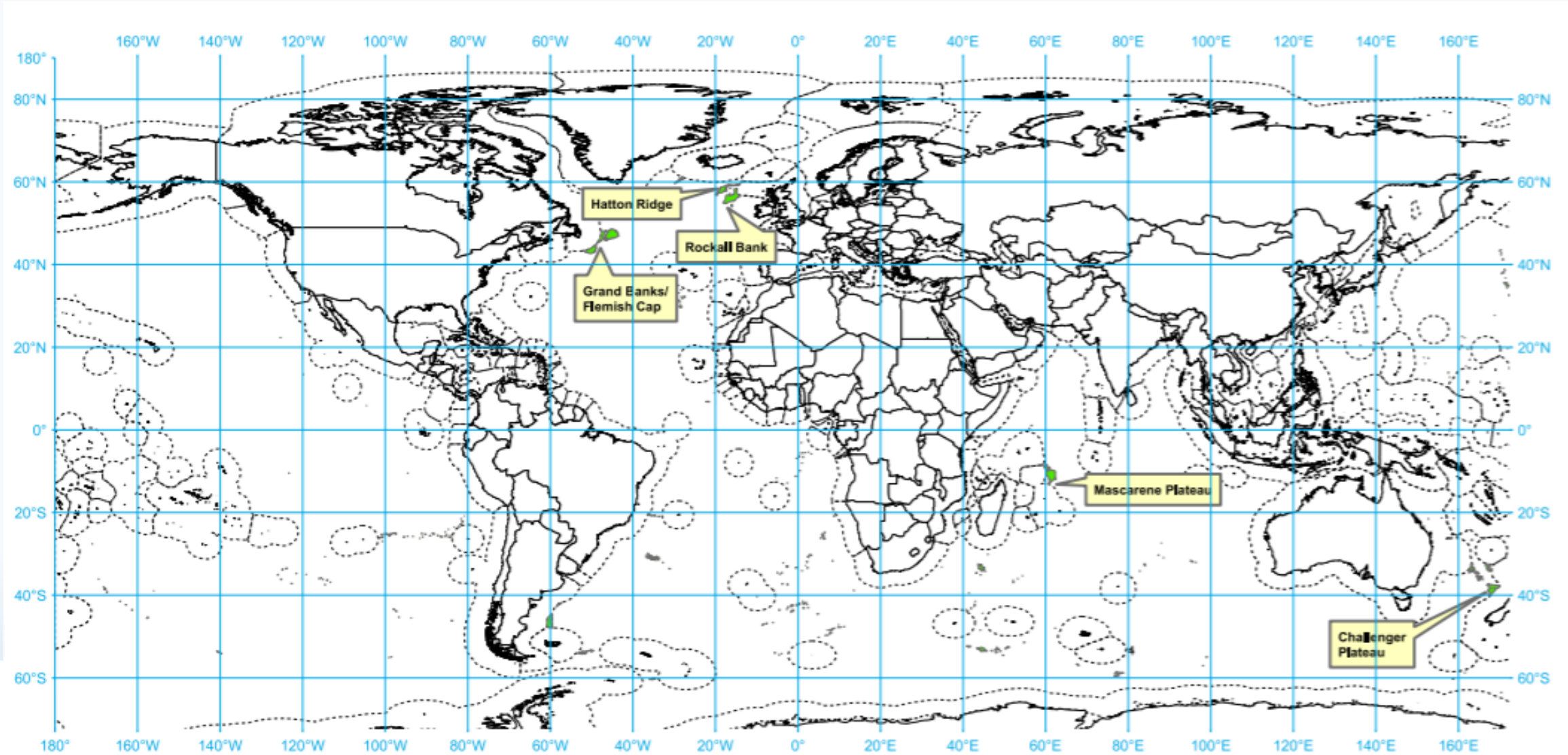
Wind farms in the high seas

The results indicate that a substantial technical offshore wind potential exist on the high seas. It should be noted that the seabed of the majority of the most promising areas is subject to claims of extended continental shelf under UNCLOS article 76. Only the three table mounts that were identified for the shallow water case have not been claimed and belong to the Area, which is the seafloor and subsoil that is beyond the limits of national jurisdiction and control.

Wind farms in the high seas: shallow waters



Wind farms in the high seas: deep waters



Wind farms in the high seas

Under the United Nations Convention in the Law of the Sea (UNCLOS), the generation of wind energy within the EEZ as well as the construction, maintenance, and removal of any offshore wind installation or structure, are under the exclusive jurisdiction and control of the coastal State, subject only to the navigation safety rules established by the relevant international organizations.

Wind farms in the high seas

Unlike the jurisdictional competence in the territorial sea and the EEZ, jurisdictional competences over activities on the high seas are mainly allocated to the flag State, not to the coastal State. Flag States possesses wide discretionary latitude on the high seas; there are some limitations but these relate mainly to matters concerning safety to navigation and environmental protection. Thus, any offshore wind park project on the high seas will be governed by the flag State legal framework.

Wind farms in the high seas

With respect to floating wind parks, an uncertainty may arise with respect to their legal status on the high seas. Is the floating wind park platform a ship/vessel or an artificial island, installation, or structure?

Flags of convenience for offshore wind projects?

Wind farms in the high seas

Within marine areas under national jurisdiction and control, many coastal States are already relying on marine spatial planning tools to rationalize and manage the different and conflicting uses of the seas.

Of paramount importance is thus the existence of Marine Spatial Data Infrastructure.

Wind farms in the high seas

It is interesting to note that marine spatial planning on areas beyond national jurisdiction is a subject of discussion at the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity.

Wind farms in the high seas

Offshore wind parks are expected to take up physical space on the high seas on a long-term basis. Their potential to adversely affect navigation and maritime traffic is therefore high. There are existing rules for safety of navigation and other maritime safety rules relevant to the offshore industry which have been established by the International Maritime Organization (IMO) but these are in the context of offshore extractive industries.

Wind farms in the high seas

While the generation of energy from wind resources may impact the natural environment and biodiversity. Examples for such negative impacts are underwater noise during construction that could cause avoidance behavior of marine mammals, risk and disturbance of turtles and fish from vessel movements associated with wind park construction and operation, and the disturbance of migratory bird species, including fatalities due to collisions with turbines.

Wind farms in the high seas

Onshore grid connection

If the power generated from the high seas is meant to be consumed onshore, there is a need to connect the power from the offshore wind farms to the onshore grid. For issues relating to grid connection, the international legal regime of cables and pipelines under UNCLOS is well-established and will come into play.

Wind farms in the high seas

It needs to be recognized that the geospatial model results need to be treated as indicative only, as the currently available bathymetry data has only a relatively coarse resolution of 30 arc-seconds. With higher resolved data on water depth, more accurate delineation would be possible. Currently efforts such as GEBCO Seabed 2030 Project are therefore to be welcomed and highly anticipated.

Conclusions

1. Generation of energy in Africa can largely benefit from offshore wind farms.

2. There is potential for wind farms in the high seas to complement the coastal wind farms.

3. Data is fundamental for the assessment of potential energy generation and for the proper legal application.

Conclusions

Marine Data

↓

Energy production

↓

Support the SDGs

Conclusions

IHO Data Centre for Digital Bathymetry (DCDB)

The International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) was established in 1990 to steward the worldwide collection of bathymetric data. The Centre archives and shares, freely and without restrictions, depth data contributed by mariners. The IHO DCDB is hosted by the U.S. National Oceanographic and Atmospheric Administration (NOAA) on behalf of the IHO Member States.

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Contribute Data

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ViewIHO Membership Details

Access Data

The DCDB contains oceanic soundings acquired by hydrographic, oceanographic and other vessels during surveys or while on passage. Data are publically available and used for the production of improved and more comprehensive bathymetric maps and grids, particularly in support of the GEBCO Ocean Mapping Programme.

IHO Member States and others can contribute bathymetric data and metadata via File Transfer Protocol (FTP), email, or mail (CD, DVD, and hard drive) in the formats below. Other formats will be considered on a case-by-case basis.

- **Raw sonar data:** MGD77T or the original manufacturer's format
- **Processed data:** BAG, NetCDF, tiff, xyz, sd, asc, etc.
- **Metadata:** XML or text

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