AIR CENTRE
ATLANTIC INTERNATIONAL RESEARCH CENTRE

International Collaboration on Integrated Geospatial Approaches for New Offshore Wind Energy Development

2019 Summit Southeast - International Commerce & Innovation Summit: Energy, Ocean Economy and Sustainable Development, Charlotte, NC, September 2019

Stewart Bernard (CSIR), Paul Elsner (UoL), Marjolaine Krug (CSIR), Miguel Marques (INEGI), José Carlos Matos (INEGI), Kittessa Roro (CSIR), Sives Govender (CSIR), Stephanie Landman (SAWS), Jose Moutinho (AIR)

Birkbeck UNIVERSITY OF LONDON

CSIR our future through science

inegi driving science & innovation

South African Weather Service

AIR CENTRE

ATLANTIC INTERNATIONAL RESEARCH CENTRE

The Atlantic International Research Centre (AIR Centre) is an international framework for scientific and technology collaboration and development of innovative ideas, common policies, shared research programmes and joint projects, aligning national priorities and global challenges

The AIR Centre integrates Space, Ocean, Climate, Energy and Data Sciences to deliver growth of the blue economy and societal impact in the Atlantic region

AIR CENTRE

Timeline
Scientific Diplomacy

Global Challenges

May **2013**

Galway Statement
EU, USA, Canada (North Atlantic)

April **2017**

1st HIGH LEVEL
Industry-Science-Government Dialogue

July **2017**

South-to-South Framework for Scientific and Technical Cooperation
Brazil and South Africa

Belem Statement
EU, Brazil and South Africa, South Atlantic and North Atlantic

November **2017**

2nd HIGH LEVEL
Industry-Science-Government Dialogue, 'Florianopolis Declaration',
Decision on AIR Centre creation

April **2018**

Constitution AD AIR Centre

May **2018**

3rd HIGH LEVEL
Industry-Science-Government Dialogue 'Praia Declaration'
Scientific Agenda

November **2018**

4th HIGH LEVEL
Industry-Science-Government Dialogue
Canary Islands, Spain

April **2019**

5rth HIGH LEVEL
Industry-Science-Government Dialogue,
Lagos, Nigeria

Ever expanding Network

Flexible, distributed and inclusive approach

Main areas of interest
Convergence is key

Marine Resources & Biodiversity

Clean & Healthy Oceans

Earth Observation: from Deep Sea to Inner Space

Mitigation & Adaptation to Climate Change

Renewable Offshore Energies

Data Science & Deep Learning

Infrastructures, Capacity Building, Knowledge for All

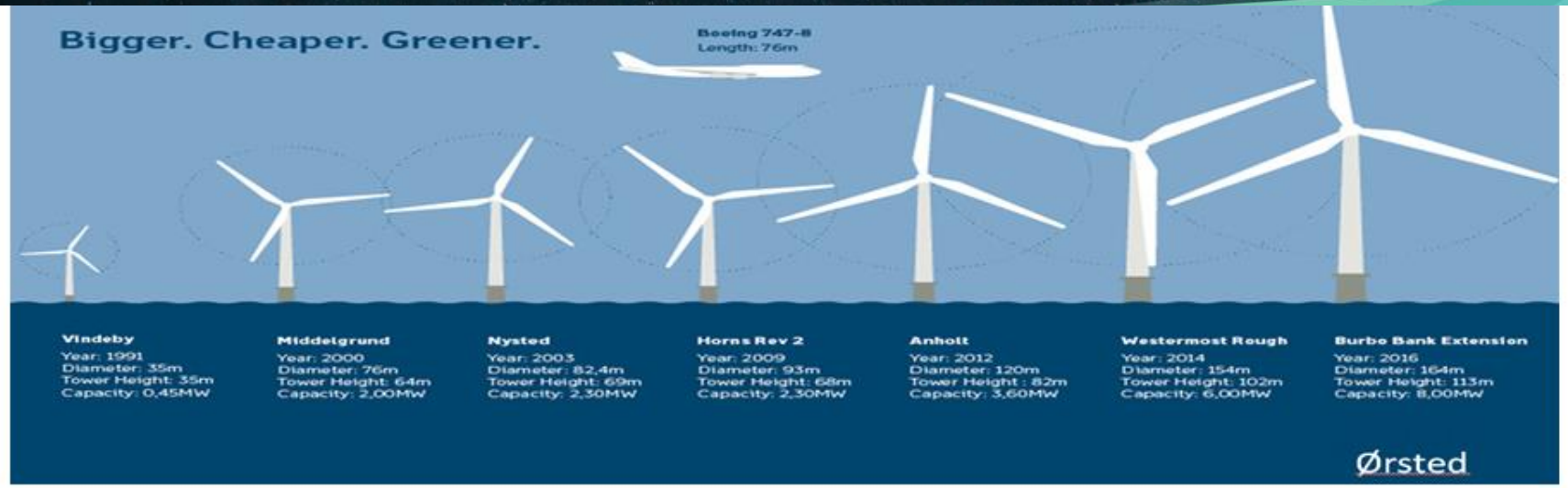
So… Why Collaborate?
Several reasons and motivations

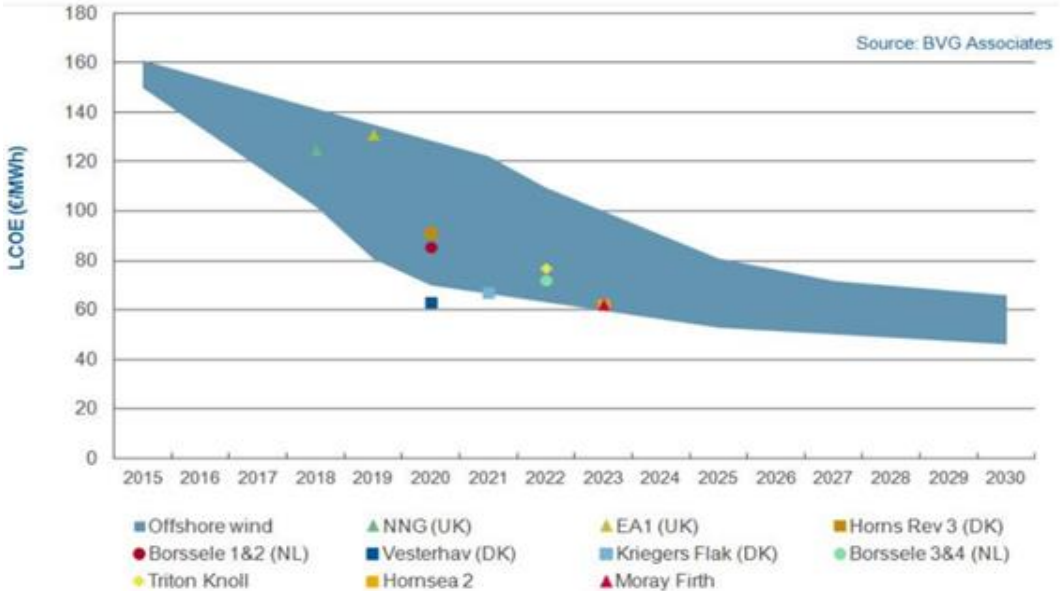
- Pool resources to address large, complex problems
- Increase solutions' robustness
- Increase odds of success
- Decrease costs
- Amplify results
- No one left behind
- Benefit from diversity

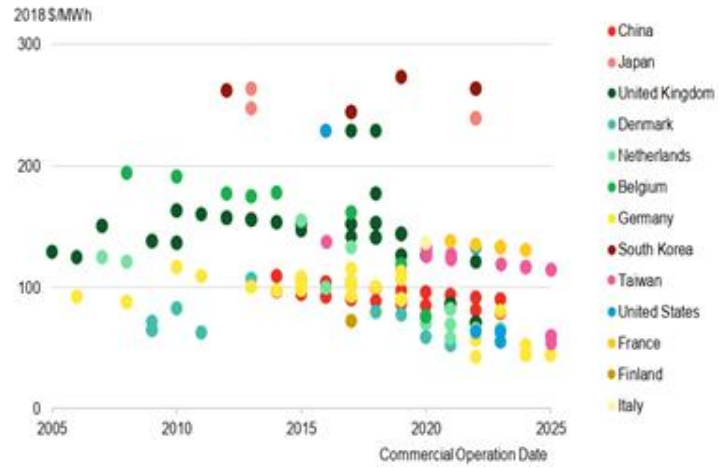
Typical collaboration framework
Bottom-up approach with strong Top-down support

Definition of high priority topics	Countries / affiliated organizations and AIR Centre
Identification of key needs/requirements	AIR Centre and international stakeholders
Elaboration of the initiative	Countries / affiliated organizations and AIR Centre
Implementation of the activities	Industry / research organizations
Service Fruition	User communities
Impact evaluation (feedback loop)	AIR Centre and end users

Mature, cost effective & low carbon offshore wind energy technology seeking markets…

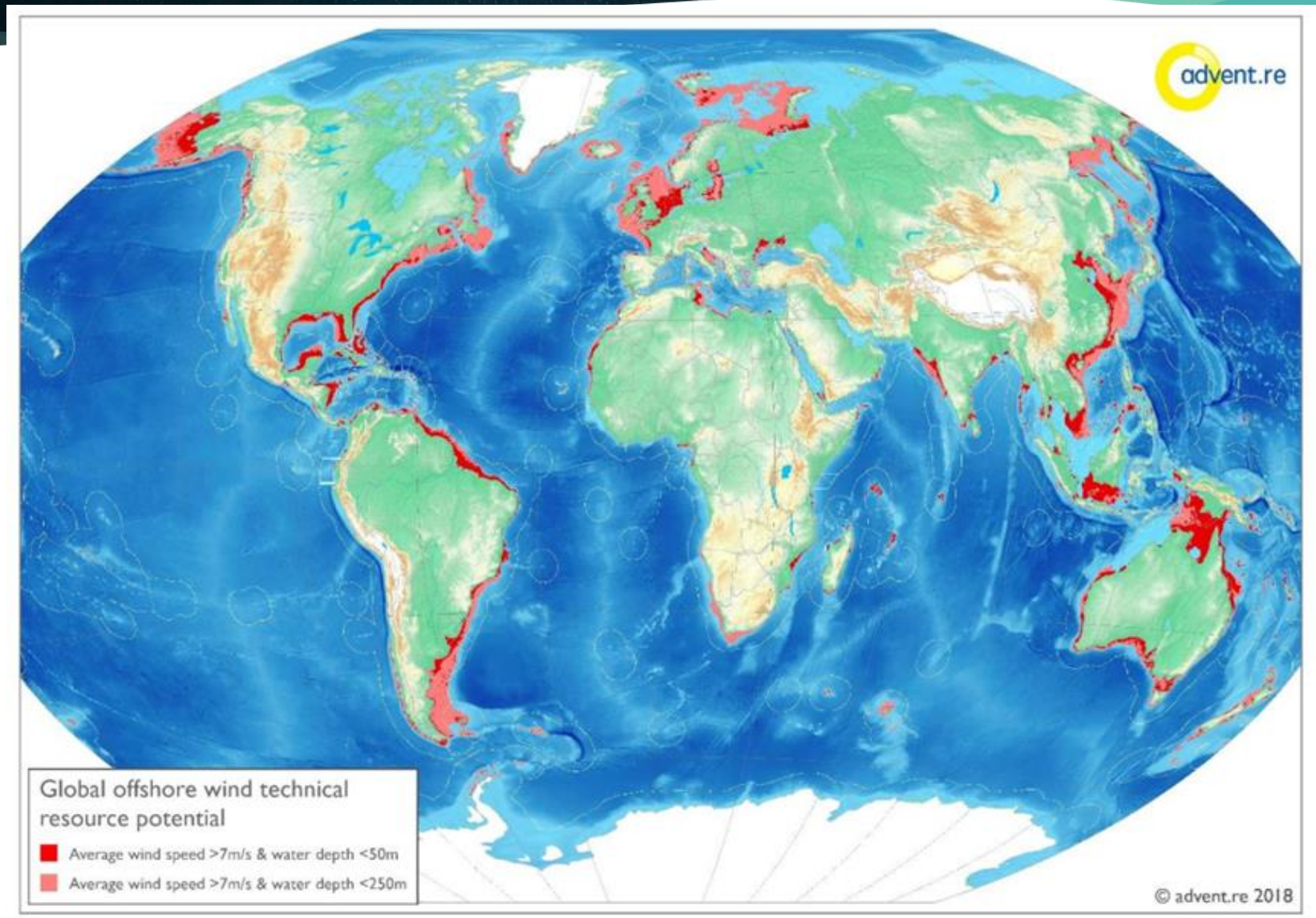




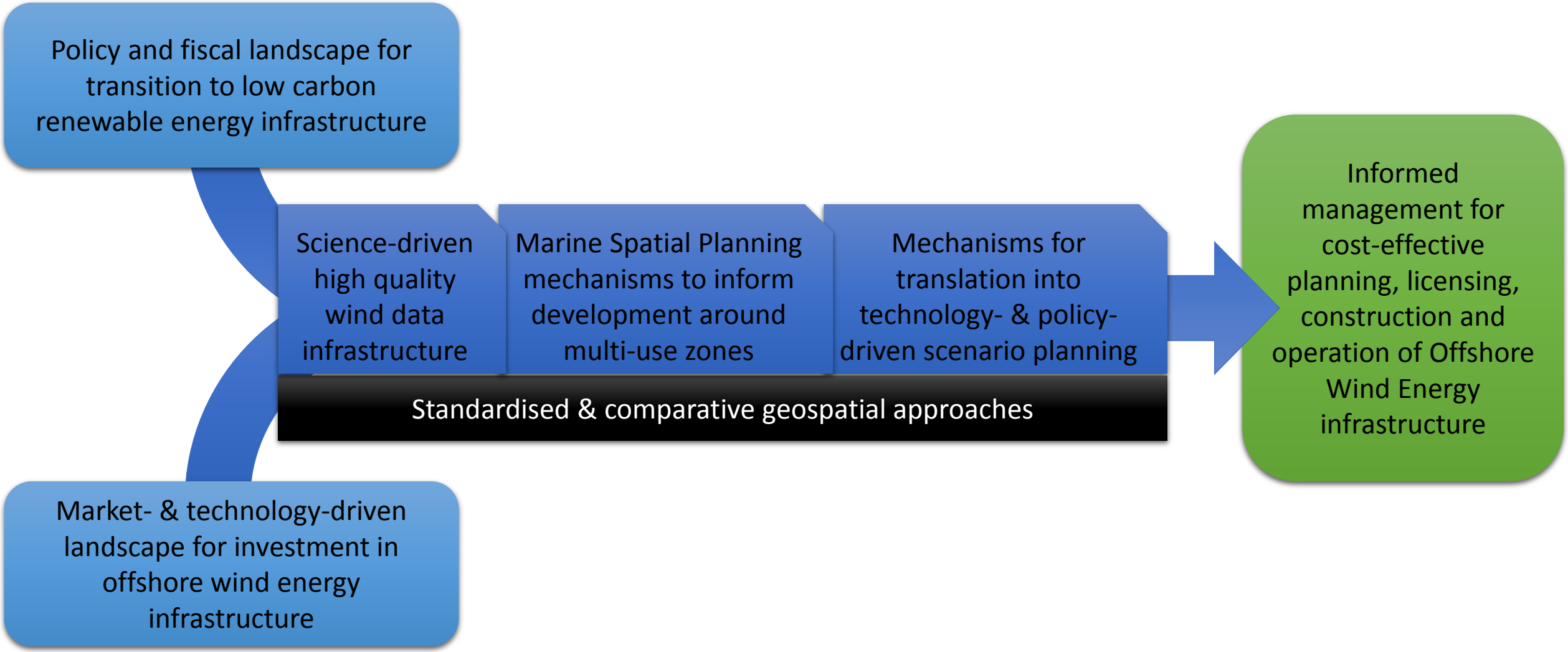


Source: BNEF. 2019. *Offshore Wind Roundtable Tokyo: Global trends & local opportunities*. Available at: https://www.bnef.com/core/insights/20553

Offshore wind resource potential: untapped Atlantic coastlines



Integrated Geospatial Approaches for New Offshore Wind Energy Development



A South African Example: Integrated Geospatial Approaches for New Offshore Wind Energy Development

Degraded, insufficient, coal dominated & debt-laden generational capacity with ESKOM. New Integrated Resource Plan (IRP) expected 2020.

Policy and fiscal landscape for transition to low carbon renewable energy infrastructure

Regional high resolution earth observation & wind models, plus new MSP capabilities in place…

Standardised & comparative geospatial a

Market- & technology-driven landscape for investment in offshore wind energy infrastructure

Climate change mitigation financing mechanisms for ESKOM debt relief and new IRP will push towards renewables

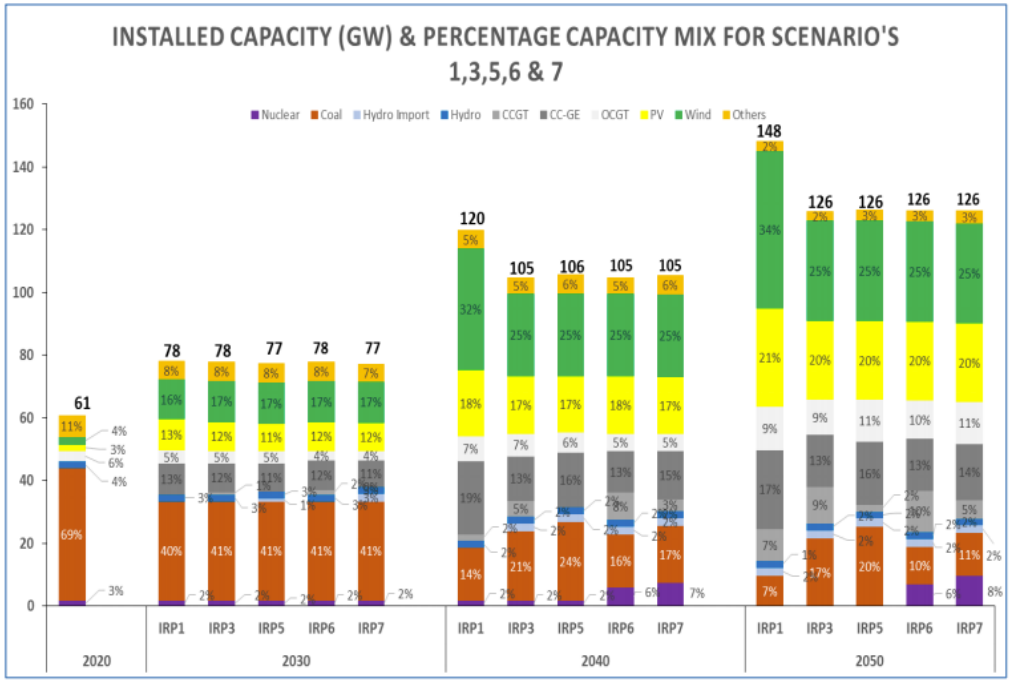
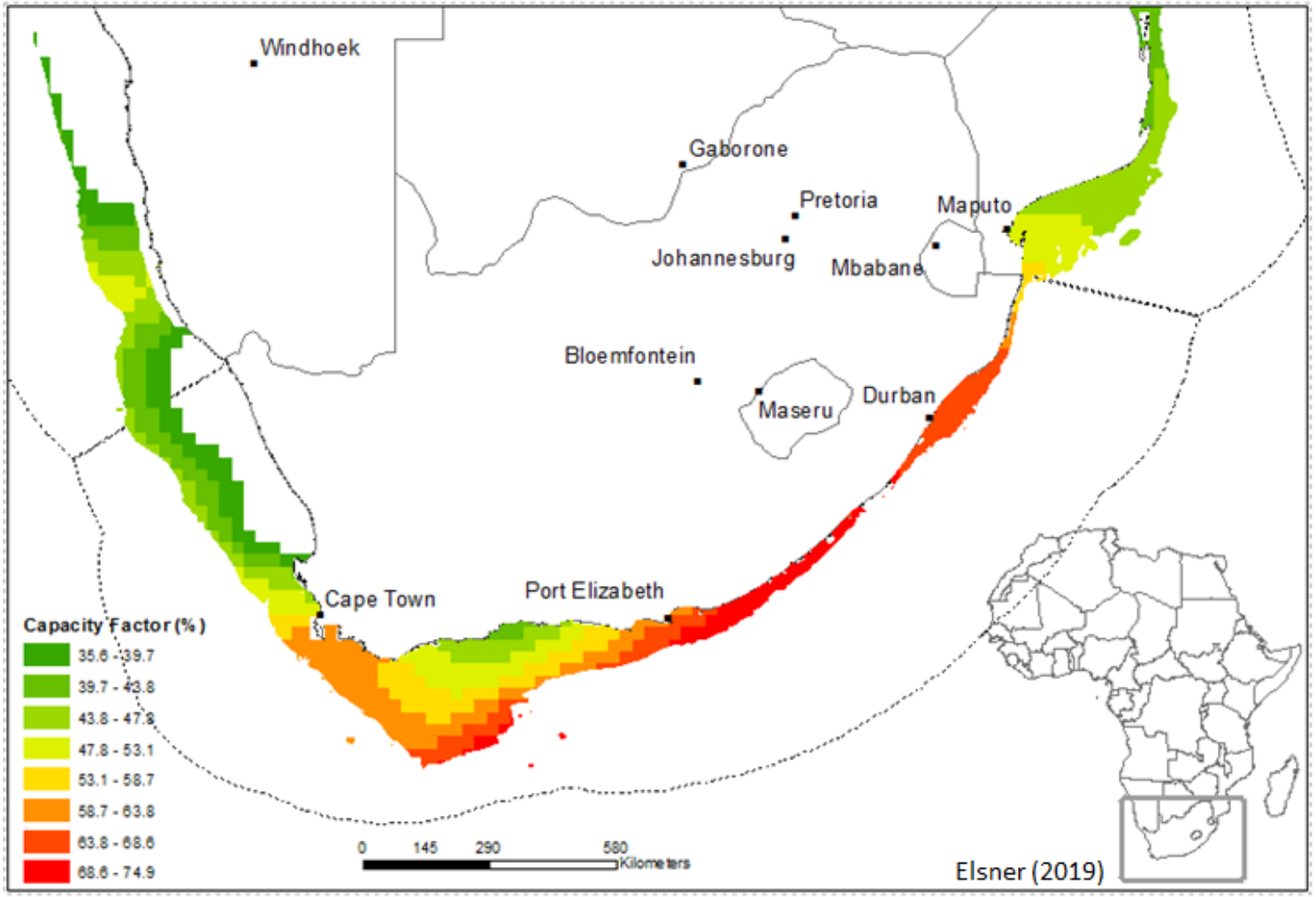


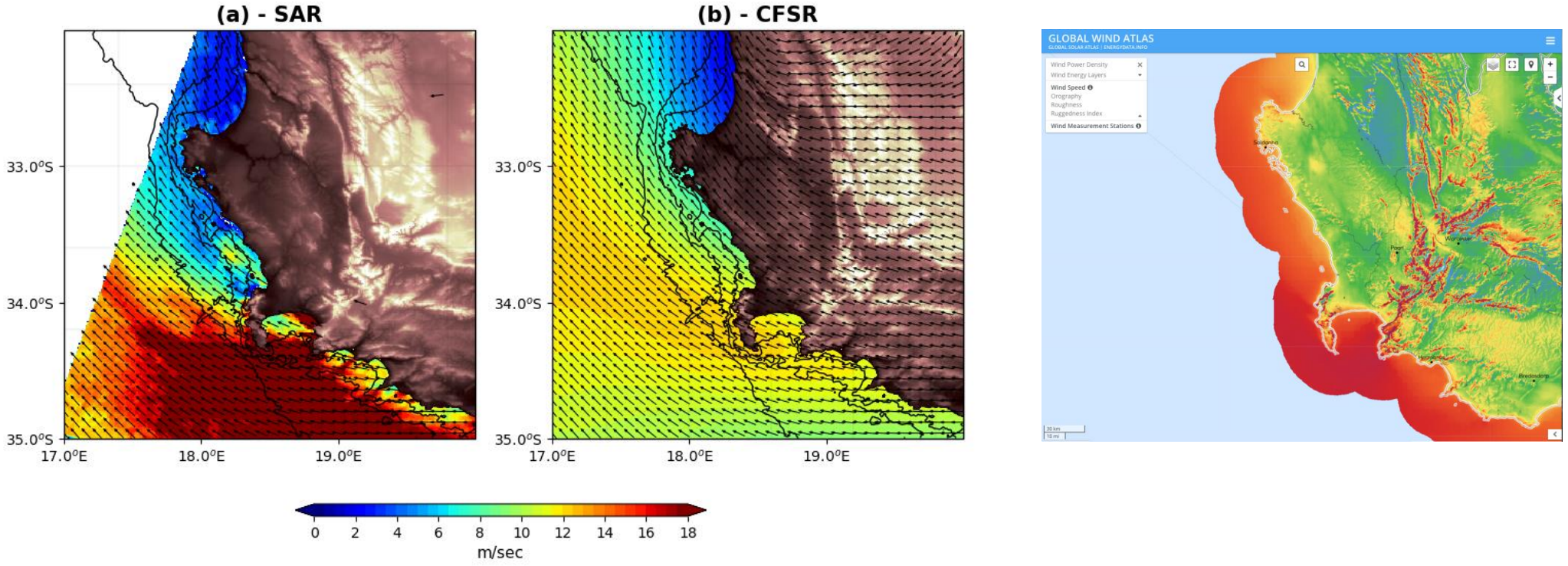
Figure 17: Installed Capacity (GW) for the No RE Annual Build Rate (IRP1), Median-growth (IRP3), Market-linked Gas Price (IRP5), Carbon Budget (IRP6) and Carbon Budget plus Market-linked Gas Price (IRP7) Scenarios

Offshore wind potential South Africa: marine spatial planning (MSP) and higher resolution wind products needed for more detailed analysis



Offshore wind potential South Africa: marine spatial planning (MSP) and higher resolution wind products needed for more detailed analysis

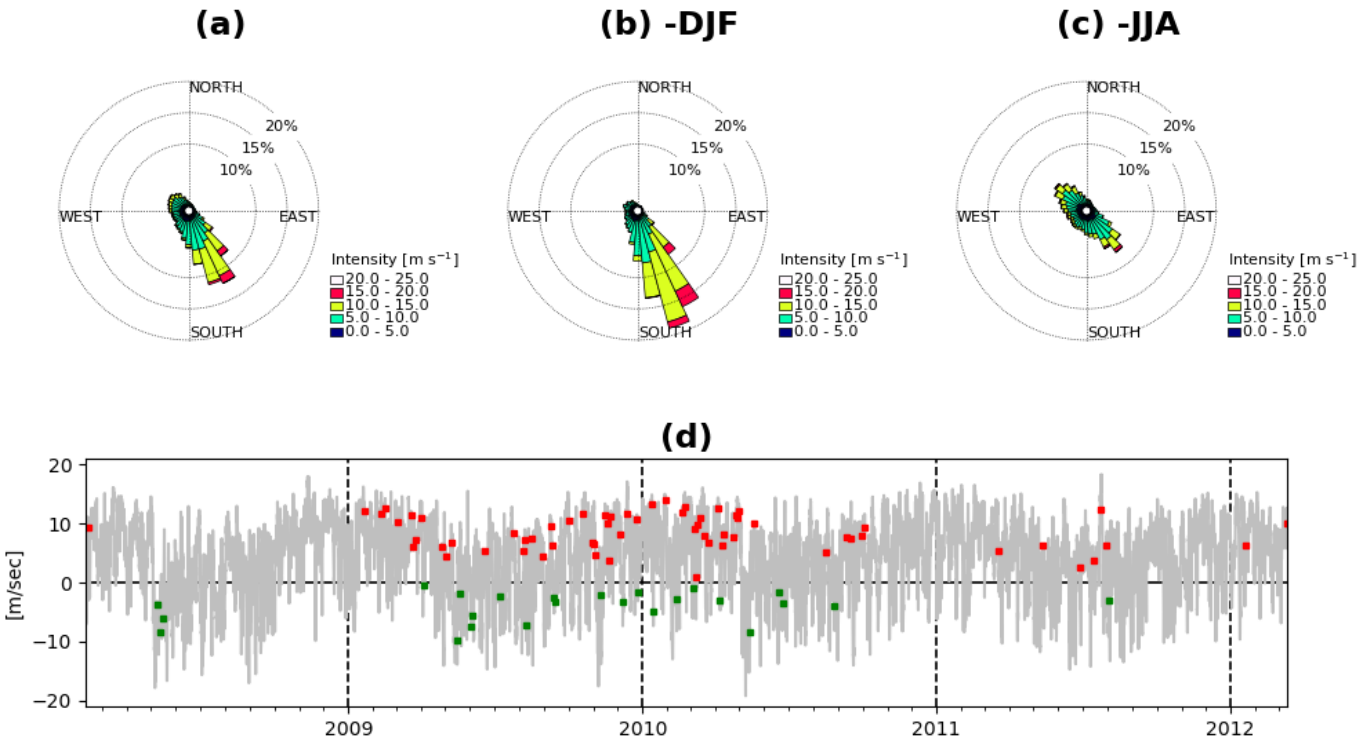
Wind speed estimates from global reanalyses products and observations can show significant discrepancies leading to inaccurate assessment of the wind potential, and extreme events…



Wind speed from (a) observations from the Advanced Synthetic Aperture Radar (ASAR) on 29 April 2010 and (b) from the CFSR reanalysis on the same day. Observations from Synthetic Aperture Radars are able to highlight the high spatial variability which characterises coastal regions.

Offshore wind potential South Africa: marine spatial planning (MSP) and higher resolution wind products needed for more detailed analysis

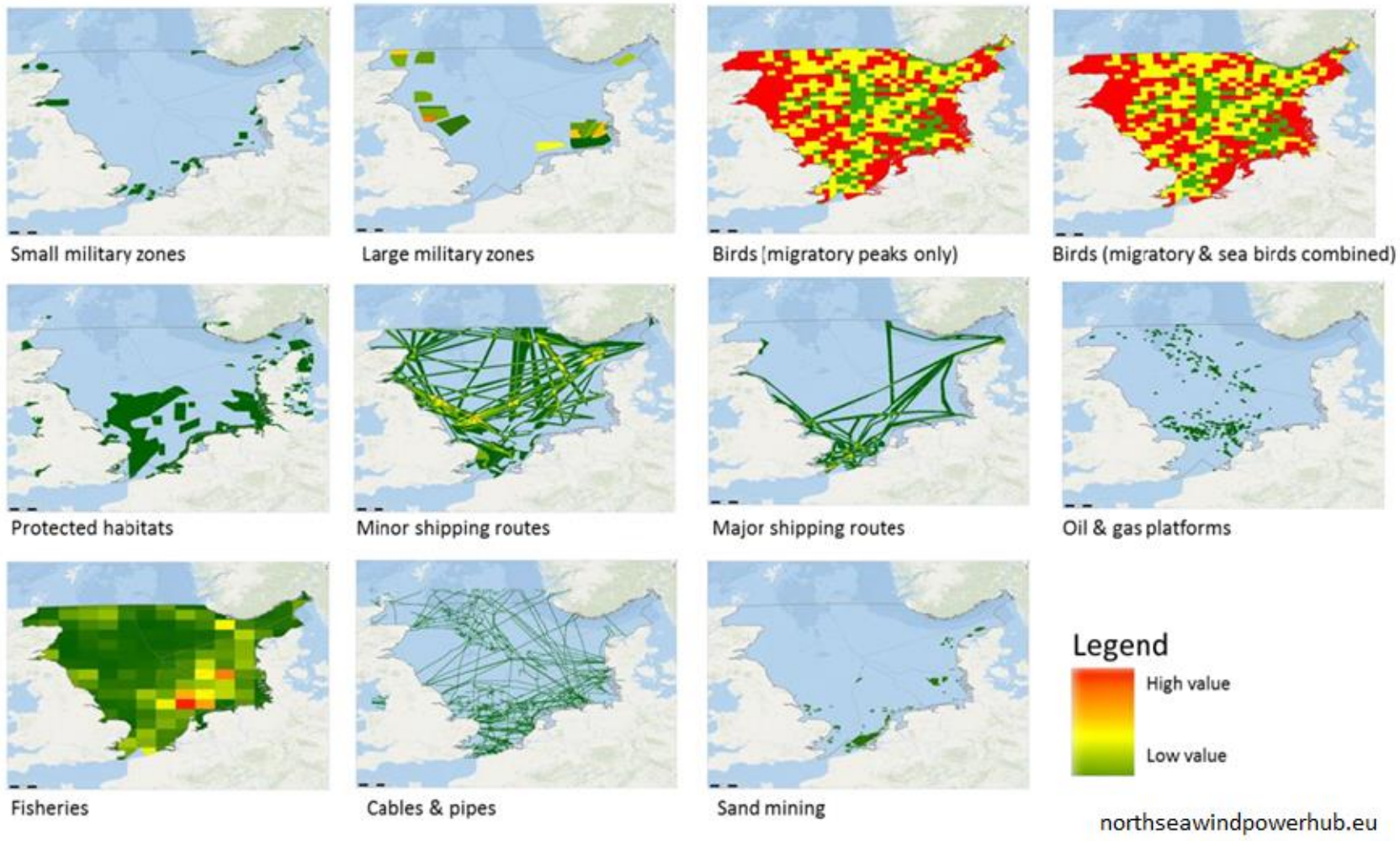
Estimates of wind variability are necessary for an adequate estimation of the wind energy potential. Statistics on wind variability can be derived from model outputs, global reanalyses products and long-term satellite records. **Most valuable products will come from new SAWS high resolution wind models validated with both EO and in situ data…**



Example of wind roses and time-series derived using outputs from the global Climate Forecast System Reanalysis (CFSR) off the Cape Peninsula (South Africa).

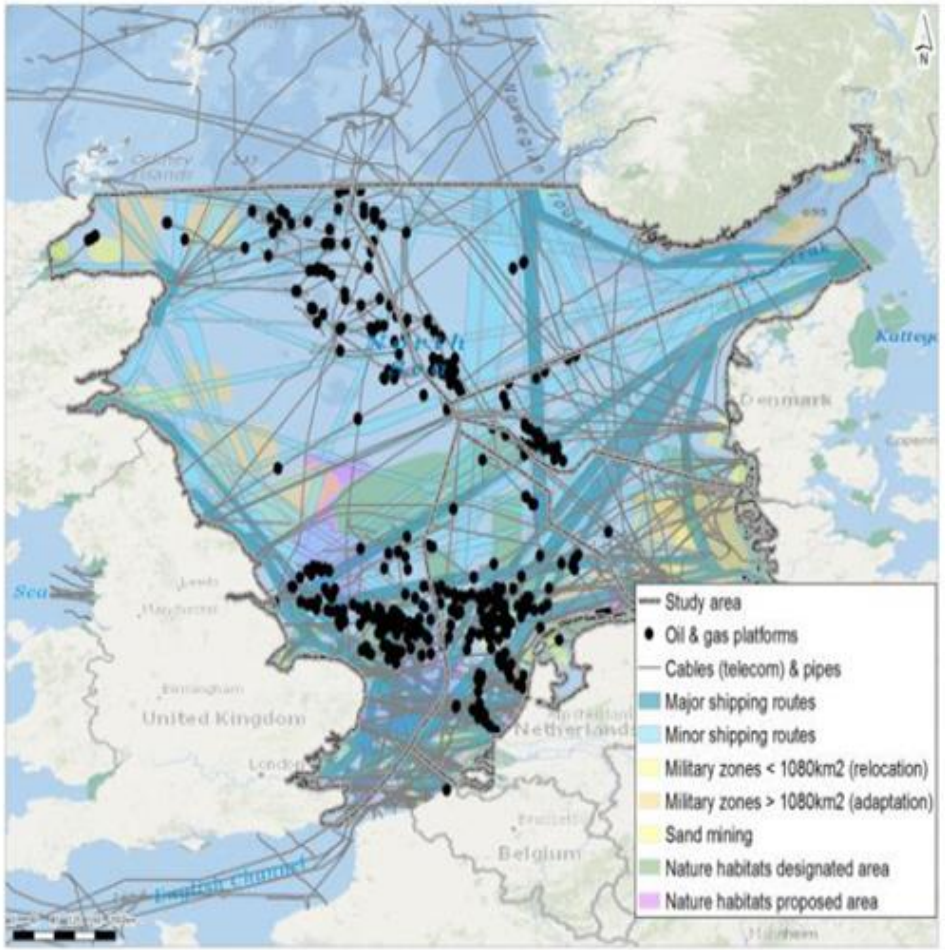
Marine Spatial Planning for identifying potential stakeholder conflicts

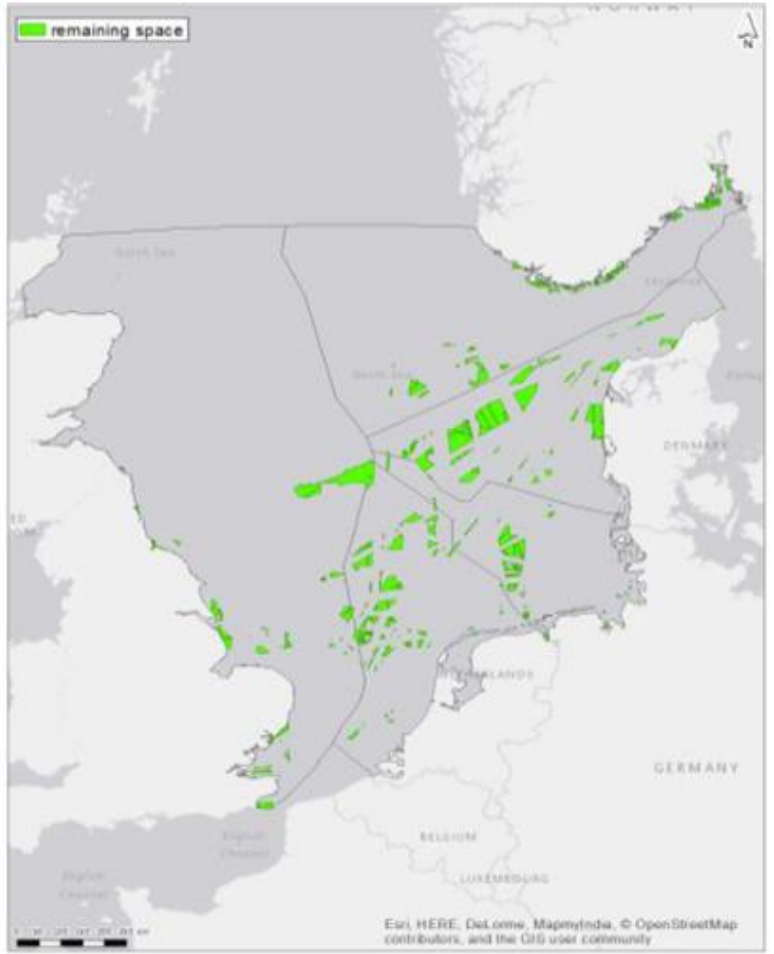
Figure 4.10 Individual spatial cost maps



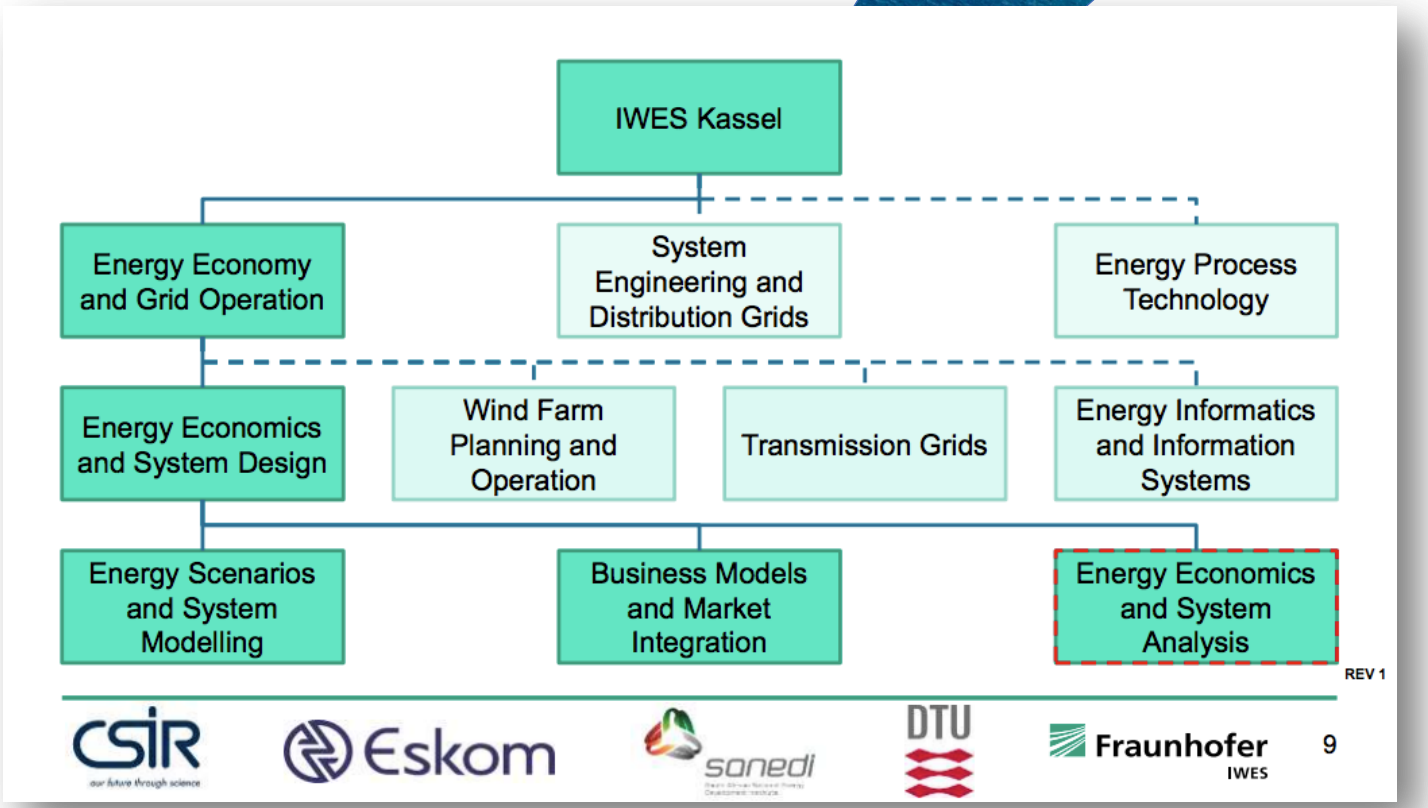
Marine Spatial Planning for site identification

Figure 2.1 Overview of the present space used in the North Sea [left], remaining space (depth < 55 m) [right]





Mechanisms for translation into technology & infrastructure assessment & national planning & policy mechanisms



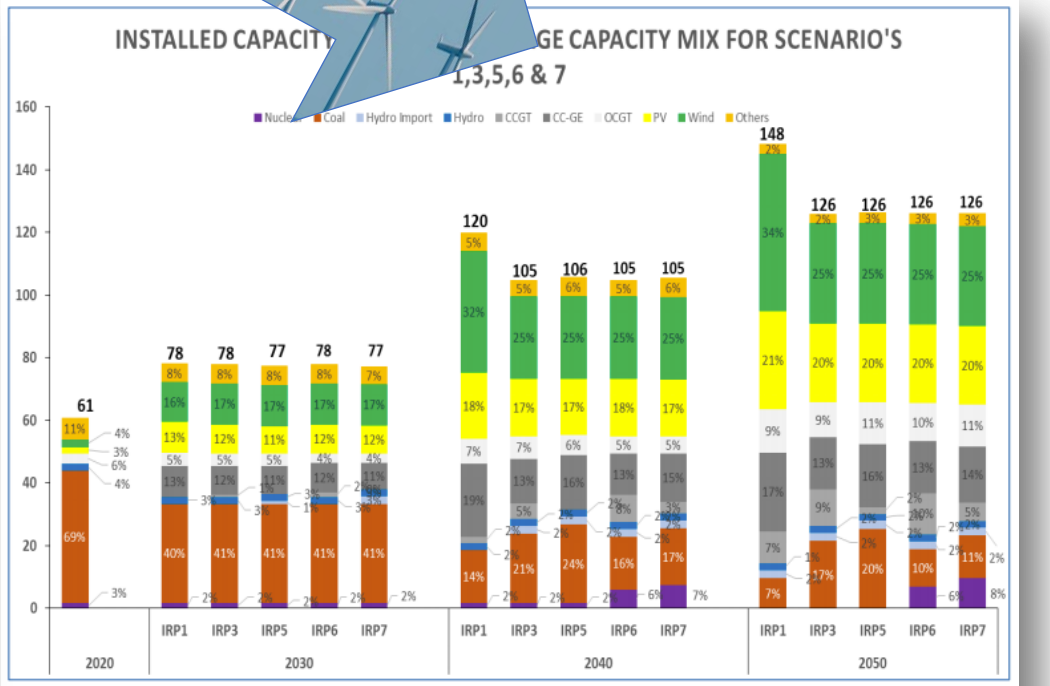
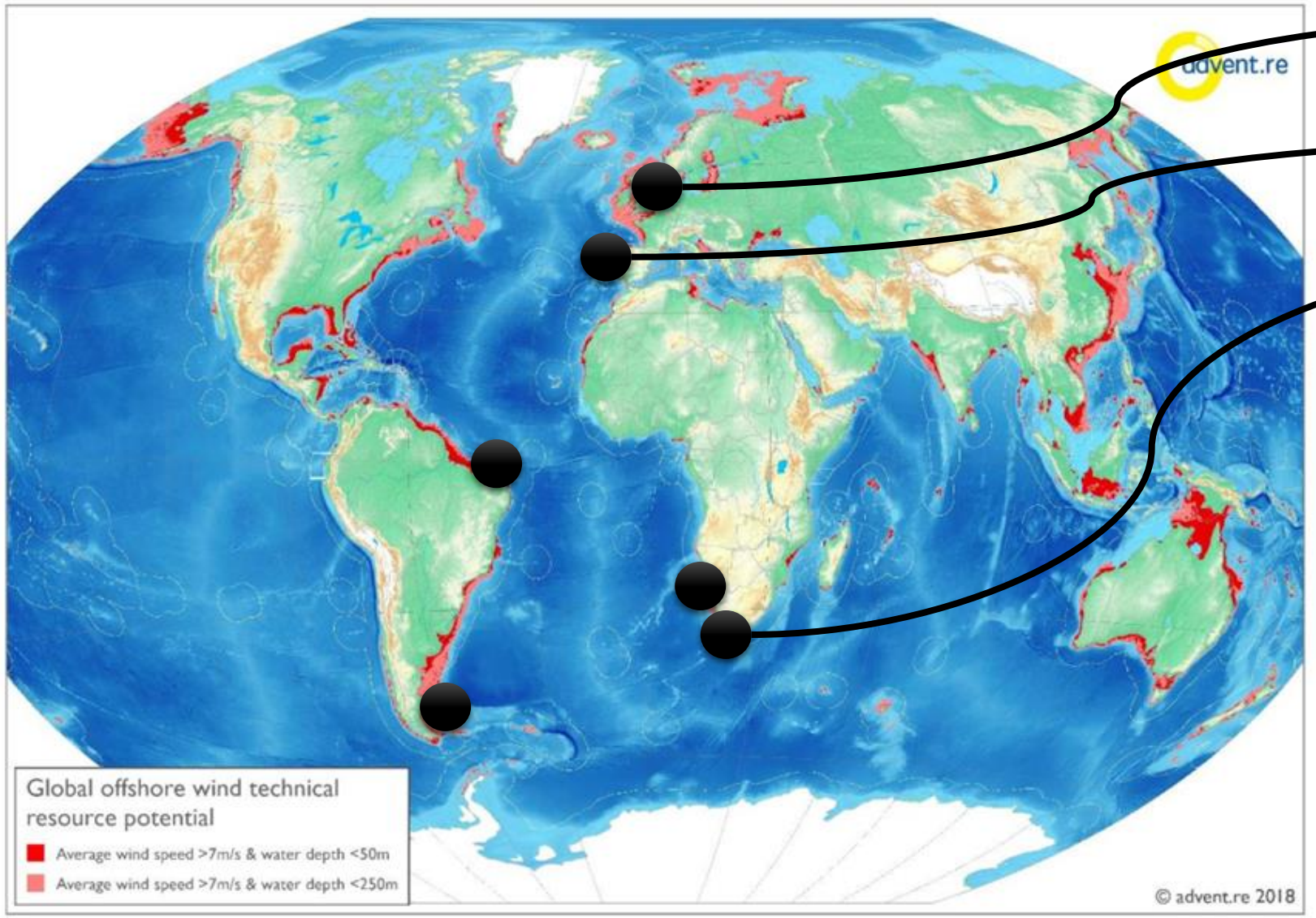


Figure 17: Installed Capacity (GW) for the No RE Annual Build Rate (IRP1), Median-growth (IRP3), Market-linked Gas Price (IRP5), Carbon Budget (IRP6) and Carbon Budget plus Market-linked Gas Price (IRP7) Scenarios

A collaborative international approach - leveraging expertise, market, and funding opportunities in the developing world



Preliminary South African project with multiple SA partners, UoL in UK, and INEGI in Portugal for science-, MSP- and technology-focused scoping, to be broadened with additional resources….

Scope for African and South American expansion through GMES-Africa II, AIR, Belem Statement, etc...

GMES AND AFRICA

Integrated Geospatial Approaches for New Offshore Wind Energy Development

Example potential socio-economic impact points from an AIR Offshore Wind Energy collaboration network:

- Aid small islands or isolated communities to speed up the replacement of foreign diesel with endogenous renewable energies…
- Assess the impact of climate change on renewable sources of energy and hydro storage, estimating the impact at a regional scale…
- Contribute to “first approach”/generic environmental impact assessment methodologies of renewable projects…
- “Crunch the numbers” from weather and earth observation (EOS) systems to obtain regional/national solar and wind resource assessment products, helping to bridge the gap from science/EOS data to standard reports shareable to developers, national officials, funding, OEMs…

Integrated Geospatial Approaches for New Offshore Wind Energy Development

- South African preliminary assessment project excellent starting point as collaboration showcase:
  - Offshore wind energy little explored resource in South Africa, and emerging political/market/technology/science landscape offers very good potential for OWE development…
  - Established bottom up/top down South African network for science/MSP/resource planning institutes (Council for Scientific & Industrial Research, South African Weather Service) and government (Department of Energy, Department of Environment, Forestry & Fisheries)
  - Establishing expertise collaboration with UK (University of London) and Portugal (INEGI)
  - Need to establish collaboration with technology & market-oriented partners e.g. World Bank
- Modular science & planning structure offers ability to use comparative approaches across Atlantic regions and leverage off established knowledge & capability
- AIR Centre has important role to play in both exchange of expertise & vertically integrated structure offers ability to use science networks & top down collaboration in tandem