

Caribbean Offshore Wind: Delivery strategy; resource and market analysis; and a five year roadmap

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on behalf of the project team of CCREEE, Aquatera and the Carbon Trust

Transformational change

- Global warming is accelerating faster than anybody predicted
- The technological solutions have proven more resilient and affordable than feared
- The mindset is breaking
- Turmoil in energy markets is accelerating the economic imperative
- The foundations in the Caribbean are gaining strength
- **We need to change the mentality to delivery mode!**

This is a mental/behavioural challenge more than a technological challenge



To be successful with new technology you need to understand mentality and habits and how to influence them

The strategy –

- Explore the options for offshore wind as a regional contributor to carbon transition
- Consider this across CARICOM, associated countries and CDB members
- Take into account local conditions, circumstances, strengths, weaknesses, opportunities and threats
- Undertake the analysis at a island by island and place by place level
- Establish a plan for five year, 2028 first wind delivery
- Five main workstreams
 - Regulatory review
 - Finance appraisal
 - **Resource and market assessment**
 - **Identification of optimal development pathways (if they exist)**
 - **Roadmap to success**



“Our mission should we choose to accept it....”

Key resource suitability factors

The key factors that establish whether a resource might be suitable in a particular area are quite numerous:

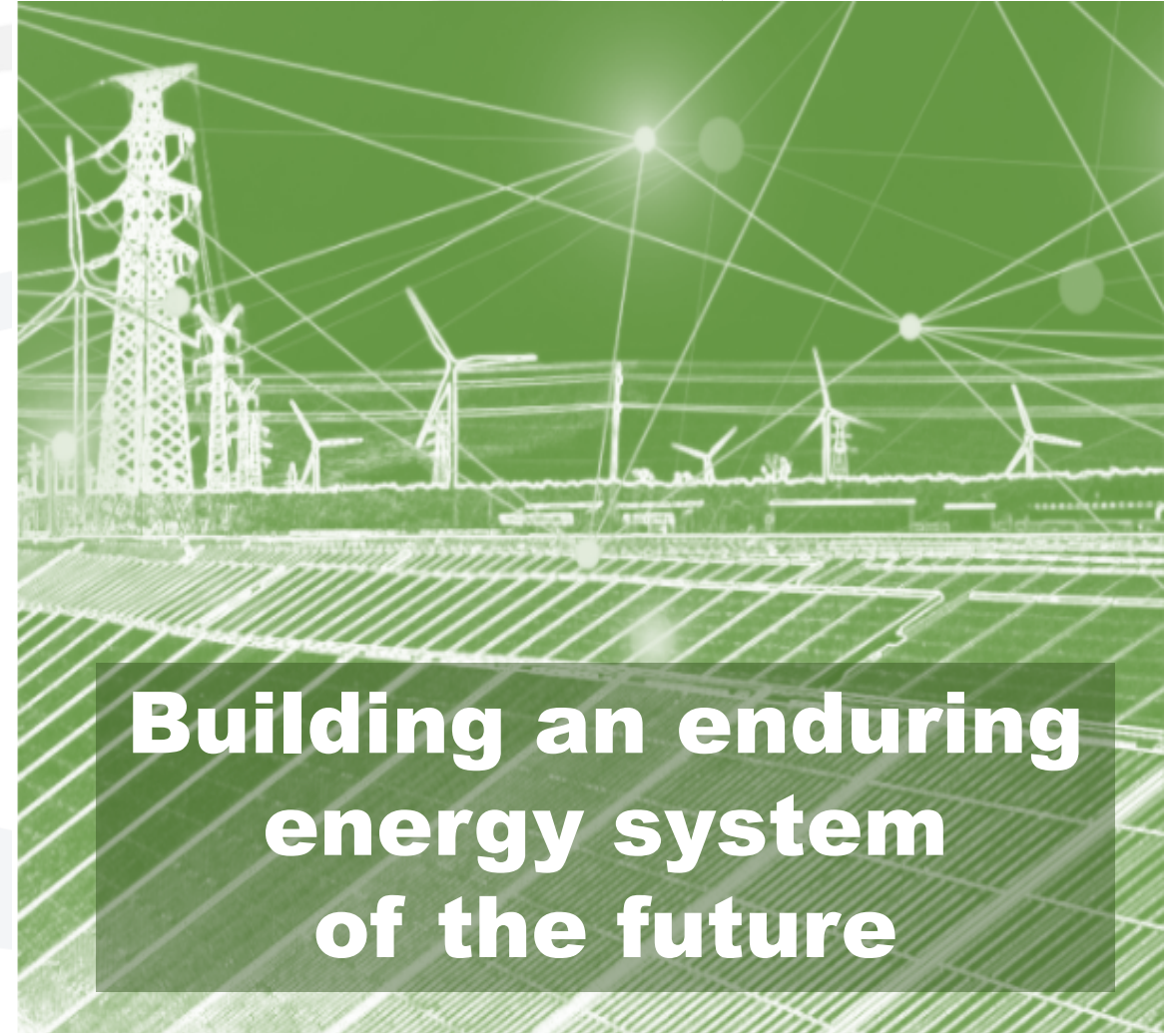
- These include factors relating to the strength or scale of the prime resource itself
- These are also closely linked to the periodicity of the resource over short term (seconds/minutes); medium term (hours/days); long term (weeks/months); seasonal; interannual; climate trending
- They include factors relating to the physical forces and dynamics of putting structures into that environment
- They include extreme survival conditions
- They also include key proximity factors
- There are also the key ecological, social and economic sensitivities and features that need to be taken into account. The patterns of many of these factors are also directly linked to the resources themselves



Building a more sustainable energy system

There are a number of key steps or activities involved in building more sustainable energy systems. These include:

- Creating a shared VISION
- Checking on FEASIBILITY and verification of approach
- Insightful, and appropriate PLANNING
- Gaining the necessary FINANCE
- Establishing a robust, effective and efficient DESIGN
- IMPLEMENTATION of supply, fabrication, deployment and staffing
- OPERATION of services and facilities
- MAINTENANCE of equipment and systems
- ADAPTATION to change
- RE-ENERGISE, REPAIR and REPLACEMENT where needed
- DECOMMISSIONING of systems that have served their purpose

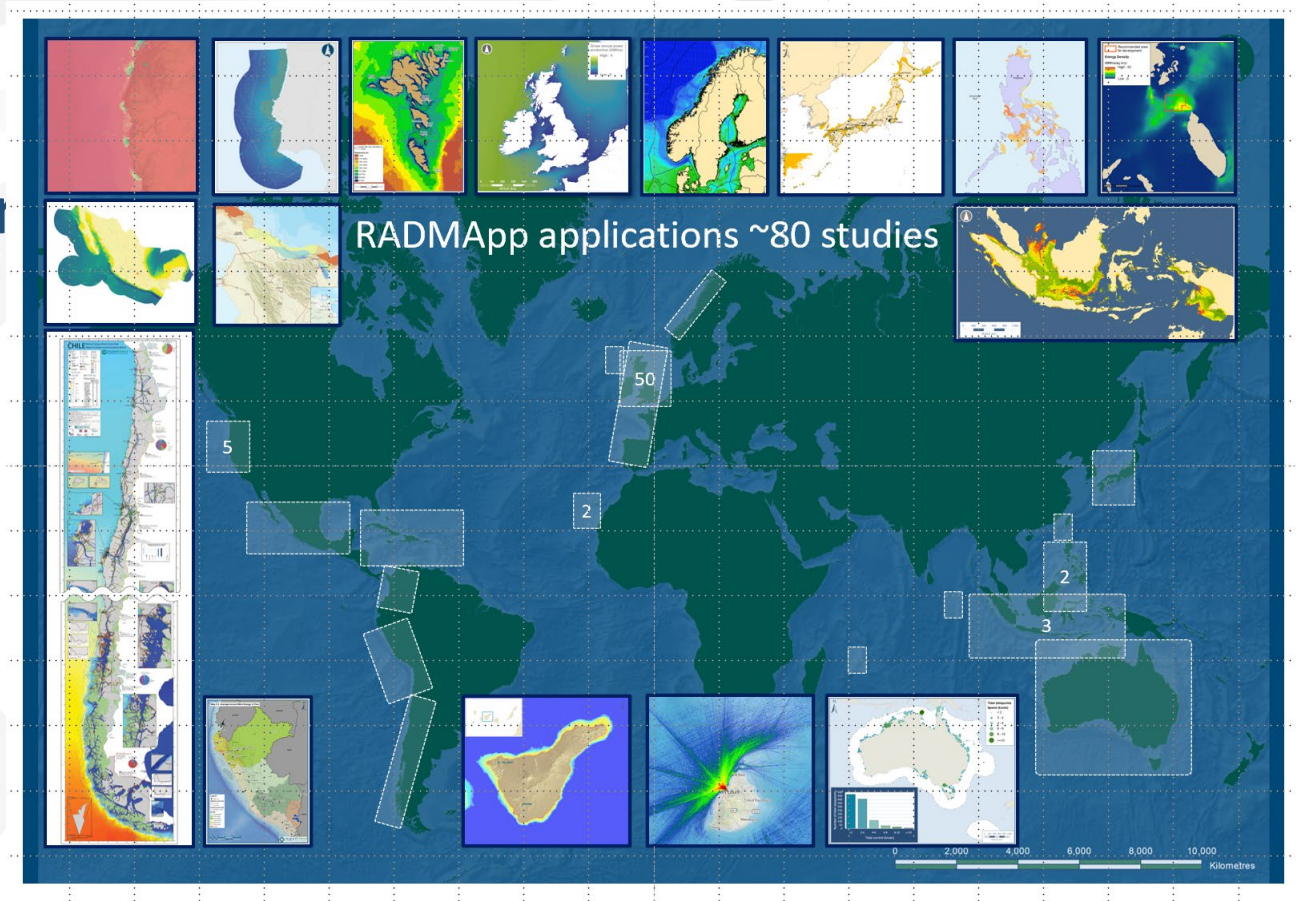




Strategy; resource and market analysis; and a five year roadmap

RADMAApp resource and market analysis

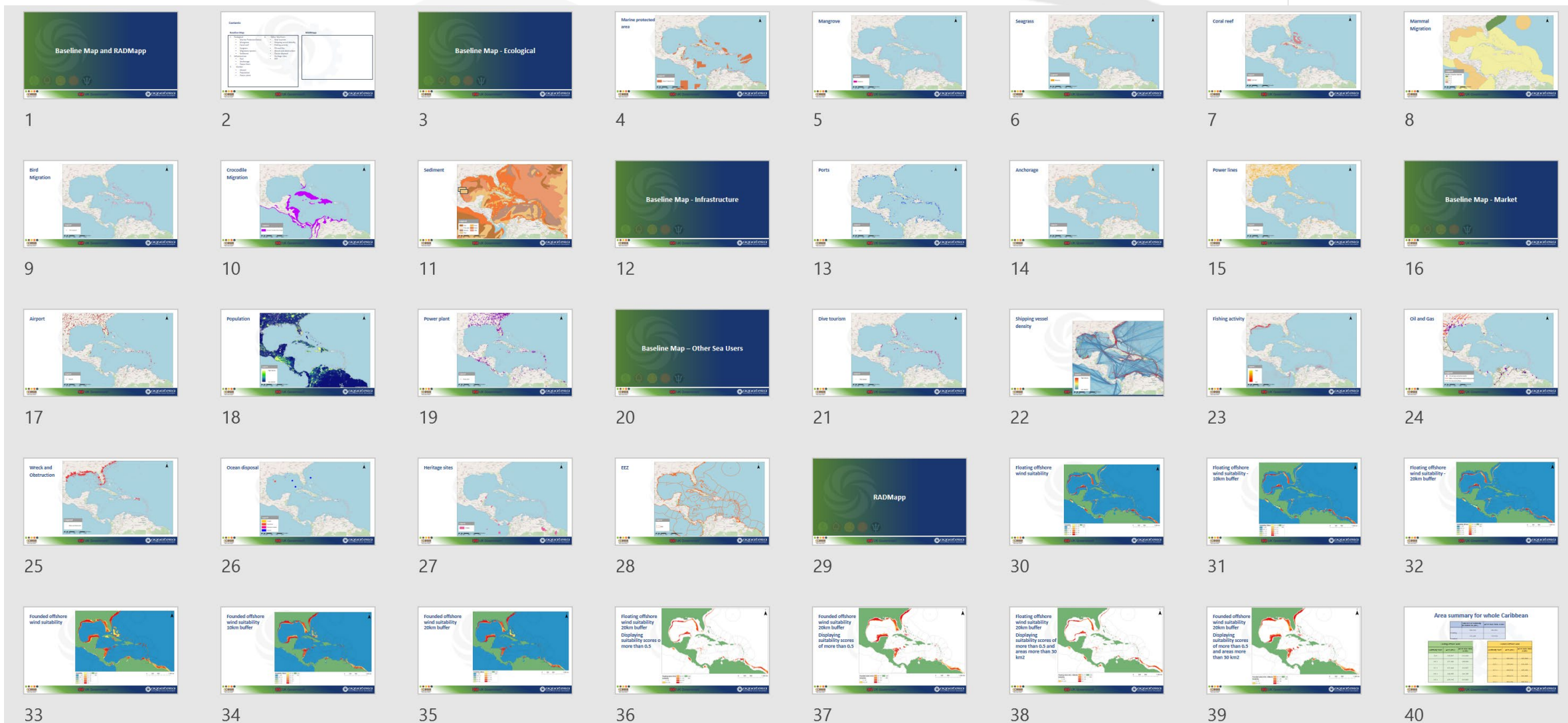
- RADMAApp is a well established resource and market mapping tool which has been used all over the world across many different sectors
- 250 m resolution
- Commercial development standard analysis
- Flexible model that can be updated as new and better data emerges



Mapping inputs

Wind resources	Other resources	Technical factors	Infrastructure	Cost factors
Speed Direction Capacity factor Daily pattern Seasonal pattern Annual variability Fatigue forces Extreme forces	Oil Gas Coal Biomass Geothermal Tidal Wave Solar	Water depth Seabed type Seabed gradient Earthquakes Hurricanes Connectivity routes Landfalls	Shipyards Laydown areas Berthing ports Grid infrastructure Fuel infrastructure Vessel availability Supply chain capacity	Distance from market Distance from port Labour costs Water depth Wave exposure Site uniformity
Other sea users	Wildlife	Fiscal factors	Finance issues	
Shipping Cables Pipelines Oil & gas platforms Fishing areas Tourism areas Coastal visibility	Protected areas Whale breeding Turtle breeding Coral Seagrass Mangroves Migrating birds	Planning processes Energy markets Tax regimes Capital flows Customs	Availability of capital Impact investing levels Financial stability Local finance advice Appetite for co-investment	

Baseline input maps – over 30 so far



RADMAApp score sheet

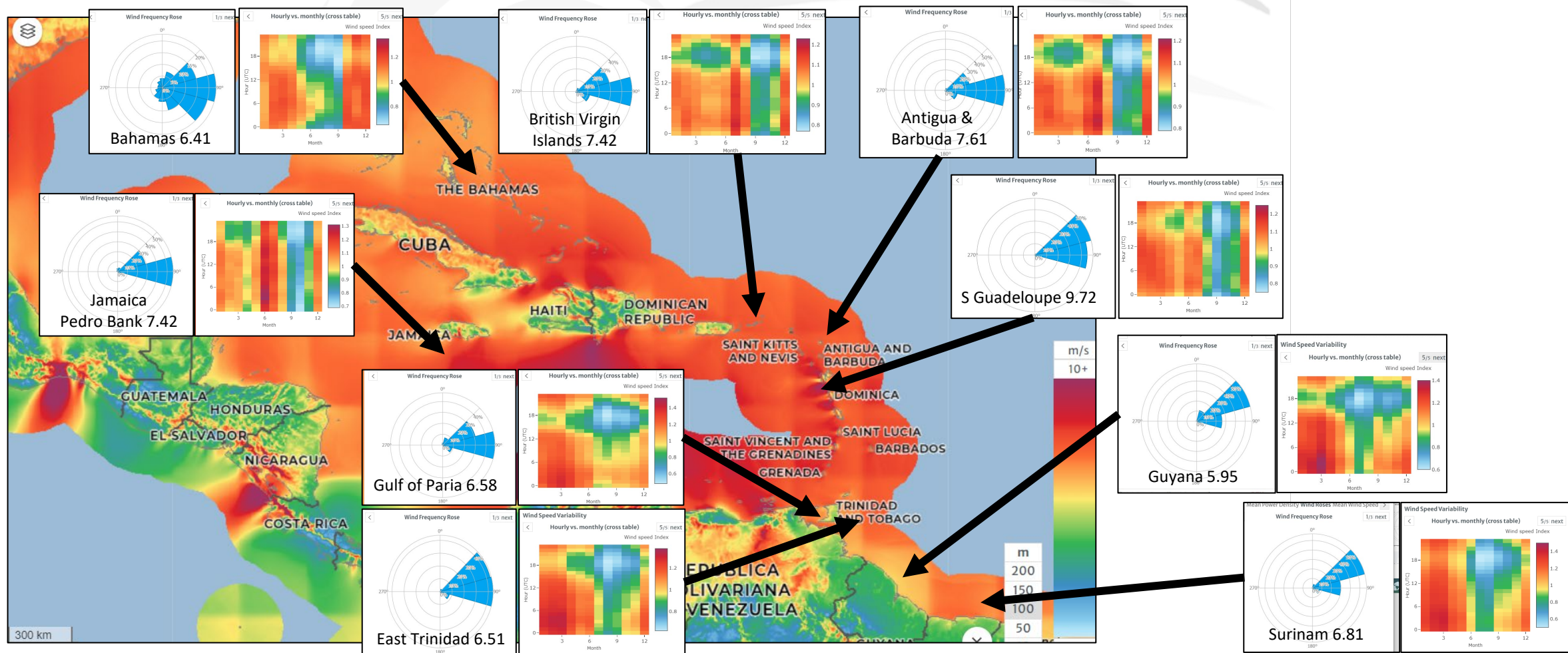
Theme	Criteria	Classification	Suitability score for founded	Suitability score for floating	Data source	Methodology	Link	Comments				
Technical	Bathymetry (m)	< -500	0	0	GEBCO	Bathymetry data were extracted for the Philippines from the GEBCO to assess the water depths suitable for each type of technology.	https://www.gebco.net/	Prepared by DC				
		-500 to -300	0	0.2								
		-300 to -250	0	0.4								
		-250 to -200	0	0.6								
		-200 to -150	0	0.8								
		-150 to -100	0	1								
		-100 to -50	0	1								
		-50 to -40	0	1								
		-40 to -30	0	1								
		-30 to -20	0.1	1								
	-20 to -10	0.5	0									
	-10 to -5	0.8	0									
	-5 to -40	0.8	0									
	-40 to -30	1	0									
	-30 to -20	1	0									
	-20 to -10	1	0									
	-10 to 1	0.5	0									
	Wave Exposure Height, Hs (m)	< 0.25	1	1	Copernicus	Sea surface wave significant height data were downloaded for the Philippines Base area for the latest data year (2022).	https://data.marine.copernicus.eu/products/GLDDB_AL_ANALYSIS_FORECAST_WAV_001_027/index	Prepared by ED				
		0.25 to 0.5	1	1								
		0.5 to 0.75	1	0.9								
		0.75 to 1	0.9	0.8								
		1 to 1.25	0.8	0.7								
		1.25 to 1.5	0.8	0.6								
		1.5 to 1.75	0.75	0.5								
		1.75 to 2	0.7	0.4								
>= 2		0.5	0.3									
< 1		0	0									
Wind Speed (m/s)	1 to 2	0	0	Global Wind Atlas	Wind speed data were downloaded for the Philippines from the GWA at 100 m heights.	https://globalwindatlas.info/en	Prepared by DC					
	2 to 3	0	0									
	3 to 4	0.2	0.2									
	4 to 5	0.5	0.5									
	5 to 6	0.7	0.7									
	6 to 7	0.9	0.9									
	7 to 8	1	1									
	8 to 9	1	1									
	9 to 10	1	1									
	>= 10	0.9	0.9									
Current Speed Exposure (kts)	Speed and distance	See right	See right	Global tidal atlas from Aquatera	Tidal stream speeds have been recorded	N/A	Prepared by DC					
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
	See right	See right	See right									
Active volcanoes (e.g. buffer or distance from)	50k	1	1	Philvolcs	The Philvolcs website contains a table with a list of active volcanoes	https://www.phivolcs.dost.gov.ph/index.php/camp-hazard-and-concept	Prepared by ED. Re-classify method of scores.					
	50 km	0.9	0.9									
	30	0.5	0.8									
	20	0.7	0.7									
	10	0.5	0.6									
	Earthquakes (250-yr peak ground acceleration (cm/2))	>= 50	1					1	UNEP - Global Data Platform	Peak ground acceleration (cm/2) raster layer map	https://www.unep.org/data-platform/arcgis/rest/services/UNEP-VOLCANO-HAZARD/MapServer/OGC/wfs?&lang=en&request=GetFeatureInfo	Prepared by ED. Re-classify method of scores.
		50-100	1					1				
		100-200	1					1				
		200-300	0.9					0.9				
		300-400	0.5					0.9				
400-		0.4	0.6									
< 0.25 event/yr (2500 gal)		1	1	UNEP	Cyclone frequency data were downloaded from the UNEP risk platform	https://www.unep.org/data-platform/arcgis/rest/services/UNEP-VOLCANO-HAZARD/MapServer/OGC/wfs?&lang=en&request=GetFeatureInfo	Prepared by ED. Re-classify method of scores.					
0.25 to 0.5		0.8	0.8									
0.5-0.75		0.7	0.7									
0.75-1 event/year		0.6	0.6									
< 1 event/yr	0.5	0.5										
< 1	1	1	Aquatera					A port dataset was developed by manually digitising port locations based on the Marine Traffic website. Some additional	https://www.maritime-traffic.com/arcgis/rest/services/UNEP-VOLCANO-HAZARD/MapServer/OGC/wfs?&lang=en&request=GetFeatureInfo	Prepared by ED. Re-classify method of scores.		
1 to 10	1	1										
10 to 50	0.9	0.9										
50 to 100	0.8	0.8										
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500 to 1000	0.4	0.4										
>= 1000	0.2	0.2										
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500 to 1000	0.7	0.7										
>= 1000	0.7	0.7										
< 1	1	1		Aqu								

Current Speed (ft/s)	Fiber distance (ft/m)															
	0 to 0.5	0.5 to 1	1 to 1.5	1.5 to 2	2 to 2.5	2.5 to 3	3 to 3.5	3.5 to 4	4 to 4.5	4.5 to 5	5 to 5.5	5.5 to 6	6 to 6.5	6.5 to 7	7 to 7.5	7.5 to 8
1 to 1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 to 2	0	0	0.26	0.32	0.38	0.44	0.5									
2 to 2.5	0	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5							
2 to 3	0	0.1	0.14	0.18	0.22	0.25	0.32	0.37	0.41	0.46	0.5					
3 to 3.5	0	0.05	0.09	0.13	0.17	0.21	0.25	0.3	0.34	0.38	0.42	0.46	0.5			
3 to 4	0	0	0.04	0.08	0.12	0.16	0.19	0.23	0.27	0.31	0.35	0.38	0.42	0.46		
4 to 4.5	0	0	0	0.03	0.06	0.09	0.13	0.16	0.2	0.24	0.28	0.32	0.36	0.4	0.44	0.48
4 to 5	0	0	0	0.02	0.05	0.08	0.11	0.13	0.16	0.18	0.21	0.24	0.26	0.28	0.3	0.32
5 to 5.5	0	0	0	0	0.01	0.04	0.07	0.09	0.1	0.11	0.13	0.15	0.17	0.18	0.2	0.22
5 to 6	0	0	0	0	0	0.02	0.04	0.07	0.09	0.1	0.11	0.13	0.15	0.17	0.2	0.22

70	Cost	Distance from Supply Chain (km) - population, demand offsetter	>= 1000	0	0	Aqualata created	Procedural distance layer	NA	EDDC processed DC to add scores used here)
71			0	See right	See right				
72			0.5	See right	See right				
73			1	See right	See right				
74			5	See right	See right				
75			10	See right	See right				
76			20	See right	See right				
77	50	See right	See right						
78	100	See right	See right						
79	100	See right	See right						
80	Distance from grid (km)	<1km	1	1	Worldbank. (published in Nature)	A global grid dataset was obtained from the worldbank and the Philippines area was extracted. A Euclidean	https://datacatalog.worldbank.org/dataset/0038055	ED processed	
81		1-5	1	1				Scored using	
82		5-20	1	1				reclassifi	
83		20-35	0.6	0.9				method.	
84		35-50	0.4	0.8					
85		50-60	0.2	0.7					
86		60-80	0.1	0.5					
87	80-100	0.01	0.01						
88	ICLIN Protected area	Within 500	0.2	0.2	Protected plane	Protected areas were developed and a euclidean distance map was created.	https://www.scoteseedbank.net/en/locations/141	ED processed	
89		500 m buffer	0.4	0.4				Scored using	
90		1000-5000	0.6	0.6				reclassifi	
91		5000-10000	0.8	0.8				method.	
92		<10,000	1	1					
93		Mangrove	0	0	UNEP Mangroves	A euclidean distance map was created using data obtained from the Allan	https://data.unep.org/data/stories/4155	ED processed	
94		500 m buffer	0.1	0.1				Scored using	
95	1km buffer	0.2	0.2				reclassifi		
96	5 km buffer	0.5	0.5				method.		
97	Seagrass	10 km plus	1	1					
98		within	0	0	Allan Coral Atlas	Data were extracted from the benthic layer obtained from the Allan	https://allencoralatlas.org/	ED processed	
99		500 m buffer	0.4	0.4				Scored using	
100		1km buffer	0.8	0.8				reclassifi	
101		5 km buffer	1	1				method.	
102		10 km plus	1	1					
103		Reef	0	0	Allan Coral Atlas	Data were extracted from the reef exten layer obtained from the Allan	https://allencoralatlas.org/	ED processed	
104	Coral Reefs	500 m buffer	0.4	0.4				Scored using	
105		1km buffer	0.8	0.8				reclassifi	
106		5 km buffer	1	1				method.	
107		10 km plus	1	1					
108		<5	0.2	0.2	UNESCO	A euclidean distance map was created for the UNESCO sites.	https://whc.unesco.org/en/interactivity/2544/	ED processed	
109		5 (5-10km)	0.4	0.4				Scored using	
110		10 (10-20km)	0.6	0.6				reclassifi	
111	20 (20-30km)	0.8	0.8				method.		
112	UNESCO Sites- buffer	>30 km	1	1					
113		V. high (values)	0	0	Manually created using MT screenshots.	Indicates commercial fishing but not artisanal fishing activity	NA	Mosaic tiles georeferenced by ED. DC Titled together and scored.	
114		High	0.1	0.1					
115		Moderately	0.2	0.2					
116		Med	0.4	0.4					
117		Moderately Low	0.7	0.7					
118		Low	0.9	0.9					
119	Shipping Levels	V. Low	1	1					
120		Very high (white)	0	0	Web app		Fisheries watch programme	data based upon ...?	
121		Fishing activity	High (bright)	0	0				
122			Moderate (pink)	0.25	0.2				
123			Low (light pink)	0.5	0.4				
124			Very low (Blue pink)	0.75	0.6				
125		Submarine cables	None	1	1				
126	<250m		0	0	No data	No data	No data	Looking for sources	
127	500		0	0					
128	1km		0.8	0.6					
129	2 km	1	0.8						
130	>2km	1	1						

Population size	Distance (km)							
	0.5	1	10	25	50	100	500	1000
< 10	1	0	0					
10-100	1	0.5	0					
100-1000	1	0.9	0.9	0				
1000-10000	1	0.95	0.9	0.5	0			
10000-100000	1	0.98	0.95	0.75	0.5	0		
100000-1000000	1	0.99	0.98	0.9	0.8	0.5	0	
>= 10000000	1	1	0.99	0.95	0.9	0.8	0.5	0

Wind speed patterns across the Caribbean



Views of offshore wind farms

Aberdeen – 8.8 MW, 2-4 km offshore

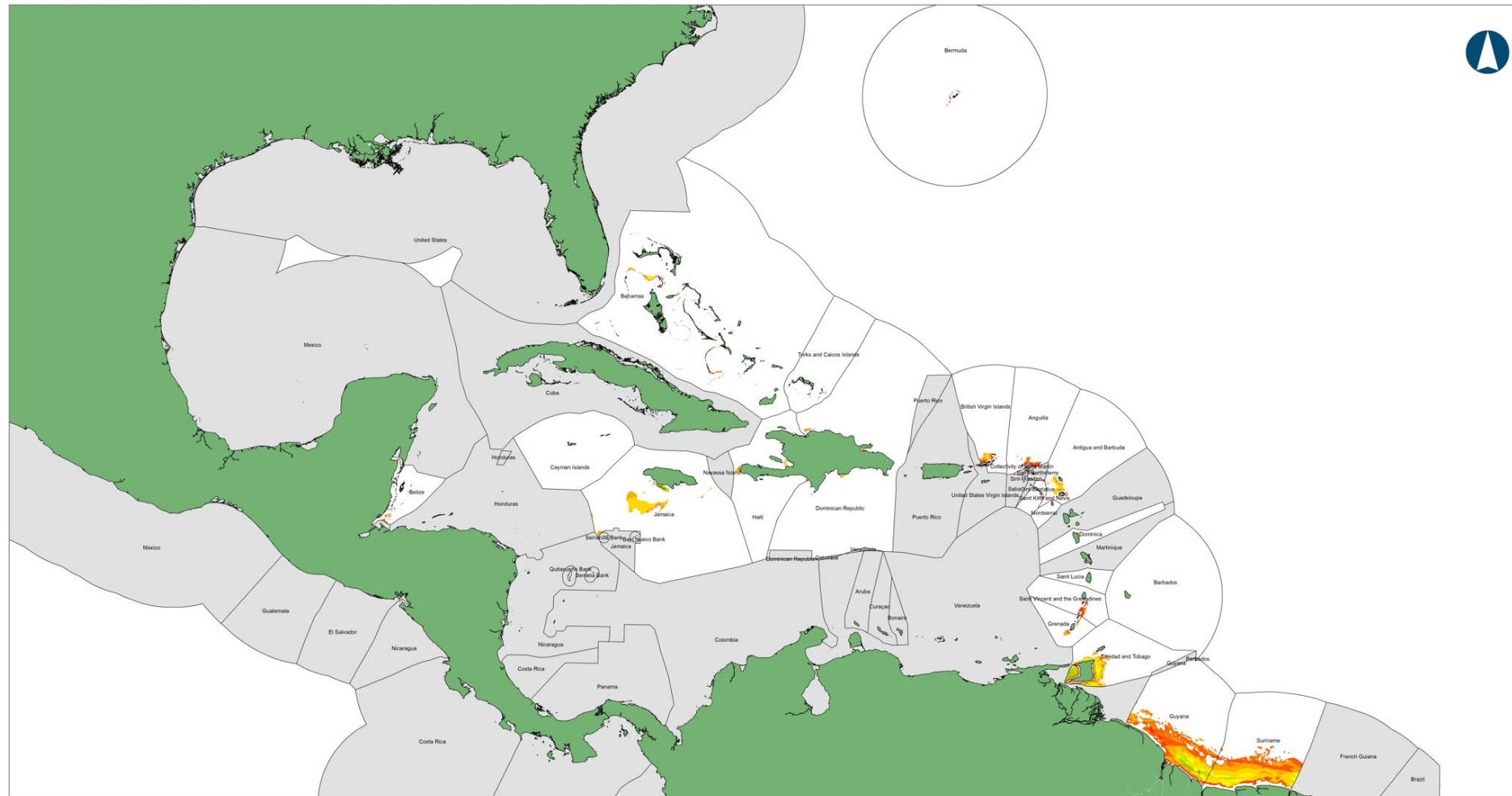


Rampion, 3.4 MW 13 km offshore



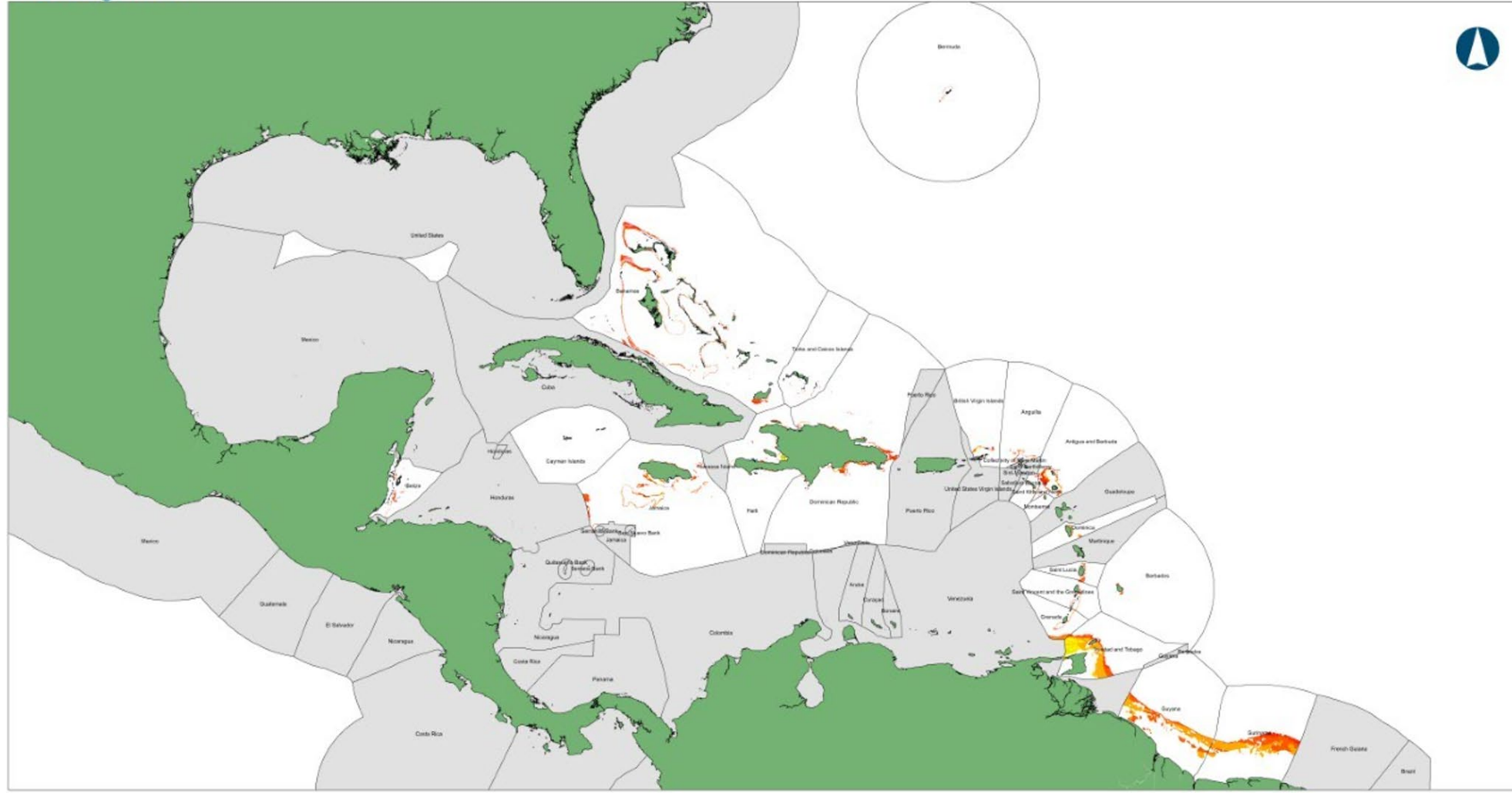
Overall assessment founded wind

Founded wind



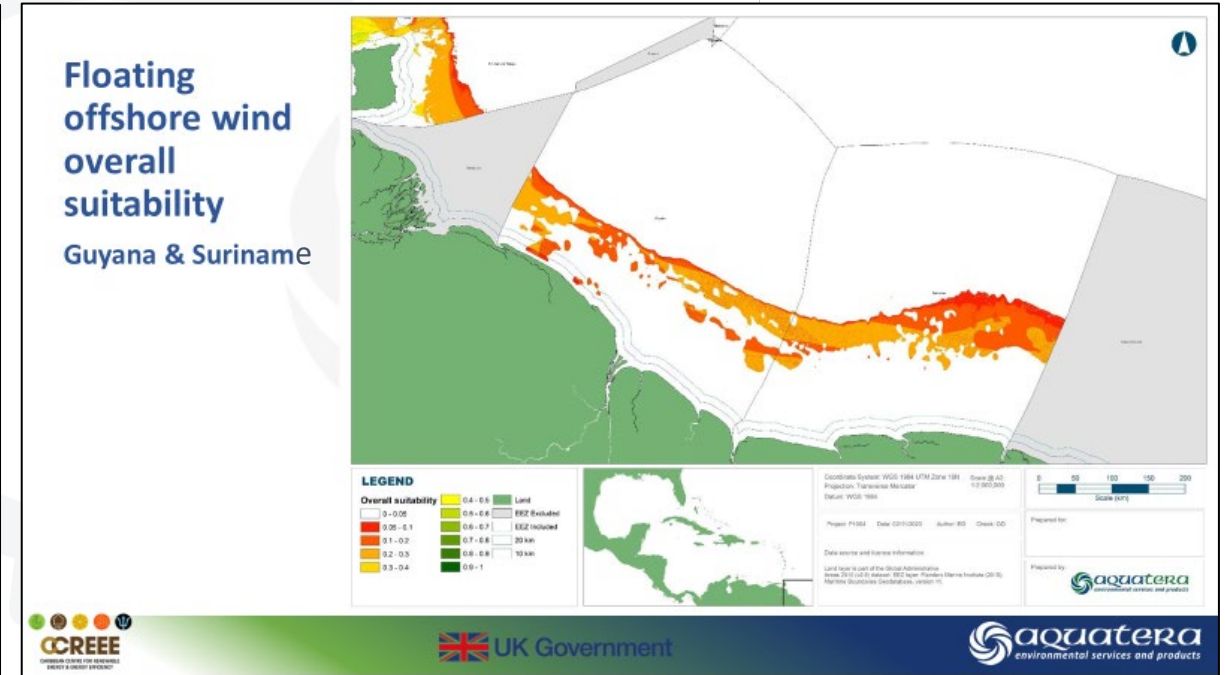
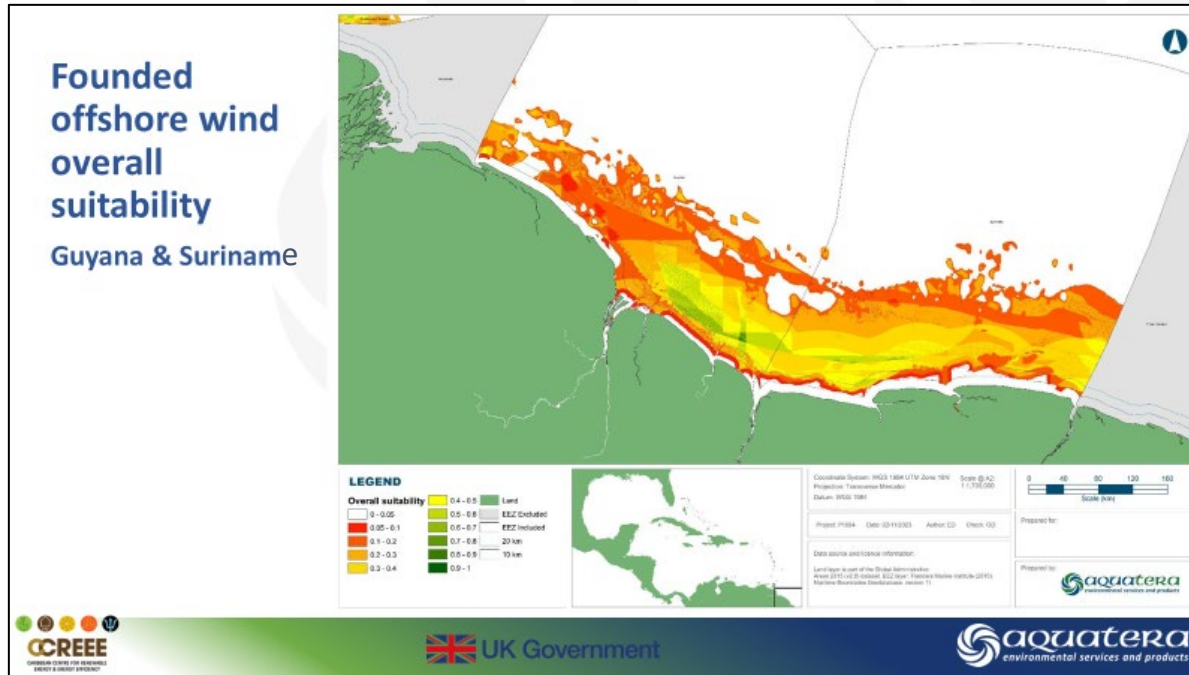
Overall assessment floating wind

Floating wind



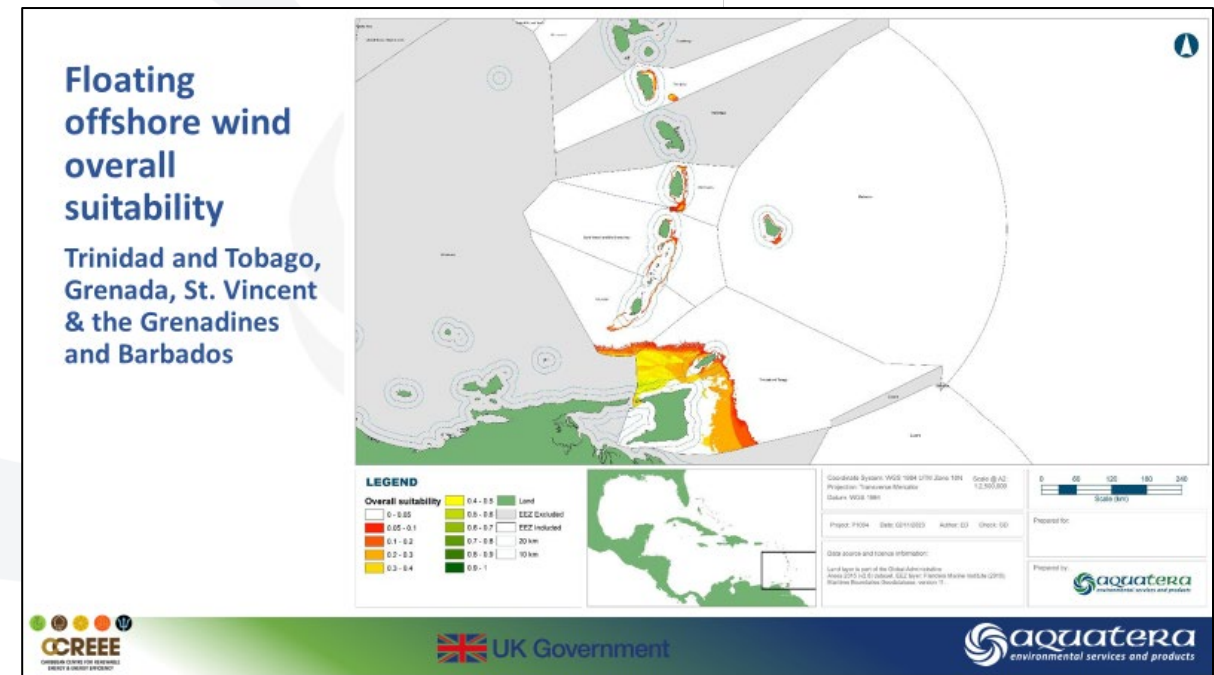
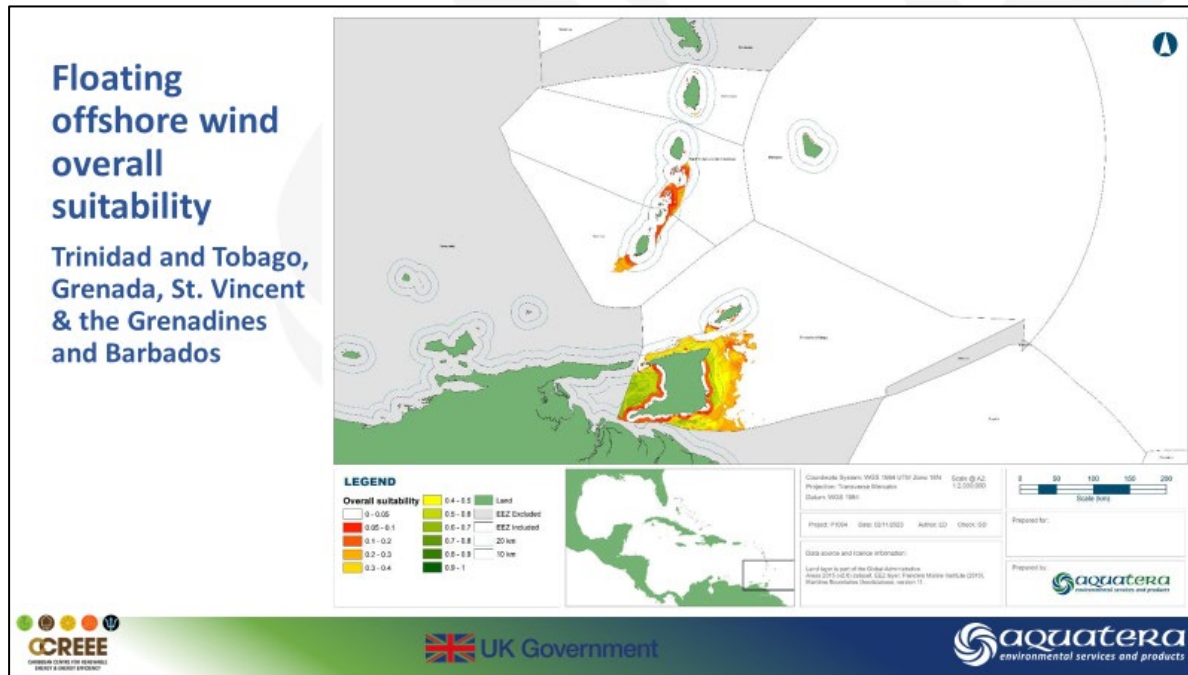
Guyana and Suriname

- The wide continental shelves of Guyana and Suriname offer by far the largest development capacity and particularly for founded turbines there are extensive areas with quite high suitability. The availability of supporting infrastructure and people with the fast growing oil and gas sector here may be challenging. Wind could offer a pathway for Green Guyana aspirations, especially in some CSR funds can be liberated from the oil and gas sector

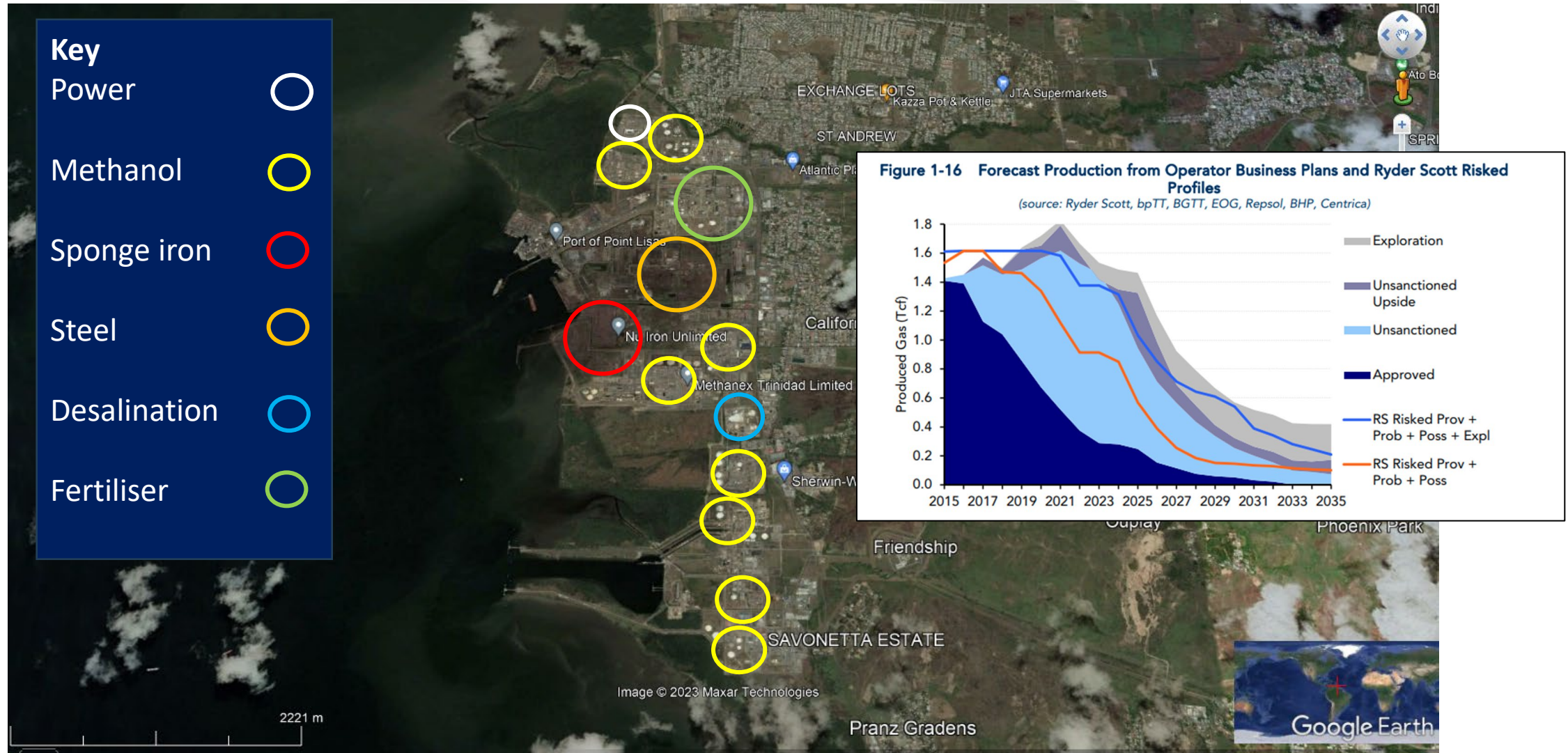


Trinidad, Tobago, Grenada, Grenadines and Barbados

- Most potential in terms of capacity and in terms of suitability in Trinidad where supporting infrastructure and markets are most developed. Key founded hot spot in Gulf of Paria, floating off norther Trinidad coast. Grenada and Grenadines have some potential but at low suitability. Barbados only small potential near to shore

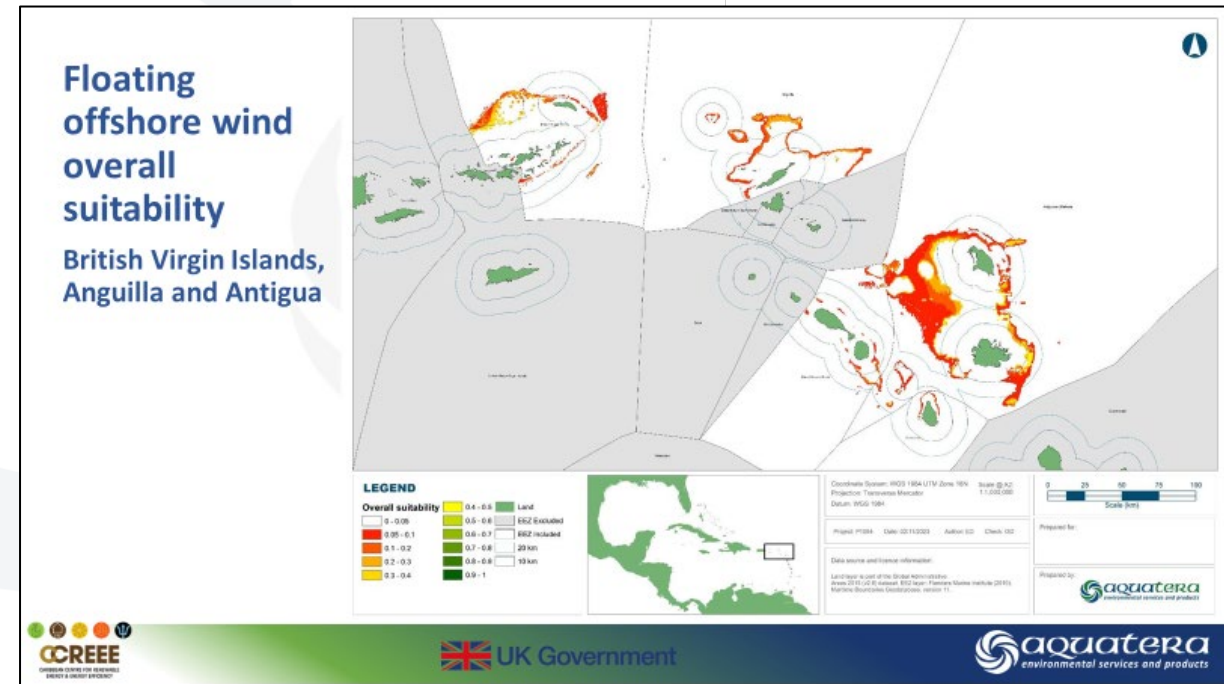
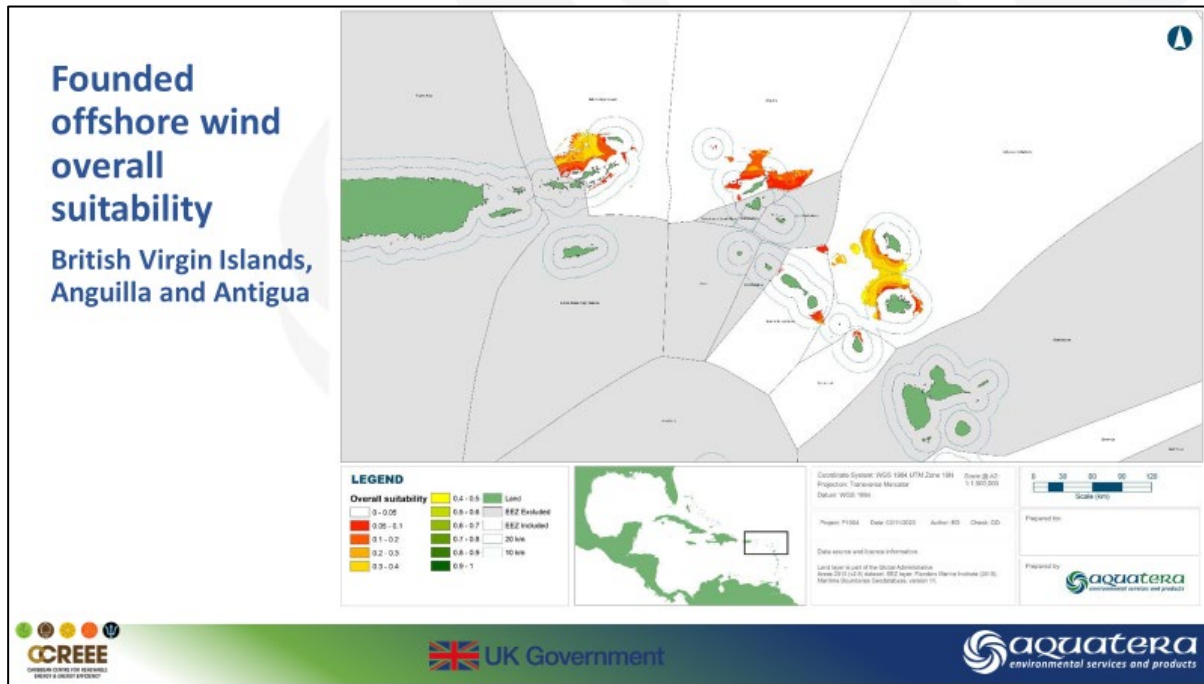


California industrial production centre



Antigua, Barbuda, Anguilla and British Virgin Islands

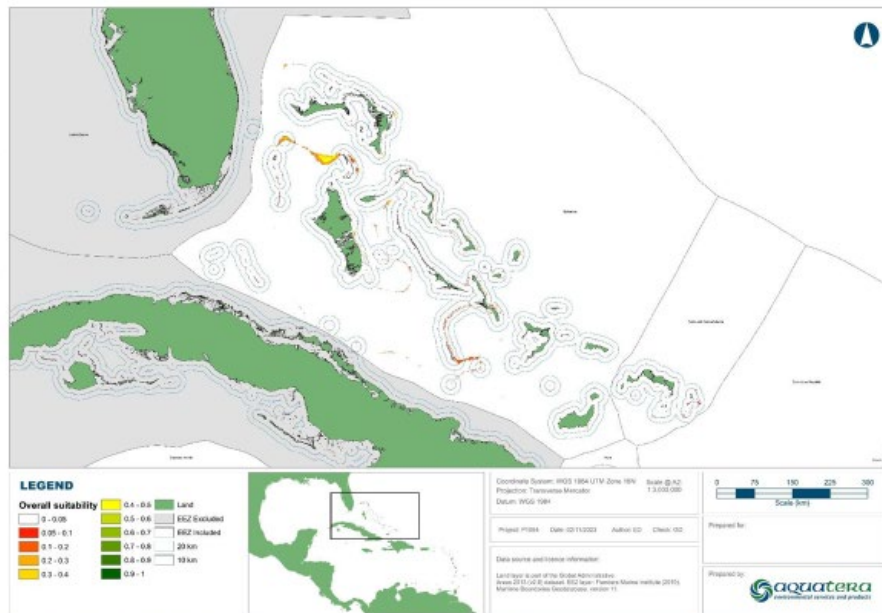
- Large capacity area indicated but at low suitability. Main opportunity may be for more limited founded developments in suitability hotspots west of Antigua/Barbuda and west of BVI. Supporting infrastructure will be a key challenge as well as extreme conditions resilience



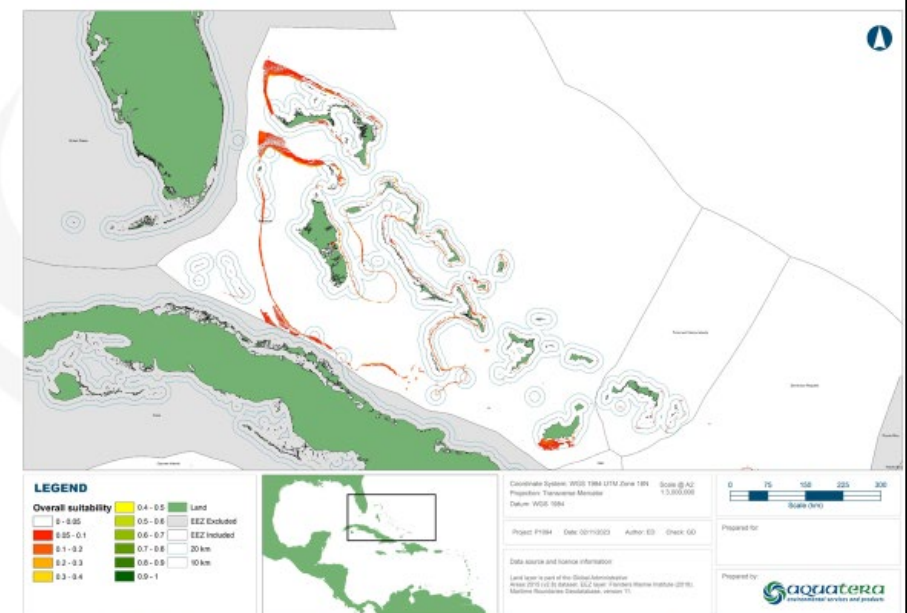
Bahamas

- Some potential in NW, near to population centres and US mainland market. Floating wind has most capacity but at low suitability. Smaller founded area has a greater suitability potential

Founded
offshore wind
overall
suitability
Bahamas

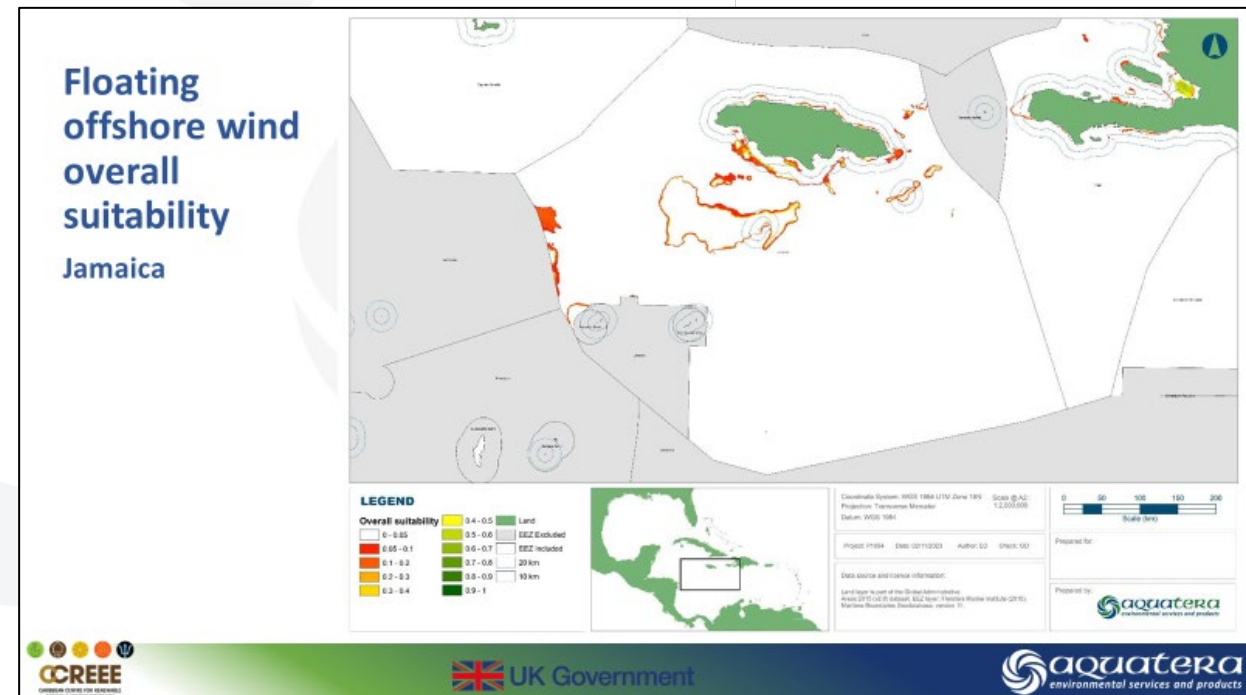
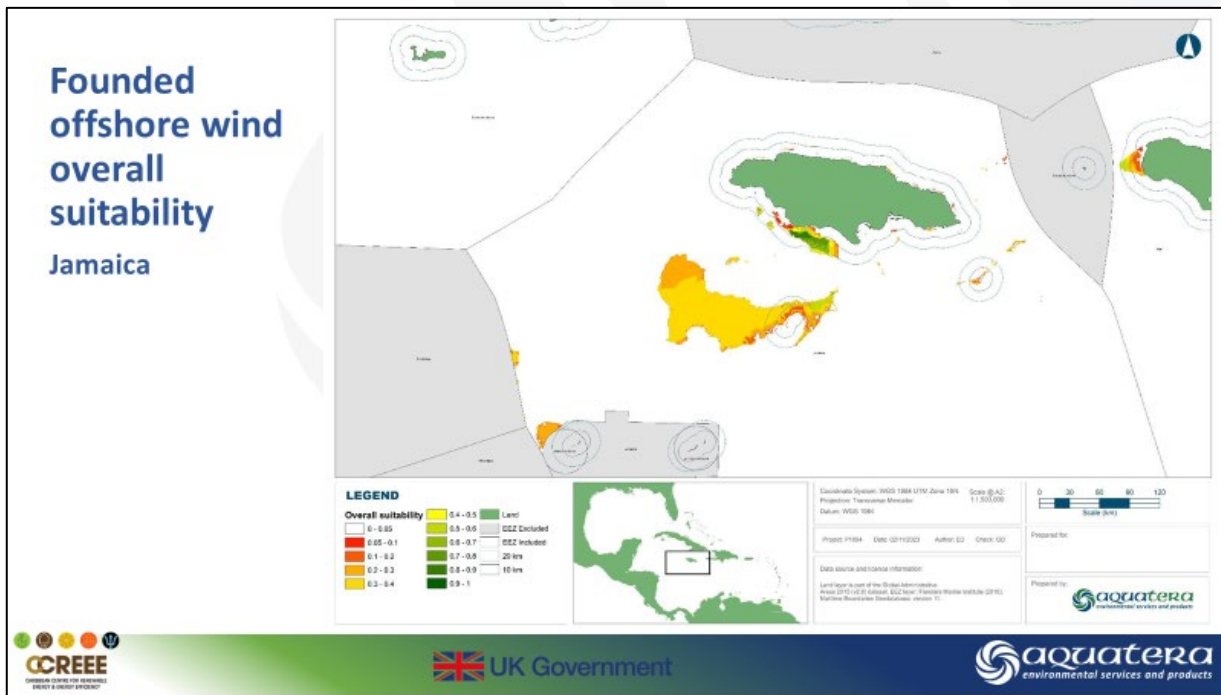


Floating
offshore wind
overall
suitability
Bahamas



Jamaica

- Founded has much better prospects that floating in Jamaica. Large area of south coast indicates high suitability but this area is quite close to shore and may have extensive coral reef habitat present. Pedro bank has large area potential but mid range in term of suitability. Nevertheless a key regional and national opportunity



Pedro Bank, Jamaica

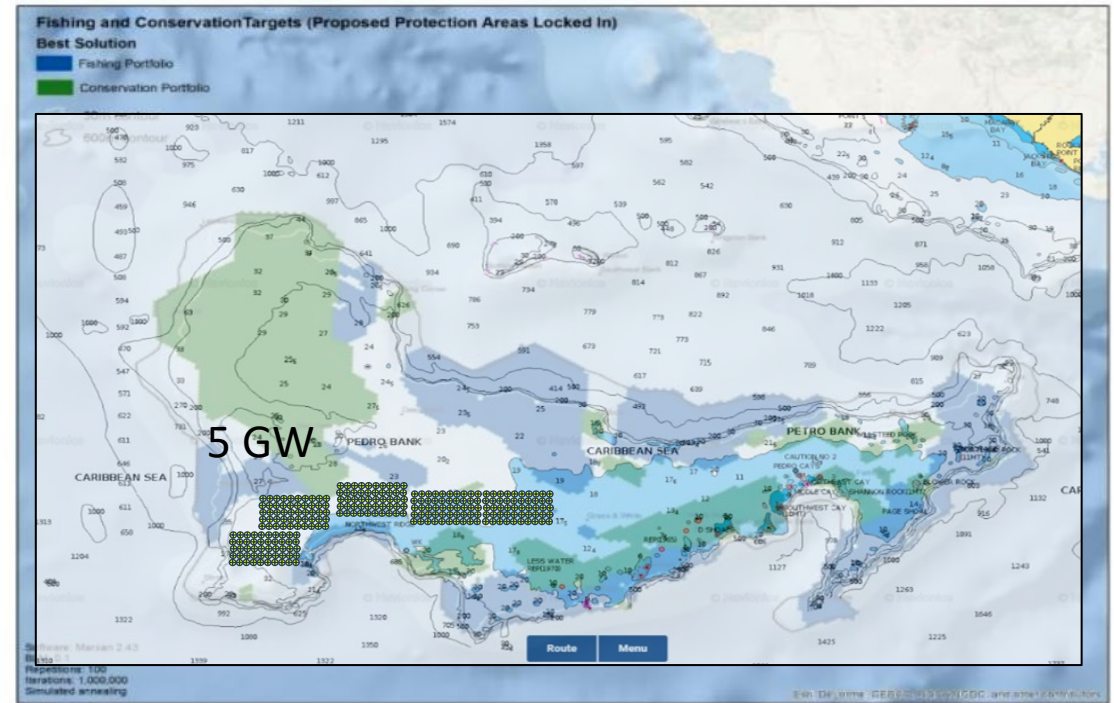
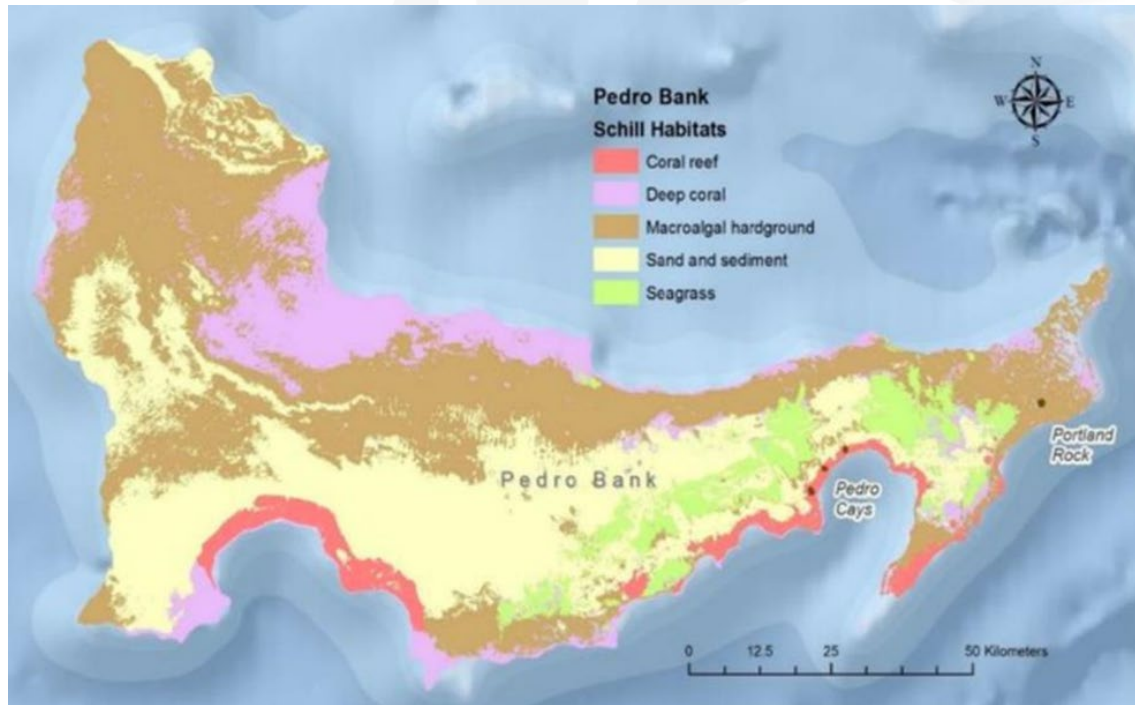


Figure 9. Marxan Scenario 2: Conservation and fishing targets based on variable goals with designated and proposed protected areas locked-in to the solution



Strategy; resource and market analysis; and a five year roadmap

Full activities associated with offshore wind

- There are many occasions when there are discussions or analysis about the economic and supply chain opportunities associated with offshore wind
- To date all of the materials and analysis produced have focused upon a very narrow 'manufacturing' focus of activity
- This narrow focus fails to recognise major areas of opportunity and particularly those opportunities linked to the less industrialised activities
- For a community such as Orkney the range of economic enagement activities needs to be fully considered and managed
- The listing opposite provides a start.....

Preparation activities

- Policy and governance
- Market mapping
- Site prospecting
- Business and commercial planning
- Investment and investment brokering
- Programme management
- Pre-development planning
- Societal alignment

Delivery activities

- Power generation and export facilities
- Port & support bases
- Airport base
- Support vessel fleet
- Support aircraft/drones
- Power aggregation, storage and conversion
- Power transmission and transport
- End user market transition
- Sector inspection, control, weather monitoring, emergency response

Additional capacity aspects

- Local community and supply chain capacity
- Workforce housing and social provisions
- Skills development, training and recruitment
- Compensation, offsetting, alternatives for disadvantaged sea users
- Workforce transition from sunset to sunrise sectors
- Export co-ordination for established skills, services and products
- Finance, insurance and legal services
- Tourism and other public interfaces



Full project lifecycle interests

All delivery activities

- Power generation and export facilities
 - turbines, substations, cabling
- Ports, support bases, airport
 - component shipping, turbine aggregation & deployment, operations support, major maintenance and decommissioning
- Support vessel and aircraft fleet
 - Tugs and workboats, component delivery, assembly, tow-out/in, maintenance, survey and monitoring, USV, UAV drones
- Power aggregation, storage and conversion
 - sub-stations, switching stations, batteries, hydrogen (ammonia) plant etc
- Power transmission and transport
 - cables, pipelines, shipping activities as well as product distribution
- End user market transition
 - housing, offices, industry, public buildings, vehicles, ships, aircraft etc
- Sector inspection and control, weather monitoring, emergency response capacity
 - locations, readiness, comms, response capacity

Delivery sub-tasks for each activity)

- Commercial management & finance
- Facility/asset operations management
- Regulations and standards
- Development planning and consenting
- Build core facilities/equipment
- Deliver balance of plant/infrastructure
- Installation and commissioning
- Operations and maintenance
- Deliver balance of services (wider supply chain)
- Decommissioning
- Meet balance of responsibilities (overall governance)

Capacity definitions for each criteria

	Capacity	None	Weak	Moderate	Strong	Very strong
	Description	None	Weak	Moderate	Strong	Very strong
Local project ownership	Capacity of the Country to own or part-own a industrial development project	No potential or candidates	One candidate No experience	Few candidates No/one-off experience	Many candidates but limited experience	Many candidates and much experience of project ownership
Professional services	Size and diversity of professional service available withing a country: legal, finance, environ, maritime etc	No services	Few small-scale service companies, no experience	Moderate services, No/one-off experience	Extensive services but limited experience	Extensive services and wide applicable experience
Regulation	Status of existing regulations and capacity for revision and update	No regulatory basis for project development	Basic building blocks and capacity to develop framework, no experience	Partial framework No/one-off experience	Established framework but limited experience	Established and proven regulatory framework for projects
Raw physical resources	The suitability of physical conditions in a country	Not at all suitable, a barrier to progress	Conditions possible to use but very difficult to make economic, safe etc	Sub-optimal conditions, likely to be expensive to operate is	Good conditions overall but a few outliers	Optimal conditions for safe, reliable, low cost and profitable development
Planning constraints	These are the factors that may restrict the freedom to operate due to competing interests and incompatibility	No offshore wind possible at all				Case by case system in place and strong local alignment
Component supply	The extent to which a given country can supply components seeded for wind project delivery	No existing equipment supply chain and no development ambitions	Capacity and willingness but not yet operational	Smaller scale engineering and assembly of manufactured components only	Medium scale engineering capacity with some capacity for primary production as well as range of assembly experience	Numerous smaller scale, wide suite of medium scale components and some capacity with large scale components

Offshore wind support capacity in each country

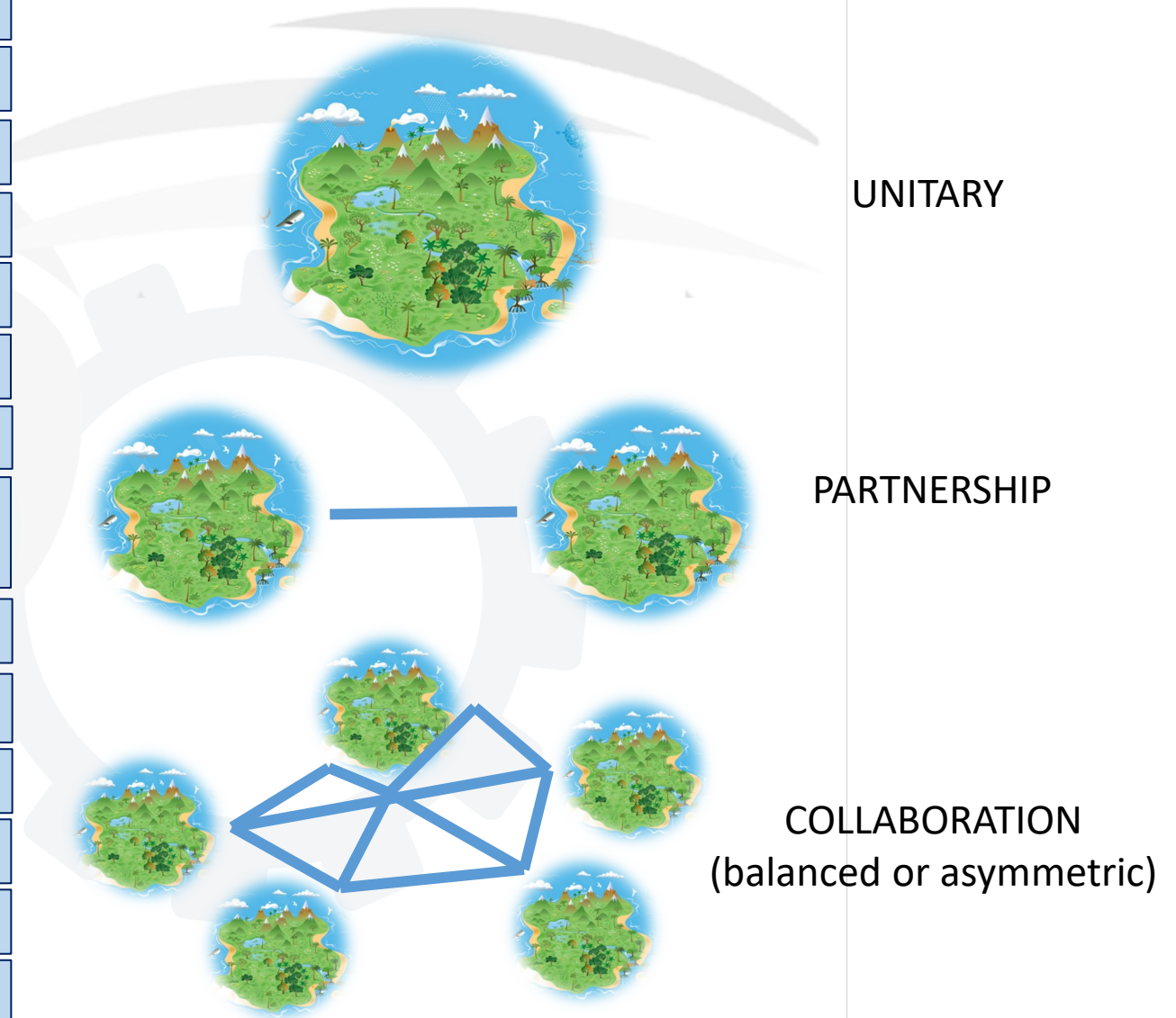
	Capacity		None			Weak			Moderate			Strong			Very strong						
	Ang	Ant & B	Bah	Barb	Bel	Ber	BVI	CI	Dom	DR	Gre	Guy	Hai	Jam	Mon	N& StK	St Luc	StV & Gr	Suri	Tri & Tob	Tur & Cai
Professional services																					
Raw resources (wind)																					
Raw resource (depth)																					
Environmental constraints																					
Component supply																					
Support vessels																					
Ports	PR			T&T			PR		Mart		T&T						Mart	T&T			
Energy handling																					
Local energy market size	15	102	395	286	400	63	31	62	74	10800	108	700	11000	2900	5	55	179	110	500	1400	35
Local energy market value	30+	30+	15	30+	15	50+	30+	30+	30+	30+	30+	15	30+	30+	30+	30+	30+	30+	15	10	30+
Cable connections																					
Remote energy markets	Isles	Isles	USA	T&T	Cent Am	?	PR	Isles	Isles	PR	T&T	Sth Am	Ja/DR	Hai	Isles	PR	Isles	Isles	Sth Am	SA & Isles	

Road map steps – specification for the project(s)

Roadmap topic	Specification	At November workshop	2023	2024	2025	2026	2027	2028
Project planning	The ongoing and supporting works through to ownership entity taking control	Prepare and agree terms of reference for early project development team	Work plan for 2024 and 2025 Outline proposals submitted to sponsor agencies	Ongoing works approved and backed by sponsors in Q1. Work continues as far as possible through in-kind and elsewhere supported efforts	Kick-off team preparing for handover to operating entity, with residual responsibility as mutually agreed	Kick-off team increasingly move onto follow on projects and the main project gains momentum		
Phases of project		Objectives and concept validation	Option evaluation	Option selection followed by detailed planning and design Planning and licensing work	Optimise approach and pre-procurement negotiations Planning and licensing work completed	Procurement	Mobilise all maritime resources Build major components and assemble them	Install, commission and operate
Type of project	Offshore wind	Confirm whether the project should link into geothermal, solar or biomass, gas or diesel power for balancing purposes	Confirm how other generation and storage capacity will interface with this project	Develop plans for project generation capacity alongside other system adaptations				
Scale of project	>50 MW, < 100 MW	Confirm envelope of aspiration in terms of capacity. 50-100 MW will likely need to have progressive buildout capacity to be fully commercial	Work with agreed scale, consider possible expansion, replication strategies at future dates	Establish a techno-economic cost and revenue model for the project so that any capacity linked issues can be quickly examined and resolved	Verify the financial viability of the progressive phases of the project.		Build out the first 50-100 MW of turbine capacity along	
Location of project	To be determined; needs 30 km ² of space to be practical	Confirm that the hot-spots identified so far are a reasonable basis for ongoing work, with additional if needed	A clear ranking of the prospective locations with full SWOT assessment for each & comparative metrics to help selection in 2024	Full consultation and survey activity for the prime site(s), with back-up/adaptive strategies fully available if needed				
Project cost profile	What budget is needed year on year, assume 50-100 MW	US\$200,000	US\$100,000	US\$2 million	US\$4 million	US\$10 million	US\$50-100 million	US\$50-100 million
Turbines	5 to 10 of 5-15 MW turbines depending upon availability	Confirm the number and size range of the turbines – establish any shortlist manufacturers and delivery timescales	Preliminary long list of possible turbines – make, size, spec, source, delivery date etc	Enter into preliminary negotiations leading to heads of terms agreement(s). Suggest progressing with three/four manufactures.				
Cables	<50 km of subsea cable	Confirm maximum length of cable and indicative delivery timescales	Preliminary list of possible cable suppliers with indicative per km costs and delivery dates	Establish a preliminary cabling plan and short list possible suppliers				
Port facilities	Turbine assembly & integration; safe haven; workboat berthing port, operations base, maintenance base	Confirm any existing infrastructure, concepts for development infrastructure and delivery timescales	Preliminary contact with most prospective ports	Development of a port facilities plan which links with the vessels plan and other facility delivery elements				

Community interests and capacity

Ownership – host community
Finance and management – host community
Regulation
Professional services community
Supply chain capacity building
Resource communities
Constraints - Sea-user & landscape communities
Components Turbine, cable & mooring/foundation manufacturing communities
Support vessels – maritime community
Support base & service port communities
Energy conversion station community
Local end-user/market communities
Energy connection communities
Remote end-user/market communities



Offshore wind within an overall decarbonisation strategy

Overall

- 15 GW geothermal; 130,000 GWh
- 4 GW wind at 50% CP, 17,000 GWh
- 10-20 GW wind at 30% CP; 26,000 – 52,000 GWh
- 7 GW of solar at 18% CP; 11,000 GWh
- 100 MW wave at 30% CP; 260 GWh
- 50 MW tide at 25% CP; 108 GWh
- 500 MW micro gen solar; 783

Total indicative regional output
185,000 – 210,000 GWh/year

