Managing a Nation’s Real Estate Assets in a Profitable and Sustainable Way

Jamie Moore

Corporate GIS Manager

Michelle Moore

Marine Asset Planning Manager

The Crown Estate (UK)

Contents

- The Crown Estate
- Our Real Estate Portfolios
- Offshore Portfolio
  - How we identify where revenue opportunity exists

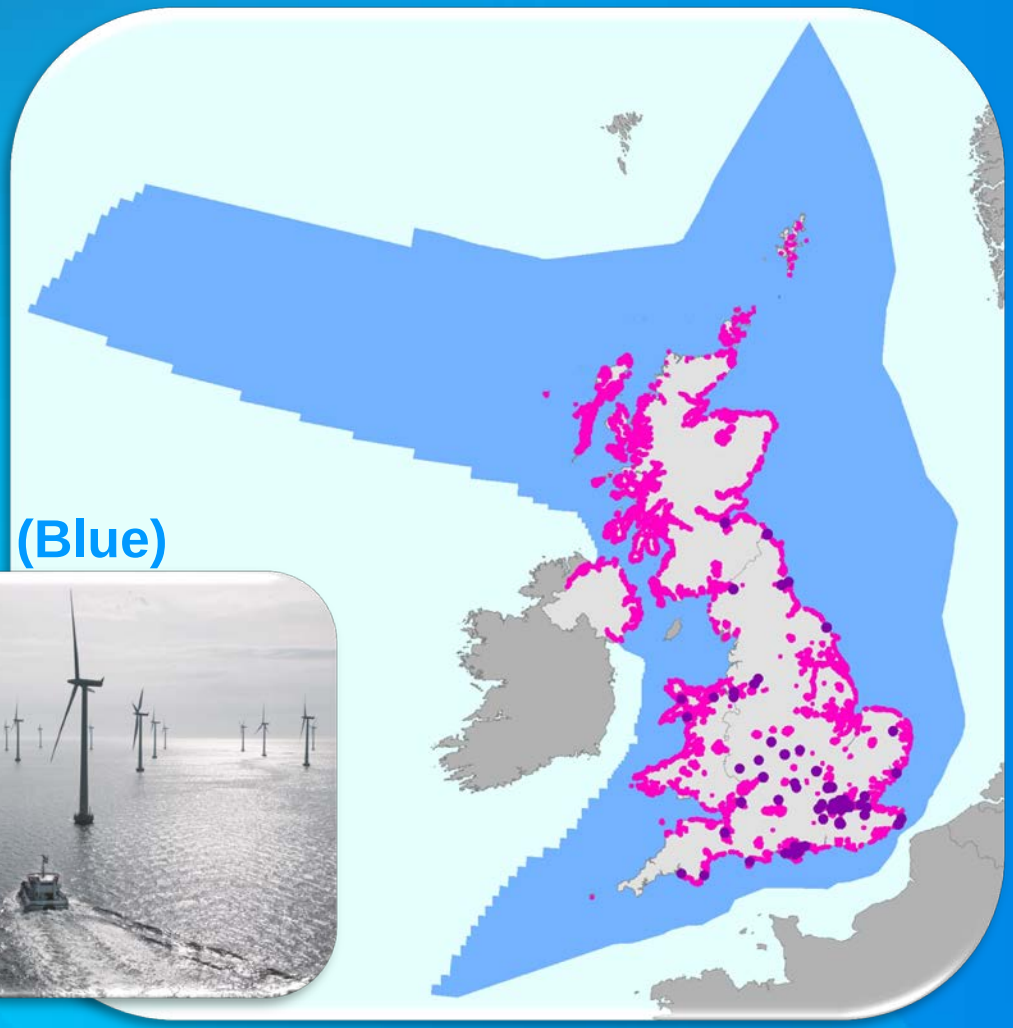
    Offshore windfarm cost of energy example
  - How we understand how potential opportunities can be realised in a sustainable way (alongside other users and users of space)

    Marine Resource System example
- Summary

The Crown Estate

- Public property of the UK Monarch
- 3 property portfolios, combined value of £11.5b
- All profit returned to government for the benefit of the nation

Rural & Coastal (Pink)



Urban (Purple)

Offshore (Blue)

The Crown Estate (2015)

Portfolio	Value	Revenue	Approx. Holdings	Notes
Urban	£8.2b	£264m	~1,300 Properties	• Well mapped • Largely static • Data rich
Rural & Coastal	£1.7b	£51m	~10,000 Properties	Rural • Relatively static • Good mapping/data Coastal • Dynamic • Less certain mapping/data
Offshore	£0.9b	£51m	~500 Properties (850,000 km^2)	• Very Dynamic • Largely unmapped • Large uncertainty/risk

Increasing

- **Area**
- **Complexity**
- **Uncertainty**
- **Risk**
- **National importance**
- **Dominant ownership**

= More opportunity for GIS to add value

Offshore Portfolio

- Large Space (3 times the size of UK land area)
- Large latent opportunity
- Limited data & largely unmapped
- Competition for space
- Need to understand where opportunities exist
- **Solution = Cost of Energy Model (Python)**
- Need to understand how opportunity can be sustainably delivered alongside other interests and users of marine space
- **Solution = MaRS Marine Resource System (Custom Extension)**

Cost of Energy Modelling

- Offshore windfarm site selection is driven by cost
- Costs are driven by market factors and physical conditions
- Our Levelised Cost of Energy Model (LCoE) identifies where conditions are optimal in UK Waters to support lower cost offshore windfarms
- This helps us to understand where there are development opportunities within our offshore real estate

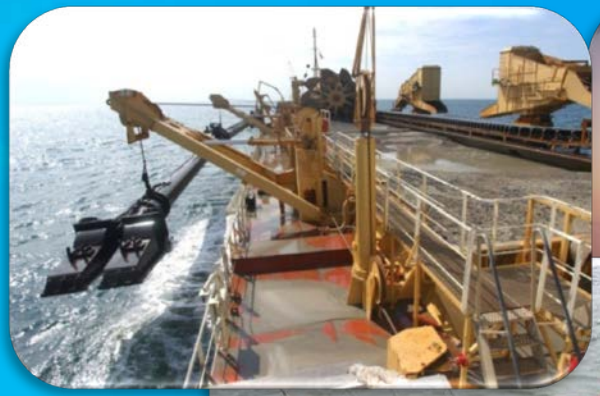
The LCoE Model

(Developed in partnership with Geospatial Enterprises Ltd.)

- **The model utilises spatial data describing physical conditions in UK waters - wind speed, water depth, seabed sediments, wave climate, tidal flows, and distance to shore.**
- **Costs relating to windfarm foundations, installation, electrical systems and operational & maintenance are calculated based on the physical conditions at each square kilometre of UK waters (735,000 cells).**
- **The result is a comprehensive prediction of the cost to construct and operate an offshore windfarm at any location in UK waters, expressed as the cost per MW of electricity predicted to be generated in the 20 year life of a windfarm.**
- **The model consists of 139 python scripts linked through a GUI interface. It has 175 user-definable inputs, 11,382 cost coefficients that are utilised in 1,450 cost functions. It uses 500mb of input GIS data and generates 12.5GB of output spatial data with run times < 1hour on a standard desktop pc.**

Sustainability Analysis using MaRS

- Once we understand where opportunity exists we must ensure it can be delivered in a sustainable way
- Our Marine Resource System (MaRS) provides a toolset to analyse proposed developments in our offshore real estate alongside social, cultural, and environmental interests and other marine industries.





MaRS – Sustainability Analysis

Data

Exclusions

Policy, Weights, Scores

Restrictions

Sustainability mapping

- Multiple datasets from a wide range of providers
- Integrated data management – full metadata, confidence assessed and quality assured
- 400+ layers
- 42 data providers

Sustainability Analysis

Data

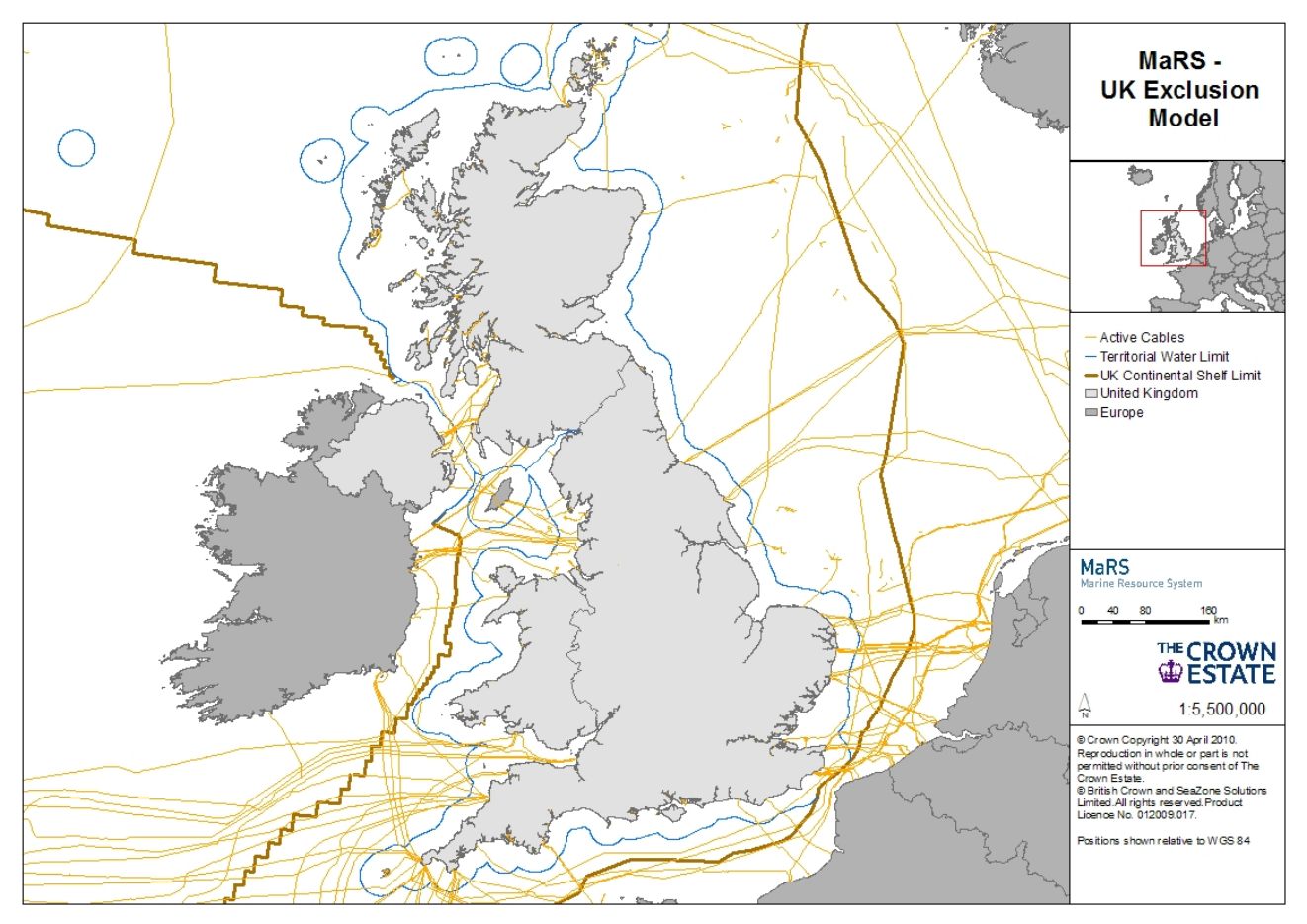
Exclusions

Policy, Weights, Scores

Restrictions

Sustainability mapping

Hard Constraints that Prevent Development

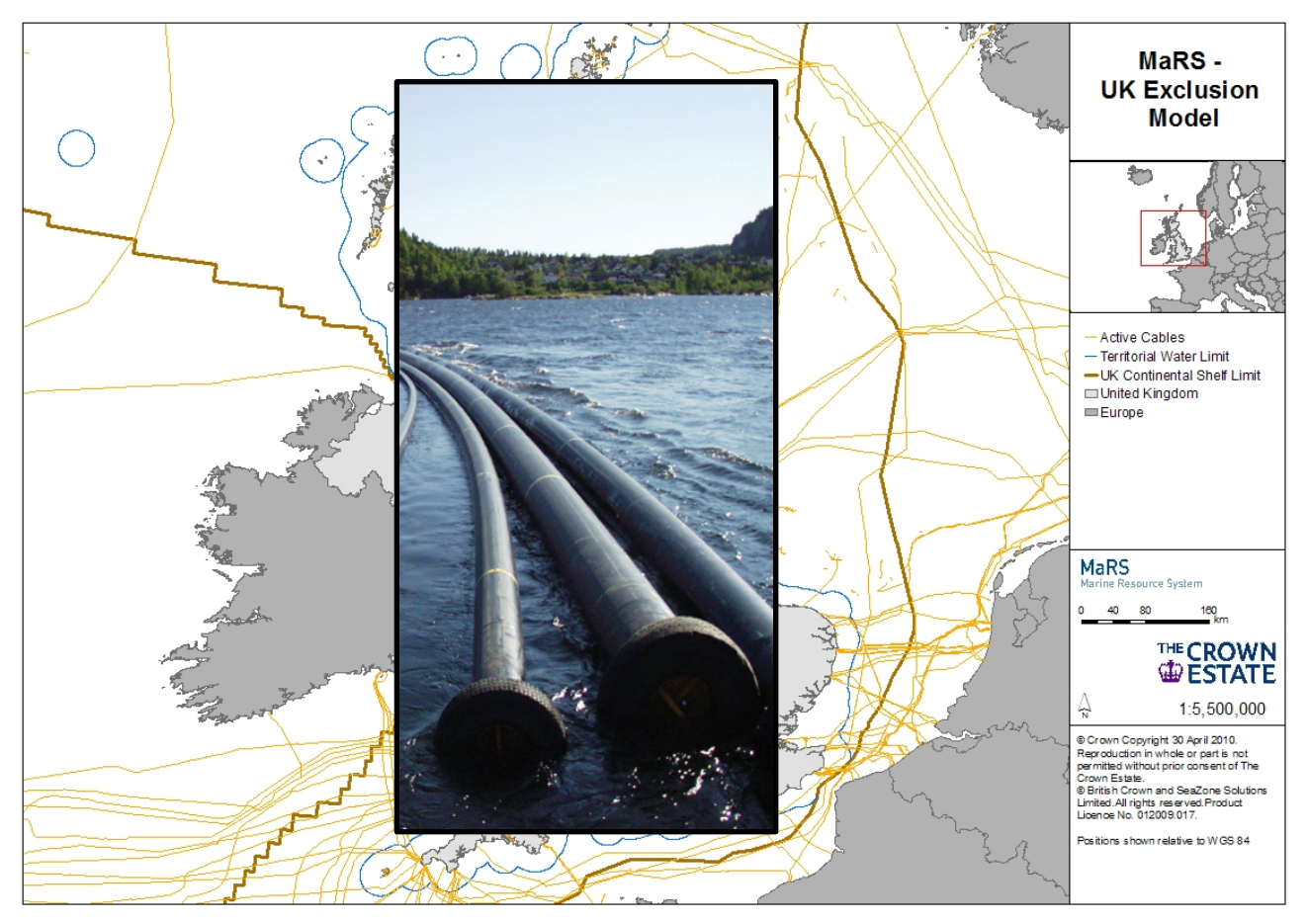


THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Hard Constraints that Prevent Development



THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Hard Constraints that Prevent Development

THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Hard Constraints that Prevent Development

THE CROWN ESTATE

Sustainability Analysis

Data

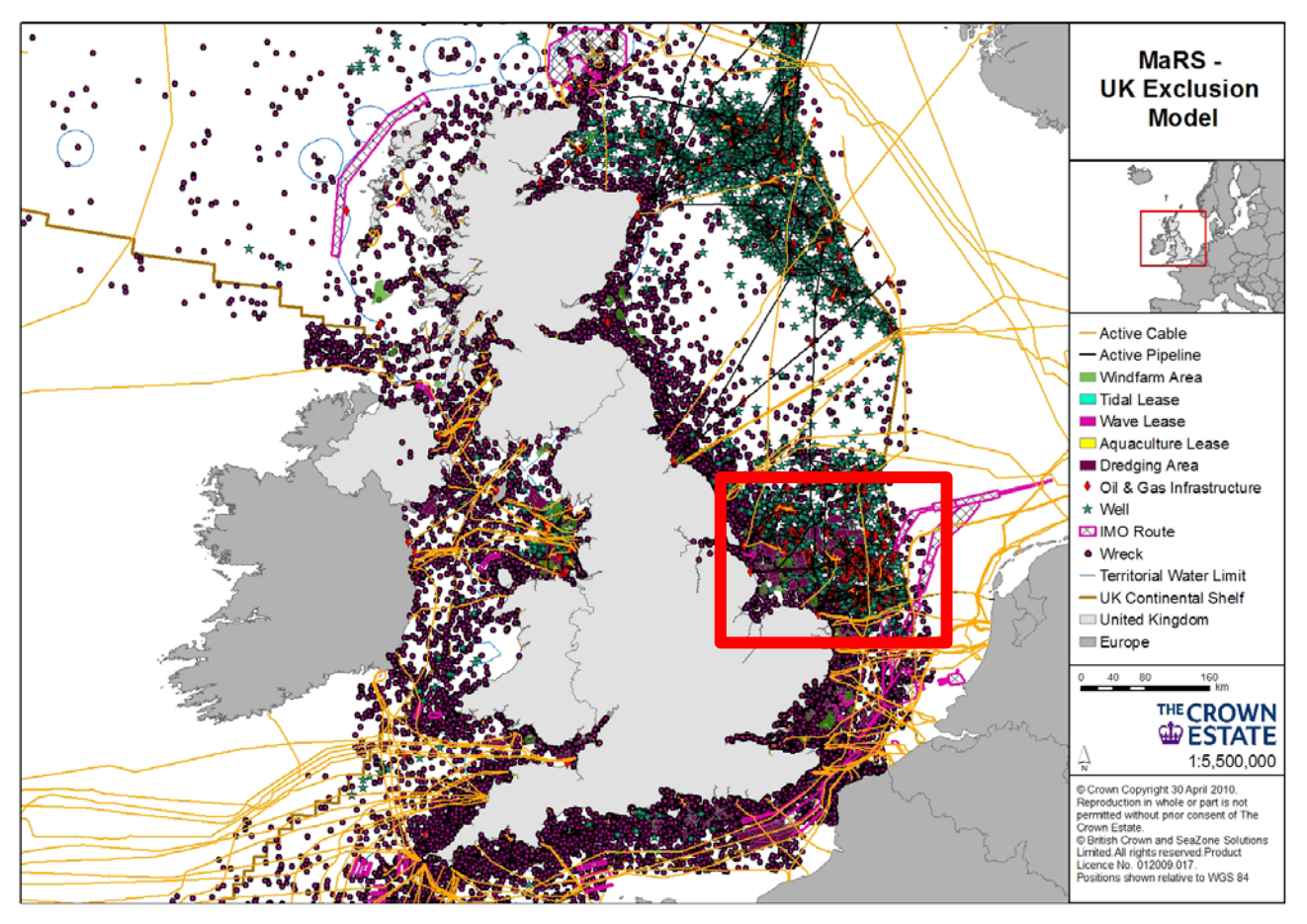
Exclusions

Policy, Weights, Scores

Restrictions

Sustainability mapping

Hard Constraints that Prevent Development



THE CROWN ESTATE

Sustainability Analysis

Multi-Criteria Analysis

Data

↓

Exclusions

↓

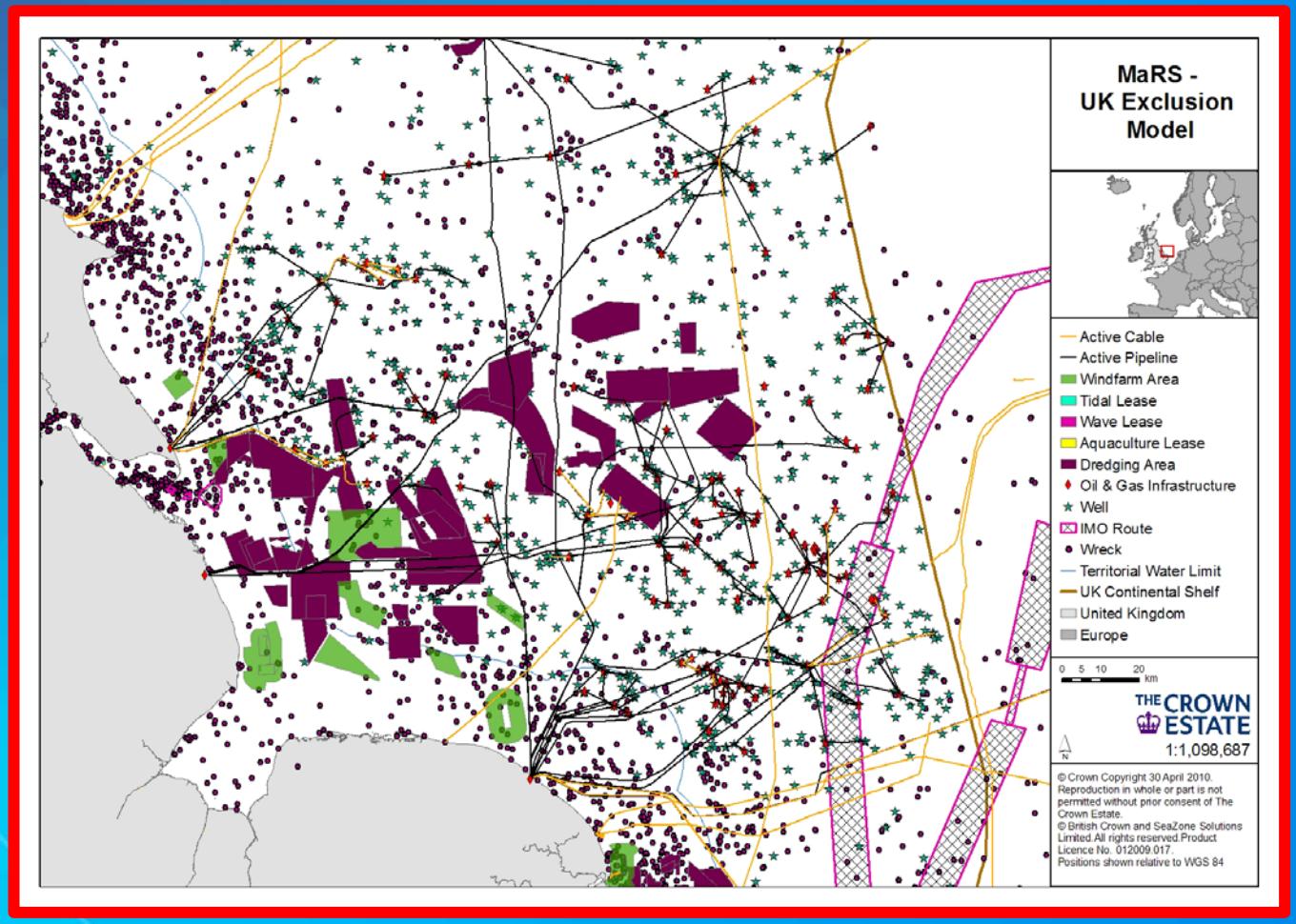
Policy, Weights, Scores

↓

Restrictions

↓

Sustainability mapping



THE CROWN ESTATE

Sustainability Analysis

Data

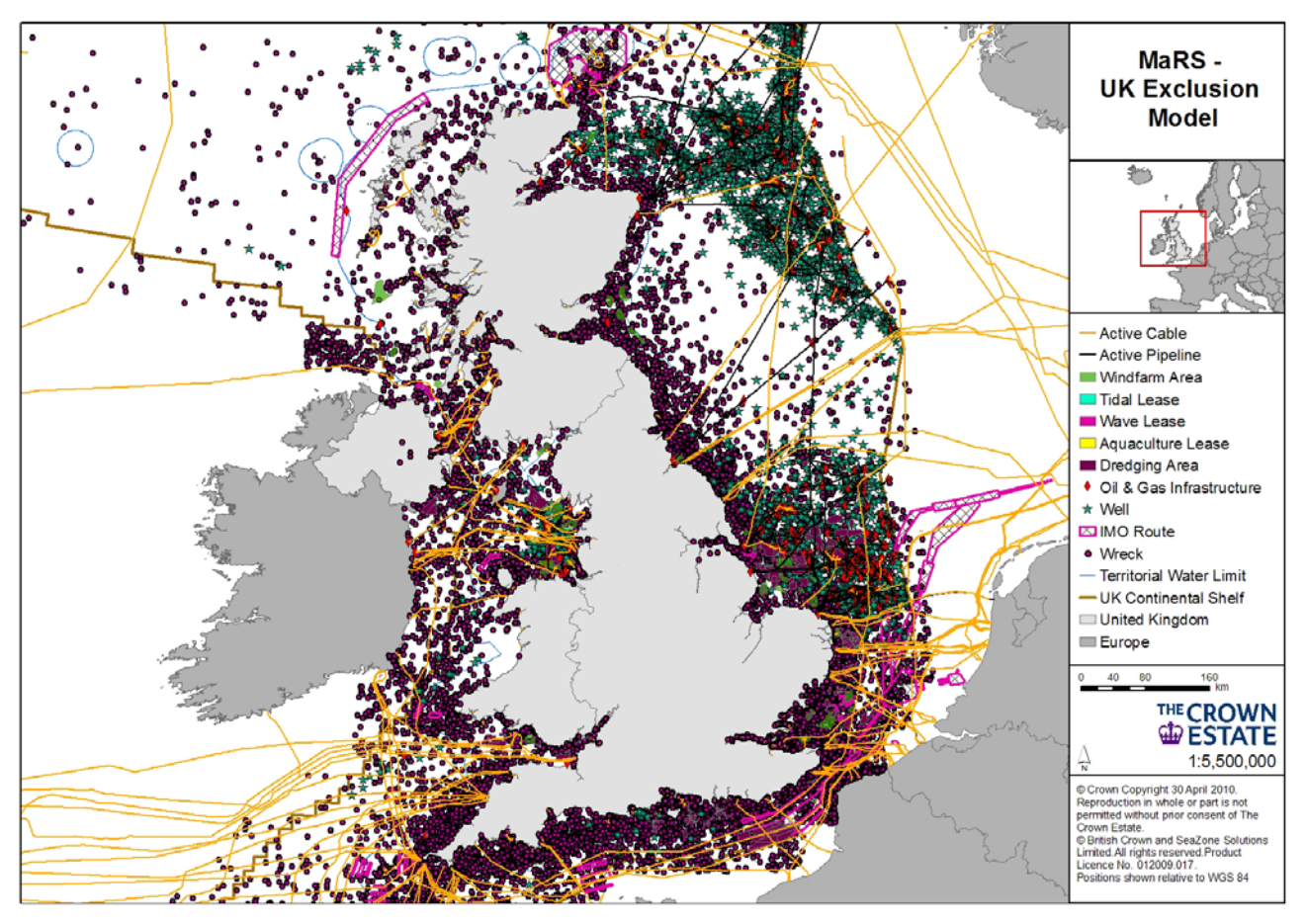
Exclusions

Policy, Weights, Scores

Restrictions

Sustainability mapping

Hard Constraints that Prevent Development



THE CROWN ESTATE

Sustainability Analysis

Data

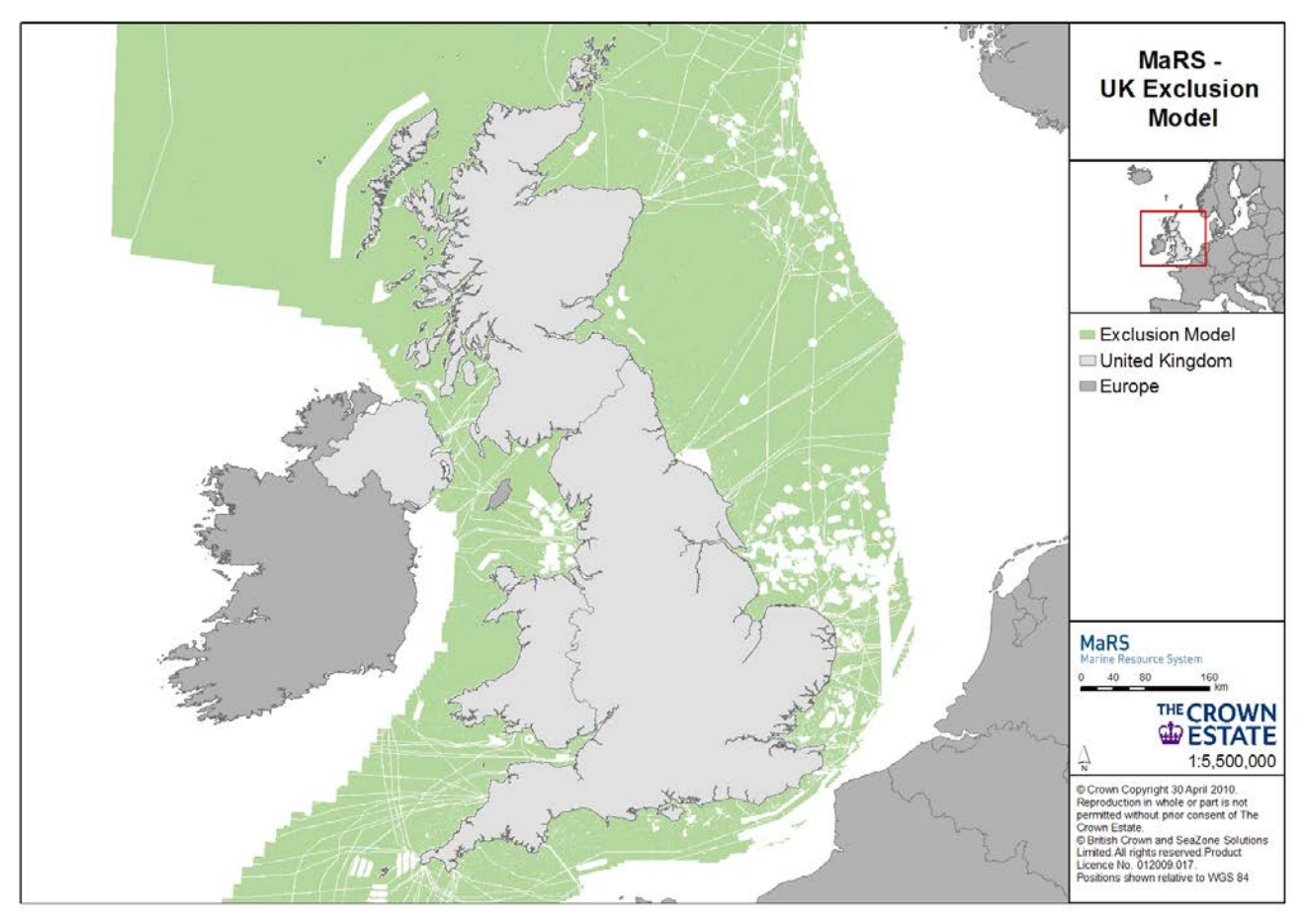
Exclusions

Policy, Weights, Scores

Restrictions

Sustainability mapping

Exclusion Result



THE CROWN ESTATE

Sustainability Analysis

Data

↓

Exclusions

↓

Policy, Weights, Scores

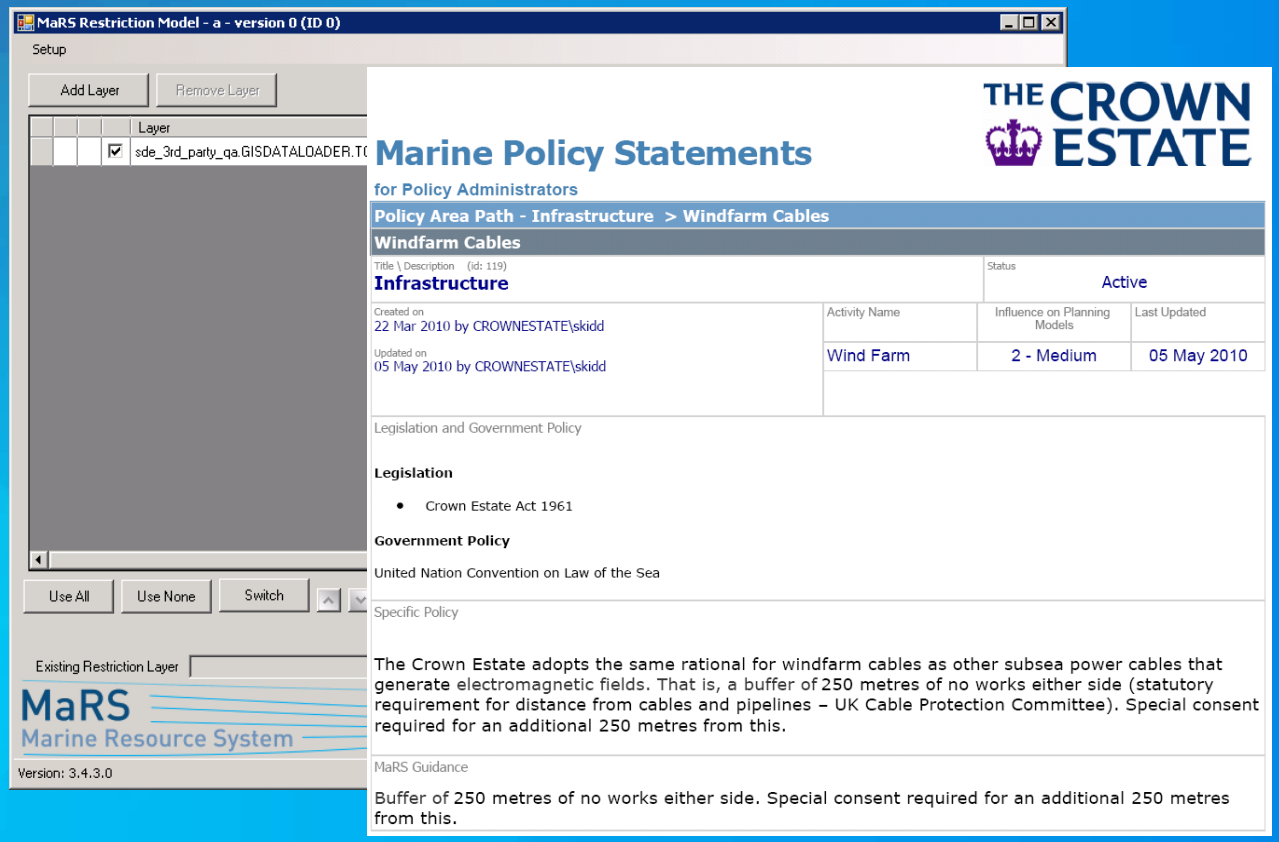
↓

Restrictions

↓

Sustainability mapping

Priorities Defined Through Internal and External Policies

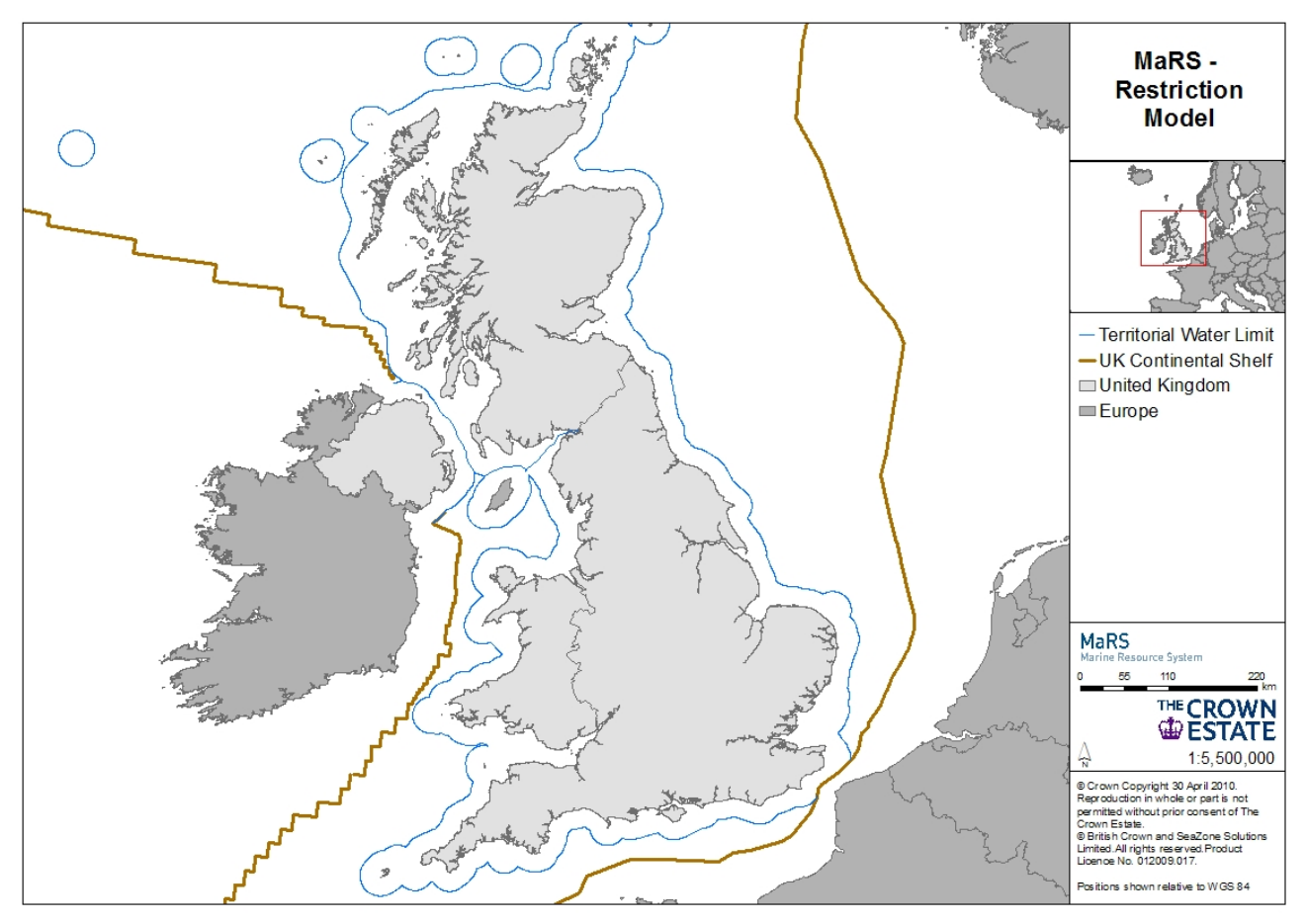


THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Soft Constraints Assessed Through Weights and Scores

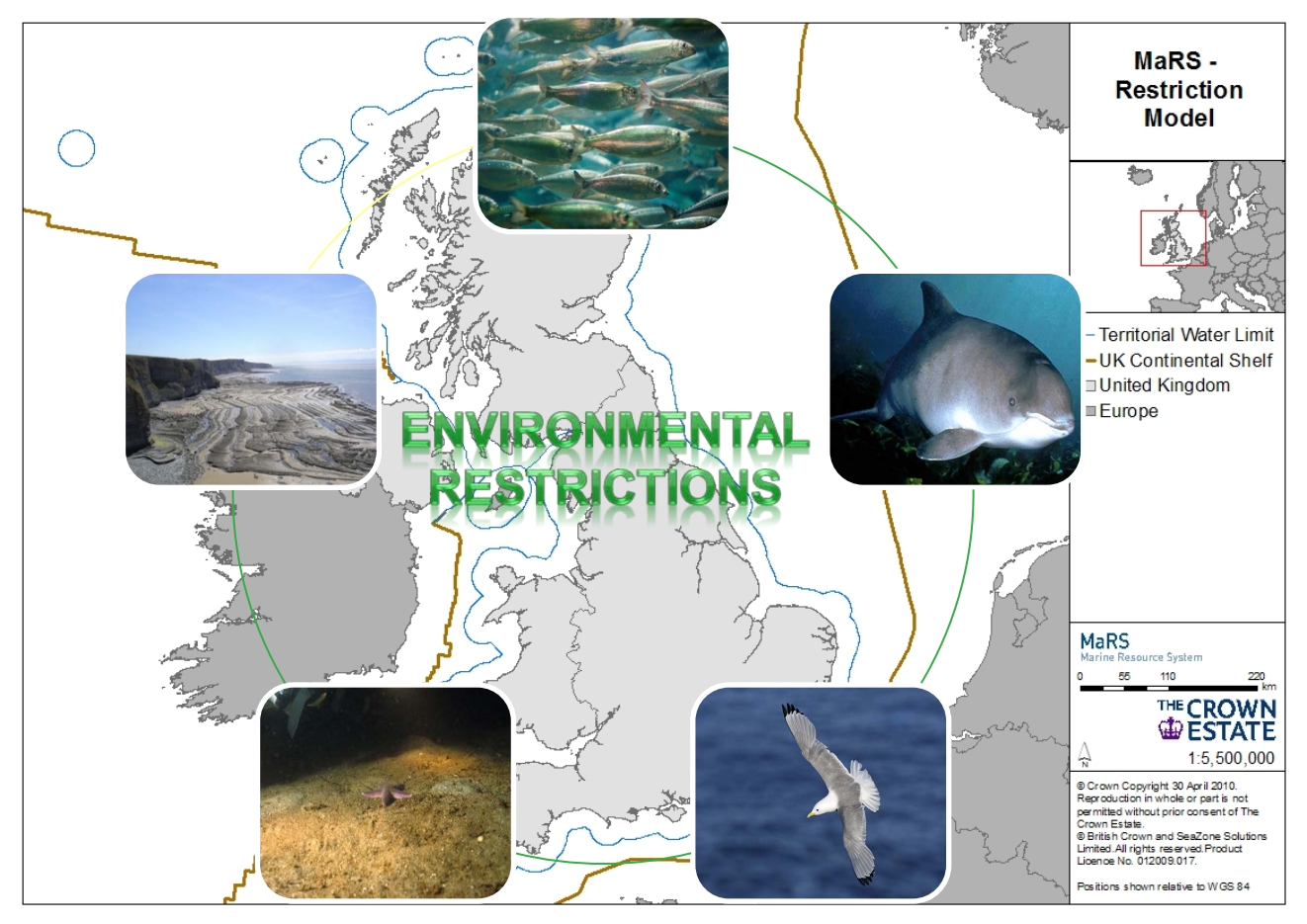


THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Soft Constraints Assessed Through Weights and Scores

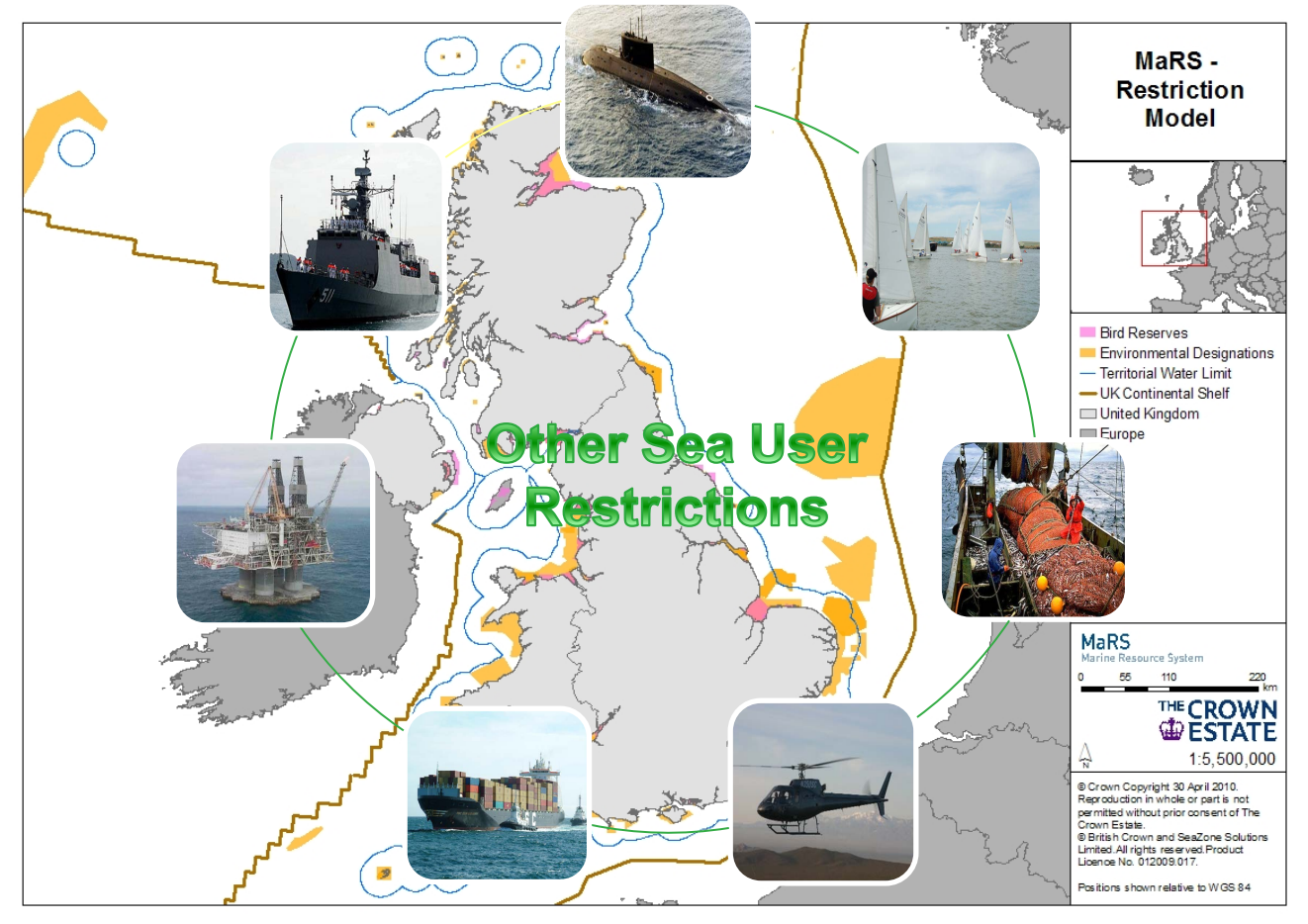


THE CROWN ESTATE

Sustainability Analysis

- Data
- Exclusions
- Policy, Weights, Scores
- Restrictions
- Sustainability mapping

Soft Constraints Assessed Through Weights and Scores



THE CROWN ESTATE

Sustainability Analysis

Data

↓

Exclusions

↓

Policy, Weights, Scores

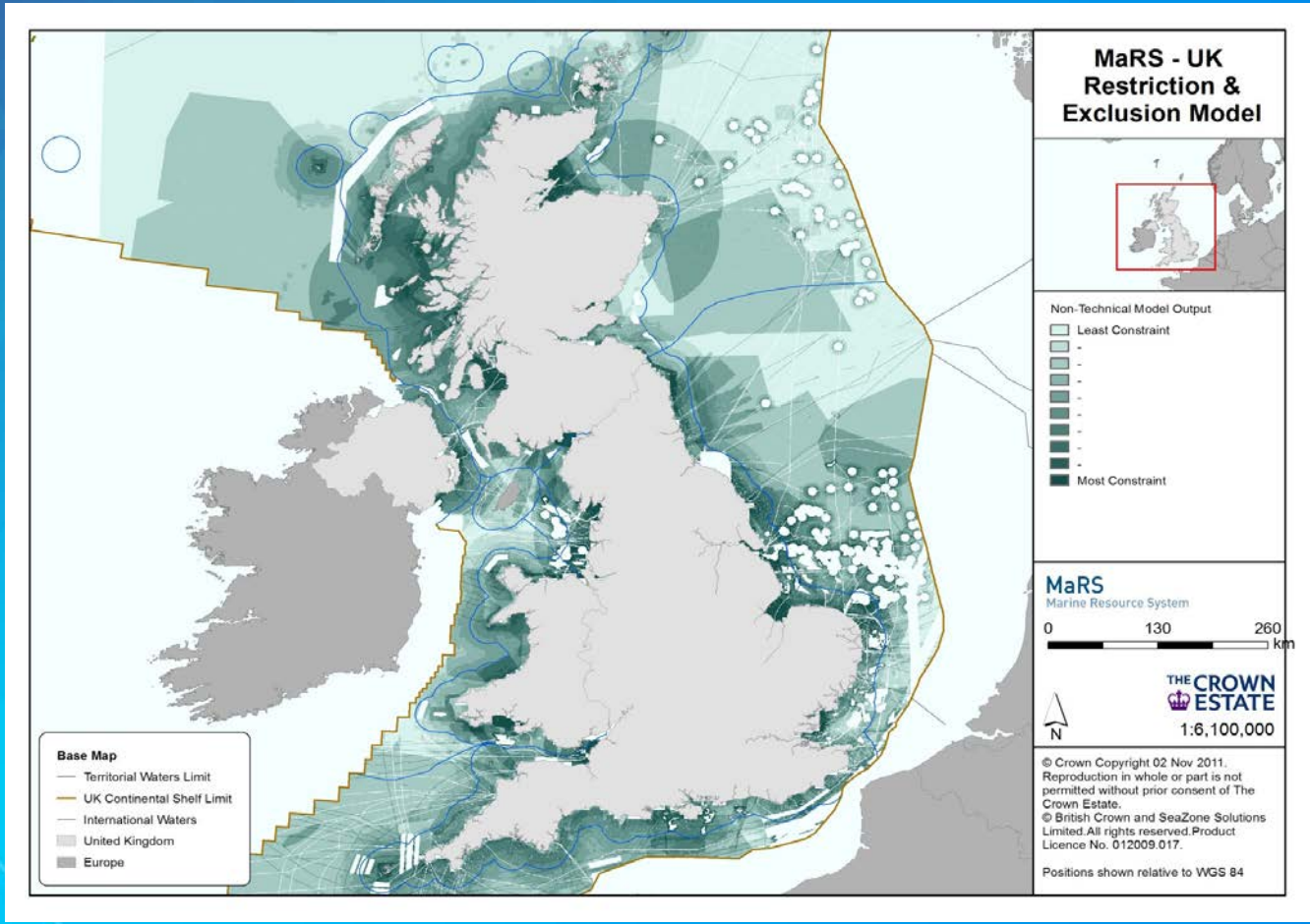
↓

Restrictions

↓

Sustainability mapping

Restriction – Exclusion = Sustainability Analysis Output



THE CROWN ESTATE

Summary

The Crown Estate manages a very diverse portfolio of UK Real Estate including Urban, Rural, Coastal and Offshore assets.

In area of less traditional real estate, GIS provides a very powerful tool for identifying opportunity and ensuring that new revenue is delivered in a truly sustainable way.

Jamie Moore
Corporate GIS Manager
jamie.moore@thecrownestate.co.uk

Michelle Moore
Marine Asset Planning Manager
michelle.moore@thecrownestate.co.uk

THE CROWN ESTATE