



# **Desperately Seeking Sustainability?**

or

# **An Environmental Vision for the Severn Estuary**

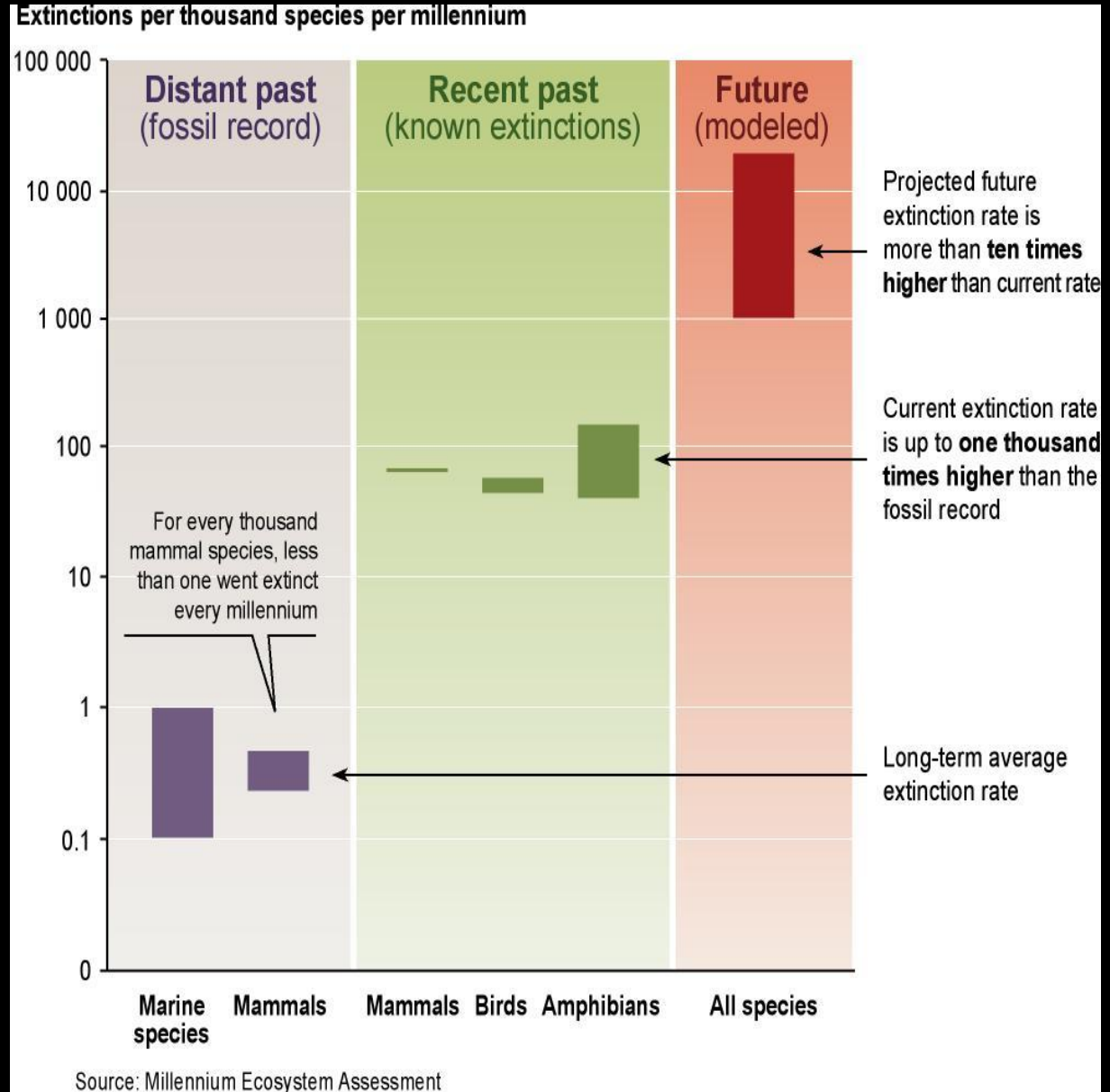
**Gwyn Williams  
Head of Conservation  
Investment, RSPB**

**University of Cardiff,  
27<sup>th</sup> April 2017**

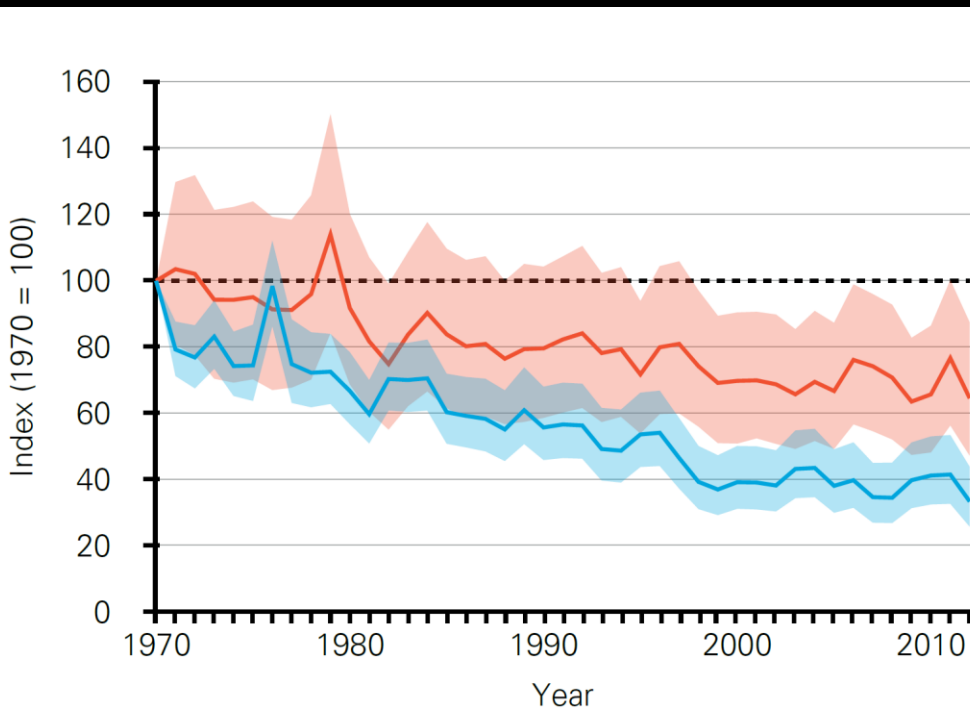


# Nature is in trouble...

Human activities have taken the planet to the edge of a massive wave of species extinctions, further threatening our own well-being



# ...and it's happening now



**Figure 3**  
 The UK Priority Species Indicator<sup>1</sup> shows the Abundance Index (blue) for 213 priority species, and the Occupancy Index (red) for 111 priority species (measured as the proportion of occupied sites). The shaded areas show the 95% confidence intervals.



- **BLUE:** An index describing the abundance of species of special conservation concern in the UK has fallen by 67% since 1970, & 12% between 2002 & 2013.
- **RED:** The measure based on occupancy has fallen by 35% since 1970, & by 6% between 2002 and 2013.

# Drivers of Biodiversity Loss

## Indirect drivers

Economic

Demo-  
graphic

Socio-  
political

Cultural &  
religious

Science &  
Technology

## Direct drivers

Habitat  
Change

Climate  
Change

Invasive  
Species

Over-  
exploitation

Nutrients  
& pollution

**Biodiversity Loss**

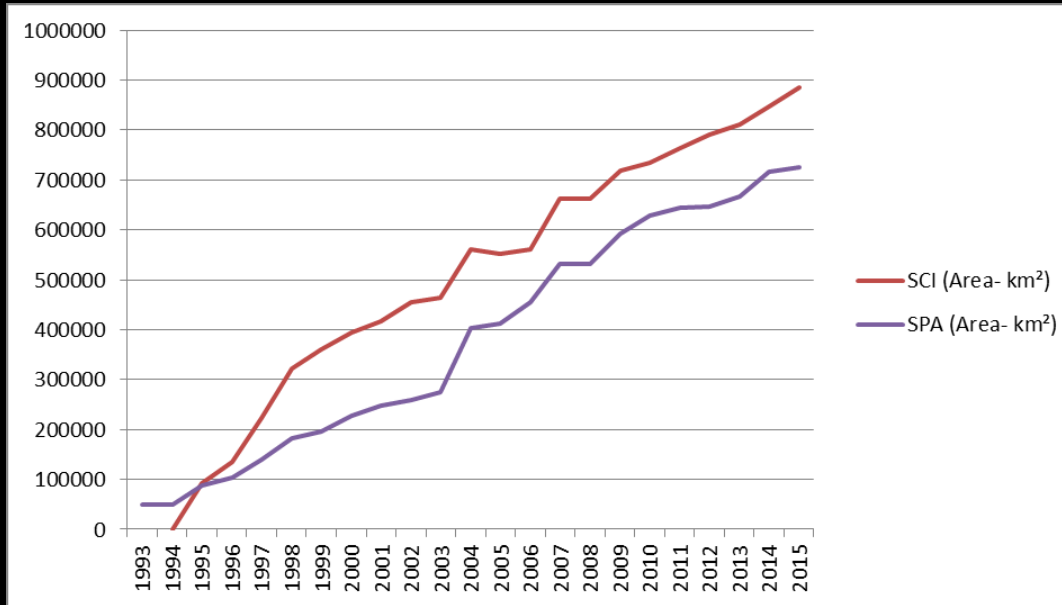
```
graph TD; subgraph Indirect; E[Economic]; D[Demographic]; S[Socio-political]; C[Cultural & religious]; T[Science & Technology]; end; subgraph Direct; H[Habitat Change]; Cl[Climate Change]; IS[Invasive Species]; O[Over-exploitation]; NP[Nutrients & pollution]; end; B[Biodiversity Loss]; E --> H; D --> Cl; S --> IS; C --> O; T --> NP; H --> B; Cl --> B; IS --> B; O --> B; NP --> B;
```

# The threat from climate change

- “Greatest threat to life on earth - estimated 10% of the world’s species pushed to the brink of extinction with every °C rise in global temperatures”
- Currently ~ 1°C
- Arctic 20°C higher last year



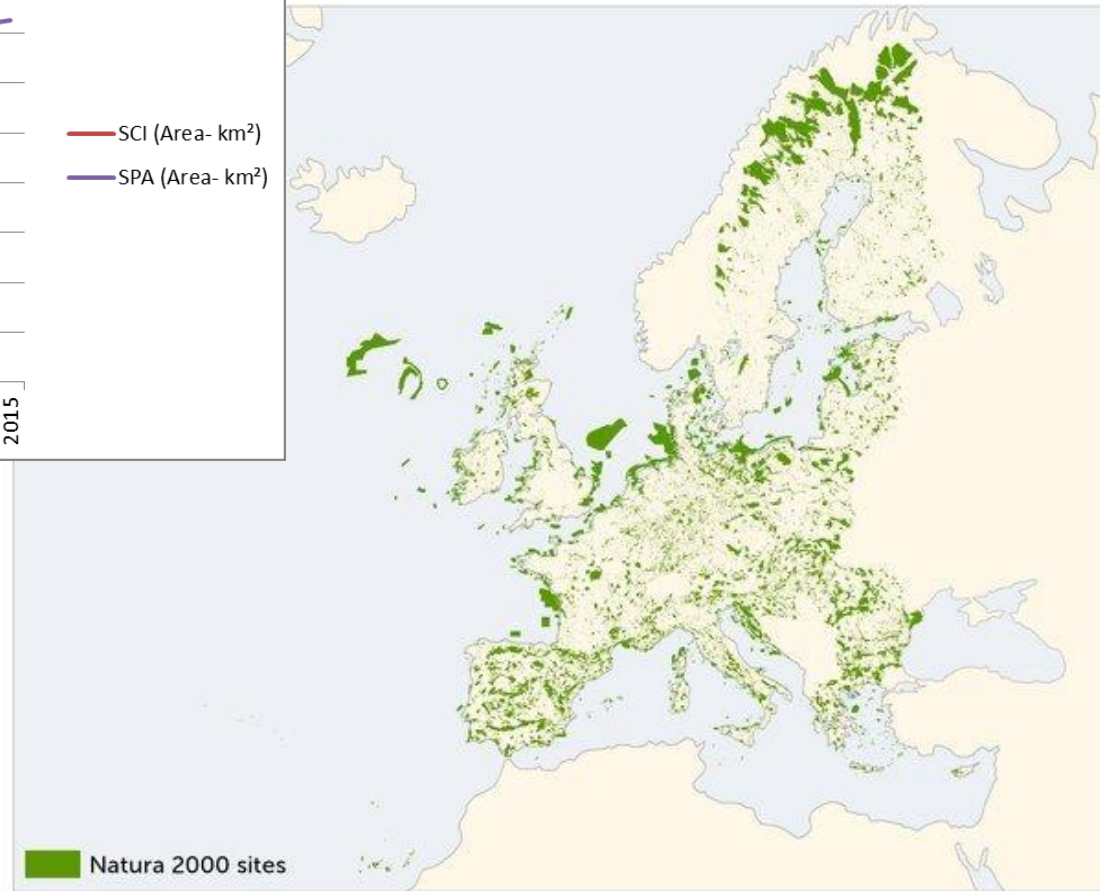
# Protected Areas: a key tool in conserving nature....



Natura Sites

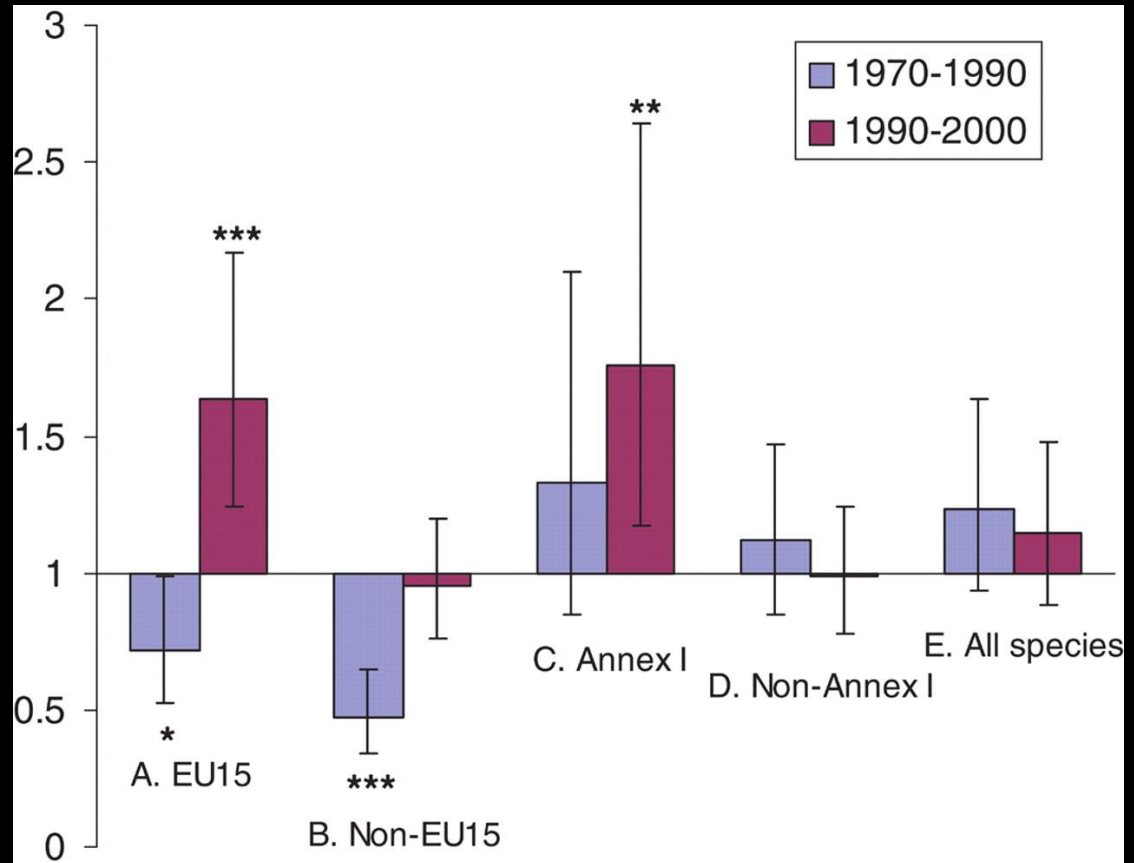
18% EU Land Area

6% EU Marine Area



## ...that works!

- Bird populations doing better in EU than non-EU countries in Europe
- Annex 1 species (those requiring special conservation measures), doing better than non-annex 1 species



# The future

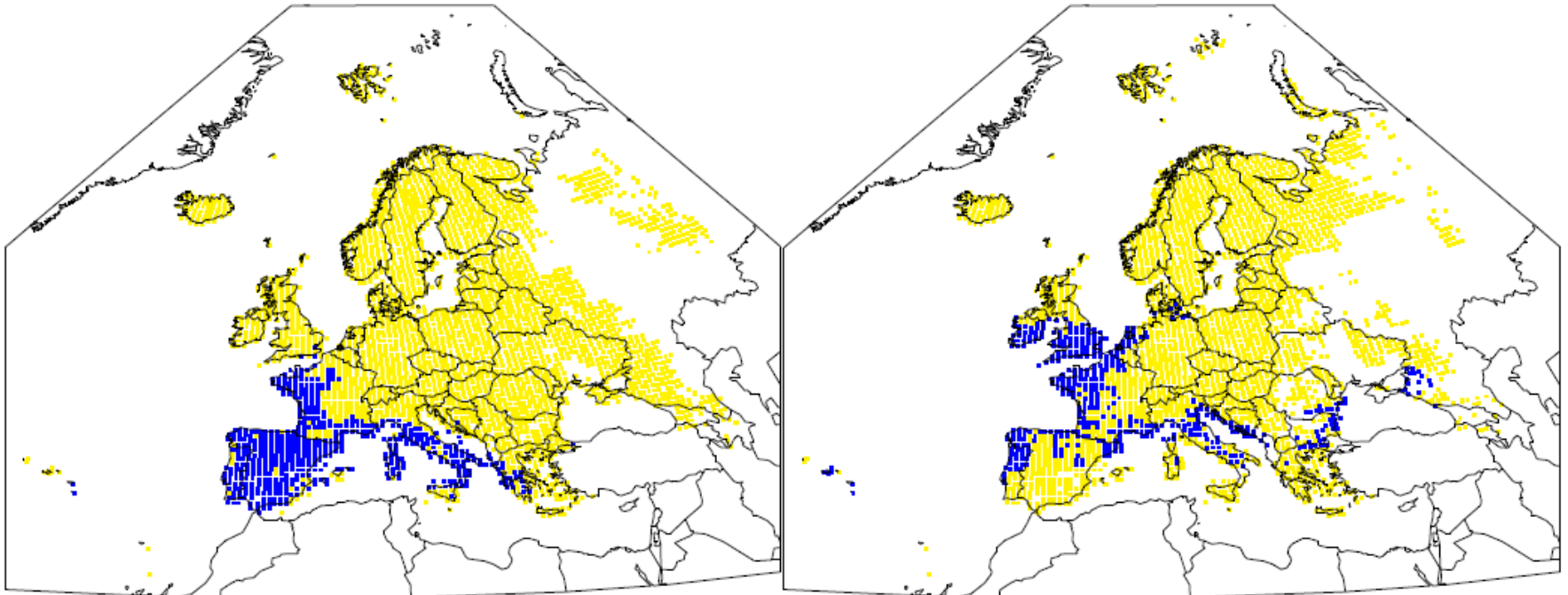
Large-scale shifts & reductions in species' ranges projected to occur



Dartford warbler

Simulated distribution for 1961-1990

Projected distribution for late 21<sup>st</sup> Century



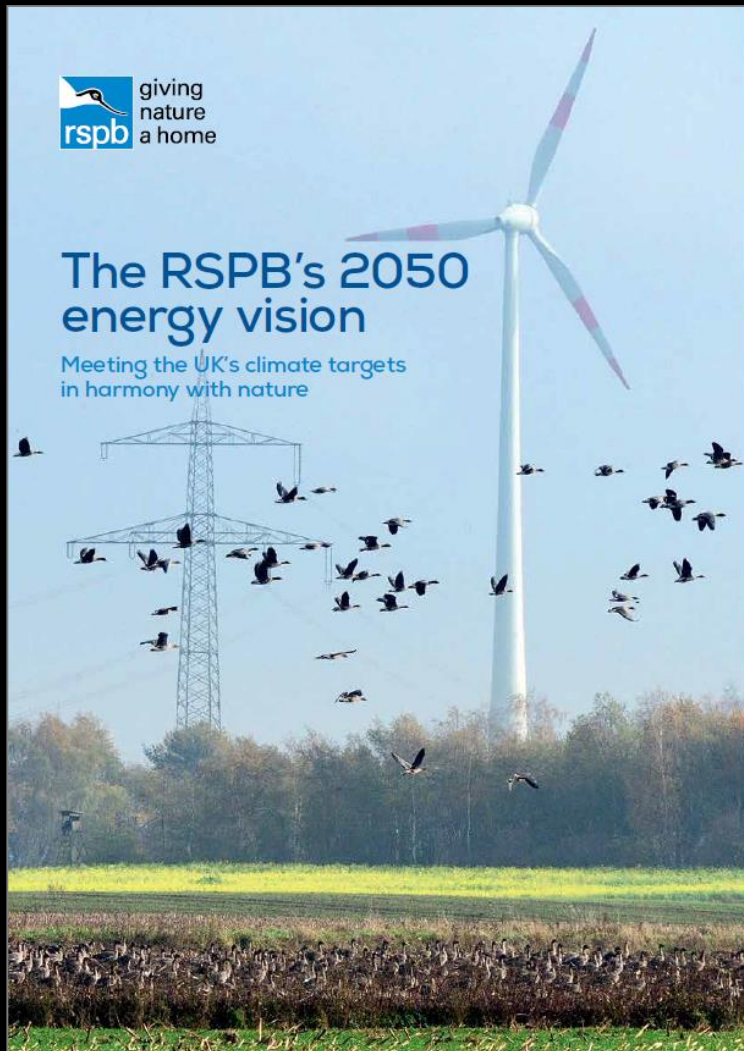
Future range: 86% size of current range, 39% overlap with current range



## So we need.....

- A rapid transition to a low carbon economy to combat climate change....
- ....delivered in a way that is sustainable and does not further deplete nature....
- ....and is supported by the society as a whole, if it is to have political and moral legitimacy

# Key question: can low carbon energy be generated without harming nature?



- Added environment layers to DECC 2050 calculator to test different generation scenarios

- Conclusion.....Yes!

- *Affordable*
- *Secure*
- *Low carbon*
- *In harmony with nature*

Two year study; thanks for data to BTO, The Crown Estate & Ecotricity. Results inc. peer reviewed paper

# THE MAGNIFICENT SEVERN

## A NATURAL PHENOMENON



UK's Largest  
coastal plain estuary



Largest  
tidal range in Europe



Over 110  
fish species



100,000 Birds  
winter feeding ground



Nature Protected  
in designated areas



Blue Carbon  
locked up in habitats

Iconic  
surrounding landscapes











Tiny





# SEVERN VISION

[WWW.SEVERNVISION.ORG](http://WWW.SEVERNVISION.ORG)



OUR VISION . . . . IS FOR A SEVERN  
ESTUARY THAT, by 2040:

Is restored as a healthy **functioning ecosystem**, valued for its internationally important wildlife, habitats and landscapes;

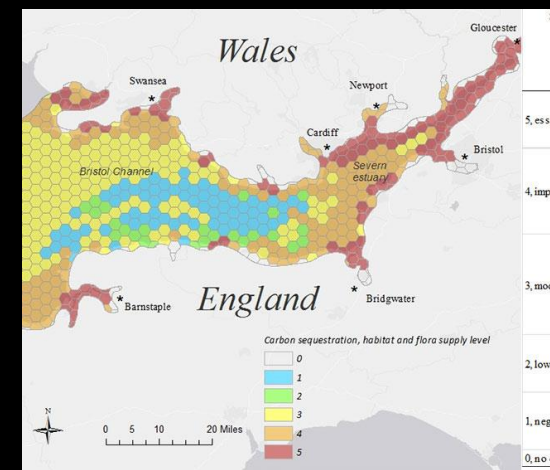
**Provides more benefits** for people, local communities, places, and economies, including **greater resilience to climate change**; and

Becomes a **natural powerhouse**, where **development is planned and managed** in a way that sustains and enhances the estuary's resources.



# The Seven Steps to a Magnificent Estuary

- Avoid further loss of nature
- Restore nature
- Use coastal habitats to reduce climate change impacts
- Use the Estuary to help reduce carbon emissions
- Grow knowledge to enable better decision making
- Develop – in harmony with nature - tidal renewable energy
- Establish stronger governance for a sustainable Severn



[WWW.SEVERNVISION.ORG](http://WWW.SEVERNVISION.ORG)



# FROM DEFENDERS TO CHAMPIONS

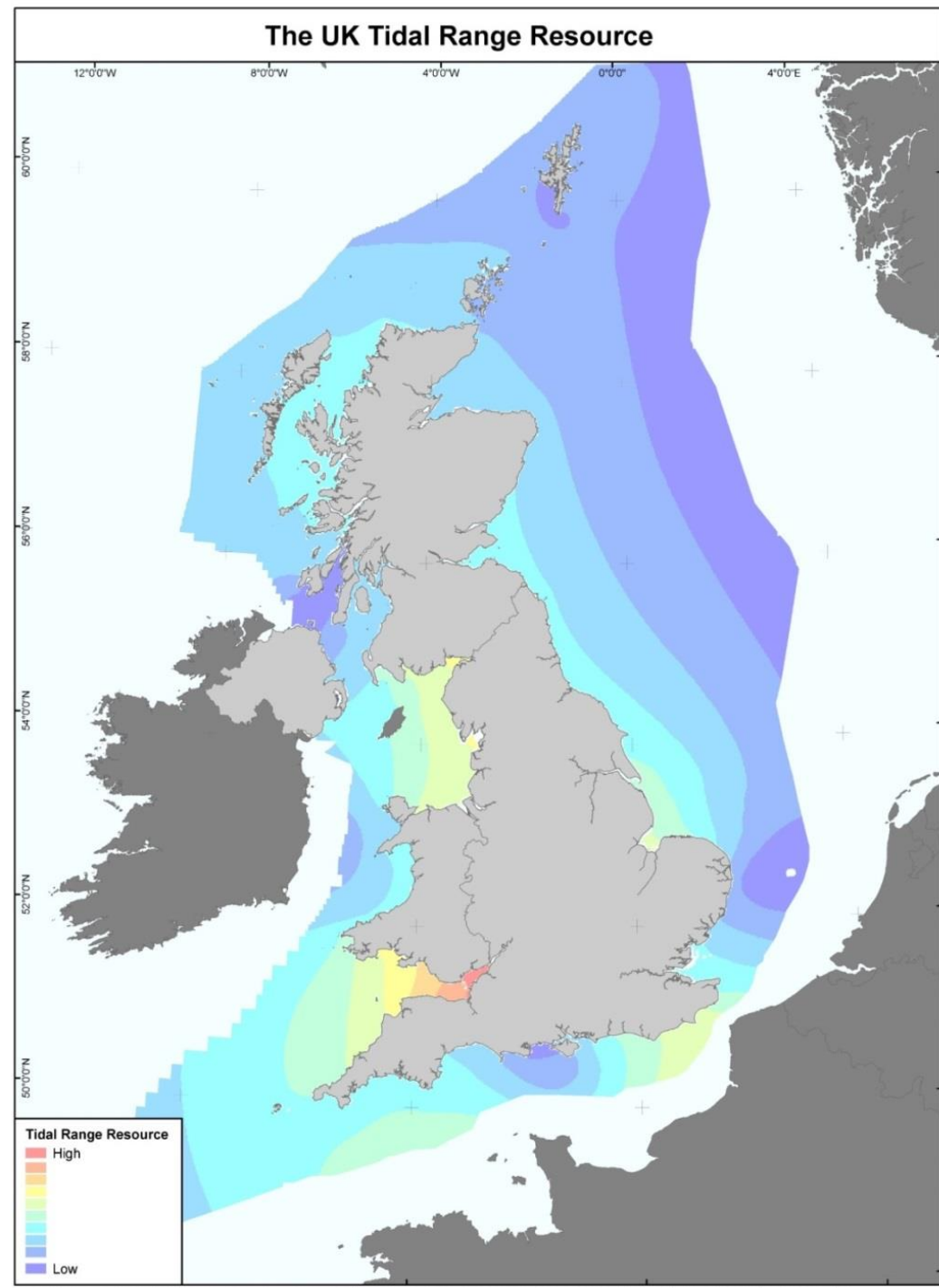
From objectors to advocates

Move from mitigation and compensation in response to big infrastructure proposals

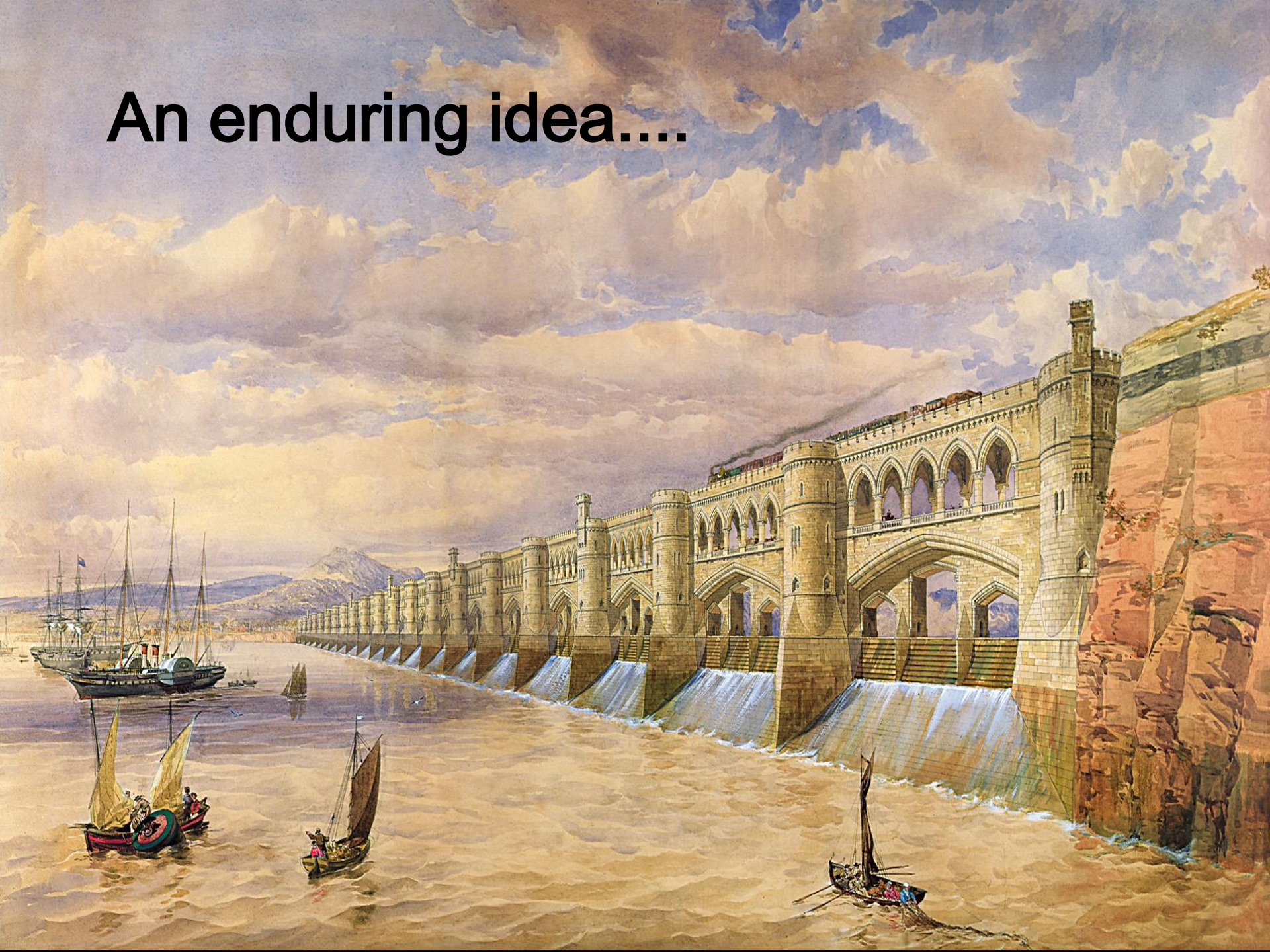
To championing the inherent value and what the estuary can do for our society.



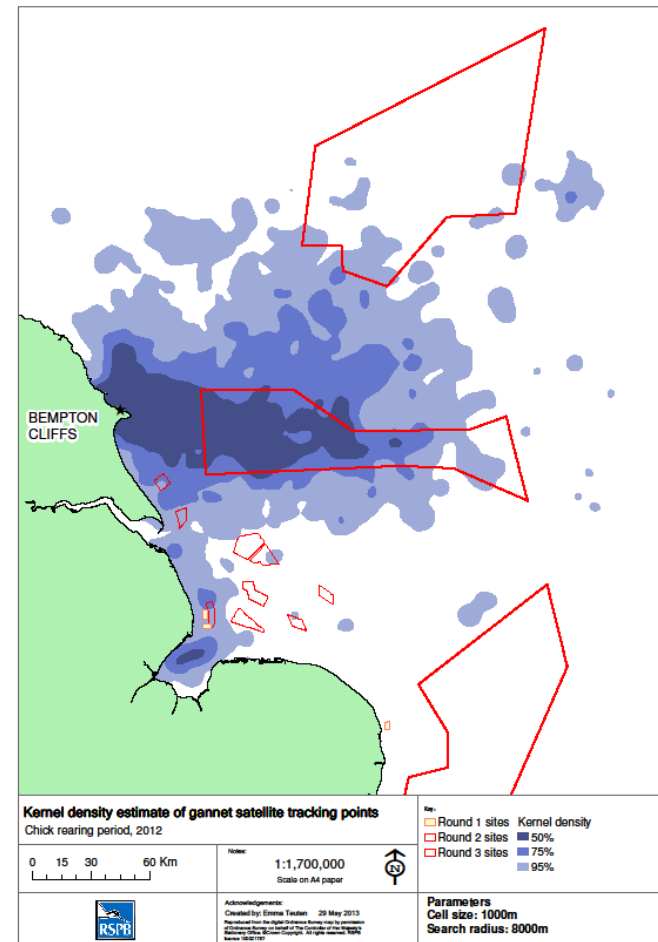
# .....and Tidal Energy from the Severn?



An enduring idea....



# Introducing a new technology: learning from offshore wind



...and the result, since 2001?

RSPB Firth of Forth Judicial Review:

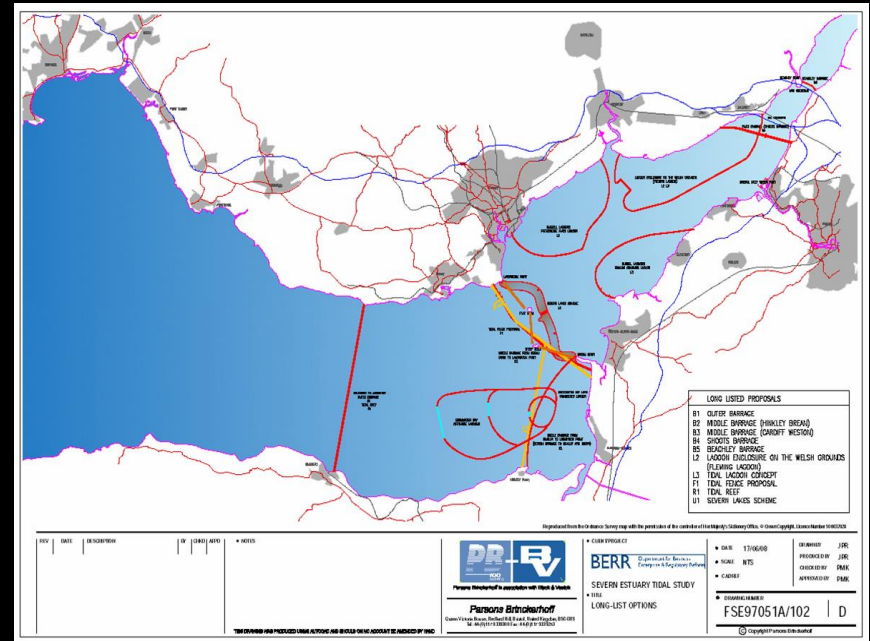
“I am not convinced that a sea bird “appropriate assessment”, however skillful, however conscientious, can aspire in the present state of knowledge to be more than a kind of structured haruspication”.

Lord Steward, Court of Session, 21<sup>st</sup> July 2016;

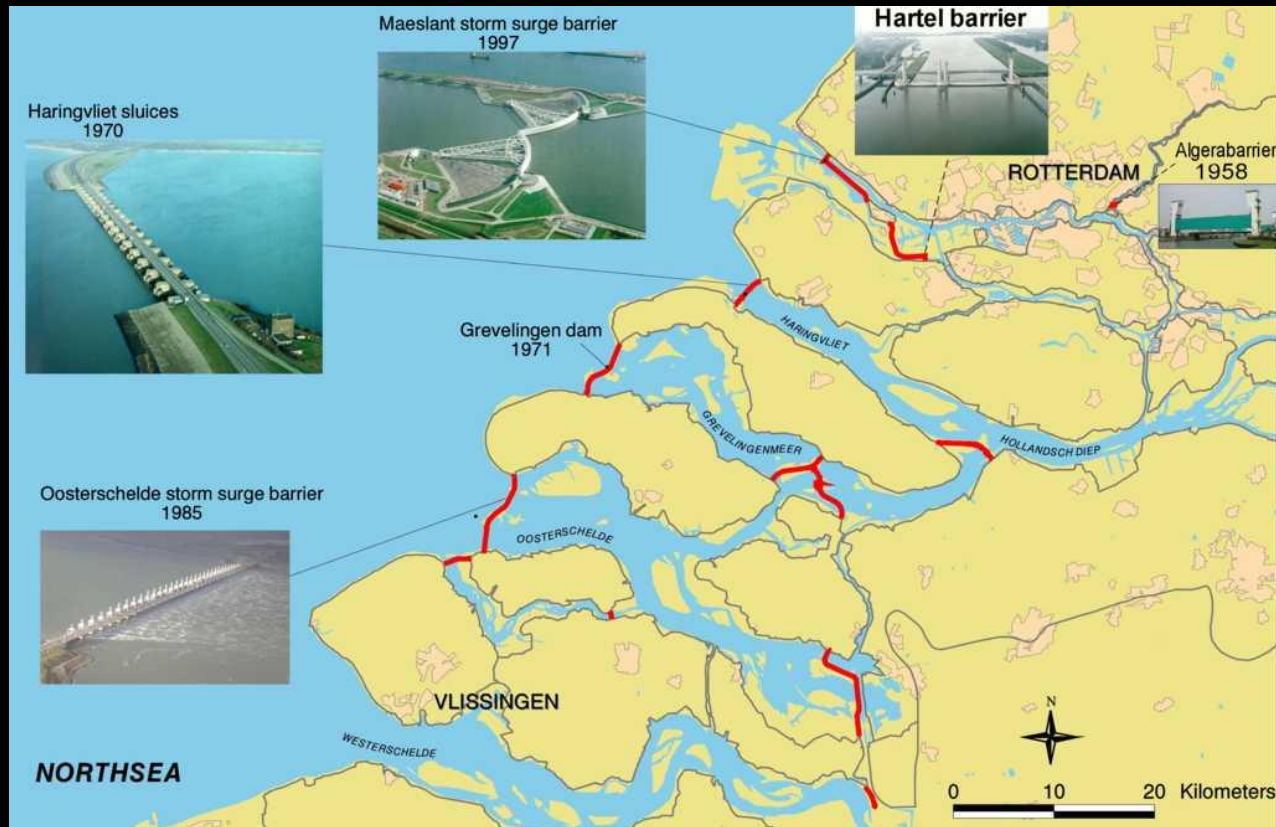


# And so to tidal...the 2006 Energy Review

- Could Cardiff- Weston \$20bn+ 17TWh/yr barrage be built using current technology, at economic cost within 5 years?
- £9m, 2yr study; £0.5m SETS
- Wrong question??
- Public consultation; RSPB contributed economic, technical and geomorphological evidence
- Conclusion: too expensive, and unacceptable impacts



# Lessons from Dutch Storm Surge Barriers



- Erosion – 50% loss of intertidal by 2050
- Oystercatchers – 80% decline by 2050
- Increased fluvial flood risk

# And Tidal Lagoons?

- High potential for other renewable technologies to help decarbonise the UK's energy supply with lower risk for nature than tidal lagoons.
- Tidal lagoons may have potential; need to learn lessons re ecological impacts and appropriate environmental management before delivering at scale.
- There is a case for Swansea as a well monitored 'First of a Kind' Scheme.





## So to conclude.....we need:

- A rapid transition to a low carbon economy to combat climate change....
- ....delivered in a way that is sustainable and does not further deplete nature....
- ....and is supported by the society as a whole, if it is to have political and moral legitimacy

# Energy Vision and tidal energy

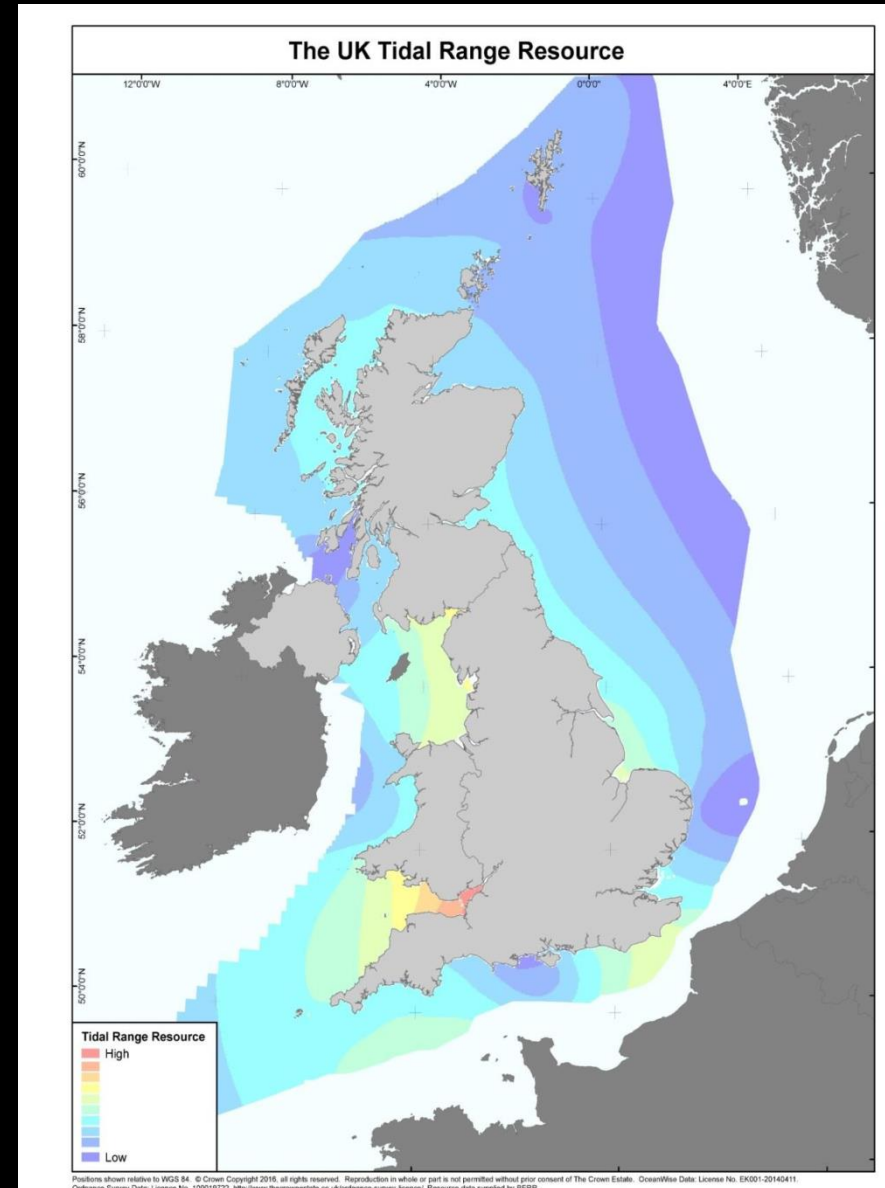
- Tidal lagoons “high ecological risk”
- Sig biodiversity impacts in most viable locations
- No barrages
- DECC 2050 Calculator does not distinguish between lagoons and barrages
- Level 2 assumes ~ 3 small lagoons
  - combined capacity of 1.7GW, generating 3.4 TWh/yr by 2050 .
- Precautionary approach as ecological impacts not yet well understood.

# RSPB evidence to Hendry Review

- Acknowledged Severn renewable energy potential
- Highlighted significant potential for wildlife harm
- Energy Vision 3 small tidal lagoons; supported
- Further schemes possible once lessons learned
- Government should support well monitored pilot projects
- At scale they should succeed in integrating energy production with nature

# Hendry on tidal energy

- Tidal lagoons would contribute to:
  - UK's security of supply
  - the UK's decarbonisation goals
  - Indigenous, predictable, reliable
- Expensive but very long lived
- Support for pathfinder project at Swansea
  - 320 MW, providing power to over 155,000 homes



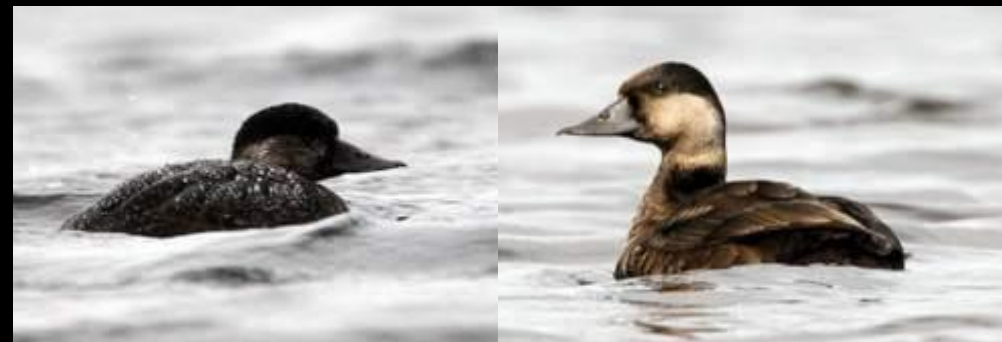
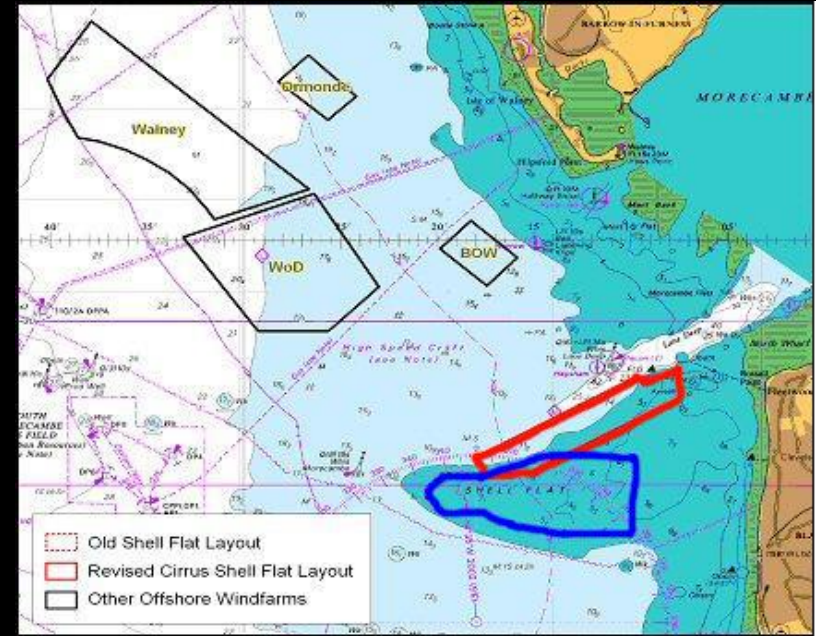


## And in achieving this, we need

- Leadership from Governments in making the difficult choices we face
- Public involvement crucial, in making the right choices for the long term
- Better Regulation
- Investment in improving evidence-base

# Shell Flat: Blackpool

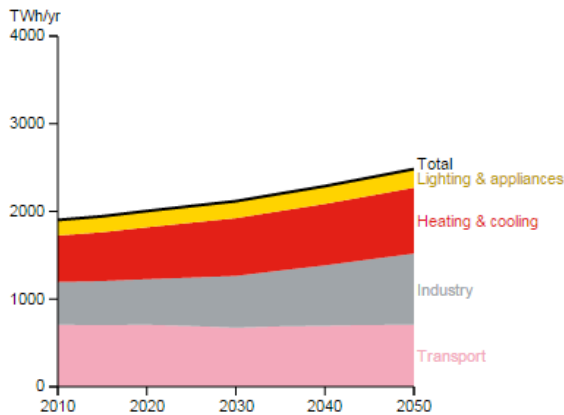
- Round 1 site: initial plans for 324MW, 90 turbines in 2003
- EIA surveys found a globally important bird population of 60,000 common scoter
- Displacement
- Attempt to modify location met problems with navigation and radar.
- Abandoned 2008



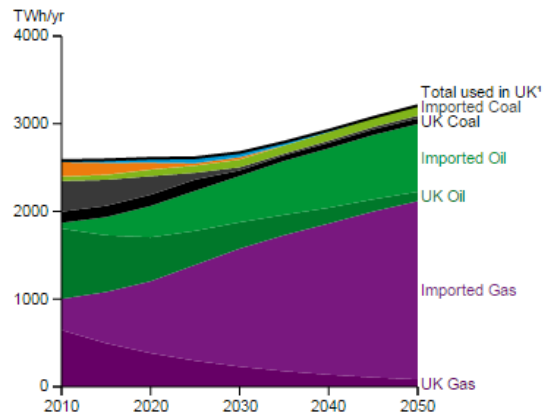


# Our approach: DECC 2050 Calculator

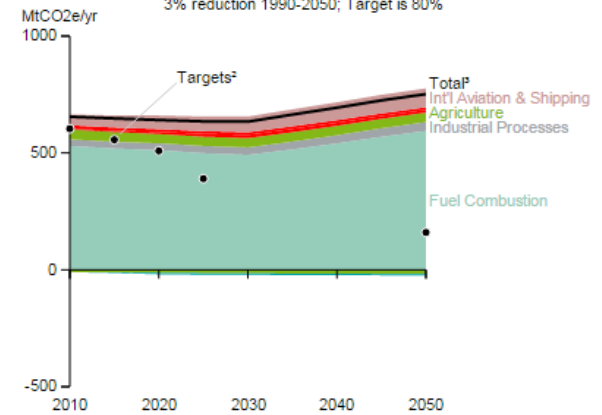
Final Energy Demand



Primary Energy Supply



Greenhouse Gas Emissions



Domestic transport behaviour	?	1	2	3	4
Shift to zero emission transport	?	1	2	3	4
Choice of zero-emission technology	?	A	B	C	D
Domestic freight	?	1	2	3	4
International aviation	?	1	2	3	4
International shipping	?	1	2	3	4
Average temperature of homes	?	1	2	3	4
Home insulation	?	1	2	3	4
Home heating electrification	?	A	B	C	D
Home heating that isn't electric	?	A	B	C	D
Home lighting & appliances	?	1	2	3	4
Electrification of home cooking	?	A	B		
Growth in industry	?	A	B	C	
Energy intensity of industry	?	1	2	3	
Commercial demand for heating and cooling	?	1	2	3	4
Commercial heating electrification	?	A	B	C	D
Commercial heating that isn't electric	?	A	B	C	D
Commercial lighting & appliances	?	1	2	3	4
Electrification of commercial cooking	?	A	B		

Nuclear power stations	?	1	2	3	4
CCS power stations	?	1	2	3	4
Choice of CCS power station fuel	?	A	B	C	D
Offshore wind	?	1	2	3	4
Onshore wind	?	1	2	3	4
Wave	?	1	2	3	4
Tidal Stream	?	1	2	3	4
Tidal Range	?	1	2	3	4
Biomass power stations	?	1	2	3	4
Solar panels for electricity	?	1	2	3	4
Solar panels for hot water	?	1	2	3	4
Geothermal electricity	?	1	2	3	4
Hydroelectric power stations	?	1	2	3	4
Small-scale wind	?	1	2	3	4
Electricity imports	?	1	2	3	4
Land dedicated to bioenergy	?	1	2	3	4
Livestock and their management	?	1	2	3	4
Volume of waste and recycling	?	A	B	C	D
Marine algae	?	1	2	3	4
Type of fuels from biomass	?	A	B	C	D
Bioenergy imports	?	1	2	3	4

Geosequestration	?	1	2	3	4
Storage, demand shifting & interconnection	?	1	2	3	4

**Notes**

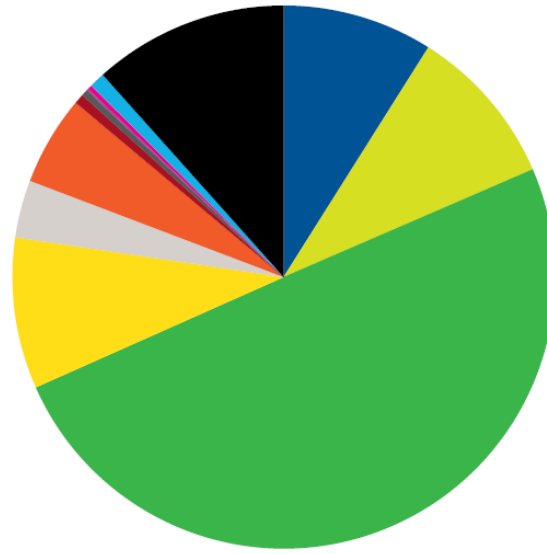
- ?** Question marks take you to one page descriptions of each choice
- 1** The least effort possible on this choice.
- 2** Viewed as ambitious, but reasonable by most experts.
- 3** Viewed as unlikely without significant change from the current system and/or significant technological breakthroughs
- 4** The upper end of what is thought to be physically plausible by the most optimistic observer.
- A-D** A range of options where one alternative is not necessarily harder than another
- Total used in the UK<sup>1</sup>** Primary energy supply is normally higher than final energy demand, because of the energy used to generate electricity.
- Targets<sup>2</sup>** The targets up to 2027 exclude international aviation and shipping. They are also calculated as five year 'budgets', rather than the single year targets shown here.
- Total<sup>3</sup>** The total includes the reduction in emissions from carbon capture and storage and from growing new biomass to replace that used (the bioenergy credit).



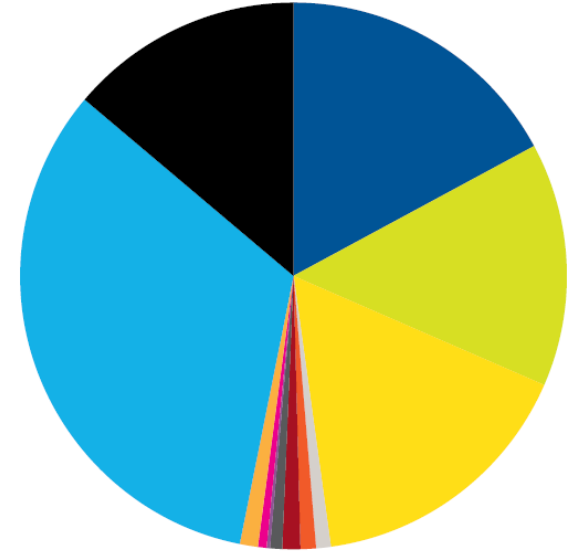
# Our scenarios: UK energy futures for 2050



Scenario 1.  
Mixed renewables



Scenario 2.  
High marine renewables



Scenario 3.  
High onshore renewables

- |                          |                |                                |                       |              |
|--------------------------|----------------|--------------------------------|-----------------------|--------------|
| ■ Onshore wind           | ■ Solar        | ■ Hydroelectric power stations | ■ Tidal range         | ■ Geothermal |
| ■ Fixed offshore wind    | ■ Wave         | ■ Biomass power stations       | ■ CCS                 |              |
| ■ Floating offshore wind | ■ Tidal stream | ■ Small-scale wind             | ■ Electricity imports |              |

- Natural assets poorly understood
- Marine protected area network incomplete
- Weak SEA = licences issued for nature rich areas
- Impacts of wind farms on nature poorly understood (displacement; collision risk); over-reliance on modelling, not confirmed by empirical data
- Significant risk to birds and cetaceans



# Key conclusions

- **Can meet targets** with high levels of renewables in harmony with nature
- Major strides in demand reduction and **energy efficiency**
- **Onshore wind** and **solar** are key; well-sited projects should be supported;
- R&D on **energy storage** and **smart grid networks** critical to long-term security of supply;
- New technologies e.g **floating offshore wind turbines**, to unlock substantial renewable energy capacity, potentially with low ecological risk,
- **Research needed on ecological impacts of technologies**, esp at sea;