



How developers of offshore wind farms deal with the avoid / reduce / offset hierarchy?

A state of the art in northern European countries and France

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Energy Challenge and Environmental Sustainability

- Environmental **sustainability**
- **Marine renewable energies:**
 - ↳ the use of conventional energy resources
 - ↳ GES emissions
- **Offshore wind farms case:** most advanced marine renewable technology in Europe
- But: potential **impacts** on marine ecosystem services

Requirements of the legal framework

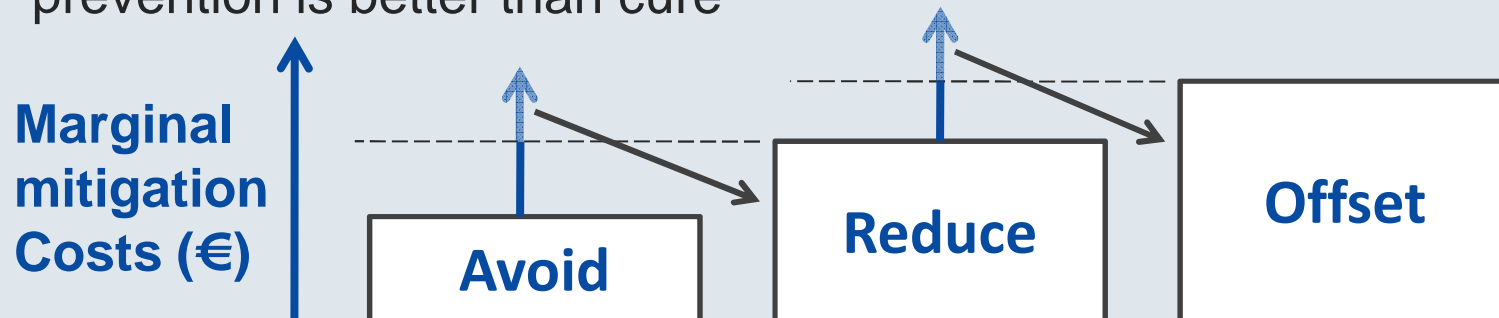
- Aim: prevent ecosystem services from impacts of projects
- **Environmental Impact Assessment Directive, Habitats and Birds Directives (Natura 2000)**
- Wind farms in the list of concerned projects
- Avoid > Reduce > Offset: mitigation **hierarchy**



Mitigation costs from an economic point of view

Rational developer should follow cost reduction strategy for the mitigation measures:

- Based on mitigation hierarchy and theoretical economic logic 'prevention is better than cure'



- Not based on mitigation hierarchy : trade off between mean cost of avoiding, reducing and offsetting measures
- Mitigation costs have no weight in the global trade off
- Mitigation costs are too high (e.g. impact on a protected species): abandonment of the project

Review of EIA reports for offshore wind farms in Northern Europe

Selected **Bottom-fixed** offshore wind farms (06/01/2012)

Country	Number of farms	
	in production	Under construction
UK	13	5
Denmark	9	1
Sweden	4	0
Germany	2	3
Belgium	2	1
Netherlands	2	0
Ireland	1	0

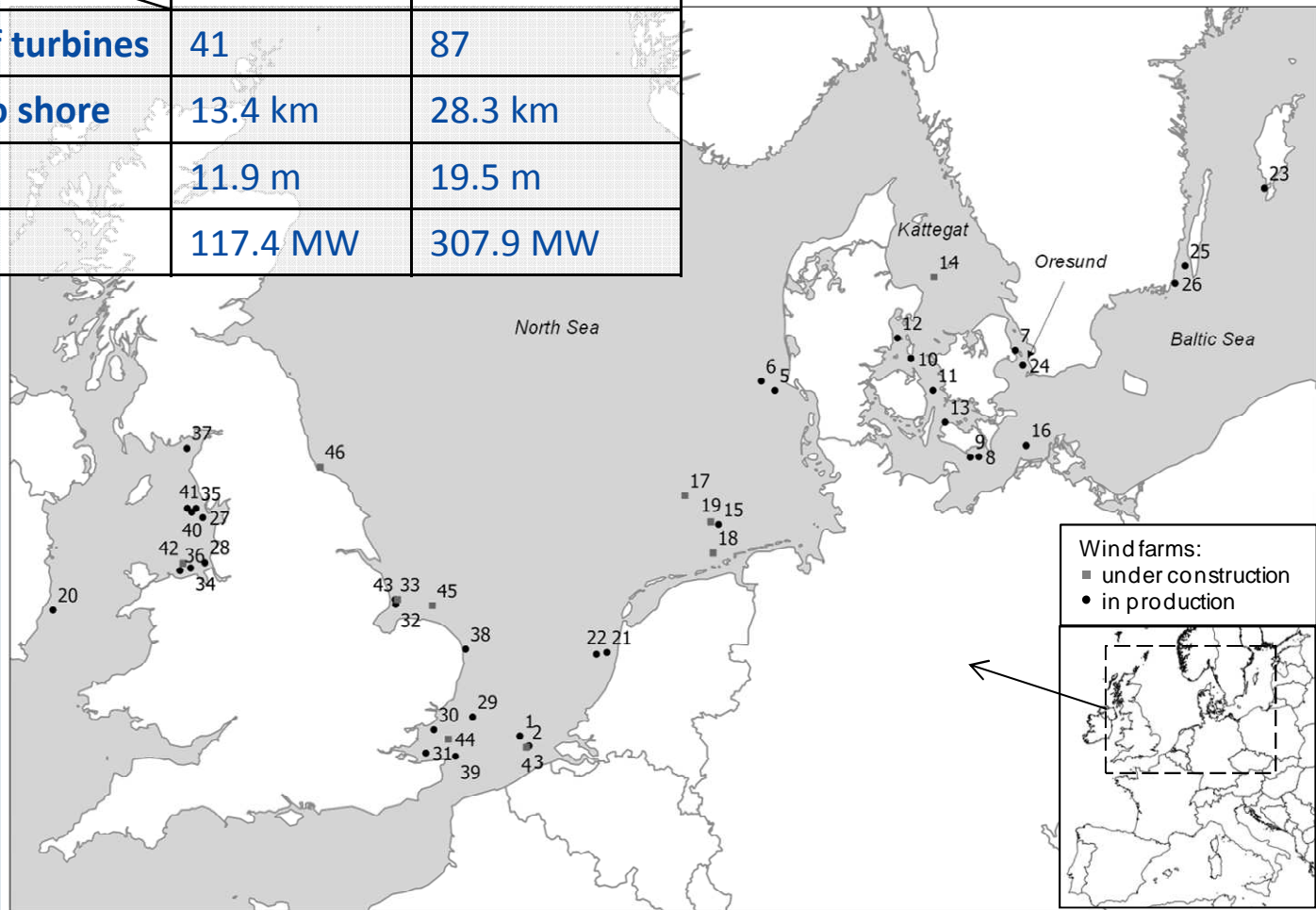
Not **Selected**:

- Small demonstration farms
- Near shore farms (artificial island, spits of land/bridges)
- Farms in lakes or not open sea areas (harbours, estuaries)
- Floating wind farms

→ 36 EIA reports collected (online or request) / 43 selected farms

Map of the 43 studied offshore wind farms

Step \ Means	In production	Under construction
Number of turbines	41	87
Distance to shore	13.4 km	28.3 km
Depth	11.9 m	19.5 m
Capacity	117.4 MW	307.9 MW



© EuroGeographics for the administrative boundaries

Main described potential impacts on marine ecosystem services

- **Construction [++]**
 - Turbidity (stirred up sediments)
 - Seabed and benthos alteration
 - Loss of seabed
 - Underwater noise and vibrations
- **Exploitation [+]**
 - Disruption of hydro-sedimentological regimes
 - Barrier effect and collision risk for birds
 - Underwater noise and vibration
- **Dismantling [?]**
 - Same impacts as during construction phase
 - (+Decrease in installed biodiversity)

Offshore ecological offset measures?

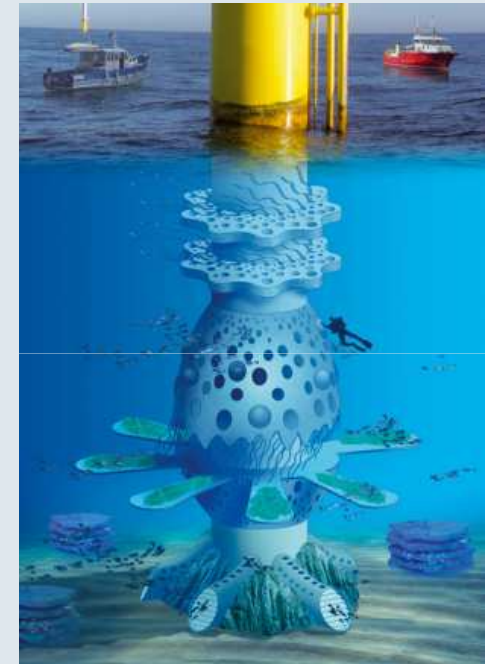
	Onshore ecosystem services	Offshore ecosystem services
Avoid	YES Spatial and temporal planning	
Reduce	YES Measures of reduction	
Offset	YES Ecological restoration	NO Residual impacts considered as non significant

BUT also positive effects of wind farms

- potential habitat gains
- reserve effect

Assumptions to explain the absence of offshore ecological offset measures

- Technical and ecological assumptions :
 - No significant residual impacts
 - Positive impacts > negative impacts
 - High resilience of marine ecosystem services
 - Poor knowledge and low technical feasibility
- Governance and social assumptions :
 - Not mandatory compensation of residual impacts
 - EIA process not efficient, no clear support policies or operational guidelines
 - Lack of an environmental stakeholder or environmental consensus
 - Underwater impacts not perceived by the public or perceived as acceptable

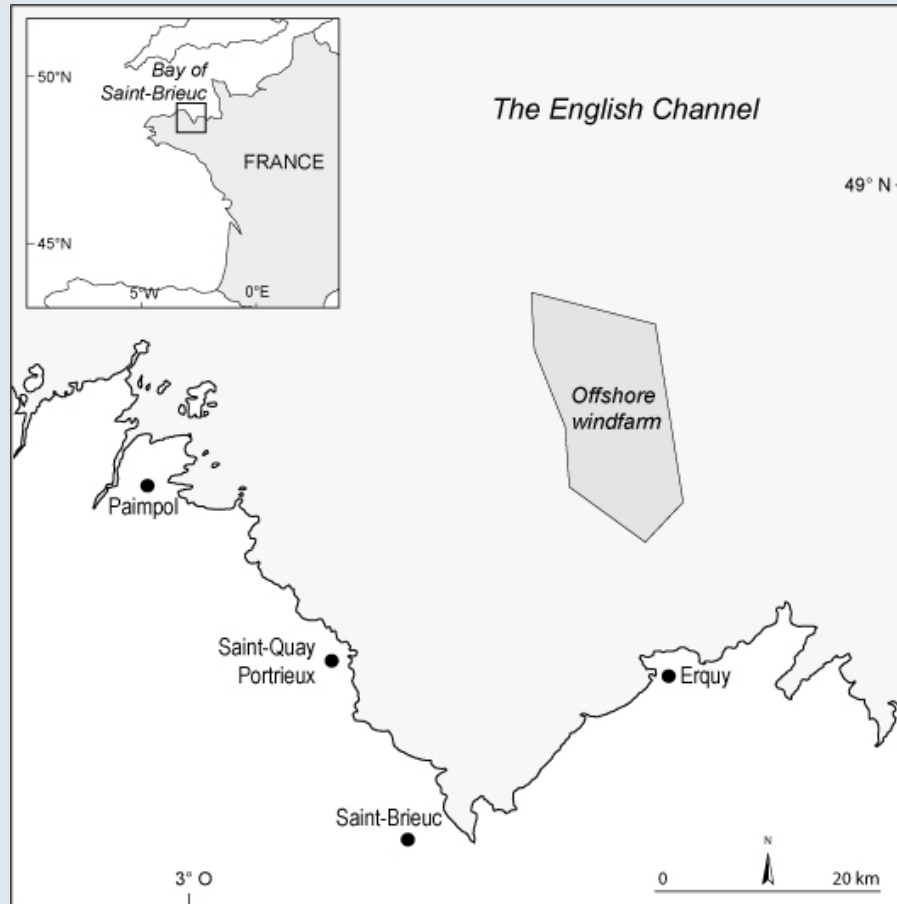


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Environmental sustainability and energy together ?

- Economic logic 'Prevention is better than cure' theoretically respected
- Environmental sustainability of marine renewable energies can be questioned if we admit that residual impacts are not so non-significant
- Trade-off between a **global** aim: making greenhouse gases emission decrease using renewable energies, and a **local** aim: stopping the erosion of biodiversity at a local scale.

A french case-study: the Bay of Saint Briec off shore Wind Farm



Key characteristics :

Investment : 2 billion €

Project area : 100 turbines – 80 km²

Situation : 17 km from the coast

Total capacity : 500 MW

Developers : Consortium lead by Iberdrola

A first survey with institutional stakeholders to capture perceptions regarding impacts and compensations

27 stakeholders met:

- Mayor of the city Erquy and Saint-Quay-Portrieux
- Leaders of the environmental association “Vivarmor” and “GMB”
- Leader of the local residents association “association des cinq chemins”
- Committee representative of the regatta of Pléneuf Val-André
- Project managers “energy” of the General Council
- Conservator of the natural reserve of the bay of Saint-Brieuc
- Project manager of the natural reserve of the bay of Saint-Brieuc
- Representative of the “Syndicat des caps”
- Representatives of the chamber of commerce
- Representative of the fisheries committee of Paimpol
- Project managers of the fisheries committee of Paimpol, Rennes and Saint-Malo
- Representatives of the association “Côtes d’Armor Développement”
- Director and instructor of “Erquy sailing club”
- Manager of the club dive “Histoires d’eau” of Erquy
- President and Vice-Chairman of recreational fishing committee
- Offshore wind farm project manager of “Nass et Wind”

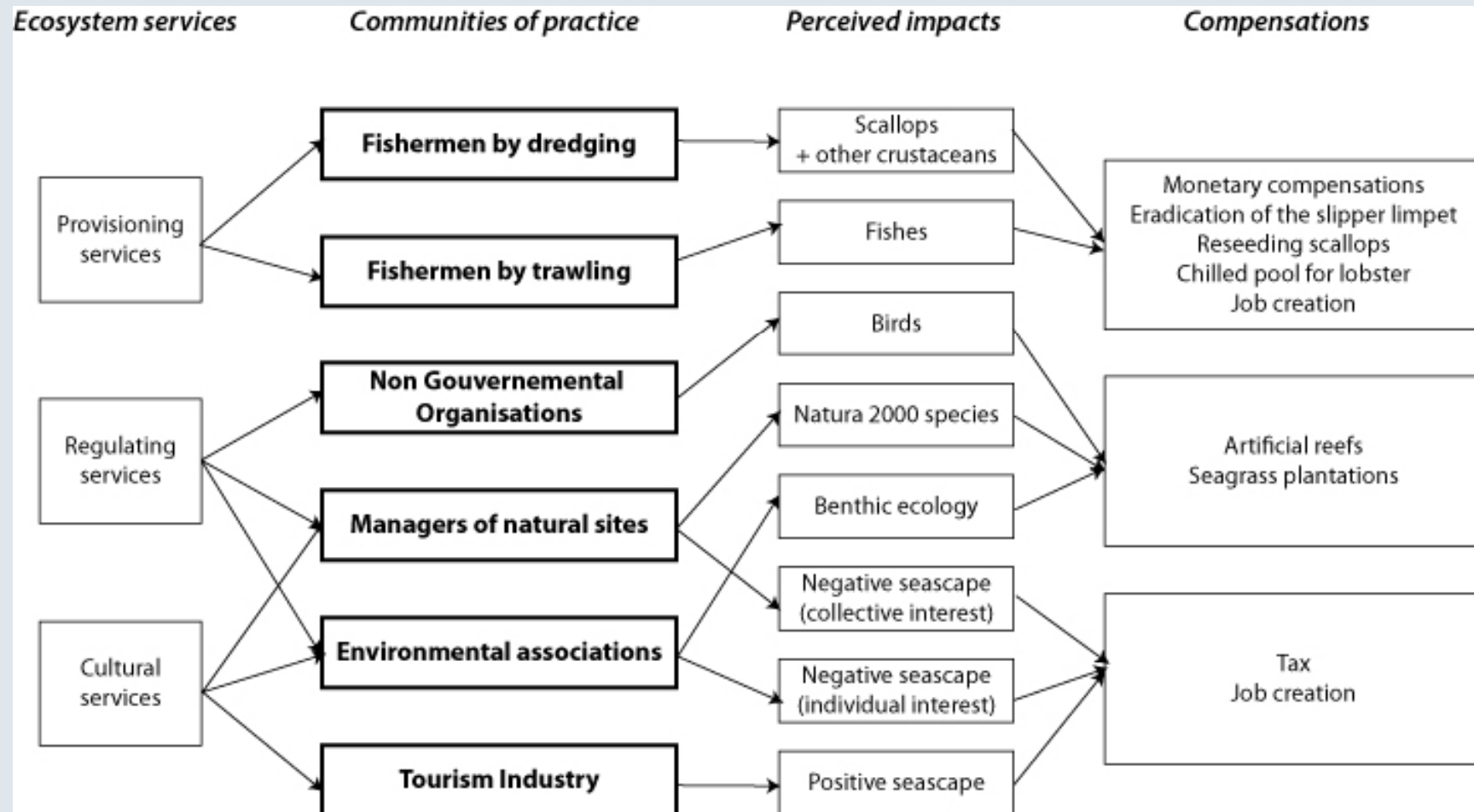
Perception of impacts in the area

- Greatly variable
- Slightly shaped except for fishermen
- Most of the time few impacts mentioned
- Main negative impact mentioned: impacts on seascape, especially at the East of the bay
- Environmental NGOs and reserve managers: agree with the project of marine renewable energy, wait and see regarding potential ecological impacts
- Commercial fishers: impact on a population of scallops, potential impact during the construction phase
- Tourism industry, recreational fishers, business organisations, recreational activities associations (diving, sailing) did not mention specific impacts

Compensations which have been negotiated

- Compensation for commercial fishers
 - Fundings coming from the tax (by 2018 when the production of electricity will start)
 - Companion compensations allowing to fill the gap between 2012 and 2018: gathering of invasive species (slopper limpet), chilled pool for lobster, job creation devoted to the marine renewable energy program, scallops seeding
 - Compensation due to loss of incomes or/and resources: individual monetary compensation and collective physical compensation
- Compensation for municipalities
 - Fundings coming from the tax
 - Employment: maintenance harbor, new tourist activities (boat tour in the windfarm)
- Compensation for other stakeholders: artificial reefs for recreational fishing activities

Summary of impacts and compensation perceived by each community of practices



Thank you for your attention