Offshore Wind Farms and Fishing Activity in the Irish Sea

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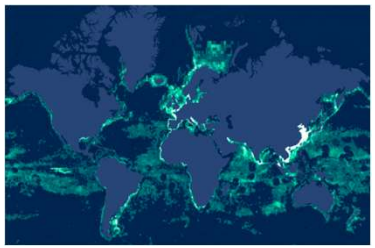
INTRODUCTION

Research Question: How does offshore wind farm operation affect fishing effort within wind farm areas in the Irish Sea?

Offshore wind is a growing energy source across the world as countries pursue lower carbon energy systems. This expansion can increase competition over marine space, most clearly with commercial fishing. Wind farm development can restrict access to fishing grounds and alter vessel behavior. The United Kingdom provides a useful setting to study this issue because it has both a large offshore wind sector and a historically important fishing industry. This study examines whether offshore wind farm operations impact fishing activity, measured using AIS-based apparent fishing effort from Global Fishing Watch. I compare fishing effort in offshore wind farm areas to similar control areas before and after wind farm operation to estimate how development affects observed fishing intensity.

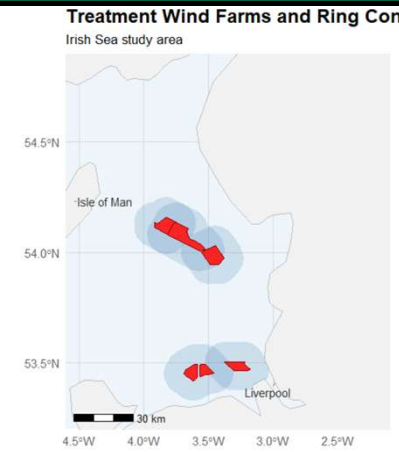
STUDY AREA & DATA

The study examines offshore wind farms in the Irish Sea study area, focusing on five wind farms that became operational after 2014. Treatment polygons are defined using The Crown Estate wind site agreement polygons, and operational dates are taken from the UK government's Renewable Energy Planning Database (REPD). Fishing activity is measured using Global Fishing Watch AIS-based daily fishing effort data from 2012 to 2025. AIS, or Automatic Identification System, was originally developed for vessel safety and collision avoidance, but it can also be used to track vessel movement over time. Global Fishing Watch uses these vessel tracks and applies a machine-learning classification method to identify when vessel behavior is likely consistent with fishing activity. The map shows both the treatment wind farms and the nearby ring-control waters used to compare fishing effort before and after wind farms began operating. Each wind farm is matched to a nearby 10 km ring control area to create a local comparison group outside the treated polygon.



Treatment wind farms in the study area.

Farm	Group	Status	Capacity (MW)	No. Turbines	Operational Date
West of Duddon Sands	Treatment	Operational	389		108 Oct 2014
Gwynt y Mor	Treatment	Operational	576		160 Jun 2015
Burbo Bank Extension	Treatment	Operational	258		32 May 2017
Walney Extension 3	Treatment	Operational	330		40 Sep 2018
Walney Extension 4	Treatment	Operational	659		110 Sep 2018



METHODS

- I use a difference-in-differences design to compare fishing effort in treated wind farm polygons to nearby untreated waters before and after operation begins.
- Each wind farm is matched with a 10 km ring control, around the border of the farm, which serves as the main local comparison group.
- Fishing activity is measured as daily fishing hours per km², allowing comparison across areas of different sizes.
- The baseline model includes pair, year, and month fixed effects, plus day-of-week controls.
- A second specification is estimated with group-specific time trends, which helps account for different underlying trends between treated and control areas
- Results are compared with an alternative surrounding-water control specification.

Equation:

$$Y_{it} = \beta_0 + \beta_1 PostTreat_{it} + \alpha_i + \gamma_{year} + \lambda_{month} + \theta_{dow} + \varepsilon_{it}$$

Definitions:

Y_{it} = daily fishing hours per km² in area i on day t

$PostTreat_{it}$ = 1 after a treated wind farm is operational by day t, 0 otherwise

α_i = pair fixed effects

γ_{year} = year fixed effects

λ_{mont} = month fixed effects

θ_{dow} = day-of-week controls

β_1 = estimated treatment effect

ε_{it} = error term

LIMITATIONS

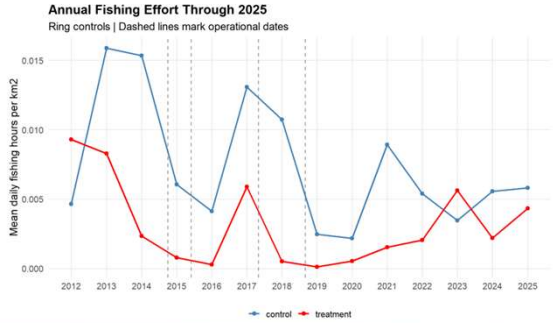
- The choice of control group can affect the estimates, since no counterfactual is perfect.
- Nearby controls may capture spillover or displaced fishing activity.
- Fishing effort may respond during construction, not just after operation begins.
- Estimates vary somewhat across specifications and modeling choices.

RESULTS

Difference-in-differences results using ring controls.

Model	Estimate	Std. Error	p-value	% of Pre-Treatment Mean
Baseline DiD	-0.0039	0.0005	0.001	-54.2%
DiD + Trend Adjustment	-0.0027	0.0016	0.161	-36.9%

Across specifications, fishing effort appears to decline inside treated wind farm polygons after farms become operational. In the preferred ring-control model, the estimated effect is negative, suggesting lower fishing activity within wind farm areas relative to nearby untreated waters after treatment begins. The effect remains negative in the second specification with group-specific time trends, though the magnitude and statistical strength change somewhat. Results using the broader surrounding-water control are also negative, which suggests the main finding is not driven entirely by one control definition.



CONCLUSIONS

- **Offshore wind farm operation is associated with lower fishing effort inside treated wind farm polygons.**
- **Some of this decline may reflect temporary disruption during construction.**
- **Continued operation may lead to more persistent changes in fishing patterns nearby.**
- **The results suggest a local shift in behavior more than large industry-wide losses.**
- **Effects are likely to depend on where projects are located, not just their overall size.**
- **Better siting could reduce conflict with fishing activity and sensitive marine environments.**
- **The main costs of offshore wind for fishing may be local and spatially concentrated, rather than evenly spread across the industry.**

REFERENCES

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