

ID: W3046786181

TITLE: Proliferation of offshore wind farms in the North Sea and surrounding waters revealed by satellite image time series

AUTHOR: ['Wenxuan Xu', 'Yongchao Liu', 'Wei Wu', 'Yu Dong', 'Wei Lu', 'Yongchao Liu', 'Biao Zhao', 'Huiting Li', 'Ruihuan Yang']

ABSTRACT:

An accurate and detailed determination of the status of offshore wind farms (OWFs) is crucial for offshore wind energy development, assessment, and management. However, existing OWF maps have several knowledge gaps, and it is difficult to keep these maps up-to-date over large sea areas. To address these issues, the North Sea and surrounding waters were selected as a case study, and a visual saliency detection (VSD) algorithm was developed, based on time-series of multi-source optical satellite images, to determine the status of offshore wind turbines (OWTs) (i.e. their locations and installation dates). A total of 4277 OWTs were detected in 71 OWFs in the North Sea and surrounding waters, as of July 2018, with an overall accuracy of 97.98%, a commission error rate of 1.69%, and an omission error rate of 0.33%. Besides, a proliferation of OWFs was observed in the North Sea and surrounding waters using time-series satellite monitoring, with an average annual growth rate of 22.99% during the past decade (2008?2018). Furthermore, the proposed VSD algorithm was applied to assess offshore wind energy utilisation and to map the global distribution of 6166 OWTs in 131 OWFs. This study contributes in providing a robust and cost-efficient framework for investigating OWFs over a large sea area. To the best of our knowledge, this is the first spatiotemporally-detailed inventory of OWFs, which will complement official databases. Moreover, it provides a reference for assessing the potential impact of active and decommissioned OWFs in marine ecosystems.

SOURCE: Renewable & sustainable energy reviews

PDF URL: <https://www.sciencedirect.com/science/article/am/pii/S1364032120304585>

CITED BY COUNT: 20

PUBLICATION YEAR: 2020

TYPE: article

CONCEPTS: ['Offshore wind power', 'Submarine pipeline', 'Satellite', 'Environmental science', 'Wind power', 'Oceanography', 'Geology', 'Engineering', 'Electrical engineering', 'Aerospace engineering']