



# The factors affecting stakeholders' acceptance of offshore wind farms along the western coast of Taiwan: Evidence from stakeholders' perceptions



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## ABSTRACT

Stakeholder participation is an important concept in marine environmental management; thus, their acceptance and opinions might influence policy decision making and effectiveness. This paper explores the factors that affect stakeholders' (traditional ocean users, including fishers and aquaculture farmers) acceptance and conducts an empirical analysis to determine the relationship among stakeholders' perceptions and acceptance. A total of 238 respondents completed a survey that was conducted in six coastal counties in western Taiwan. We used principle component analysis and two logistic regression models for the analysis: one model does not consider perception factors, while the other model estimates perception factors. The empirical results reveal that three perception factors related to the benefits of offshore wind farms significantly affect stakeholders' acceptance. Furthermore, the explanatory power, goodness-of-fit, and the predicted probability are greater when perception factors are considered in the logistic model. As a result, stakeholders' perceptions are important factors that influence their acceptance of OWFs along the western coast of Taiwan. According to our findings, recommendations are offered to resolve the user conflicts regarding OWF turbine construction and operation, including (1) communicating effectively and integrating stakeholder participation and (2) offering benefits to ocean users and local communities.

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## 1. Introduction

Climate change is a critical issue in the global environmental crisis. According to the Intergovernmental Panel on Climate Change (IPCC) report, renewable energy sources have the potential to reduce carbon emissions and solve the climate crisis (IPCC, 2011). Thus, renewable energy will play a key role in the post-oil era by providing stable and clean energy (Panwar et al., 2011). Wind power energy was developed in the 1990s in Europe; Denmark installed the first offshore wind farm (OWF) in 1991. Since then, many countries have announced related projects for offshore wind

power (OWP) development. Over 97% of the energy supply in Taiwan relies on imports from other countries, particularly on fossil fuel (77.65%) (Bureau of Energy, 2012); thus, the Taiwan government has actively developed renewable energy. Following this trend, the "Renewable Energy Development Act" was introduced by the Taiwan government in 2009 to help accelerate the development of green energy in Taiwan. Obviously, OWP development is one of the major topics discussed by the Taiwan government. In addition, the Taiwan Ministry of Economic Affairs (MOEA) set up an office to promote wind power development, i.e., the "Thousand Wind Turbines Promotion (TWTP)", and set targets for wind power development. According to the target of the TWTP, the government will increase the number of onshore turbines to 450, with 1200 MW of wind energy capacity by 2020. In terms of OWP development, 600 turbines with 3000 MW of wind energy capacity will be installed in the Exclusive Economic Zone (EEZ) of Taiwan through 2030 (Table 1). The MOEA publicly announced the implementation of

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**Table 1**  
The goals of wind power development in Taiwan.

Year		2015	2020	2025	2030
Onshore wind power	Number	350	450	450	450
	Megawatt (MW)	866	1200	1200	1200
Offshore wind power	Number	3	120	360	600
	Megawatt (MW)	15	600	1800	3000
Total	Number	353	570	810	1050
	Megawatt (MW)	881	1800	3000	4200

Source: Bureau of Energy, Ministry of Economic Affairs, Taiwan, R.O.C.

“The Incentive Program of Offshore Wind Power Demonstration System” to accelerate OWP development in 2012. Moreover, BOE also announced that three public/private corporations were chosen to participate in the incentive program on January 09, 2013, including Taiwan Generations Corporation (TGC), Formosa Wind Power Corporation Limited (FWPC) and Taiwan Power Company (TPC). At the present stage, OWP has only started to develop. Because of the natural conditions and potential OWP of western Taiwan (Lai et al., 2012), the power companies have proposed to develop their projects in this area; the TGC demonstration wind farm is located in Changhua, and the FWPC demonstration wind farm is located in Miaoli (Fig. 1).

OWP can benefit climate change mitigation and carbon emission reduction by enhancing the sustainability of the energy supply. Further, potential benefits and implications exist for ocean users and the environment, as noted by previous studies (Leonhard et al., 2011; Nienhuis and Dunlop, 2011; Stephen, 2013), such as fish-aggregating, mariculture, and recreation. In terms of the impacts on ocean users, several studies have discussed the relationship between OWP and fisheries (Kentish Flats1, 2006; Fayram and de Risi, 2007; Leonhard et al., 2011; Reubens et al., 2013; van Deurs et al., 2012). Berkenhagen et al. (2010) indicated that a real cost-benefit analysis has never been undertaken for fisheries to address the potential impacts; hence, an evaluation needs to be conducted for wind farm planning and turbine construction.

Moreover, an environmental impact assessment (EIA) is necessary prior to constructing OWF turbines, and stakeholders' acceptance should be considered in the decision-making process for environmental policy and the EIA (Petts, 1999; Johnson and Dagg, 2003; Portman, 2009). Because the western coastal waters of Taiwan are traditionally used for arsenal fishing and aquaculture, fishers and aquaculture farmers are major stakeholders who pay attention to OWF-related policies and worry about the potential impacts of OWF construction and operations. Therefore, the stakeholders' perceptions (potential benefits and impacts) will most likely influence the acceptance of OWFs in the coastal areas; the stakeholders' perceptions need to be considered when siting OWFs and making related decisions. This study aims to determine the influential factors of stakeholders' acceptance of OWFs and to determine if their perceptions influence their decisions. An empirical analysis is conducted to identify the influences on stakeholder's acceptance and establish two logistic models, one model with perception factors and another without perception factors, to compare the empirical results and understand how the stakeholders' perceptions influence their acceptance of OWFs along the western coast of Taiwan. Hopefully, the empirical results can provide more useful information to the government, the OWF project implementers (TGC, TPC, and FWPC), and stakeholders (fishers and aquaculture farmers) for implementing related policies.

## 2. Theoretical background and hypotheses

To meet the objective of this study, the related theories for designing the questionnaire and building analytical models are discussed. We review the theoretical background related to (1) stakeholders' participation in marine environmental management, (2) the potential benefits of OWP development, and (3) the potential impacts of OWF construction. Additionally, hypotheses are proposed according to the theoretical background for empirical analysis.

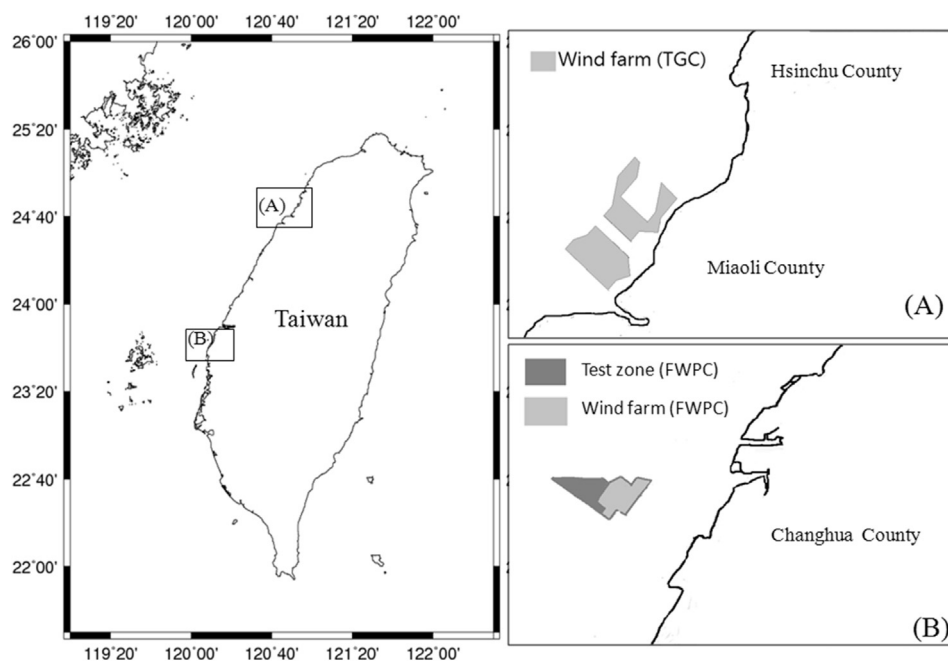


Fig. 1. Map of the study sites.

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