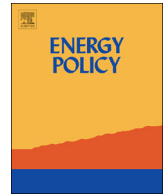




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Are South Korean people willing to pay for official development assistance for building renewable power plants in developing countries?☆

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ABSTRACT

The South Korean government is considering financially assisting developing countries to construct renewable power plants both to improve their electricity-related welfare and to reduce CO₂ emissions globally. More specifically, official development assistance (ODA) is being planned for building 5 MW wind, photovoltaic, and biomass power plants in developing countries every year from 2017 to 2026. This article aims to evaluate South Korean people's willingness to pay (WTP) for carrying out the ODA plan. To this end, a survey of 1000 households was conducted using the contingent valuation (CV) technique. The mean yearly WTP for the ODA plan implementation is calculated to be KRW 3551 (USD 3.03) per household. When the sample value is expanded to the whole country, it amounted to KRW 68.5 billion (USD 58.5 million) per annum, for the next ten years. The South Korean people's total WTP is more than the cost required, given that the yearly cost is estimated to be about USD 35.0 million. Therefore, the ODA plan execution contributes to the South Korean people's utility and can be done with public support.

1. Introduction

As is well known, an international agreement on mitigating carbon dioxide (CO₂) emissions was reached in Paris in December 2016. In order to carry out the Paris agreement, the Standing Committee on Finance reports and makes recommendations to the conference of the parties (COP) annually and the COP will organize annual in-session workshops on long-term finance through to 2020. For example, total global climate finance increased from USD 650 billion for 2011–2012 to 741 billion for 2014 (United Nation Framework Convention on Climate Change, 2016, 2017). In particular, developed countries provided public climate finance that amounted to USD 41 billion for developing countries during the period of 2013–2014.

On the Commitment to Development Index provided by the Center for Global Development (2017), South Korea was ranked 23rd among the world's twenty-seven richest countries on policies that affect people living in poorer nations. Moreover, on June 30th, 2015, South Korea announced its voluntary mitigation target to reduce its CO₂ emissions by 37% from the business-as-usual level by 2030, to adhere to the post-2020 new climate regime. Of this, 25.7% relates to reductions in the domestic area and the remaining 11.3% to the use of the international market mechanism and/or reduction in foreign countries. Thus, South

Korea should carry out its plans to reduce CO₂ emissions in foreign developing countries by providing official development assistance (ODA) to them. South Korea is the home of the headquarters of the Green Climate Fund, a product of the United Nations Framework Convention on Climate Change (UNFCCC), and should therefore make a financial contribution to the global response to climate change.

Moreover, South Korea should increase its ODA for renewable energy in the developing world in order to foster their economic development and welfare. The International Energy Agency (2016) reports that there is no electricity supply for approximately 1.2 billion people in the developing world. In addition, about 2.7 billion people continue to use conventional solid fuels for cooking and heating. The toxic fumes from biomass fuels take 3.5 million lives every year and exacerbate climate change. Because of urbanization, industrialization, and population growth, the demand for electricity has been and will continue to rapidly increase in the developing world. On the other hand, the infrastructure for a stable supply of electricity is not sufficient, and thus national development and energy welfare improvement are being seriously hindered. Therefore, ODA from developed countries is needed to increase the supply of electricity in developing countries.

South Korea, as a past recipient country, has received ODA from foreign countries, which significantly contributed to South Korea's

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economic and social development. The World Bank's ODA to South Korea finished in 1995. South Korea was removed from the list of ODA recipients in 2000 and was listed among the Development Assistance Committee's (DAC) donor countries in 2010 (Korea Official Development Assistance, 2016). South Korea has already undertaken several new and renewable energy-related ODA projects, such as 0.5 MW grid-connected photovoltaic power generation in Sri Lanka, a hybrid power system in Cambodia, and a 0.3 MW fuel cell power plant in Indonesia. However, the scale of the ODA is too small when considering that the gross domestic product of South Korea was the eleventh highest in the world in 2016.

Therefore, the South Korean government is considering providing financial assistance to developing countries for constructing more renewable energy power plants both to improve their electricity-related welfare and to globally reduce CO₂ emissions. In order to ensure universal access to electricity and achieve the 2030 national reduction target, an ODA plan should be developed and implemented now. Information on the South Korean people's WTP for the ODA plan is required in order for policy-makers to mediate between opponents and proponents of the ODA plan, and to develop the CO₂ management policy. More specifically, ODA for building 5 MW wind, photovoltaic, and biomass power plants in developing countries every year from 2017 to 2026 is being planned. Since a financial burden will be incurred if the ODA plan is executed, it is necessary for there to be South Korean public support for the ODA plan in order to carry it out successfully.

Before the plan can be enforced, it is vital to obtain public agreement for its intensive financing. Accordingly, the public's acceptance of implementing the plan should be examined. Many previous studies have looked into people's willingness to pay (WTP) for reducing carbon emissions that employ economic techniques involving a stated preference method. This method includes contingent valuation (CV) (e.g. Hite et al., 2008; Lee et al., 2017; Lim and Yoo, 2014; Lu and Shon, 2012; Zografakis et al., 2010) and a choice experiment (e.g. Cheung et al., 2012; MacKerron et al., 2009; Vecchiato and Tempesta, 2015).

On the other hand, some studies have discussed recipient countries' WTP or benefit for infrastructure for water and electricity using CV (Abdullah and Jeanty, 2009; United Nations Development Programme–World Bank Water and Sanitation Program, 1997; van Ruijven et al., 2012). Other studies have dealt with co-benefits of clean development mechanism (CDM) or technology cooperation for China, India, Pacific Island Countries, and Uganda (Eto et al., 2013; Murata et al., 2016; Taibi et al., 2016; Lederer et al., 2017). However, no research has looked into the public acceptability of implementing an ODA plan for renewable energy in the literature, as far as the authors know. Obviously, the public preference for implementing an ODA plan can be used as an appropriate and important reference point for a more detailed discussion on whether or not to execute the plan. Public preferences can be investigated by assessing people's WTP for execution of the ODA plan through an increase in their current income tax.

The prime purpose of this study is, thus, to look into the South Korean public's WTP for implementing the ODA plan. The research will be done using a CV technique. The rest of the article comprises four sections. Section 2 explains the ODA plan and the methodology employed in the study. Section 3 presents the WTP model. Section 4 provides and discusses the results. Conclusions and policy implications are contained in the final section.

2. Methodology

2.1. Object to be investigated

The object that this study investigates is the ODA plan of building 5 MW wind, photovoltaic, and biomass power plants in developing countries every year from 2017 to 2026. Thus, the total production capacity that the government plans to create amounts to 50 MW over the ten years. The government made a preliminary set of forty four

developing countries to receive ODA and then selected twenty one countries of them as a receiving country based on several criteria. These include whether the country has a national policy of increasing renewable energies or not, how much the electricity supply rate of the country is, how good the electric power system of the country is, and whether implementing the ODA plan contributes to improving the relationship between South Korea and the country.

Accordingly to the ratio of the population with access to electricity, the twenty one countries were classified into three groups by Korea International Cooperation Agency (2017). The ODA guidelines specifically appropriate for each group were prepared. The government asked the twenty one developing countries to submit any proposals concerning building wind, photovoltaic, and biomass power plants in their countries to South Korea, examined the proposals and visited the proposed sites for the wind, photovoltaic, and biomass power plants, and conducted a feasibility analysis for each proposal. Usually, in order to make objective judgments the feasibility analysis is independently carried out by external experts affiliated with university, public research institute, and engineering company. An ODA plan will be implemented only for the proposal that passes the feasibility analysis.

The ODA can improve the countries' electricity-related welfare and reduce CO₂ emissions globally. The expected effects of the ODA plan implementation, which were explained in detail to the respondents in the CV survey using visual aids such as color pictures and tables, are summarized in three points. First, the ODA plan promotes the electricity-related welfare of developing countries. Second, power plants with renewable energy contribute to the reduction of CO₂ emissions through substitution of conventional fossil fuel. Third, South Korea is responsible for the fulfillment of their obligations as a party to the UNFCCC.

2.2. Methods: the CV approach

The renewable energy-related ODA plan should be understood as a case of a public service. In terms of microeconomics, the public's WTP for a governmental plan or policy constitutes the underpinning rule for the economic value that ensues from undertaking the plan or policy (e.g., Brent, 2006; Yoo and Kwak, 2009). However, as a public service is not traded in the market, the WTP for provision of it cannot be observed in the market. Thus, in order to measure the public's WTP for a public service, it is necessary to construct a hypothetical market, immerse people in the hypothetical market, and make people to trade it in the hypothetical market. The CV approach can carry out these procedures based on a well-organized survey of people using a well-constructed survey instrument and well-trained interviewers.

The CV has been the most frequently applied technique in the literature and can easily capture compensating surplus, which is defined as a welfare gain generated from more provision or improvement in quantity or quality of a non-market goods. In particular, Arrow et al. (1993) strongly recommended the application of the CV method in circumstances requiring administrative and/or jurisdictional decision-making. Moreover, because the value obtained from the CV application implies the economic benefits of consuming the public goods, one can evaluate whether the provision of the public goods is socially profitable or not by comparing it with the costs of providing the public goods. Thus, the authors use the CV technique to evaluate South Koreans' WTP for expanding renewable power plants in developing countries.

2.3. Sample and survey instrument

A CV survey can be conducted using face-to-face in-person, telephone, or mail interviews. The response rate to a mail survey is usually quite low in South Korea, and a telephone survey can present only a limited amount of information to respondents. The authors wished to convey a large amount of explanatory information on the ODA plan, and to provide visual cards to describe the situation with and without

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