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A SOCIAL COST-BENEFIT ANALYSIS ON RENEWABLE ENERGY DEVELOPMENT PLAN — A CASE STUDY OF TAIWAN

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Overview

The objective of this project is to (1) evaluate the impact of Renewable Energy Development Plan 2005-2020 on Taiwan's economy, by employing the concept of economic cost, which differs with the accounting cost concept used in Liang, Wu, Kuo and Liu (2004) and (2) conduct a social cost-benefit analysis on the Renewable Energy Development plan 2005-2020 for Taiwan. The social cost in question includes (i) investment and price subsidies, (ii) extra reserve capacity investment cost for renewable energy and (iii) the effect of renewable energy subsidies on electricity price. The social benefit includes (i) CO2 and air pollution reductions, (ii) peak-load capacity provided by PV, (iii) the net linkage effect via the investment of PV and Windpower, and (iv) the energy security provided by the indigenous natural of renewable energy.

Methods

We employ a Dynamic General Equilibrium Model of Taiwan (DGEMT), i.e. Liang-Jorgenson Model (2003), to do the simulations.

Results

Table1. Simulation Results of Renewable Energy Development Plan in Taiwan, 2005-2020

Accounting Cost		Economic Cost	
Economic effect (%)		**Economic effect (%)**	
Electricity Price Changes	3.313%	Electricity Price Changes	3.471%
Price (PPI) Changes	0.181%	Price (PPI) Changes	0.189%
Economic growth changes	-0.038%	Economic growth changes	-0.040%
Environmental effect (thousand tons)		**Environmental effect (thousand tons)**	
CO_2 Changes	-110,637	CO_2 Changes	-114,351
SO_X Changes	-560	SO_X Changes	-583
NO_X Changes	-213	NO_X Changes	-222
PM Changes	-125	PM Changes	-130
Social Benefit Changes (million NTD)	338,210	**Social Benefit Changes (million NTD)**	347,019
Linkage effect of Windpower	8,039	Linkage effect of Windpower	8,039
Energy Security via Indigenous Sources	326	Energy Security via Indigenous Sources	326
Peak-load Capacity provided by PV	1,364	Peak-load Capacity provided by PV	1,364
CO_2 and Air Pollution Reduction	253,704	CO_2 and Air Pollution Reduction	262,513
Linkage Effect of PV	74,777	Linkage Effect of PV	74,777

Social Cost Changes (million NTD)	356,697	Social Cost Changes (million NTD)	371,456
Price Subsidies	49,168	Price Subsidies	59,446
Investment Subsidies	168,696	Investment Subsidies	168,696
Economic Growth Reduction	95,916	Economic Growth Reduction	100,397
Extra Reserve Capacity Investment Cost	42,917	Extra Reserve Capacity Investment Cost	42,917
Net benefit	-18,487	**Net benefit**	-24,437
Net benefit（Present Value）	-10,116	**Net benefit（Present Value）**	-13,516

Conclusions

The major findings and suggestions are as follows:

1. To implement the Renewable Energy Development Plan 2005-2020, a subsidy, totaled NTD 228,142 million (USD 7,026 million) is needed in the case of economic cost or NTD 217,864 million (USD 6,709 million) in the case of accounting cost. Reflecting these subsidies directly on the electricity price, the price will increase by 3.47 percent in the case of economic cost or 3.31 percent in the case of accounting cost annually during 2005-2020.

2. The net social benefits in terms of economic cost as well as accounting cost are both negative. This result indicates that the Renewable Energy Development Plan 2005-2020 proposed by Energy Commission is by and large not economically feasible.

3. This differs with the result in Liang, Wu, Kuo and Liu (2004). This could be contributed from the different assumptions on PV cost and corresponding subsidies. Both Liang, Wu, Kuo and Liu (2004) and this study assume that the cost and the buying price of PV will decline by 5 percent per annum. However, in Liang, Wu, Kuo and Liu (2004) the cost reduction process begins from 2003, while in this study it begins from 2010. The assumption adopted in this study is closer to the relevant provisions under the Renewable Energy Promotion Act (Draft).

4. To avoid resource misallocation, it is suggested that the whole Renewable Energy Development Plan should be carefully evaluated on the basis of social cost-benefit analysis before it is implemented. And the target level and subsidies for the PV development should be as conservative as possible.

References

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