REDD-based Offsets: Benefit Sharing and Risks

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Research Highlights

In this study we identified promising approaches to effective financial support of Reduced Emissions from Deforestation and Degradation (REDD) [1].

1. Parties’ risk aversion increases the volume of contracted REDD-based offsets at fair prices.
2. Benefit sharing mechanism increases contracted amount and at the same time decreases the price.
3. Public funds might help closing the price gap and ultimately enable REDD.

Methodology and Results

We construct a microeconomic model of interaction between the forest owner (REDD-supplier), electricity producer, and electricity consumer [2].

The decision-making process of the electricity producer (under uncertain CO2 tax/price) consists of:

1. Choosing power plant load factors to minimize the cost given the hourly electricity demand profile and installed capacities of particular power generation technologies;
2. Setting electricity price to maximize the profit based on the demand function indicating consumer’s sensitivity to electricity price;
3. Hedging by REDD-based offsets.

Fair prices of the risk-neutral electricity producer (EP) and forest owner (FO) depending on the volume of REDD offsets. The future CO2 price distribution is uniform within the range 0-80 US$/ton CO2.

Risk preferences are modeled by exponential utility functions [3].

Fair prices with respect to risk preferences: α=0 – risk-taking, α=0 – risk-neutral, α>0 – risk-averse.

Fair REDD offset price in the study is understood in the sense of parties’ indifference to whether contract a given amount of offsets, or not. Fair prices represent risk-adjusted supply and demand curves for REDD-based offsets.

Fair-averse (r.-a.) behavior considerably increases the contracted amounts of REDD offsets and creates a higher potential for REDD implementation.

Fair prices of the risk-neutral electricity producer (EP) and forest owner (FO) depending on the volume of REDD offsets, US$/ton CO2.

Average hourly electricity demand (based on [7]).

The fair REDD offset price in the study is understood in the sense of parties’ indifference to whether contract a given amount of offsets, or not. Fair prices represent risk-adjusted supply and demand curves for REDD-based offsets.

Benefit sharing mechanism increases contracted amount and at the same time decreases the price.

Technological data for the case-study*

<table>
<thead>
<tr>
<th>Technology</th>
<th>Annual fixed cost, thousand US$/MWy</th>
<th>Variable cost, US$/MWh</th>
<th>Installed capacity, MW (≈ size of Belarus)</th>
<th>Emission factors, ton CO2/MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal-fired</td>
<td>224</td>
<td>18.9</td>
<td>3800</td>
<td>1.02</td>
</tr>
<tr>
<td>Natural gas-fired combustion turbine</td>
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<td>55.6</td>
<td>1900</td>
<td>0.55</td>
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<tr>
<td>Natural gas-fired combined cycle</td>
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<td>39</td>
<td>2200</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* Sources: [4][6].

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References