Setting up a Tradable Carbon Offsets System: Risk, Uncertainty and Caveats

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ABSTRACT

The provision of trading carbon offsets under the Kyoto Protocol allows a flexible mechanism for meeting carbon reduction goals. Offsets are a form of credit-based emissions trading and are created when a land-based source (more generally a source that faces no mandatory emission caps) makes voluntary reductions in emissions or increases in sequestration activities. A vast and growing literature has emerged surrounding the feasibility and challenges of implementing a carbon offset program. A large number of concepts related to offset policy are currently being discussed in existing literature such as, baseline, leakage, permanence, monitoring, verification, enforcement, financial feasibility, and third party verification. Cutting across these multitude of concepts are a variety of risks and uncertainties. Perhaps due to the diverse and wide ranging literature, a comprehensive framework for cataloging and analyzing the variety of risks has not yet emerged. These risks play a major role in developing effective market designs that achieve aggregate emission caps while encouraging market participation and investment in carbon reduction activities. The purpose of this paper is to develop a conceptual framework to describe carbon trading risks based on existing literature and to draw policy and research implications from this framework.

Risks associated with carbon offsets policy can be classified into three major categories: institutional/policy, project level and measurement risks. Institutional/policy risks are related to uncertainties surrounding the future policy decisions and the institutional arrangements established. Policy/institutional risks relate to baselines, monitoring/enforcement, and leakage. Emission baselines are the best estimate of emissions that would occur in the absence of a project. Baseline estimates are necessary to calculate the net carbon reduction of a program or project. Since there are no national standards for establishing baselines the method of calculating baselines could change over time. If baselines become more relaxed, the carbon credits generated by early adopters might be undermined. If baselines become stricter, the financial costs to participants of complying with the program might increase. Baseline is a source of risk because the amount of carbon emissions occurring in the absence of the project could change over time due to changes in market incentives, technologies, or other government policies. For example, changes in tilling technologies could change carbon emissions from crop production that would occur in the absence of emissions control policies. Depending on how the baseline is specified, this risk may be borne by the seller or buyer of the carbon emissions credits.

Monitoring/enforcement risk is associated with the regulators' ability to detect whether the promised carbon sequestration activities are undertaken. If failure to comply with emissions controls is not detected, society loses the benefits of emissions controls. If failure is detected, the penalties for noncompliance may exceed the original cost of controls. Monitoring risk may be borne by buyers or sellers of carbon credits depending on how liabilities for not controlling emissions are assigned. For example, utilities that purchase carbon credits from farmers may be held liable if farmers fail to follow through with promised emission reduction activities. How liabilities are assigned and how activities are monitored will affect incentives to invest in carbon emissions reductions.

Leakage occurs when carbon sequestration at one site encourages increase in carbon emissions on some other site. Most of the literature concentrates on indirect leakage, where green house gas emissions are encouraged elsewhere due to the market incentives created by the carbon emissions controls. For example, emissions controls, which increase fuel

efficiency, may lower prices of fossil fuels leading to increased fuel consumption. Direct leakage may also occur when carbon emissions activities are simply shifted elsewhere within the firm or to other firms. For example, a farmer who plants trees to receive carbon credits may clear trees elsewhere.

Project risk refers to non-performance of a carbon sequestration project in terms of not achieving the requisite target of carbon sequestration. Project risk includes physical risk and financial risk. Physical risks are associated with unexpected carbon emissions due to natural hazards or events such as fire, or hurricanes or changes in the rate of sequestration, which depend on weather and pests.

Farmers or other economic agents will not participate in carbon sequestration programs if they expect to incur financial losses by participating. Financial risks are associated with reduced investment profitability due to changing economic factors such as changing output prices, interest rates, and currency values or project requirements. Two sources of financial risks are opportunity costs and transactions costs. Transactions costs are incurred in the process of searching for a trading partner, negotiating deals, securing regulatory approval, monitoring and enforcing deals and insuring against risk of failure. Changes in these requirements may change the costs of emissions controls and financial profitability of the project. Opportunity cost is the income given up when land or other resources are committed to carbon sequestration activities. For example, the opportunity cost of land committed to carbon sequestration activities may rise due to changes in development pressures. Financial risks continue to affect project performance even after expiration of the contract. For instance, once a sequestration project on a forestland terminates, the forest might be harvested or reverted to agricultural production causing release of stored carbon.

Measurement risk arises because it is difficult to measure actual rates of carbon sequestered. Spatial and temporal heterogeneity of carbon present in agricultural and forest production systems tends to increase the difficulty and expenditure of estimating the amount of carbon present. Moreover, carbon sequestration usually occurs slowly with wide fluctuations due to changes in weather and/or natural pest pressures. There is a tradeoff between measurement risk and costs, by spending more on improving measurement techniques the risk of measurement can be lowered.

Developing a comprehensive framework for analyzing the risks associated with offset policy will help identify the gaps in literature. It will also be useful in providing a more comprehensive perspective of the multiplicity and magnitude of risks affecting emissions reduction. Moreover the theoretical foundation provided by this framework will allow policy makers to focus on ways to reduce these risks effectively.