PURDUE UNIVERSITY | Environmental and Ecological Engineering

EEE Research Seminar

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Delivery Terms for Voluntary Carbon Offsets (Joint work with Vishal Agrawal and Şafak Yücel)

Abstract

A carbon offset represents one unit of reduction in greenhouse gas emissions that can be used to compensate for emissions that occur elsewhere. Almost 40% of S&P 500 companies purchase carbon offsets voluntarily (rather than for compliance with regulations) to achieve their carbon-neutrality goals, i.e., maintaining zero net emissions. Such offsets are generated by various kinds of projects, including forestry, waste disposal, and renewable energy, exceeding a market size of $6 billion and accounting for 1.7 billion tons of emissions reduction. Companies can purchase voluntary carbon offsets under two delivery terms---forward and prompt delivery. Under forward delivery, a buyer purchases a certain quantity of offsets before the seller undertakes the investment. Given that emissions reduction from a project is inherently uncertain, the seller may generate fewer offsets than the buyer's purchase quantity, exposing the buyer to a quantity risk. Under prompt delivery, a buyer purchases offsets after the seller undertakes the investment and generates them, which enables the seller to use pricing as a recourse action based on the realized emissions reduction. In this paper, we analyze and compare economic and environmental implications of delivery terms for buying voluntary carbon offsets. We find that a buyer prefers prompt delivery for projects with a low or high investment cost, even if the seller may use its pricing decision as a recourse action in equilibrium. A buyer prefers forward delivery for projects with an intermediate investment cost, even if the buyer faces quantity risk in equilibrium. Finally, we find that a buyer's preference between the two delivery terms is not always aligned with their environmental effectiveness.

Bio

Gökçe Esenduran is an associate professor of management at Daniels School of Business, Purdue University. She received her Ph.D. from Kenan-Flagler Business School, the University of North Carolina at Chapel Hill. Before joining Purdue, she was an associate professor at The Ohio State University. Gökçe's current research primarily focuses on sustainable operations. She has published in journals such as *Management Science*, *Manufacturing & Service Operations Management, Production and Operations Management, Journal of Operations Management, IISE Transactions*, and *Naval Research Logistics*. She received the Krannert Young Faculty Scholar Award in 2019. She is serving as a senior editor for Production and Operations Management and as an associate editor for Decision Sciences Journal. She was the treasurer of Women in OR/MS between 2014-2015. She served on the board of POMS College of Sustainable Operations between 2016-2020, first as the secretary and then as the president/past-president and also as the chair of M&SOM Sustainable Operations SIG.