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EDITED AND REVIEWED BY
J.B. Ruhl,
Vanderbilt University, United States

*CORRESPONDENCE
Ugur Soytaş
uguso@dtu.dk

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Editorial: Carbon pricing and trading

Ramazan Sari and Ugur Soytaş*

Department of Technology, Management, and Economics, Technical University of Denmark, Lyngby, Denmark

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Editorial on the Research Topic Carbon pricing and trading

The threat of climate change requires urgent global action to mitigate greenhouse gas emissions. The United Nations Framework Convention on Climate Change (UNFCCC) provides the primary guidance for all countries to combat climate change in line with sustainable development goals. In light of this development, reducing greenhouse gas emissions has become all countries' top priorities. The Kyoto Protocol, one of the primary documents of the UNFCCC, brought a window of opportunity to utilize the carbon trading (pricing) instruments under the 'Flexibility Mechanisms' channel (Hepburn, 2007). Carbon pricing has become a popular instrument for controlling and reducing greenhouse gas emissions by utilizing the emissions trading system (ETS) and carbon tax methods (Rontard and Hernández, 2022). The ETS is considered an essential and cost-effective mechanism to address global warming and an effective measure to reduce carbon emissions (Zhao et al., 2016).

The recent progress on the multilateral environmental agreements is reflected in the Paris Agreement. Paris Agreement has novel dimensions to enhance the collaboration among all stakeholders through Article 6 of the Agreement and to ensure all nationally determined contributions. The ultimate objective is to limit global temperature increase below 2 degrees by the end of this century. To achieve this, carbon pricing instruments are emphasized under Article 6 of the Paris Agreement. This special issue aims to bring different perspectives that address critical knowledge gaps in the literature. The exciting papers examine diverse topics such as using carbon pricing instruments in previously ignored sectors, accounting for climate justice while protecting oceans, incorporating carbon trading in investment decisions, assessing the macro-economic impact of carbon pricing, and using the Green Climate Funds efficiently.

In this special collection, the research paper "Internalizing CO₂-Equivalent Emissions Issued From Agricultural Activities" by Dragicevic deals with how carbon pricing helps internalize the emissions externalities in carbon-intensive sectors such as agriculture. The measurement and tracking of emissions at the farm level is a complicated and challenging task. Henceforth, the agricultural sector has not yet been targeted by market-based instruments. This paper sets up a hypothetical market with double barriers and targets emissions reduction levels from the agricultural activities set by the French

government. Simulations based on an options pricing model reveal that these targets can be met if the carbon prices remain in the €76.35 and €89.56 range. The methodology proposed in the article can be used for other sectors, regardless of whether carbon pricing schemes currently govern them or not.

The second paper, “A Framework for Operationalizing Climate-Just Ocean Commitments Under the Paris Agreement,” by Reiter et al. is about the presence of a dynamic and complicated link between the Ocean and climate. Nature-based solutions for the Ocean can help mitigate and adapt to climate change. However, successfully implementing such policies requires careful treatment of climate justice. This paper proposes an operational framework that promotes climate justice across three critical layers of ocean commitments: science, law, and economics. At the first layer lies the coastal ecosystems with a large amount of blue carbon. Hence, protecting these ecosystems from the harmful impact of climate change may be critical from a climate mitigation point of view. The second layer is where ecosystem services are considered in tandem with coastal planning at the local level to ensure socio-ecological resilience. Finally, financial instruments that support the sustainability of coastal habitats. These instruments need to promote environmental justice and avoid burdening the local communities. The proposed framework enables progress assessment for climate just mitigation and adaptation tools for sustainable Oceans.

The following paper, “Financing the Transition Toward Carbon Neutrality—an Agent-Based Approach to Modeling Investment Decisions in the Electricity System,” by Yang et al., develops an agent-based model for electricity system investments by explicitly accounting for investment financing. The Heterogenous Agent-based Power Plant Investments Model proposed in this paper includes a financial feedback module that tracks the investment decisions of power companies (agents). In that respect, the study helps fill an important gap in the climate economics literature. The model is run under different capital accessibility scenarios to capture the system and individual firm-level impacts. A sensitivity analysis is conducted using a growing carbon tax rate. Capital constraints and risk averseness reduce the green transition speed. On the other hand, carbon tax leads to high electricity prices and profits in the face of capital constraints.

The fourth paper, “Analyzing the macro-economic and employment implications of ambitious mitigation pathways and carbon pricing,” by Fragkos and Fragkiadakis, addresses the socio-economic implications of ambitious EU and global climate policies, targeting to limit the increase in global temperature below 2 °C, or more ambitiously below 1.5 °C. The paper highlights the importance of the modeling approach and specific model assumptions on low-carbon innovation and technology uptake, labor, and financial markets. The authors present a methodological enhancement in the general equilibrium model

GEM-E3-FIT, which obviously “improves the simulation of the impacts of ambitious climate policies.” The analysis indicates that high carbon pricing has limited negative impacts on the EU GDP and consumption toward achieving Paris Agreement goals. The results also indicate that carbon prices have a negative socio-economic impact in countries with significant hydrocarbon exports and in economies that rely on coal and have high energy and carbon intensities.

The last paper, “Assessing the performance of the developing countries for the utilization of the Green Climate Fund” by Ari and Isik, deals with the Green Climate Fund (GCF) as a source of financing for decarbonization in developing countries. GCF is considered to be an essential pillar for the mitigation of emissions. It is one of the United Nations Framework Convention on Climate Change’s financial mechanisms to stabilize the emissions to prevent dangerous anthropogenic interference with the climate system. However, the contribution of developed countries to the GCF is lower than the needs of developing countries. Therefore, utilization of the GCF would follow some prioritization. The paper uses the data envelopment analysis method as a decision-making tool to analyze the countries’ performance in utilizing the GCF sources. Developing countries, including the least developed countries and small island developing states, have various national circumstances to benefit the GCF. Capability as a part of national circumstances is crucial for ensuring a higher emission reduction per unit of GCF funding. This means that higher capable countries would mitigate much more emissions for the same amount of GCF. Allocation of the GCF should be prioritized according to the national capacities of developing countries to achieve the ultimate objective of the UNFCCC and the Paris Agreement.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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