Abstract

The transportation sector, responsible for over one-fifth of global carbon emissions, must undergo a rapid and profound technological transformation to align with global climate goals. However, few studies have comprehensively modeled pathways to zero emissions across all transportation modes—including aviation and shipping—while accounting for cross-sectoral feedbacks and environmental interactions. In this talk, I will give an overview of the global 1.5°C decarbonization pathway and then discuss our recent research paper on how the global transportation sector can contribute to this ambitious goal by driving its emissions to zero. Using a global integrated assessment model, we evaluate deep decarbonization scenarios for transportation, exploring varied timelines for fossil fuel phase-out and the deployment of advanced alternative technologies. Our analysis finds that electrification plays a dominant role in emissions reduction, while biofuels and hydrogen are critical for hard-to-abate sectors such as aviation and shipping. In our most ambitious scenario, transportation emissions are eliminated by mid-century, significantly advancing climate targets but requiring swift technological shifts, strategic energy transitions, and coordinated policy action.