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## Exploring Uncertainty Surrounding Deep Decarbonization Pathways: Application to Colombia

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Limiting end-of-century temperature rise to 1.5-2 degrees C will require achieving net-zero CO<sub>2</sub> emissions globally by 2050. Toward this goal, the Government of Colombia (GoC) is crafting a portfolio of actions (i.e., a mid-century strategy) that will not only substantially reduce emissions but also perform well across a range of societal objectives, despite the many uncertainties to which those actions will be exposed. In collaboration with a diverse array of stakeholders, here we seek to discover which actions hold promise for Colombia to achieve its climate and other societal objectives under a range of future uncertainties. The most effective mix of actions from Colombia's perspective maybe those that create a solid near-term foundation for future ambitious action, and also those that avoid poor performance (across multiple societal objectives) under future uncertainty. This presentation will identify key elements of a robust decarbonization strategy for Colombia, and understand which sources of uncertainty may be critical to acknowledge and better understand.

It is not possible to assign meaningful probabilities to scenarios that consist of complex combinations of policy actions (i.e., levers) and uncertainties. However, it is possible to discover which scenarios, or combinations of levers and uncertainties, drive consequential outcomes across societal objectives. We use the "XLRM" conceptual organizing framework for defining this immense challenge and its possible solutions in Colombia, including: policy levers ("L"), such as renewable portfolio standards and electric vehicles deployment; future uncertainties ("X") such as socioeconomic change, technological change, and climatic change; and metrics ("M") for evaluating the relevant societal outcomes that result from the implementation of levers in uncertain future worlds, such as air quality, food security, water security, energy access, land use change, and economic development. To map policy levers to key outcomes (metrics) under uncertainty, we use the Global Change Analysis Model (GCAM) v5.3 to explore the order of 10,000 GCAM scenarios reflecting diverse futures. The study focuses on a set of questions, and a methodological approach, that have immediate relevance to Colombia but also broader applications both within Latin America and beyond to the rest of the world.