Global economic growth relies on the continual production, transportation, and use of a tremendous amount of energy. Historically, this has been provided mainly by fossil fuel, resulting in increasing environmental costs due to accumulated greenhouse gas emissions, as well as local pollutants. We are currently experiencing a revolution where technological progress in renewable sources, such as solar and wind, and innovations related to unconventional oil and gas are changing the landscape regarding energy supply and use.

While fueling economic growth, our energy use has also created some serious challenges. Climate change has been termed the biggest market failure in human history. It presents a serious threat to the global economy, and to the overall well-being of millions of people across our planet. It is widely considered to be largely the outcome of human activity, and in particular, of our choices regarding energy supply and consumption. The study of issues related to energy and the environment is an interdisciplinary endeavor and requires joint efforts by several actors, including universities and other research institutions, government, as well as the private sector. Given various uncertainties, including those associated with the precise effects of climate on economic activity, desirable policies must be
In the sense that they perform well and exhibit tolerance in a variety of possible scenarios, including worst-case ones.

My research investigates a variety of questions in the intersection of energy, the environment, and the global economy. These include the optimal energy transition to a sustainable, low carbon economy, the current and future trends in road transportation in the developing countries, the contribution of the maritime industry to local pollution levels in coastal areas, the implications of innovation and new technologies, such as storage and autonomous vehicles, and the design of self-enforcing international climate agreements. I also study theoretical and experimental models of the evolution of environmentally responsible behavior through social networks.

An interdisciplinary approach is necessary to investigate most of these questions, as the answers require insights and methodologies from several fields. For example, energy-modeling by engineers often focuses on technology issues and on energy supply. At the same time, economic models often abstract from issues related to technology and from environmental considerations. Finally, both economic and engineering modeling often abstract from the social aspects of energy use. For example, given appropriate incentives, social networks can have an effect on how environmentally responsible behavior spreads among consumers.
In short, I am mainly interested in interdisciplinary research that integrates economic, climate science, and social considerations in order to assess the economic and environmental impact of policy and of technological developments. In joint projects with several coauthors, including Ken Medlock (Rice University, Baker Institute for Public Policy), Peter Hartley (Rice University, Economics), Amy Jaffe (UC-Davis, Graduate School of Management), Borghan Narajabad (Federal Reserve Board), Xin Li (IMF), Xinya Zhang (Bureau of Economic Geology, UT-Austin), and Cyril Monnet (University of Bern, Economics), I have combined economic, public policy, political economy, game theory, and systems approaches in order to address questions related to energy, innovation, growth, transportation, and climate change.