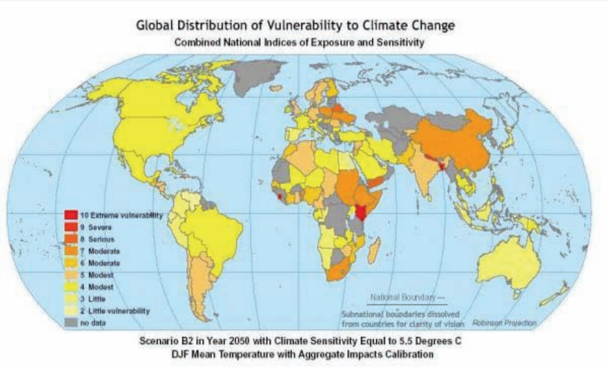
RESEARCH at the University of Maryland

Climate Mitigation and Adaptation



What should be done about climate change? Policy makers and stakeholders need information to develop practical responses to a warming world. They need options for *mitigation*–actions that slow climate changes–and *adaptation*–choices by communities that respond to the inevitable results of climate change. Informed choices about energy technology, economic development, and agriculture policy must be made at local, regional, and international levels; researchers at the University of Maryland are providing the critical science to support reasonable and rational policy decisions.

While many globally recognized research institutions contribute to the study of climate-change mitigation and adaptation, few host the interdisciplinary capacity of Maryland. Our strengths in atmospheric chemistry, meteorology, applied mathematics, risk communication and policy analysis–to name a few–offer a critical mass of researchers who collaborate on sound policy responses to climate change.

The Joint Global Change Research Institute (JGCRI) is an interdisciplinary, multi-institutional research center that evaluates emissions polices and technologies by modeling the effects of these mitigation strategies. JGCRI models are used by the Intergovernmental Panel on Climate Change (IPCC), the group that shared the 2007 Nobel Peace Prize with Albert Gore.

The Center for Integrative Environmental Research (CIER) connects decision makers with the science they need to develop local and regional climate-adaptation strategies. CIER Director Matthias Ruth develops regional climate models for locations around the world, including Maryland. These models anticipate local conditions under changing climate scenarios.

Anna Alberini develops economic theory to place dollar values on complex environmental qualities, such as clean air and water. Determining these values can help decision makers balance environmental choices with ever-shrinking budgets.

Steve Fetter models energy scenarios to helps policy makers see that a viable low-carbon future depends on healthy energy policy today. His work suggests that nuclear energy can play a critical role.

JGCRI: An International Leader in Climate Mitigation Models

Headquartered at the University of Maryland, the Joint Global Change Research Institute (JGCRI) combines the wide and deep expertise of campus researchers with the environmental and energy innovation strengths of Pacific Northwest National Laboratory. Directed by Anthony Janetos, JGCRI's interdisciplinary Maryland teams include economists and social scientists, life and physical scientists, and business experts and engineers. These researchers assess the growth of atmospheric greenhouse gas and analyze technologies and policies for mitigating and reducing emissions.

JGCRI's adaptation and mitigation models are widely used by analysts and policy makers–including the Intergovernmental Panel on Climate Change–to examine the impact of climate change on agriculture, water resources, and unmanaged ecosystems. JGCRI models provide "integrated assessment" information for policy development by including and reconciling climate and Earth systems data, biological sciences information, economic factors, and energy variables. Currently, JGCRI distributes and supports three models: SGM, MiniCAM, and EPIC.

JGCRI's Second Generation Model (SGM) is a global general-equilibrium model that projects energy consumption and the resulting greenhouse gas emissions. This model is used to predict the effects of climate change policies and technologies for emissions mitigation. SGM incorporates variables related to population demographics, resources, agriculture, energy, energy-intense industries, household consumption, and government expenditure. SGM offers several advantages over other mitigation models, chiefly regional customization. For example, rather than assuming a one-size-fits-all global economy, SGM allows regionally specific variables of particular economic systems. For instance, SGM can reflect differences in technology investments in the US, India, and China.

The Miniature Climate Adaptation Model (MiniCAM)–like SGM–investigates the impact of climate change policies and technologies for emissions mitigation. However, MiniCAM's approach also includes data on land-use allocation and its emissions–important details for determining the role of agriculture and development in climate change. The user-friendly MiniCAM interface allows users to explore long-run scenarios about energy technology and policy choices for 14 global regions, in real time.

The Environmental Policy Integrated Climate (EPIC) Model is an agricultural-systems model that simulates conditions for weather, hydrology, nutrient cycling, pesticide fate, and a host of other agronomic variables. Widely applied for practical farming needs, this model can help farmers choose crops under conditions of change. Recent work by JGCRI refined EPIC to include new sub-models for soil-carbon dynamics and nitrogen cycling. This work is yielding important data on how soil sequesters or captures carbon.
http://www.globalchange.umd.edu/

Center for Integrative Environmental Research: Regional Approaches to Climate Change

What regional changes will shape Maryland agriculture, fisheries, transportation hubs, weather patterns, and economic health? The Center for Integrative Environmental Research (CIER) of the Maryland School of Public Policy helps Maryland leaders assess mitigation and adaptation responses. CIER researchers, directed by Matthias Ruth, are analyzing Maryland climate change scenarios for the costs of inaction. CIER is also convening *Maryland 2050*, a series of dialogues between researchers and state leaders about local environmental planning.

Ruth's research program focuses on dynamic modeling of natural resource use, industrial and infrastructure systems analysis, and economic policy. Ruth was lead author of *The U.S. Economic Impacts of Climate Change and the Costs of Inaction*, a 2007 report that presented the most thorough estimate to date of the economic impact of climate change. Ruth's location-specific work concerns climate scenarios for Boston, MA and New Zealand, as well as Maryland and the Mid-Atlantic.
Center for Integrative Environmental Research http://www.cier.umd.edu/
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Valuing the Critical Components of Ecosystems

Environmental policy is often set by economic issues. But how can we compare the profit of a polluting power plant with intangible elements like clean air and biodiversity? Policy analysts and policy makers need reasonable estimates to apply tools like cost-benefit analysis.

Economist Anna Alberini develops ways to "valuate" non-market natural resources. For example, a proxy measure for clear air and water is health, which has been assessed in economic terms for decades. Alberini works to quantify how air quality contributes to the incidences of lung diseases like asthma. She also "prices" the costs of environmental "bads" like hazardous waste and contaminated sites. Valuing non-market factors helps place reasonably weighted information about the environmental services performed by nature into mitigation and adaptation models. Thus, the models can better determine the "real" costs of action and inaction.
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Speaking Knowledge to Power: Responsible Energy Policy for Climate-Change Mitigation

Steve Fetter works on international energy cooperation to promote a new portfolio of cleaner and greener global energy supply. His work helps quantify low- or no-carbon energy scenarios–including scenarios with sizeable nuclear energy components.

Fetter, dean of Maryland's Policy School, sees a role for nuclear energy in energy and climate policy. Nuclear energy's role in a low-carbon future is controversial, but an emerging role for nuclear energy, along with renewable energy sources, can help the world transition to climate-friendly energy sources. But, to even consider a larger role for nuclear energy, policy makers and scared publics need sound information. Fetter's work demonstrates how environmental science, energy technology assessment, and risk communication can intersect for a lower-carbon future
Steve Fetter sfetter@umd.edu http://www.publicpolicy.umd.edu/Fetter/index.htm