



SCHOOL OF  
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SUSTAINABILITY



**Maryland**  
Department of  
the Environment

# Pathways to Maryland's GHG Reduction Goals

Mitigation Working Group Meeting  
Feb 16, 2023

# Agenda

- Objectives and Scope
- Modeling Tool: GCAM-USA Overview
- Modeling Approach
- Timeline

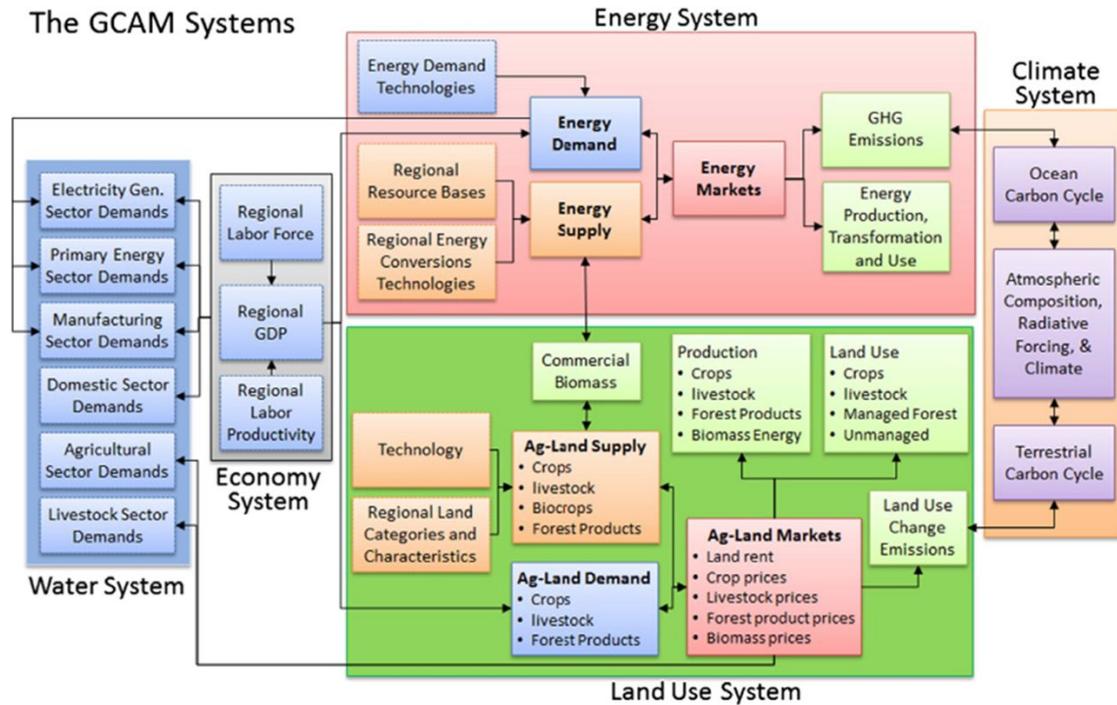
# Objectives and Scope

Two products will be delivered in 2023:

1. June: Pathways to Maryland's GHG Reduction Goals (CGS product)
  - *Providing alternative conceptual policy pathways to achieve the emissions reduction targets*
  - *Initial impact analysis and preparation for future assessment with equity dimensions*
2. December: Maryland's GHG Reduction Plan (MDE led)
  - *One concrete policy plan to achieve the 2031 target*
  - *Refining modeling of policy plan and deepening impact analysis*

# Our Research Approach and Methodological Toolkit: Global Change Analysis Model (GCAM-USA)

- Integrated Assessment Model of Economic, Energy, Land-use, Water, Emissions and Climate systems
- One of roughly five major international IAMs used for understanding future emissions scenarios (including IPCC)
- Emissions of 16 greenhouse gases and short-lived species across all economic sectors
- A “neutral” platform that projects forward from current data based on scenario assumptions and economic interactions
- GCAM is an open-source community model developed over 30 years and maintained at PNNL/JGCRI (College Park, MD)
- GCAM-USA is a version of GCAM with 50 state-level resolution in the US and is embedded within the global GCAM.



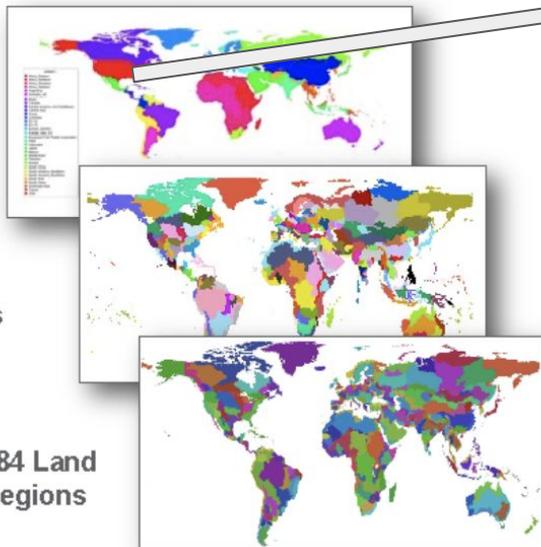
# Apply GCAM-USA to Maryland Analysis

32 Energy & Economy Regions

235 Water Basins

384 Land Regions

## Global Coverage



- Economy-wide decarbonization pathways, covering energy systems and land-based sources/sinks
- Energy system linked to agriculture, water, and land systems through bioenergy production

change in emissions relative to 1990

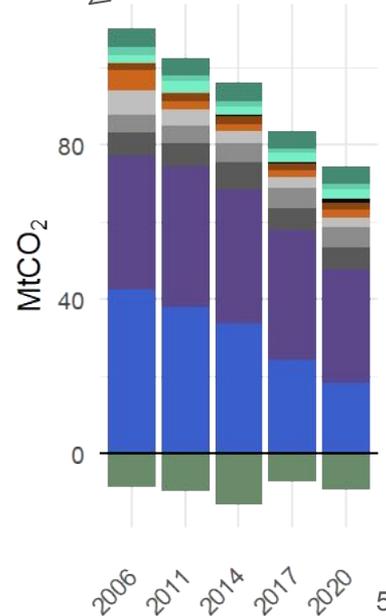


• Emissions matched and calibrated to MD inventory

## State-level Details

- CO2 and energy consumption along with major sources of CH4, N2O, and F-gases are modeled at state-level
- Electricity trade in fifteen grid (NERC) regions
- Key inputs harmonized with Annual Energy Outlook
- Ability to model subnational policies

## MD Inventory

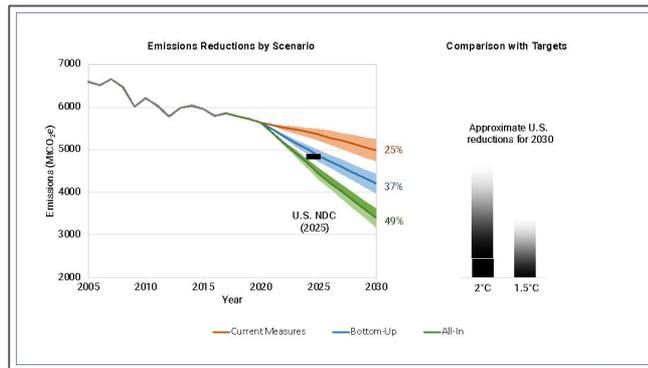


# Assessment of Comprehensive 2030 National Climate Strategies

## Example : Subnational + Federal across the United States

- GCAM-USA allows for comprehensive U.S. and global modeling with state level resolution
- As analytical leads for America's Pledge/America Is All In coalition, assess how combined actions from federal government, states, cities, and businesses can more effectively reduce emissions

### The All-In Climate Strategy: Policy interactions contributing to 100% clean electricity



Hultman et al. 2020. "Fusing national and sub-national climate action is central to rapid near-term decarbonization: The case of the United States." *Nature Communications*. 11: 5255

Hultman et al. 2019. "Accelerating America's Pledge." The America's Pledge Initiative on Climate Change and Bloomberg Philanthropies, with the University of Maryland Center for Global Sustainability, Rocky Mountain Institute, and World Resources Institute.

Kennedy et al. 2021. "Blueprint 2030." America Is All In.

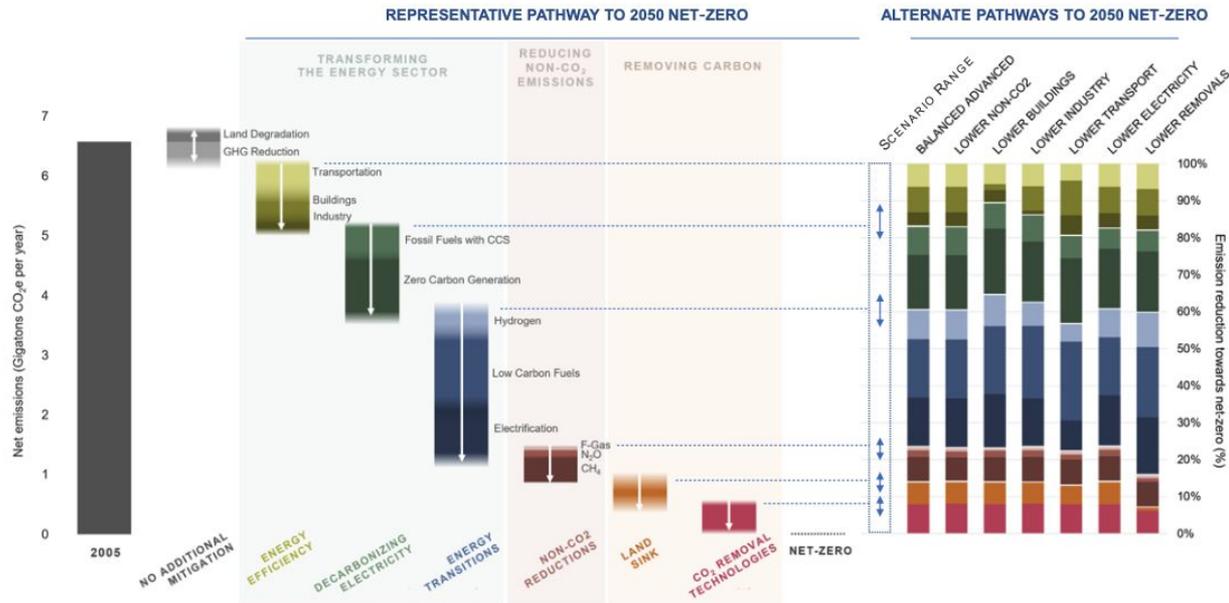
Zhao et al. 2022. "Transportation Sector Emissions Reduction Potential." America Is All In.

Zhao et al. 2022. "U.S. Methane Emissions Reduction Potential." America Is All In.

# Long-term Strategy Assessments for U.S. and Other Countries

## Example: U.S. Long-Term Strategy (2021)

- UMD team a key contributor to the U.S. Long-Term Strategy Report, including the core analysis
- Hultman led writing and launch of report while at SPEC



# Scenario Development: Reference Scenario

Includes existing Maryland policies, most relevant federal policies such as IRA and IIJA, most relevant policies for surrounding states

Key policies plan to be modeled in GCAM-USA

- a. **Power:** RPS, RGGI, Planned coal retirements, IRA incentives
- b. **Transport:** ACC II, VMT reduction policies, IRA incentives, IIJA infrastructure funding, CAFE standards
- c. **Buildings/Industry:** Energy efficiency standards, Building Energy Performance Standards, EmPower
- d. **Non-CO2s:** AIM Act, MD HFC reg, Gas and Landfill methane reg

# Scenario Development: Policy Scenarios

1. **Reference** (Current measures): existing Maryland policies, most relevant federal policies such as IRA and IIJA, most relevant policies for surrounding states
2. **Policy** scenarios (Current measures + additional MD policies)
  - a. *Technology/sectoral variation*
  - b. *NY's proposed policies or "best practices" across states (in discussion)*
3. Additional sensitivity:
  - a. *Low/High baseline demand*
    - i. *Transport vmt*
    - ii. *Buildings (fuel substitution)*
  - b. *Accounting sensitivities*
    - i. *Biofuels*
    - ii. *Imported electricity*
  - c. *Federal policies sensitivity (Current measures + additional MD + additional federal)*

# Timeline for the June Report

- January – February: model customization for Maryland and exploratory top-down scenario
- February – March: reference (current measures) scenario
- March – April: core set of policy scenarios
- April – May: socio-economic impact analysis, sensitivity scenarios
- June: delivery of report

Engage with MWG throughout the process, input to MDE welcome for items such as potential new policy areas (sectors/technologies) to consider that were not previously recommended by MCCC.



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# Thank you!

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