SCHOOL OF PUBLIC POLICY
CENTER FOR GLOBAL SUSTAINABILITY

Maryland Department of the Environment

Maryland's Climate Pathway

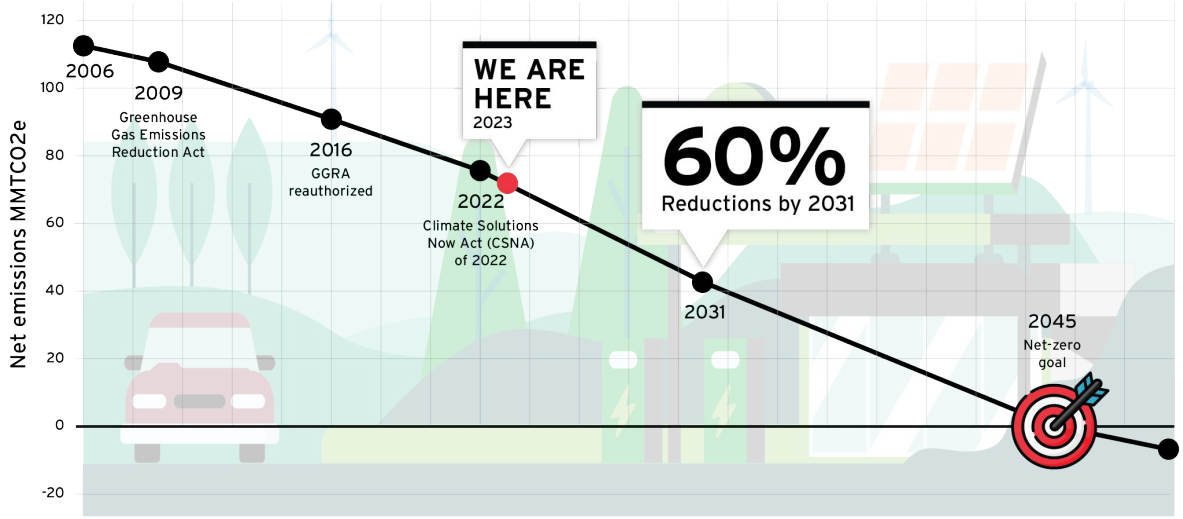
GCAM-USA State Application Community of Practice
Feb 22, 2024

Agenda

- Project overview
- Summary of final results for core scenarios
  - Current Policies
  - Maryland’s Climate Pathway
- Health and economic impacts of Maryland’s Climate Pathway
- Public engagement sessions
- Climate Pollution Reduction Plan

Project Overview

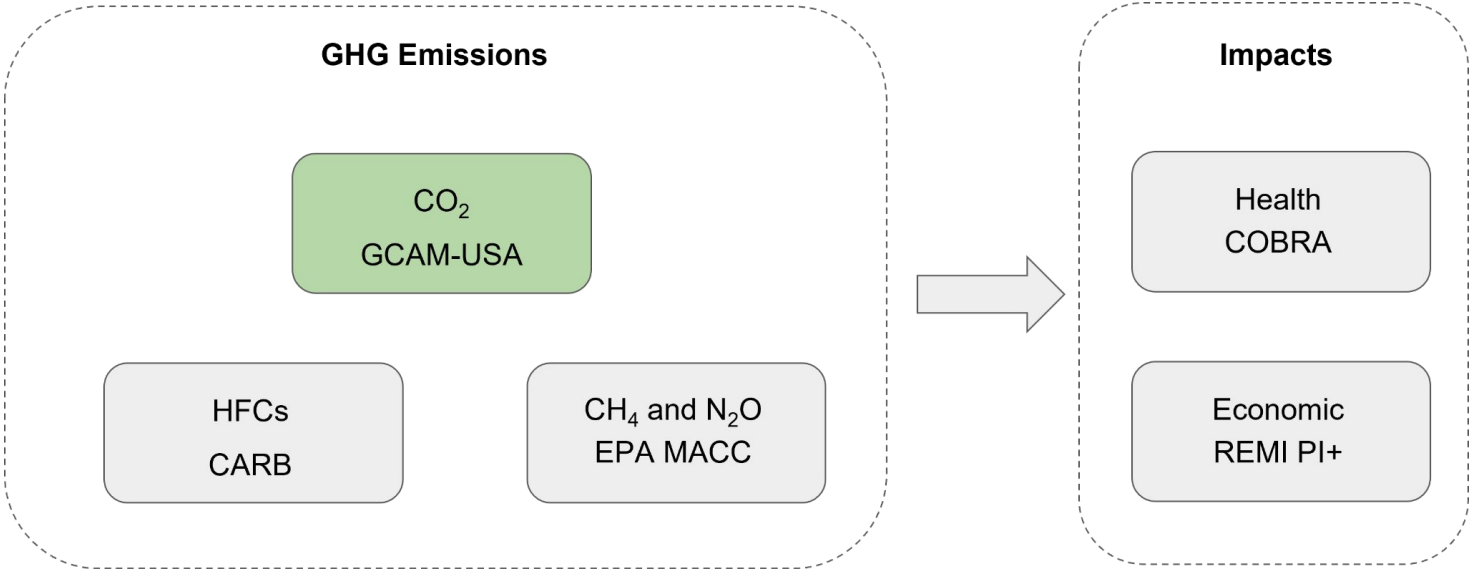
The Climate Solutions Now Act (2022) mandated that the Maryland Department of Environment (MDE) produce a plan to meet the state's GHG reduction goals.



Maryland's Climate Pathway Report (June) → Listening sessions (July - Sep) → Climate Pollution Reduction Plan (Dec)

Analytical Approach

- State and federal policies modeled through 2050 for two core scenarios
  - Current Policies
  - Maryland's Climate Pathway



Current Policies Scenario

- Key policies included:
  a. **Power:** RPS**,** RGGI, Planned coal retirements, IRA incentives
  b. **Transport:** ACC II, ACT, IRA incentives, IIJA infrastructure funding, VMT reduction policies, CAFE standards*
  c. **Buildings/Industry:** EmPower, Building Energy Performance Standards, IRA incentives
  d. **Non-CO2s:** AIM Act, MD natural gas methane regulations, MD HFC regulations, MD landfill methane regulations, IRA methane fee
  e. **Other:** COVID impacts, GHG constraint on rest of states, Technology cost update
- Added in Climate Pollution Reduction Plan:
  - Tree Solutions Now Act

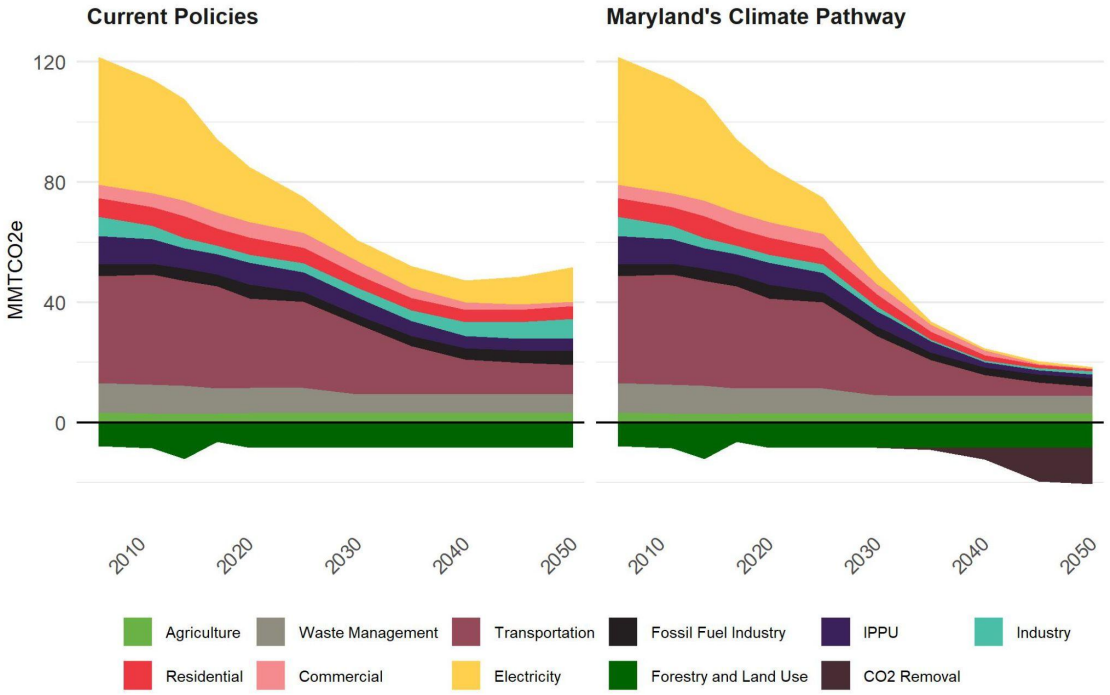
*Note that these policies are implemented as they exist right now, not the new rules/regs being proposed.

Additional Policies in Maryland's Climate Pathway

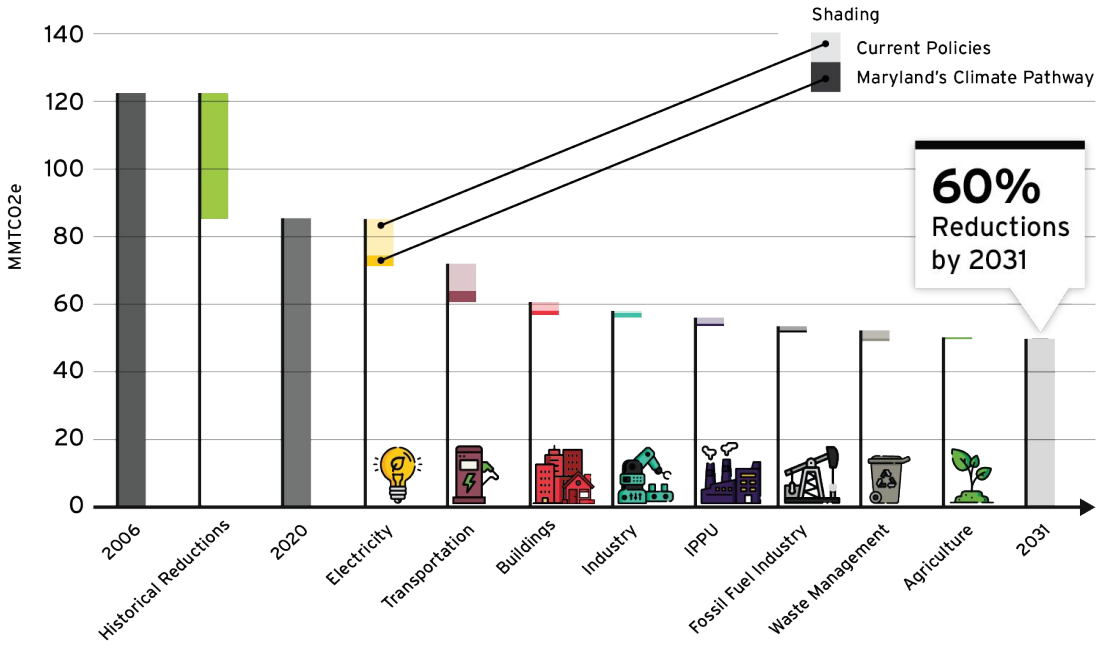
- All current policies included
- Additional policies:
  a. **Power:** RGGI cap reduced to net zero by 2040, Clean electricity standard of 100% by 2035
  b. **Transport:** Advanced clean fleets, additional VMT reductions, nonroad electrification, 100% electric bus sales by 2025
  c. **Buildings:** Zero emissions appliance standards, all-electric construction standards, strengthened energy efficiency standards
  d. **Industry:** "Buy clean" standards to increase efficiency and electrification, fuel switching for cement & other industry, cement CCS
  e. **Non-CO2s:** Methane reductions w/ marginal abatement cost curve for gas, waste, and agriculture
  f. **Economy-wide:** Cap and invest backstop policy to achieve remaining reductions

In Maryland's Climate Pathway, economy-wide emissions reduce 60% below 2006 levels by 2031

- Current Policies achieve 51% reductions by 2031, but emissions rebound through 2050 due to expiration of many policies
- Maryland's Climate Pathway reaches 60% gross emissions reduction in 2031 and net-zero in 2045
- Negative emissions are needed to reach net-zero, with ramp-up beginning in 2035



Pathway to 60% reduction in 2031 includes additional actions across all sectors



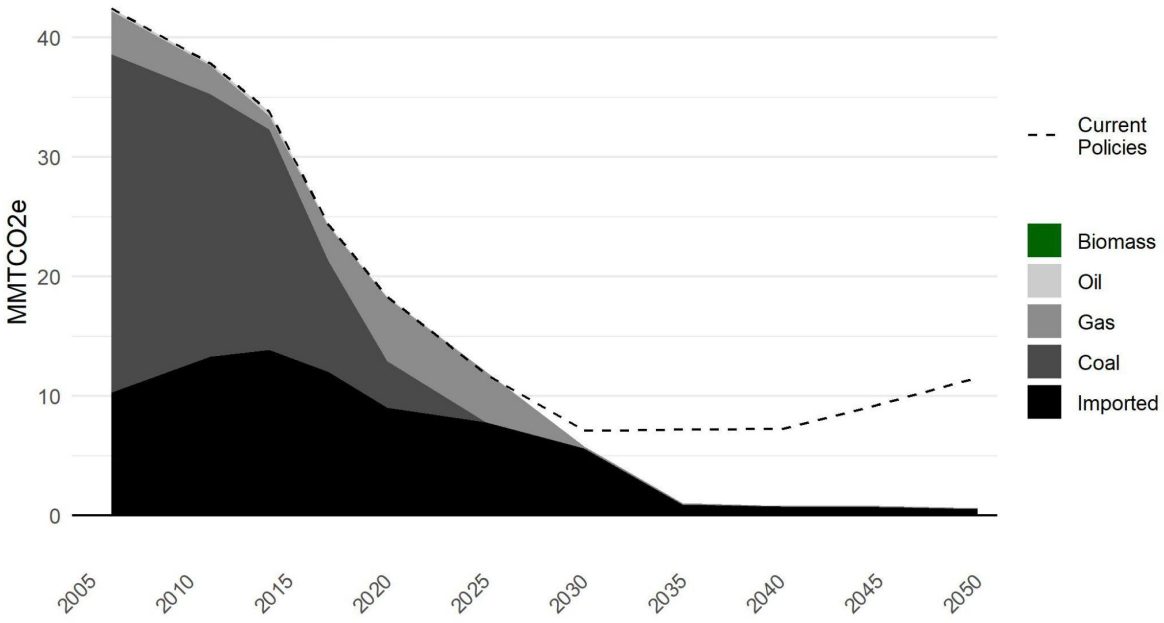
- Total reductions needed: **73.3**
- Already achieved: **36.7**
- Current policies can deliver: **26.0**
- Gap to be filled with additional policies: **10.6**

(All numbers in MMTCO2e)

Modeling challenges

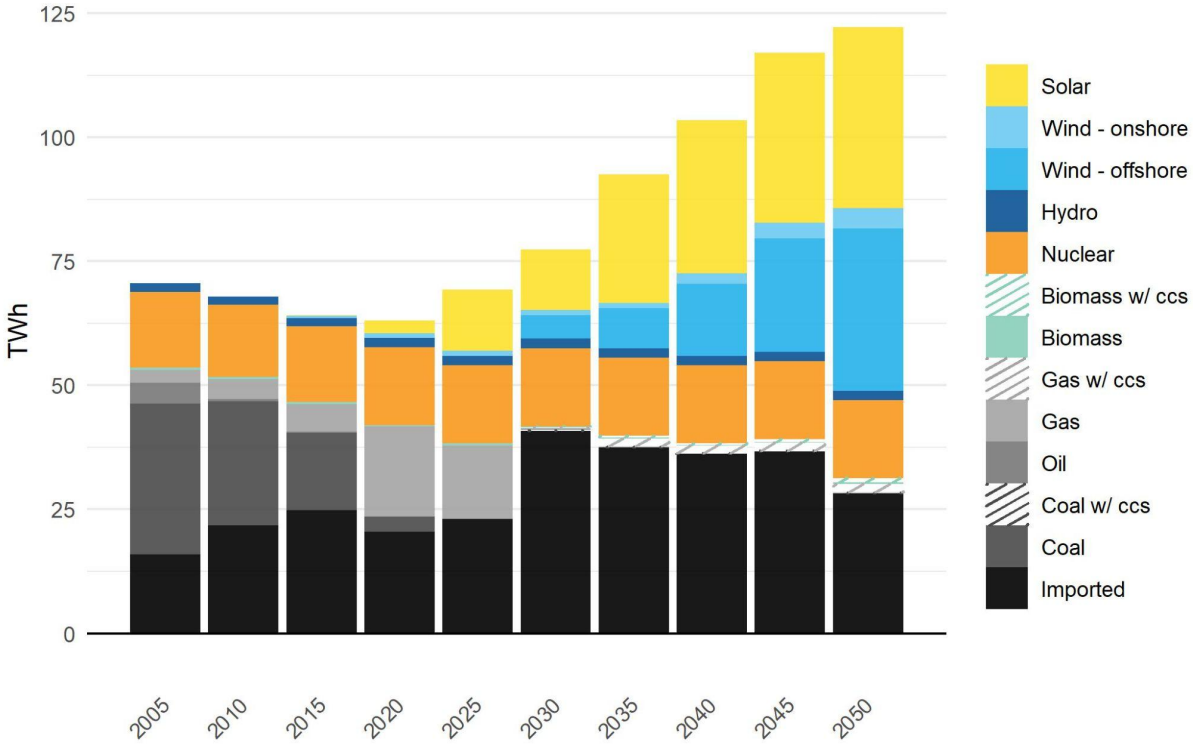
- Overlapping policies
  - **Power sector:** RGGI, Clean electricity standard, Renewable portfolio standard
  - **Buildings sector:** Building energy performance standards, zero emissions appliance standards, energy efficiency resource standards
  - Cap and invest
- Inventory accounting
  - Biomass emissions
  - Exported electricity emissions
- Coordinating with other agencies/groups
  - Bilateral meetings
- Representing Maryland accurately

Electricity sector achieves 89% reductions by 2031, with solar and wind rapidly replacing fossil technologies

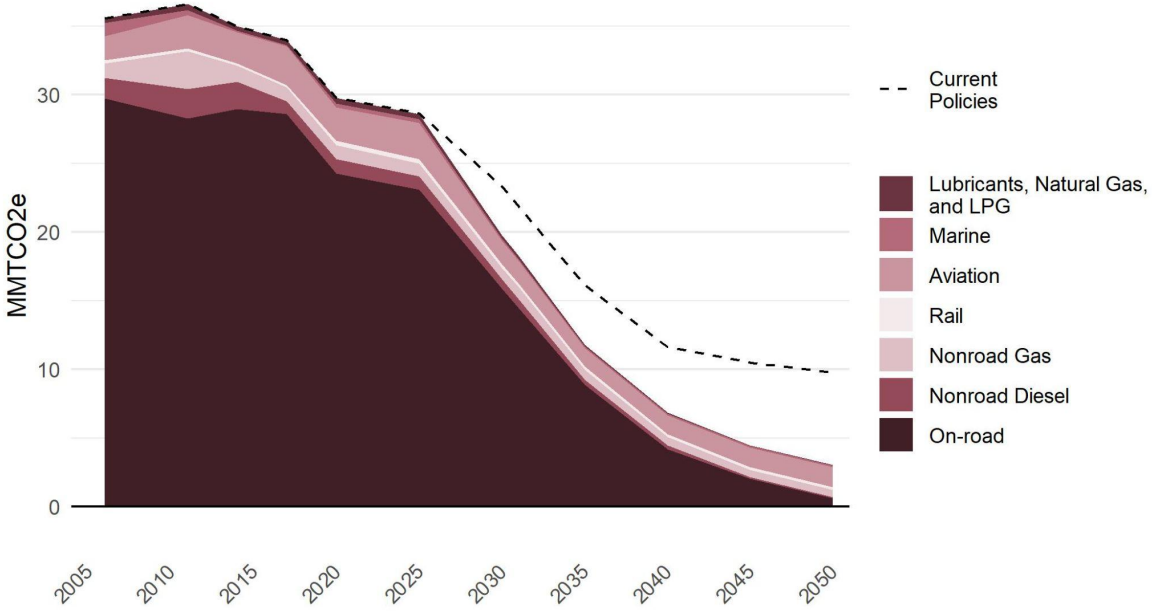


- **Key policies included:**
  - *Current:* RPS, planned coal retirements, renewal of nuclear licenses, IRA tax credits
  - Coal retirements are based on EIA, EPA, and Global Energy Monitor databases, and announced retirements by coal companies
  - 100% clean electricity by 2035
  - RGGI goes to zero by 2040

Electricity sector achieves 89% reductions by 2031, with solar and wind rapidly replacing fossil technologies

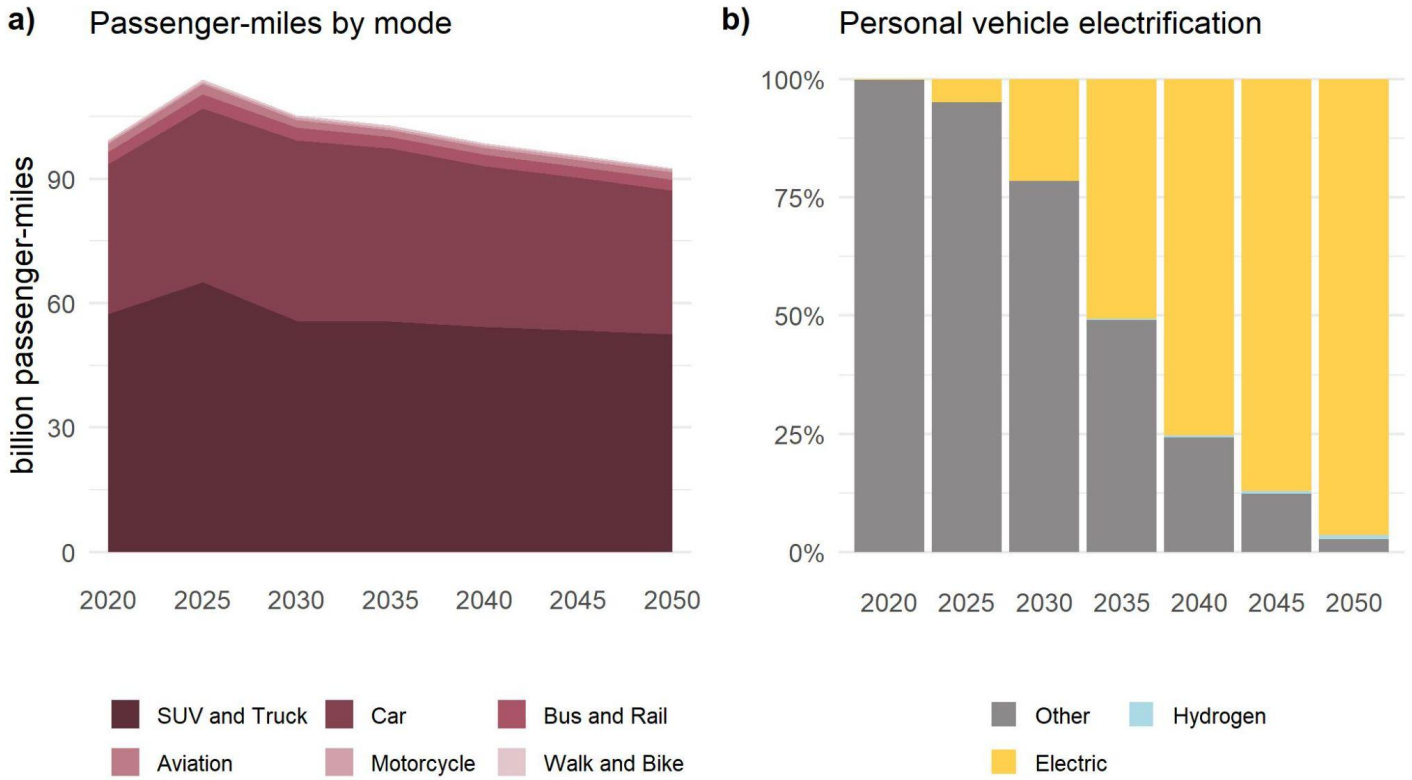


Transportation sector achieves 49% reductions, primarily through road vehicle electrification & efficiency measures

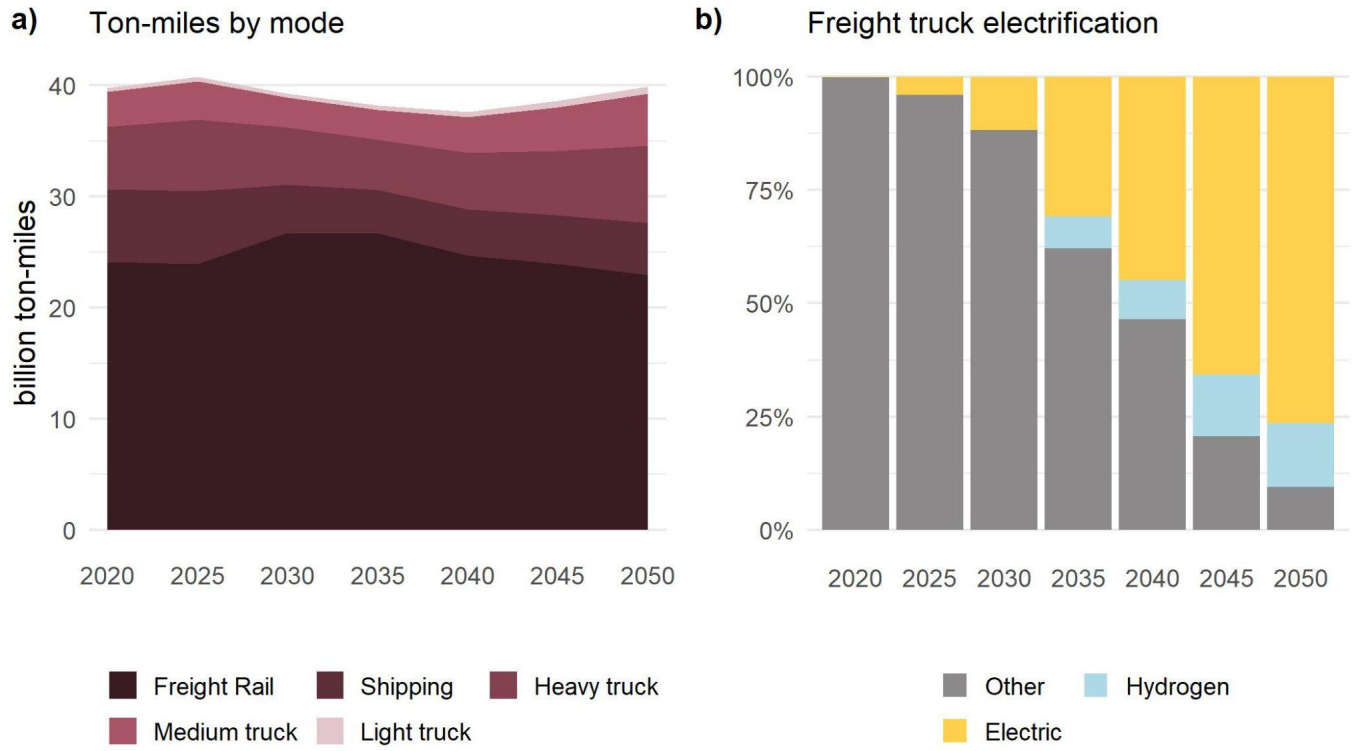


- On-road vehicles contribute to majority of reductions
- **Key policies included:**
  - *Current:* Advanced Clean Cars II, Advanced Clean Trucks, IRA tax credits, IIJA infrastructure funding, CAFE standards
  - Advanced Clean Fleets
  - VMT reductions from mode switching and smart growth, consistent with current ambition in leading states

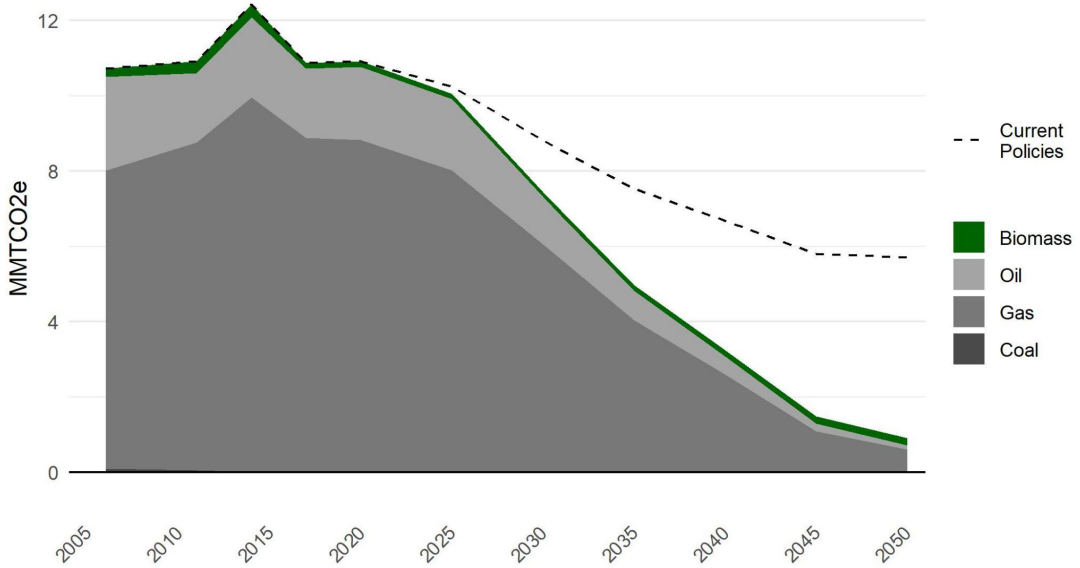
Passenger service declines over time with ZEV accounting for over half of road travel by 2035



Freight service sees decline, ZEV fraction of trucking expands rapidly



Buildings sector achieves 35% reductions, through energy efficiency & electrification measures

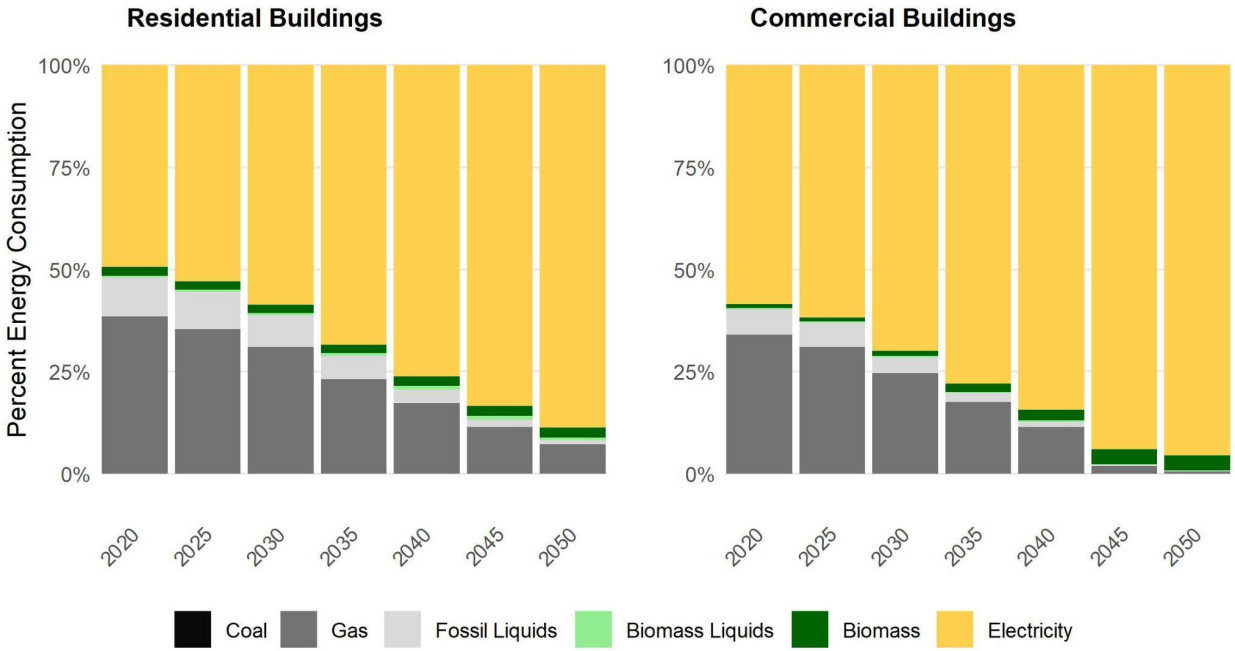


Key policies included:

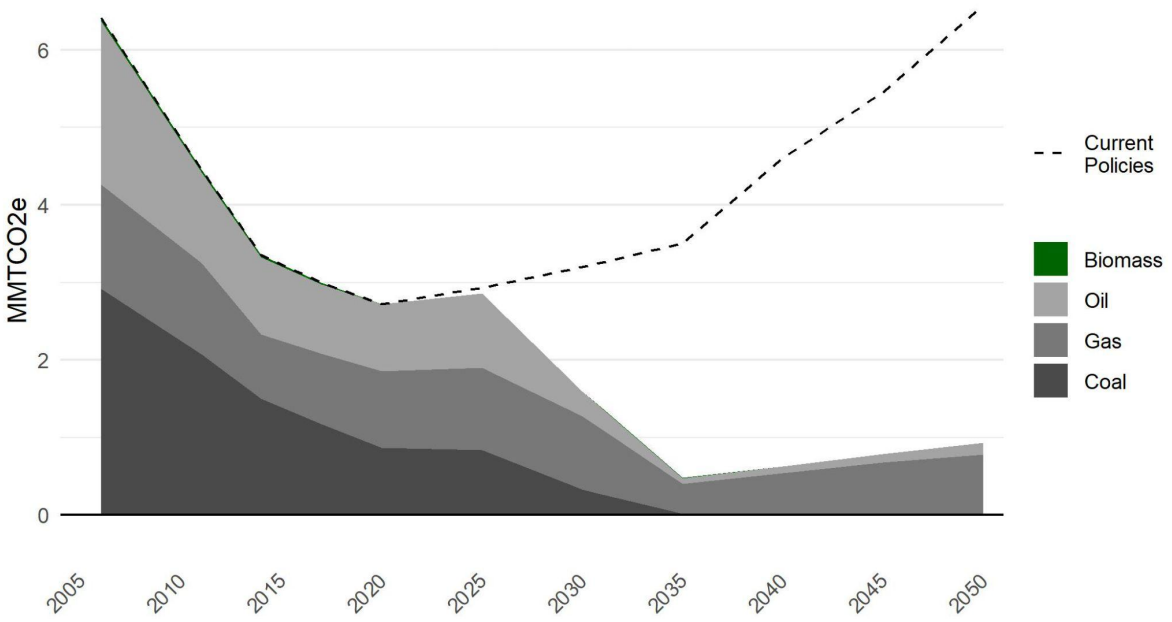
- *Current:* EmPower, Building Energy Performance Standards, IRA tax credits & rebates
- All electric construction standards starting in 2027
- Zero emissions appliance standards in line with San Francisco Bay Area's standards
- Extended energy efficiency standards beyond 2027

Electrification increases in both commercial and residential buildings

- Electricity increases to 60% and 70% of total energy consumption for residential and commercial by 2031

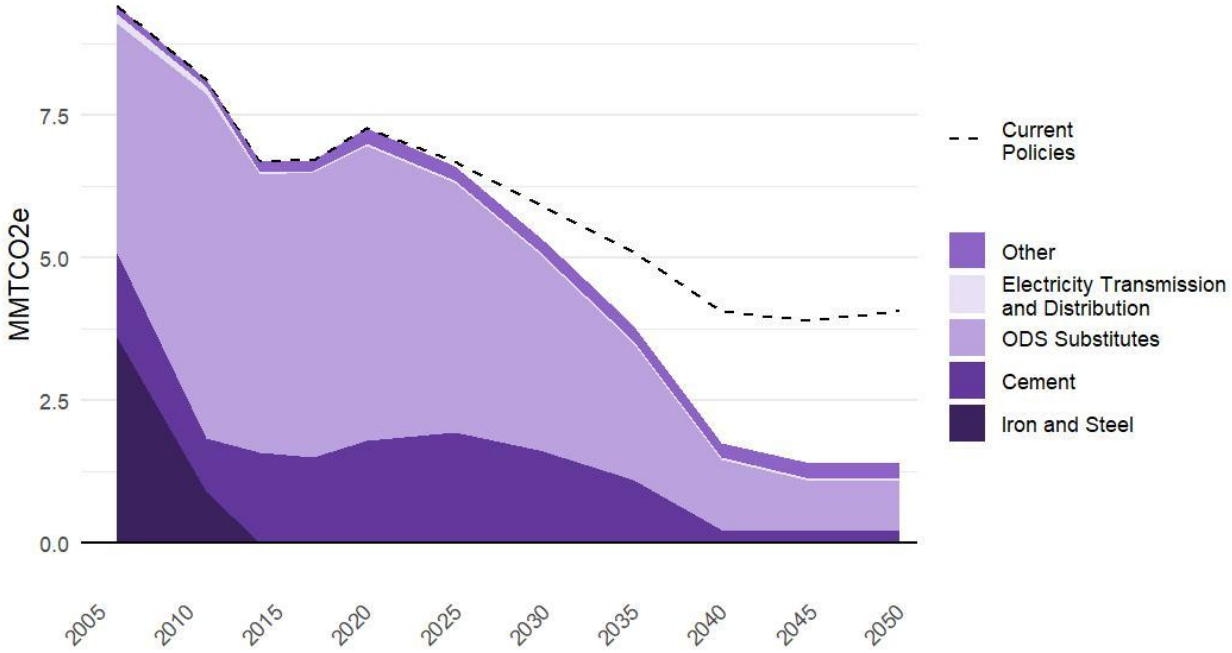


Industrial sector achieves 79% reductions below 2006 levels in 2031



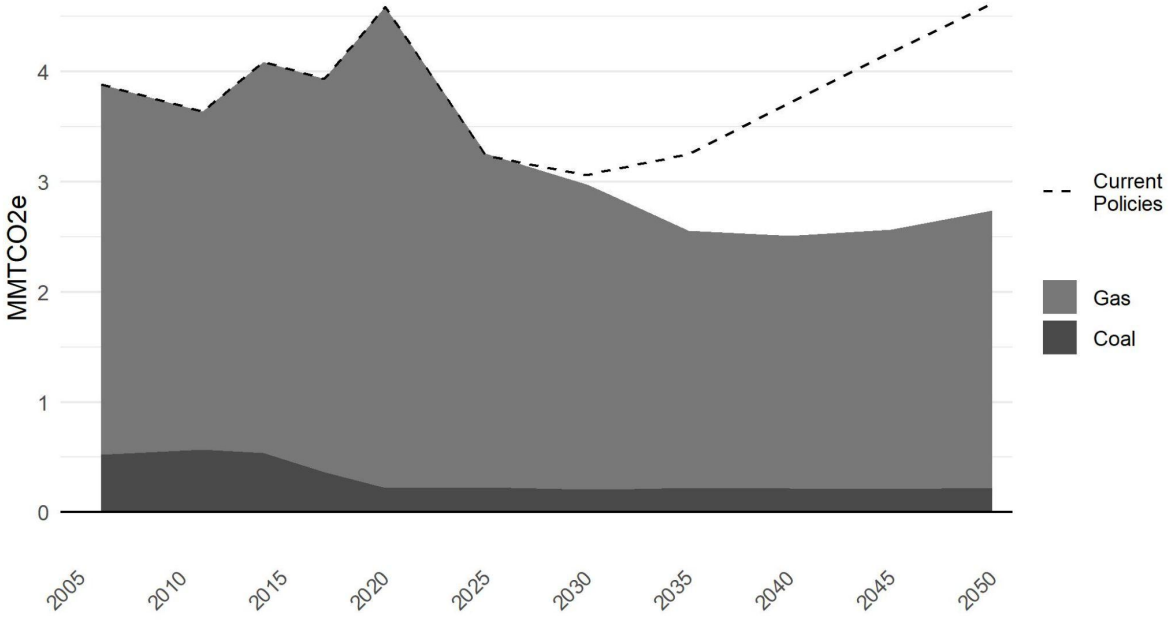
- **Key policies included:**
  - *Current:* IRA hydrogen tax credits, 45Q credits for CCS
  - Fuel switching from coal to natural gas
  - “Buy Clean” standards to increase electrification, efficiency, CCS
  - Included under cap and invest
- Additional policies would require removing the manufacturing exemption

Industrial Processes and Product Use (IPPU) achieves 46% reductions in 2031



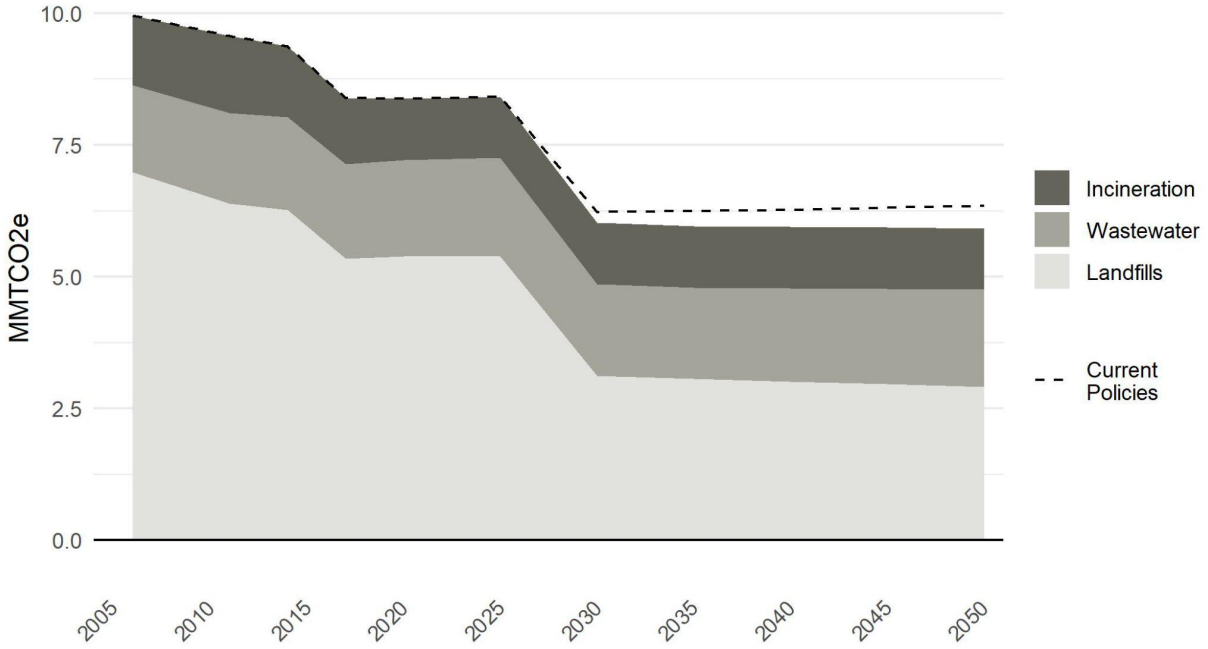
- Emissions from substitutes for ozone-depleting substances (ODS) decrease
- **Key policies included:**
  - *Current:* AIM Act, MD HFC regulations, 45Q tax credits
  - Cement CCS

Fossil Fuel Industry achieves 26% reduction in 2031



- **Key policies included:**
  - *Current:* MD gas methane regulations, IRA methane fee on 2 facilities
- Large reduction in MD gas consumption drives difference between Current Policies and MCP scenarios, not additional policies in this sector

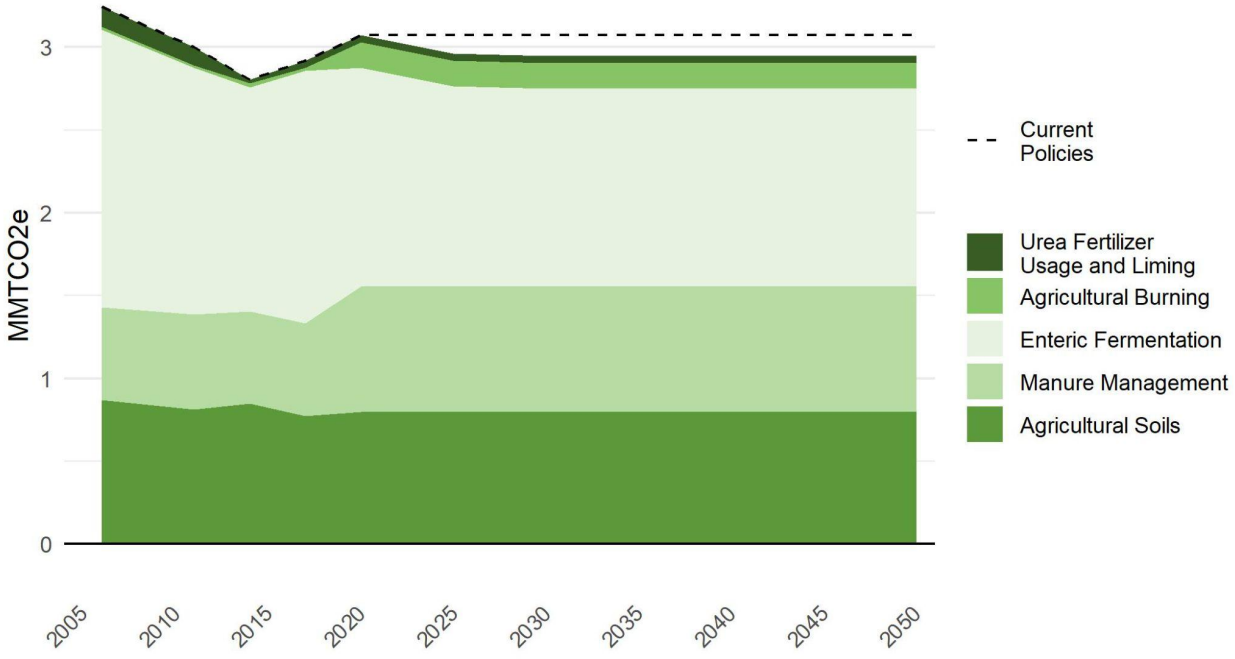
Waste Management achieves 40% reductions in 2031 through methane reductions



Key policies included

- *Current*: MD landfill regulations (assume average of min. & max. estimated reductions)
- In MCP scenario, assume additional waste diversion efforts are successful

Agriculture achieves 9% emissions reductions in 2031 with zero-cost actions



Key policies included

- No current policies scenario for livestock
- In MCP scenario, assume that reductions achievable in livestock at <$0 from the EPA's marginal abatement cost curve for MD are achieved

All sectors play a crucial role in reaching 60% reductions, but distribution is uneven across sectors

Percent emissions reductions achieved by 2031

Sectors	Current Policies	Maryland's Climate Pathway
Economy-wide	51%	60%
Electricity	83%	89%
Transportation	38%	49%
Buildings	20%	35%
Industry	49%	79%
IPPU	39%	46%
Fossil Fuel Industry	20%	26%
Waste Management	37%	40%
Agriculture	6%	9%

- Largest reductions come from the electricity sector
- Transportation reductions are large in MMTCO2e, but relatively low as a percent-change compared to other sectors
- Even reductions in small sectors like Agriculture are critical to reaching overall goal

Health and Economic Impacts of Maryland's Climate Pathway compared to Current Policies

- Health benefits analyzed using EPA's COBRA tool
- Economic analysis by Towson with REMI PI+

Climate

Snapshot of 2031

60%
Emissions reduction

Contribute to national and global reduction goals

Co-pollutant reductions bring health benefits to Marylanders

Health

Snapshot of 2031

Up to 1000
fewer cases of upper and lower respiratory symptoms

Up to 51
lives saved

Over 16,500
fewer days of restricted activity from pollution

Economy

Cumulative through 2031

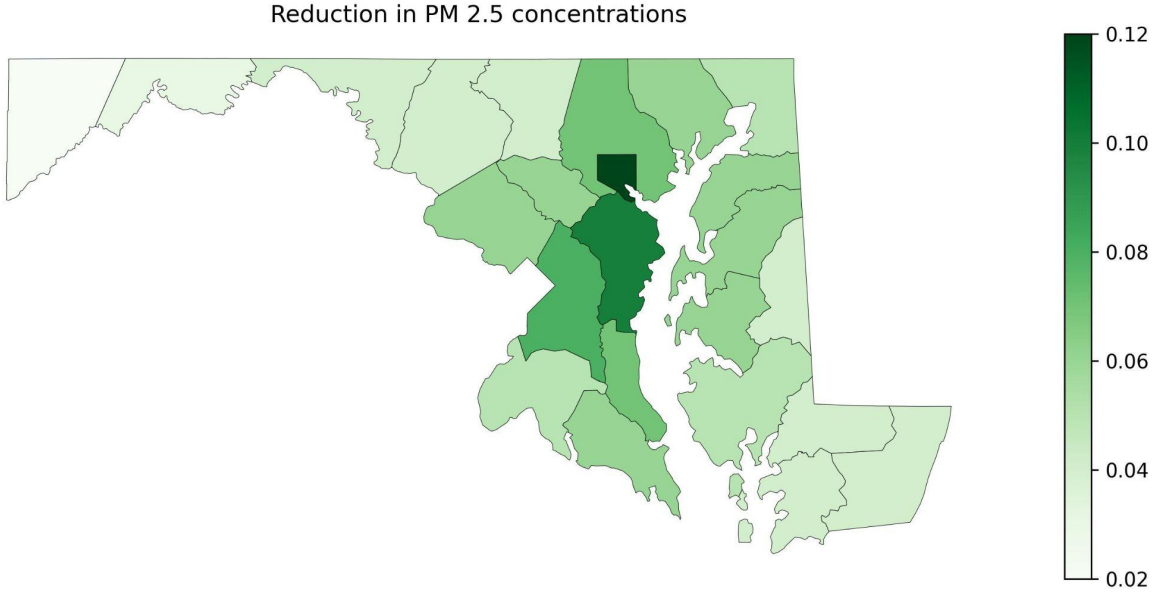
$1.09-2.44B
in health benefits

16,700
jobs created

$1.5B
increase in personal income

Maryland's Climate Pathway sees pollutant reductions centered on Baltimore City and Bay area

- PM 2.5 reductions shown in $\mu g/m^3$
- Benefits center on population centers where sources of pollution are greatest
- Results are specific to 2031 - not cumulative



County-Level Result Highlights

- Baltimore City, a well-known focus area for environmental justice issues such as pollution from waste incineration and from Baltimore Harbor, is estimated to have 96 fewer incidents of asthma exacerbation
- Prince George's County, diverse and densely populated, is expected to have 475 fewer work loss days
- Washington, Worcester, Talbot counties will see the greatest reduction in minor restricted activity days per capita
- Garrett County, with the lowest monetized $/person benefit, is still estimated to see significant delivered total health benefits delivered in 2031 though, between $383,821 - $864,379

MARYLAND'S CLIMATE PATHWAY
LISTENING SESSIONS

Experts will discuss the report and welcome your feedback during a series of in-person sessions across the state.

July 25, 6 p.m. - Bowie State University
Aug. 8, 6 p.m. - Hagerstown Community College
Aug. 19, 2 p.m. - Salisbury University
Sept. 12, 6 p.m. - Morgan State University
Sept. 19, 6 p.m. - College of Southern Maryland

http://bit.ly/MDlisteningsessions

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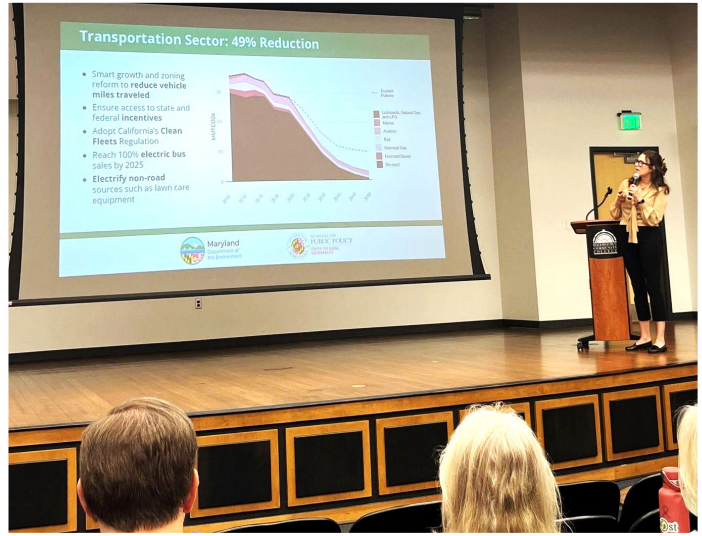
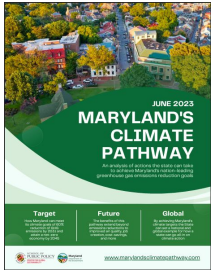
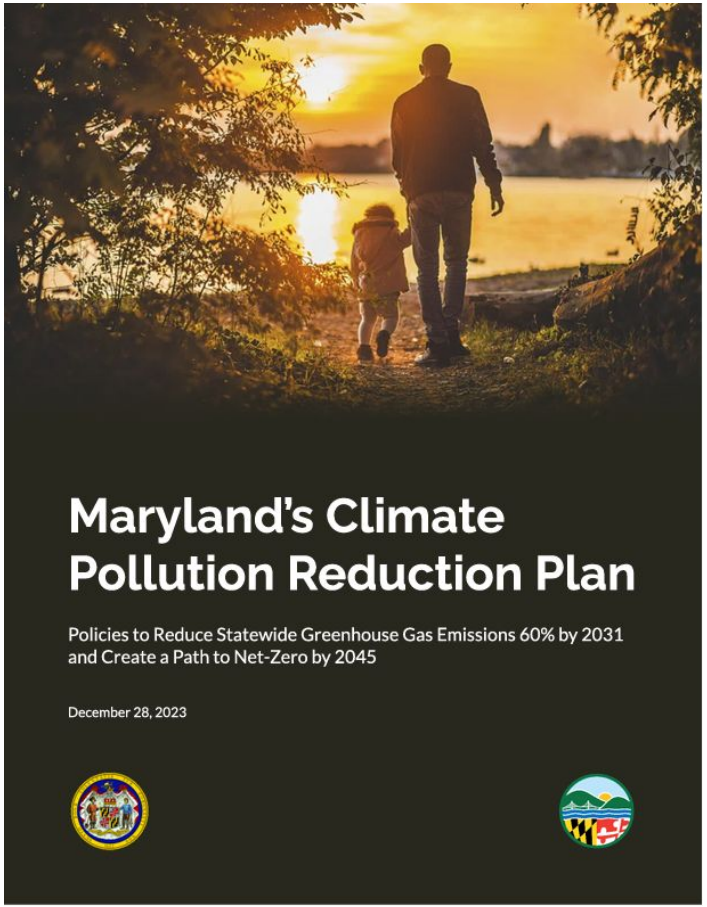




Climate Pollution Reduction Plan

- Climate Pollution Reduction Plan released by MDE in December
  - Incorporated feedback from listening sessions
- Policies largely the same as in Maryland's Climate Pathway
- CGS provided updated modeling scenarios for the Plan



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Thank you!

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Alicia Zhao, Research Manager, Center for Global Sustainability, University of Maryland School of Public Policy