

Global Climate Change

Tipping Points, Comfort Zones, and Wayne Gretzky

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Disclaimer: Much of the information presented is based on PB work for NCHRP 20-24 (59). PB's work is in progress. This presentation is not a NCHRP report nor does it represent the panel's views. The NCHRP work is intended to inform AASHTO members' policy-development discussions and does not include making recommendations on matters of policy.

Climate Change Is Real and Poses Major Risks

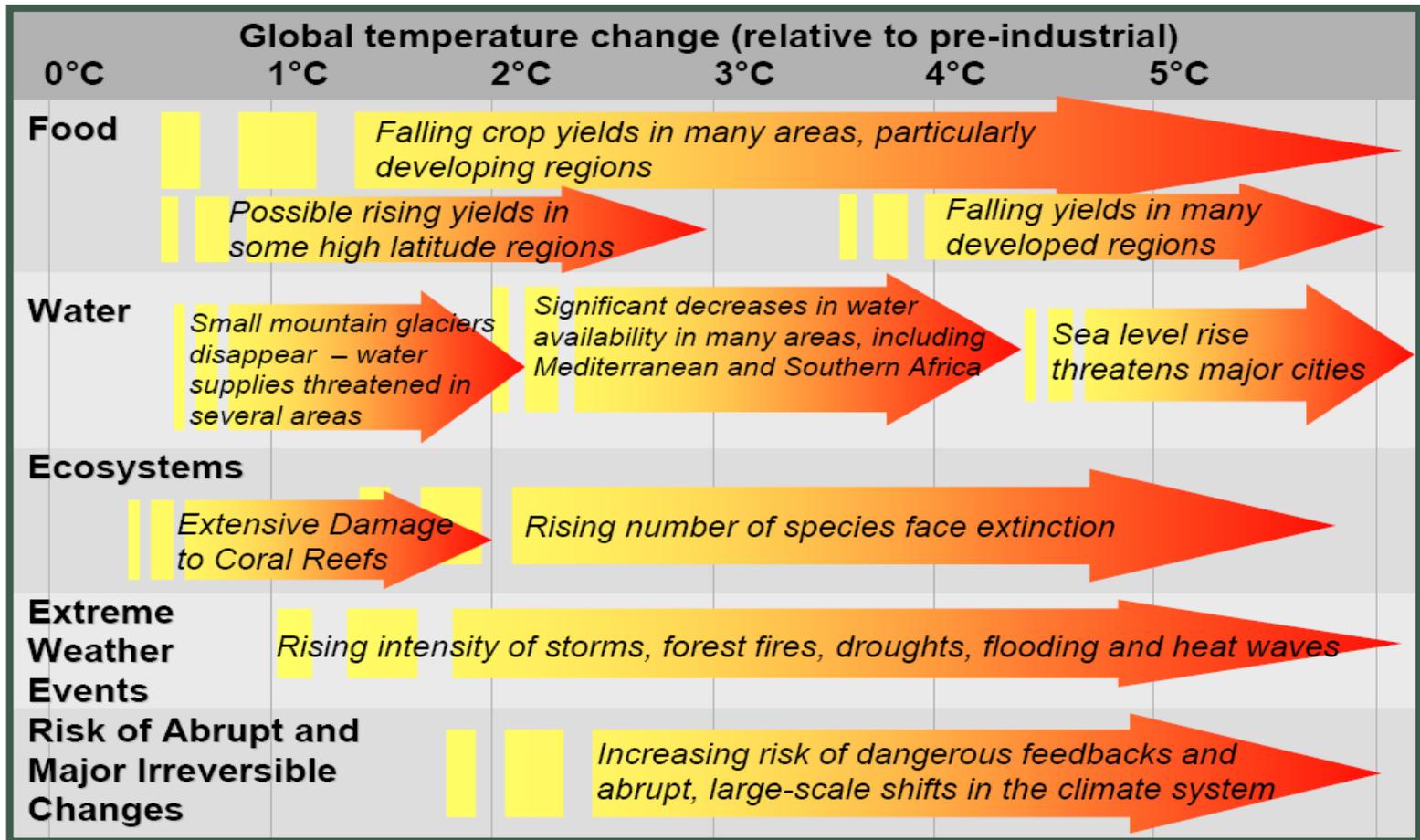
- “Warming of the climate system is unequivocal...”
-- Intergovernmental Panel on Climate Change
- “An overwhelming body of scientific evidence paints a clear picture: climate change is happening, it is caused in large part by human activity, and it will have many serious and potentially damaging effects in the decades ahead.”
-- Pew Center on Climate Change

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Dangerous Tipping Points Lie Ahead



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GCC Will Push Us Way Beyond Our Comfort Zones

- Both climate adaptation and GHG reduction are necessary & costly
- IPCC scientists call for 50-80% GHG reduction below 1990 by 2050
- U.S. will be expected to achieve greater reductions
- Huge technology shifts will be required
- Transportation changes will be especially costly

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Climate Adaptation is Necessary and Costly

- “Climate change will affect transportation primarily through increases in several types of weather and climate extremes... very hot days; intense precipitation events; intense hurricanes; drought; and rising sea levels, coupled with storm surges and land subsidence.”
- “The impacts will be widespread and costly in both human and economic terms and will require significant changes in the planning, design, construction, operation, and maintenance of transportation systems.”

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- TRB Special Report, March 2008



Transportation Vulnerability is Substantial

Vulnerable assets:

- Bridges
- Culverts
- Causeways and coastal roads
- Paved surfaces
- Hillside slopes and
- Vegetation in ROW

Threatened by:

- Rising sea levels
- Severe storms – flooding, winds, surges, more scour
- Temperature spikes
- Drought in some areas
- 100-year storms become 10-20-year storms?

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U.K. Highways Agency – Risks Identified

- Assets deteriorate faster due to changes in climate
- Assets are more badly damaged by more extreme climatic events
- Network restrictions needed to maintain safety
- More onerous design requirements
- Increased costs
- More frequent & extensive construction/maintenance/repairs
- Increased safety risk to road workers and traffic officers from working on the network more often and during extreme events
- More frequent (expensive) incidents to pay for
- More research needed – specific to state climate conditions

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50-80% GHG Reductions Are Needed

Climate scientists	80% below 1990 by 2050
California, Montana, Florida	80% below 1990 by 2050
Oregon	75% below 1990 by 2050
Massachusetts, Vermont, New Hampshire, Connecticut, Maine, Rhode Island	75-85% below 2001 by 2050
Colorado	80% below 2005 by 2050
New Mexico	75% below 2000
Climate Security Act (Lieberman-Warner) S.2191	Up to 66% below current levels by 2050
Global Warming Reduction Act (Kerry-Snowe) S.485	62% below 1990 by 2050
Climate Stewardship and Innovation Act (McCain-Lieberman) S.280	60% below 1990 by 2050
United Kingdom	60% below 1990 by 2050

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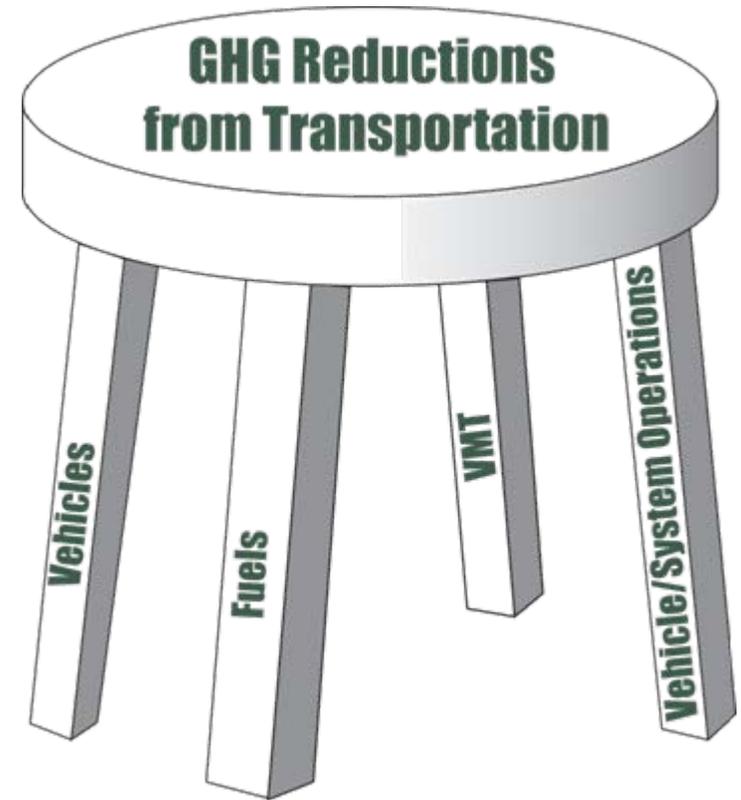
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Transportation GHG Reduction is a Four-legged Stool

The 3-legged stool:

- Vehicles
- Fuels
- VMT



The 4th leg:

- Vehicle/System Operations

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1st & 2nd Legs: Vehicles & Fuels

- 50% cut in ***GHG/mile*** is feasible by 2030 from conventional technologies and biofuels
- Almost complete decarbonization of transport vehicles/fuels by 2050 is a “***realistic ambition,***” with advanced technology/fuels
- But technology is not enough – this is ***not*** like reducing NAAQS under CAA

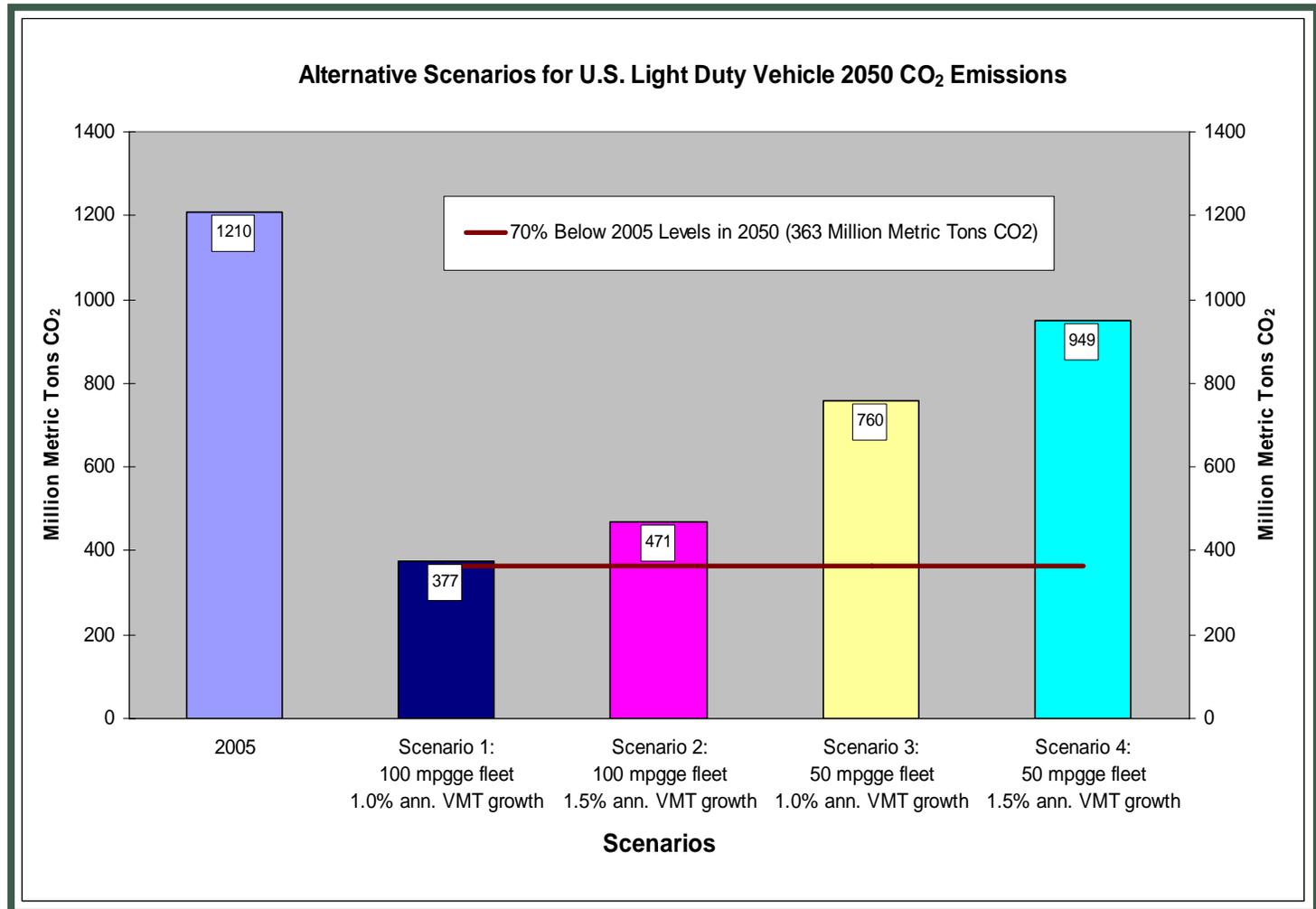
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3rd Leg: VMT

To meet GHG targets, we must slow VMT growth to 1% or less



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3rd Leg: VMT (continued)

- VMT growth is slowing, due to fuel prices and demographic changes
- But is this a temporary or permanent change?
- What is the desired VMT rate – for GCC, for congestion, for economy, for quality of life?
- How do we achieve the desired rate?

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4th Leg: Vehicle/System Operations

10-20% LDV GHG reduction potential:

- Manage speed (40-50 MPH is optimal)
- Reduce congestion, accel-decel
- Encourage “eco driving”
- Use LRR tires, inflated optimally
- Minimize weight and drag
- Energy-efficient construction and maintenance practices

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Prices Are Key to GHG Reduction

- Higher energy prices are essential to promote energy conservation and new technologies in all sectors
- In transport, pricing can be powerful:
 - PAYD Insurance
 - Mileage fees
 - Parking pricing
 - Congestion pricing
 - Vehicle “feebates”

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What About Land Use?

“Growing Cooler” Report by ULI/CCAP, et al, 2007:

- “It is realistic to assume a 30 percent cut in VMT with compact development.”
- “... smart growth could ...reduce total transportation-related CO₂ emissions from current trends by 7 to 10 percent as of 2050.”
- Assumes:
 - 67% of development in place in 2050 is new or rehab
 - 60-90% of that development is “smart growth” (equivalent to 13 housing units per acre)

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What About Transit?

- APTA: Transit reduced GHG by 6.9 MMT in 2005* (1/3 of 1% of U.S. transportation GHG)
- European Ministers of Transport caution “*Modal shift policies can not... form the corner-stone of effective CO2 abatement policy.....*”
- But transit has huge popular support, serves other goals, and is seen as key to land use changes
- In Gallup survey, 77% cite transit as GHG strategy

* APTA includes 3.0 MMT reduction for transit's effect on congestion reduction

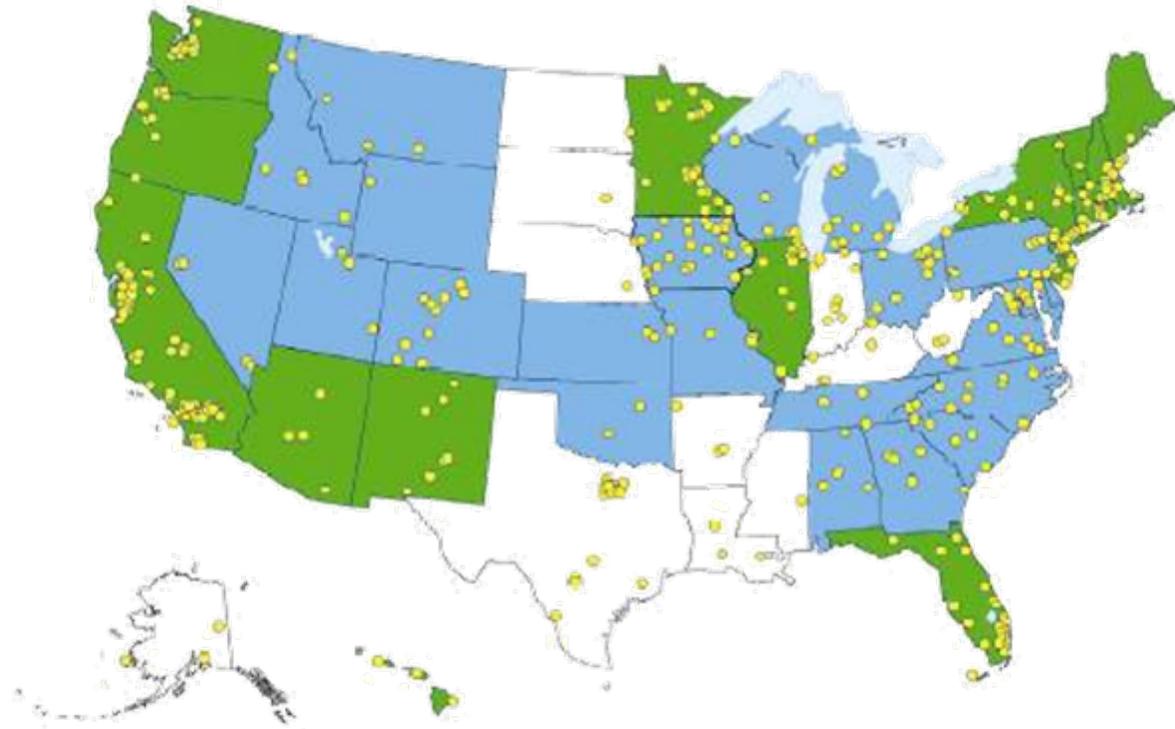
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Many States Are Developing Aggressive Climate Action Plans

State and Local Participation in Selected Climate Change Initiatives



- States with Greenhouse Gas Emission Targets and Participating in the Climate Registry (17)
- States Participating in the Climate Registry without a Greenhouse Gas Emissions Target (22)
- Cities Participating in the U.S. Mayors Climate Projection Agreement (780)



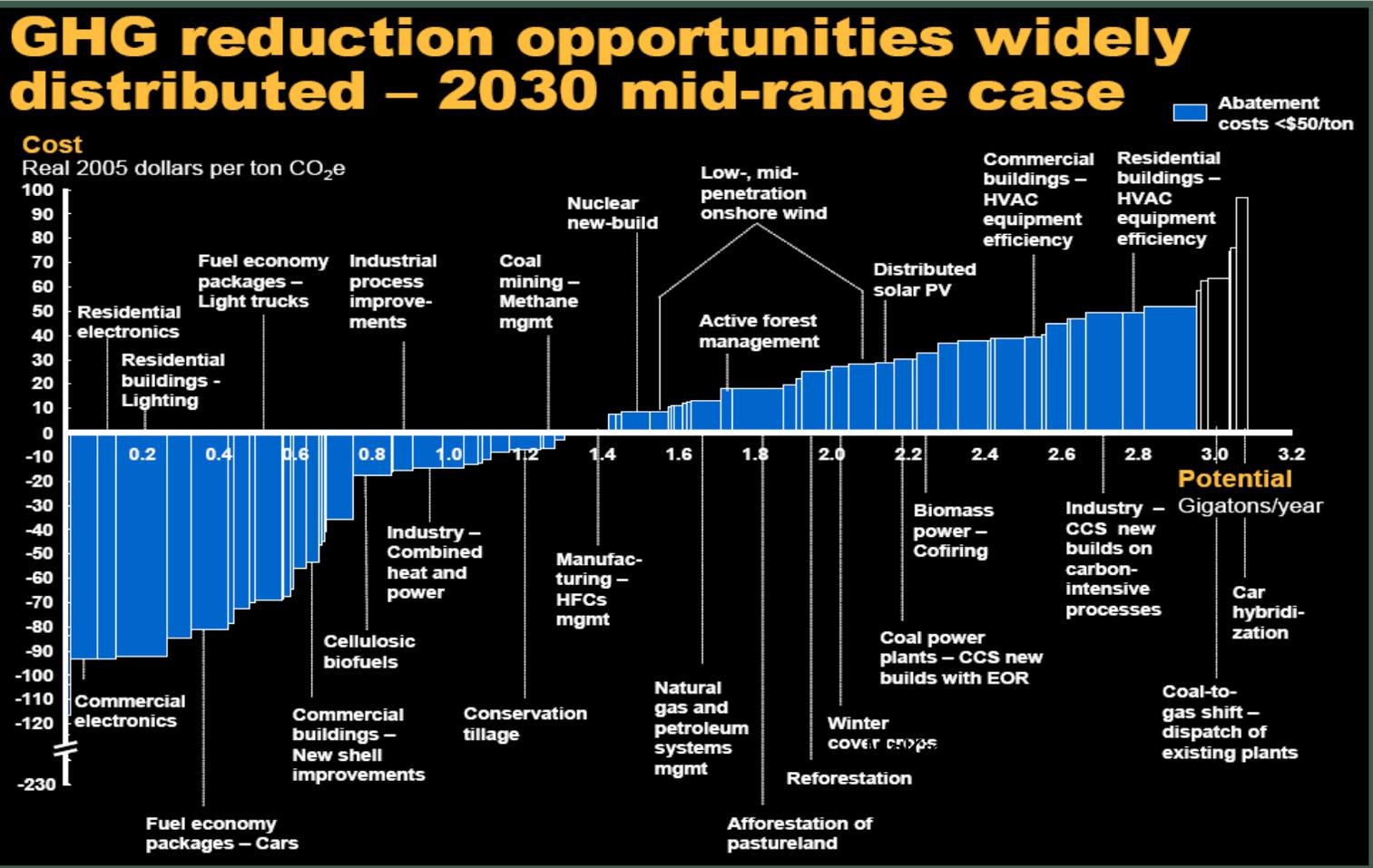
Statewide Climate Change Action Plans – Transportation Elements

State	Year	Vehicle	Low Carbon Fuels	Smart Growth and Transit	Other
AZ	2020	40%	7%	25%	28%
CA	2020	54%	6%	38%	2%
CO	2020	40%	26%	22%	13%
MT	2020	61%	24%	8%	7%
NM	2020	31%	21%	16%	31%
OR	2025	80%	14%	6%	0%
WA	2020	8%	23%	64%	5%

Statewide Climate Change Action Plans – Transportation Elements

State	Year	Vehicle	Low Carbon Fuels	Smart Growth and Transit	Other
CT	2020	51%	38%	8%	2%
ME	2020	53%	25%	21%	1%
MD	2025	24%	12%	45%	20%
MN	2025	15%	35%	25%	25%
NC	2020	35%	12%	38%	15%
NY	2020	59%	11%	27%	4%
PA	2025	45%	36%	18%	0%
RI	2020	46%	10%	31%	14%
SC	2020	14%	55%	29%	1%
VT	2028	21%	14%	49%	17%

“Transport is one of the more expensive sectors to cut emissions from because low carbon technologies tend to be expensive and the welfare costs of reducing demand for travel are high.” -- Stern Report



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Issues for Maintenance & Asset Management

- Higher prices for energy
- Higher prices for materials
- Need to reduce operational energy use
- Need for new risk frameworks re asset vulnerability
- Change asphalt and concrete mixes/methods?
- Convert to LED lights?
- Opportunities to incorporate solar power?
- Need to relocate some facilities?
- Modify ROW vegetation management

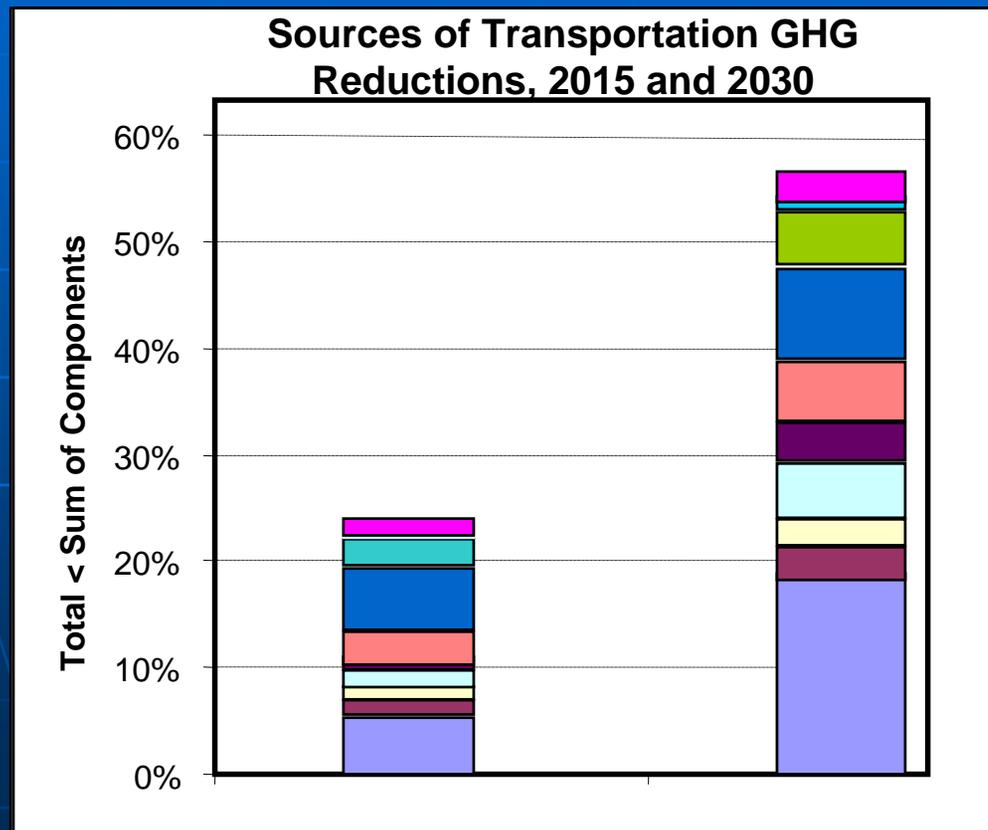
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Comprehensive Policies Could Cut U.S. Transportation GHG in Half by 2030

-- David Greene and Andreas Schaefer, for Pew Center



- Information and Education.
- Systems
- Infrastructure
- Pricing
- Carbon Cap
- Hydrogen
- Low-Carbon Fuels
- Air Efficiency
- Heavy Duty Truck Effic.
- LDV Efficiency

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A Tip from Wayne Gretzky

“I skate to where the puck will be.”

-- Wayne Gretzky, when asked
the secret behind being
one of the best hockey players
of all time

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