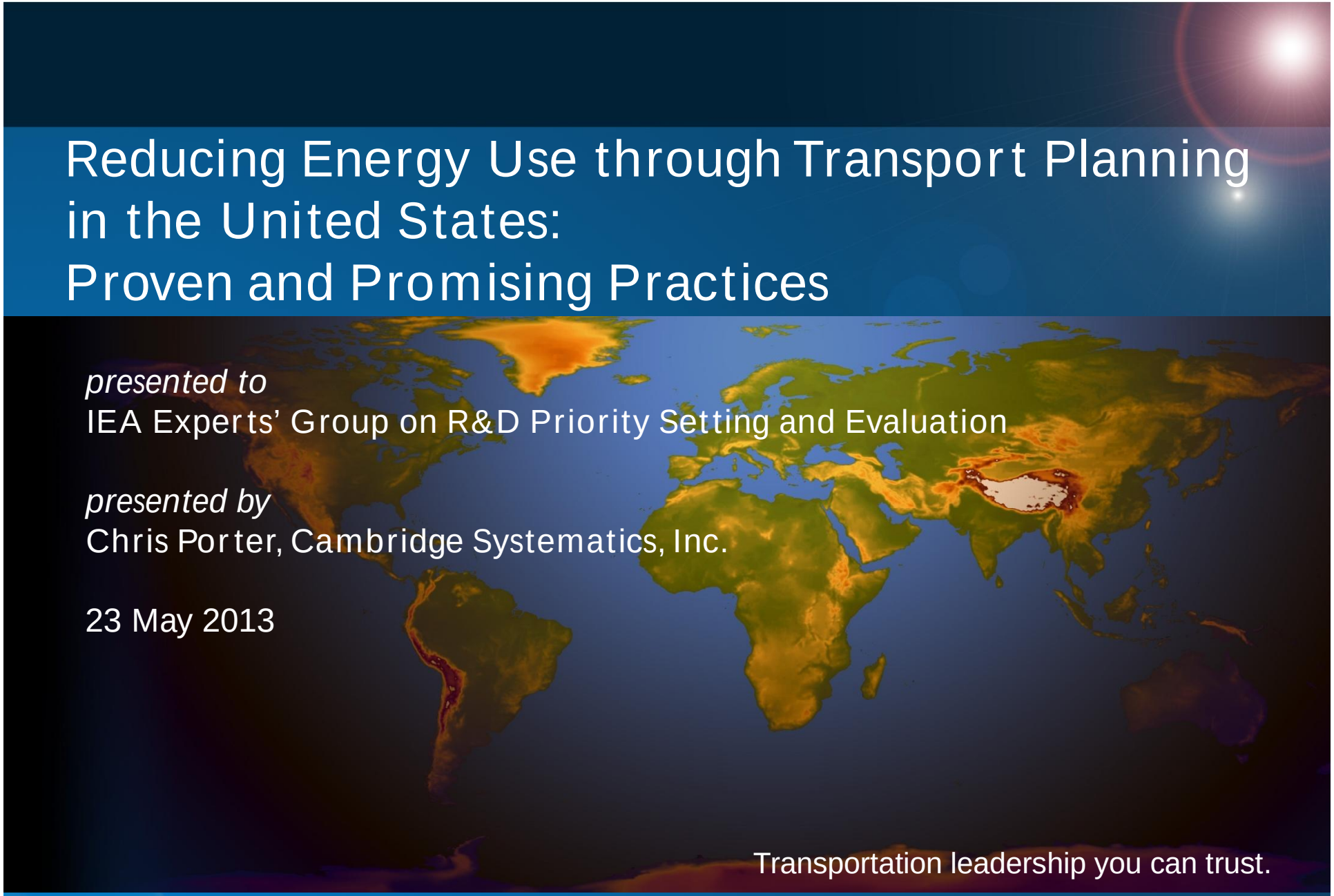
Reducing Energy Use through Transport Planning in the United States: Proven and Promising Practices



presented to
IEA Experts' Group on R&D Priority Setting and Evaluation

presented by
Chris Porter, Cambridge Systematics, Inc.

23 May 2013

Transportation leadership you can trust.

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Overview

- U.S. Context and Trends
- Effectiveness of Energy/GHG Reduction Strategies
- How do We Get There?
- Research Needs

U.S. energy and climate change mitigation experience

- National-scale assessment studies
  - » Moving Cooler, USDOT Report to Congress, National Renewable Energy Lab - Transportation Energy Futures
- State and Metropolitan Planning Organization (MPO) GHG & energy inventories, mitigation plans, & tools
  - » Massachusetts, Maryland, Oregon, Southern California, Northern New Jersey

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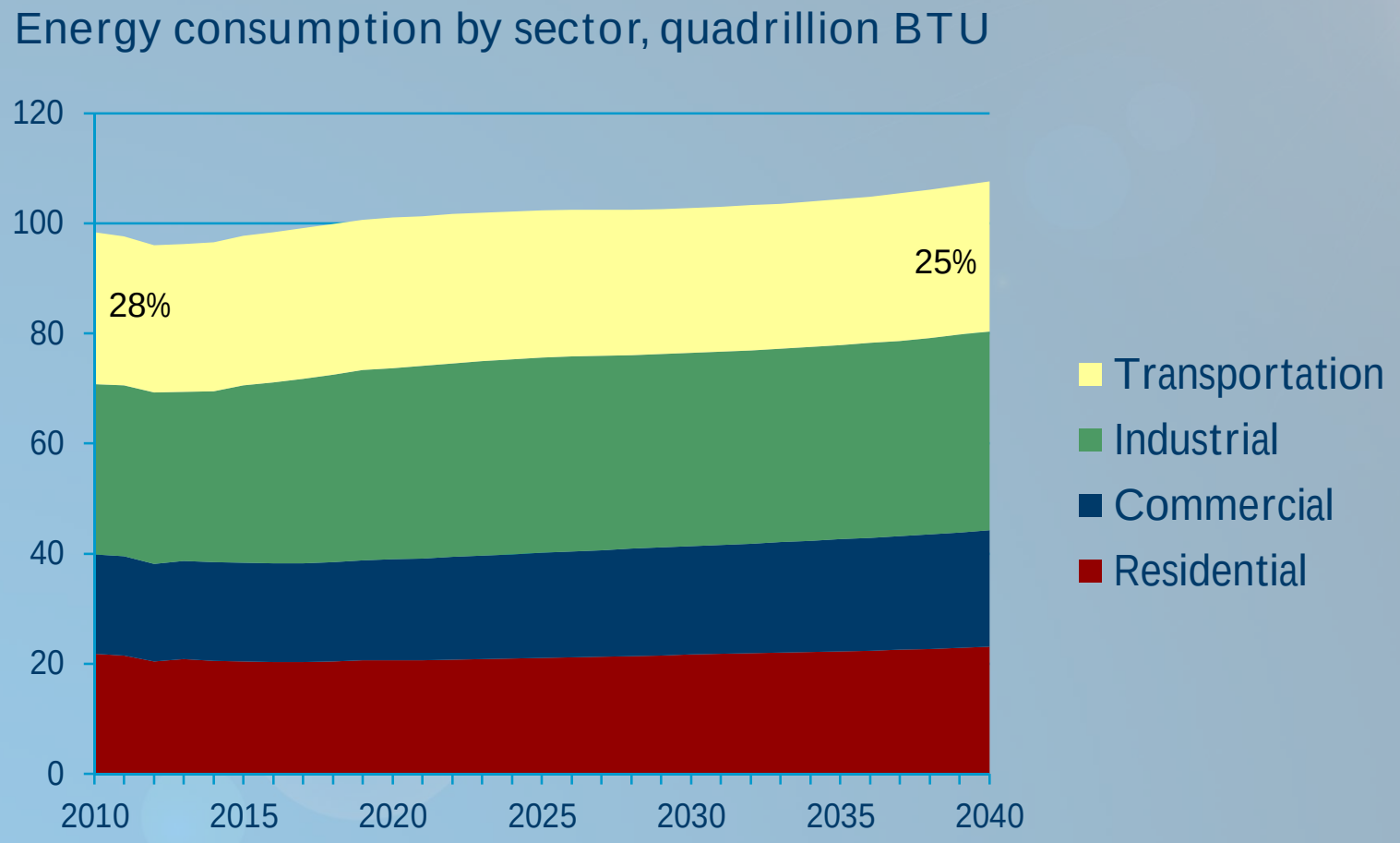
Transportation declines slightly to about one-quarter of U.S. energy consumption



Source: Energy Information Administration, Annual Energy Outlook 2013 (Reference Case)

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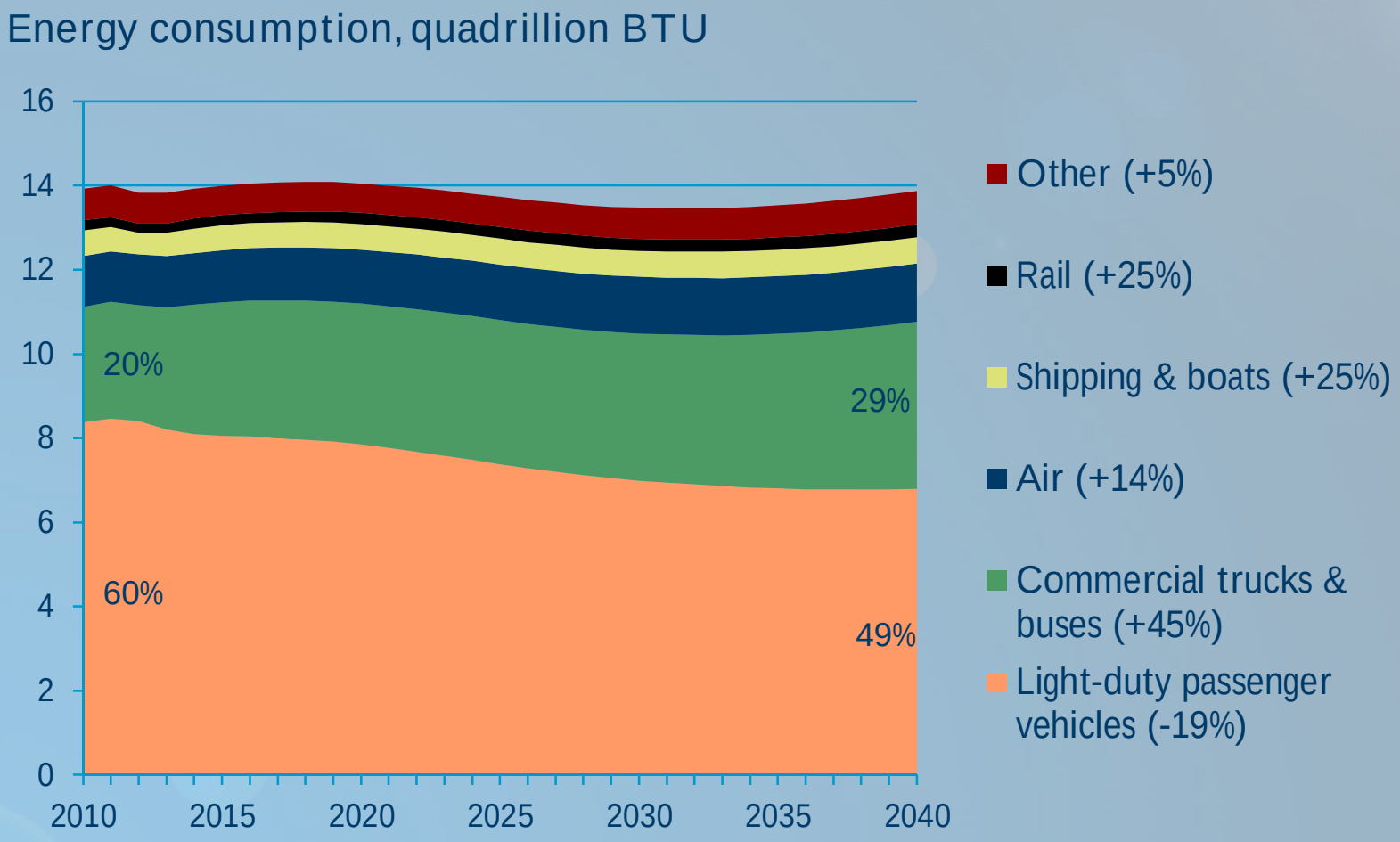
Transport energy use expected to hold steady, but modal contributions change



Source: Energy Information Administration, Annual Energy Outlook 2013 (Reference Case)

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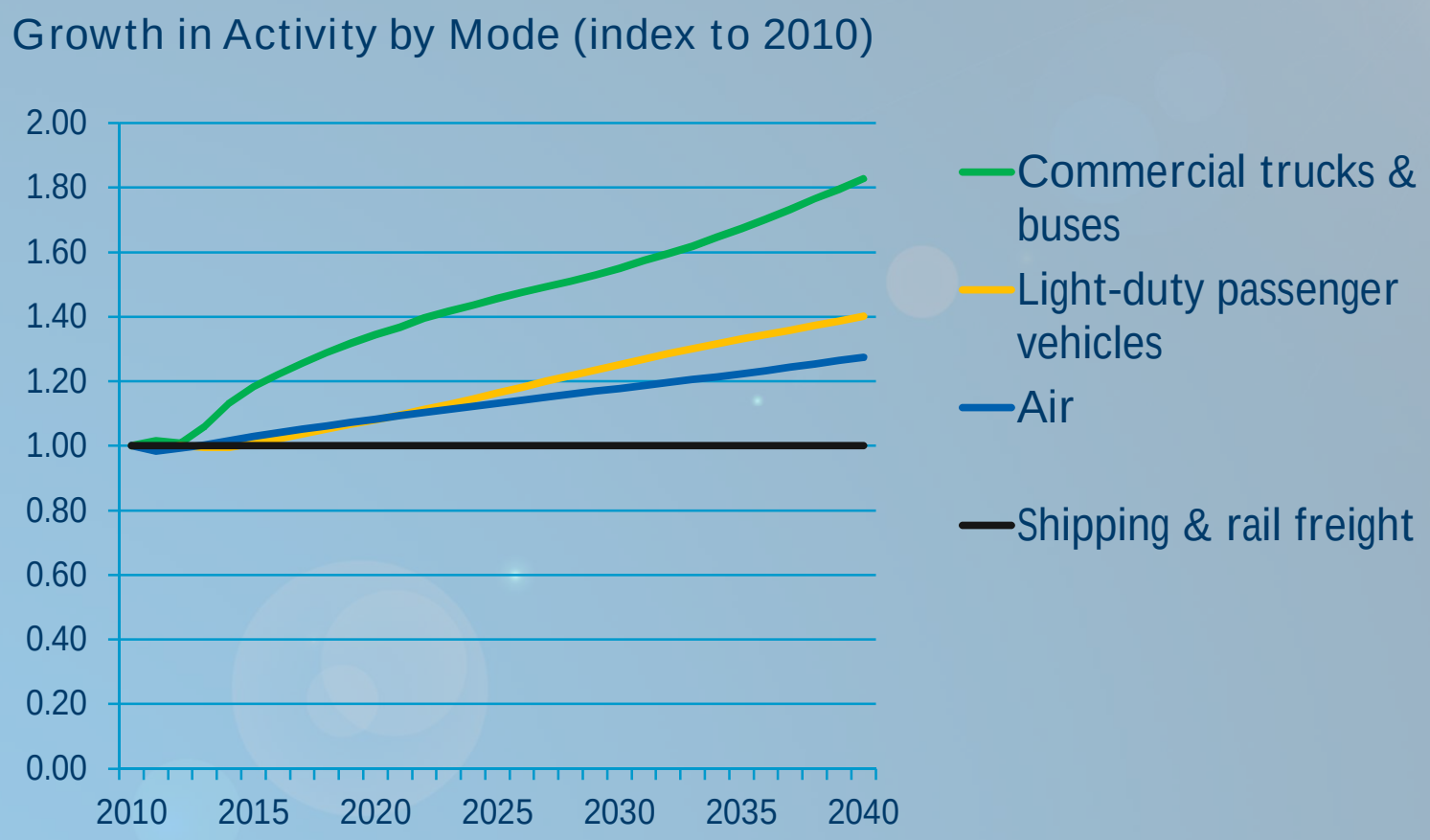
Rapid growth in freight truck activity expected



Source: Energy Information Administration, Annual Energy Outlook 2013 (Reference Case)

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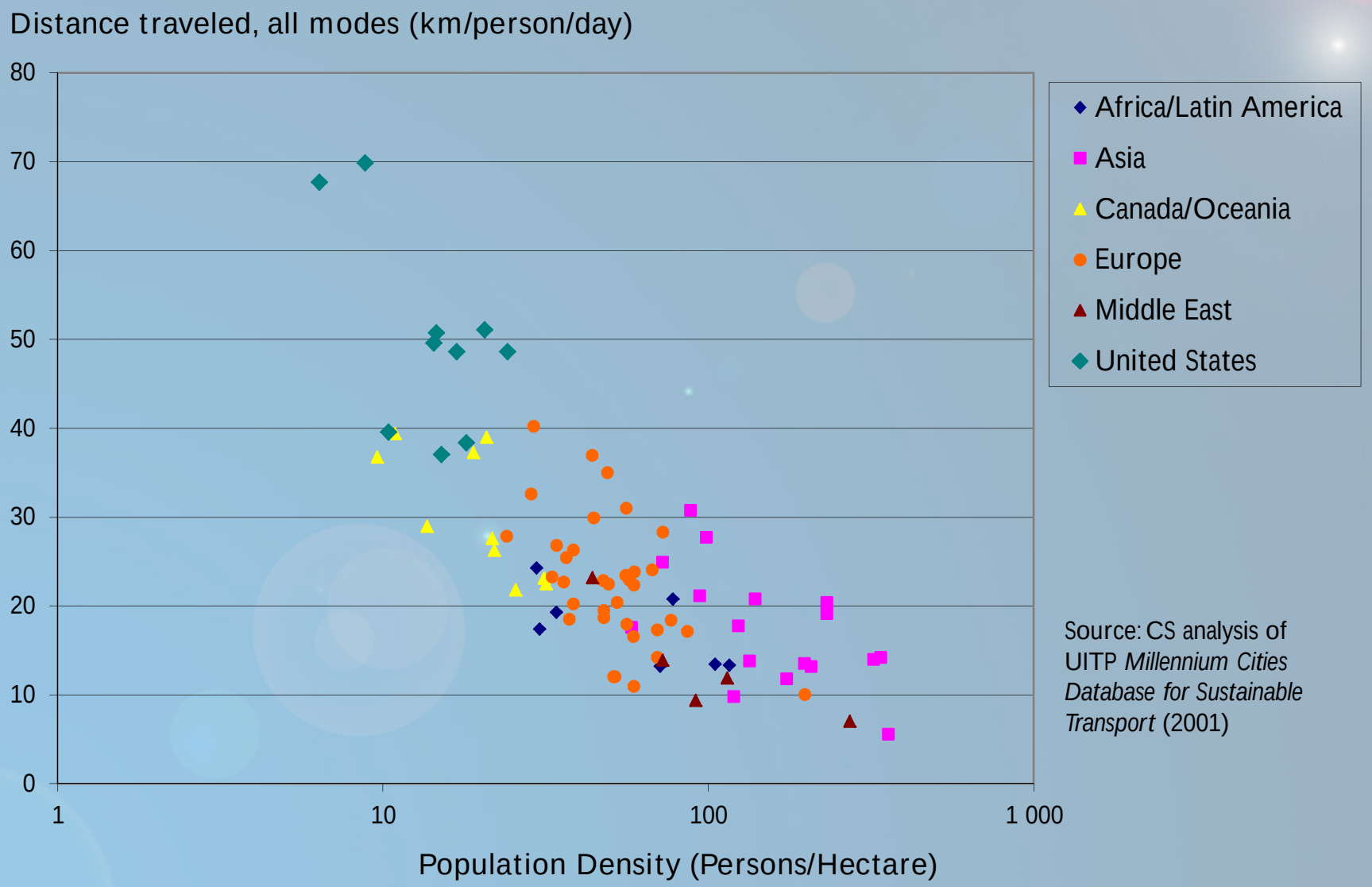
U.S. has low urban densities and high distance traveled



Source: CS analysis of UITP *Millennium Cities Database for Sustainable Transport* (2001)

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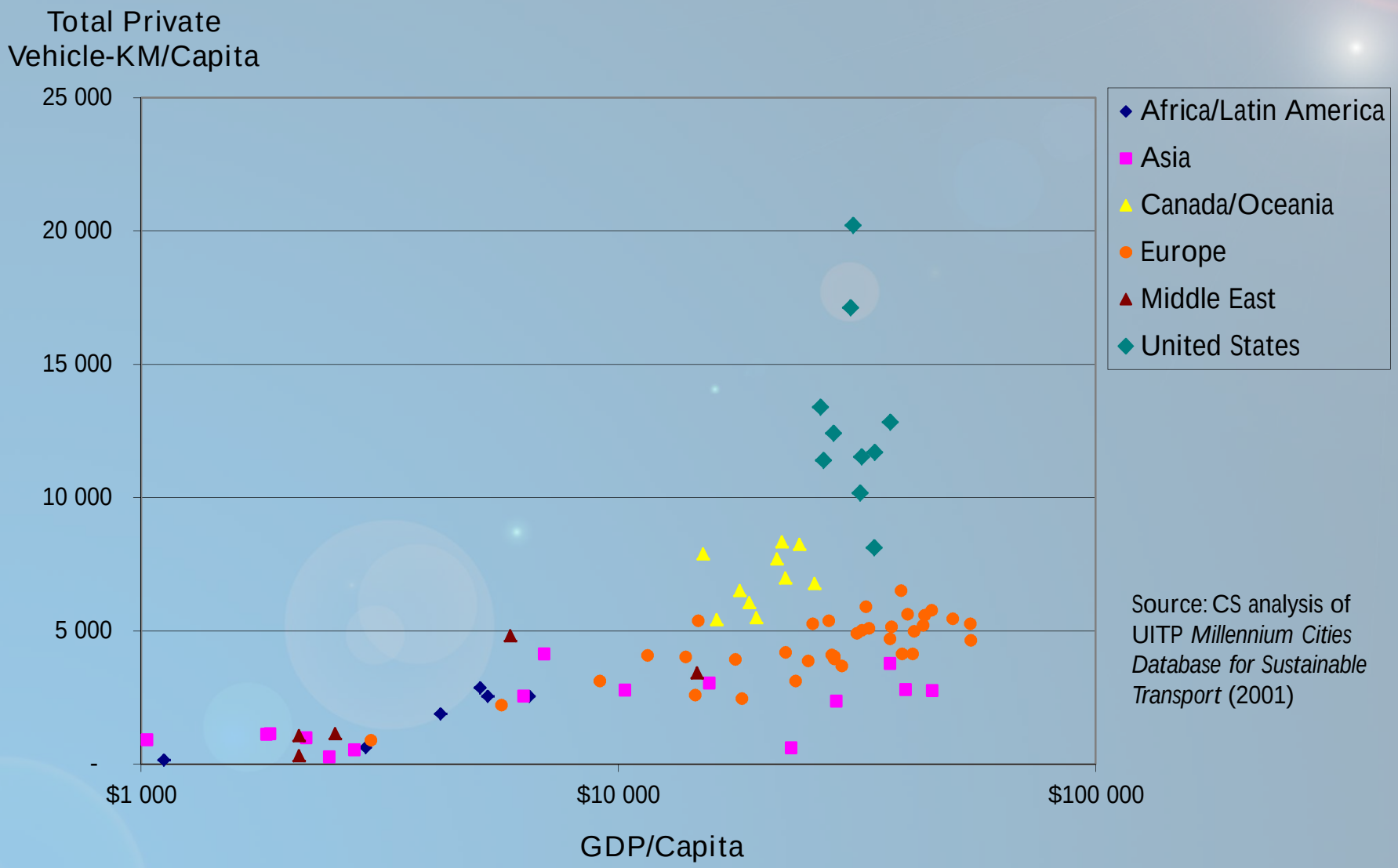
U.S. has >2x distance traveled per capita compared to European countries



Source: CS analysis of UITP *Millennium Cities Database for Sustainable Transport* (2001)

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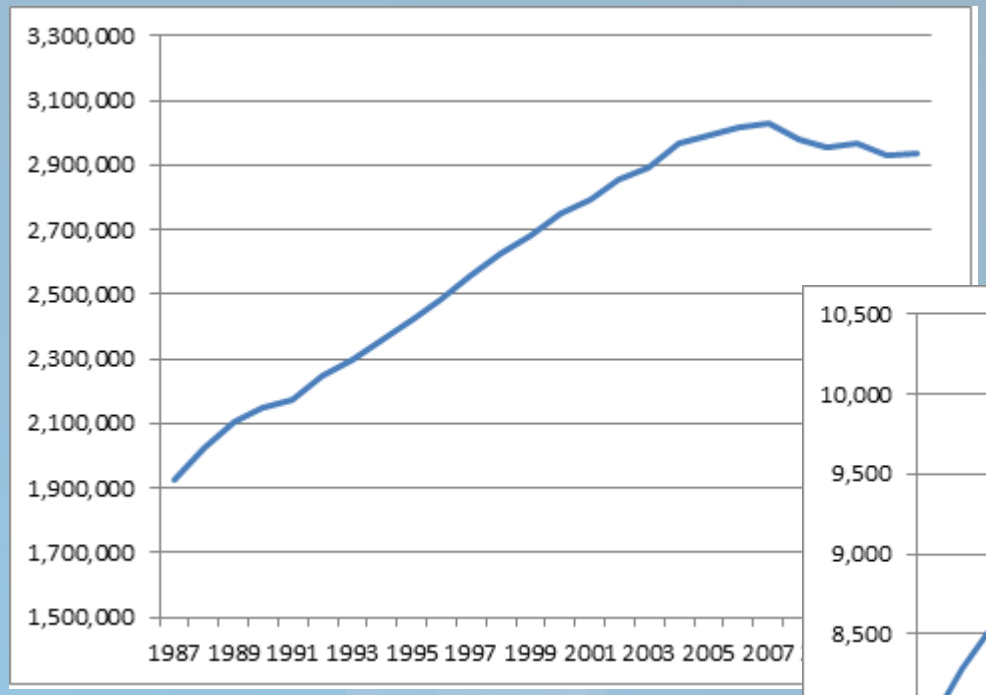
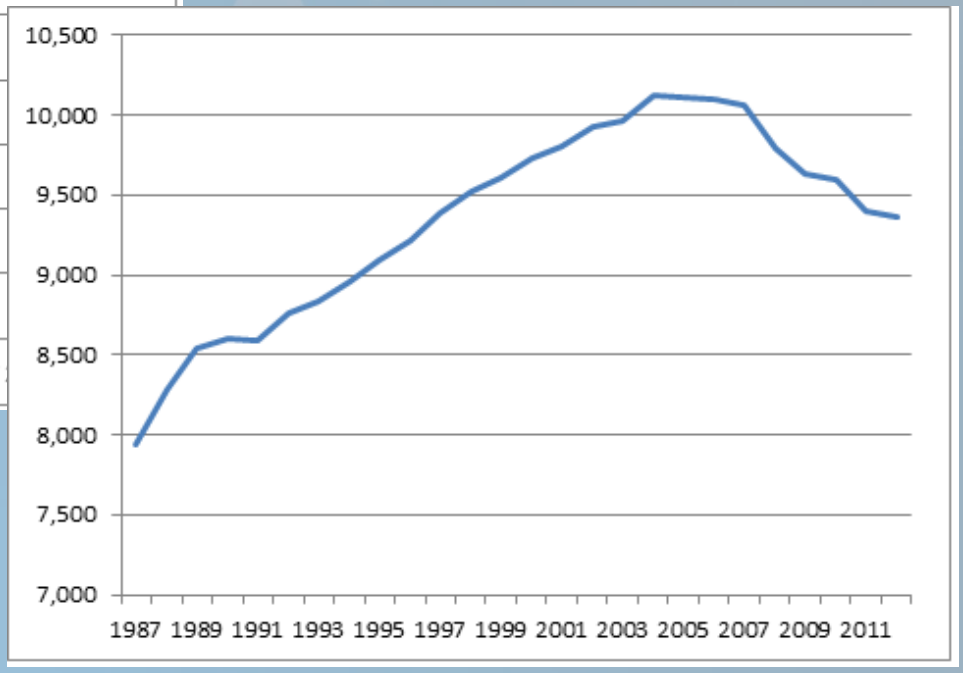
VMT has stopped growing … will the trend last?

Total VMT (millions)



VMT per Capita



Source: Sundquist, E., State Smart Transportation Initiative, 2013

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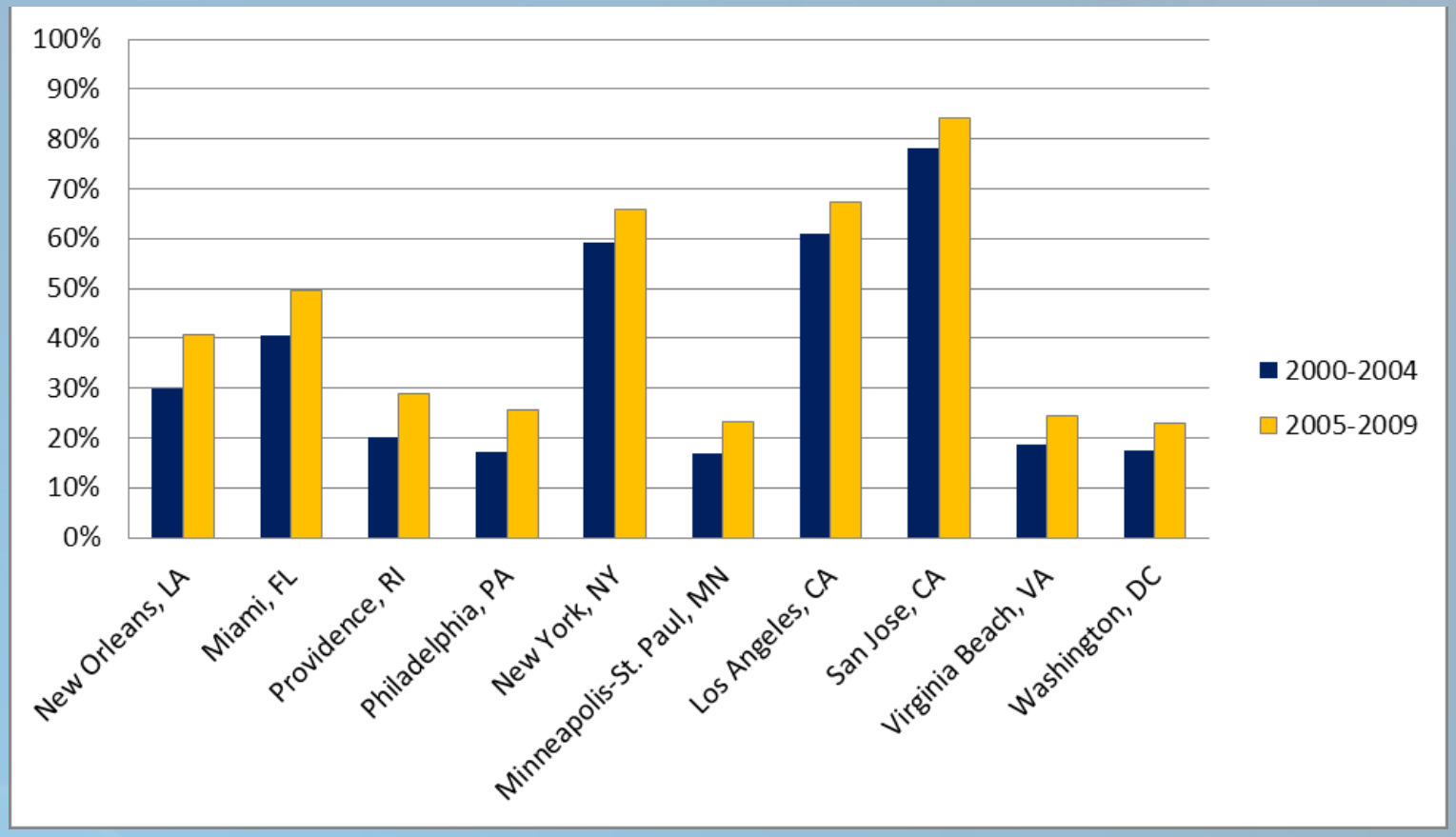
Urban development trends are changing – at least in some areas

Large metropolitan regions with the greatest increase in share of infill home construction



Source: U.S. EPA (2012), Residential Construction Trends in America's Metropolitan Regions.

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Effectiveness of Energy/ GHG Reduction Strategies

Moving Cooler –
GHG reduction potential of ~50 strategies

Travel Reduction

- Pricing
- Land use and smart growth
- Nonmotorized transportation
- Public transportation improvement
- Regional ride-sharing, car-sharing and commuting
- Regulatory strategies

System Efficiency

- Operational and intelligent transportation systems (ITS)
- Bottleneck relief and capacity expansion
- Multimodal freight

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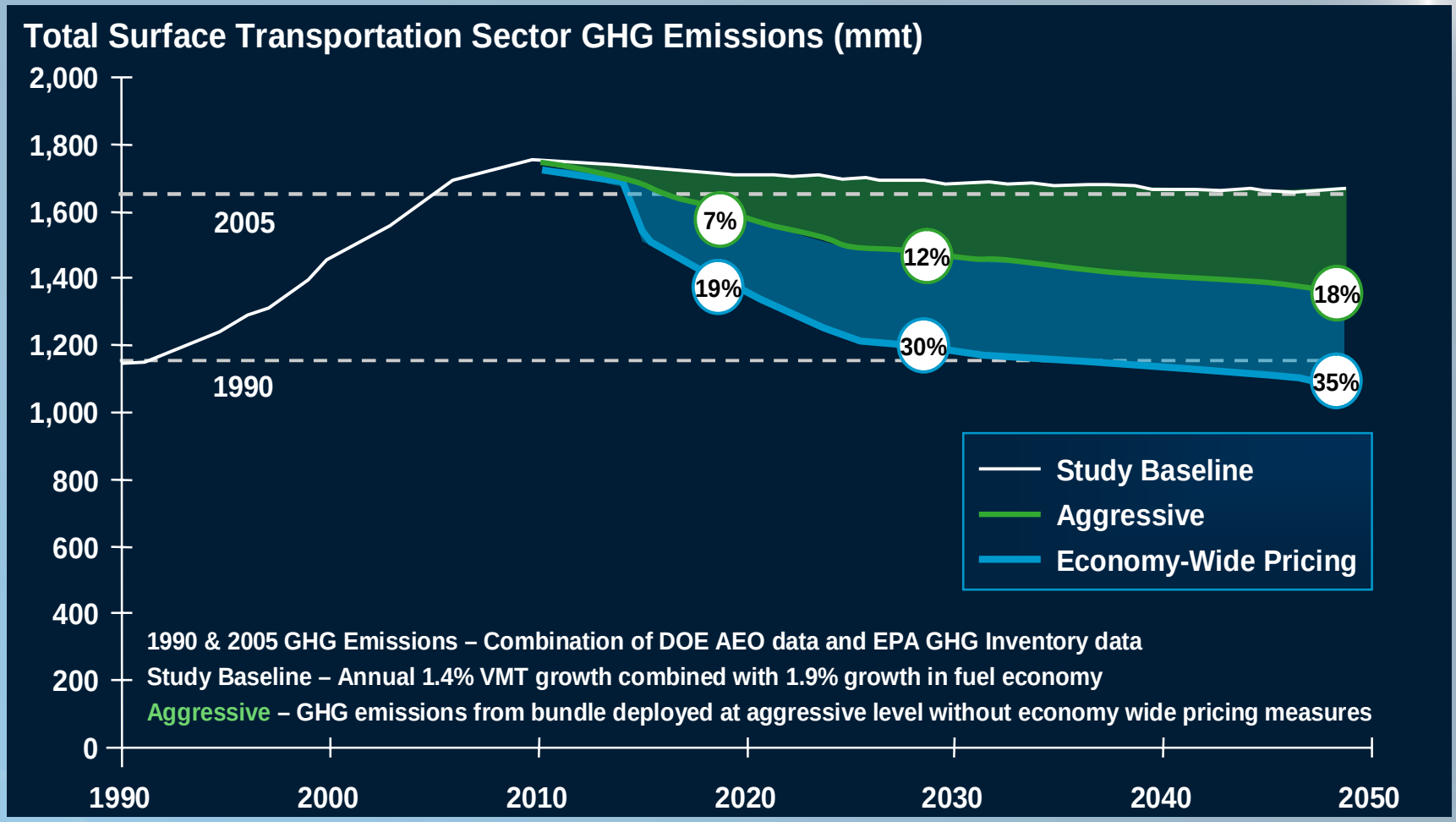
Moving Cooler – sample results



Source: Moving Cooler, Prepared for Urban Land Institute by Cambridge Systematics, 2009

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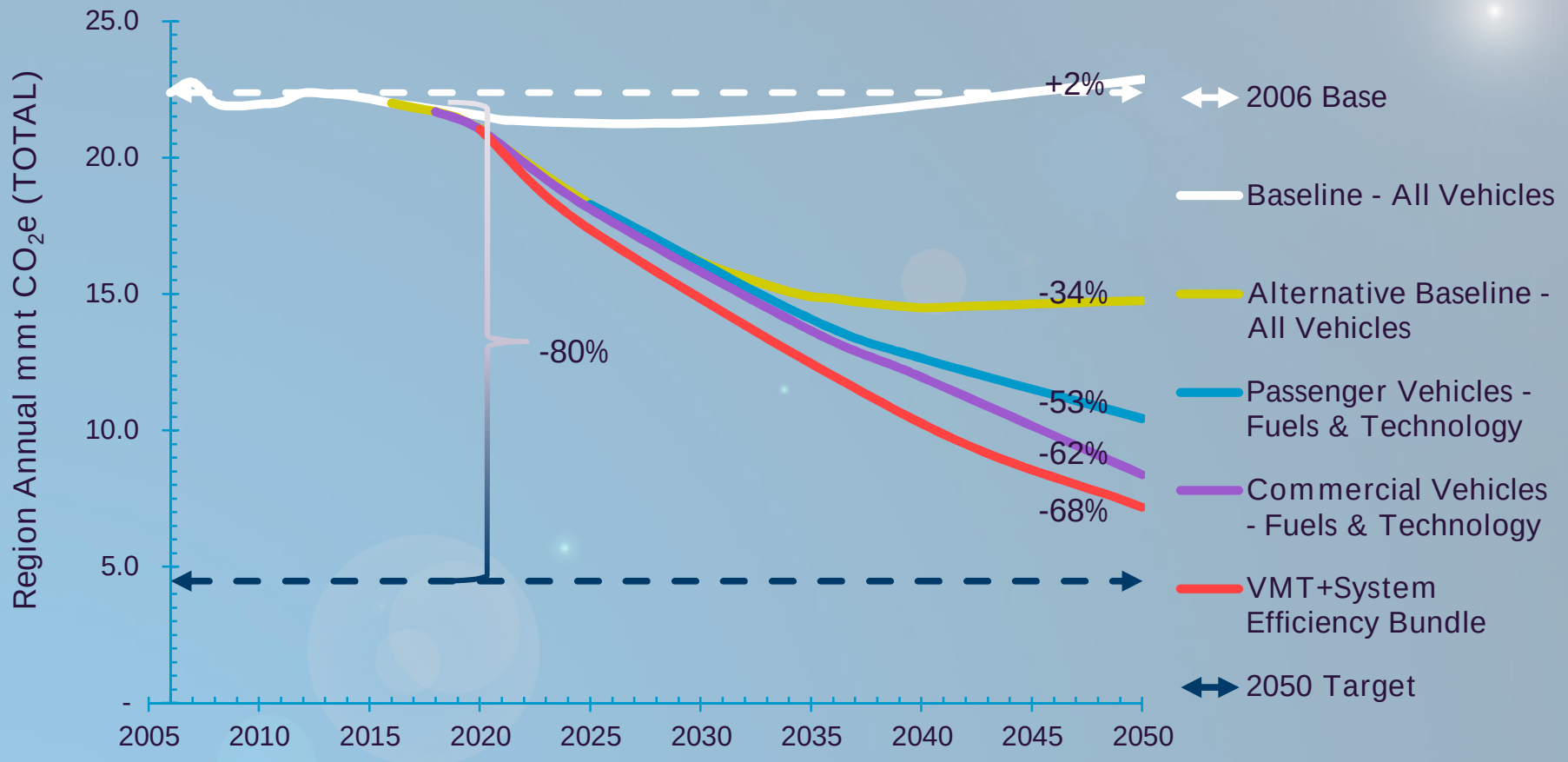
Northern New Jersey – 68% GHG reduction feasible by 2050



Source: Greenhouse Gas Mitigation Plan developed by Cambridge Systematics for North Jersey Transportation Planning Authority, 2012

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Combined impact of demand management/ efficient driving strategies could be 7-15%

Strategy	Percentage of On-Road Energy/GHG Reduction
Pricing	
PAYD Insurance (Mandatory)	2.5%
VMT Fee – $0.02-$0.05/Mile	1.0%-2.5%
Congestion Pricing	0.5%-1.1%
Transit Improvements	0.4%-1.1% (2030); 0.6%-2.0% (2050)
Nonmotorized Improvements	0.3%-0.8%
Parking Management	0.3%
Work Site Trip Reduction/Employee Commute Options	0.2%-1.1%
Telework and Alternative Work Schedules	0.9%-1.1%
Ridesharing and Vanpooling	0.1%-2.0%
Carsharing	0.1%-0.2%
Educational and Marketing Campaigns	0.3%-0.5%+
Eco-Driving and Maintenance	1.1%-5.0%
Idle Reduction	0.1%-0.4%
Speed Limit Reduction/Enforcement	1.7%-2.7%
Combined Effects	7.0%-15.3%

Source: Effects of Travel Reduction and Efficient Driving on Transportation Energy Use and Greenhouse Gas Emissions, prepared by Cambridge Systematics for National Renewable Energy Laboratory, 2012

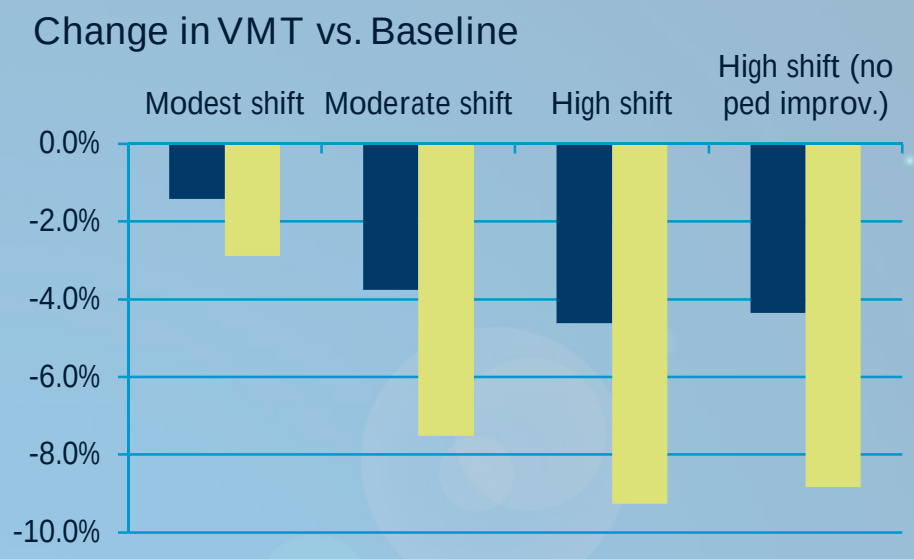
Land use changes are key to long-term benefits

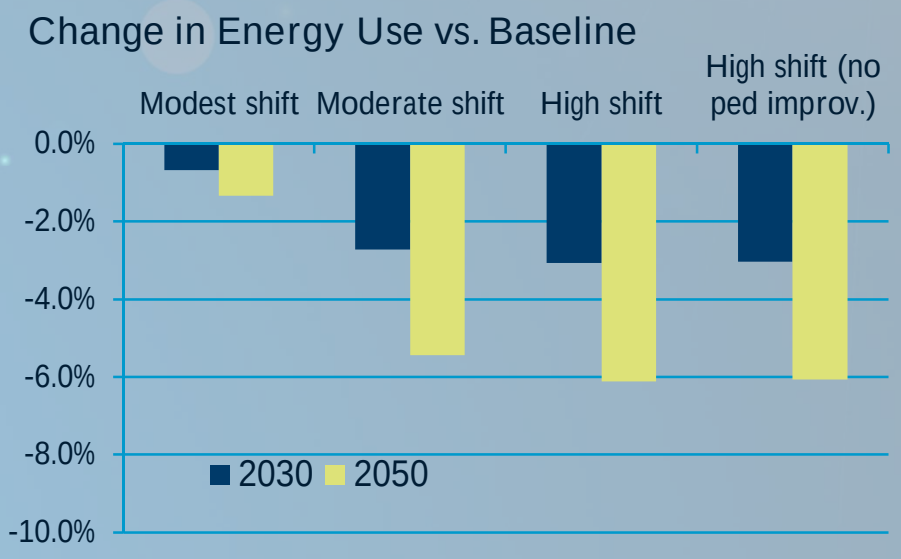
	TRB Special Report 298 (2009)	Moving Cooler (2009)	Growing Cooler (2007)
2050 % new/re-development	41-55%	64%	67%
% of new devel. that is "compact"	25-75%	43-90%	60-90%
VMT in compact development	5-25% lower	23% lower	30% lower
Urban light-duty VMT reduction	1-11%	2-13%	12-18%
Transportation GHG/ energy reduction	0.6 – 6.5%	2.0 – 3.4%	7 – 10%

Sources: TRB (2009); Cambridge Systematics, Inc. (2009); Ewing, et al (2007), as summarized in U.S. DOT Report to Congress: Transportation's Role in Reducing U.S. Greenhouse Gas Emissions (2010)

Another look at land use impacts

- Shift population from lower-density, single-use areas to higher-density, mixed-use areas (up to 15% in 2030, 30% in 2050)
- Pedestrian environment improvements





Source: Built Environment Analysis Tool developed by CS for National Renewable Energy Laboratory, 2012

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Conclusions regarding transportation energy and GHG reduction potential in the U.S.

- Recently-adopted fuel economy standards will reduce surface transport energy by over one-third by 2035, compared to a previously flat baseline
- More aggressive vehicle and fuel technology strategies could reduce energy use by over half
- Land use and travel demand/efficiencies provide smaller, but still important benefits
  - » Land use could achieve up to 10% reduction in VMT by 2050, 6% reduction in energy/GHG
  - » Other travel reduction/demand management could achieve 7-15% reduction collectively (surface transportation)

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How do We Get There?

The U.S. planning context

National (Federal)	• Vehicle and fuel standards and fuel pricing • Transport planning – procedural requirements, funding, and technical assistance
State	• Transport investment priorities (non-metropolitan) • Roadway design standards • Freeway/arterial systems management • Roadway and fuel pricing
Regional (MPO)	• Transport investment priorities (metropolitan) • Transit investment • Freeway/arterial systems management • Voluntary cooperation on land use, etc.
Local (City, County, Town)	• Land use planning • Local transport investment priorities & design standards • Bicycle and pedestrian infrastructure

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Some energy reduction measures look familiar…

"Transportation Control Measures" in the 1990 Clean Air Act Amendments

1. Improved public transit
2. HOV lanes
3. Employer-based transportation management
4. Trip-reduction ordinances
5. Traffic flow improvements
6. Park-and-ride
7. Auto-restricted zones
8. High-occupancy vehicle programs
9. Spatial or temporal restriction on motorized vehicle use of roads
10. Bicycle parking and lanes
11. Idle control programs
12. Extreme cold-start emissions control
13. Flexible work schedules
14. Programs to facilitate non-automobile travel
15. Non-motorized paths
16. Vehicle scrappage

… some are fairly new

Demand Management

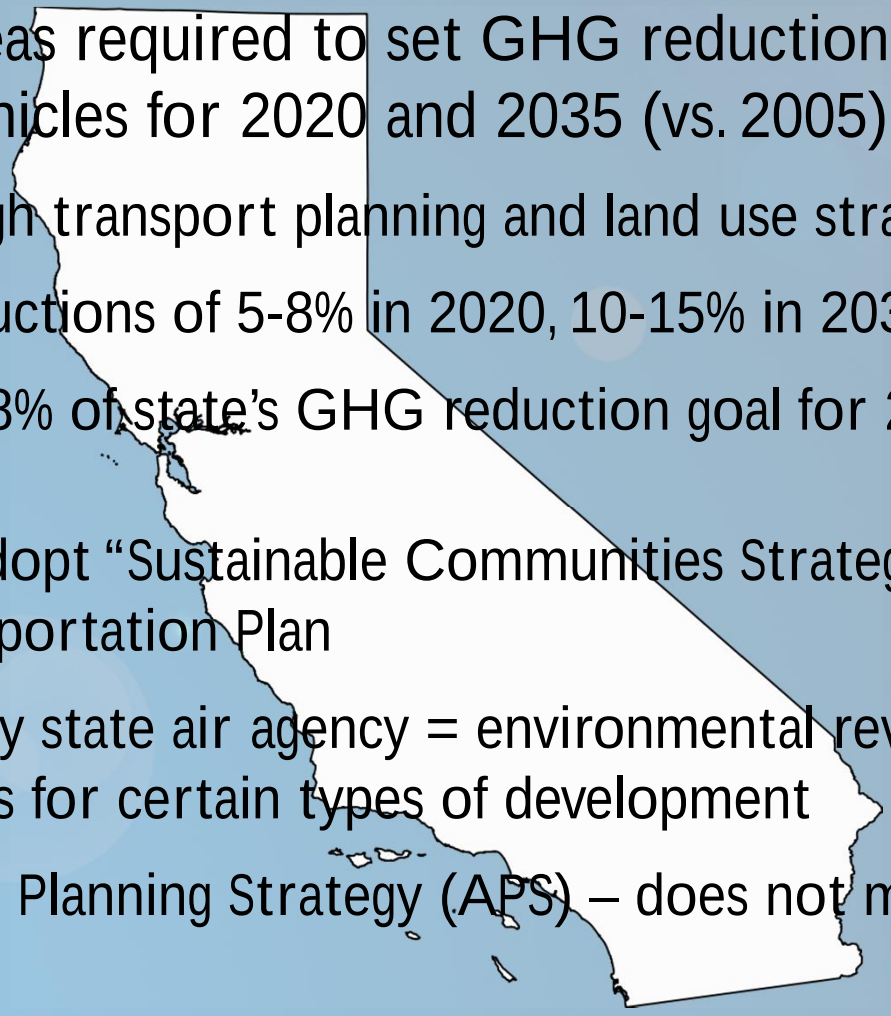
- VMT fees and congestion pricing
- Pay-as-you-drive insurance
- “Smart” parking management
- Dynamic ridesharing
- Car-sharing and bike-sharing programs
- Real-time, multimodal travel information
- Location-based marketing

System Efficiency

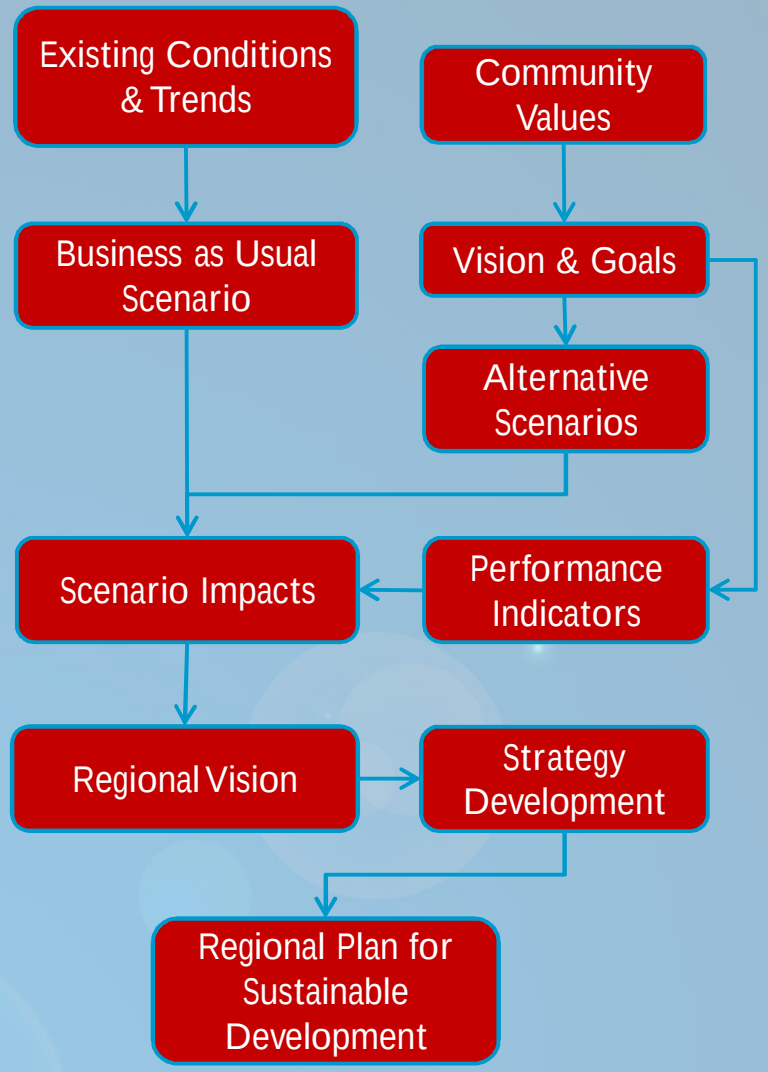
- Eco-driving with real-time feedback
- Dynamic eco-routing
- Eco-adaptive traffic signals & corridor management
- Low-emissions zones

Planning innovations – California's SB 375

- All metro areas required to set GHG reduction targets for passenger vehicles for 2020 and 2035 (vs. 2005)
  - » Met through transport planning and land use strategies
  - » Target reductions of 5-8% in 2020, 10-15% in 2035 (larger areas)
  - » Achieve 2.8% of state's GHG reduction goal for 2020 (5 MMT)
- Required to adopt "Sustainable Communities Strategy" as part of Regional Transportation Plan
  - » Approval by state air agency = environmental review exemptions for certain types of development
  - » Alternative Planning Strategy (APS) – does not meet target



Planning innovations – regional visioning and scenario planning



- Multi-sectoral – transportation, land use, housing, economic development, environment
- Extensive public and stakeholder involvement process
- GIS-based data and technical tools to support indicator development

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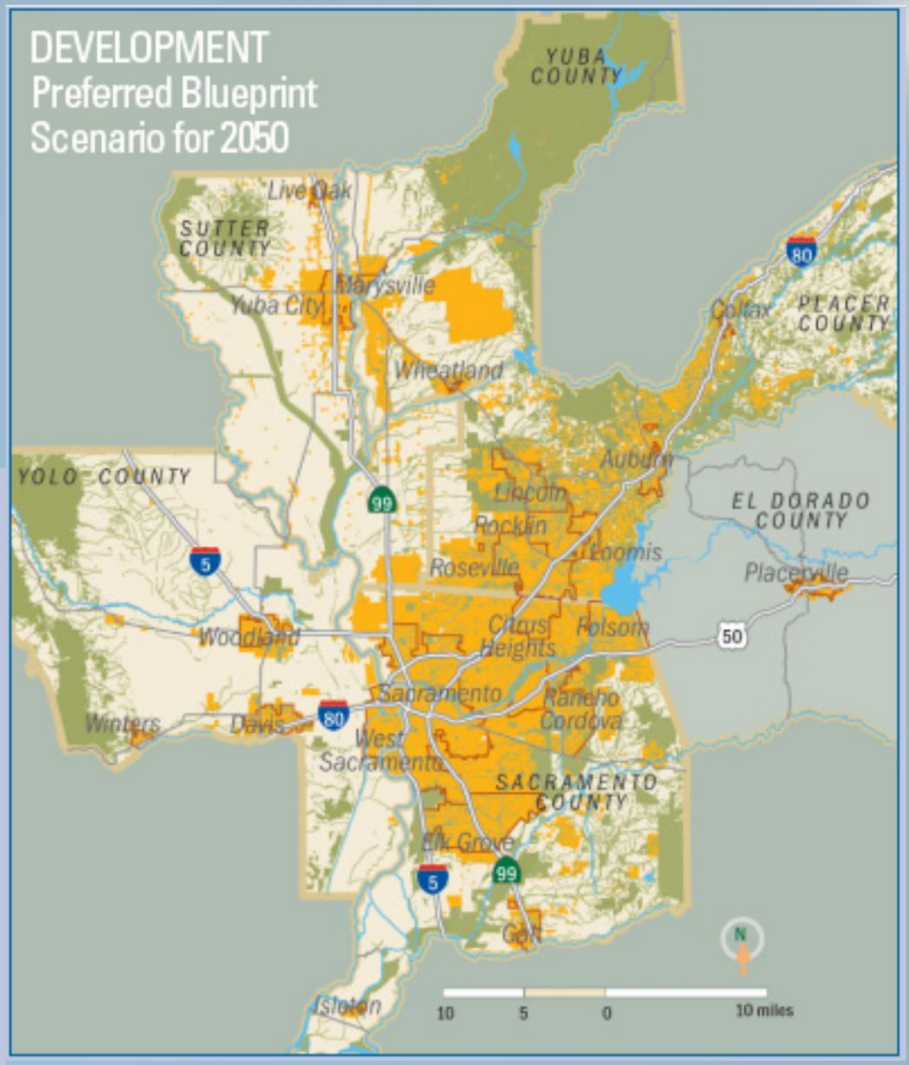
Planning innovations (example) – Sacramento Blueprint

- Increased residential density, mixed-use areas, expanded transit
- 25% reduction in VMT, 15% reduction in CO_2 from base case by 2050



Key to the Map

- areas of existing and future development
- green areas (e.g. open space, parks, wetlands, vernal pools, stream corridors, hardwood stands)
- agriculture and other undeveloped lands
- rivers, streams and lakes
- city boundaries
- highways
- county boundaries

Source: Sacramento Area Council of Governments

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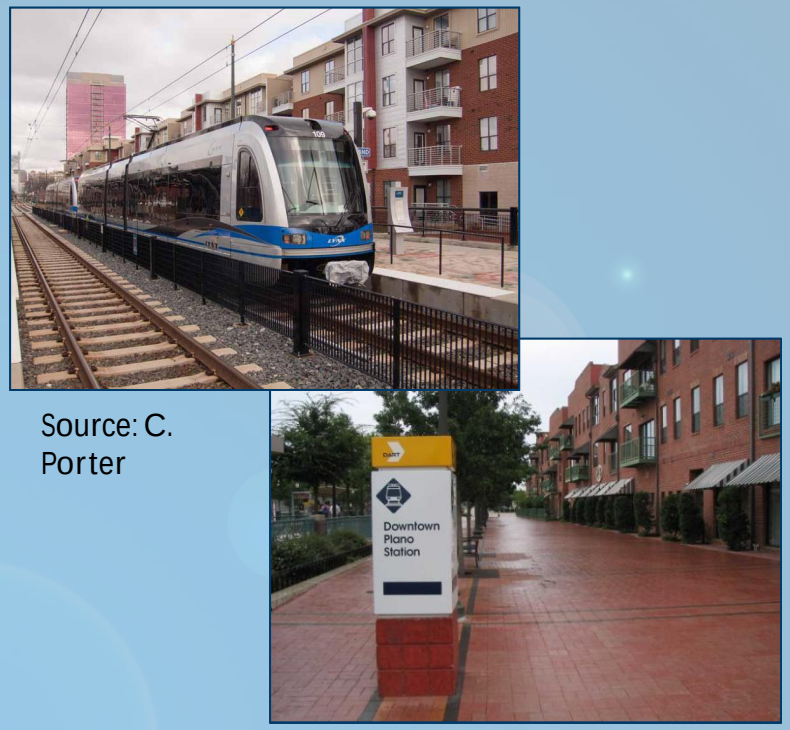
Planning innovations – Transit-oriented development

- Federal criteria for transit-supportive land use, plans & policies - required in assessment of new transit project funding since late 1990s



Source: C. Porter

Source: Denver Regional Transit District

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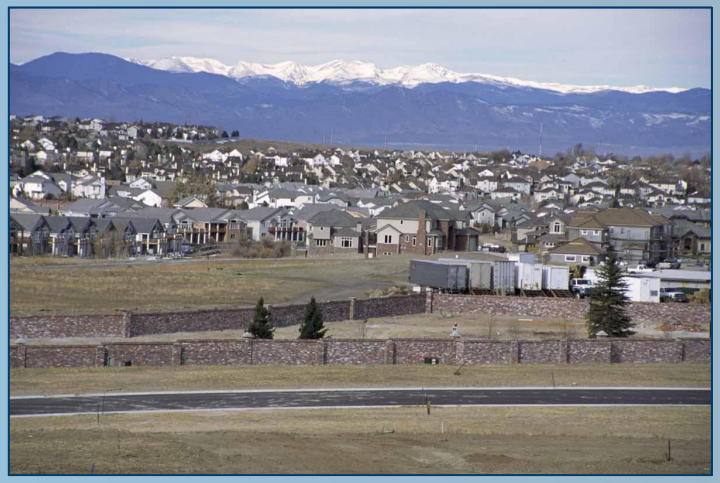
Challenges to reducing transport energy use

- Historically auto-oriented development patterns
- Fragmented/multi-level decision-making environment
- Strong private property rights ethic
- No appetite for Federal requirements or for pricing of externalities
- Gas is still cheap



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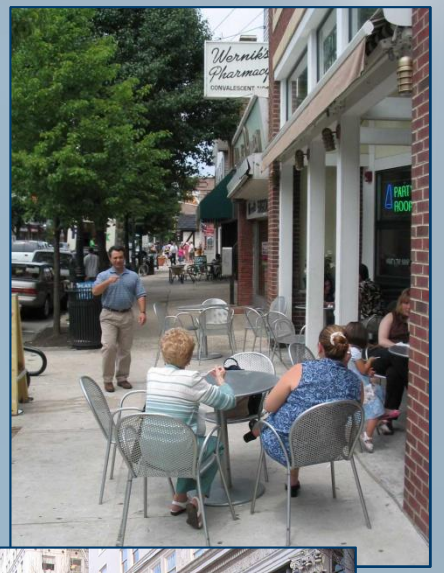
Opportunities

- Shifting demographic trends and lifestyle preferences
- Changing economics
- Interest and innovations in voluntary, regional-scale planning
- “Leader” states stepping in where Federal government cannot
- New technology to support travel efficiencies



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Research Needs

- Continued demonstration, deployment, and evaluation of new technologies to promote travel reduction/efficient driving
  - » Pricing (congestion, VMT, PAYD)
  - » Dynamic ridesharing
  - » Eco-driving & eco-system operations
  - » Real-time information
- Strategy interactions – land use, transit, pricing, TDM
- Long-term impacts of telework, teleshop, etc. (including location decisions)
- Urban form – measures and impacts (economic, accessibility, etc.)