



Transportation Planning and Climate Change

Analysis and Use of New Tools in the Central
Puget Sound Region

New Partners for Smart Growth Conference
February 4, 2010

Puget Sound Regional Council




Agenda

Setting the Stage

- Climate Change Actions in Washington State

PSRC

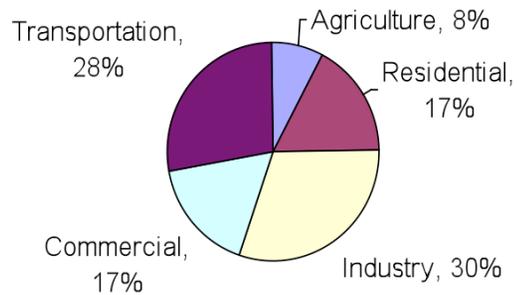
- Who we are, what we do
- Incorporating Climate Change into our planning processes
 - Policies
 - Technical Work

Transportation 2040 Update

- Overview
- New Tools
- Analysis Results

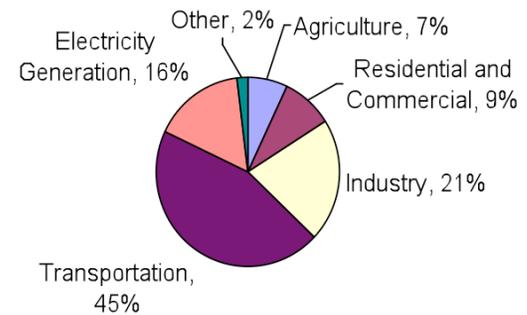
Washington State and Climate Change

US Greenhouse Gas Emissions by Sector, 2004



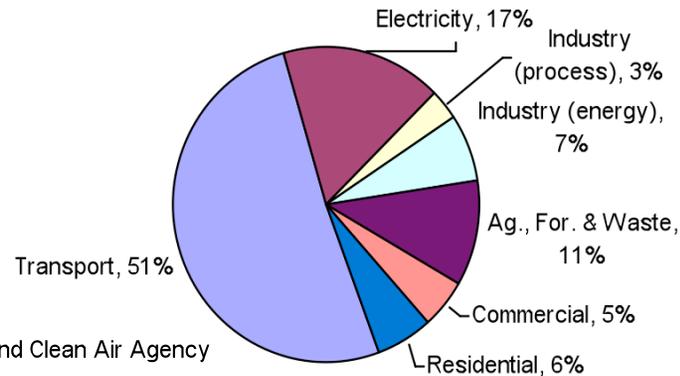
Source: Pew Center on Global Climate Change

Washington State Greenhouse Gas Emissions by Sector, 2004



Source: WA Dept. of Community, Trade and Economic Development

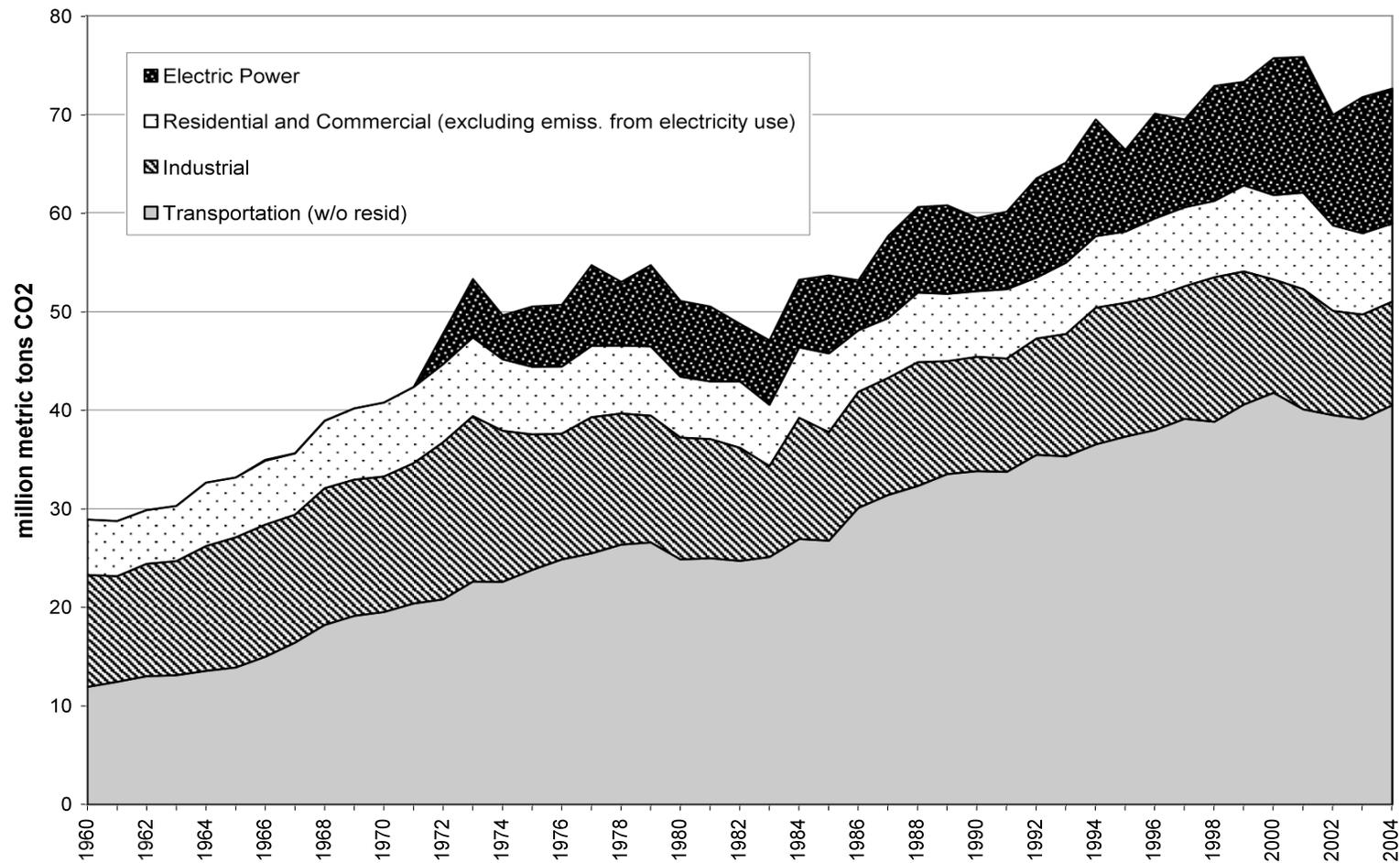
2002 Greenhouse Gas Emissions for the Puget Sound Region



Source: Puget Sound Clean Air Agency

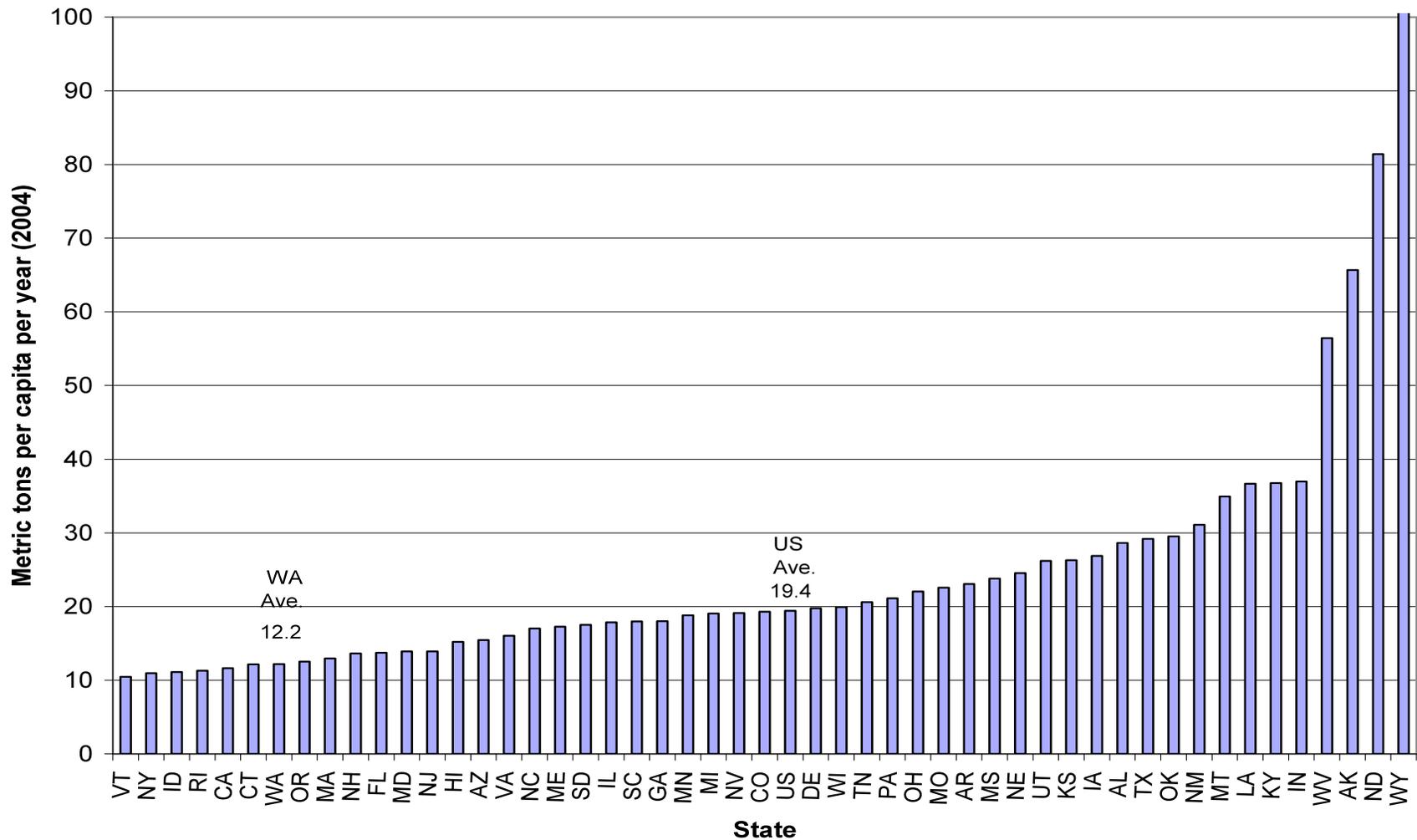
Washington State and Climate Change

Cumulative Energy-Related CO₂ Emissions by Sector in Washington State (CTED)



Washington State and Climate Change

Washington State per capita CO2 emissions for 2004 (CTED)





Washington State and Climate Change

Greenhouse gas emission reduction goals:

- ***To 1990 levels by 2020***
- ***25% below 1990 levels by 2035***
- ***50% below 1990 levels by 2050***

Climate Change Framework:

- Emissions monitoring and reporting system
- Regional multisector market-based system
- Green Economy Jobs Growth Initiative
- ***Statewide vehicle miles traveled reduction benchmarks***
 - Using a baseline of 75 billion total statewide VMT in 2020, less VMT from trucks over 10,000 lbs.:
 - By 2020, decrease annual per capita VMT by 18%
 - By 2035, decrease annual per capita VMT by 30%
 - By 2050, decrease annual per capita VMT by 50%



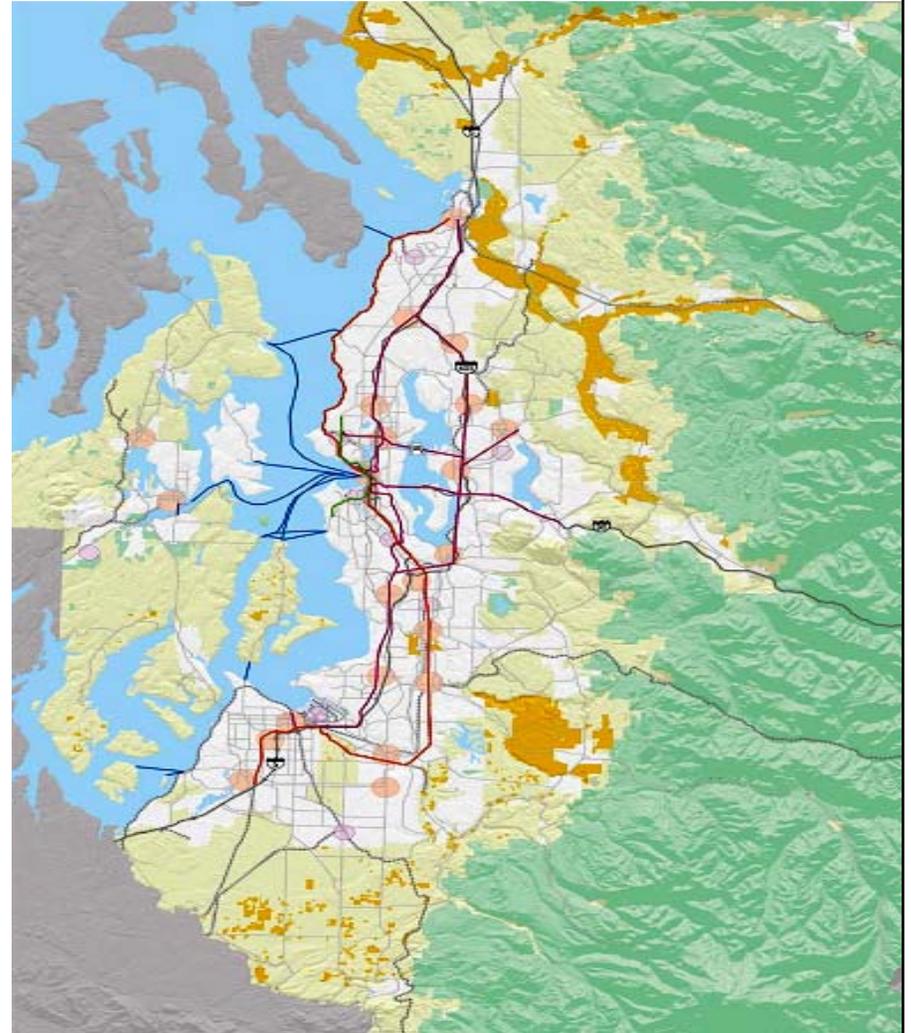
Washington State and Climate Change

- Numerous other state actions, including vehicle electrification and biofuel goals, clean car standards, clean technologies, renewable energy goals, etc.
- December 2008 Climate Action Team report to the Governor and Legislature:
 - “Most promising” strategies to reduce GHG emissions
 - Four working groups:
 - Built environment
 - Transportation
 - Beyond waste
 - State Environmental Policy Act
- Local government actions:
 - King County Global Warming Action Plan, climate preparedness guidebook, renewable energy order, environmental reviews
 - Seattle Climate Action Plan, US Mayors Climate Protection Agreement, climate partnership

PSRC Region

Four Counties – King, Kitsap, Pierce, Snohomish

- Major cities include Seattle, Tacoma, Bellevue, Everett, Bremerton
- Approx. 55% of the state's population
- Located between the Cascade and Olympic mountain ranges, bisected by Puget Sound





PSRC: Who We Are

Metropolitan Planning Organization for the Central Puget Sound Region

- 90 Member Agencies/Organizations: counties, cities/towns, ports, transit agencies, tribes, Washington State Department of Transportation, Washington State Transportation Commission
- Transportation, Growth Management, Economic Planning
 - VISION 2040 – regional growth, transportation and economic strategy
 - Destination 2030 – 30-year long-range metropolitan transportation plan
 - Prosperity Partnership – coalition of government, business, labor and community organizations to develop and implement a regional economic strategy



PSRC and Climate Change: VISION 2040

VISION 2040, the regional growth, transportation and economic strategy:

- Adopted April 2008
- Addresses anticipated growth by the year 2040: 1.7 million more people, 1.2 million more jobs
- Environmental Framework (new; includes climate change)
- Regional Growth Strategy – focus growth in urban centers and compact communities
- Multicounty Planning Policies - environment, economy, development patterns, transportation, public services, housing
 - Climate change addressed throughout
 - Goal: The region will reduce its overall production of harmful elements that contribute to climate change
 - Action: Regional Climate Action Plan
- Analysis - CO₂ analysis in EIS, growth alternatives comparisons
 - Broad analysis based on total vehicle miles traveled



PSRC and Climate Change: Transportation 2040

Transportation 2040 and Climate Change

- Update to Destination 2030, scheduled for adoption May 2010
- Policy Board direction to consider climate change in the update
- Scoping process identified climate change as a significant issue to be addressed, along with:
 - Land Use
 - Economy
 - Congestion and Mobility
 - Equity and Special Needs Transportation
 - Safety and Health
 - Security
 - Energy and the Environment
 - Preservation of the System
 - Funding
 - Project Prioritization



PSRC and Climate Change: Transportation 2040

Technical Issues:

- VISION 2040: tools capable of simple greenhouse gas analyses, only VMT-based
- Transportation 2040: travel demand modeling improvements plus utilizing draft MOVES model
 - Ability to analyze for speed variations, changes in vehicle/fuel mix, corridor/subarea analyses, analysis of transportation and land use strategies (e.g. pricing, cost of fuel, etc.)
 - More refined greenhouse gas analyses of each alternative
 - Board direction to address the state's greenhouse gas reduction goals and VMT reduction benchmarks as part of the Transportation 2040 alternatives analysis
 - Draft alternative designed to address both
 - Emissions and VMT reported for all alternatives
 - Emissions included in the environmental criterion
 - Research on the potential from improved technologies



PSRC and Climate Change: Transportation 2040

Transportation 2040 Climate Change Analyses:

- Greenhouse gas emissions quantified for each alternative using the draft MOVES model
- Emissions and VMT included as part of the criteria for evaluating results
- Analysis of energy consumption -
 - VISION 2040 policy screen
 - Estimated energy consumption of each alternative from the following: fuel consumption, construction activity and land use development
- Research into the potential emission reduction benefits from technology –
 - Combination of information from the draft MOVES model, as well as “off-line” research into vehicle and fuel technologies
 - Research also needed regarding market penetration rates, ability to accelerate technology improvements



PSRC and Climate Change: Transportation 2040

Policy Issues:

- Transportation 2040 will also need to consider and address the impacts of climate change *to* the transportation system (adaptation):
 - Accelerated pavement deterioration
 - Flooded roadways
 - Bridge damage
 - Increased maintenance
 - Increased stormwater, drainage issues



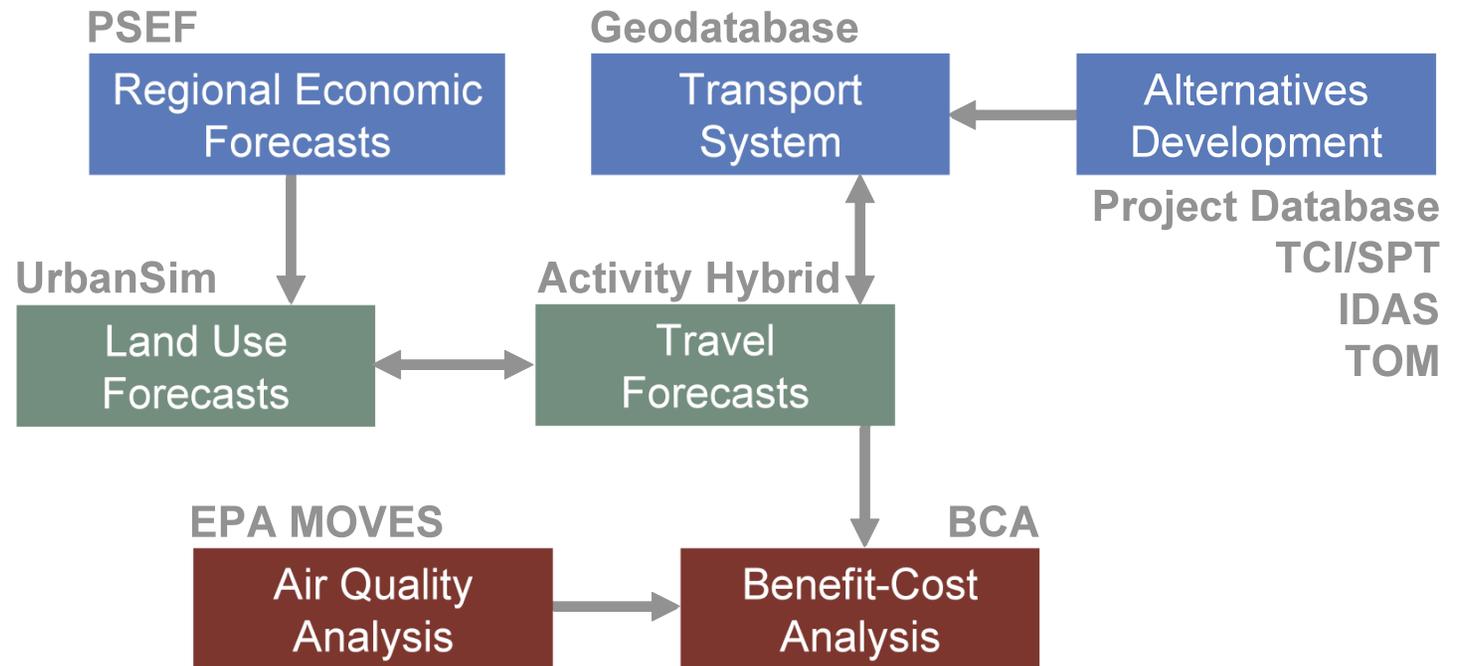
PSRC and Climate Change: Transportation 2040

Transportation 2040 Analysis

- Six DEIS alternatives
- Varying levels of the following strategies:
 - system management
 - demand management
 - strategic expansion (all modes)
 - user fees/tolls – including HOT lanes, freeway system tolling, full system tolling, parking surcharges, etc.
- Preferred alternative is a “hybrid”



PSRC and Climate Change: New Tools





PSRC and Climate Change: New Tools

Integrated Modeling System Summary:

- Puget Sound Economic Forecasting Model
 - Regional economy as input to the land use forecasting model
- UrbanSim
 - Parcel-based, market-driven
 - Iterative with travel model
 - Sensitive to public policy
- Geodatabase
 - Central repository on all transportation projects
- Activity Based Travel Demand Model
 - tracks individual activities
 - Improvements for analysis of pricing, freight, mode choice, nonmotorized travel, speed and reliability
- Alternatives Development Tools
 - Toll Optimization Model
 - Transit Competitive Index/Service Planning Tool
 - ITS Deployment Analysis System
- MOVES
 - Used draft Demo version as MPO pilot project to calculate greenhouse gas emissions at various speeds
- Benefit-Cost Analysis
 - Monetizes user benefits and costs (including emissions, travel time and reliability, etc.)



PSRC and Climate Change: New Tools

HOT Lanes Toll Rates

- Toll Optimization Model
- Mathematical description of how drivers respond to tolls on HOT lanes

Freeway System/Full System Toll Rates

- Mathematical techniques applied in travel demand model to set toll rates

Technique varies by tolling configuration

Toll rates optimized to maximize user benefits

- Not to maximize revenue or reduction in VMT or emissions



PSRC and Climate Change: New Tools

MOVES

- forecasts to the year 2050
- models energy consumption, N₂O and CH₄ explicitly
- employs a “modal” emission rate approach
- models a broad array of advanced technology vehicles
- explicitly models periods of extended idling
- relies primarily on second-by-second data to develop emission rates
- includes well-to-pump energy emission estimates to enable life-cycle analysis
- uses a graphical user interface (GUI)
- uses a relational database to store underlying data
- calculates total energy and emission inventories rather than simply calculating per-mile emission factors

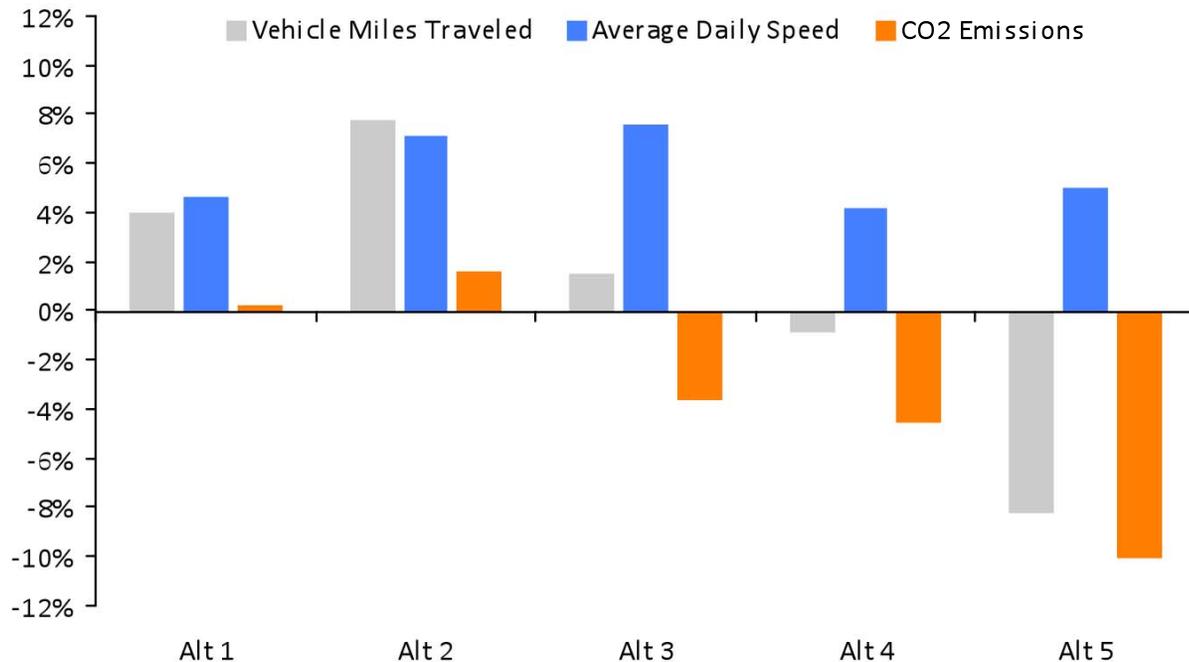
Transportation 2040: GHG Results

Does reducing congestion reduce greenhouse gas emissions?

Speed and the amount of travel are the key components for the amount of emissions produced – improving the flow of traffic* and reducing vehicle miles will reduce emissions.

** Each pollutant has a specific “speed curve” – the optimal speed for reducing emissions is around 45-50mph*

**Vehicle Miles Traveled, Speeds and CO2 Emissions
Percent Change from the 2040 Baseline**



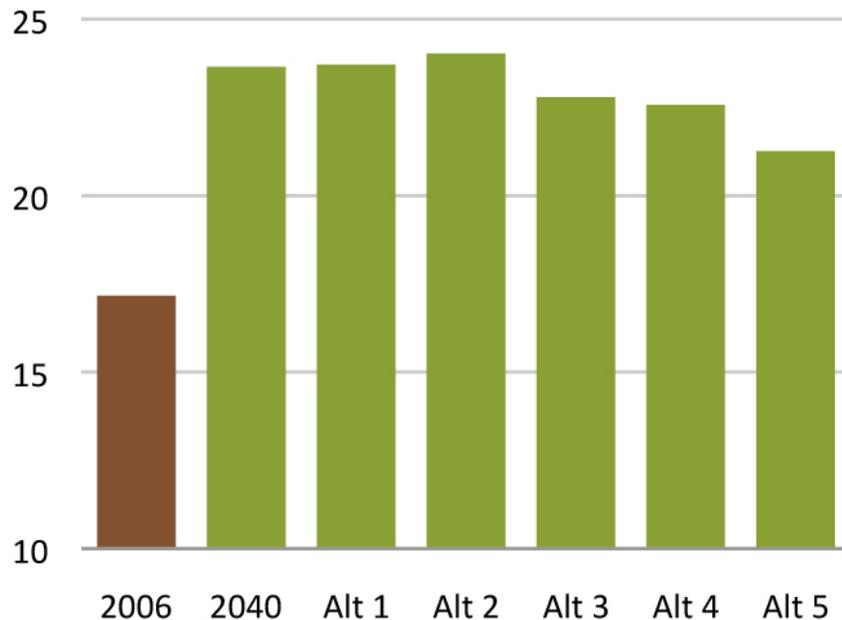
Person Trips in 2040

Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
19,150,000	19,176,000	19,191,000	19,170,000	19,169,000	19,147,000

Transportation 2040: GHG Results

Greenhouse Gas Emissions

In millions of tons of CO₂ produced per year, mobile sources only, vehicle fleet held constant, existing regulations



None of the alternatives alone will reduce CO₂ emissions below 1990 levels

STATE GOALS

1990 levels by 2020

25% below 1990 by 2035

50% below 1990 by 2050

Baseline Alternative = "no build"

Alt 1 = efficiencies, HOT lanes

Alt 2 = substantial capacity, 2-lane HOT lanes

Alt 3 = tolls to fund projects

Alt 4 = freeway system tolls

Alt 5 = full system tolls, expansive transit



Greenhouse Gas Strategy

Land Use	User Fees
Technology	Choices

Land Use

Implement VISION 2040

- Jobs Housing Balance (macro)
- Centers, Transit Oriented Development & efficient communities (micro)

User Fees

Implement Roadway Pricing to support VMT reduction and reduce travel delay emissions

Choices

Expand transportation choices that reduce GHG emissions ⁽¹⁾

Technology

Support development of technology to dramatically reduce tailpipe emissions ⁽²⁾

- (1) Post plan work item designed to better understand the cost and benefits of strategies
- (2) State, local and regional action item--white paper being developed



Greenhouse Gas Strategy

Technology

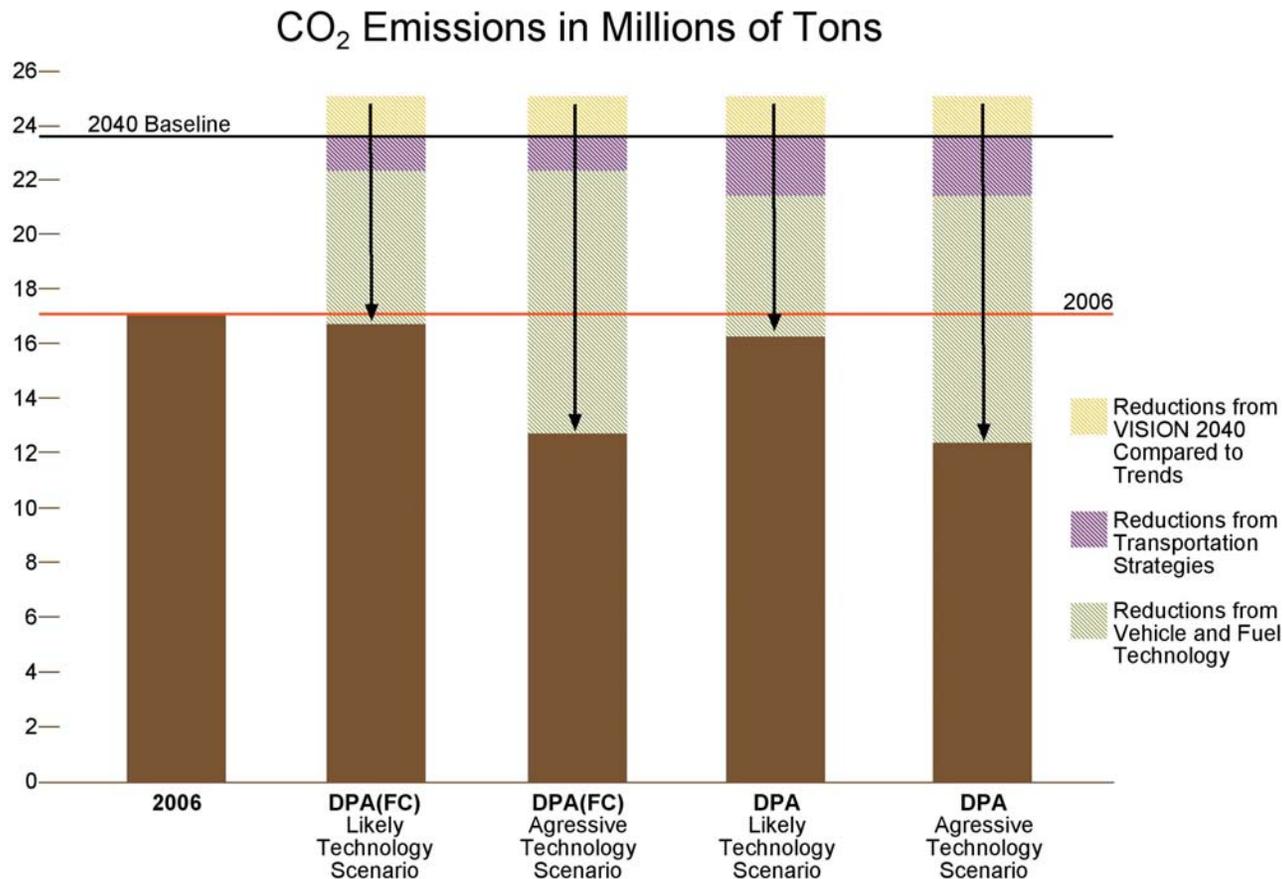
Support development of technology to dramatically reduce tailpipe emissions

In partnership with Ecology, we have developed the following assumptions for the 2040 vehicle fleet, from “likely” improvements to “aggressive” improvements:

	LIKELY SCENARIO ¹	AGGRESSIVE SCENARIO ²
Percent of Electric Vehicles in Fleet	20%	45%
Improvements to Fuel Economy	40 mpg	50 mpg
Reduction of Carbon Intensity of Fuel	10%	25%
Improvements to Heavy Duty Vehicles	5%	10%

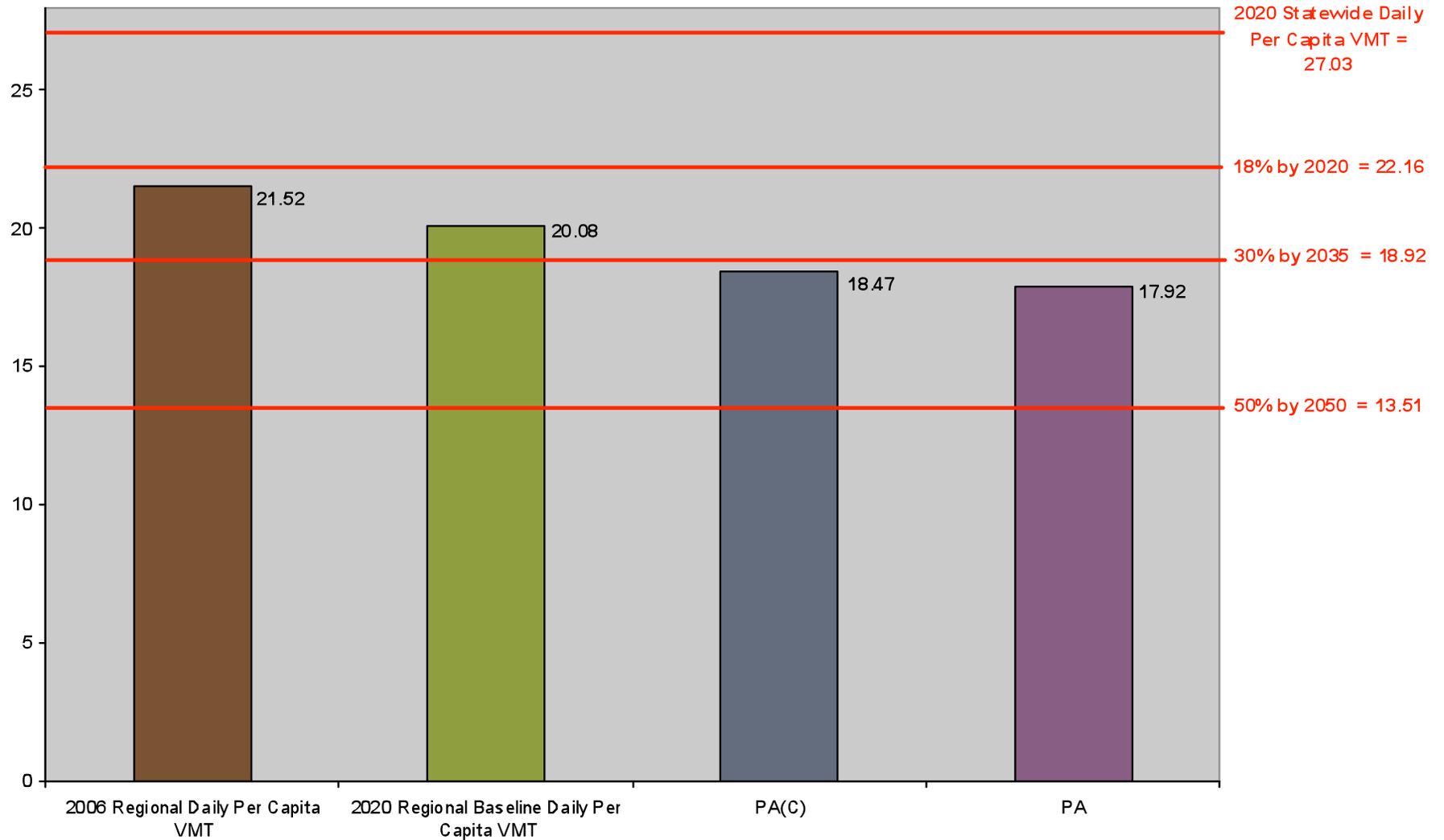
Greenhouse Gas Strategy

- Land Use: VISION 2040 resulted in a 6% reduction in GHG emissions from the trend
- User Fees and Choices: the transportation investments in the DPA result in a 9% reduction in GHG emissions from the Baseline
- With the application of likely and aggressive technology improvements, the DPA results in a total GHG emissions reduction from the Baseline of 31% (5% below 2006 levels) to 48% (28% below 2006 levels)



VMT Per Capita

Daily Per Capita VMT





Greenhouse Gas Strategy

Summary of GHG Analysis:

- Investments and strategies through land use, user fees and providing transportation choices result in GHG emission reductions from the Baseline of 6% [DPA(FC)] to 9% [DPA]
- With assumptions for vehicle and fuel technology improvements by 2040, *additional* reductions of GHG emissions in the range of 25-43% are possible
 - *All four components of the GHG Strategy combined result in GHG emissions 5-28% below 2006 levels*
- These results are consistent with state and national research related to transportation GHG emissions reductions

All four components of the strategy are necessary to achieve reductions; the region and the state will continue to work together to pursue options for reducing GHG emissions from the transportation sector

Greenhouse Gas Strategy: What More Can Be Done?

- Land Use: VISION 2040 resulted in a 6% reduction in GHG emissions from the trend
 - Further focusing growth in metropolitan and larger cities could result in a 9% reduction in GHG emissions
- User Fees and Choices: the transportation investments in the DPA result in a 9% reduction in GHG emissions from the Baseline
 - Higher assumptions of vehicle operating costs would result in additional reductions
 - The toll rates in Alternative 5 were higher (25¢ per mile) and resulted in a 10% reduction in GHG emissions from the Baseline
 - *Moving Cooler* analyzed fees equivalent to an *additional* \$5.00 a gallon which resulted in a 28% reduction in GHG emissions from their study baseline by 2050
 - The alternatives analysis conducted for Transportation 2040 included significant investments in alternatives to single occupant vehicle travel, consistent with the 2008 Climate Action Team's recommendations
 - Additional research can be conducted regarding the impact of the region's "short trips," as well as the benefits of localized bicycle and pedestrian investments, active traffic management, transportation demand programs, etc.
- Technology: the application of likely and aggressive technology improvements to the DPA results in a total GHG emissions reduction from the Baseline of 31% (5% below 2006 levels) to 48% (28% below 2006 levels)
 - The region can consider opportunities to influence the direction of vehicle and fuel improvements over the next 30 years, to ensure these potential emissions reduction benefits are achieved (e.g., through legislation, incentives, etc.)



Questions?

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