

Using Scenarios to Explore the Future of Demographics and Land Use in Metro Boston

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What do the feds say about projections?

- Section 176(c)(1)(B)(iii) of the Clean Air Act: “The determination of conformity shall be based on the most recent estimates of emissions, and such estimates shall be determined from the **most recent population, employment, travel, and congestion estimates** as determined by the MPO or other agency authorized to make such estimates.”

Where do projections come from?



Traditional forecasting approaches fall short

- Past/current trends may change
- Policy choices will influence what future comes to pass
- Unpredictable forces outside the region will influence our future
- Models are limited in their ability to simulate complex systems
- Singular "expert" forecast doesn't have same cache it once did

Rather than a "best" forecast, focus on *scenarios* and *interactions* between different systems and driving forces

Scenario Planning

uses *internally consistent* articulations of *plausible future conditions* in order to support informed deliberation, engagement, and decision-making

Scenario Planning

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graph TD; A[Scenario Planning] --- B[Predictive]; A --- C[Normative]; A --- D[Exploratory];
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Predictive

Identify “probable” futures based on existing trends and observed variability

Normative

Define a range of end states and estimate outcomes and/or pathways to achieving them

Exploratory

Identify which “driving forces” will shape the future and explore their potential effect

Exploratory Population Scenarios

Base Scenario

This scenario uses historic rates of migration (2005-2011), Births, and Deaths (both 2011-2015) to project our region's population forward. These are the same rates that were used to create projections for the 2040 Long Range Transportation Plan in 2018.



Booming Region

In this scenario the MAPC region experiences a strong college population and retains a larger percentage of the college-aged population than it does today. The region experiences the highest values in recent history for migration and fertility. Mortality rates for each age group are at their recent historic lows.



Sleepy Region

In this scenario the region stagnates and very few people move into or out of the region. Residents continue to have lower fertility rates than today. College students tend to leave the region after their schooling and less students migrate to the region.



Older Exodus

In this scenario the MAPC region experiences an out-migration of its older population who instead decide to retire to other areas. This reduces domestic out-migration of middle-aged residents as families with children decide to stay in the region. Overall, the region's population shifts to be younger.



Slow Growth

In this scenario we assume that residents want to leave the MAPC region. Out-migration increases, fertility rates continue to decline and mortality rates remain stable. The region's college population dwindles.



International Migration Policy

In this scenario federal immigration policy severely limits international in-migration. In all other ways, the region's behaviors remain similar to today.

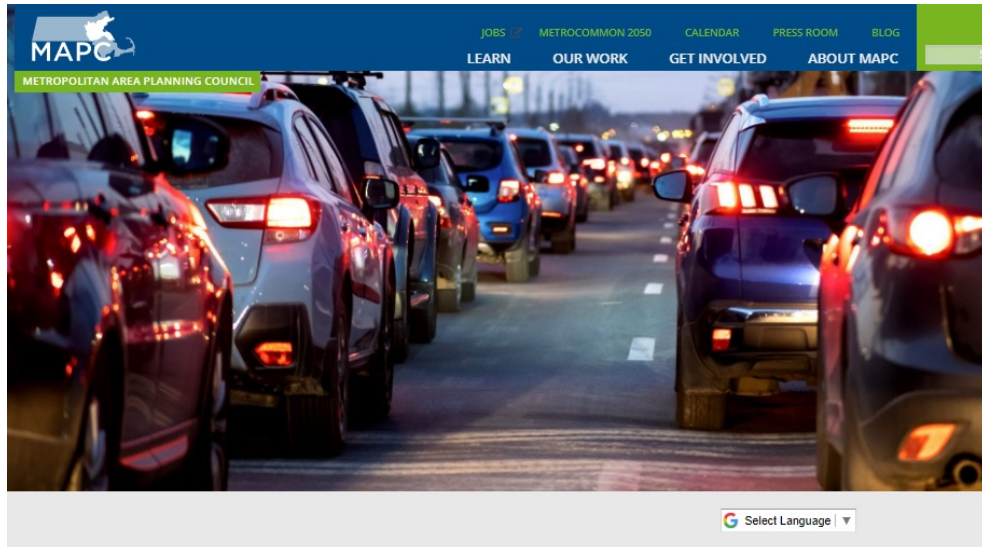


What the populations scenarios tell us

1. Every scenario shows big increases in the senior population
2. Most (not all) scenarios show declining numbers of school-age children
3. Seniors' choices about downsizing/moving out of state will have a big impact on the new for new family housing
4. Long term labor force/job growth is likely to be modest under any scenario



Land Use and Transportation Scenarios



The Impacts of Land Use and Pricing in Reducing Vehicle Miles Traveled and Transport Emissions in Massachusetts

A RESEARCH BRIEF FROM THE METROPOLITAN AREA PLANNING COUNCIL

Published January 22, 2021

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www.mapc.org/resource-library/vehicle-miles-traveled-emissions

- How much is VMT likely to increase by 2030 under a ‘base case’ (pre-COVID) scenario?
- How would different regional patterns of development affect VMT growth?
- What is the relative impact of various roadway pricing policies (increased gas tax, VMT tax, or congestion fees) on VMT?
- How do our estimates compare to those used for the EEA reports?
- What does this suggest for policy priorities?

MAPC Model tools



UrbanSim land use allocation model

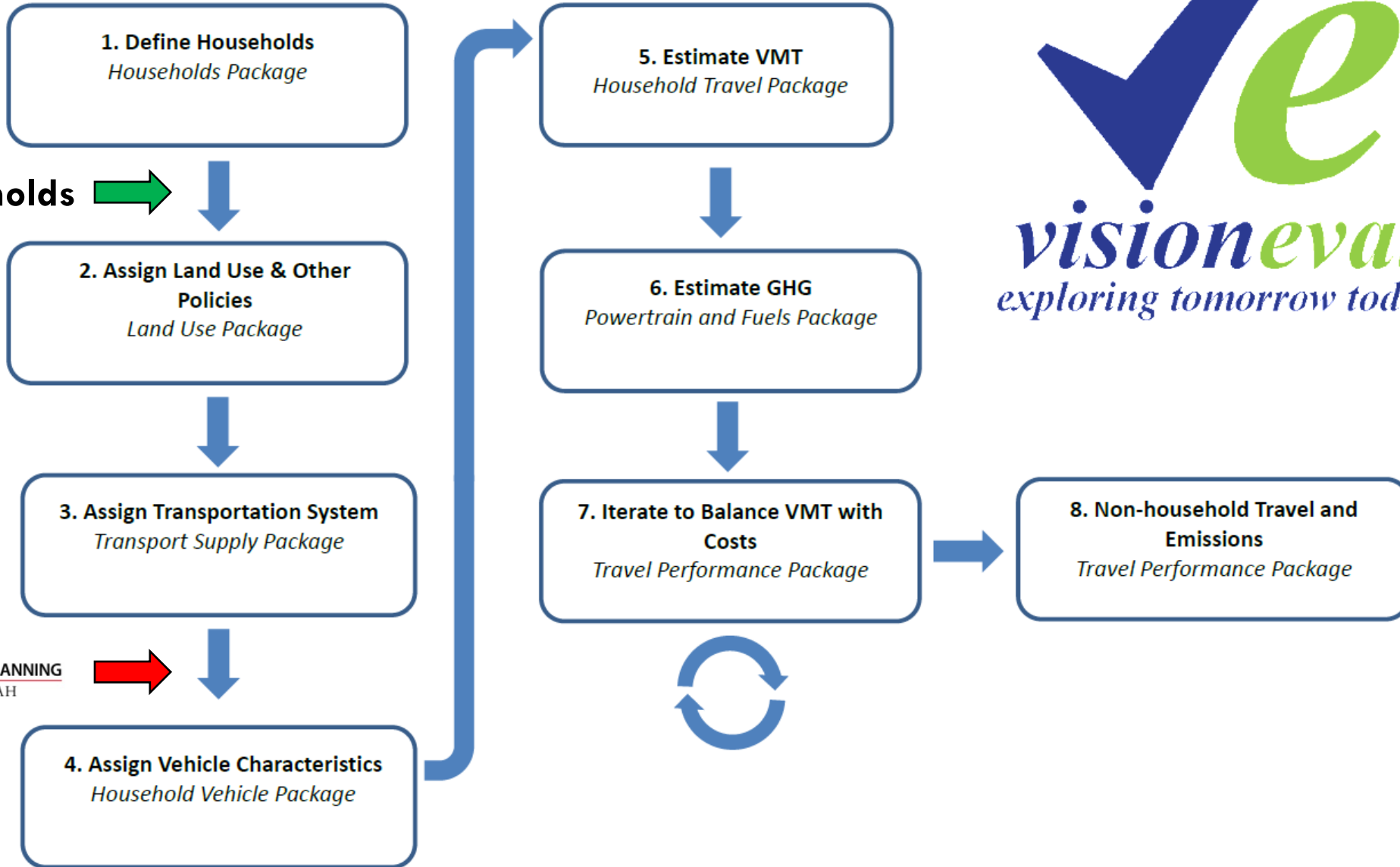
- Developed in partnership with MassDOT and EOEEA; managed by MAPC
- Allocates forecasted households and employment to census blocks throughout the MAPC region based on zoning capacity, attractiveness, and development in the pipeline.
- Can be used to create detailed scenarios of land use and demographic change



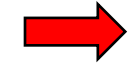
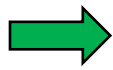
VisionEval Regional Scenario Planning Model (VERSPM)

- Transportation “sketch model” maintained by Federal Highway Administration
- Uses inputs from land use model, regional travel demand model, and surveys
- Estimates vehicle availability (number of vehicles per household, vehicle type, access to TNC rideshare) and household travel behavior (trips, trip length, trip mode)

VisionEval Model Schematic



Households



Vehicle Model

 Department of
CITY & METROPOLITAN PLANNING
THE UNIVERSITY OF UTAH

 Keeping Utah Moving
Utah Department of Transportation - Research Division
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Scenario Development



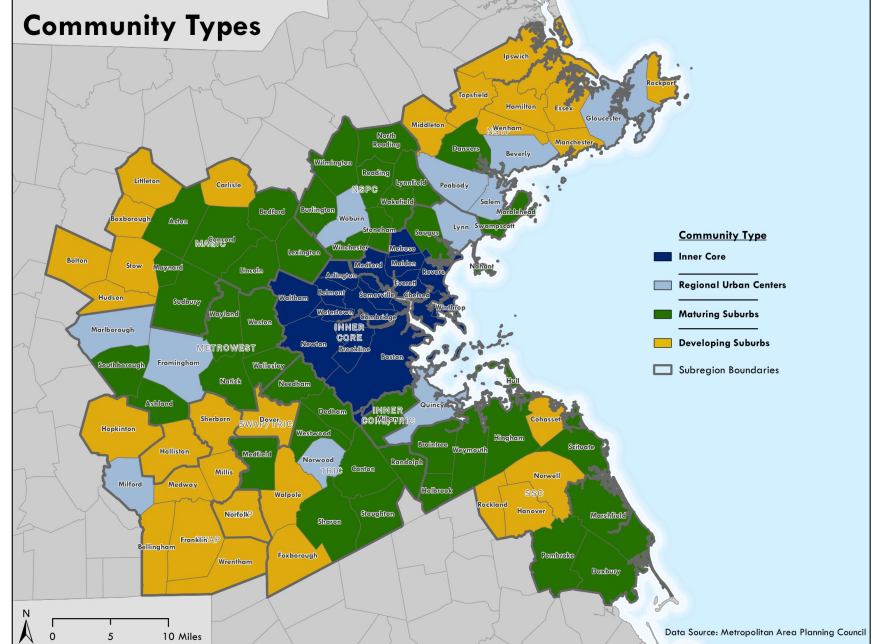
- We use UrbanSim to create alternative land use scenarios for the region, each representing a different distribution of future growth across the region



- The resulting outputs are then fed into VERSPM, which estimates travel demand and VMT for each land use scenario based on specified assumptions about the cost of gas and driving

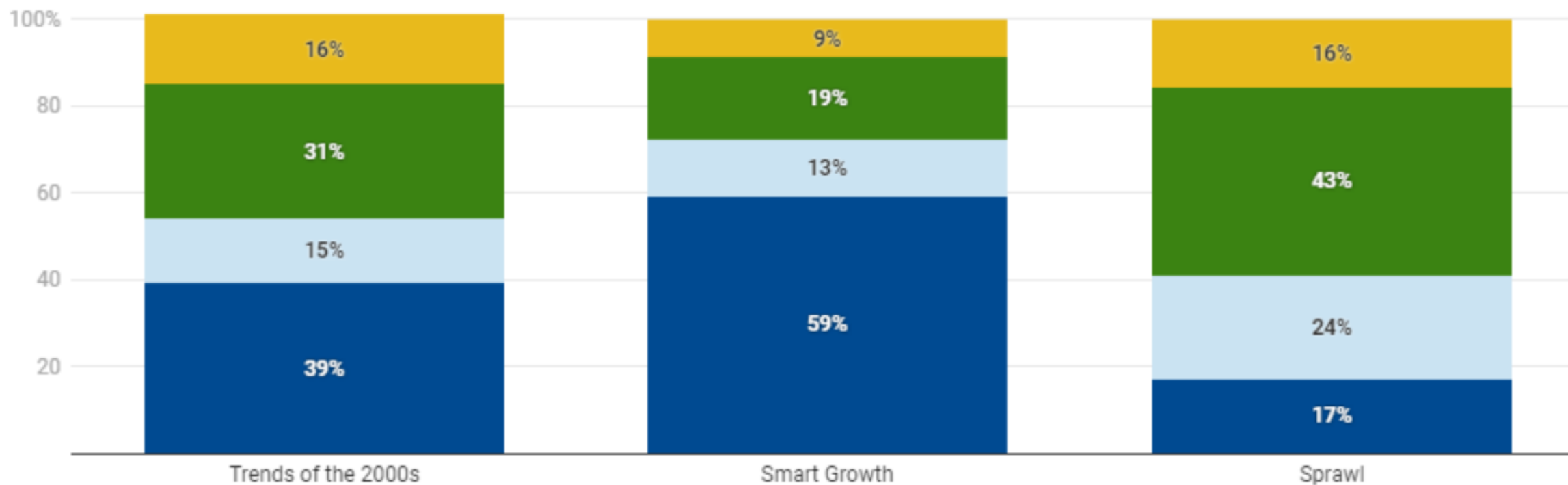


UrbanSim Land Use Scenarios



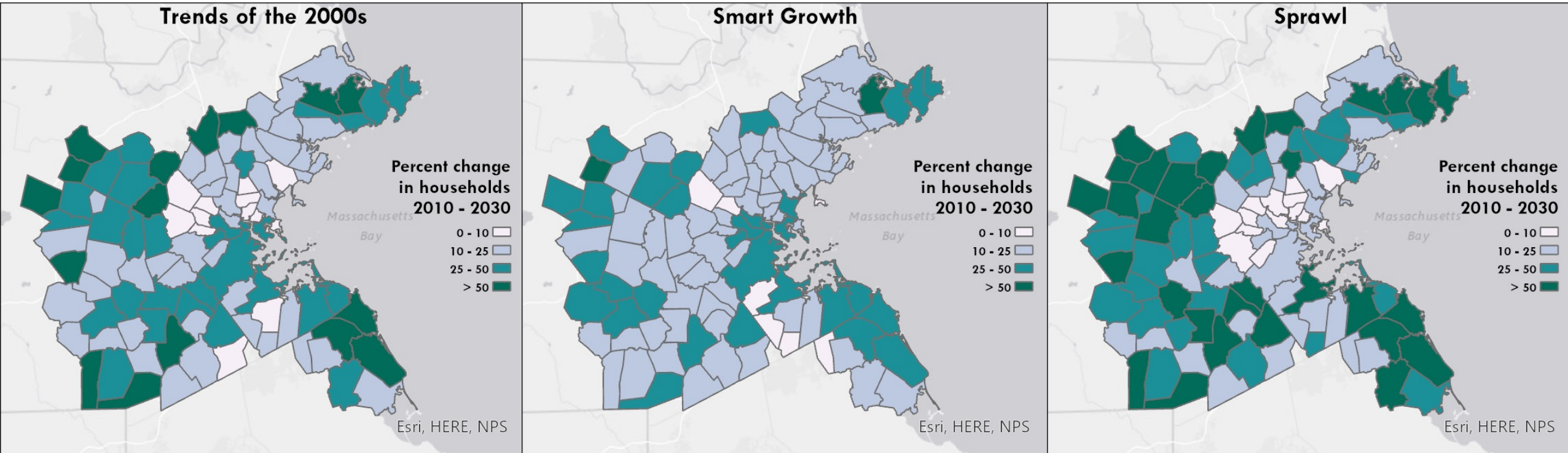
Share of Household Growth by Community Type, 2010-2030

Inner Core Regional Urban Centers Maturing Suburbs Developing Suburbs





Land Use Scenarios: Spatial patterns



- Regional control totals for future households do not change – only the spatial allocation
- Employment patterns are held constant across scenarios

Base Case VMT forecast

Base case scenario: **household VMT may increase by more than 21%** between 2010 and 2030

Fleetwide average fuel efficiency would need to improve to 29 miles per gallon (from 21 today) by 2030 just to keep transportation GHG emissions at their current level

Even a return to the Obama-era fuel efficiency standards would be insufficient to achieve this target given current rates of vehicle turnover



Pricing Scenarios

Description

\$0.24 gas tax (no change from current)

\$0.42 gas tax

\$0.75 gas tax

\$0.75 gas tax + freeway congestion fees

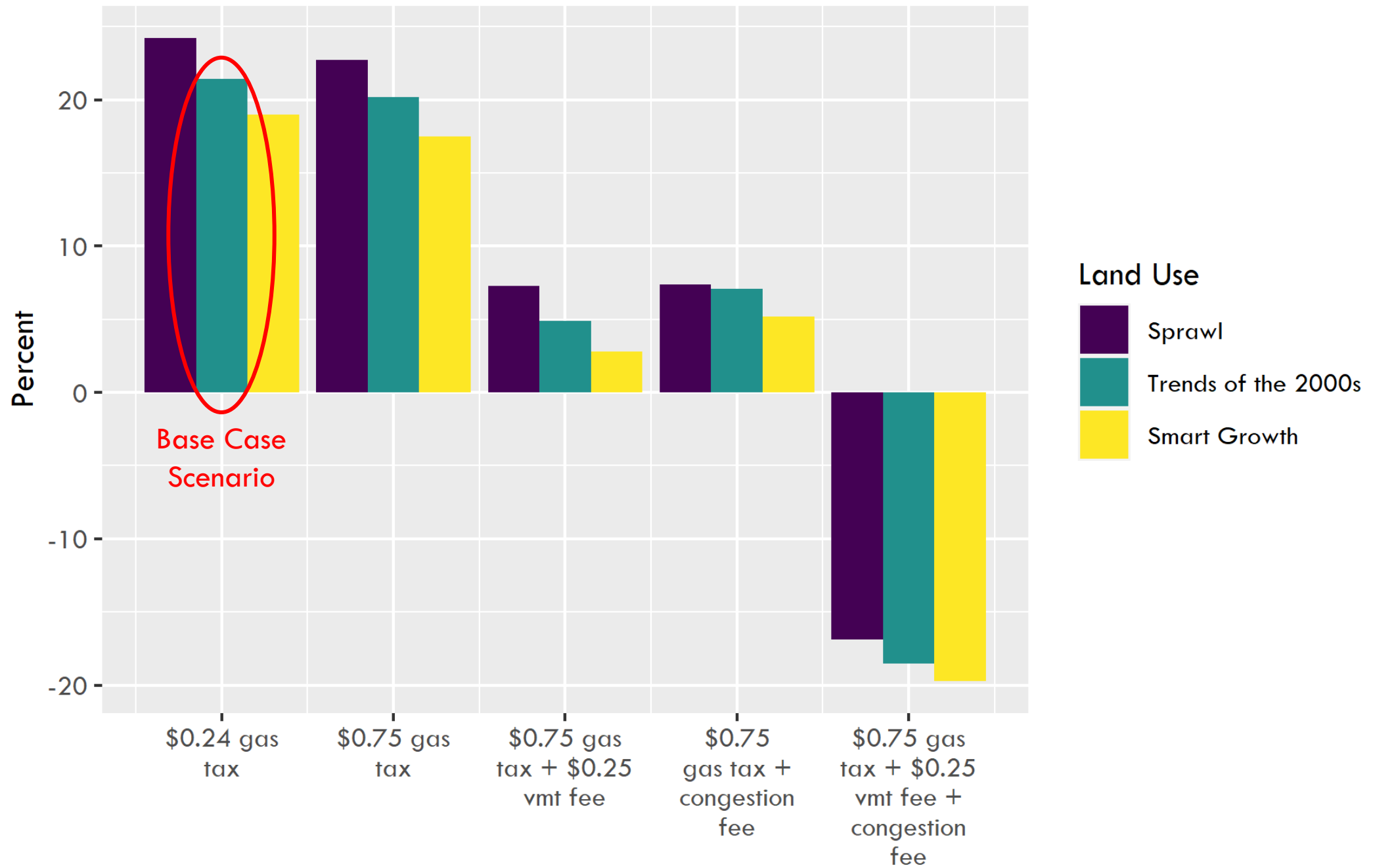
\$0.75 gas tax + \$0.25 VMT fee

\$0.75 gas tax + \$0.10 VMT fee + freeway congestion fees

\$0.75 gas tax + \$0.25 VMT fee + freeway congestion fees

Pricing scenarios are for testing only, and do not represent specific proposals.

Percent Change in Household VMT 2010 - 2030



Model Results

- Land use matters! VMT growth in a “sprawl” scenario is 5.2 percentage points higher than a “smart growth” scenario with more development in urban areas and denser suburbs
- The difference in VMT between Smart Growth and Sprawl is larger than the difference created by more than tripling the gas tax
- Roadway fees of 25 cents per mile or more may be needed to eliminate growth of VMT
- The relative benefit of Smart Growth vs. Sprawl persists across all pricing scenarios

Conclusions

- Different approaches to Scenario Planning are useful in different contexts
- Some aspects of the state's demographic future can be predicted with confidence; others are highly uncertain
- Scenarios models can help demonstrate how much intervention is needed to curb growth in vehicle miles traveled

MetroCommon × 2050
Shaping our Region Together

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www.mapc.org/about-mapc/employment-opportunities/



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