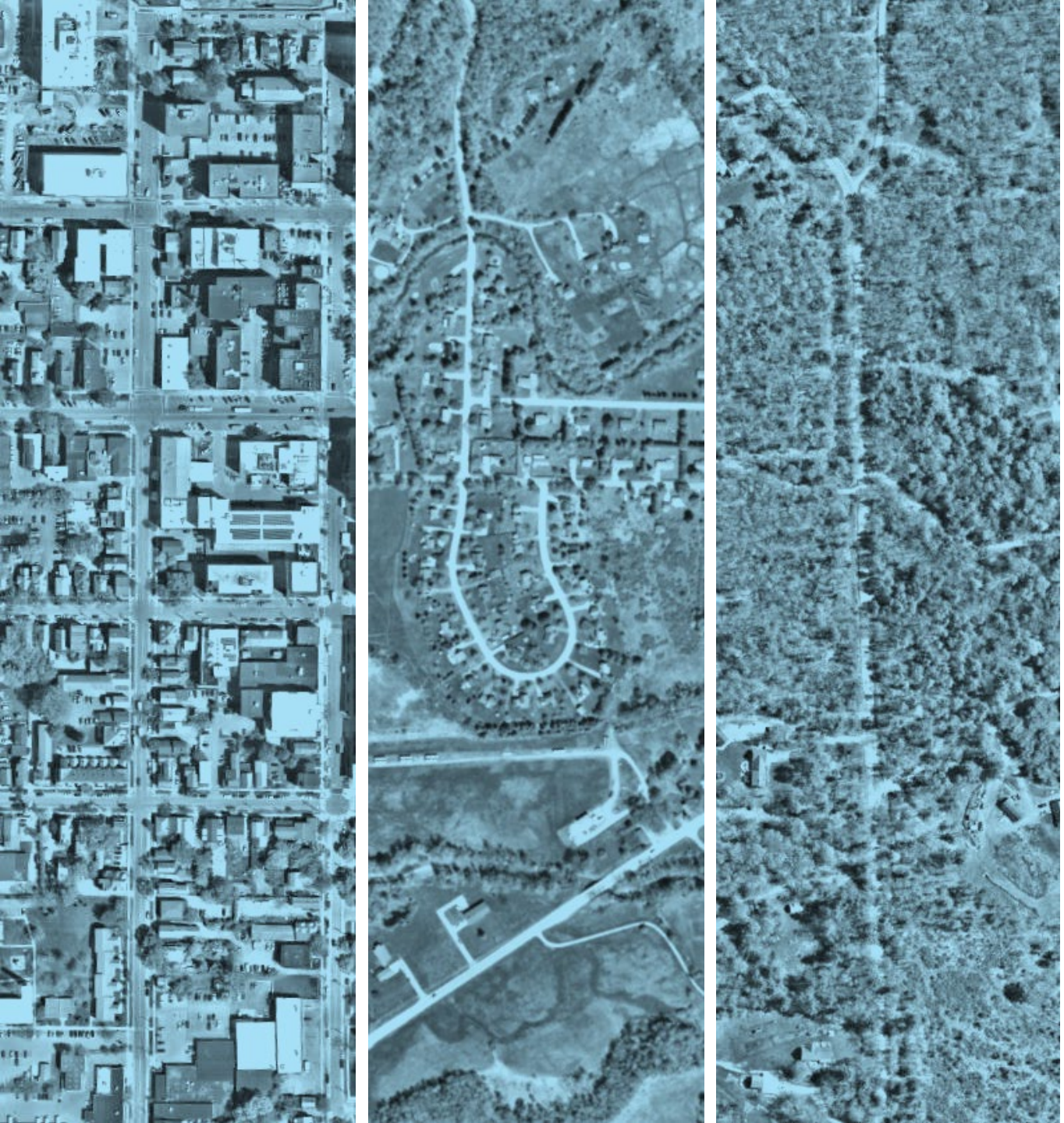

Estimating the Effects of Smart Growth Strategies on VMT & GHG Emissions

VTrans Research Symposium 2024

September 25th, 2024

VTrans Champion: Matthew Arancio | Policy, Planning, & Research Section

Principal Investigators: Theodore Mansfield | RSG & Karen Sentoff | VHB

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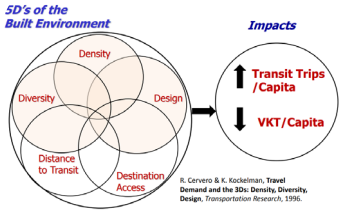
Project Objectives

Overarching Hypothesis: Compact, mixed use development patterns intrinsically generate less VMT and GHG emissions per person than more dispersed or rural settlement patterns.

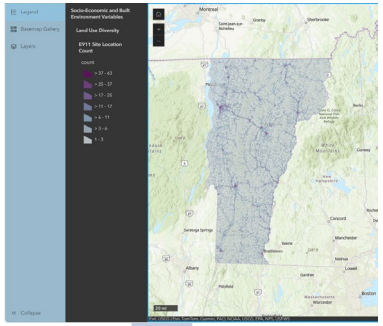
RESEARCH OBJECTIVES:

1. **Demonstrate** the degree to which smart growth strategies, particularly in the Vermont context, can reduce VMT to meet transportation related GHG emission reduction targets as promulgated in the *Vermont Pathways Analysis Report*.
2. **Quantify** the co-benefits of smart growth strategies beyond GHG emission reductions, including **health** benefits of increased active and multimodal travel, **safety** benefits for reduced VMT, **reduced maintenance** associated with fewer vehicles and possibly fewer lane miles, and **increased economic activity** in downtowns and community centers.

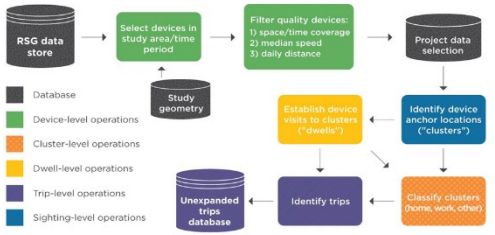


Literature Review

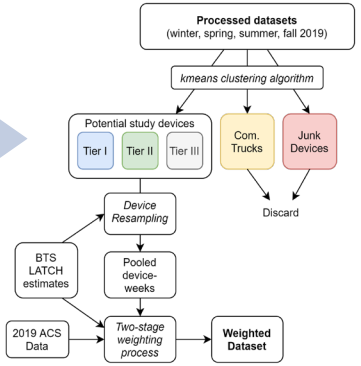
Methodology



Compile Built Environment & Socioeconomic Variables



Passively Collected, Location-Based Services Data Processing



Data Post-Processing for VMT Estimates

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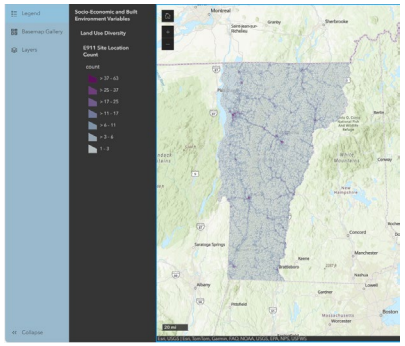
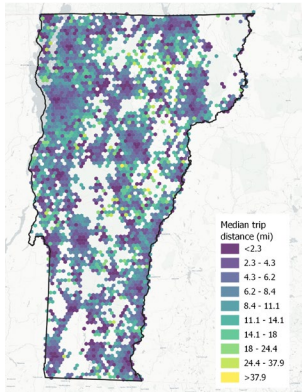
Methodology

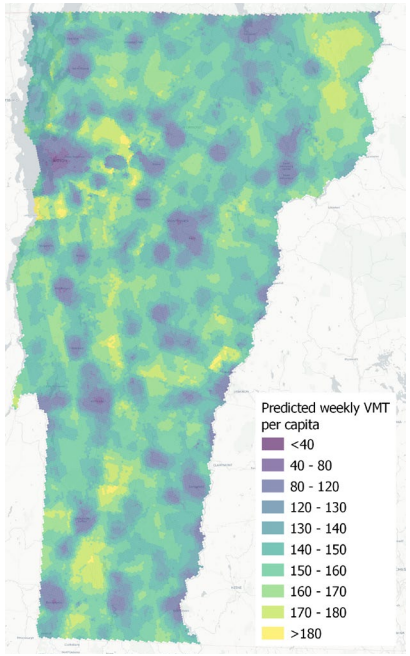
Built Environment & Socioeconomic Variables



Weighted Device Weekly Trip Making & Adjusted VMT Estimates



VMT Model



BUILT ENVIRONMENT VARIABLE	UNIT CHANGE IN BUILT ENVIRONMENT MEASURE	MARGINAL EFFECT ON WEEKLY VMT
Median household income	$10,000 increase in median income	+4.7 (+3%)
OSM-derived sidewalk density	1 unit increase in sidewalk density	-7.2 (-5%)
Intersection density	50-unit increase in intersection density	-8.4 (-6%)
Transit service density	5-unit increase in transit service density	-4.7 (-3%)
Population density in 2-mile buffer [a]	100 persons/mi² increase in population density	-10.6 (-7%)
Retail job in 3-mile buffer [a]	100 jobs/mi² increase in job density	-15.3 (-10%)
Office job density in 2-mile buffer [a]	100 jobs /mi² increase in job density	-21.4 (-15%)
Land-use mix in 3-mile buffer	0.10 increase in land-use mix	-0.7 (-0.5%)

Future Scenarios

- Dispersed Growth
- Concentrated Growth & Jobs in Dense Areas
- Concentrated Growth in Dense Areas with More Dispersed Job Growth
- Concentrated Growth and Jobs Emulating Places with Low VMT
- Concentrated Growth Emulating Places with Low VMT and Jobs in Other Core Places

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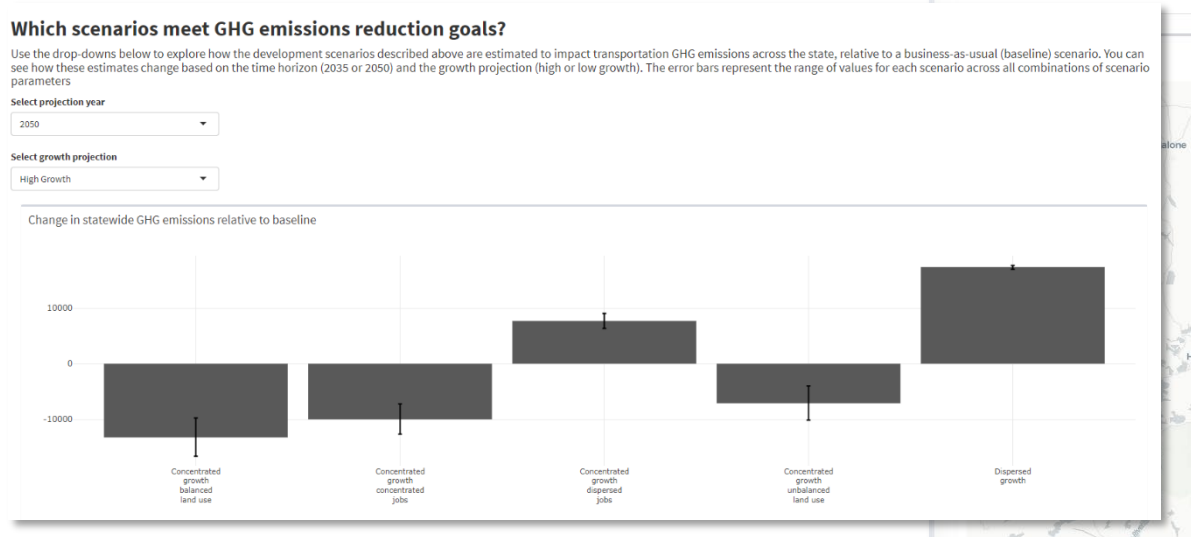
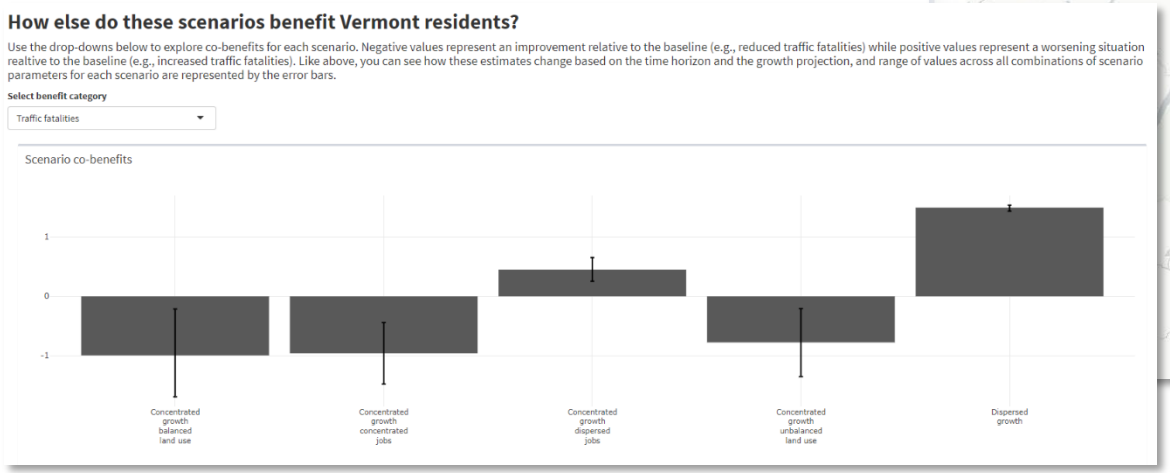
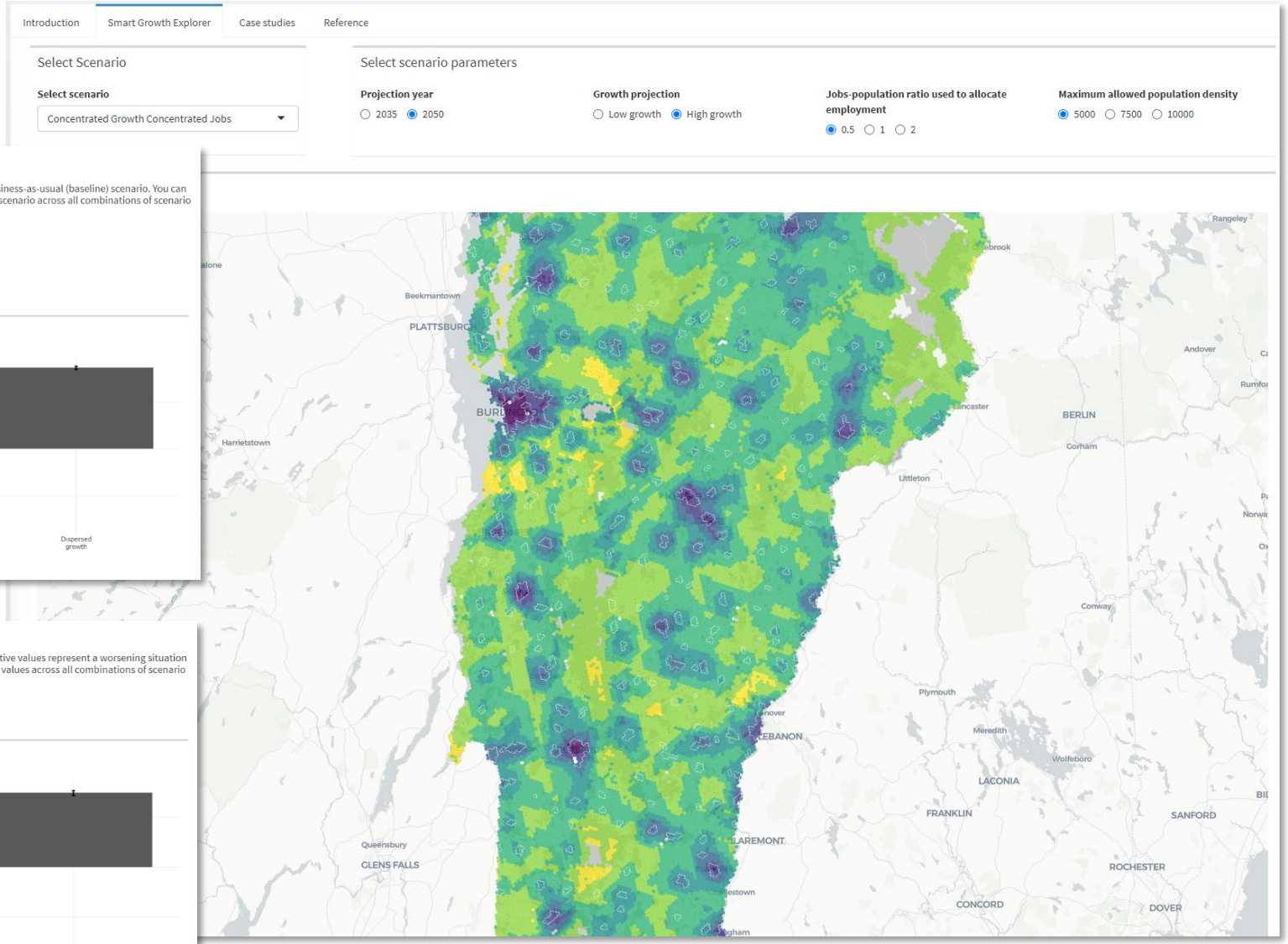
Dashboard Tool







[Link to Tool]

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Conclusions

- **Smart growth contributes to the solution.**
  - Global Warming Solutions Act (GWSA) requires 80% reduction in GHG below 1990 levels by 2050
  - Most effective scenario achieves 15% of the annual reduction required to meet the target
- **Concentrate growth by mimicking low VMT places.**
  - Emulated “prototype” communities in Vermont with smart growth characteristics
  - Prioritized residential and job growth in low VMT areas
  - Reduced VMT by 10 miles per person per week compared to dispersed growth
- **Benefits reach beyond VMT and GHG reductions.**
  - Safety co-benefits included 1 avoided traffic death per year and 30 avoided traffic injuries per year
  - Reduced physical inactivity mortality saved 4 lives annually
  - Reduced maintenance costs could save up to $1.5M per year
- **Case study communities tell more of the story.**
  - Denser, mixed land uses require job proximity
  - Vermont’s “good bones” support smart growth strategies
  - Proximity of neighboring town centers with complementary land uses play a role in VMT patterns