

Estimating the Effects of Smart Growth Strategies on VMT and GHG Emissions in Vermont

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Objectives

- 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*
- Quantify** the co-benefits of smart growth strategies beyond GHG emission reductions, including **health** benefits, **safety** benefits, **reduced maintenance** costs, and **increased economic activity** in smart growth areas.

Approach

The project team compiled a database of built environment measures across Vermont relating to the 5D's (Figure 1). VMT was estimated using passively collected big data. Data processing steps were developed and applied to devices seen in each season in Vermont in 2019. Through filtering and post-processing, the data were refined into a sample of 750,000 trips from 30,000 Vermonters. Two stage weighting expanded the sample. VMT estimates and built environment measures were resolved to hex grid geometries at the neighborhood scale. A VMT model was developed to predict VMT based on built environment measures. Future development scenarios were examined representing different potential growth scenarios out to 2035 and 2050. The changes to VMT based on each scenario were used to estimate the potential co-benefits of each future scenario.

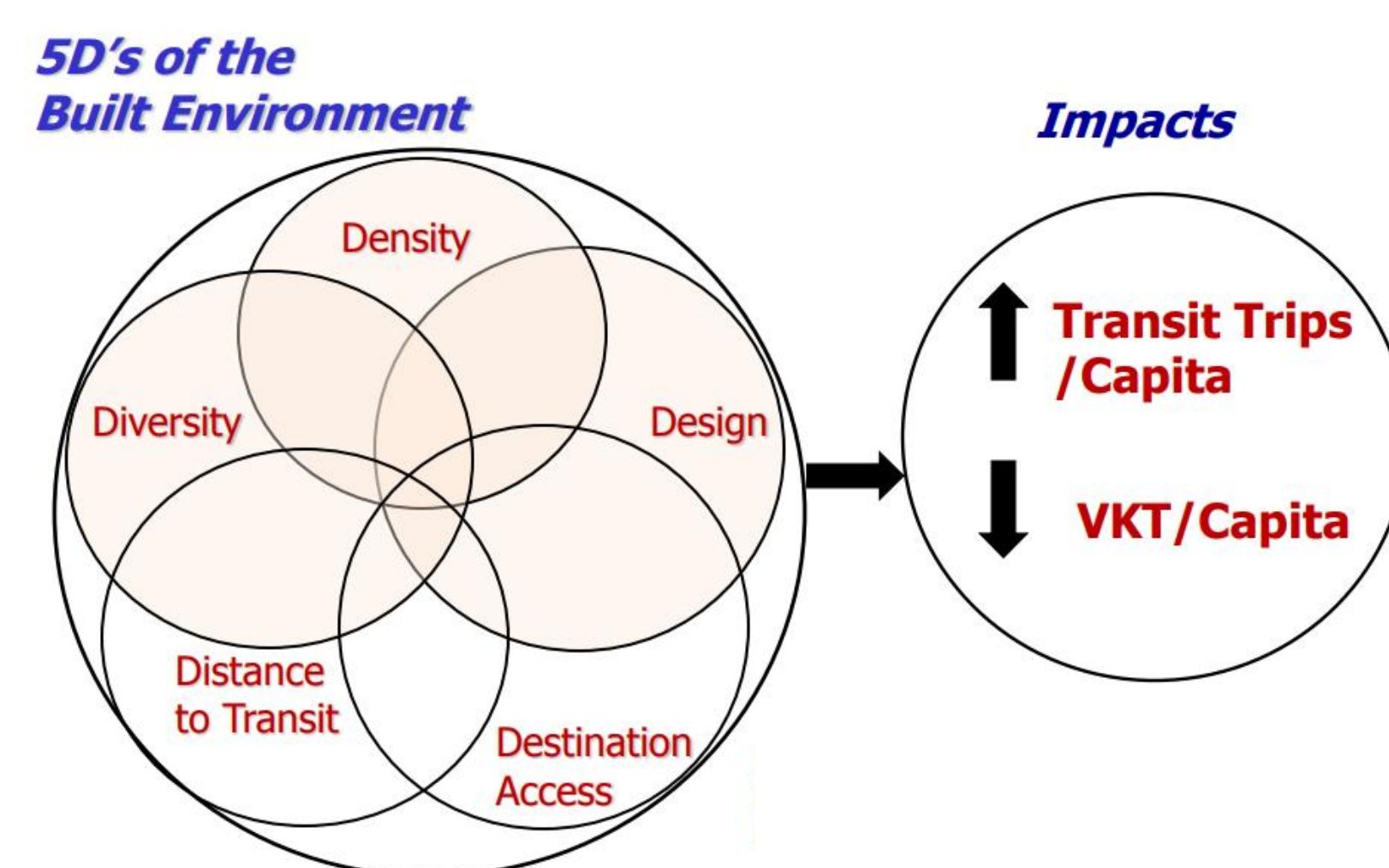


Figure 1. This research explores how built environment measures (left) influence VMT (right) in the Vermont context

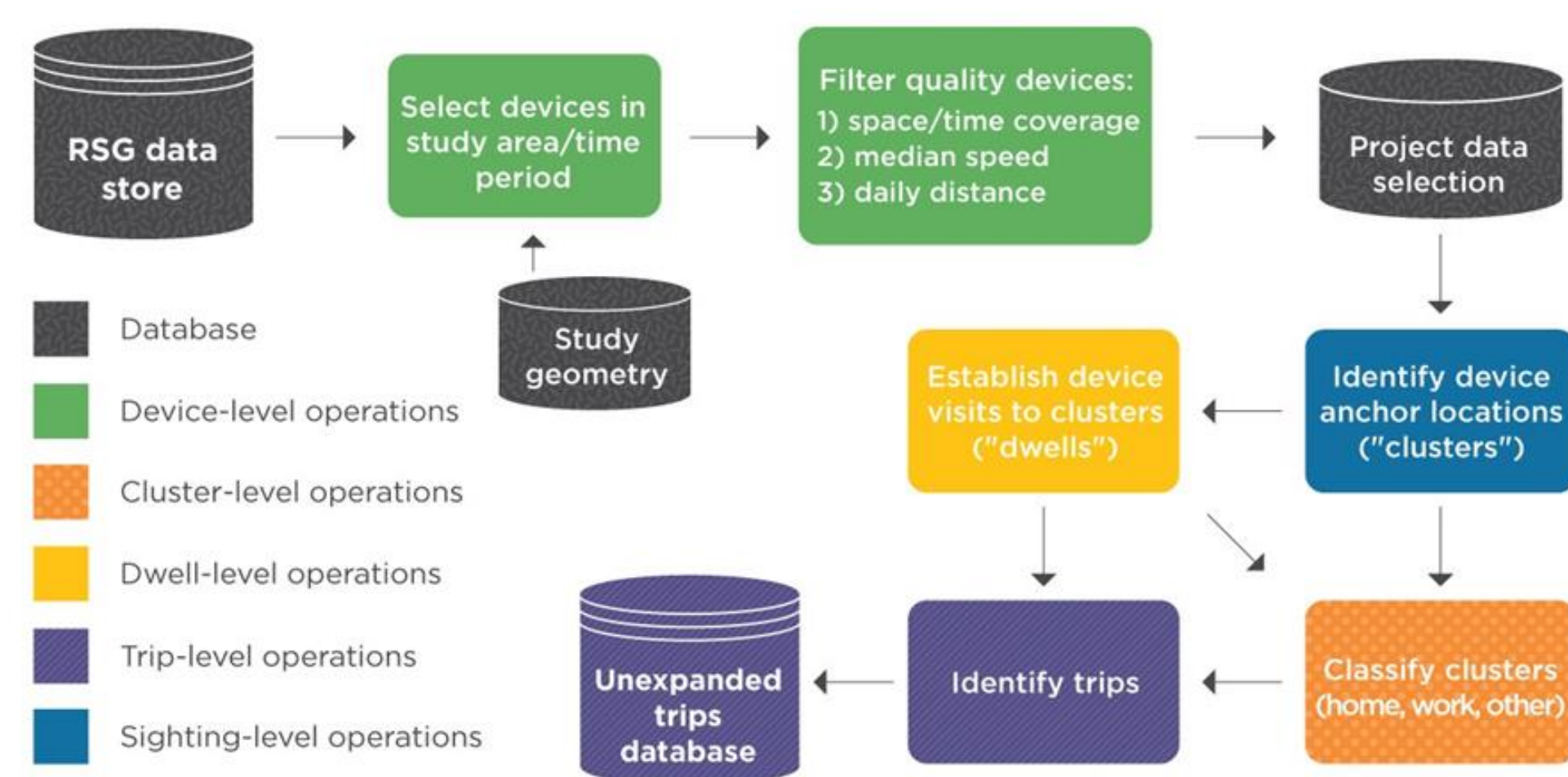


Figure 2. Passively collected data processed using the rMerge platform

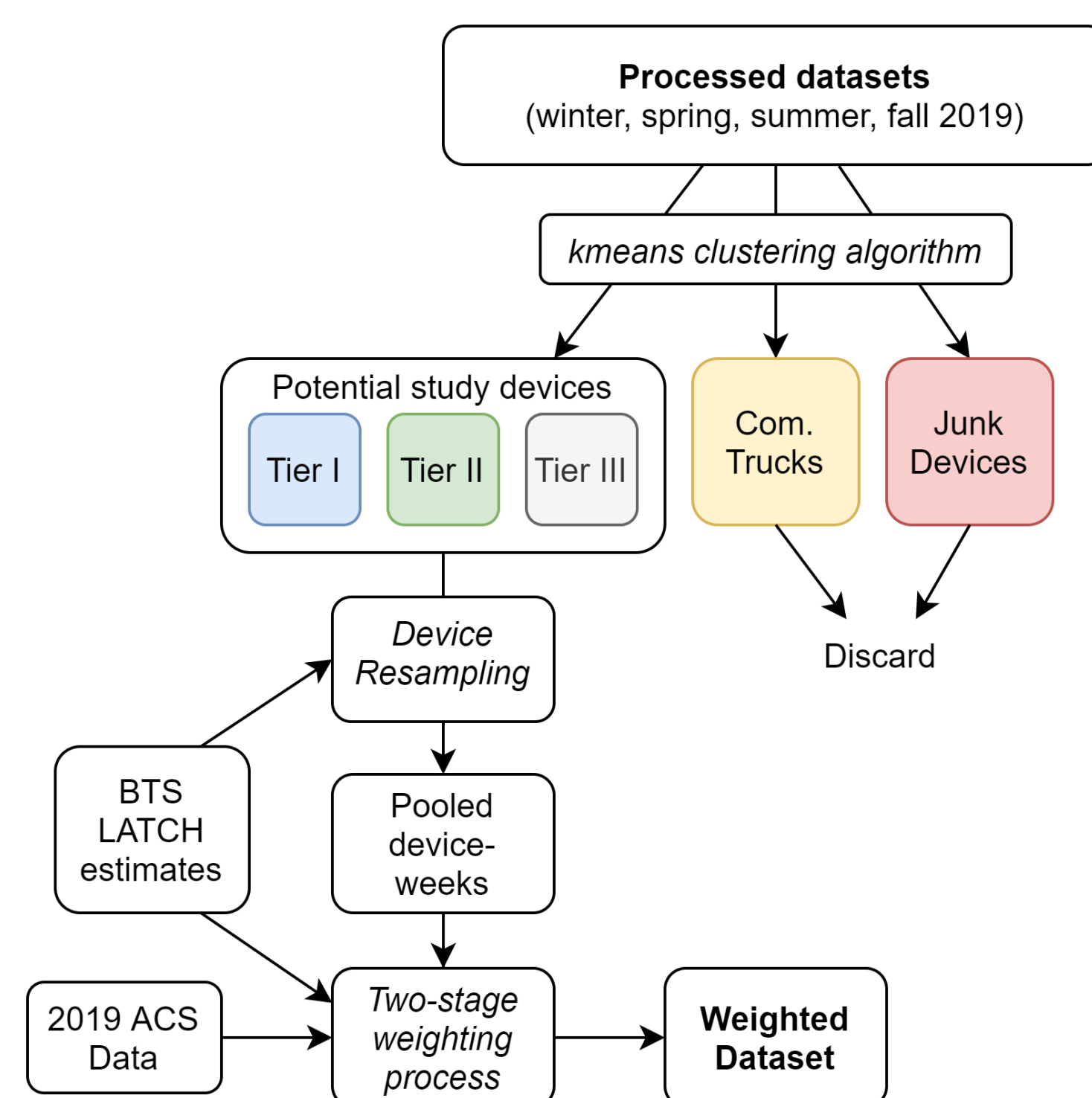


Figure 3. Data post-processing procedures.

Results

The Global Warming Solutions Act (GWSA) targets an 80% reduction in greenhouse gas emissions below 1990 levels by 2050. The most effective scenario evaluated in this research prioritized growth in low VMT areas and emulated prototype communities in Vermont with smart growth characteristics. Based on the annual reduction required to meet GWSA targets, this smart growth scenario was able to achieve over 15% of the annual reduction required to meet the target by 2050. Moreover, this concentrated growth, balanced land use scenario demonstrated the benefits of smart growth strategies for Vermont communities aimed at emulating places that achieve low per capita VMT. Benefits of this scenario included:

- Reduced weekly VMT to 110 miles per capita;
- Reduced GHG emissions by over 13,000 metric tons annually;
- Avoided 1 traffic death per year;
- Avoided over 31 traffic injuries per year;
- Reduced physical inactivity mortality by nearly 4 lives annually;
- Reduced annual maintenance costs by over \$1.5 million; and,
- Avoided 364 additional road miles.

Combined with the results from each scenario, case studies of a selection of Vermont communities, including Rutland, Springfield, and Morrisville, revealed key research takeaways, including:

- Denser, mixed land uses require job proximity to achieve targeted VMT reductions
- Vermont's historical settlement patterns and landscape of denser centers surrounded by more rural areas lends itself inherently to smart growth strategies
- Regional neighbors influence VMT where condensed movement patterns within town centers may serve some needs complemented by more expansive travel patterns to adjacent communities to serve other needs.

Acknowledgments

The research team would like to acknowledge the project champion Matthew Arancio, VTrans, and all members of the project's Technical Advisory Committee.

References

Reid Ewing & Robert Cervero (2017) "Does Compact Development Make People Drive Less?" The Answer Is Yes, *Journal of the American Planning Association*, 83:1, 19-25, DOI: 10.1080/01944363.2016.1245112

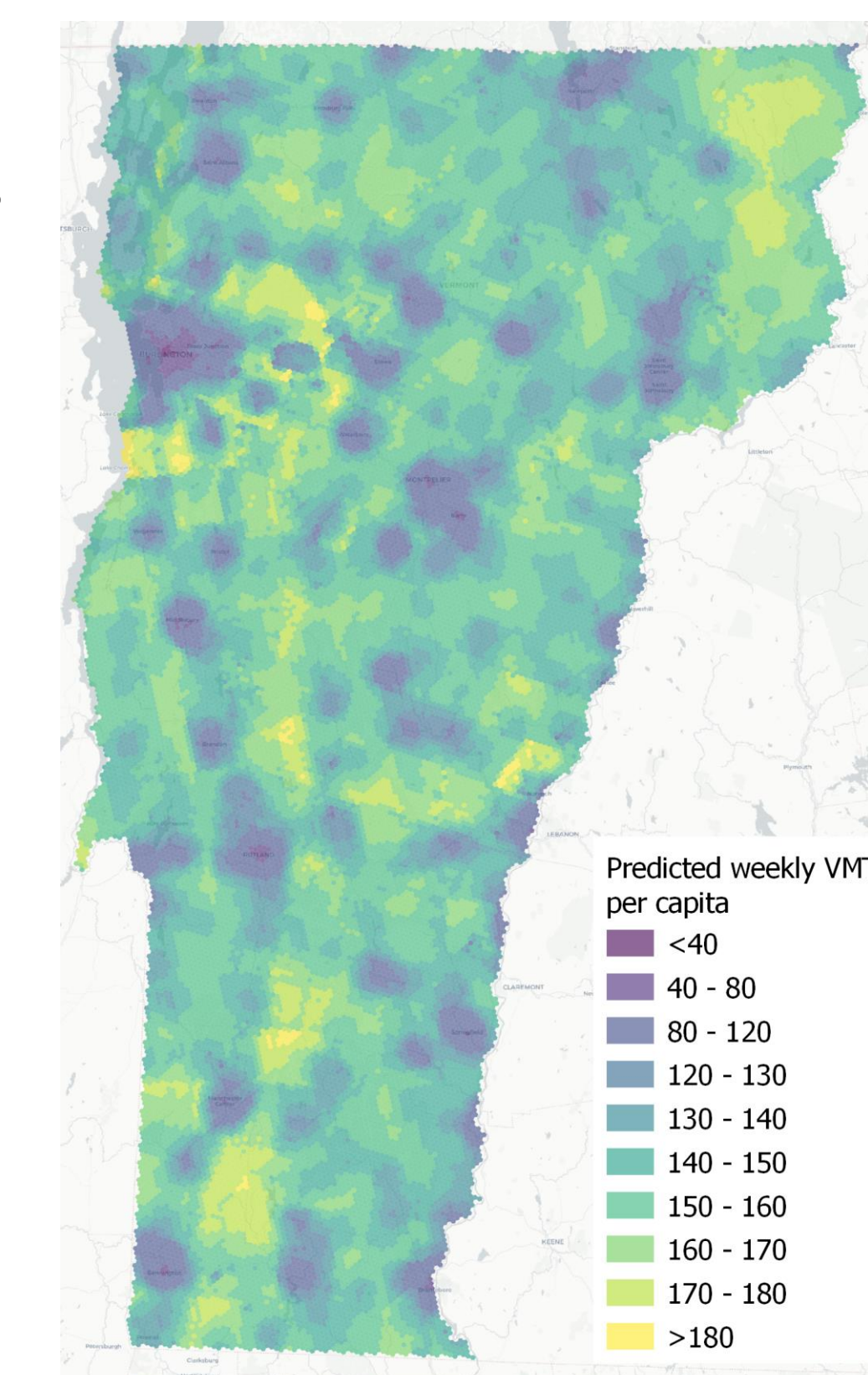


Figure 4. VMT estimates