VDOT Virginia Department of Transportation
Virginia Center for Transportation INNOVATION & RESEARCH

Research Brief
VCTIR 12-R7RB August 2013

Land Development Risk Analysis for Multimodal Transportation Corridors

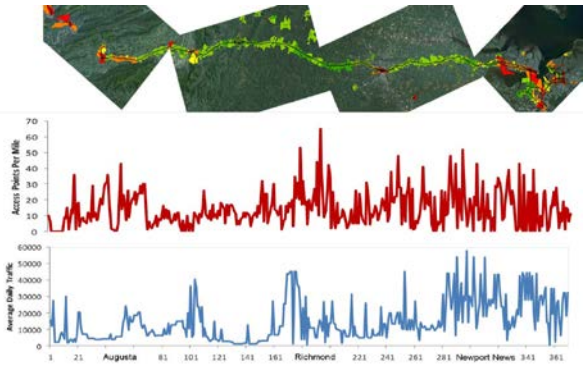
Perspective Virginia has thousands of miles of critical multimodal transportation corridors. Significant land development along these routes has the potential to lead to an increase in delays and crashes. Researchers led by Dr. James Lambert at the University of Virginia's Center for Risk Management of Engineering Systems developed a risk-based method to predict land development. This method helps to prioritize sections of transportation corridors most in need of protection from development within the next decade. Their integrated risk and reliability models help weigh trade-offs among the costs, benefits, and risks of protecting transportation routes. Such models focus the selection of projects for the VDOT Six-Year Improvement Program.

Innovative contributions from this study were:

- A set of procedures to estimate the densities of access points (driveways or intersections) along corridors. The researchers' manual count of more than 70,000 roadway access points from satellite imagery was less costly than a field inspection and more accurate than image processing computer programs.
- A "corridor trace analysis"—a linearization of the map of each corridor using color codes to indicate the estimated risk of future development along all the land parcels in the corridor. These maps, in combination with graphs of the corridor access point densities and average traffic volumes, quickly indicate corridor sections that most need protection in anticipation of future development.

Background VDOT's Transportation and Mobility Planning Division (TMPD) requested this study to learn about the sources, relative likelihoods, and potential consequences of the risk of land development along both the 5,700-mile multimodal transportation network known as the Virginia Statewide Mobility System and the VTrans Corridors of Statewide Significance—an overlapping set of highways, rail, transit services, ports, and airports identified in Virginia's long-range statewide multimodal plan.

Research and Recommendations The researchers used 40 GIS data layers, expert panels, influence diagrams, fault tree analysis, and rule-based modeling to rank the risk of development of each block of land within 1 mile of the corridors on a 5-to-10-year horizon. Researchers related economic, demographic, and land-use factors to the risk of development, identifying approximately 240 corridor miles with high development risk. They calculated and graphed the density of access points along the corridors, because a corridor with a higher number of access points per mile tends to be more expensive to protect. This approach helped identify areas where adaptation to land development would be costly.



Corridor trace analysis with risk levels, access point densities, and traffic volumes for one of the VTrans corridors of statewide significance

The study recommends that the TMPD share this approach for forecasting development risk with local governments, metropolitan planning organizations, and developers as a way to coordinate plans to protect transportation corridors. The researchers have provided half-day training sessions and workshop presentations that reached more than 25 localities and several metropolitan planning organizations. The work was recognized as a nationwide best practice in a 2012 National Cooperative Highway Research Program Scan Team Report. The TMPD has funded follow-up work.

For the full report, see VCTIR 12-R7. For more information about the research, contact John S. Miller, Ph.D., P.E., VCTIR principal research scientist, at John.Miller@vdot.virginia.gov.

The Virginia Center for Transportation Innovation and Research (VCTIR) is proud to contribute to VDOT's reputation as a national transportation leader. VCTIR greatly appreciates the cooperation and support of VDOT and the Federal Highway Administration.

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530 Edgemont Road | Charlottesville, VA 22903 | 434-293-1900 | vtrc.virginiadot.org