

FY 2021 American Rescue Plan Act Build Back Better Regional Challenge PHASE 1 Application: The Future of Transportation and Logistics (narrative)

The world's industrial and consumer economy relies on rapid movement and delivery of goods, as evidenced by strained supply chains during the COVID pandemic. The demand for truck freight movement grew 6.0% last year, fueled by the increasing shift to E-commerce.¹ Projections by the World Economic Forum expect freight demand to triple by 2050. This growing demand poses challenges from environmental degradation to a strained transportation workforce. Transportation and logistics professionals are turning to electric, automated land & air vehicles to address these challenges. Electrification of personal vehicles is accelerating, yet electrification of commercial medium and heavy vehicles lags despite greater opportunity for reduced carbon emissions and **environmentally-sustainable development**; these trucks are only 5% of total vehicles on the road, but they contribute 25% of U.S. greenhouse gas emissions.² Likewise, automation in the trucking industry and its integration with drones for delivery is necessary to meet the sustainability, safety, and economic productivity goals for the future mobility of goods in our nation.

The Southwest and Southern Virginia region is ideally positioned to lead this industry transformation by building upon existing strengths in vehicle manufacturing, digital technology R&D, and vehicle test and evaluation (i.e., continued **technology-based economic development**). This tightly aligned cluster focuses on providing the **workforce, technologies**, testbeds, and facilities to accelerate the adoption of electric and automated vehicles necessary to ensure international leadership and realize the potential of this industry for the region and nation.

Southern and Southwest Virginia

Southwest and Southern Virginia is primarily rural with some small cities, stretching from the mountains and valley of central Appalachia to Virginia's former tobacco belt along the North Carolina border (See Figure 1). The region is historically disadvantaged as old natural resource economies and traditional **manufacturing** fade. This trend created many poor rural populations with lower education attainment levels and compounded challenges for minority populations particularly in Southern Virginia counties, Roanoke and Lynchburg. Today, about 50% of the region's counties are either coal dependent, coal impacted, or at-risk.³ Komatsu Mining Corp's March 2021 closure demonstrates this continued decline, with 128 jobs lost.⁴ Per capita incomes (PCI) of all but two regional counties are lower than U.S. PCI (\$34,013), and 22 of 35 regional counties have PCIs below 80% of the U.S. PCI.⁵ Layoffs and a low labor force participation rate (54.8% versus 63.4% nationally) indicate an underutilized workforce supply.⁶ Indeed, about 40.5% (7,535 out of 18,602) of Virginia's mass job losses between 2016 and today occurred in the region. More than 39% of these jobs have been lost from the transportation

¹ FTR Transportation Intelligence (September 2021). "C-Suite Synopsis for September 2021." *State of Freight Insights*. Retrieved from: <https://today.ftrintel.com>.

² U.S. Department of Transportation, Bureau of Transportation Statistics (2019). *Freight Facts and Figures*. Retrieved from: <https://data.bts.gov>.

³ Appalachian Regional Commission (2018). "County-level Coal Industry Ecosystem Supply Chain Analysis." *An Economic Analysis of the Appalachian Coal Industry Ecosystem*. Retrieved from: <https://www.arc.gov>.

⁴ Virginia Economic Development Partnership (Accessed in September 2021). *Virginia Announcements & Closings Database*. Retrieved from: <https://announcements.vedp.org>.

⁵ United States Census Bureau (2020). *2015-2019 American Community Survey (ACS) 5-year estimates*. Retrieved from: <https://data.census.gov>.

⁶ Ibid.

manufacturing and supply-chain industries. COVID-19 exacerbated these trends with layoffs at companies like Utility Trailer Manufacturing Co., which lost 326 jobs in Spring 2020.⁷

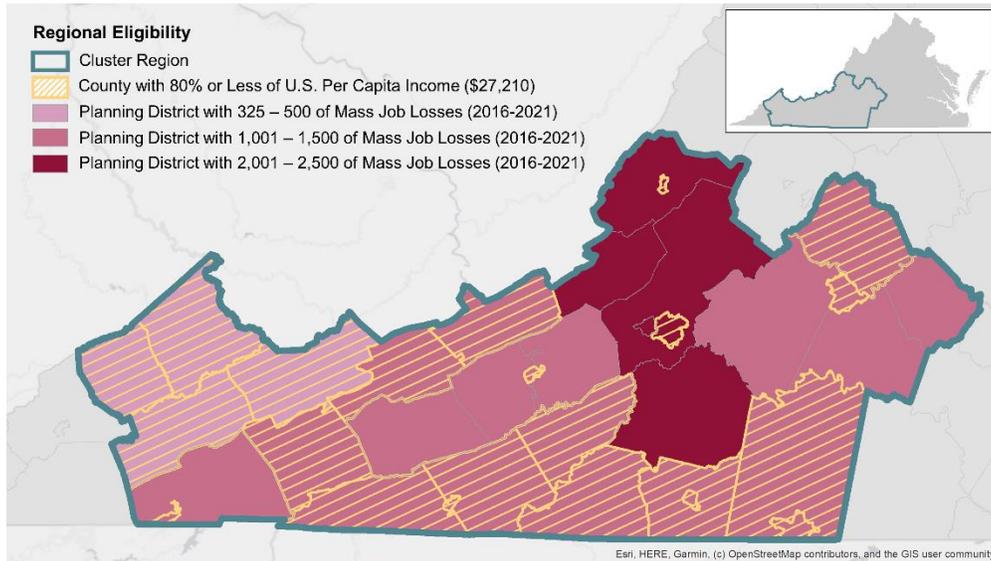


Figure 1. Southern and Southwest Virginia Region

[An Innovation Cluster for Autonomous and Sustainable Commercial and Industrial Vehicles](#)

Despite these challenges, this region boasts one of the largest collections of truck manufacturing plants nationally (Mack, Volvo, and Morgan-Olsen). Volvo, one of the three largest truck manufacturers, has its flagship facility here, where they manufacture full-size electric trucks. Daimler, another Big 3 truck manufacturer, purchased the region's largest autonomy firm, TORC Robotics, to spur development of autonomous trucks. This region hosts the only commercial drone delivery service in the U.S. by Wing, supplier firms like Eldor Powertrains, and innovative startups like TROVE, specializing in truck battery conversion. Appendix A illustrates the region's technical, research, and workforce development assets, necessary to become the world's premier destination for automated, electric delivery.

The commercial and industrial vehicle cluster excels in fourteen key industries, or four key industry groups (Figure 2). The core transportation manufacturing group and the value-chain industry group are historically strong here. In 2021, motor vehicle manufacturing, motor vehicle parts manufacturing, and rubber products manufacturing still have significant location quotients of 4.1, 4.2 and 6.4, respectively. Most importantly, the emerging innovation industry group that includes manufacturing and R&D for automated and electrical software and technologies will grow faster than the U.S. average. Engine, turbine, and power transmission equipment manufacturing is predicted to increase 50% in the coming decade. Navigation, measuring, and control instrument manufacturing will grow 44%.⁸

This cluster comprises 7.6% of regional GDP. Sadly, the cluster experienced significant job declines during COVID. Motor vehicle manufacturers alone lost 855 jobs or a 21% decline in jobs from 2019-2020. The cluster overall declined by 7%. The most nationally competitive industries in this cluster—motor vehicle body and trailer manufacturing and rubber product manufacturing—have forecasted employment declines of 13% and 28% respectively.⁹

⁷ Ibid.

⁸ Emsi Q3 2021 Data set. Retrieved October 2021.

⁹ Ibid.

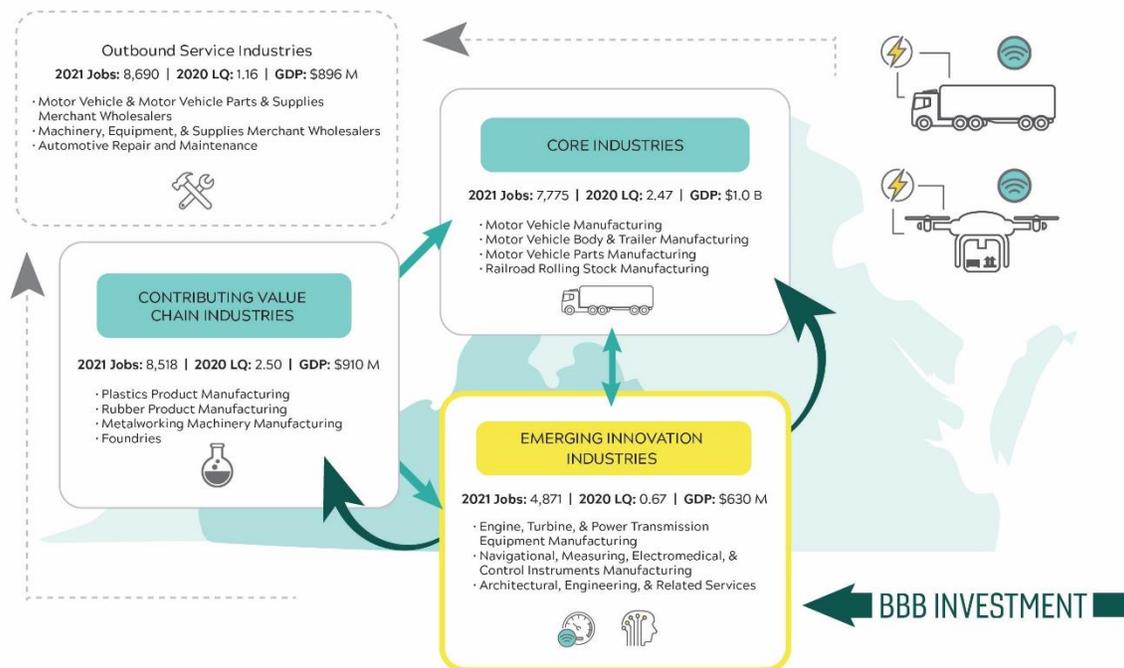


Figure 2. Electrical and Automated Transportation and Logistics Cluster

The region also has unmet workforce needs. Top in-demand skills are technology solutions, machinery, agile methodology, computer science, software development, and automation. Most in-demand occupations with low regional completions are CDL drivers, automotive service technicians and mechanics, and IT workers. Retention of higher-skilled engineers and computer scientists is notoriously low; so, while the region produces these professionals, most leave due to lack of knowledge about the local opportunities.¹⁰

his cluster lacks identity, voice, and alignment, impeding growth. For example, only 24% of the goods and services purchased by these industries are in-region purchases.¹¹ The significant amount of transportation, energy, and autonomous systems R&D taking place in higher education institutions and firms has resulted in limited commercialization. Despite the underutilized workforce in the region, these workers also lack the tech-savvy skillsets required for this vibrant, innovative cluster, and students from Virginia Tech and elsewhere overwhelmingly leave the region upon graduation. Additionally, this cluster’s aging workforce lacks the racial and gender diversity present nationally, with only 15% of jobs belonging to non-white workers and 19% belonging to women.¹²

Build Back Better Commercial and Industrial Vehicles

The objective of this initiative is to catalyze regional economic growth by aligning regional assets, accelerating the adoption of critical vehicle technologies, and achieving global prominence in automated electric delivery. This cluster initiative will spur the growth and diversification of this regional industry cluster by responding to regional business demands for more accessible technology testbeds and greater networks for tech transfer, business development support, and talent development. These activities align with all seven of EDA’s investment priorities as illustrated in this

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

narrative and its appendices. Building a coalition is key to this effort; working across sectors to support industry needs in areas like product development, technological integration, workforce training, and business development. With 50 public and private organizations, this coalition is composed of managing members, collaborating project members, and business engagement members. A full list of coalition members is in Appendix A. The coalition will: 1) facilitate asset alignment, 2) develop plans for building critical new assets to assist in firm growth, 3) build a shared agenda and identity for the cluster, and 4) equitably develop a diverse and technically ready workforce.

Initiative activities support the **growth and resiliency** of a large regional traded sector, transportation, promoting **exports and FDI** for the region and nation. They build on state-wide investments in the tech-talent pipeline program, cyber security, and transportation technology to attract, develop, and retain the talent needed for successful transformation of the industry. Our **diversity and equity strategy**, outlined in Appendix D, encourages regionwide engagement of disadvantaged institutions and communities. If successful, this initiative will change the trajectory of the region's transportation cluster, from a projected 1% decline in the coming decade to cluster growth of 3% or more (i.e., more than national growth). This growth will occur both in urban hubs along I-81 and more remote communities. Finally, success for this initiative means creating greater diversity of workers in terms of race, gender, and first-generation postgraduates.

When preparing this proposal, coalition partners considered over a dozen activities that we narrowed to three transformative projects to grow the cluster across the region (see below). During the Phase One timeline, December 2021 to March 2022, we will develop and expand upon these three projects. In addition to the activities outlined by projects, Phase One will also be used to strengthen relationships, better align cluster stakeholders, engage in-depth industry input, and develop future steps for strengthening and sustaining the cluster (See Appendix B for full timeline). Partners see no significant impediments to implementation at this stage; however state and federal regulations may slow industry adoption and implementation of automated technologies. There are also frequent challenges with building large coalitions over a broad geographic area; as illustrated in Appendix C Sustainability, many of the coalition members including the lead institution (Virginia Tech) have extensive experience addressing these pitfalls.

1. I-81 autonomous-electric testbed: Safety, trust, and public acceptance are among the most critical components for accelerated adoption of automated electric vehicles in freight and delivery applications. The cluster will address these challenges in partnership with VDOT, VT, VTTI, I-81 Corridor Coalition, utilities like AEP, truck manufacturers, and logistics firms using the most sophisticated connected vehicle testbeds in the world. Specifically, the cluster leverages current efforts to designate a continuous segment of connected highways around Blacksburg as a heavy-vehicle Automated Driving Systems test corridor. This testbed features highly varying terrain, a wide variety of mixed-traffic conditions, a full spectrum of weather conditions, and a large share of truck freight that services the eastern seaboard. This corridor is integrated into VDOT's I-81 Improvement Plan and BBB Phase 2 implementation funding will extend this corridor by 40 miles from Dublin to Salem, and complement additional planned improvements that support heavy vehicle automated driving testing and infrastructure testing (e.g., electrical charging stations, IT and wireless technology). Test corridor expansion enables new industry partnerships across the region due to desired geographic proximity and the innovative technologies and test bed itself.

We anticipate this will require up to \$20M in A&E, hardware, and other equipment, with significant cash and in-kind match available from the state of Virginia and industry partners. Phase 1 BBB Planning funds

will allow us to bring additional industry and utility leadership into our current state-supported efforts and attract them to the region. Those market-led insights in the planning process will allow us to develop a firm BBB Phase 2 proposal for implementation of this project.

2. Advanced air mobility testbed: This project would create a testbed and corridor of ~130 square miles for test and evaluation of UAS safety in beyond line-of-sight operations (BVLOS). This would be supported by Raytheon Skyler radars mounted on mobile phone towers and includes 5G wireless coverage across the testbed and operated in partnership with multiple UAS traffic management (UTM) providers. This combination provides UAS operators (e.g., UPS) the opportunity to test and conduct realistic BVLOS commercial flights. The Mid Atlantic Aviation Partnership (MAAP) has a track record of leading R&D efforts that transition to commercial operations. Additionally, the corridor provides the ability for Raytheon to operationalize the “surveillance as a service” business and provide commercial entities the opportunity to operate BVLOS. This initial corridor would become the foundation of a much larger one connecting population centers across Virginia and beyond. The anticipated cost of this project is \$4M in hardware and \$2M in labor for demonstration, validation, and approvals. Cash match is available in the form of in-kind surveillance, communication, control, and flight equipment contributions from partners; labor; and cash contributions from the Commonwealth of Virginia. During Phase 1, the team anticipates finalizing the geographic range and sighting of surveillance and communications assets to maximize business opportunities for the team and future partners.

3. Industry network for training, talent, technology, and entrepreneurial development: This project builds a critical training and entrepreneur resource facility to fill the void of talent needs for the critical vehicle technologies. Under BBB, the Virginia Tech Corporate Research Center (VTCRC) will provide an integrated multi-use facility to co-locate industry, build relevant startup programming, and house the *VT Manufacturing Technologies Training Studio*. The Studio provides vibrant on-site workforce development through multiple levels of training, and coordinates business and technical assistance to cluster firms. A coalition of education and business development partners will lead this Studio component.

This project leverages existing assets and initiatives to create a large, regionwide network for cluster development. VT College of Engineering (VTCOE) is working with manufacturing partners to develop a novel approach to Industry 4.0. The planned growth through the state-supported Tech Talent Pipeline Program addresses critical digital workforce needs in computer science and electrical engineering. Finally, the project enhances state and university support for new facilities and curricular development on the VT campus through partnerships with regional community colleges, Virginia State University, manufacturing extension services, small business development centers, GenEdge and others to grow a network of facility, training, technical, and entrepreneurial resources serving the region’s commercial and industrial vehicle cluster.

Estimated costs for this project include \$24M in implementation funds, with more than \$2M in cash match already in hand. We anticipate substantial cash and in-kind match from partners. During Phase I, the team will conduct an analysis of regional talent needs and alignment with phased programming, structure an industry roundtable and obtain priorities for engagement in the facility, and develop initial designs and budget for the multi-use facility and the VT Manufacturing Technologies Training Studio.