E-Week Essay Competition

Restore and Improve Urban Infrastructure

When I was first learning to drive, I remember hitting pothole after pothole, wincing in response to the jarring thuds the car would make. I had not yet learned the routine of swerving slightly or crossing straight over them, as I now know. In these moments, I wished the roads in my hometown of Parkersburg were smoother and newer, shiny black with crisp white lines instead of cracked gray with lines so faded you can’t even see them. While city roads admittedly don’t need as much maintenance, you can find construction on almost every highway or interstate nowadays. Sadly, I wasn’t too surprised to learn that West Virginia ranked among the country’s worst in terms of road infrastructure. I know several people in our state who told me of a “shaking bridge” they often cross to get home, a notion that was terrifying to imagine. Improving the state’s roads and bridges would be a major accomplishment at the state level, as infrastructure problems have been at the forefront of state concerns as long as I can remember.

I didn’t realize how dire the road infrastructure situation is here until I began to research it thoroughly. According to most recent reports from the Federal Highway Administration, West Virginia’s roads and bridges rank second worst in the United States. 31% of roads are in poor condition, and about 20% of bridges are “structurally deficient.” In fact, this is a national issue, as upwards of 25% of the country’s bridges are also deficient. Though it doesn’t mean the bridges are unsafe for vehicles, this does mean they need repairs and/or are in bad condition. Just last week, a section of the I-64 St. Albans/Nitro bridge near Charleston was closed for
emergency repairs. West Virginia’s Division of Highways (DOH) reported that a joint had failed, most likely due to a broken bolt. Even though workers began repairs right away, traffic delays were as long as four hours, and vehicles were detoured to Route 60.

There is a newer, sophisticated technology that could be perfect for detecting infrastructure problems throughout West Virginia’s unique terrain: fiber optic cables. These glass strands carry data along vast distances in the form of light. Fiber optics were first invented in the 1920s, but the US government didn’t begin implementing them until the 1960s, when fiber optic cameras were sent to the moon landing. More recently, they have been used for communication, monitoring, and broadcasting, which is similar to how they would be used for the state’s infrastructure. These fibers, individually the diameter of a strand of hair, have thousands of sensing points, and they can detect cracks, strain, bending, and more. By placing these cables along roads and bridges, bridges’ safety can be monitored electronically 24/7, instead of relying on inconsistent inspections. According to the US Department of Transportation, 83% of bridges are only inspected once every two years. Structural integrity can change in an instant, as seen with the bridge near Charleston. The lead DOH engineer even said, “I’ve dealt with bridges for 20 some years, and I’ve never seen one fall apart this quickly.”

Fiber optics are a smart choice for West Virginia for several reasons, first being that they are well-suited for the environment. They can be installed in tough terrain, such as WV’s mountains, they can withstand extreme temperatures, and they don’t need a nearby power supply. They can send signals long distances, and these transmissions don’t use any electricity, which is ideal for rural areas of West Virginia. While they are expensive now, they are predicted to last decades, much longer than something like copper sensors, which can only last about 5
years. They can last that long because they are corrosion, water, and lightning resistant. Also, the average highway budget allocates 30% for road repairs, and West Virginia only uses 19%. If it gave more to this effort, fiber optics would be a good financial choice that would help with said road repairs.

Civil engineers are involved in infrastructure endeavors from design all the way to actual construction and upkeep. They would design how these fiber optics would be embedded in the roadway, which is quite simple and often done in concrete. Electrical engineers would design systems for receiving transmissions and understanding what they mean. When the fiber optic sensors send signals of a problem with a road or bridge, infrastructure problems can be dealt with before something worse happens. Fiber optics would be a great investment because their long-term benefits to the state society, safety, and economy will far outweigh the initial installation costs.
Works Cited


“Highway Bridge Inspections.” *US Department of Transportation*, United States Department of Transportation, 6 June 2017, cms7.dot.gov/testimony/highway-bridge-inspections.


