Alex Zickar
Brief #1 – Rodgers Lecture

How Transportation Systems Affect the Environment

Transportation systems affect the environment in which they reside both directly and indirectly. Direct effects are immediate and revolve around the construction or usage of the transportation systems. These include atmospheric emissions, runoff changes, erosion and introduction of invasive species. Indirect effects, however, are those felt by adjoining systems as a result of the implementation of a transportation system. Examples of indirect effects include climate change, geomorphology changes and ecological change. It is important to recognize that effects on the environment come from all stages of production and use of the transportation system—impacts during the construction phase are just as relevant as those in the operational stage.

Emissions from mobile sources play a large role in the growing environmental concerns with atmospheric pollution. Mobile emissions, however, are not limited to just those from automobiles. In fact, automobile emissions are regulated so strictly that they comprise only about 1% of all NO_X and PM_{10} emissions into the atmosphere. For these two criteria pollutants, cargo handling equipment, heavy trucks and marine vessels are the largest contributors, accounting for approximately 95 – 97% of each pollutant.

Looking at energy efficiency is one way to improve the environmental impacts of transportation industry. In 2012, it was determined that transportation uses the largest fraction of energy produced in the United States, but was only able to utilize about 20% of it for energy services. Due to thermodynamic cycle inefficiencies, aerodynamic losses, and friction, 80% of energy used by transportation is lost to the environment, meaning that transportation creates significant carbon emissions with very little work produced. The transportation industry is improving its energy efficiency and carbon emissions continuously through engine improvements, use of alternative fuels and reducing overall demand.