Project Information Form

Project Title:	Life Cycle Assessment and Life Cycle Cost Analysis of Pavements from Alkali-activated Materials
University:	Georgia Institute of Technology
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Funding Source(s) and Amounts Provided (by each agency or organization):	U.S. Department of Transportation (US DOT) - $60,000.00 Georgia Institute of Technology (Salary Cost Share) - $60,000.00
Total Project Cost:	$120,000.00
Agency ID or Contract Number:	DOT 69A3551747114 GT-DOT-515
Start and End Dates:	September 1, 2018 – August 31, 2019
Brief Description of Research Project:	The capital investment in the United States for construction and maintenance of the infrastructure road network is on the order of $150 billion/year. These substantial investments are likely to increase in the near future, as a result of the growing demand for new infrastructure driven by the exponential growth of metropolitan cities. In addition to funds allocated for new construction, additional investments will be disbursed for the expected increase in material cost and shorter than anticipated maintenance schedule. Concurrently, the environmental impact of maintenance and new road construction is also likely to rise since asphalt and concrete, the preferred materials for pavements, have high embodied energy. For these reasons, it is of primary importance to explore alternative, more sustainable pavement materials, which may have benefit in terms of environmental impact and durability performance over the current asphalt technology. Alkali activated materials (AAM), also known as geopolymers, present these characteristics. They have been studied with growing interest during the last three decades as they show promising results in terms of durability performance while also having a global warming potential impact less than that of concrete. The main advantages of AAM over asphalt and concrete are: 1) lower production cost: the raw materials needed for their production are mainly by-product or waste from other industrial processes; 2) lower embodied energy: being made from by-products require less energy and consequent less CO_2 emissions; 3) rapid setting and strength development: facilitates rapid construction and

	maintenance; and 4) longer service life: decreases maintenance requirements. However, research that quantifies the extent of those benefits compared to current technology is needed to understand the potential applicability of AAM for pavement construction and identify opportunities and issues rising from a large-scale study. To compare different solutions, the Federal Highway Administration encourages the use of Life Cycle Assessment (LCA) combined with Life Cycle Cost Analysis (LCCA) to quantify environmental and cost impacts. Thus, the objective of this research proposal is to compare AAM, asphalt and “green” asphalt pavement technology through LCA and LCCA for the case study of the State of Georgia with a lifespan of 50 years. The expected outcome is to provide an additional and publicly available tool to designer, producers, contractors, and Department of Transportation, tool to be used in combination with the FHWA readily available LCCA tool and LCA framework.
Describe Implementation of Research Outcomes (or why not implemented): Place any photos here	
Impacts/Benefits of Implementation (actual, not anticipated):	
Web Links • Reports • Project website	https://ncst.ucdavis.edu/project/pavements-from-alkali-activated-materials/