April 2014 **FHWA-NJ-2014-009**

New Jersey Department of Transportation
Bureau of Research

Technical Brief

Environmental Management System for Transportation Maintenance Operations

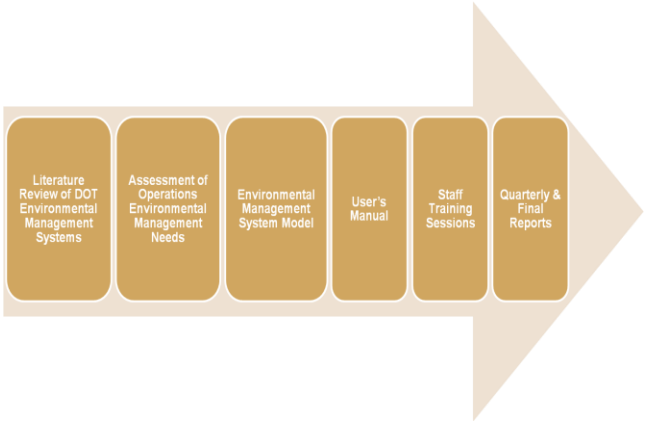
This report provides the framework for the environmental management system to analyze greenhouse gas emissions from transportation maintenance operations. The system enables user to compare different scenarios and make informed decisions to minimize greenhouse gas emissions and impact of transportation maintenance operations on climate change.

Background

The New Jersey's Global Warming Response Act, enacted in 2007, mandates reductions in greenhouse gas (GHG) emissions to 1990 levels by 2020, approximately a 20 percent reduction, followed by a further reduction of emissions to 80% below 2006 levels by 2050. To achieve this goal, NJDOT focused on assessing and monitoring the GHG emissions of both its Capital Program and Operations. The purpose of this research project is to support this effort by focusing on effective monitoring of GHG emissions produced by Operations Maintenance activities and identifying solutions for their reduction. The project evaluates emissions generated by vehicles, equipment, and materials used in maintenance operations projects by applying the life-cycle analysis approach.

Research Objectives and Approach

Various sources of data and methods for evaluating carbon potential of materials mostly used in highway maintenance projects, such as asphalt, concrete, and steel were identified. Potential methods and strategies that will help reduce the GHG emissions of highway maintenance projects, focusing primarily on construction processes and aggregate industry, especially asphalt and bitumen were studied. The emissions generated by vehicles and equipment are also analyzed, along with the strategies for reducing the related carbon emissions through introduction of more fuel-efficient or hybrid engines and alternative fuels. Based on the methods developed in this study and the collected data, a decision support software tool is developed to guide NJDOT in monitoring and assessing alternatives for reduction of GHG emissions related to Operations Maintenance. Both the analysis framework and the decision support tool will provide means for quantifying the effects of different strategies for reducing GHG emission, and will ultimately be useful tools in developing Department-wide GHG emission reduction strategies.

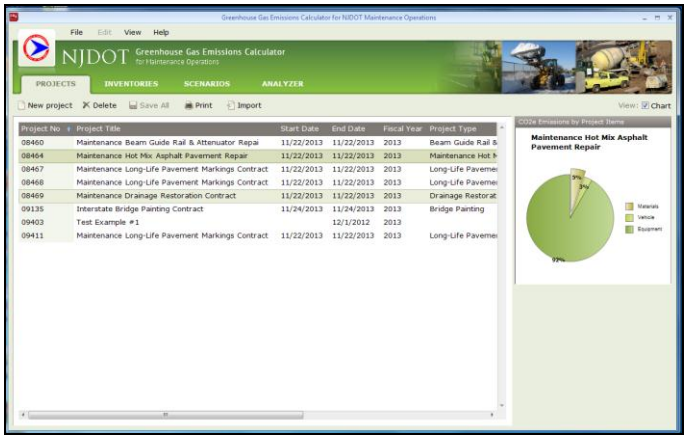


Findings

The review of the state of practice largely confirms that very few DOTs have estimated the impact of mitigation strategies on CO2 and/or other GHG emissions. While DOTs are increasingly exploring mitigation strategies, most have not conducted a detailed evaluation of current GHG emission inventories.

Databases used in the study include:

- National Renewable Energy Laboratory (NREL) Database: NREL has published a database for life cycle GHG emissions for several products in the US,
- Inventory of Carbon and Energy (ICE) database,
- NCHRP Project 25-25(58) – GreenDOT Model,
- Processes, Equipment, and Materials: Based on the 2007 NJDOT Specifications and definitions of the Bid Sheet items.



Strategies for Reducing GHG Emissions:

Use renewable, energy efficient, and recycled materials	▪ Materials that require less energy and have smaller lifecycle footprint. ▪ On-situ recycling and reuse of materials and equipment. ▪ Alternative preparation practices, e.g. Warm-mix asphalt.
Use alternative fuels	Biodiesel, Ethanol, Methanol, CNG.
Use more efficient vehicles and equipment, retro-fit engines	Hybrid, plug-in hybrids, retrofit CNG and biodiesel engines for equipment and heavy machinery.

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A final report is available online at: http://www.state.nj.us/transportation/refdata/research/.
If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.