DRISI

Caltrans Division of Research, Innovation and System Information

Research Results

Life Cycle Assessment of Complete Streets: Case Studies

To Test Life Cycle Assessment Framework to Quantify the Environmental and Social Impacts of Complete Streets through Three Case Studies

Pavement

JULY 2022

Project Title:
Life Cycle Assessment of Complete Streets: Case Studies

Task Number: 3336

Start Date: January 01, 2020

Completion Date: September 30, 2021

Task Manager:
Junxia Wu
Transportation Engineer
junxia.wu@dot.ca.gov

WHAT WAS THE NEED?

Life cycle assessment (LCA) of complete streets projects is a holistic approach in which the environmental sustainability of a product, project, process, or system can be assessed and quantified. Environmental LCAs quantify the energy, resource use, and emissions to air, water, and land for a product or a system. Social LCAs quantify the social and sociological aspects that are related to a system. One gap that has been identified in current LCA impact indicators is the lack of socio-economic indicators to complement the existing environmental indicators. A preceding study by the same research team developed a framework for LCA, including development of social and economic performance indicators based on literature review and previous research. Social life cycle assessment (S-LCA) can also help understand the processes that decide where complete street projects get built, what goals they are designed to achieve, whether they are beneficial, and determine who receives such benefits.

Although, Federal, State, and local funding agencies overseeing public infrastructure investment pay close attention to the provisions of Title VI and Executive Order 12898, little to no information is provided on how to meet these requirements. This Complete Streets SLCA model is an attempt to add to our knowledge of how complete streets projects can assist transportation planners in moving towards achieving environmental protection for minority and low-income populations.

Caltrans

DRISI provides solutions and knowledge that improves California's transportation system

WHAT WAS OUR GOAL?

The primary purpose of the case studies was to evaluate the efficacy of the performance measures proposed in the previous project regarding reasonableness of the results and the practicalities and difficulties of using them with the intent to provide a recommended final set of indicators. The second purpose was to evaluate complete streets in different contexts and see what kinds of benefits the indicators identified, and where the indicators did not identify benefits. The third purpose was to advance the use of quantitative tools to help measure the success of a complete streets project to promote the most increase in the use active transportation as part of mobility to safely access locations of interest using active transportation and active transportation with transit.

WHAT DID WE DO?

The complete streets LCA framework was used to quantify the environmental and social impacts of complete streets through three case studies. The results were compared with the existing streets that were configured to be vehicle-centric. The case studies were solicited in more and less advantaged neighborhoods so that the framework could also be evaluated in different contexts. The case studies also include one project each in urban, suburban, and rural areas. Case study evaluation was based on the project design for those that had not yet been started or completed. Where the case study project had been completed, the project was evaluated based on performance before and after project completion.

WHAT WAS THE OUTCOME?

The social and economic performance indicators included in the social LCA (SLCA) framework that was used in this project provide a great deal of insight into specific and different potential benefits of a given complete streets project.

The SLCA framework is based on five categories of concerns and 17 performance measures or indicators. They span the range of benefits typically expressed as being desirable for a neighborhood, and potentially coming from a complete street. Examining the likely changes in these indicators from the complete street projects provides a more holistic view of each project, its likely benefits, and potential for social and/or economic harm and ineffectiveness, than would otherwise be possible. A method for considering environmental justice concerns in minority and low-income neighborhoods was considered in this project, and the framework was expanded using the CalEnviroScreen tool from the California Environmental Protection Agency to assess the exposure of neighborhoods and their vulnerability to environmental impacts in conjunction with the performance indicators.

WHAT IS THE BENEFIT?

The benefits of complete streets have been identified as increased transportation choices, economic revitalization, improved return on infrastructure investments, livable communities, improved safety, more walking and bicycling to improve public health, greenhouse gas (GHG) reduction, and improved air quality.
This Complete Streets SLCA model demonstrates how a more rigorous analysis can be used to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations.

LEARN MORE

Here is a report published for this project:
https://escholarship.org/uc/item/4n4081k8