

Abstract

Improving pavement sustainability through integrated design, construction, asset management, LCA and LCCA [†]

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1. Improving the sustainability of pavements requires action across all stages of the full life cycle of the pavement:

- Materials extraction
- Materials processing
- Materials transportation
- Construction
- Use
- End of Life

Proposed solutions that do not look at the complete life cycle of the pavement, and do not consider the full system (all interactions of the pavement with other systems in each stage) may result in less than optimal positive outcomes and create the risk of negative unintended consequences. Negative unintended consequences means that the proposed solution make actually go backwards from sustainability goals.

The focus of most efforts in pavement have focused on materials, which is only one part, albeit an important one, of the steps in the project delivery process where changes can be made to improve sustainability. Proposed solutions must be found in every stage of infrastructure delivery:

- Planning (if new)
- Pavement management to select project (if PMR&R)
- Conceptual design (Scoping)
- Design (PS&E)
- Construction

- Monitor performance 1

Finally, new approaches for improving pavement sustainability do not change anything until they are completely implemented, meaning that the change is now embedded in policies, specifications, guidance, tools, and is part of every practitioner's everyday practice. The steps of moving from an idea to complete implementation are: 4

- Conceptual idea 5
 - Feasibility analysis using life cycle assessment (LCA) and life cycle cost analysis (LCCA) quantify expected outcomes and cost/benefit, and other assessment of the proposed change to assess which ideas are most promising to move forward 6-8
- Research 9
 - Reassessment as the idea is developed using LCA and LCCA to better calculate its potential for beneficial outcomes and the cost per unit of beneficial outcome 10-11
- Development 12
 - Creating the databases, validated models, tools, policies, specifications, and training 13
- Implementation 14
 - Getting approval for implementation, making the changes in all information that is part of the project delivery process, training all users; and supporting users in their daily practice 15-16
- Feedback 17
 - This process above should have feedback for continuous improvement, and new concepts should be developed as the current ones are being implemented 18-19

2. Research and development are advancing pavement structural and materials design technologies, and methods for modeling performance and cost and environmental impacts. However, many of these advances are not well integrated when implemented and advances in part of the pavement project delivery process and network management system may not be recognized or considered in other parts. This presentation summarizes the overall vision and milestones completed to date for creating and implementing an integrated systems approach and continuous improvement process for the pavement enterprise in California, including structural design, materials specifications, construction specifications, network pavement asset management, life cycle cost analysis, environmental life cycle assessment, and prioritization of policies for achieving state-wide environmental goals. 26

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