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# Pavement Life Cycle Assessment Workshop

University of California Pavement Research Center, Davis and Berkeley

California Department of Transportation

Institute of Transportation Studies, UC Berkeley and UC Davis

With collaboration of:

International Society for Asphalt Pavements, Asphalt and the Environment Technical Committee,  
International Society for Concrete Pavements

University of California, Davis

Davis, California

May 5–7, 2010

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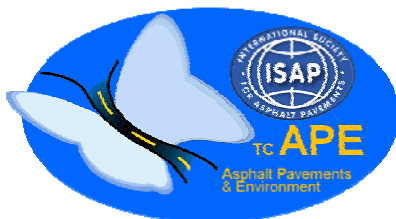
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## **BACKGROUND**

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The University of California Pavement Research Center (UCPRC, Davis and Berkeley) and the University of California Institute of Transportation Studies (Berkeley and Davis) are working together on establishing common practices for conducting environmental life cycle assessment (LCA) for pavements. Funding for this work is provided by the California Department of Transportation in partnership with the MIRIAM pooled fund project which is led by the Danish Road Institute (Ministry of Transportation, Road Directorate). This work is being done in collaboration with the International Society for Asphalt Pavements (Asphalt Pavement and the Environment Technical Committee, ISAP APE) and the International Society for Concrete Pavement (ISCP).

Research products under development as part of this work include:

- a. An LCA framework for pavements.
- b. A summary of system boundaries and assumptions for the framework, as well as an examination of the pros and cons of alternatives.
- c. Assessment of models/data for each phase of the life cycle with regard to project type.
- d. Documentation requirements for pavement LCA studies sufficient to permit comparison between studies in terms of completeness, assumptions, system boundaries and data/models.

Desired Outcomes of the Workshop:

1. Review and discussion of documents prepared by the research team for each of the four items (a through d) listed above.
2. Brief presentations and discussion of critical issues for pavement LCA where conflicting practices or gaps in knowledge have been identified.
3. Summary of areas of consensus and disagreement with regard to items a, b, c, and d above and documentation of alternative views.

The UCPRC/ITS research team will use the results of the workshop to improve the LCA framework and recommended documentation requirements. The focus of the framework and documentation will be for studies to be performed for California, and later for the MIRIAM project; however, they may serve as guidance documents for pavement LCAs performed in any region. A follow up will likely be required to

capture similar information for European studies to be performed as part of the MIRIAM project. The final documents prepared by the research team, after incorporation of the workshop results, will be posted for comment and critique by the pavement and LCA communities. The intention of the research team and workshop sponsors is that the results will provide the following benefits:

- Use of appropriate assumptions, system boundaries, models, and data by the research team for the California and MIRIAM studies.
- Better understanding of LCA among pavement LCA practitioners, sponsors, and consumers of pavement LCA information.
- Recommendations for improvement in practice of LCA studies.
- More transparency in the documentation of how pavement LCA studies are performed.

## **DISCLAIMER**

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The contents of this workshop document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California, the Federal Highway Administration, the University of California, the MIRIAM project or its sponsors, the International Society for Concrete Pavements, or the International Society for Asphalt Pavements. This workshop document does not constitute a standard, specification, or regulation.

## WORKSHOP AGENDA AND SCHEDULE

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### Day 1—Wednesday, May 5

- 8:30–9:30 a.m. Sign in and introductions
- 9:30–10:15 a.m. **Introduction to Life Cycle Assessment (45 min.)**  
Alissa Kendall, Nick Santero  
An introduction to LCA, including ISO 14040, and a simple, general LCA example  
A review the objectives of this workshop
- 10:15–10:45 a.m. *Break*
- 10:45–11:30 a.m. **The Pavement LCA Framework Proposed by the UC Team (45 min.)**  
Alissa Kendall, John Harvey  
A presentation of the proposed framework for pavement LCA  
A description of the standard assumptions and system boundary proposed by the UC team  
A description of the UC team’s proposed pavement LCA documentation checklist  
A review of the important questions to be discussed
- 11:30 a.m.–  
11:50 a.m. **Introduction and Initial Discussion\* :  
Materials, How to Consider Bitumen Feedstock Energy (20 min.)**  
Nick Santero  
\*Note: The intent of the prepared discussions is to provide a brief overview of the issue(s), and to pose the questions to be discussed further by smaller groups in the breakout sessions.
- 11:50 a.m. -  
12:15 p.m. **Introduction and Initial Discussion:  
Materials, Allocation of Impact from co-Production  
(25 min.)**  
Alissa Kendall, Nick Santero
- 12:15–1:30 p.m. *Lunch*
- 1:30–2:00 p.m. **Introduction and Initial Discussion: Materials,  
Average Data vs. Local Data (30 min.)**  
Alissa Kendall, Tom Van Dam
- 2:00–2:45 p.m. **Introduction and Initial Discussion: Use Phase, Pavement Surface and Structural  
Characteristics and Vehicle Rolling Resistance (45 min.)**  
Karim Chatti, John Harvey (with input from Ulf Sandberg and Stefan Deix)
- 2:45–3:15 p.m. *Break*
- 3:15–3:45 p.m. **Introduction and Initial Discussion: Use Phase, Impacts of Pavement Surface  
Characteristics on Goods and Vehicle Damage (30 min.)**  
Wynand Steyn
- 3:45–4:45 p.m. **Discussion (All): Create list of topics for discussion in breakouts. (60 min.)**
- 4:45–5:00 p.m. **Individuals fill out forms for personal preferences for discussion groups.  
(Final selection of topics and discussion group rosters to be made by organizing  
team prior to start of Day 2.)**

## Day 2—Thursday, May 6

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| 8:30–9:00 a.m.   | <b>Organization of Groups and Discussions (30 min.)</b><br>The assignment to groups, a discussion of the break out discussion process, and expected deliverables from each group |
| 9:00–10:30 a.m.  | <b>Break-Out Discussions Part 1 (90 min.)</b>  |
| 10:30–10:45 a.m. | <i>Break</i>   |
| 10:45–11:15      | <b>Introduction and Initial Discussion: Multi-Criteria Analysis (LCA and LCCA) and Implementation (PMS and other) (30 min.)</b><br>Nakul Sathaye                                 |
| 11:15–12:00      | <b>Break-Out Discussions Part 2 (45 min.)</b>  |
| 12:00–1:15 p.m.  | <b>Lunch</b>   |
| 1:15–2:00        | <b>Break-Out Discussions Part 2 <i>cont'd</i> (45 min.)</b>  |
| 2:00–2:15 pm     | <i>Break</i>   |
| 2:15–3:45 p.m.   | <b>Break-Out Discussions Part 3 (90 min.)</b>  |
| 3:45–5:00 p.m.   | <b>Groups prepare brief summaries from Break-Out Discussions (75 min.)</b>   |

## Day 3—Friday, May 7

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| 8:30–10:30 a.m.  | <b>Presentation of Break-Out Session Summaries (120 min.)</b> <ul style="list-style-type: none"><li>• Review summarized results from each breakout session and questions and answers clarifying group summarized results.</li><li>• Discuss areas of consensus/disagreement.</li></ul> |
| 10:30–10:45 a.m. | <i>Break</i>   |
| 10:45–11:45 a.m. | <b>Presentation of Break-Out Session Summaries <i>cont'd</i> (60 min.)</b>   |
| 11:45–12:15 p.m. | <b>Next steps to be taken by research team</b><br><b>Adjourn</b>   |