National Center for Sustainable Transportation

POLICY BRIEF

A Road Map for Advancing Permeable Pavement as a Stormwater, Transportation, and Flood Control Solution

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Permeable pavements provide the same function as traditional pavements, serving as city streets for the movement of vehicles and people. But permeable pavements also have several key advantages over traditional pavements. They can improve stormwater quality by keeping polluted water from directly entering stormwater systems and streams, and they can provide flood control benefits by slowing the rapid runoff of rainfall in heavily paved urban areas. Permeable pavements do this by capturing stormwater through their surface, storing it, and allowing it to either infiltrate into the soil beneath, slowly evaporate after the rain has stopped, or gradually flow into the stormwater drainage system (Figure 1). Despite these advantages and years of research and development on their design, construction, and maintenance, permeable pavements are still not widely used, and are not considered a standard tool in the toolbox for transportation, stormwater quality, or flood control.

Figure 1. Three examples of permeable pavements, from top to bottom: porous asphalt, pervious concrete, and permeable interlocking concrete pavement

The University of California Pavement Research Center and the Interlocking Concrete Pavement Institute worked with partners in the concrete and asphalt pavement industries and Tongji University to organize a workshop in November 2017 with the goals of identifying knowledge, information, and communication barriers to adoption of permeable pavement of all types, and then creating a road map to address and overcome them. The workshop brought together stakeholders from the planning, stormwater quality, flood control, and pavement communities to listen to presentations, exchange ideas, discuss unanswered questions identified by the group, and develop a proposed road map to fill the gaps in knowledge, processes, and guidance. Participants represented local, state and federal government, consultants, non-governmental organizations, contractors/material producers, and academia. The road map produced from the discussions is built around "routes" of proposed actions to remove technical and institutional barriers to realize the goal of making permeable pavements a fully viable alternative in standard practice.

The Road Map

The road map created by workshop participants includes 10 routes, each of which consists of a set of projects to address a barrier to widespread implementation of permeable pavements, with estimated timeframes and costs. The routes and underlying tasks are summarized below.

Route 1. Help infrastructure management organizations to consider the full functionality of permeable pavements. Bridge the gap between stormwater agency and road agency priorities and cultures. Develop guidance for updating planning and design codes that facilitate multi-functional hardscapes and meet both agencies' priorities.

Route 2. Develop planning guidance that considers the multi-functionality of permeable pavements. Develop planning guidance, review the long-term performance of existing installations, develop criteria for user comfort, and develop idea books.

Route 3. Develop accurate life cycle cost analysis and environmental life cycle assessment tools. Improve life cycle cost analysis tools to account for on- and off-site costs and benefits to support designer, stormwater agency, and road agency decisions regarding use of permeable pavements that consider all benefits. These tools will allow a more accurate comparison of permeable and impermeable pavements in pavement design and asset management programs.

Route 4. Reduce target pollutants to meet water quality requirements. Design decision trees or menus for reduction of target pollutants based on existing and additional research. Include runoff reduction as an integral part of water quality management objectives and pollutant reduction credits.

Route 5. Reduce urban flooding risks. Develop approaches for considering permeable pavement in flood models for use in zoning, planning, land development codes, and flood control design.

Route 6. Develop reliable pavement structural designs. Complete the development of reliable structural design tables that account for long-term saturated soils typical to permeable pavements.

Route 7. Routinely achieve high-quality construction. Improve construction guide specifications, construction methods, quality control and quality assurance test methods, and inspection protocols/checklists for permeable pavement construction.

Route 8. Develop maintenance and rehabilitation costs and methods. Refine information regarding best practices for maintenance methods and their costs for different applications, and make the information widely available. Identify best practices for hydrologic and structural rehabilitation and for reconstruction methods for aging permeable pavements.

Route 9. Incorporate permeable pavements into asset management systems. Develop and refine asset management tools for stormwater agencies and road agencies. These should include inspection methods and standards, and maintenance costs. Concurrently, improve and, where possible, validate quantitative performance models.

Route 10. Ensure efficient and comprehensive access to the best information. Develop a clearinghouse and/or a center or centers for permeable pavements, and open communication channels with practitioners, policy-makers, and other stakeholders. Build support for funding to execute this road map.

More Information

This policy brief is drawn from "Permeable Pavement Road Map Workshop and Proposed Road Map for Permeable Pavement," a report from the National Center for Sustainable Transportation, authored by John T. Harvey of the University of California, Davis and David R. Smith of the Interlocking Concrete Pavement Institute. The full report can be found on the NCST website at https://ncst.ucdavis.edu/project/permeable-pavement-road-map-workshop-2017.

For more information about the findings presented in this brief, please contact John T. Harvey at jtharvey@ucdavis.edu.

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