

# Paving the way for green roads

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Kevin Gardner sees green roads right around the corner. “A lot of the infrastructure in this country needs to be re-built,” says Gardner, University of New Hampshire associate professor of civil engineering and director of the Environmental Research Group. “We have a real opportunity to re-build the infrastructure the right way with sustainable materials and socially sensitive designs that protect air, water, land, and human resources.”

Funded by the Federal Highway Administration and pooled state highway funds, as well as Environmental Protection Agency (EPA) grants for specific research projects, Gardner established the new Recycled Materials Resource Management Center (RMRC) at UNH on June 1, 2007.

The RRMC is a collaboration between UNH environmental and social impact researchers and University Wisconsin-Madison geotechnical, or soil behavior, faculty. Working closely with a board of advisors composed of representatives from the EPA, the Federal Highway Administration and the American Association of State Highway and Transportation Officials, as well as numerous other stakeholders, one of the Center’s activities is to establish a green roads program that develops criteria for what makes a roadway green.

Similar to the green buildings program established by the U.S. Green Building Council, which triggered a boom in green building construction, a green roads program, it is believed, will give the green light to sweeping reforms in the way we build roads. The project is full

of twists and turns. Today's urban sprawl requires road builders to confront a range of sensitive issues involving air, water, land, building materials, energy use, biodiversity, and social capital—an index of social productivity and quality of life.

To jump-start the process, the RMRC faculty teamed up with the UNH Stormwater Center in Durham. Their task is to account for both environmental and social impacts of road-building, as well as establish better uses of recycled and virgin aggregate materials, such as crushed rock, much of which must be transported from New Hampshire. Green standards, according to Gardner, will give road builders the guidelines they need to effectively reduce the environmental impacts (such as carbon footprint, wetlands disturbance, and stormwater runoff generation) and improve the quality of life in communities affected by infrastructure re-construction.

The first step is to figure out how to reduce the 300 million tons of virgin aggregate materials mined in this country every year. The U.S. currently recycles 90% of used asphalt, but still uses a large percentage of virgin materials in the recycled mix. The question is, can pavement be made with 90% recycled asphalt, or does it have to be less than 40% or even 20% to get a roadbed that lasts? What happens to the modifiers that bind these materials over time? How recyclable are the recycled materials?

“The cost of building a road is not reflected fully in the price of materials,” Gardner adds. “The total cost of mining virgin materials, for instance, involves not only the cost of materials and labor, but also the environmental cost at the mining site, the environmental costs (such as air pollution and its associated health care costs) of transporting these materials to the building site, and the environmental costs of building the equipment to mine and transport material and build the roads.”

To account for these hidden costs, the RMRC created a computer model that Gardner's Ph.D. student Alberta "Birdie" Carpenter uses to capture the full environmental, social and material costs of road-building. The model was recently "road-tested" in the Pittsburgh region to help identify the significant influence that materials recycling can have on regional air quality, hazardous waste generation, greenhouse gas emissions and other environmental impacts.

Research and development of better ways to re-build infrastructure is only half the battle. The other half is education and outreach to developers, road-builders, and engineering students. In addition to publishing and publicizing the results of their research and green roads standards, the RMRC is now offering a sustainable engineering class at UNH and expects to have fellowship and Ph.D. programs by 2010.

"The first green roads will probably start with small housing developments and municipalities because developers and local developers have already seen the benefits of green building construction," says Gardner, "but as the benefits and cost-savings begin to be realized on a bigger scale, we believe the RMRC green roads program will pave the way for rapid adaptation at all levels of road-building."

Source: University of New Hampshire

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