Sustainability of Transportation and Other Infrastructure Systems

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This is the second of two special issues we have organized on the broadly defined concept of sustainability of infrastructure. Our view of infrastructure (and the resulting call for papers) is instinctively broad, including buildings, transportation, energy, information and communication technologies, and various utilities. The first issue (September 2004) focused on sustainable energy systems. The current issue is centered on the sustainability of building and transportation infrastructure, discussing highways, bridges, stormwater facilities, as well as buildings in terms of environmental implications and energy use.

Jonsson’s forum article leads the issue with a discussion on sociotechnical infrasystem services. Infrasystems are large technical systems with a public character. His discussion considers social innovations and a framework for managing infrasystems based on needs and conveniences.

Zapata and Gambatese perform an abbreviated life-cycle energy assessment of asphalt and concrete pavements. They note some sources of life-cycle energy use, as well as differences in the leading life-cycle stages.

Jeon and Amekudzi summarize sustainability initiatives for transportation systems. They note the shortcomings in existing measures and propose frameworks consistent with sustainability as potentially useful for transportation agencies to adopt.

Keoleian et al. compare bridge deck systems using conventional and alternative (engineered cementitious composites) materials. They find that the new material yields significant environmental and energy benefits over the life cycle.

Matthews and Williams broadly consider the energy implications of telecommuting in the United States and Japan. Beyond the usual focus on transportation system impacts, they include net energy use of residential and commercial buildings. They conclude that when these categories are considered, total energy benefits are small.

Finally, Haselbach et al. provide a technical note pertaining to compliance rates in stormwater detention facilities. Using data from 700 sites with planned stormwater detention, they find some surprising results pertaining to facilities installation compliance and discuss the implications for nonpoint source pollution.

Relative to the topics and systems suggested in the initial call for papers, we received 18 contributions on buildings, energy, transportation, water, and information technology systems. The topic areas included material and process choices, environmental life-cycle assessment, full cost accounting, impact assessment, and energy use of emerging technologies.

Unfortunately, we did not receive contributions in four important areas: decision analysis, logistics, education, and implications for professional practice. These areas are at the forefront of issues that will face the field of civil and environmental engineering in the near future. For example, the construction industry, through green building and other initiatives, will have to consider more sustainable logistics and extended producer responsibility.

While there are courses of study at several universities, we were disappointed not to have received manuscripts detailing approaches for teaching the next generation of civil and environmental engineers about these important issues, or how these approaches are improving the understanding of sustainability. Further, it remains to be seen how academic papers on sustainability (including these special issues) can be successfully integrated into civil and environmental engineering curricula and practice.

Professional practice implications will include making sustainability choices amongst alternatives along both private and social dimensions. All of these areas will depend on improved tools for sustainability that are scientifically defensible, practical, in the public domain, and comprehensive in nature.

In summary, there remain several gaps in research on sustainable infrastructure, but we hope that any future research on infrastructure systems will garner increased consideration of sustainability implications. We encourage others to pursue these avenues of study and consider the Journal of Infrastructure Systems as an appropriate outlet.