Abstract

The inherent complexity of decision-making related to transportation infrastructure systems can be formalized using complex systems theory. Complex systems are characterized by: 1) many agents or decision-makers acting in parallel with dispersed control, 2) the presence of many organizational levels, 3) the ability of agents to adapt depending on the decisions made at other levels, and 4) the use of internal models to anticipate the future.

This presentation presents insights into network-level pavement management by investigating the behavior of a network of pavements as a complex system. We use a network of 1,000 pavement sections and various policies, deterioration models, random events, interactions, and constraints to illustrate these behaviors through a series of simulations. This includes exploring the impact of rehabilitation deferral, budget constraints, different acceptable condition thresholds, including user cost in decision-making, cost of inspection and varying traffic. Impacts include expenditures, average network condition, and the number of rehabilitation projects in any year. Finally, we draw on complex systems theory to understand why infrastructure is often neglected and deferral of maintenance is common. We demonstrate that complex systems theory provides a wider set of tools for solving infrastructure problems, with direct benefits to life-cycle analysis and modeling of political considerations.

Bio

Sue McNeil is Professor of Civil and Environmental Engineering at the University of Delaware. Prior to joining the University of Delaware in August 2005, she was Director of the Urban Transportation Center and Professor in the College of Urban Planning and Public Affairs and the Department of Civil and Materials Engineering at University of Illinois at Chicago (UIC). Her research and teaching interests focus on transportation infrastructure management with emphasis on the application of advanced technologies, economic analysis, analytical methods, and computer applications. Dr McNeil is a member of the Executive Committee of the Transportation Research Board and the Board on Infrastructure and the Constructed Environment. She chairs the Transportation Research Board Task Force on Asset Management and has provided technical support for the AASHTO Task Force on Asset Management. She has also developed a graduate course titled Infrastructure Management. Dr McNeil initiated and chaired (1988-1993) the ASCE Urban Transportation Division Committee on Transportation Facilities Management She is an Associate Editor for the ASCE Journal of Infrastructure Systems.