Title of Proposal: A Socio-Technical Case Study of Sustainable Stormwater Management in Austin, Texas

Statement of Critical Regional Water Problems:

Conventional approaches to urban stormwater management are slowly evolving as municipalities shift from supply side to demand side approaches for infrastructure services. This research will study the technical and social implications of this shift towards more sustainable forms of stormwater management in Austin, Texas.

Nature, Scope and Objectives of Research:

Introduction

Urban stormwater runoff has been recognized as a source of water pollution since the late 1960s (Wolman 1967, Leopold 1971). The increased amount of impervious surfaces constructed for urban development reduces infiltration and concentrates stormwater flows, resulting in water quality and quantity problems in receiving waterbodies (Schueler 1994). Following the passage of federal, state, and local environmental legislation in the 1970s, engineers and scientists developed and implemented a variety of technical approaches to retain and treat urban stormwater volumes. Municipal and regional stormwater networks emerged to reduce the impacts of impervious surfaces on urban streams, rivers, lakes, and aquifers as well as downstream waterbodies.

In the early 1990s, a small group of stormwater practitioners in the United States, the United Kingdom, and several countries in Northern Europe began to develop new forms of stormwater management to more effectively address water quality and quantity problems while also reducing management costs (Niemczynowicz 1999). Referred to as Low Impact Development or Sustainable Stormwater Management in the United States and Sustainable Urban Drainage Systems in the United Kingdom and Northern Europe, these approaches have developed unevenly due to regional differences in environmental regulations, municipal and county governance, and cultural conditions. In the United States, stormwater programs in several regions (for example, Austin, Texas; Santa Monica, California; Seattle, Washington; Denver, Colorado; Prince George's County, Maryland; the State of Wisconsin) have been identified as leaders in adopting sustainable stormwater strategies (NRDC 1999, U.S. EPA 2005). These programs deemphasize conventional supply-side approaches to stormwater management and instead, promote demand-side management of stormwater using technologies such as infiltration trenches, grassy swales, pervious pavement, vegetated roofs, and constructed wetlands (Niemczynowicz 1999, Moss 2001). Such strategies challenge centralized infrastructure technically and socially by introducing localized subsystems that redistribute responsibilities and costs of stormwater treatment (Moss 2000).

Specific Objectives

The aim of this study is to understand how sustainable stormwater management strategies have been developed and applied by the Watershed Protection Department at the City of Austin. Specifically, the study will examine how these approaches have been technically integrated into

the existing stormwater network as well as how these strategies relate to regional cultural understandings of stormwater flow.

Methods and Materials

This study employs a socio-technical approach to understand change in technical practices. Scholars in the discipline of Science and Technology Studies developed this approach over the last two decades using the theory of Large Technical Systems (LTS). LTS theory emphasizes the importance of expansive infrastructure networks such as electricity, transportation, water, and telecommunications to modern societies and aims to understanding how actors, technologies, markets, and regulations shape the initiation, evolution, expansion, and demise of these networks (Hughes 1987, Summerton 1994). This study contributes to LTS theory by examining the regional-specific practice of stormwater management. Whereas other technical networks such as electricity and telecommunications are relatively easy to transfer to other contexts, stormwater networks are highly dependent on their geographic locales due to hydrologic, economic, environmental, and cultural conditions. To date, two studies have focused on stormwater management from an LTS perspective (Chatzis 1999, Moss 2000, Moss 2001).

The project will employ a qualitative case study approach that uses data from a comprehensive literature review, in-depth interviews, and field observations to describe and interpret how stormwater practices have changed over time in Austin, Texas and how these changes are related to the environmental culture of the city (Yin 2003). In addition, geographic information systems (GIS) analysis will be used to analyze the spatial characteristics of sustainable stormwater management strategies and how they are related to the existing stormwater network.

Data Collection

Data will be collected from three main sources: a literature review, in-depth interviews, and field observations. The literature review will include historic documents on the development of stormwater management networks in Austin as well as contemporary reports and articles on stormwater strategies and innovations. Between 12 and 15 in-depth interviews will be conducted with municipal engineers, journalists, politicians, and residents to understand the technical and cultural dimensions of sustainable stormwater management both regionally and nationally. Finally, field observations will be conducted to document exemplary stormwater projects in the region. All of the datasets will be analyzed using qualitative analysis software to systematically analyze the data to produce conclusions (Yin 2003).

References

Chatzis, K. 1999. “Designing and Operating Storm Water Drain Systems: Empirical Findings and Conceptual Developments,” in Olivier Coutard (Ed.) *The Governance of Large Technical Systems,* New York, NY: Routledge, pp.73-90.

Hughes, T.P. 1987. "The Evolution of Large Technological Systems," in W.E. Bijker, T.P. Hughes and T.J. Pinch (Eds.) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology,* Cambridge, MA: The MIT Press, pp.51-82.

Leopold, L.B. 1971. “Hydrology for Urban Land Planning – A Guidebook on the Hydrologic Effects of Urban Land Use,” in *U.S. Geological Survey Circular,* 554.

Moss, T. 2000. "Unearthing Water Flows, Uncovering Social Relations: Introducing New Waste Water Technologies in Berlin," in *Journal of Urban Technology* 7:1, pp.63-84.

Moss, T. 2001. "Flow Management in Urban Regions: Introducing a Concept," in S. Guy, S. Marvin and T. Moss (Eds.) *Urban Infrastructure in Transition: Networks, Buildings, Plans,* Sterling, VA: Earthscan, pp.3-21.

NRDC (Natural Resources Defense Council). 1999. *Stormwater Strategies: Community Responses to Runoff Pollution,* New York, NY: NRDC.

Niemczynowicz, J. 1999. “Urban Hydrology and Water Management – Present and Future Challenges,” in *Urban Water,* 1, pp.1-14.

Schueler, T.R. 1994. “The Importance of Imperviousness,” in *Watershed Protection Techniques,* 1, pp.100-111.

Summerton, J. 1994. "Introductory Essay: The Systems Approach to Technological Change," in Jane Summerton (Ed.) *Changing Large Technical Systems,* Boulder, CO: Westview Press, pp.1-21.

U.S. EPA. 2005. *EPA Clean Water Act Recognition Awards,* Office of Wastewater Management, www.epa.gov/owm/mtb/intnet.htm, accessed 2 August 2005.

Wolman, M.G. 1967. “A Cycle of Sedimentation and Erosion in Urban River Channels,” in *Geografiska Annaler,* 49a, pp.385-395.

Yin, R.K. 2003. *Case Study Research: Design and Methods, Third Edition,* Thousand Oaks, CA: Sage Publications.

Results Expected from this Project:

The results from this project will be used in a comparison of three case studies for a doctoral dissertation being completed by the principal investigator. The dissertation case studies include Austin, Texas; Seattle, Washington; and Prince George’s County, Maryland with the intent of better understanding how sustainable stormwater practices are related to their regional cultural contexts. The findings from this research will be used to better understand the socio-technical nature of urban infrastructure networks and to promote sustainable technical practices in other regions.