TOWARDS A SUSTAINABLE CAMPUS INFRASTRUCTURE

MARGOT McDONALD
California Polytechnic State University, San Luis Obispo

INTRODUCTION

Infrastructure—known traditionally as the domain of civil engineers that deals mainly with roads, bridges, utilities, and waste—is in need of broadening and redefinition if it is to continue serving the public into the next millennium. The concept of engineering single function paths, nodes, and objects is an insufficient model for the complex interrelationships and intrinsic resource-based value of support structures as we advance through the post-industrial era. The next generation of infrastructure must include in its design and execution the three pillars of sustainability: ecology, economics, and socio-cultural factors. This paper will examine the development of a new "tectonic" which is centered on the community and their growing needs to find alternatives to traditional infrastructure. The ideas presented in this paper are grounded in practice where the author is part of a consulting team working on the proposal of a new infrastructure for several campus and community projects. The author uses three illustrations from practice based primarily on the development of a biological solid waste and wastewater facility which combines placemaking with environmental technology and using the university campus or similar sized communities as the typological model. The paper also examines the emerging role of virtual communities and the transformation of social space brought about by the influences of electronic media on architectonic form.

DEFINITIONS

Sustainability: Sustainability, having a multitude of meanings in different settings, is a term best defined in the context where it is used. In this paper, the term *"sustainability" signifies practices that promote vitality and regeneration of human and natural systems in ways that protect the fundamental elements that sustain life: food, shelter, habitat, and rituals.* Implicit in this definition is a balanced but utilitarian view of the dependent relationship between nature and society. The motivation for a movement specifically *towards a sustainable infrastructure* is largely the result of the deterioration of human and natural systems, witnessed at the end of the twentieth century and due to the cumulative effect of environmental, economic, and social stresses especially when density or concentration has created an imbalance or inequity. Although not a panacea, sustainable design attempts to remedy society's current problems with integrated solutions grounded in primary physical, social, and biological sciences while trying to avoid creating new, negative, and even longer lasting consequences.

Virtual Communities: From a sociological point of view, one emergent trend is the impact of electronic media on communication, causing social interaction to assume new forms and for the hierarchical, formerly time and space dependent, barriers to information access to be removed. The term "virtual communities" has been adopted to refer to social discourse and creation of culture (in the anthropological sense) that exists independent of physical location. These activities are characterized as "communities" since they exhibit many of the same functions found in a village or similar human settlement but "take place" without a phenomenological setting. Although these communities exist in a time rather than space continuum (over the Internet), they are difficult to characterize. They are fluid bodies that band and disband as needed and usually without leaving artifacts behind. As the boundaries, materiality, and meaning of "place" transform, so must the institutions and physical artifacts hardcoded in reality.

Post-industrial Infrastructure: Accepting the philosophical basis for sustainable practices with the emerging concept of virtual communities, the need for a redefinition of "infrastructure" should be apparent. The term "post-industrial infrastructure" is appropriate because it embodies the need for change in our current practices as a direct result of our industrial past.

In comparative terms, industrial versus post-industrial paradigms present the following oppositions; one is mechanistic while the other is grounded in socio-bio-geo-chemical concerns; one is extractive and exhaustive as opposed to restorative and regenerative; one is based on centralized command-and-control technologies and management while the other is decentralized and encourages customization; one is defined by linear networks as opposed to a more holistic inclusion of objects (e.g., people, buildings, ecosystems, etc.), actions (e.g., community building) *and* networks as infrastructure; finally, one requires materiality while the other is moving towards dematerialization, ideation and the realm of cyberspace. Each of these characteristics plays an important role in contemporary ecological and progressive design thinking as will be demonstrated through the examples which follow.

EXAMPLES OF APPLYING THE THEORY OF SUSTAINABILITY TO INFRASTRUCTURE DESIGN

Three examples from consulting practice are provided as illustrations for the form-related and formative characteristics of a sustainable, post-industrial infrastructure. The examples address the need for concretization of formal design theories, giving tectonic form to an ideal as well as the need for an examination and inclusion of the social dimension which is rarely considered in the development of the tectonic. While giving form to a post-industrial infrastructure is one goal of this paper, it is also the author's intent to make evident the virtual aspects of electronically formed communities which are part of the newly defined infrastructure as well.

Los Osos, California: An Integrated Model: In a *green* community plan, formerly discrete elements such as housing, transportation, community life, local economy, watershed management and waste treatment are examined for common needs and mutual benefits in how they are meshed into the community design. In June 1993, a group of thirteen Cal Poly-San Luis Obispo faculty and alumni earned recognition for such an integrated solution in the American Institute of Architects & International Union of Architects' *Sustainable Community Solutions Competition.* The entry illustrated, for a community of 15,000 people, how a wastewater treatment system could create a community center, provide parks and wildlife refuge, support aquaculture *and* treat sewage at the same time (McDonald and Rennick 1994). The proposal was based on a real water quality crisis in the town of Los Osos, California, where high levels of nitrates were detected in the groundwater supply which is within close proximity to residential and commercial septic systems. The proposal met the sustainable design criteria of being ecologically, economically, and socially beneficial to the community, however, the political climate did not allow for the project proposal to be built in Los Osos. An alternative siting location with new community parameters surfaced as the nearby state university expressed renewed interest in the demonstration potential of the facility and attention has shifted to a similar development on the Cal Poly-SLO campus.

Cal Poly-San Luis Obispo: A Pilot for Post-Industrial Infrastructure: Since 1991, a group of faculty at Cal Poly-SLO have endeavored to build an example of a sustainable campus infrastructure (McDonald, Panetta, and Williams, 1996). The proposal includes solutions for managing solid waste and wastewater for the Cal Poly campus of approximately 15,000 Full Time Equivalent (FTE) students. The proposed facility converts waste into valuable resources such as energy and nutrients and achieves this at a substantially lower cost to the campus. The design satisfies multiple sustainability criteria from environmental and economic concerns, as it is based on renewable resources that produce new inputs and create a positive revenue stream, as well as social criteria by improving the quality of life for students on campus through recreation and access to an environmental learning laboratory. The technology used is a combination of an Advanced Integrated Ponding System (AIPS) and constructed wetlands for wastewater treatment and water reclamation and a Municipal Recycling Facility (MURF) and anaerobic digester for solid waste reduction, reuse, and conversion into energy and compost. A schematic design mapping energy and resource flows has been created together with a preliminary economic analysis and funding is being sought.

CSUMB: An Academic and Physical Master Plan for the Next Century: The third illustrative project that has allowed for a broader application of sustainable planning and design principles is a military base conversion (McDonald, Cooper and Haggard, 1995). In this example, Fort Ord, a former army base on the Central California Coast, is being transformed into the newest campus of the California State University system. The California State University-Monterey Bay (CSUMB) Office of Facilities Planning and an outside master planning team sought assistance with the creation of a "green university" that would reflect the philosophy of a campus designed around a changing student population consisting of returning professionals, commuters, etc., and an emerging 21st century educational paradigm based on community service, interdisciplinary learning, technology enhancements, and future trends. The project typifies some of the common problems experienced in the transformation of military bases but also represents some of the best successes. It has made evident the dual purpose of the post-industrial phenomena, what this author labels "place/non-place," demanding both an *ecological* foundation to the physical infrastructure and an advanced *technological* foundation to support the campus and its virtual community.

JUXTAPOSITION OF PHYSICAL AND VIRTUAL ENVIRONMENTS

Although traditional engineering practice has furthered a disassociation between site and resource availability and recent architectural trends (such as post-modern) have encouraged a divorce between regional context and design, the development of an ecologically planned campus or community and its infrastructure depends heavily on "place" as a necessity to limit negative impacts. This is counter to societal trends towards globalization with disregard for local climate, economy, and culture. However, as environmental impacts mount, so will the need for regionally-based, context-specific solutions; hence, the knowledge of and ability to work within the local ecology will be a quintessential part of sustained human settlements. Moreover, the desire to serve multiple purposes through our investment in infrastructure, such as wastewater treatment plant as wetlands and lakes, suggests that environmental designers involve themselves with civic and civil projects.

As for the virtual aspects of the post-industrial "non-place" infrastructure, communities and campus have no precedents for the formal implications of an electronic and technological infrastructure used to support a virtual community in conjunction with other aspects of social life. There is much that we need to reconcile in our own understanding of the far reaching impacts of electronic media on social relationships that were previously coincident with spatial settings. In his book, *No Sense of Place* , Joshua Meyrowitz highlights the impending change in perceptions and semantics regarding place.

The relationship between physical place and social situation still seem so natural that we continue to confuse physical places with the behaviors that go on in them. The words "school" and "home" for example are used to refer both to physical buildings and to certain types of social interaction and behavior.

This is yet another quandary for the campus and community visionaries, uncertain what the architecture of "A Campus or Town for the 21st Century" should be.

In our efforts for the military base conversion project, a few design principles have helped to guide the process of master plan development with keywords such as "flexible," "diverse," "regenerative" and "fractal" (meaning "non-Euclidean, recursive, and self-similar"). The terms have been considered in the context of space planning, site planning, and any other design decision-making and will form part of the language of the campus master plan.

CONCLUSIONS

Community and campus development are defined by their infrastructure. A sustainable approach allows for maintained quality of ecological systems as well as human institutions such as economy and social well being. Moreover, a sustainable design approach suggests the involvement of the full spectrum of design professionals so that society no longer builds the single function behemoths of the past.

Electronic media should also be recognized as part of a post-industrial infrastructure. The impacts of telecommunications and electronics are vast and the spatial implications are not well understood because there are few, if any, precedents. It is unclear generally how technologies such as the Internet, World Wide Web, and video-conferencing will influence the physical and social experience of communities. The change is creating a democratization and liberation from an existential foothold.

As our spatial dependencies evolve in directions which include on the one hand, a greater environmental and context-specific awareness, and on the other, a less localized, global virtual community, one hopes architects and engineers would reconsider their professional roles not only as creators and restorers of the tectonic but also to expand their roles to encompass time and process dimensions as well. This is part of the cultural transformation, transition, and evolution of how we define the future of the "tectonic" in our endeavor.

SELECTED BIBLIOGRAPHY

Benedikt, Michael. *For an Architecture of Reality.* New York: Lumen Books, 1987.

Benedikt, Michael, ed. *Cyberspace: First Steps.* Cambridge: MIT Press, 1991.

Hawken, Paul. *The Ecology of Commerce: A Declaration of Sustainability.* New York: Harper Business 1993.

Hough, Michael. *Out of Place: Restoring Identity to the Regional Landscape.* New Haven: Yale University Press, 1990.

Kunstler, James H. *Geography of Nowhere: The Rise and Fall of the American Man-Made Landscape.* New York: Simon & Schuster. 1993.

McDonald, Margot, M. Polly Cooper, and Ken Haggard. "CSUMB: Military Base Conversion as an Opportunity for Sustainable Design," *Proceedings of the 20th National Passive Solar Conference,* Minneapolis, Minnesota, July 1995.

McDonald, Margot, Dan Panetta, and Doug Williams. "Sustainable Infrastructure for Campus Waste," *Proceedings of the Greening of the Campus Conference,* Ball State University, Muncie, Indiana, April 1996.

McDonald, Margot and Jennifer Rennick. "Los Osos, California: A Sustainable Community in a Sustainable Watershed," *Proceedings of the 19th National Passive Solar Conference,* San Jose, California, June 1994.

Meyrowitz, Joshua. *No Sense of Place.* New York: Oxford University Press, 1985.

Orr, David. *Earth in Mind: On Education, Environment, and the Human Prospect.* Covelo, California: Island Press, 1994.

Panetta, Daniel. "Sustainability and Wastewater," *Solar Today,* September/October 1992: 18-20