The Ties that Bind: Infrastructure as the Defining Role of Planning

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Prologue: The Relationship of Infrastructure and Planning

Practitioners and theorists have long searched for a clear definition of the role of planning. The attention to the subject is not surprising since a clear role lends any profession's sense of identity, integrity, and legitimacy. Wildavsky (1973) criticized the planning profession's lack of clarity in this regard, implying that the profession was attempting to encompass too much. He suggested that if "planning is everything, maybe it is nothing." This view exemplifies a debate common to many disciplines over what constitutes core theory and practice.

However, such debates are particularly important for inter-disciplinary professions such as planning. This essay argues that, for the planning profession, infrastructure is the organizational backbone around which basic principles, technical methods, professional norms, and even research are expressed. Interpreting its meaning liberally, infrastructure defines the very nature of planning. In turn, infrastructure requires planning, perhaps now more than ever. This symbiotic relationship between planning and infrastructure is unique and helps provide a clarity and focus that allow the profession to be sufficiently comprehensive without losing its meaning and purpose.

The events of September 11, 2001 revealed just how essential, yet sensitive, infrastructure networks are to our economic activity and daily life. The attack itself was highly symbolic, manipulating both the transportation and communications infrastructure to transmit a message of terror. The attacks also paralyzed key industries that depend upon efficient inter-regional transport to manage supply chains or provide their products and services to consumers. In addition to the tragic impact the events had on those who lost family, friends or co-workers, millions of people were indirectly impacted through lost jobs, lower incomes, or higher costs of

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living. The scope of the impact was evidence of the dramatic importance infrastructure plays in binding our increasingly global society. The subsequent threats to our food and mail systems further demonstrated the frailty of the infrastructure systems that are vital to our daily lives.

The need for planning to maintain these vital networks of communication and transportation was also starkly evident. The grounding of the aviation system for several days was not a technical failure of the aviation system, but a social disruption of a technological network. It was not a problem easily addressed by engineers and technicians. Primarily it was a failure of human infrastructure that precipitated a breakdown of security measures. Therefore, the problem requires solutions developed through a process among the key stakeholders: the traveling public, elected officials, and industry. In this process, the federal, state and local agency planners responsible for the organization and operation of air travel had to play a role.

The experience rebuilding physical destruction of infrastructure also reveals the strong role of planning. Planning has always played a central role with respect to natural disasters, such as earthquakes, floods and hurricanes. Such events impact a broad range of local and regional infrastructure. Planning is required to ensure effective coordination and priority setting. Disaster contingency plans, building codes, floodplain regulations and other forms of state and local planning also seek to reduce or prevent damage prior to such events.

The same role holds for man-made disasters. The World Trade Center was a vital link in the infrastructure network of the entire New York metropolitan region. Its destruction disrupted transportation and communications across the tri-state area. The reconstruction of office space, transportation, and communication services will encompass an enormous range of interests and institutions. As facilitators of this process, planners are crucial to reviving New York's place as a dominant global financial and business center.

Defining Infrastructure

Given the rather broad and often ill-defined nature of both planning and infrastructure, any discussion of their relationship requires explicit definitions. Infrastructure represents the flow and transfer systems of civilization: our transportation, communication, water and power

transmission, and waste-removal systems. Significantly, infrastructure is much more than just physical systems. The social processes and institutions that govern the physical systems must be included in the definition. This is what extends infrastructure beyond the purely technical realm of engineering into the so-called 'real' world of social institutions, politics, and economic constraints – in other words, the realm of planning.

Precisely due to its extensive reach, infrastructure most typically requires high levels of coordination and management. The range of coordination includes: developing shared standards and accepted protocols, long-term financing, system management and installation of physical elements. The significant outlays of capital and level of organization required for most infrastructure also necessitates some level of public involvement. Even when capital and operation costs are paid for by the private sector, major projects generally require public input and consent.

Over time, the balance of responsibility for financing, providing, and managing infrastructure has shifted from the public to the private sector as well as from Federal and state government to local agencies. Throughout most of the 20th Century, the public sector was responsible for the provision of most large-scale physical infrastructure. Graham and Marvin (2001) document the shift in this presumption over the past 30 years. Increasingly, large-scale infrastructure is market-oriented in its operating cost recovery and decentralized in its organization. Capital costs are also increasingly expected to come from the private sector.

However, the need for government or public involvement has not been fundamentally challenged. Private firms can rarely finance many forms of large-scale infrastructure entirely by themselves. Additionally, although subsidies to finance the operations and maintenance have been declining, many networks still require public finance or subsidy to recover capital costs. Even, when infrastructure is exclusively private on both counts, the need for public coordination, regulation, and standards endures. However, the characterization of infrastructure as mostly private, mostly public, or a blend of both, is not central to core argument of this article. Regardless of ownership or operation traits, the process of urban development depends on infrastructure networks to bind our societies and economies together. Cities are largely products of these networks and planning is inherently about supervising this process of urban creation.

Cities as Networks

Infrastructure networks shape and define the physical, economic and social structure of cities. As the networks and their underlying technology evolve, cities respond in both form and function. Major cities are increasingly portrayed as nodes in global economic and social networks. In *The Network Society*, Castells' (1997) explores the role of emerging information technologies in transforming these underlying relationships and structures. He argues that our lives are increasingly defined in relation to "spaces of flows" rather than our "places of space." In other words, our connections to others within a metropolitan region, across the country, or overseas have become more socially and economically important than our connections to our immediate neighbors. As our society and economy become increasingly 'global', the networked nature of cities in facilitating and managing the "flows" of information, products and people become even more prominent.

The historical evidence of cities as essentially defined by their networks is clear. Cities have always depended on external networks of commerce and supply for their survival. William Cronon's *Nature's Metropolis: Chicago and the Great West* describes in detail the mutual dependence of cities and their hinterlands. In this sense, the reach of the city extends far beyond its nominal political boundaries (Cronon, 1992). This notion also is found in Patrick Geddes' writings, which formed the early foundations of the profession. Additionally, Walter Christaller's Central Place Theory, articulated in the 1930's, provides support for this idea grounded in economic geography (Christaller, 1933).

While cities are nodes on national and global networks, the city itself also consists of internal networks of physical and social exchange. In this sense, they can be better understood as an urban network within a global network. As global cities have continued to develop and expand (Sassen, 2000), new infrastructure-based technologies have been required to accommodate ever-increasing agglomerations of people. Large cities, therefore, have become more directly dependent on their infrastructures for support.

Mitchell (1999) contends that understanding the networked infrastructure that defines and shapes urban processes should be the prime concern of planners. How cities function through their myriad array of social, physical, and economic networks — and how these processes might be

improved — should be seen as the cornerstone of the profession. If this is true, understanding cities as both social and physical networks is elemental to what city planners do.

More than just the Pipes: The Social Context of Infrastructure

It is also important to note that social and physical networks are not separate and distinct systems, but inter-related. Infrastructure is as much a social process as a technological process. The anthropologist Clifford Geertz (1973, pg. 5) once characterized culture as representing the "webs of significance" that bind us together. These webs of social interaction are expressed through relationships mediated by the physical infrastructure that makes relationships possible. Culture itself is essentially a complex network of interaction. The expanding scope and scale of our society has made infrastructure more essential to sustaining these webs of interaction.

Therefore, effective infrastructure planning should not be assessed by engineering and economic criteria alone. Unfortunately, the study of infrastructure has traditionally been dominated by engineering and economic analysis. Yet, the relevance of infrastructure extends beyond these narrow technical confines. As Graham and Marvin (1996) have eloquently argued, infrastructure technologies should not be divorced from the political and social processes that manage them.

With such broad implications, the decisions regarding the configuration and use of infrastructure are at least as important as the actual pipes, concrete, and cable. Infrastructure, more than other classes of goods or services, is shaped by legal procedures, regulations, and the bureaucracies organized around their provision.

The nature of the technology that supports infrastructure is also better understood as a socially mediated process. Scholars have questioned the traditional notion of *technological determinism* – the view of technological innovation as driven by scientific progress alone. Increasingly the social and political influences on technological innovation have been identified (Bijker et al, 1989; Smith and Marx, 1994). The view of technology as *socially constructed* leads to a greater understanding of the importance of institutions, organization, and collaboration in shaping outcomes (Hall, 1998).

The Foundations of the Planning-Infrastructure Connection

Planning is a profession that is fundamentally concerned with 'connecting the dots' between complex urban and regional issues. This feature is often a characteristic that attracts practitioners to the field. Additionally, the profession depends upon the expertise of a broad range of related professions: architecture, engineering, economics, public policy, etc. In spite of this multi-disciplinary nature, the field has a distinct role. As noted above, the complex nature of infrastructure requires that it be understood from different perspectives. Therefore, the process that surrounds infrastructure development, provision, implementation and reconstruction provides the mechanism to bind this multi-disciplinary profession together.

Planning has long been about infrastructure decisions. While the perspectives of planning have shifted over time, infrastructure issues still remain at the core of planning. Precisely because cities are both literally and figuratively built around their infrastructure networks, planning decisions are essentially decisions regarding access, or the lack there of. Even contemporary theories attempting to redefine planning around 'communicative action' still primarily use examples related to infrastructure. Although, 'communicative action' describes a planning process in which interest groups reach decisions on important issues, infrastructure issues are typically at the center of such processes.

Planning rose to prominence by managing the expansion of the industrial city. The combined impact of a declining quality of life in the industrial city and a shift in settlement patterns enabled by new technologies necessitated professional planning. First, industrialization brought with it substantial wave of rural to urban migration and a class of working poor whose living conditions prompted concern among progressive reformers. (Hall, 2001) Additionally, rising industrial pollution was affecting the quality of life even among the wealthiest city dwellers. Along with these motivations to leave the central city, urban expansion was facilitated by new technologies that encouraged dispersal (streetcars, telephone, electricity, automobiles). However, the high capital and operating costs of such technology necessitated the careful organization of new development. Emerging from the pressures of these technical demands, alongside social reforms and lofty idealism, planning as a profession was born.

Even the traditional concern of the field over social inequality and depravation is essentially tied to infrastructure. Advances in infrastructure provision were seen as the path to addressing the social and environmental problems of the 19th-century industrial city. Technological progress as the emancipator of human society was the central ideology of the modern planning movement. Distinct from other social welfare professions, many planners sought to provide disadvantaged groups access to sanitary systems, transportation facilities, and other infrastructure that would enhance their quality of life. An inequality of access to infrastructures is often a major source of social inequality, and it is one that planners have often sought to address. The current attention devoted to the "Digital Divide" is only the latest manifestation of this long-standing concern over inequalities of access to key infrastructure networks.

Examining the Planning-Infrastructure Connection Across the Discipline

Examining infrastructure's role in each of the traditional subfields of the planning profession can also provide helpful illustration of the point. A brief scan of the field illustrates that, although the level of attention devoted to infrastructure may vary among planners, its centrality to the profession is clear.

Transportation Planning

Transportation planning is quite clearly infrastructure based. The mobility it provides can be defined as a classic public good. However, increased mobility through infrastructure provision also creates several economic, social and environmental externalities that must be addressed. Therefore, the relationship between transportation infrastructure, the built environment and natural resources has become a prime concern for planners.

Land Use Planning

While land itself is not a form of infrastructure, land development is contingent upon infrastructure. Access to infrastructure is a strong determinant of the market value of land. The provision transportation access, water, power, and waste-removal are all critical to the success of any land development. New development also places burdens on existing infrastructure. In a sense, land use planners are not so much managing the land itself as they are coordinating land development in its relation to infrastructure.

Environmental planning
Infrastructure networks are at the core of concerns over ecological sustainability. Again, Cronon's *Nature's Metropolis* illustrates a clear historical example of the central role cities and their networks of influence play in environmental change. Historically, networks facilitated resource extraction and agricultural expansion (Cronon, 1992). By better understanding the role urban networks play in contemporary environmental change, ecological sustainability is more likely to be achieved.

Sustainability is perhaps best addressed through managing resource flows. Better use of 'flows' of resources involves better infrastructure processes. Shaping or limiting new development can best be done by constraining infrastructure or pricing its use in a manner that internalizes environmental externalities. Whether dams, large highways, or new power plants, large infrastructure projects have long been a focal point of protest by environmentalists. Better infrastructure management is an essential pillar of sustainable environments.

Community Development and Housing
Community development planners should be centrally concerned with how the community is served and connected with the varieties of infrastructure and their quality. Clean water, safe hygiene, and accessible power supplies are the first essentials of a healthy community. Like land, housing is not a form of infrastructure, but its quality is often measured by its level of infrastructure service. The planners' goal is to facilitate the infrastructure base from which healthy communities can thrive, which can involve a variety of processes and theories. Furthermore, while education itself is not a form of infrastructure, an environment deprived of suitable infrastructure services hinders one's education, and the lack of education in turn prohibits the effective use of infrastructure, especially advanced communications infrastructure.

Economic Development
Economic development often revolves around infrastructure capacity. Smooth supplies of power, goods, information, and people and the removal of waste are fundamentals of economic production and commerce. The exact relationship between new infrastructure investments and economic growth is hotly contested, but no one disputes that there is a basic link between infrastructure and economic productivity. Indeed, the zero-sum

game of "smokestack chasing" often revolves around the provision of subsidized, low-cost infrastructure by competing municipalities to attract industry.

Urban Design

Urban design is also fundamentally about infrastructure. Urban design distinguishes itself from the profession of architecture by claiming expertise is designing larger urban spaces, often linked with infrastructure. Infrastructure gives these places their identity and shapes their character. Infrastructure defines the context of place in relation to other places (Relph, 1987). While architecture is often focused the infrastructure of single isolated projects, urban design is about the links that connect places. For example, street design is realm of urban design, not architecture. The core questions of urban design often examine how to make infrastructure investments more aesthetically pleasing and culturally valuable. How can streets be better designed for social uses as well as traffic flows? Can a telecommunications tower be better placed or designed to be more congruent with the existing cityscape? Do overhead electricity and telephone wires disrupt the historical context of a traditional neighborhood? Can they be placed differently? These are the infrastructure questions urban design addresses.

Infrastructure as Force for Change and a Lever of Influence

Precisely because of the large scale and far-reaching implications of infrastructure, some level of public involvement is often necessary. Technological progress has further expanded the scale and scope of many infrastructure networks. This implies a set of interests often stretching well beyond individual communities and seldom limited to private concerns.

Planning's essential role in infrastructure provision is particularly relevant in such a context. Within a broader context of political decentralization, the increasing scale of infrastructure increasingly requires large-scale political organization and cooperation. Compounding this conundrum is the skepticism about the scalability and effectiveness of public institutions in a highly competitive global economic system.

More than ever, the coherence of planning as a profession revolves around infrastructure as an organizing principle. Infrastructure is the lever of control over broad, inter-related processes. As a result, infrastructure

propels change. Water supply, for example, reflects this clearly. The dependable supply of water is fundamental to all other economic and social processes. In arid regions, the control of water *is* power. (Reisner, 1986) Nothing happens without it.

The use of infrastructure provision as leverage can open up sclerotic political and social institutions. It encourages inter-jurisdictional cooperation and coordination at multiple levels. This coordination is the ideal of professional planning. While control over land use is highly political and jealously guarded by local government, infrastructure is the lever that can provoke significant shifts in land use policy. For instance, transportation infrastructure investments might require some degree of land organization or density requirements to receive approval. Without cooperation from the local community, infrastructure investments might not be made. In this sense, infrastructure becomes a powerful 'carrot' for cooperation and a good weapon against NIMBY-ism. Fierce NIMBY proponents would have to seriously question their opposition to change if they came to believe that their stance actually led to a decline of services.

Summary
Critics of the profession of public policy revolve around loose notions of "good government" and the "public interest. The assumption is that there is little concrete about the field. While city planning shares similar weaknesses, it can claim a unique set of skills and expertise around infrastructure processes within spatial environments. Infrastructure, therefore, is the 'spine' of planning, binding the profession together.

For decades, the planning profession has sought to distinguish itself from other professions. However, even developing a coherent definition for the field has turned out to be difficult. Most professions define themselves by claiming a precise area of 'expertise'. The area of expertise for planning is the management and facilitation of infrastructure processes. How flows of people, information, power, water, and even waste interact within the spatial environment is the domain of planning. These flows are both physical and social. Although, the varying approaches to the interaction of these processes may represent a divergence of contemporary planning discourse, they reconfirm that infrastructure remains the essential root of the planning profession.

References

Bijker, Wiebe E., Trevor Pinch, and Thomas P. Hughes, eds. (1989) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.

Castells, Manuel. (2000) *The Rise of the Network Society*. 2nd edition. London: Blackwell.

Christaller, Walter. (1933) *Die zentralen Orte in Süddeutschland*. Jena: Gustav Fischer.

Cronon, William. (1992) *Nature's Metropolis: Chicago and the Great West*. W.W. Norton & Co.

Geertz, Clifford. (1973) *The Interpretation of Cultures*. New York: Basic Books.

Graham, Stephen and Simon Marvin. (1996) *Telecommunications and the City*: *Electronic Spaces, Urban Places*. New York: Routledge.

Graham, Stephen and Simon Marvin. (2001) *Splintering Urbanism: Networked Infrastructures, Technological Mobilities, and the Urban Condition*. New York: Routledge.

Hall, Peter. (1998) *Cities in Civilization*. New York: Random House.

Hall, Peter. (2001) *Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century.* Third Edition. London: Blackwell.

Mitchell, William J. (1999) *E-topia: "Urban Life, Jim, But Not as We Know It."* Cambridge, MA: MIT Press.

Reisner, Marc P. (1986) *Cadillac Desert: The American West and Its Disappearing Water*. Viking Penguin.

Relph, Edward. (1987) *The Modern Urban Landscape*. Baltimore: Johns Hopkins University Press.

Sassen, Saskia. (2000) *The Global City*. Second Edition. Princeton University Press.

Smith, Merritt Roe, and Leo Marx, eds. (1994) *Does Technology Drive History?: The Dilemma of Technological Determinism*. Cambridge, MA: MIT Press.

Wildavsky, Aaron. (1973) "If Planning Is Everything, Maybe It's Nothing." *Policy Sciences*, 4, pp. 127-153.