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Progress reports



Transportation geography: new directions on well-worn trails

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I Introduction

It may seem axiomatic to argue that transportation is a necessary, but not sufficient, component of growth and development. Decades of research have exposed the critical relationships between infrastructure, accessibility, mobility, policy, and social change. Simply put, those regions and places that are better endowed with transportation have fared better overall, as measured by macro-economic statistics of development, than those that are poorly equipped. Simple comparisons of countries like Haiti, Afghanistan, or Chad with Japan, Germany, or the United States suggest that the role of transportation in driving socio-economic change is critical. Yet transportation is more than just the provision of infrastructure, facilities, networks, or investment; it is inextricably intertwined with how humans interact through policies, ideologies, and societies across time and space. Transportation provides a fundamental foundation for the building blocks of societies – labor, capital, territory – and intersects with the human and physical environment in ways that have profound geographical consequences.

Progress in transportation geography research has been impressive over the nearly two decades since Rimmer (1988) completed a series of reports on the state of the subdiscipline. New research theories and methodologies have been stimulated, in part, by the growing importance of globalization as both ideology and process, and the evolution of spatial analytical technologies. The notion that one can now make anything anywhere on the planet and sell anything anywhere on the planet (political and economic barriers notwithstanding) argues for an intensity of interaction between people, goods, and information that has motivated significant shifts in the way that accessibility is analyzed at multiple scales. More sophisticated analytical and computing capabilities (GIS, for example) have facilitated broader, deeper, and more interrelated approaches to transportation research. One-dimensional, structural approaches to transportation have been superseded by research agendas that embrace myriad perspectives on the relationship between transport and society. Yet significant research challenges remain, not least of which is the need to provide a more scaled and

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integrative approach to transportation's relationship with people and places. In this first of three progress reports, my focus is on transportation research at the global scale. In future reports, transportation research at both the regional and local contexts will be examined. Before commencing this journey, however, a brief discussion of the broad framework of transportation research provides some context to how place and space are currently engaged with by transport geographers.

II Transport theories and concepts: a *sine qua non*

Research on transportation issues preceding the mid-1980s took a somewhat sclerotic approach to explanations and analyses of the movement of people and goods across space and time. Knowles (1993) and Black (2003) provide a solid historical overview of the evolution of transport geography, highlighting some of the important paradigm shifts from basic spatial interaction models to more sophisticated network approaches, and on into the realm of social-behavioral research. As technologies and economies became more sophisticated and globalized in the 1980s, transport geographers began to embrace the philosophy that a greater understanding of the intersection of history, society, technology, and geography (see, for example, Soja's discussions on 'Thirdspace', 1989, and critical social theory, 1996) could provide new insights into accessibility and mobility. Such insights into the spatiality of human interaction might help to influence public policy and shed light on new ways of understanding the role of transport at local, national, and global scales (see Tolley and Turton, 1995).

With the launching of the *Journal of Transport Geography* in 1993, a trans-Atlantic endeavor from the transport specialty groups of the US and British geography associations, transport geographers now had an influential, specialized outlet for their research. In the inaugural edition, Knowles (1993) laid out nine research agendas, essentially a summary

of the most important issues facing transport geographers in the 1990s. Similar themes were identified by Goetz *et al.* (2003), although the authors also address the perception of transport geography as 'ghettoized' because it tends to extend across disciplinary boundaries. In practice, transportation does cut across the grain of human societies, influencing economics, engineering, politics, resource use, social interaction, recreation, etc. It makes possible the myriad geographies of human interaction. Transportation is quintessentially geographic, so it seems surprising that anxiety still exists about whether transport geographers have strayed from the core theories and methodologies of geography. Have transport geographers lost touch with the core principles of their discipline in order to make their research more relevant to others? Are they stuck in the narrow confines of network structures and flows, unable to explicate the multiple ways that transportation shapes human activity across the globe?

Hanson (2003: 469) suggests as much when characterizing transport geography as a 'quiet, some might say moribund, corner of our discipline'. Her criticism implies that transport geographers have not kept pace with theoretical and methodological advances in the discipline and she frets that transportation has 'lost its disciplinary centrality, largely because it has remained within the analytical framework of the 1960s' (p. 481). *Au contraire*, argue Preston (2001), Goetz (2006), and others, as the extant literature can attest. Transport geographers have teased out useful linkages between geography's conceptual structures and empirical contexts in recent years, even though some critics fuss over what is perceived to be an ongoing movement away from geography's core (see discussions by Johnston, 1998, and Vowles, 2006a). For example, in a new text that offers an innovative approach to understanding transport systems, Rodrigue *et al.* (2006) provide an excellent perspective on concepts, methods, and applications in modern transport geography, building on prior work by

Taaffe *et al.* (1996), Hoyle and Knowles (1999), Banister (2002), Black (2003), and others.

Despite these advances, however, geographers often tend to engage with transportation (when it is engaged at all) as if it were merely a backdrop to, or a consequence of, the local or global geographic frameworks they seek to explore. Many geographers take on sweeping regional analyses in introductory world regional textbooks with nary a hint of transportation's role in articulating socio-economic interactions at multiple scales, nor even a reference to transportation in the index or glossary (see, for example, de Blij and Muller, 2006). Even authorities on transport geography frequently take an *a priori* approach to the relationship between transportation and socio-economic change. Transportation is treated as so obviously fundamental to society that there is no need to explain how or why. For instance, Hoyle and Knowles (1999: 2) posit that transport geography is concerned with explaining, from a spatial perspective, 'the socio-economic, industrial and settlement frameworks within which transport networks develop and transport systems operate'. This definition hints at a subordinate and unproblematic relationship between transportation and these frameworks. In an otherwise excellent treatment of transport geography, Hoyle and Knowles (1999) never discuss the conceptual linkages between transportation and the frameworks that it transforms. The text describes and discusses urban transport, economic development, rural accessibility, multimodality, and global air transport without getting at the fundamental relationship that undergirds the interaction of people, resources, and places in the global system.

Similarly, Black (2003) provides a detailed foundation for the study of transport geography that fails to theorize adequately the transport–society nexus. He states that the interests of transport geographers center on the location and pattern of systems and on the magnitude of movement or spatial

interaction in such systems, but does not conceptualize these relationships. As a final example, an edited volume by Hensher *et al.* (2004) provides systematic and methodologically detailed coverage of many analytical aspects of transport geography. Even though the editors argue that transportation has a substantial influence on the evolution of human settlement patterns, little discussion is offered on the theoretical structure of such influence. If transportation geographers fail to problematize the relationship between transport and socio-economic frameworks – if questions are asked about how a place or region is being changed or influenced by transportation without probing the genesis and significance of that relationship – then transportation, at least on one level, is being treated as merely one-dimensional networks of conduits through which inanimate objects flow without purpose or design.

There is no shortage of theoretical and conceptual musings on transport systems, networks, flows, economics, engineering structures, planning, sustainability, demand elasticities, modeling, and infrastructure, but mostly by non-geographers. The challenge for transportation geographers, it seems, is to define a set of theories and concepts about the spatial relationships between people and places that situate accessibility and mobility at the nucleus of human interaction. As Goetz (2006: 231) points out, 'transportation is central to the study of geography, just as geography is central to the study of transportation'. Theories about transportation geography must move beyond the strictly utilitarian or orthodox and challenge the very essence of the social processes that take place in myriad spatial milieus. Myths that shape the identity of transportation analysis must be challenged (see Black, 2001), and new perspectives on old issues should be advanced by engaging with recent developments in spatial analytical techniques (Hanson, 1998). Over a decade ago, Taaffe and Gauthier (1994: 165) argued for a 'renewed and intensified focus on the specific-theory level' and suggested that

debates by transport geographers would be more productive if they concentrated on research findings rather than on techniques or philosophy. They also reiterated Rimmer's (1988) earlier call for a better understanding of linkages at various scales of analysis, not just between people and places but between conceptual structures and empirical contexts from the local to the global.

III Global transportation: jumbo geography redux

Some of the most exciting challenges in transport geography research over the past 20 years have emerged from new ways of thinking about global development and change. Whatever one thinks about the theory and process of globalization, with all of its conceptual, methodological, and empirical contradictions, transportation sits at the core of new kinds of global interaction. One of the mantras of successful engagement with globalization is to think globally, while acting locally, and to think locally while acting globally. Certainly this applies to research on transportation issues, especially in terms of how people, goods, and information are linked at myriad scales. Janelle and Beuthe (1997: 199) argue that 'the dualistic role of transportation as a pro-active agent of globalization and as a beneficiary of its development' provides a powerful rationale for research into how the global economy is evolving spatially and transport's role in that evolution. There are obvious linkages, for example, between global trade, transport, and the digital world (e-commerce) that need more detailed examination (Capineri and Leinbach, 2004; Kobayashi *et al.*, 2004), especially in terms of how new sets of spatial relationships are being constructed that transcend traditional state-based frameworks (Murphy, 1991).

Over the past decade, significant effort has been applied to understanding and explaining how transportation is critical to the globalization imperative. Yet transport geographers have been reticent to tackle the bigger methodological and empirical challenges

raised by an expanding *world system* and the world cities that act as command and control centers in the global economy. Missing from the discourse is the kind of sweeping historical analysis of transport development provided by Vance (1990) or the focused questions raised by Rimmer (1998) concerning the role of transport and telecommunications in shaping relationships between world cities. However, transport geographers have embraced the kinds of analytical challenges presented by changing airline networks, shipping systems, commodity flows, and inter-continental flows of people, goods, and information (see Kassim, 1997; O'Connor, 2003).

Indeed, some promising advances in the transportation–globalization nexus have been spurred by research conducted under the auspices of the Globalization and World Cities (GaWC) project at Loughborough University, England. Prior to the 1980s, relationships between and among cities at the global scale had been neglected by both world-cities researchers and transportation geographers. In the early 1990s, after mapping and analyzing the dominant linkages in the global airline system, Keeling (1995: 115) noted that 'we still do not have a clear appreciation and understanding of either the dynamics or the role of transport in shaping world cities'. Yet empirical research on airline data in the context of global connectivity is not without methodological challenges. Derudder and Witlox (2005) point out that such data provide but a static snapshot of the global air transport map, they often do not differentiate between specific flows within various networks, and they are biased towards interstate rather than transstate flows. Nonetheless, much of the empirical work based on the world-city paradigm, especially research conducted under the auspices of the GaWC, has incorporated air transportation implicitly into the goal of explicating the external relationships of world cities (see Smith and Timberlake, 2001; Witlox *et al.*, 2004; DeRudder and Witlox, 2005; Taylor

et al., 2006). Much more is now known about how cities interact within the global system as innovative techniques for conceptualizing, mapping, analyzing, and modeling transport-driven linkages continue to be refined.

Several important research challenges for transport geographers derive from the intersection of globalization with world-city development. Broader and deeper geohistorical analyses are needed of transportation relationships among cities at the transregional scale, moving beyond traditional colonialism-centered explanations of flows and linkages. Policy constraints on the development of global airline linkages also need further exploration, especially as they influence socio-economic relationships between regions and across continents.

GIS-based airline traffic-pattern analysis offers potential for the development of new theories about emerging economies and their linkages into the global system. For instance, how might India's emerging role as a back-office service provider and as a center for information technology reshape regional and global flows of the transnational elite (Vaidya, 2003)? How will China's recent investments in new transportation infrastructure reshape relationships between cities at both national and transnational levels (Jin *et al.*, 2004)? How are urban interactions in advanced economies (North America and Europe, for example) being restructured by changes to globally influenced national transport systems (see Hanson and Giuliano, 2004)? New theories are also needed to help transport geographers understand and explain evolving regional trade linkages within and between trade blocs such as the Asia-Pacific Economic Cooperation, Mercosur (Southern Cone Common Market), and the European Union.

IV Planes, boats, and trains: the transport triad

Beyond the framework of world-city analysis, the transport modes that have commanded most general research attention over the past two decades from a global perspective are the

triad of airlines, shipping, and railroads. Graham (1995: 99) argued that air transport geography 'cannot be understood without reference to the globalization of previously discrete national economies'. Within this context, he linked air transport provision to patterns of uneven development, sustainability, and environmental change, themes explored by Long (1997), Button and Taylor (2000), Espey and Lopez (2000), Goetz and Graham (2004), and Vowles (2006b). Transport hubs also attracted a lot of attention, not only those that shape global airline networks (New York, London, Singapore, etc) but also regional and national networks as well (Fleming and Hayuth, 1994; Bryan and O'Kelly, 1999; Horner and O'Kelly, 2001; Martín and Román, 2003). These studies do well in theorizing the reasons for hub-and-spoke systems and applying statistical models to explain network design, yet they are less forthcoming about the geopolitical, land-use, social, and environmental implications of such systems. Thus, although research on the geography of air transport has reached new heights in recent years, especially in the application of ever-more sophisticated mathematical and spatial models, more focus is needed on the social and economic implications of air transport. Research on the links between pandemics and global mobility (see Grais *et al.*, 2003), international tourism and development (Wheatcroft, 1998; Becken, 2006), air cargo and regional security (Rodrigue and Slack, 2002), and commodity chains and air transport (Gwynne, 1999) could create exciting new theoretical and empirical destinations for transport geographers.

After the 1970s, the worldwide containerization revolution began to open up multiple trajectories for research on shipping and ports by transport geographers (Mccalla *et al.*, 2004; Pinder and Slack, 2004). Port restructuring raises significant questions about changing links in the global maritime system (Dolman and Ettinger, 1992; Slack, 1994; Rodrigue *et al.*, 1997), and about how urban environments

benefit from port revitalization projects (Hoyle, 2000; Slack and Wang, 2002). Many of the issues that have shaped the airline industry in recent years, such as privatization, labor pricing, mergers and acquisitions, and regional politics, have also affected global shipping, and transport geographers would do well to pursue some of these research opportunities. Themes such as natural disaster impacts (tsunamis and earthquakes, for example) (Chang and Nojima, 2001), internationalization of port operations (Slack and Frémont, 2005), and the role of shipping in global food production and distribution (Barrett *et al.*, 1999) might productively be advanced by those interested in the geographical dimensions of the global maritime system.

Progress on railroad research over the past two decades by transportation geographers has been less than inspiring. Compared to airlines and shipping, railroads have become the stepchild of transport research at the global scale, in part because networks and services are more easily analyzed within a state-based framework or within the context of regional trade relationships such as the European Union (Gutierrez *et al.*, 1996; Vickerman, 1997). Railroad geographies have been incorporated into broader treatments of transportation policy and planning (see Leinbach, 1995; Button and Stough, 1998; Banister and Berechman, 2000; Black, 2003). Railroad development in emerging economies also has received some attention (Loo and Liu, 2005), a theme that will be explored in future progress reports. Yet the kind of sweeping analyses of railroad geographies presented by Roccatagliata (1998) that touch on themes such as technology, new regional economies, linkages to global systems, and the reconfiguration of social space remain to be written.

V Policy, planning, and imagination: *inter alia*

A number of other important themes have been addressed by transport geographers since the 1980s, most prominently in the arenas of policy, planning, and the environmental impacts of transportation infrastruc-

ture and services. Policy has long been a favorite research topic for transport specialists, especially when it is linked to environmental challenges (Banister, 1998), social change (Button and Slough, 1998; Black and Nijkamp, 2002), the politics of mobility (Preston *et al.*, 2000; Vigar, 2002), or the sustainability of societies in terms of accessibility choices (Nijkamp, 1999). Missing from the literature are broad syntheses of transport policy implications for specific segments of society across larger regions. For example, more attention needs to be focused on gender issues, the implications of neoliberalism and capitalism for the transport disadvantaged (see Banister and Button, 1991), and on the link between institutions and transport consumers at the regional and global scales.

Research on transportation planning continues to generate very useful questions about relationships between location, infrastructure, mobility, recreation, the environment, and social overhead goals (Nijkamp *et al.*, 1998; Hall, 2001; Banister, 2002). A more nuanced treatment of the transport-planning relationship at the global scale, particularly from the perspective of emerging economies that seek to participate more fully in the global marketplace (Hilling, 1996; Simon, 1996), might open up some new research directions. Tourism, for example, has become a key development strategy for many communities in Africa, Asia, and Latin America in recent years. As an integral part of the transport planning process for any society, tourism especially requires more theory supported analysis because of the kinds of accessibility and mobility demands that derive from it. Indeed, tourism is intimately linked to issues of environment, policy, gender, development, economics, infrastructure, and resources (see Hall, 1993; Lumsdon and Page, 2003).

Issues such as transport inequality and the social dimensions of the external costs of transport have yet to be fully explored (Hall, 1999), and the role of GIS in explicating, for example, tourism planning and development needs more attention from transport geographers. In many

ways, GIS techniques have revolutionized transportation analysis and have opened up new research directions on well-worn trails (Goodchild, 2000; Miller and Shaw, 2001). Yet those transport geographers who have embraced GIS are perhaps repeating the mistakes of the 1960s and 1970s, when a 'narrow emphasis on network analysis and mechanistic models' (Knowles, 1993: 3) led to transportation research becoming disembodied from its social and political implications. Those embracing GIS technologies need to focus on the policy-making, problem-solving, and forecasting capabilities of GIS from social and political viewpoints rather than allowing the flashy technical capabilities of the software to dominate the discourse.

Unexplored relationships between transportation and the environment also offer new directions for future geographic research (Button, 1993; Banister, 1998). How and where do global airline services contribute to the buildup of greenhouse gases in the atmosphere and what are the long-term implications of significant air-traffic growth, especially from rapidly changing economies like China and India? What challenges face global environmental systems as emerging economies adopt North American-style transportation policies and attitudes towards accessibility and mobility? There are tremendous opportunities for transport geographers to broaden and deepen our understanding of how accessibility and mobility are fundamental to a globalized society. New analytical techniques, redefined spatial relationships, enhanced transport capabilities, and infrastructure for a global economy all argue not only for fresh approaches to traditional problems (after all, [re]search also means to go back and look again) but also for innovative ways of conceptualizing and analyzing transportation for the twenty-first century. As Hanson (2006) presciently remarked:

To enhance awareness of the centrality of transportation to many if not most geographic problems and to make transportation studies

once again vibrant and central to the study of human geography, I believe that both groups of geographers – the transportation aware and the transportation oblivious – need to do more imagining. (Hanson, 2006: 233)

Transportation geographers would do well to embrace a little imagination as they generate new research on transport relationships in an increasingly complex global milieu.

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