VIEWPOINTS

Discussion of topical issues in urban morphology

Comparing metropolitan regions

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Making comparisons between metropolitan regions around the world is fashionable. Newman and Kenworthy's *Cities and automobile dependency* (1989) was one of the first attempts to collect data from cities around the world and make systematic comparisons (although highly criticized: see, for example, Gomez-Ibanez, 1991). Recent books (Simmond and Hack, 2000; Susteren, 2005) and even a summer 2007 exhibit at the Tate Modern continue the tradition. A further attempt, a poster prepared by Sorensen and me, has been sponsored by the Neptis Foundation, a Toronto based non-governmental organization (Sorensen and Hess, 2007). Its data and methods are described at www.neptis.org/atlas/show.cfm?id=60&cat_id=29. The aim was to promote discussion, showing simple comparisons (of regional form, density, and the use of private motorized vehicles) between the built-up area of Toronto and selected metropolitan areas in Canada, the United States, Europe and Australia (Figure 1).

In the course of the project major difficulties were encountered. Scheduled to take less than 2 months, the project ended up taking 2 years and required significant efforts and technical support by Zack Taylor and Marcy Burchfield of The Neptis Foundation and Byron Moldofsky and Jo Ashley of the Cartography Office at the Department of Geography at the University of Toronto. The greatest difficulties were locating comparable data and arriving at similar definitions for how the built-up areas were to be measured and defined. These issues were not fully resolved.

The transportation data, for example, came from *Millennium cities database* by Kenworthy and Laube (2001). This provides little information on sources or accuracy but yielded the best data that could be found for international comparisons. We had more control over the definition of built-up areas. In the United States and Australia we used the national census, which in each case defined the built-up or urbanized area of each metropolitan region based on a population density of about 4 persons per hectare for small census units (blocks in the United States) and provided rules on their contiguity. In Canada, national census data allowed us to develop a similar method. For European cities, comparable small census units were not available and the built-up area was defined using a combination of population density, based on administrative units, and land cover data for 'urban morphological zones' from the European Environmental Agency. This meant that some non-urban population was ascribed to built-up areas, thus raising density.

Despite the difficulties, we believe this is some of the most careful comparative work to date and allows for informative comparisons between the selected metropolitan regions. Differences in patterns of development at the edges of the metropolitan regions are striking. The urban 'islands' around the European cities may partly reflect definitions of built-up areas, but in some cases they are indicative of growth around historical villages and towns. In Toronto, the relatively smooth edges are explained by a strong planning regime that only releases fairly large blocks of land for urban development at the urban edge. The feathery patterns around American cities reflect strong land rights, weak planning regimes,

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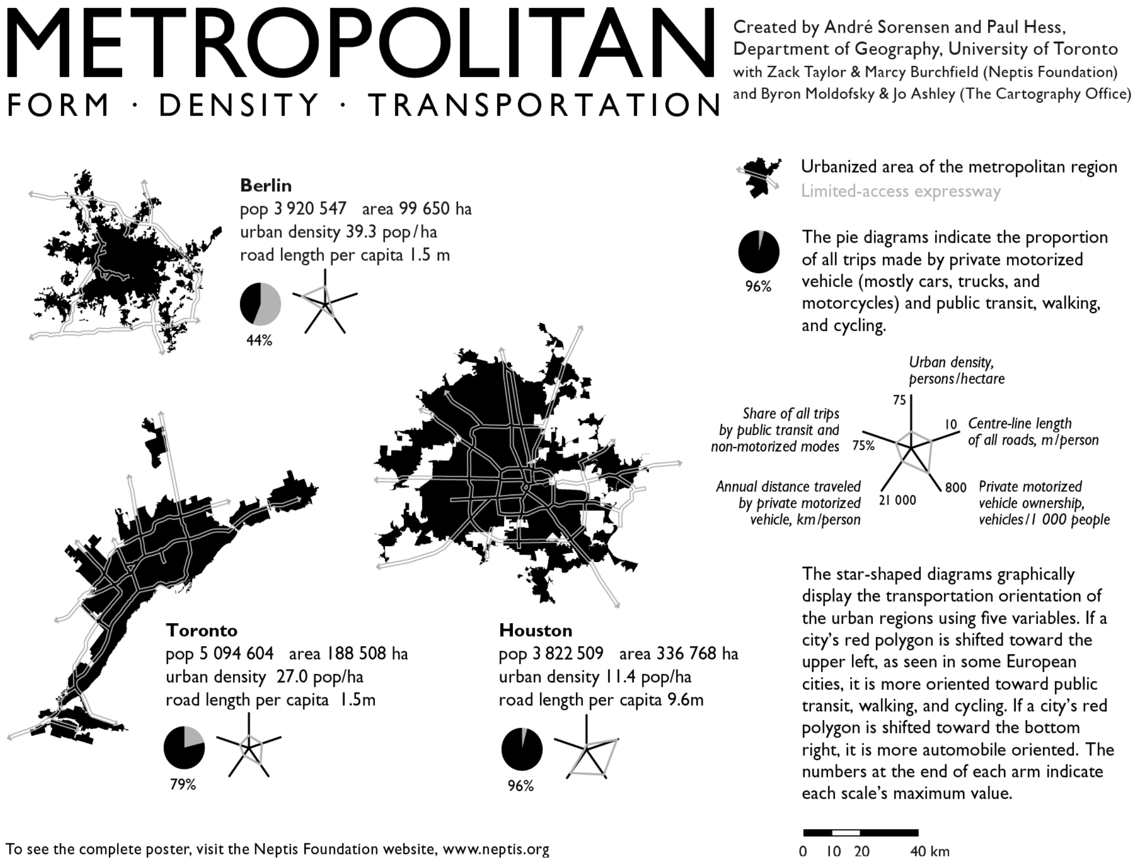

Figure 1. Examples of the data included in the poster.

and a continuous process of leapfrog development and infill.

The differences in the density of the metropolitan regions within and between Europe, the United States, Canada, and Australia are remarkable, with Madrid's density being more than 10 times that of Atlanta's. Generally, the European cities are the most dense, although the Canadian cities of Montreal and Toronto are as dense as the Scandinavian cities of Copenhagen and Stockholm. Similarly, the Australian cities are less dense than the Canadian cities, and the American cities are clearly, as a group, the least dense of all. It is tempting to make causal links between transport and density, but even with such highly aggregated data, this set of cities shows the relationships are complex. Certainly, all the low density cities are heavily automobile dependent and the highest density ones much less so, but in between the relationships are not so clear, with Montreal and Toronto much more reliant on automobiles than Copenhagen or Stockholm, a difference not explained by density alone. In addition to helping to answer such questions, the city comparisons are useful in posing them. For example, why do the cities largely cluster geographically based on density? How do such variables as differences in the culture, planning regimes, periods of rapid growth and other factors interact? Why are Canadian cities so much denser than their American counterparts even though, in many respects, they share similar histories of growth?

In light of the speed and potential consequences (environmental and otherwise) of urbanization across the world, posing and answering such questions is critical to making better cities. Researchers interested in urban and regional form need to continue to work on methods that allow meaningful, systematic comparisons at a variety of scales, from the individual street block to the entire city. Part of this effort must be to develop datasets that are more comparable across national boundaries.

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GPS and historical maps on hand-held computers: potential use in urban morphology

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High grade global positioning systems (GPS) have a number of urban morphological applications; for example in surveying and analysing the built form of medieval settlements.[1] There is, however, potentially interesting work that can be undertaken using the considerably cheaper, though less accurate, forms of GPS which are now starting to become common in everyday life, particularly through satellite navigation systems. The range of maps on proprietary satellite navigation systems is quite limited, but the new generation of personal digital assistants (PDAs) has moved from being little more than electronic diaries, to full blown mini-computers, and many come with navigation-grade GPS, or can have this facility added via an inexpensive expansion card. ESRI, the makers of one of the most widely used geographical information systems (GIS), have produced ArcPad, a stripped down version of their main mapping software, specially for use on small hand-held computers.

At the School of Geography, Earth and Environmental Sciences at the University of Birmingham we have recently acquired a number of Fujitsu-Siemens PDAs as part of a teaching project developing course materials using mobile GIS.[2] A series of campus maps has been uploaded to these machines, spatially referenced such that when the GPS units are activated, students are placed ‘in’ the correct location on the maps. This has a number of potential applications. It allows data collected in the field to be entered directly into a GIS. This can then be easily processed when back in the office.

A major element in urban morphological fieldwork, particularly among Conzenians, is to enter the spaces under consideration, armed with a series of historical plans, to gain an understanding of the changing plan form.[3] While this is a highly effective technique, in the field it can be quite awkward switching between large paper plans and locating oneself in certain areas where landmarks have changed. This can be a particular problem for less experienced fieldworkers.

Spatially referenced historical maps and plans can be put into the ArcPad system as easily as contemporary maps and this offers very interesting possibilities to urban morphologists. The user can be placed ‘in’ an historical landscape on the screen while walking around the contemporary city. With a series of historical maps loaded into the PDA it is possible to walk to a particular part of a site tracked by the GPS. This allows the user to very quickly orientate and then switch between a series of different historical ‘layers’ to examine the changes to an area over time. The effect of walking around a site whilst watching your position move within a historical map[4] on the PDA screen can be a little eerie, in part because it helps to generate something akin to an embodied understanding of a space that does not now exist.

As experienced urban morphologists we sometimes take for granted the ability to look at a series of maps and work out how the different spaces fit together with the currently existing landscape. Some people do, however, find it difficult to orientate themselves spatially within two-dimensional maps of the contemporary landscape,[5] let alone historical maps. The use of a GPS enabled GIS in the field therefore offers a tremendous teaching tool to urban morphologists, removing one of the barriers to people making the connection between a map space and a physical space. Of course there are technical limitations. The screen size of PDAs is too small to see larger