The availability of open data and new trends in data visualisation will transform how we understand our cities.

blogs.lse.ac.uk/impactofsocialsciences/2013/11/15/luminocity-project-urban-cartography/

11/15/2013

Due to the increasing availability of large urban datasets, it is now becoming easier to produce online visualisations that capture and help interpret the complex spatial dynamics of cities. **Duncan A. Smith** *argues that as further open datasets are made available, a much wider range of interests and user groups are set to be represented and explored. These urban cartography projects allow users to ask questions about how city areas have changed and are likely to change in the future.*

We have seen a recent explosion of spectacular new ways to visualise cities and urban activities, providing novel perspectives into the patterns of urban life. From the daily journeys of millions of people on transport systems; to social and ethnic information for entire urban populations; to identifying the age of every building in a whole country. These new datasets and tools are engaging and visually spectacular. But are these new tools simply flashy infotainment, or can we use these techniques to improve our understanding of urban processes and make cities work better?

Several recent trends have come together to make available huge volumes of data, and software to analyse this data. On the one hand the ubiquitous use of smart cards, credit cards, mobile phones and social networking sites means that there is now a vast digital trail recording our daily interactions. This is a great treasure trove of behavioural data that is beginning to be used for academic research, although there are clearly significant concerns with protecting privacy and with the corporate ownership of much of this data.

In parallel to this 'big data' trend, the open data movement is leading to the release of much government data with the aim of boosting transparency and innovation. Traditionally government data has been restricted to relatively small groups of expert users. Open data presents a radically different approach where as much government data as possible is released freely to the public online. This is intended to improve scrutiny of public services, and allow the development of new applications bringing social and economic benefits. For instance the release of public transport data in the UK has led to a boom in highly useful public transport apps. Recent changes in the UK have been influenced by trends in the US in relation to freedom of information legislation, and the creation of gateway websites such as data.gov and the London datastore.

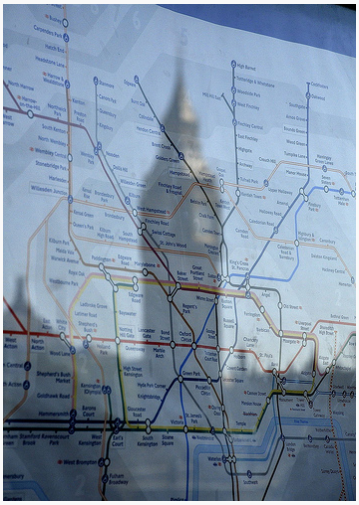
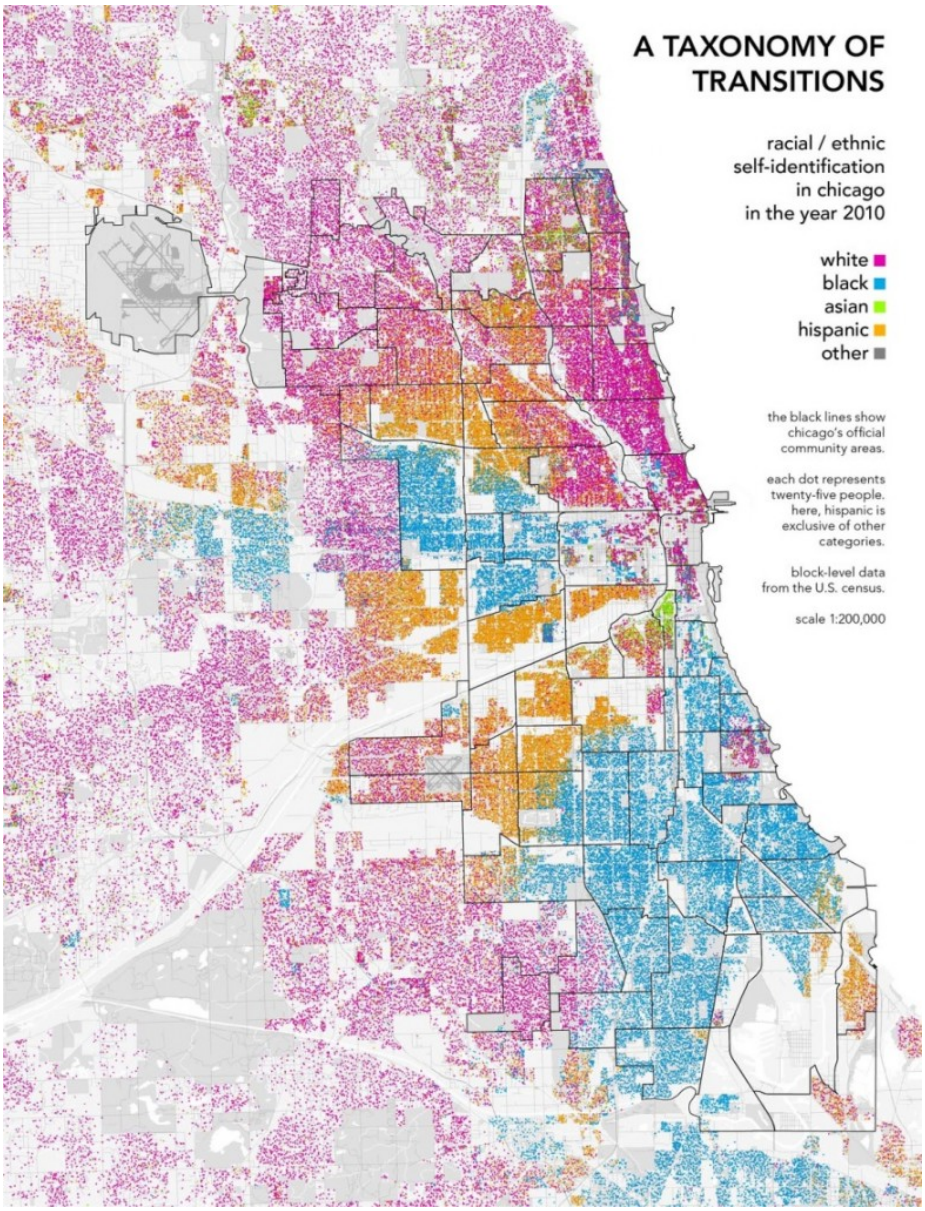


Image credit: Steve James (CC BY NC ND)

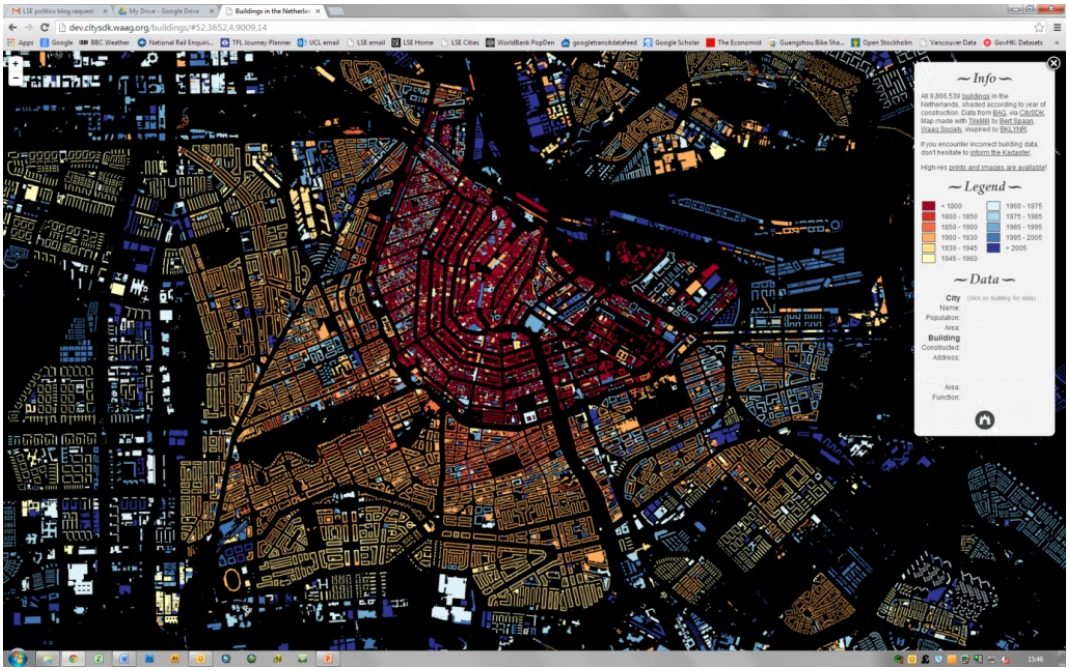
Complementing the surge in data availability, there has also been significant progress in the availability of software to analyse and visualise large datasets. Similar to the open data movement, much of this software is open source and free to use, having been produced collaboratively through online communities of developers. These tools are more user-friendly and accessible than traditional business software, thus expanding the user base and allowing more diverse interests to be represented and published online.

To understand how these changes in open data and software tools are changing our perspectives on cities, we have to look at some recent examples. One very active areas of urban visualisation, particularly in the US, has been the mapping of ethnicity in major metropolitan areas. Reinventing the classic technique of dot density mapping, Bill Rankin has produced influential maps of ethnic groups in Chicago using the US Census (see below). As well as clearly showing the high degree of segregation in the city, the mapping technique captures subtle patterns of mixing between different groups in Chicago's communities. This approach has subsequently been used to map ethnicity in

many major US cities by Eric Fischer, and even the entire USA by the University of Virginia. While these visualisations are no more than descriptive, they do raise awareness of the high degree of urban segregation, and highlight the complex and varied patterns within and between cities.

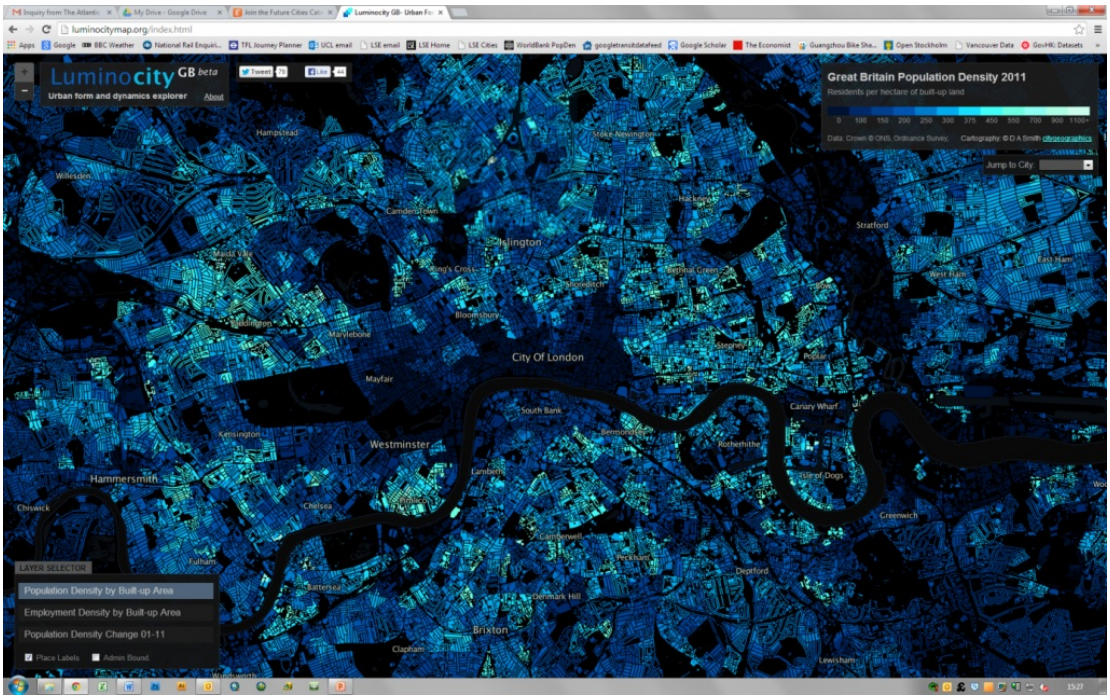


As well as mapping urban residents, the built environment is also a rich source of new urban visualisations derived from government data. Different cities and countries vary in how open and integrated their built-environment datasets are. One of the most forward-thinking is the Netherlands, where the national cadastre of every building in the entire country has been mapped online. That's an impressive total of 10 million buildings. One of the most interesting variables to be mapped is the age of buildings due to its close relationship with the growth and the historical evolution of cities. The example below shows the age of buildings in Amsterdam, revealing the horse-shoe shaped medieval core in red, transitioning to the 19th century inner-city and 20th century suburbs and docks. As well as the clear aesthetic appeal of the project, it's also useful for urban researchers and modellers. The visualisation framework could also be used to visualise further building related information, such as land use and energy variables.



The UK has also been contributing to these new urban cartography trends. There is a rich British heritage in this field, with pioneering work such as Jon Snow's mapping of cholera cases in 1854 , and Charles Booth's extensive work mapping poverty in London (now in the LSE archives). This tradition continues with current work such as Danny Dorling's mapping of social inequalities, and innovative visualisations from centres such as CASA, which includes the updating Booth's map with current deprivation data.

Inspired by these projects, I have been investigating relationships between population and built-environment data in my own research. The Luminocity project is an interactive map of urban form and dynamics in British cities. Activity and built-form data are combined, seeking to highlight patterns of urban intensification, redevelopment and decline. For example the complex density mosaic of Inner London is shown in the figure below. Building outline data (provided through the Ordnance Survey open data initiative) gives a strong sense of the urban texture of London's districts. Areas of low residential density (from the 2011 census) appear dark. These include major employment centres as well as the remaining inner-city brownfield sites, such as the Olympic Park, Battersea and the Royal Docks, which are rapidly being filled in.



The Luminocity website also includes changes in population density over the last decade. There is a clear pattern across British cities, with densification in city centres coupled with relatively static suburbs. The results of the 2011 census mark a very significant reversal in the pattern of urban population decline that dominated the late 20th century. Spectacular growth is evident in city authorities such as Manchester (+28%), Leicester (+18%), Nottingham (+14%), Bristol (+12.5%) and of course London (+14%). This pattern is highly uneven however, and cities with deeper rooted deprivation and economic problems such as Glasgow and Liverpool show much weaker growth.

So we have seen the increasing availability of large urban datasets, and how these are being visualised in innovative ways to highlight spatial patterns and dynamics in cities. A range of demographic and built-environment variables are being explored, and will be added to as further open datasets are made available. It is increasingly straightforward to produce online visualisations, allowing a much wider range of interests and user groups to be represented. Currently many of the visualisations remain static maps, and it is likely that newer urban cartography projects will include further interactive and analytical capabilities to allow users to ask questions about how city areas have changed and are likely to change in the future.

Note: This article gives the views of the author, and not the position of the Impact of Social Science blog, nor of the London School of Economics. Please review our Comments Policy if you have any concerns on posting a comment below.

About the Author

Duncan A Smith *is urban visualisation and GIS researcher, interested in city form, dynamics and sustainability. He holds a PhD from the Centre for Advanced Spatial Analysis at UCL, and is now employed at LSE Cities. Current projects at LSE Cities include investigating new urban mobility trends in London and Berlin, and researching the development of green economic growth in Stockholm and Copenhagen. He blogs at City Geographics and can be found on Twitter @citygeographics.*