How Big Can Cities Get?
Explorations in the Dynamics of Shape, Size and Scale

Michael Batty
Bartlett Professor of Planning, UCL
m.batty@ucl.ac.uk

Abstract

City sizes and their distributions reflect two interlocking trends: urbanisation, which implies that we will all live in cities eventually, and world population growth, which may well stabilise as limits to global capacity are reached. In measuring urban growth, there are remarkable scaling regularities in city size distributions which have remained stable for many centuries. Despite these, there is continual volatility in the relative distribution of their sizes as cities rise and fall in population and as they aggressively compete with one another. It was Herodotus in **The Histories** who said: "I will [tell] the story as I go along of small cities no less than of great. Most of those which were great once are small today; and those which in my own lifetime have grown to greatness, were small enough in the old days".

We barely understand this pattern of dynamics where this micro-volatility exists within the relatively stable envelope of city size distributions which appear to be log-normally or power law distributed, everywhere, at every spatial scale, and for every time we are able to observe them. In this talk, I will show some of the evidence for this stability and volatility and make some attempts at verbal explanations of this kind of dynamics at different spatial scales from entire cities to individual buildings. I will begin with the example of what is happening in cities which contain the world's tallest buildings and then aggregate the analysis to the largest cities, examining historical as well as contemporary evidence. I will outline ways of visualising multi-scale patterns of relative stability and volatility, using ideas about ranking the size of cities, and then conclude showing ways in which the changing size of cities can be explored by examining their tallest buildings. Growth and decline differ with respect to whether or not we measure them in terms of buildings or population, for the growth and life cycles of these various sets of objects differ despite providing complementary perspectives.

You may ask "What is all this for?". Well, these explorations provide an illustration of the complexity of the dynamics of growth and competition but they also force us to pose the key questions of how big cities might be, what are their limits to growth, and how big should they be. This provides us with a focus for defining cities appropriately in terms of what we might measure, and how we might describe their mass and density, one of the most confused concepts in urban studies but which is widely invoked in any discussion of cities (M. Batty, **Science**, **319**, 769, 2008). They open up our explanations to the role of technology in enabling cities to grow and agglomerate their functions. But most of all, an analysis of urban growth at the global scale lets us pose the question "What will a city be when everyone eventually lives in one form of city or another?"