# Defining and Measuring Metropolitan Regions: a rationale

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## Abstract

This paper was presented an OECD working group of city measurement, in Paris, in November 2006. It presents the rationale for, and a method for measuring, the 'Functional Urban Region' of London which establishes an estimate of its true economic extent, independent of its actual or historical boundaries.

Noting that there is no consistent definition of the boundaries of 'economic' London, and that different suppliers of data work on the basis of definitions that not only conflict, but produce inconsistent and widely different data about London, it applies the FUR-based method developed by the GEMACA group for defining and measuring cities. This system, similar to the SMSA system employed in the USA by the Office of Management and Budget, calculates a core, defined either as a densely populated area or an area with a high job density, and a 'commuting field' containing people that regularly travel into or communicate with the core for economic purposes, principally work.

It differs from the Urban Audit system in use at the time that this paper was presented, insofar as the UA system uses a mix of administratively defined cores and economically defined commuting fields, and varies the parameters used for both in accordance with local views, leading to a lack of comparability.

The paper exhibits the effect of various choices for defining the core and commuting field, and shows that the population of London in 2000 lay somewhere between 12,250,000 and 13,920,000. The final choice of parameters – and the eventual estimate of population – should pay due regard to issues of international compatibility, but the method itself is eminently practical.

**JEL codes**: H70, R0, J0

**Keywords**: City; global city; Functional Urban Region; Larger Urban Zone; Territorial Indicators; Metropolitan Region; pluralism

# Defining and Measuring Metropolitan Regions: a rationale

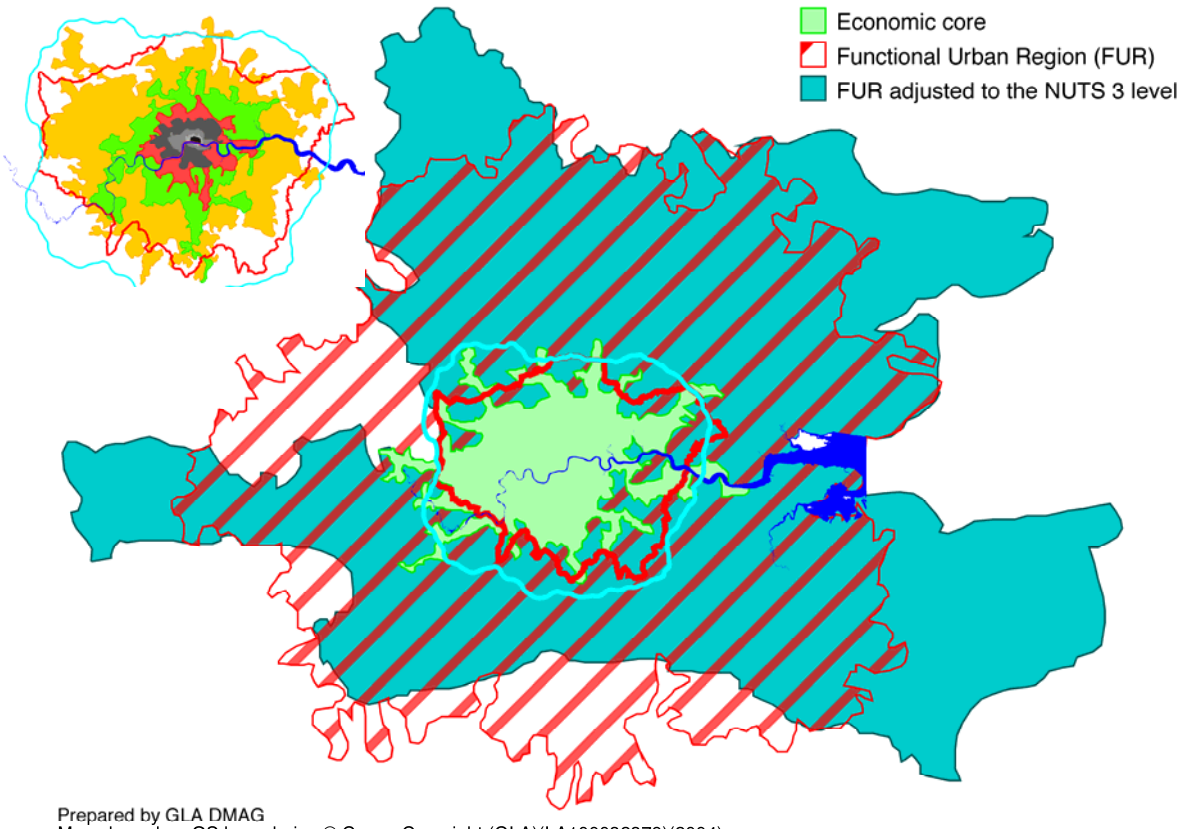
In this paper we explain from a London and UK standpoint the need for a common standard of definition for urban regions, we discuss the range of options we have considered, and we explain the rationale behind our approach to procuring and commissioning research on city definitions. We also present some initial results for London that arise from our work on bilateral comparisons with Paris.

## Why London needs a common standard

> Studying successive images of [London's] 'metropolitan' market, we see it growing and expanding year by year with the same rhythm as the city itself (at most 250,000 residents in 1600, 500,000 in 1700). The global population of England also never stops growing, but less quickly. Who better than a historian, then, to say that London "Is going to eat up England"? Did not James 1st himself say that "With time England will only be London"?
>
> - Fernand Braudel

> It appears that by A.D. 1840 the people of the city will be 10,718,880, and those of the whole country but 10,917,389, which is but inconsiderably more. Wherefore it is certain and necessary that the growth of the city must stop before the said year 1840, and will be at its utmost height in the next preceding period, A.D. 1800, when the number of the city will be eight times its present number, 5,359,000
>
> - William Petty (1662)

**LONDON'S FUNCTIONAL URBAN REGION ACCORDING TO GEMACA (INSET: LONDON'S GROWTH FROM AD200 TO 1939)**

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*Les Cahiers No. 135, 4th quarter 2002;* GEMACA

London, like many cities, requires an international benchmarking standard. It needs to compare itself with other cities for the purpose of identifying best practice for policy. It also needs soundly-based estimates of its own socio-economic extent, for the purpose of forecasting and planning. Nor is this need confined to the authorities responsible for London: national and international governments need common standards both to compare the situation of cities and to allocate and implement policy resources. This need is particularly important within the EU but is relevant also for OECD, UN and development agencies.

In addition there is an increasing recognition that urban regions are likely to be the most relevant spatial units for the application of significant policy functions. With the transport area this is already partially recognized in Britain with the existence of Metropolitan Passenger Transport Agencies but is also increasingly recognized as relevant for the implementation of land use planning functions. Fragmented local governments fail to internalize benefits as well as the costs of development leading to systematic NIMBYist pressures and land use and infrastructure needs to be coordinated at a Metropolitan Region level. Such units may also be the most appropriate for (local) economic development policies.

Finally not only does the evaluation of policy require comparable urban units but also any academic study of cities equally needs data for such comparable units.

Neither the GLA nor the wider policy and academic communities can therefore, continue just to accept existing data because there is no consistent standard. Because there is no standard there is no robust comparison. The variation between suppliers of data is greater than the variation between cities within each suppliers' estimates. This is clear from Table 1 which compares estimates of output per employee in 2001 from three suppliers, dealing with six cities. As can be seen, the highest estimate of London's productivity puts it level with Stuttgart and nearly twice as productive as the next largest English cities while the lowest estimate assigns it bottom rank.

**TABLE 1: OUTPUT PER EMPLOYEE IN 2001 AT 1995 CONSTANT PRICES**

| | Supplier 1 | Supplier 2 | Supplier 3 |
|---|---|---|---|
| Frankfurt | 68,000 | 78,000 | 44,000 |
| Munich | 76,000 | 74,000 | 41,000 |
| Stuttgart | 61,000 | 63,000 | 37,000 |
| London | 32,000 | 62,000 | 25,000 |
| Birmingham | 30,000 | 52,000 | |
| Manchester | 28,000 | 48,000 | |

A standard is clearly required. But London cannot just create its own – nor can it accept that other cities should. It therefore works bilaterally (eg with Paris), multilaterally (for example with GEMACA and with BAK) and through agencies (eg Urban Audit, OECD, Metrex) to attempt to secure an agreed harmonized standard that is based on sound economic and geographical principles. It is our view that having a common standard is more important than having the right standard since in some senses if there is a common standard which represents city-regions in a reasonably consistent way then that itself is the 'right' standard.

## What kind of standard?

A standard needs to address the following requirements:

1) The definition of a city cannot be political or take political or administrative boundaries as a starting point, but should instead arise from socio-economic study of what a city actually consists of, and does.

2) We need to make comparisons across the world and at least with 'world cities' hence US, Europe and ideally Japan

3) Whilst there is a need to recognize broad continental variations eg different historical evolution of US cities compared to European cities (leading to different densities, morphology, and commuting patterns) the requirement for a standard dominates over the requirement of scope for local variation

There exist three main approaches to defining cities which share many features in common

(1) The US Metro area system: the advantage of this is its long period of development and the fact that it has also been adopted in other countries (eg Canada). Its drawback is that US cities evolved under different historical conditions from those in Europe, or, indeed, in Asia. Pragmatically attractive for London, because if it adopted the US definition, it could immediately compare itself with a large databank of US data.

(2) GEMACA: The advantage of this is that the groundwork has been done for many European countries; and may be economically sounder than US (S)MSA system. Its drawback is that it is not yet extended beyond Europe and it has limited coverage

(3) Urban Audit: The advantage is its extensive coverage in Europe. Its drawback (in our view decisive at present) is that the definition is not (a) based on the economic reality of a city (b) uniformly applied relying too much on local judgments.

Nevertheless the common feature of these systems is

(1) A core, which may be defined either as a densely populated area or an area with a high job density.

(2) A 'commuting field' containing people that regularly travel into or communicate with the core for economic purposes, principally work.

These result in a 'range' of options and our main aim is to know how sensitive city statistics are to the selection of one option in preference to another. We want to know whether 'the difference makes a difference'.

If for example it makes little or no difference, for example, whether the core is defined by employment, population, or building density, then we are relatively indifferent between the US (population-based) or GEMACA (employment-based) standard adopted. But since it makes a very significant difference what size of unit is used as 'building-blocks' to define the core (smaller units leading to significantly smaller city definitions) we are not indifferent to whether the specification is at least compatible with the US census-tract-based definition, or there will be a fundamental incompatibility between US and European city definitions which arises not from economic causes but from problems of measurement.

This is why we are involved in the BAK proposal because it will yield this essential information.

## The purpose of a comparative study

The purpose of a comparative study is not to immediately establish a new standard, but to provide the cities and the statistical agencies with the information they need, to judge the consequences of the standard chosen. Its function is therefore to study the effect of varying the criteria by which cities are defined.

The areas of variation which we are considering at present include:

(1) Whether the core is defined by population, job (or 'workplace') density, or some other criterion such as morphology

(2) What are the economic purposes of travel and communication (generally agreed to be work but some reports have considered consumption (for example event and shopping visits)

(3) What size units are appropriate to define the core

(4) What is the threshold density for the core

(5) What are the threshold densities for in- and out- commuting?

(6) What size units are appropriate to define the hinterland/commuting field?

(7) City-Regions: what criteria lead to the exclusion or separation of distinct conglomerations which fall statistically within the wider hinterland of a large metro area? In the case of London, for example, Watford, Harlow?

Initial research suggests that, as far as London is concerned:

(1) The size of its Functional Urban Region (FUR) is highly sensitive to the size of the 'building blocks' used to define its core

(2) FUR size is relatively insensitive to the choice between population or work density

(3) Although core size varies significantly with core threshold densities, FUR size itself varies by a relatively small magnitude over quite a large spectrum of densities

(4) We have not yet investigated the sensitivity of FUR size to commuting thresholds or to the inclusion of out-commuting; that is there may be 'building-blocks' close to the current delimited boundaries where there are 'commuter-sheds' and from which more commute to some other external core than commute to London

(5) FUR size is highly sensitive (for London) to whether the hinterland is composed of NUTS3 or NUTS4 building blocks. This is a significant problem since statutory Eurostat data is available only at NUTS3 level and these are generally accepted as being too large.

In the tables below we present the range of data derived from adopting varying definitions of the core density. This was produced for the purposes of a comparison with Paris on the basis of the GEMACA standard and this is why it is confined to density of workplace employment. Some of our previous work has considered cores based on the density of population: in the presentation we hope to bring together the two sets of definitions for comparison, as well as studying more carefully the effect of changing the size of the hinterland building blocks from NUTS4 to NUTS3.

**TABLE 2: EFFECT OF CHANGING CORE DENSITY THRESHOLD – SUMMARY TABLE**

| | Employment Density Threshold Level | | | | | |
|---|---|---|---|---|---|---|
| | **1000** | **1500** | **1813** | **2000** | **2500** | **Lowest/ Highest Density** |
| **LAU2** units in total FUR | 1,786 | 1,736 | 1,676 | 1,685 | 1,613 | 90% |
| Resident population of total FUR | 13,310,717 | 13,017,914 | 12,766,609 | 12,729,043 | 12,407,213 | 93% |
| Workplace population of total FUR | 6,653,364 | 6,495,638 | 6,388,281 | 6,349,001 | 6,197,473 | 93% |
| Geographic area (sq mi) | 5,230 | 4,913 | 4,757 | 4,716 | 4,355 | 83% |
| **LAU1 (NUTS4)** units enclosing FUR | 83 | 85 | 83 | 82 | 80 | 96% |
| Resident population of LAU1 units enclosing FUR | 12,645,988 | 12,868,188 | 12,660,293 | 12,454,272 | 12,255,906 | 97% |
| Workplace population of LAU1 units enclosing FUR | | | | | | |
| Geographic area (sq mi) | 4,578 | 4,263 | 4,103 | 4,019 | 3,732 | 82% |
| Number of **NUTS3** units enclosing FUR | 14 | 14 | 14 | 13 | 12 | 86% |
| Resident population of NUTS3 units enclosing FUR | 13,922,024 | 13,922,024 | 13,922,024 | 13,737,653 | 12,407,935 | 89% |
| Workplace population of NUTS3 units enclosing FUR | | | | | | |
| Geographic area (sq mi) | 5,855 | 5,855 | 5,855 | 5,838 | 4,470 | 76% |

**TABLE 3: DETAILS OF COMPONENTS OF FURS**

| CORE | | | | | | |
|---|---|---|---|---|---|---|
| Proportion of Total Population in Core | 60 | 57 | 54 | 52 | 45 | 76% |
| Proportion of Total Population in Hinterland | 40 | 43 | 46 | 48 | 55 | 136% |
| LAU2 units in core | 801 | 722 | 648 | 634 | 521 | 65% |
| Resident population of core | 7,958,285 | 7,398,129 | 6,944,252 | 6,667,240 | 5,617,435 | 71% |
| Workplace population of core | 4,278,575 | 4,112,970 | 3,958,464 | 3,885,234 | 3,505,256 | 82% |
| Geographic area (sq mi) | 698 | 583 | 514 | 478 | 360 | 52% |
| ENCLAVES | | | | | | |
| LAU2 units in core enclaves | 17 | 16 | 19 | 17 | 22 | 129% |
| Resident population of core enclaves | 100,005 | 176,569 | 199,691 | 172,928 | 236,787 | 237% |
| Workplace population of core enclaves | 21,346 | 35,509 | 36,904 | 31,151 | 50,806 | 238% |
| Geographic area (sq mi) | 29 | 32 | 29 | 22 | 30 | 103% |
| COMMUTING HINTERLAND | | | | | | |
| LAU2 units in commuting area | 935 | 953 | 964 | 980 | 1,017 | 109% |
| Resident population of commuting area | 5,055,000 | 5,266,575 | 5,453,724 | 5,650,236 | 6,336,820 | 125% |
| Workplace population of commuting area | 2,210,585 | 2,154,288 | 2,199,241 | 2,200,318 | 2,410,102 | 109% |
| Geographic area (sq mi) | 4,405 | 4,194 | 4,106 | 4,099 | 3,869 | 88% |
| COMMUTING HINTERLAND ENCLAVES | | | | | | |
| LAU2 units in commuting area enclaves | 50 | 61 | 64 | 71 | 75 | 150% |
| Resident population of commuting area enclaves | 297,432 | 353,210 | 368,633 | 411,567 | 452,958 | 152% |
| Workplace population of commuting area enclaves | 164,204 | 228,380 | 230,576 | 263,449 | 282,115 | 172% |
| Geographic area (sq mi) | 127 | 136 | 138 | 139 | 126 | 99% |

## Note: maps are available as a separate powerpoint document

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GAWC [http://www.lboro.ac.uk/gawc/] is the home page of the Globalisation and World Cities Study group (GAWC), a research project managed by the Geography Department at Loughborough University, contains much useful information and many valuable links.

[http://www.lboro.ac.uk/gawc/citylist.html] contains links to the official home pages run by most major world cities.