Chapter 10
Towards a List of Optimal Centrality Indicators

It may be useful now to consider in some detail the various national contributions towards a list of optimal centrality indicators, a twofold list that considers both the city effect and the urban overload.

As anticipated in Chapter 7, the list is built around a "core" set of indicators that each group was invited to apply, unless this proved to be impossible. In addition, other indicators have been proposed and applied to selections of urban settings.

It is useful to repeat that applications took place *at the current data availability conditions*. This means that levels of disaggregation or spatial units of reference reflect the statistical *status quo* that is far from optimal. We do hope that a future addition to the Actvill research could carry out the *testing of these indicators on the new territorial organisations*, presented in the second part.

This chapter is structured into five sections. Four are devoted to a brief report on the French, German, Italian and British contributions, aimed at stressing their most original and innovative characteristics. The fifth contains a tentatively synthesized final list, as well as recommendations for an appropriate system of territorial data collection at the European level.

1. France

As described in Chapter 8, the French working group has empirically validated a set of 79 indicators in order to produce a final list reduced by 50%. The 39 resulting indicators - city effect and overload indicators - are divided into three groups, concerning companies, households, and the state. These indicators are listed in **Table 10.1**.

1.1 Indicator Elaboration

The French paper, as already said, tries to connect indicator behaviour to city size and type of economic base. The distinction between indicators concerning companies and indicators concerning households is tied to the operational hypothesis that companies are the main beneficiaries of urban concentration and

suffer from overload less than households. Verification of this hypothesis was logically placed in the second part of the research.

Table 10.1: French City Effect and Overload Indicators

City Effect-Companies

Title	Composition	Comment
Amount of loans granted to companies	Urban population rate/Amount of loans granted to companies in FF/1,000 inhabitants	Value linked to urban population rate and perhaps to type of economic base
Access to TGV	Type of access (no connection, direct connection linked to low speed TGV, directly linked to high speed TGV)	Linked to urban unity size
Air passengers	Number of passengers in the airports in 1992	Linked to urban unity size, threshold effect
Part of international air traffic in total local traffic	Percentage	Linked to urban unity size. Not influenced by the presence of TGV
Doctoral candidates among students	Proportion of doctoral candidates among students	Linked to agglomeration size and to type of economic base
Doctoral candidates in the total population	Doctoral candidates/total population	Linked to agglomeration size and to type of economic base
Number of students in engineering schools	Total number of students in engineering schools	Linked to agglomeration size

Overload-Companies

Title	Composition	Comment
Local Company Tax rate	Medium local company tax rates	No apparent relation to urban unity size or type of economic base
Cost of leasing office space	Cost of leasing office space in main town of the urban unity	Partly linked to agglomeration size
Mass transportation taxes paid by companies		

City Effect-Households

Title	Composition	Comment
Civil associations	Urban population rate/ Number of civil associations created between 1975 and 1990/ 1000 inhabitants	Not linked to size but to type of economic base
Hospital beds	Number of hospital beds/1000 inhabitants	
Surgical services	Number of beds in surgical services/1000 inhabitants	
Public transportation: average speed	Commercial speed of buses, streetcars and subways (km/h)	Bell curve with an optimum for agglomerations like Nantes
Public transports: number of km	No of passengers/number of km	Linked to the size of the urban unity, threshold effect
Public transportation: closing time		Linked to the size of the urban unity, threshold effect
Level of services and facilities	Presence of superior urban services and facilities among a selected list of 20	Linked to agglomeration size. Perhaps a threshold for 500,000 inhabitants
Doctors	Number of doctors/1000 inhabitants	Linked to agglomeration size
Specialised doctors	Number of specialised doctors/1000 inhabitants	Linked to agglomeration size
Proportion of students in the population	Percentage	Linked to type of economic base
Movie theatre equipment	Number of movie theaters/1000 inhabitants	Linked to agglomeration size and to economic base
Movie theatre attendance	Number of tickets sold per year per inhabitant	Linked to agglomeration size and to economic base

Overload - Households

Title	Composition	Comment
Average household local tax rate		No apparent relation to urban population rate
Public subsidies for mass transportation deficit and for subsidised fares for		Linked to the urban unity size and to type of economic base

certain segments of population		
Minimum welfare revenue	Number of people receiving the minimum welfare revenue/1000 inhabitants	Partly linked to urban population rate or type of economic base
Drug use and dealing	Number of arrests for drug addiction or dealing/1000 inhabitants	Partly linked to urban population rate
Drug use and dealing	Same as above, department scale	
Crime rate	Number of established facts (including all criminal offences)/1000 inhabitants	Linked to urban population rate
Cost of renting a flat in town centre		Partly linked to agglomeration size
Price of improved land for single family home		Linked to agglomeration size
Number of violent deaths among young women (15-24)	Per 100,000 inhabitants/year between 1988 and 1990	Linked to urban population rate
Number of violent deaths among young men (14-24)	Per 100,000 inhabitants/year between 1988 and 1990	Linked to urban population rate
Number of AIDS cases diagnosed in 1990	Per 100,000 inhabitants	Linked to urban population rate
Number of AIDS cases diagnosed between 1978 and 1990	Per 100,000 inhabitants	Linked to urban population rate

State Indicators

Title	Composition	Comment
Annual medium household income		Linked to urban population rate and to economic base.
Unemployment rate		Linked to urban population rate with a U shape curve. Also liked to economic base.
Population density	Number of inhab./km2	Linked to agglomeration size
Annual population variation due to migrations (1982-1990)		U shaped curve linked to agglomeration size. Perhaps also linked to

		economic base.
Unemployment	Unemployed active/Active population 1990	Higher in industrial cities

2. Germany

Two sets of indicators have been used by the German working group. One, more extended, was applied to a sample of 116 cities. On the basis of 39 of these indicators, eight indexes were constructed: three of city effect and five of the load dimension. They have then originated comprehensive city effect and urban load indexes.

The second, a shorter selection, was applied to the five case studies dealt with in a mainly qualitative way. The extended list can be found on page 54 of the German Final Report (PSC (1996), vol. II-B, Germany). We reproduce here the eight indexes and the selected list.

2.1 City Effect Indexes

a) Economic power index

- average monthly purchasing power per habitant
- gross value added per employee (secondary sector)
- gross value added per employee (tertiary sector)
- annual sales volume per employee (secondary sector)
- annual sales volume per employee (retail trade)
- number of employees per square km. of built-up area
- total net communal tax revenue per inhabitant

b) Service accessibility index

- number of retail shops per 10,000 inhabitants
- number of medical specialists per 10,000 inhabitants
- number of apprenticeships per 100 demanders
- number of seats in theatres and cinemas per 10,000 inhabitants
- number of books in public libraries per inhabitant
- annual number of adult evening classes per 10,000 inhabitants
- number of high and Waldorf schools per 10,000 inhabitants aged between 15 and 20 years
- number of further training courses for 10,000 employees

c) Cultural diversity index

- number of theatre performances

- number of museums
- number of public libraries

2.2 Urban Load Indexes

a) Environmental load index

- annual NOx emissions per ha built-up area (industry + households)
- car traffic emissions (NOx) on inner-city roads per ha built-up area
- annual SO2 emissions per ha built-up area (industry + households)
- proportion of built-up area
- green spaces (sq. m.) per inhabitant

b) Price level index

- real estate prices (DM/sq. m.)
- cost of living index
- average housing rent (DM/sq. m.)

c) Housing problems index

- housing space (sq. m.) per inhabitant
- number of residents per room
- share of dwellings with number of residents higher than number of rooms
- share of dwellings without bathroom or toilet

d) Social problems index

- income support rate
- unemployment rate
- proportion of long-term unemployment
- reported offences per 1000 inhabitants
- divorce ratio

e) Commuting duration, road congestion and accidents

- percentage of in-commuters with one-way commuting time more than one hour (as a percentage of all commuters)
- annual traffic volume (in units of 1000 km) per ha. inner-city roads
- annual number of accidents per ha. inner-city roads
- proportion of accidents with personal injuries

2.3 Selected City Effect Indicators

- gross value added per employee (DM)
- proportion of employees in the tertiary sector (%)
- retail selling area (sq. m.) per inhabitant
- total net communal tax revenue per inhabitant (DM)
- average monthly purchasing power per inhabitant (DM)
- number of applications for firm birth loans of the European Recovery Programme per 10,000 inhabitants
- annual number of adult evening classes per 10,000 inhabitants
- number of students per place at university
- number of medical specialists per 10,000 inhabitants
- number of seats in theatres and cinemas per 10,000 inhabitants
- proportion of population with high-school diploma (%)
- average time needed to reach the nearest 3 agglomeration centres (min)
- average time needed to reach an international airport (min)

2.4 Selected Urban Load Indicators[1]

- unemployment ratio
- proportion of long-term unemployment (longer than a year) (%)
- income support rate (%)
- reported offences (except larcenies) per 1000 inhabitants
- reported larcenies per 1000 inhabitants
- housing space (sq. m.) per inhabitant
- average housing rent (DM/sq. m.)
- annual NOx emissions in t per sq. km. built-up area (industry + households)
- annual SO2 emissions in t per sq. km. built-up area (industry + households)
- annual traffic volume (in units of 1000 km) per ha inner-city roads
- percentage of in-commuting pupils, students and apprentices with one-way commuting time of more than one hour
- average life expectancy (women)
- average life expectancy (men)
- general fertility rate (per mil.)
- voter turnout in Federal parliament election (%)

2.5 Indicator Elaboration

[1] The German Report explains the preference for 'load' rather than 'overload' in these terms: "We use the term 'urban load' instead of 'urban overload' because overload is subject to valuation rather than description. What makes urban load become 'overload' is a conceptual and empirical question and a subject of policy, which has to be addressed to the strategy part of the project."

We concentrate in this section on the work done with the construction of indexes, that is the quantitative part of the study, since the qualitative part combines the use of a selected list of indicators with a relevant amount of interviews and other data. First, urban scale has been correlated with city effect and load indexes, as in **Table 10.2**.

Table 10.2: Correlation of Urban Scale with City Effect and Load Indexes[1]

	r with net urban population[2]	r with net urban population density
	n=92	n=92
Indexes of City Effect		
Economic Power	.45**	.71**
Service Accessibility	-.25*	.21*
Cultural Diversity	.89**	.59**
Indexes of Urban Load		
Environmental Load	.55**	.58**
Traffic Congestion, Commuting Load & Accidents	.85**	.68**
Price Level	.59**	.59**
Housing Problems	.36**	.35**
Social Problems	.57**	.15
Comprehensive Indexes		
City Effect	.61**	.73**
Urban Load	.81**	.67**
Net Benefits	-.19	.05
*significant correlation at the 0.05 level **significant correlation at the 0.01 level [1]Pearson correlation coefficients [2]Logarithmic transformation		

The German report shows, through an interesting series of scatterplots and maps, how indexes behave in the different cities considered (pages 89-108).

The importance of urban scale for the degree of **Economic power** is illustrated by these scatterplots. For **Service accessibility,** instead there is a general tendency of rising index values (which implies better supply) in smaller city size classes. For the **Cultural diversity index**, mappings indicate the dominant influence of urban scale on the number of cultural facilities. The **Environmental load index** mirrors the increment of environmental load with increasing city size, although the largest cities do not have the highest values nation-wide. The impacts of urban scale on the **Price level index** are clear, but there is comparatively large variance between cities of similar size. There is a slight tendency for worse housing

conditions (**Housing problems index)** in larger cities, but the correlation is relatively weak. The shape of **Social problems index** is clearly affected by urban scale, but it is rather difficult to work out a distinct pattern. The **Road congestion index** turns out to be largely determined by urban scale.

3. Italy

As mentioned in the previous chapter, the Italian working group carried out an extensive quantitative investigation of 58 cities, and a qualitative study of five cases.

3.1 City Effect Indicators

In both respects, the *city effect indicator* applied contains three kinds of elements:

a) Positive externalities stemming from the interaction between the economic and physical environment. In this area, the chosen indicators are:

- per capita use of energy;
- per capita use of petrol;
- per capita use of water.

b) Positive externalities stemming from the interaction between the economic and the social environment. In this area, the chosen indicators are:

- the share of people holding a university degree with respect to urban population;
- the number of schools with respect to urban population;
- the number of bank branches with respect to urban population;
- the supply of urban services with respect to urban population;[2]
- the price of new houses per sq. m. in cities.[3]

c) Positive externalities stemming from the interaction between the physical and the social environment. In this area, the chosen indicator is:

- per capita sq. m. of green areas in cities.

[2] In this case, the available information is rather the number of people using public services, i.e. the demand, which is used as a proxy for the supply. This latter data is in fact unavailable.

[3] In micro-economic terms, this is generally regarded as a cost. The adopted approach, instead, is a macro-urban approach, where urban rent is assumed as a proxy for urban economics and well-being of inhabitants, as it reflects income and economic wealth within the city.

The general city effect indicator is calculated as the sum of the different indexes obtained.

3.2 Urban Overload Indicators

The *urban overload indicator* takes into account the negative aspects of the interaction between the three environments, namely:

a) Negative externalities stemming from the interaction between the economic and physical environment. The chosen indicators are:

- per capita NOx emissions;
- per capita Kg of urban waste;
- number of vehicles per km2.

b) Negative externalities stemming from the interaction between the economic and the social environment. In this area, the chosen indicator is:

- the unemployment of urban population.

c) Negative externalities stemming from the interaction between the physical and the social environment. In this area, the chosen indicator is:

- the number of crimes with respect to urban population.

Also in this case, the overall indicator is the sum of the different indicator, each divided by its maximum before being aggregated.

As independent variables, two additional indicators have been considered, one referring to high order economic functions developed in the city, and the other to the level of network integration of the city with the rest of the world:

- the share of private tertiary value-adding produced by the city;
- number of telephone subscribers in each city.

3.3 Indicator Elaboration

As already mentioned, the results obtained by applying the indicators to 58 Italian cities, "are perfectly in line with the abstract interpretation of the optimal urban size theory: in fact the curves are "well behaving", showing a city-effect which increases with urban size up to a certain point (approximately 361,000 inhabitants) and then decreases".

For what concerns the city effect, in fact, the results show the possibility to exploit:

– economies of scale which exist for public services (like schools, public transport, banks), but also environmental resources, like water, petrol and energy use;
– indivisibility of public services in general, since the larger the city, the greater the possibility to exploit a critical mass of users.

The city effect, however, is exploited up to a certain level of urban size, after which its slope becomes negative; the traditional expected congestion effects and diseconomies of scale prevail in large cities.

A city can exploit increasing returns to scale if a minimum level of high order functions is present in the city. This threshold has been estimated around 49% of private tertiary activities on the total of urban activities.

As far as overload effect is concerned, our results show a decreasing trend up to a certain urban size (approximately 55,000 inhabitants), and an increasing trend afterwards, in line with the traditional expectations once again. Two elements may generate this trend:

– in small cities, an economic and territorial effect;
– in large cities, a negative environmental effect.

4. United Kingdom

The British group selected 45 indicators for the measurement of city effect and overload in the sample of 5 cities described in Chapter 8. They are 24 city effect and 21 overload indicators, summarised in **Table 10.3**.

Table 10.3: British City Effect and Overload Indicators

City Effect

Title	Composition	*Comment*
Population and density within commuting catchment area	Population total in TTWA and number of people per unit area	TTWA (Travel to work area) is ideally the space in which commuting takes place between home and workplace
GDP per capita	GDP per head calculated by applying regional employment by industry to TTWA employment by industry, redistributing total GNP produced to total population	Employment data related to employed persons; excludes self-employed (around 12% of workforce)

Household income	Relevant county household income per head indexes applied to corresponding districts in TTWA	Not an exact fit with TTWA
Proportion of affluent population	Population in socio-economic groups I and II as a proportion of total economically active population	A relatively crude measure of income groups based on a simple and increasingly archaic classification
Conference facilities	Population per venue that seats 200 or more people	Proxy measure for "Venues for international conferences"
Headquarters location	Number of trading premises (headquarters sites) of commercial companies located in the area relative to population size	Gives and indication of the number of substantial companies in an area (those with turnover of more than £20 million)
Economic activity	Number of economically active as a proportion of total population aged 16+	A measure of level of economic activity
New firm formation	Index of firms registering for VAT purposes weighted by population versus national average	A surrogate for the level of entrepreneurial activity
R&D employment	Number employed in R&D sector relative to employed population	Relative level of technological development and entrepreneurialism
Tertiary sector	Number of people employed in the tertiary sector as a proportion of employed population	Weight of the tertiary sector

Workers in the art market	Number relative to employed population	
Retail catchment	Floor space in retail centres per head of population	All shopping centres containing over 50 multiples (chain stores) are covered by data collected on a regular basis
Service levels	Incidence of various providers of services relative to number predicted on the basis of resident population	Weight of the service sector
Night time entertainment	Number of night clubs and discos relative to population	
Live performance venues	Number of seats relative to total population	Surrogate for the number of significant live performances
CAT scanner availability	Average number of population per scanner available	
Hospital bed availability	Number of hospital beds relative to the resident population	
Access to education services	Percentage of pupils under five in nursery and primary schools and classes	Data refers to the direct state provision
Provision of open space	People per hectare of open space	
In-migration	Proportion of population in-migrated from a neighbouring county or from further away over the previous year	The measure is not ideal as the county definition overstates migration where the TTWA extends over more than one county
University Graduates	Graduates as proportion of the population	
Ethnic diversity	Proportion of ethnic population (those identifying themselves in non European categories) relative to the national	This indicator is as much a measure of deprivation (i.e. overload) as the opportunities (i.e. city effect)

	average	

Overload

Title	**Composition**	***Comment***
Air pollution	Parts per billion of NO2	NO2 is the most significant air pollutant, because of its known effect on human health and the environment
Distance of travel to work	Median distance in km by rail, bus and car for each city	
Traffic speeds	Average traffic speeds as measured by a comprehensive survey of the traffic network in 24 towns and cities in the UK	
Derelict land	Amount of derelict land	Excludes land derelict for natural causes, land still in recognised use, land damaged by development but now in some acceptable use, and sites designated for development
Prime rents for the main commercial property types (offices, industrial buildings, and retail property)	£ per square meter, constructed into an index for each property type, with a summary composite index	
Cost of living	Income needed to meet a set standard of living	
House prices	Local average house prices in relation to the national average	
Overcrowding	The number of people living in households with more than one person per room as a proportion of total population	
Concealed families	Number of 'concealed'	Measure of actual housing

	families (by enforced cohabitation with other households) as a proportion of the total number of households	need
Degree of absolute deprivation	The number of people lacking a 'home' per 1000 of population	The extreme degree of housing need as indirect indicator of absolute deprivation
Unemployment	Unemployment as a proportion of total workforce	
Long term unemployment	Those unemployed for longer than 52 weeks as a proportion of the total population	
Single person household	Number of single person households as a proportion of all households	
One parent households	Number of households with children but only one parent as a proportion of all households	
Fertility rate	Total period fertility rate	
Total criminal offences	Number of notifiable offences per 1000 of the population	A large proportion of crime is not reported to the police
Unsolved crimes	The clear up rate for total of all crimes expressed as a percentage	
Violent crimes	Total reported violent crimes per 1000 of the population	Excludes sexual offences and robberies
Mental illness	Number of people treated for mental illness as a proportion of the total population	
Long term illness	Number of people suffering from long term illness as a proportion of the total population	
Standardised mortality rates		This is a good summary indicator of a whole range

		of conditions contributing to 'unequal life chances'
Waiting time for surgery	Average waiting time in months until surgery is undertaken	Day surgery not included
Delay before criminal trial	Average number of weeks between committal and trial	

4.1 Indicator Elaboration

"For each indicator," explains the British report, "the cities have been ranked according to their performance; the ranking being highest for the city which has the strongest (i.e. largest) effect ...

"We have examined the indicators for the purposes of extracting those that rank the cities in the expected way in relation to indicators of city effect and overload, and for these indicators attempt to set thresholds .... We have classified these indicators as either "primary" or "secondary" dependent on the strength of the association."

4.2 City Effect Indicators

a) Primary indicators

- *Population density:* the relationship between population density and city size is evident. Whilst it may therefore be assumed that the greater the population density the greater the city effect (as such a population will support a greater array and quantity of service provision), a caveat exists; namely, that the consumption patterns of the residents are clearly related to income. Density and income both, therefore, contribute to city effect.
- *Ethnic diversity:* there is a certain difficulty with this indicator since it is closely associated with deprivation and could therefore be considered a contributor to overload, whilst its contribution to the cultural mix of the city is a positive aspect.
- *Educational provision for those under 5:* the indicator does correlate with city size.

b) Secondary indicators

- *Retail catchment:* the larger cities show a greater amount of retail floor space per head of population. This implies that the smaller cities are therefore effectively under provided for in terms of retail floor space.

4.3 Overload Indicators

a) Primary indicators

- *Cost of living:* this shows a correlation with city size, and the ranking of the cities is not the same as for household incomes, which does suggest that size is a factor in expense.
- *Single person households:* the fit with city size can be considered in two ways, namely, the attractiveness of the city to single people (choice) or the lack of choice about locating elsewhere (for instance due to high housing costs); this indicator should therefore be treated with some caution.
- *Fertility rate:* this clearly has a correlation with deprivation and is therefore a good indicator of a range of factors contributing to social stress.
- *Single parent households:* there is a correlation between this indicator and others of deprivation.

b) Secondary indicators

- *Air pollution (NO2 levels):* there does appear to be some correlation with city size, as a function of the amount of downtown traffic.
- *Overcrowding:* a further indicator related to levels of deprivation, housing stress, etc.

5. City Effect and Urban Overloading: A Proposed List of Indicators and Standards

We have already mentioned, in various parts of this book, that the Actvill research program used a remarkable amount of diverse approaches and methodologies in different national contexts (which entails even a diversity in statistical sources and the available data) to test feasible city effect and urban overloading indicators.

We also said that, despite the variety, in each of the studied cases we adopted roughly a “basic” set of indicators that, where necessary, have been adjusted to fit to the existing data systems.

It is therefore not difficult to brew, from this enquiry, an ideal list of indicators which we suggest to apply on a European scale. Such an application is still strongly experimental, but could represent a useful starting point for measuring city effect and urban overloading that, as we have seen, are relevant for defining optimal centrality.

This proposal therefore is not immediately operational: quite the opposite. We are in no way suggesting to use the two lists of indicators to support centrality re-distribution policies. We only propose that they are tested on a larger scale than in the present study, they are revised on the basis of the tests, and therefore they could contribute to questioning the statistical sources currently available on the European and national scales.

The element that the proposed list already highlights clearly - even in the initial state of the art permitted by this study -, is the question of reference parameters or standards, to couple each indicator.

Working in a decision-structured context and searching for appropriate territorial dimensions both qualify and make this endeavour harder, for quite patent reasons. In fact, looking for *optimality* within specific *territorial* limits - in the process of being designed - one is precluded from merely "incremental" solutions (i.e.: the higher the number of public libraries the better, or the higher the number of specialised doctors per head of population the better, etc.), because these are generally at the root of *overload* phenomena, since they attract additional load of population from less served areas.

In only one case - that of the air pollution indicator, expressed in concentration of NO2 - could we refer to a precise and dedicated European Union standard. In all the other cases we had to cope with the lack of established standards. This caused quite a problem for which we needed to find an operational solution. As a result, we tried to bridge the gap in a way we do not think altogether satisfactory, by means of alternative values obtained from various sources.

This "second best" solution is mainly based on:

- *ex post* thresholds, like those elaborated by the team headed by R. Camagni;
- the use of mean (national mean or sample mean) value as reference value;[4]
- the use of the minimum values empirically obtained by applying indicators in the study of overload as a reference value (e.g. the minimum value recorded for "Number of reported offences per 1,000 of population");
- the use of values obtained by cities that the report results show to be well balanced;
- reference values found in literature for similar indicators.

In order to specify the sources, we indicated in parenthesis the national study from which the suggested reference value is drawn.

The following table, **Table 10.4**, presents the proposed list of city effect indicators and standards and overload indicators and acceptable thresholds.

Table 10.4 City Effect Indicators and Standards, and Overload Indicators and Acceptable Thresholds

City Effect Indicators

Indicator	Reference Value	Comment

[4] A further clarification is needed on this choice. We are aware of the deep difference between *normative standards and average values*: whereas the first convey a decision-oriented approach, characterised by the will to modify the existing situation, the second only record the status quo. However, in half the cases we had to resort to average values, and in another 11 cases of the 36, to the “best value” we could draw from our applications.

Population density	10.5 persons per hectare	Average value in the 5 sample cities, short of external standards (UK)
Demographic dimension	361,000 inhabitants (higher thresholds if tertiary activity is more than 49%)	City Effect increases with urban size up to a certain point (361,000 inhabitants) and then decreases. Higher threshold if tertiary activity is more than 49%. (Italy)
Headquarters location: number of trading premises (headquarter sites of companies located in the area with turnover of more than £20 million relative to population size)	4800 persons per company	Average value in the 5 sample cities, short of external standards (UK)
New firm formation	0.003 registrations per head of population	A surrogate for the level of entrepreneurial activity. Average value in the 5 sample cities, short of external standards (UK)
Number of applications for firm birth loans	23 per 10,000 heads of population	Average value, short of external standards (Germany)
Level of employment in the tertiary sector	Over 75%	Average national value (UK)
R&D Employment	10 per 100 heads of population	Relative level of technological development and entrepreneurship. Average value in the 5 sample cities (UK)
Occupation in the art market	13 per 10,000 heads of population	Average value in the 5 sample cities (UK)
Art galleries	33,400 persons per service unit	Value of the urban system used as exemplary (Italy)
Share of population that can reach the following facilities within 10 minutes (%):		Best value for cities over 500,000 inhabitants (Germany)
Retail shop/supermarket	over 90%	
Physician	88.1%	
School	over 80%	
Kindergarten	over 75%	

Public transport connection Pub Park	99% over 95% over 85%	
Retail sales area	over 1.5 sq. m. per inhabitant	National mean (Germany)
Night time entertainment	One unit every 30,000 inhabitants	Average value (UK)
Number of seats in performance venues	22.24 seats per 1,000 population	Average value in the 5 sample cities (UK)
Seats in cinemas and theatres	20 per 1,000 inhabitants	Average value (Germany)
Average time to reach an international airport	50 minutes	Average value (Germany)
Public transportation closing time	01:15	Best time (France)
Number of beds in surgical services	2.8 per 1,000 population	Best value (France)
Medical specialists	17 per 10,000 inhabitants	Average value (France)
CAT scanners availability	1 per 150,000 inhabitants	Average value in the 5 sample cities (UK)
Percentage of pupils under five in nursery and primary schools and classes	100%	Theoretical value (UK)
Provision of open space	300 persons per hectare open space	Average value (UK)
Herbalists	One per 180,000 persons	Average value (UK)

Overload indicators

Indicator	**Reference Value**	**Comment**
Demographic dimension	55,000	Urban overload effect shows an increasing trend over this value (Italy)
Degree of concentration of N02	30 parts per billion (ppb)	EU standard
Public transportation average speed:		
peak	15.45 m.p.h.	Best value (UK)
off peak	19.22 m.p.h.	Best value (UK)
Share of derelict land	0.3%	Lowest value in the sample (UK)
Unemployment rate	10.6%	National mean (Germany)
Proportion of long term	32%	National mean (Germany)

unemployment		
Income support rate	5.9%	National mean (Germany)
Reported offences (except larcenies)	42 every 1,000 inhabitants	National mean (Germany)
Reported larcenies	62 every 1,000 inhabitants	National mean (Germany)
Violent crimes per 1,000 inhabitants	3.5	Best value (UK)
Waiting time for surgery	3.2 months	Best value (UK)
Delay before criminal trial	11.9 weeks	Best value (UK)
Maximum travelling time between any two points within the metropolitan area	80 minutes	Theoretical threshold (Italy)