

## London and Paris

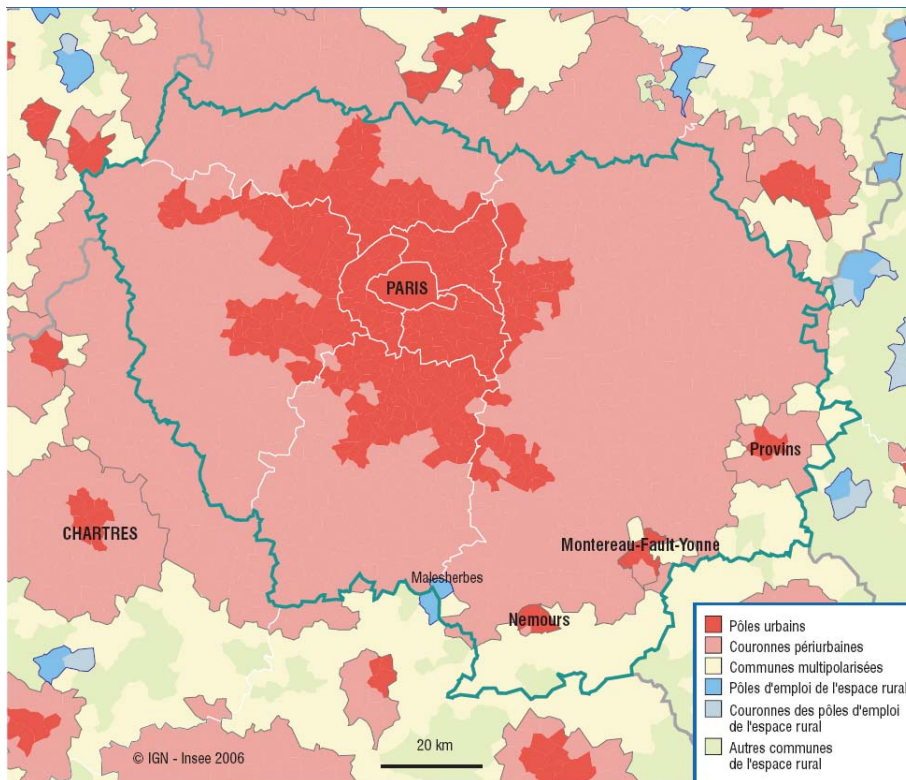
London and Paris are two of the three largest European megacities, the third (and largest) being Moscow.

### General presentation

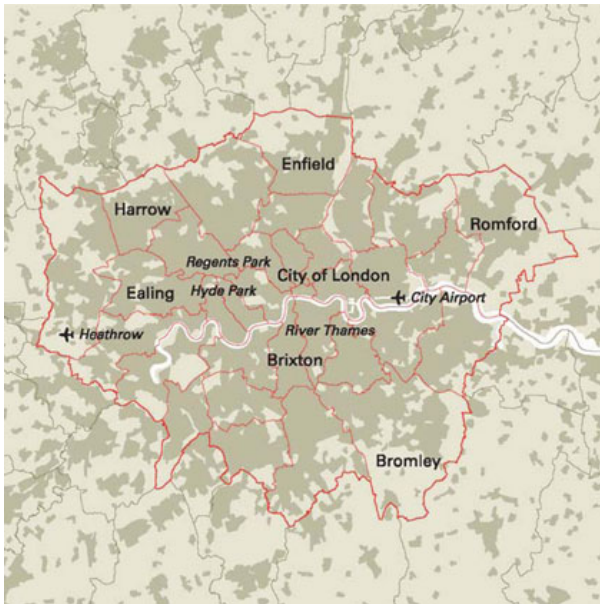
These cities are capitals of relatively large and very wealthy countries, meaning notably that they have very good connections either by road, by train, by ship or barges (both are located on navigable rivers), by oil or gas pipelines, by strong electricity networks, and by plane with the rest of the country and the rest of the world.

They have a similar climate: average January temperatures 3-4 °C (but some winters have been much colder, and more so in Paris), average July temperatures 17 to 19 °C, making air-conditioning unnecessary for dwellings (at least for the time being, and for “normal” years).

London and Paris are two small megacities: according to UN numbers (2005) the agglomeration of Paris has 9.8 million inhabitants and the London agglomeration 8.5 million inhabitants (according to the same numbers the agglomeration of Tokyo has more than 35 million inhabitants) (note that for London, the figure represents more than the Greater London Area, (7,5 millions), it represents the urban area, slightly larger (1623 km<sup>2</sup> instead of 1573km<sup>2</sup>)



**Figure 1 Paris agglomeration is here in red. The green line represents the Île de France region (12 000 km<sup>2</sup>). Paris city is in the centre. 2773 square kms for the agglomeration. Insee, 2006.**



**Figure 2: Greater London Area with some of the boroughs mentioned, 1572 square km, source: Urban age**

The shapes and densities of the two agglomerations are somewhat different:

The shape of the agglomeration of London is more or less “potato-like” (within the M25 ring highway) reaching up to some 35 km from the City as the agglomeration of Paris is more or less “octopus-like” with “tentacles” as far as 50 km from downtown Paris; the density of the Paris agglomeration is around 3500 inhabitants/km<sup>2</sup>; London’s density is some 30% higher. (4700 in/km<sup>2</sup>)

### Demography.

#### Population growth.

In Île de France, the average population growth between 2005 and 2009 was about +0,6% per year. The growth projection are +0,35% per year between 2005 and 2030 (tendancies), explained by natural change which will be more important than the migration deficit. (Insee, 2006)

In Greater London, growth average between 2002 and 2006 was 0,54%<sup>1</sup>(Office for national statistics, 2008). Between 2001 and 2016, projections are an average of +0,6% per year (Greater London Authority, 2005).

Fertility rates are similar: 1.98 in 2004 for Ile de France (Insee). 1.91 in 2007 for Greater London (Demographic review, 2007).

### Migration

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<sup>1</sup> 2003-2004: +0,34, 2004-2005 +0,9% 2005-2006 +0,75, 2002-2003 Greater London Area + 0,2%

In 2007, 163.6 thousand persons moved to London and 246.3 thousand left London for other UK destinations. This is a net loss of 82.7 thousand. International migration compensates this with an inflow of 162 thousand and an outflow of 92 thousand, ie **a net inflow of 70 thousand** (2007). Then the total of migration is - **12 thousand** (Greater London Demographic Review 2007).

For the past 15 years, annual average was 113 000 coming from other regions to Ile de France, (but as Ile de France territory is much larger, small movements are considered like internal movements and not counted whereas they are in the Greater London area since small migration leave more easily the territory), and 198 000 people left Ile de France. Then there is a net loss of - 85 000 per year for internal migration. International migration partly compensates this, for the past 15 years, annual average was 70 000 people coming, (half were French), and 33 000 people leaving France. The total was **-48 thousand** due to migration (Insee, 2009).

**The two cities have very similar demographic features. Concerning migration, there are more movements in London (which could be explained by the difference in the size of the areas), but the phenomenon are the same relatively. It is worth noting that the megacities have negative inflow of migration, they do not attract more people than thus leaving. Fertility rate are slightly lower than in their respective country and very close, growth are currently the same but projections are higher for London.**

### Population ageing

Ile de France. In 2030, if past 15 years trends continue, Ile de France population would be 12 780 thousand, 1,250 thousand more than in 2006. On this 1,250 thousand, **3/4 would be over 60 years old.**

Population over 60 share would **increase from 16% in 2006 to 22% in 2030.** This ageing would be slower than in France, where the over 60 share would increase from 22% to 31% between 2006 and 2030. It is explained by migration: old people and family move to the province whereas young adults come (international or national migration). Without migration population ageing would be two times quicker. (Insee, IAU, 2009)

London is expected to grow by 800 thousand people (11%) between 2001 and 2016. The majority of this increase is in the working ages, which will grow by 660k (13%) with much of this total being an aging of the working population as the large birth cohorts of the late 1950s and 1960s reach their 40s and 50s. The population in their 30s changes very little. The school age population will also grow by 100 thousand (13%) and the pre-school population by 90 thousand (18%) but it is anticipated that **the population over 65 will decline by 50 thousand (6%).**

In London, population over 60 represented 16% in 2001 and will represent 14.4% in 2016. "London is most different to the UK in respect of its future population structure in terms of

the elderly: the rest of the UK is expected to see significant growth of the retired population and rather more modest growth of children.” (Greater London Authority, 2005)

**London and Paris do not expect the same evolution of the population age even if they currently share the same figures. London expects to keep attracting more young people to decrease the population ageing.**

## Economy

Both Ile de France and Greater London area are key for the economy of France and UK, they represent respectively  $\frac{1}{4}$  and  $\frac{1}{6}$  of national GDP.

Both London and Ile de France strongly concentrate wealth: in 2008 in Île de France, GDP per employed person was 98,700 euros and per inhabitant, 47,150, whereas in France it was only 76,000 and 30,700<sup>2</sup>. For Greater London, GDP in 2006 (London economic outlook 2007) was 200 billions L, (7.5 million inhabitants): 26,600L/ inhabitant whereas it is 19,300 for UK<sup>3</sup>.

Concerning growth, the situation is quite different between the two cities: between 1990 and 2008, Ile de France average growth was 1.86 % per year whereas it was 1.98 % in France (Insee, real GDP, base year 2000); in GLA, average GDP growth (real GDP, 2005 base year) between 1990 and 2008 was about 2.46<sup>4</sup> whereas it was 2.07 for UK (UK Statistics)

Even if Ile de France is still the main economic region, between 1990 and 2008 it seems that it was not the fast growing region, it maybe explained by a catching up phenomenon between French regions, pushed by national public policy during last decades.

The fact that London is more dynamic than IDF motivated the Grand Paris project, from the French central government. The aim of this project is stimulate growth through the creation of clusters in periphery of Paris, concentrating firms, research centres and universities, and of an ambitious mass transit system able to link these clusters.

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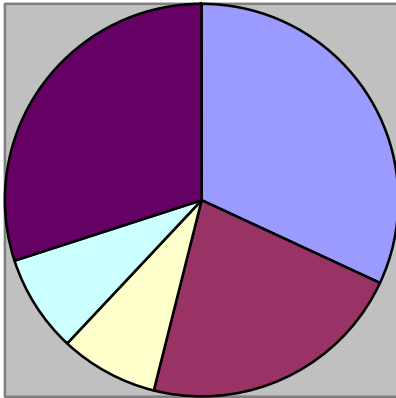
<sup>2</sup> See Annex, Insee, Comptes régionaux, 2008.

<sup>3</sup> References: GDP L 1157 billions for UK in 2006 (World economic outlook, IMF), Mid-2006 population Estimates, United Kingdom, estimated resident population by single year of age and sex

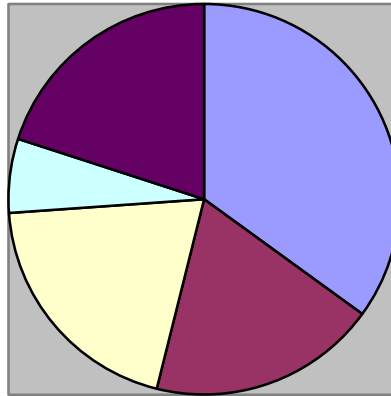
<sup>4</sup> calculus from London Economic Outlook 2007 datas

## Major economic activities

Figure 3 : Major economic activities



Paris 2007, IAU,  
Emplois et  
territoires, (2009)



For London and Paris, business activities and finance are the major economic activities. Industry is more important in Ile de France; it could be partly explained by the lower density of its periphery, favourable to this kind of activity.

### Energy consumption and CO2 emissions

Since no data is available for the agglomeration of Paris, figures are for Région Ile de France.

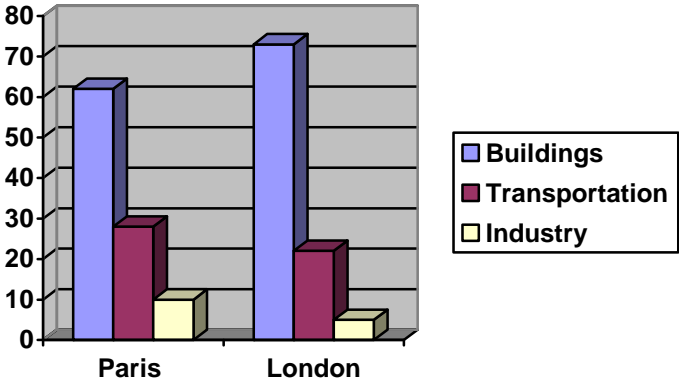


Figure 4 : Energy consumption by sector (2005) Final energy (excluding aviation)

Considering energy, buildings sector (housing, commercial) represents biggest share of energy consumption in the two cities, reflecting the predominance of business sector in economy. Transportation represents quite a small share, it shows the relative good performance of public transport in these two megacities.

Considering emissions the share are somewhat different, mostly because of the low carbon energy mix of France (some 90% of the electricity being carbon-free, this electricity being used mainly in buildings) and because natural gas, which is used only in stationary uses, has a lower CO2 emission factor than oil products. As result, transportation is a very important emitter in Ile de France.

In London, the building sector represents 70% of the emissions and is therefore the priority for mitigation efforts. In Paris, both buildings and transportation are important. The modal shares confirms this fact, public transports represent 36% in Greater London and only 20% in Île de France.

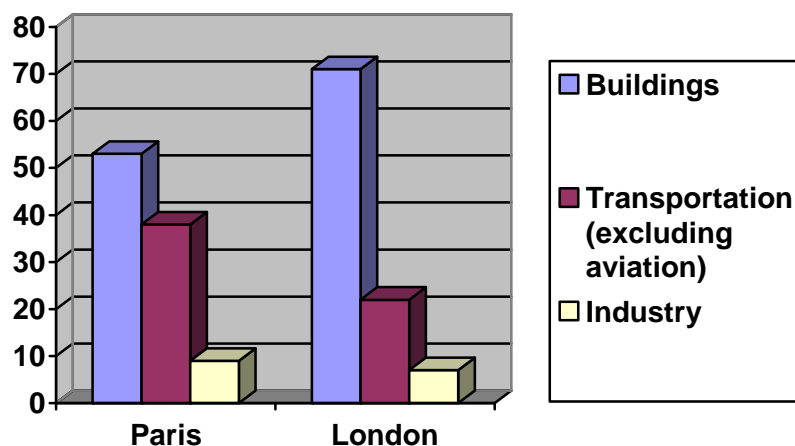


Figure 5 : CO2 emissions per sector (2005, 2006)

In both cases, energy consumption and CO2 emissions per capita (excluding aviation) are lower than the national average. This is due to the high density of these agglomerations, and to the absence, or quasi-absence, of energy-intensive industries (hence, the share of industry in energy consumption and energy-related CO2 emissions is also lower than average). The difference of per capita emissions is explained by the difference of electricity generation mix: 90g/kWh in France and 500 g/kWh in UK<sup>5</sup>.

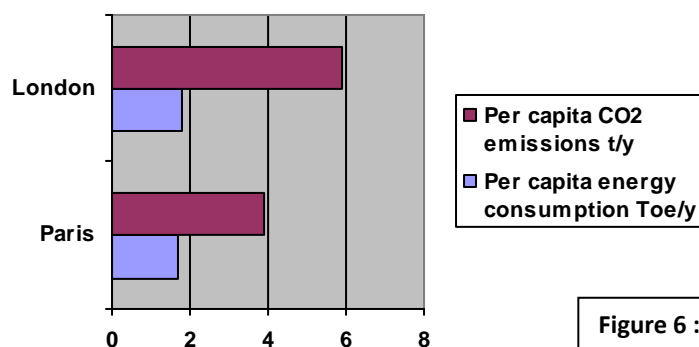


Figure 6 : Per capita comparison (excluding aviation) (2005,2006)

In our charts, aviation emissions and consumption are excluded since currently cities do not have many local policy levels to make them decrease. Yet, it is worth noting that in Paris 5 Mtoe are consumed for aviation, for a total of 25Mtoe and that 58 per cent of aviation energy is consumed by Paris inhabitants and then could be took into account. For the greater London area, energy consumption in 2005 amounts to some 21.5 Mtoe, of which

<sup>5</sup> Figures for 2007, reference: IEA-CO2 emissions from fuel combustion 2009-Highlights

some 8 Mtoe for aviation (the difference between London and Paris for this last number is directly linked to different traffic levels: all in all, London airports have a traffic 50% higher than Paris airports; it has to be noted that energy consumption due to aviation is heavily concentrated in the airports of the capitals of both countries: some 2/3 of UK's traffic, some ¾ of France's traffic).

### **Problems linked to energy**

We can say that specific problems of security of supply do not occur in these cities.

A main local problem is linked to the poverty of a significant part of the population; this is especially true in the agglomeration of Paris , where there is still a large number of poorly insulated dwellings, heated with fuel-oil (which is more expensive than natural gas) or with electricity, which is even more expensive. If these dwellings are far away from public transportation, which may happen due to the size and (relatively) low density of the agglomeration, an important part of income of people living in these dwellings may be needed to cope with heating and transportation needs.

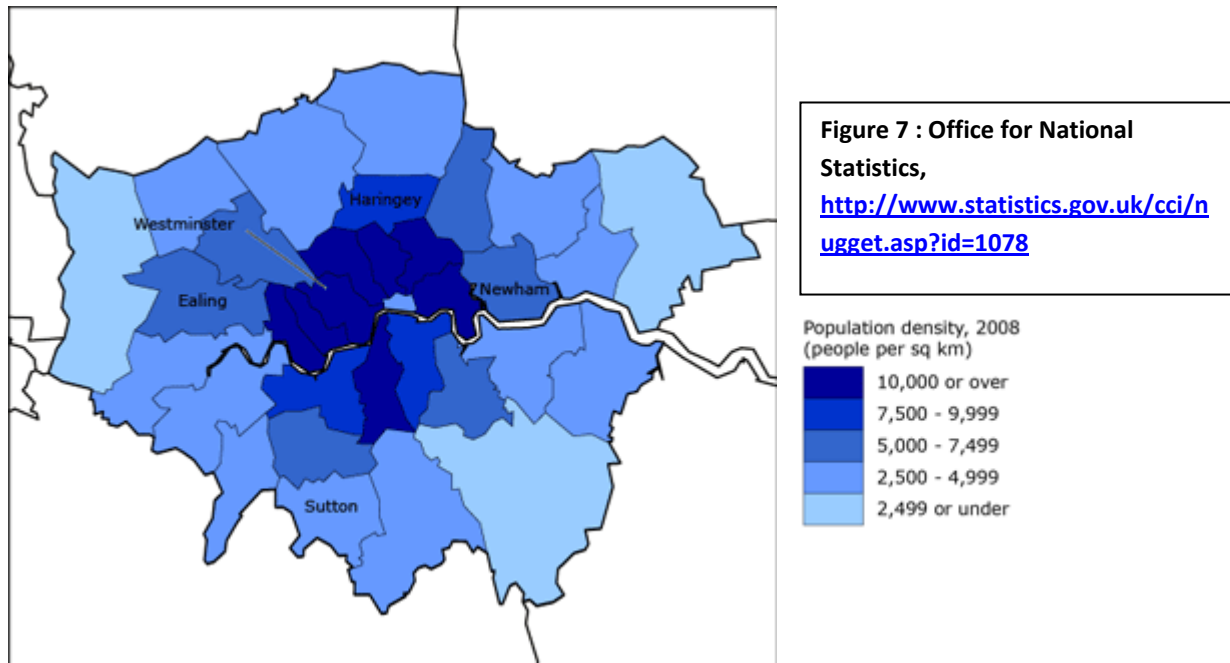
Another local problem is the local pollution arising mainly from road transportation (but also from aviation, and-more so in London-from Diesel –powered rail transportation). In Paris 3 millions people breath air which does not respect norm concerning NO<sub>2</sub> (Stif, 2009, PDU). Congestion problems, which are a well-known characteristic of most megacities, are something different, as they would happen even with pollution-free, low consumption vehicles. It is significant to note that the urban toll introduced in the center of London in 2003 carried the name of “congestion charge” and that its ex posts benefits are primarily a congestion reduction.

Moreover in the future, and in the case of London, climate change and higher sea level will represent an important threat. There is already a large flood control structure on the Thames river (the “Thames barrier”), which might need more investments.



## Administrative structure

We saw in the precedent parts that Paris Agglomeration and Greater London Area are largely similar concerning the demography, economy and energy domains. The main difference we explained is the density profile: Paris city is very dense (20,000 inhabitant/km<sup>2</sup>) but urbanization in its periphery is discontinuous and as a result the agglomeration is globally less dense than Greater London Area (3600 vs 4700). In London, as we can see figure 7, densities are quite homogenous in the entire area. We are not in a situation where many peaks are located in an area while density is very low elsewhere.



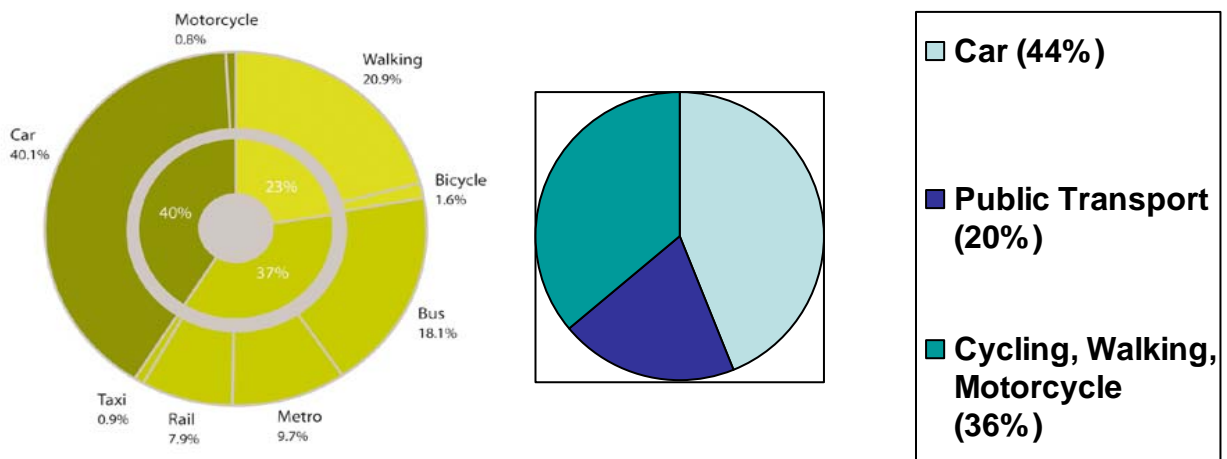
Above all, the administrative and political power coincides (more or less) with the agglomeration in the case of London: the Greater London area, headed by an elected Mayor and Council, comprises 7.5 million inhabitants (close to 90% of the agglomeration) and has large power of decision, even if the role of the 22 London Boroughs is also significant (for instance the “Merton rule” introduced an obligation of use of renewable energy in situ for large new buildings in that Borough as early as 2003; it was later generalized in the UK). The situation is quite different for Paris: the city of Paris (with also an elected Mayor and Council) has only 2.2 million inhabitants (and 105 km<sup>2</sup>, out of 2773 km<sup>2</sup> for the agglomeration); there are also 6 “intermediate” administrative and political areas called départements: 3 of them are entirely within the agglomeration of Paris. Finally, the Région Ile de France covers the city of Paris and the 6 départements. From the demographic point of view it has only some 15% more inhabitants than the agglomeration, but it is more than four times larger. In a political view, Paris agglomeration does not really exist. That is why all the figures in this case study are from Ile de France region and not for the agglomeration. Paris agglomeration is composed by **396 cities (“communes”)**. Each one has significant power for land use planning: planning permissions are given by each “commune” according to the local urban

planning document (“plan local d’urbanisme”) that has to be consistent with the Regional Planning Document (see below). Moreover, the préfet de Paris, as a representative of the central government, has a right of veto concerning modification of traffic condition in the city.

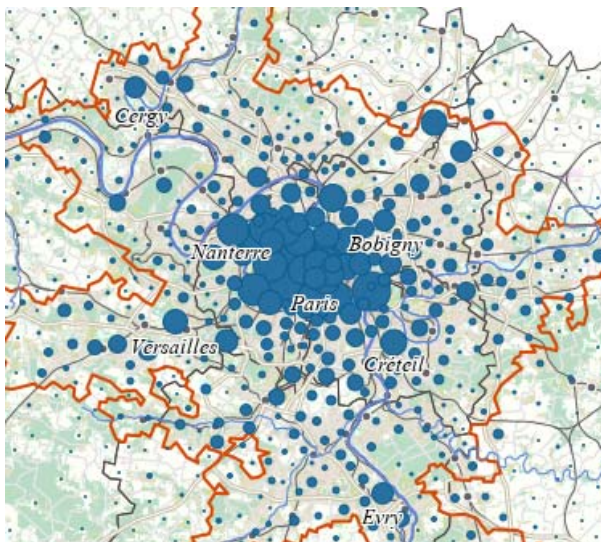
In both cases, the central government has an important role to play, notably through the contribution to financing of transport infrastructures. As an example, the British government is expected to grant 5 Billions £ for the Crossrail 1 Project, the total cost being 16 Bilions £.

### Mobility& Modal Share

**Figure 8 : London modal share (Urban age, 2009) and Ile de France modal share (2005, STIF), in journey**



In Paris city the high density of building and of public transport permit high level of public transport use and non motorized mobility. In its periphery, cars are privileged because public transport is less dense and because distances are great. Since the majority of jobs are in the centre, see figure X, many trip are generated from the periphery to the centre, implying important congestions and corresponding loss of utility and productivity.



**Figure 9 : Public and private employment in the agglomeration of Paris, Insee, IAU IDF, Clap 2006.**

## Networks

In these two megacities, networks run at full capacity during peak hour, which impacts the service quality. Public transports are more regular in Paris than in London, mainly because of under public investment in London networks during many years. Nevertheless, situation is improving in London since investment programs were set up in 2000, while the situation deteriorates in Ile de France.

The networks designs differ in some way. The centre of Paris agglomeration is very well served with a very tight network of subway whereas the periphery is much less served. In London, rail systems are more available in the whole territory, even in the periphery. Indeed at peak hour, there are 119 trains per 100,000 inhabitants+jobs in Inner London and 172 in Paris, but 50 trains in Outer London against 24 in the periphery of Paris (IAU, 2009). Even if the subway network in the centre is not very tight the mobility is preserved in Inner London thanks to an important bus network, larger than in Paris.

Nevertheless the public transport offers are quite close in the two cases: its two pretty well served developed countries cities.

The bigger figure for public transport mobility in London (see figure 8, London Public transport 36% -Cars 40% instead of 20%-44% for IdF) is explained by the network structure as described previously.

### Action plans from local authorities

The most important role local political authorities may have concerning energy use is to define an appropriate urban development strategy, and to implement it. For the greater London, this strategy is defined in the “London plan” published in 2004 and updated since then. For the agglomeration of Paris, it is the role of the “Schéma Directeur de la Région Ile de France” or SDRIF, which was published in September 2008 but is still expecting its approval by the central government, who, as least for the time being, holds different views on the future of the agglomeration. Without this approval, the SDRIF is not legally binding. The last news is that approval should be given within some weeks.

The main targets in the London plan are:

- to make London a more compact city and to integrate the future scale and phasing of development with the capacity of the public transport system and accessibility of different locations.
- to improve and expand London’s public transport, notably through rejuvenation of the underground system (after decades of under-investment), and through the completion of the very ambitious Crossrail 1 line (east-west high capacity high frequency railway line with a length of 70 Miles and an estimated cost of £ 16 billions)
- to encourage use of public transport, cycling and walking rather than car-based travel.

All these targets have several consequences; as far as energy consumption is concerned, they should reduce it globally, and specifically the use of oil products. Specific energy targets are in more details in the London climate change action plan (see hereafter).

In the Ile de France, the targets are very similar, notably the idea that the city of the future should be compact, so as to make an efficient use of resources, specially land and energy. The most ambitious public transport project is a new fully automatized railway around the city of Paris, called Arc Express by the Région, in the same time the French central government promotes an even more ambitious project, which has been heavily criticized by most specialists, notably because it would create a high capacity line in places where transportation flows are quite small, and will remain small in the foreseeable future. Nevertheless, both projects are not precisely defined (when? Where? At what cost?) for the time being, in sharp contrast with the Crossrail project.

Moreover there is an important political battle between the different authority levels making even more difficult the required coordination and we can say that the huge need of financing will be difficult to meet in the next decade. The difficulty to produce a shared and feasible project for Paris agglomeration is an important issue since this megacity would really need a strategic plan at a relevant scale: the agglomeration. It is likely than no one of these two projects will be implemented because of the weakness of the projects, the deep lack of consensus between all the authority levels and the huge need of money. In Paris more than in London, mobility sustainability depends on the ability of many authorities to work together, especially concerning land use and strategic development plan (detailed in the next section).

### **Climate action plan**

But of course, both London and Paris political authorities feel that they must play a role to fight climate change, even if most of its consequences do not affect directly these megacities. If one uses the distinction made by Lefevre and Wemaere between incremental changes-such as very low emission vehicles and buildings-and systemic innovations in urban design, spatial organization, networks and transport systems, it is clear that the latter are part of the above-mentioned London plan or SDRIF, not of specific climate change action plans. Nevertheless, the Mayor of London has elaborated a specific climate change action plan (published in February 2007) followed by the city of Paris (autumn 2007). There is no similar document for the time being concerning the Paris agglomeration (but Region Ile de France is preparing a climate plan), but the SDRIF contains some provisions concerning climate change.

The London climate change action plan sets out very ambitious targets: 60% emissions reduction by 2025 compared to 1990, but recognizes that “without much more rigorous national and international action-including widespread carbon pricing-we will divert from this path and by 2025 London’s emissions level will have stabilized at just 30% below 1990 levels “.

### **The main measures in this plan are:**

- The development of CHP, and of the use of biomass to generate heat and power, notably in the Thames Gateway urban regeneration project area.
- The replacement of Transport for London's buses with hybrid buses (that has already started; by 2012 all new buses should be hybrid buses)
- The development of energy efficiency, specially in public buildings.
- The development of renewable energies other than biomass to generate electricity: wind turbines (including building-mounted micro wind turbines) and PV.
- The use of urban refuse (most of it (70%) is presently buried in landfills) to generate energy.

The city of Paris has an apparently less ambitious plan, if one refers to the above-mentioned 60%, but its targets are quite similar to London's 30% by 2025. Similarly to the European "climate package" it includes not only CO2 emissions reduction targets, but also energy consumption reduction targets and renewable energy share targets: all three numbers are fixed at 25% by 2020, compared to 2004; clearly, the city of Paris wants to show that its plan is more ambitious than the European climate package (3 times 20%). For buildings and vehicles under the responsibility of the city of Paris, and for public lighting, these numbers become three times 30%.

The climate change plan of the city of Paris is quite comprehensive: almost every aspect of energy consumption is included. It also wants to take advantage of the few urban regeneration operations that are possible to make them showcases of sustainable development.

Most significant measures in this plan are the following:

- New and renovated buildings financed by the city of Paris, notably the social-housing stock, will have to be extremely energy-efficient. This will have a limited impact because new buildings inside Paris are in limited number, and also because it is not always possible to retrofit old buildings, due to architectural reasons.
- In privately owned buildings, energy consumption diagnoses will be financed up to 70% by the city of Paris, the Region Ile de France and ADEME. In some cases, the city of Paris will also subsidize up to 20% of the cost of works. Infrared thermography has been performed by APUR (Atelier Parisien d'Urbanisme), the local urban planning agency, on 500 buildings that are representative of Paris's buildings of different time periods. An awareness-raising exhibition of these pictures shows typical heat losses locations and gives advices on what kind of improvement is most necessary.

- The company providing district heating (Compagnie Parisienne de Chauffage Urbain: CPCU) will increase the share of renewable energies (more biomass, geothermal energy) in its mix to reach 60% by 2012. This 60% refers, in reality, to the sum of energy generated by urban refuse (be it renewable or not; usually it is considered that half of urban refuse is renewable) and geothermal energy (presently under development by CPCU; independent district heating networks using geothermal energy already exist in parts of the agglomeration not served by CPCU). More generally, the city of Paris acts through the companies of which it is a shareholder, or with which it has contractual links, so as to reduce energy consumption (public lighting, social housing...).
- Concerning transportation, and after the success of Velib' (self-service bicycle scheme), this service is being extended to neighbouring municipalities, and a self-service electric cars scheme (Autolib') is foreseen in the near future (normally 2011).
- Ambitious targets are fixed concerning the modal share of bicycle; it has already doubled between 2001 and 2008, and should double again till 2020. A large number of cycle lanes will be built, and, in most one-way streets, bicycles will be allowed to circulate two ways. More generally, the ambition of the Mayor of Paris is to limit the modal share of cars (as an example, he recently announced his intention to limit car traffic along the Seine banks).

More symbolic measures are the installation of 200000 m<sup>2</sup> PV on roofs (if this target is reached, it will provide some 20 GWh of electricity; that is to be compared to the electricity consumption of Paris (13.4 TWh or 13400 GWh) or of small wind turbines

To summarize, the targets are very similar on the two sides of the Channel. The greater London has very ambitious plans and it is not clear yet how will be achieved the results especially in the building sector. Much will depend on inhabitant's behaviour and choice even if the concierge service initiative is of interest. Nevertheless this plan has globally a good chance to be implemented, notably because the local government covers the major part of the London agglomeration, with significant possibilities of new developments and appropriate urban planning and new public transportation schemes; the situation is more complicated for the Paris agglomeration: in Paris itself, the climate plan is very systematic but action possibilities are relatively limited, as there are but a few new developments; concerning the whole agglomeration, conflicts between the Region Ile de France and the central government render a clear global view quite difficult, at least for the time being.

Who does what in Paris agglomeration?

Three levels : communes (some 400), departments (a total of eight: the city of Paris which is at the same time a commune and a department), three in the direct vicinity of the city of Paris (petite couronne), 4 more distant (grande couronne)), and Région Ile de France.

As far as buildings are concerned, and besides their own buildings (mairies, public libraries...) the communes are in charge of Kindergartens and primary schools, the departments of "colleges" (for children between approximately 11 and 15 years) and the Région of "lycées" (for children between 16 and 18 years). Public social housing can be under the responsibility of a commune or of a department or any other public collectivity (there also exists cooperative and private social housing). Hence the role of communes, departments and the Région can be crucial if they decide to build new schools or social housing buildings with very low energy consumption and/or renewable energy integration, or to renovate them with the same objectives.

The communes are responsible for urban planning, but their urban plans (PLU) have to be consistent with the more general document (SDRIF) elaborated by the Region (once this document has been approved by the central government... )

The authority in charge of organizing and financing public transportation is the STIF (syndicat des transports d'Ile de France) in which the Région, the departments and the city of Paris are represented. The Région has the majority of votes in the Board of STIF. Basically, there are two enterprises in charge of rail transportation : RATP: metro and a fraction of two RER lines (A and B), SNCF (and RFF for fixed infrastructures) for all other railways lines. RATP also operates bus lines in or close to Paris; bus lines farther away are operated by other companies.

As far as operational expenses are concerned, they amount to some 8 billion Euros financed more than half by STIF (who in turn gets around three quarters of this money paid by enterprises ("versement transport") and one quarter by his members (of which half paid by the Région). Users of public transport pay some 40% of the above-mentioned 8 billions (and even less for wage earners: in that case the firm where they work has the legal obligation of financing half of their transportation cost (if done by public transport))

Investments are financed on a case by case basis.

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